Baseline Human Health Risk Assessment

Columbia Falls Aluminum Company
2000 Aluminum Drive
Columbia Falls, Flathead County, Montana

Prepared for:

Columbia Falls Aluminum Company LLC

Prepared by:

EHS Support

July 29, 2019

Volume II of II

Appendices

Appendix A	ISM Evaluation
Appendix A1	ISM vs Discrete Sample Results Comparison
Appendix A2	ISM Triplicate Calculations
Appendix B	VISL Output for Trichloroethene
Appendix C	Surficial Soil Sampling Results from Asbestos Landfills Report
Appendix D	Summary of Samples Used in the HHRA
Appendix E	Analytical Data Tables
Appendix F	ProUCL Output
Appendix G	Interim Deliverable
Appendix H	Venison Uptake Models
Appendix I	Incremental Sampling Risk Characterization
Appendix J	Additional Groundwater Evaluation
Appendix K	Groundwater Statistical Analysis

Appendix A ISM Evaluation

Appendix A1 ISM vs Discrete Sample Results Comparison

Table A1-1
Comparison of Discrete and ISM Sample Detected Consitutents (Main Plant Area)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Main Plant Area Discrete (0 to 0.5 ft-bgs)			Main Plant Area Discrete (0 to 12 ft-bgs)			Main Plant Area ISM (0 to 0.5 ft-bgs)			Main Plant Area ISM (0 to 12 ft-bgs)		
CAS Number	Chemical Name	Detection Frequency	CAS Number	Chemical Name	Detection Frequency	CAS Number	Chemical Name	Detection Frequency	CAS Number	Chemical Name	Detection Frequency
57-12-5	Cyanide	74 / 83	57-12-5	Cyanide	192 / 284	57-12-5	Cyanide	11 / 11	57-12-5	Cyanide	28 / 28
16984-48-8	Fluoride	82 / 82	16984-48-8	Fluoride	279 / 283	16984-48-8	Fluoride	11 / 11	16984-48-8	Fluoride	28 / 28
7429-90-5	Aluminum	82 / 82	7429-90-5	Aluminum	283 / 283	7429-90-5	Aluminum	11 / 11	7429-90-5	Aluminum	28 / 28
7440-36-0	Antimony	6 / 82	7440-36-0	Antimony	12 / 283	7440-36-0	Antimony	11 / 11	7440-36-0	Antimony	28 / 28
7440-38-2	Arsenic	82 / 82	7440-38-2	Arsenic	283 / 283	7440-38-2	Arsenic	11 / 11	7440-38-2	Arsenic	28 / 28
7440-39-3	Barium	82 / 82	7440-39-3	Barium	283 / 283	7440-39-3	Barium	11 / 11	7440-39-3	Barium	28 / 28
7440-41-7	Beryllium	82 / 82	7440-41-7	Beryllium	283 / 283	7440-41-7	Beryllium	11 / 11	7440-41-7	Beryllium	28 / 28
7440-43-9	Cadmium	14 / 82	7440-43-9	Cadmium	23 / 283	7440-43-9	Cadmium	11 / 11	7440-43-9	Cadmium	28 / 28
7440-70-2	Calcium	82 / 82	7440-70-2	Calcium	283 / 283	7440-70-2	Calcium	11 / 11	7440-70-2	Calcium	28 / 28
18540-29-9	Chromium, Hexavalent	2 / 5	18540-29-9	Chromium, Hexavalent	2 / 9	18540-29-9	Chromium, Hexavalent	NA	18540-29-9	Chromium, Hexavalent	NA
7440-47-3	Chromium, Total	84 / 84	7440-47-3	Chromium, Total	287 / 287	7440-47-3	Chromium, Total	11 / 11	7440-47-3	Chromium, Total	28 / 28
7440-47-3_EST	Chromium, Hexavalent - Estimated	79 / 79	7440-47-3_EST	Chromium, Hexavalent - Estimated	278 / 278	18540-29-9	Chromium, Hexavalent - Estimated	11 / 11	18540-29-9	Chromium, Hexavalent - Estimated	28 / 28
16065-83-1_CALC	Chromium, Trivalent - Calculated	5 / 5	16065-83-1_CALC	Chromium, Trivalent - Calculated	9 / 9	16065-83-1_CALC	Chromium, Trivalent - Calculated	NA	16065-83-1_CALC	Chromium, Trivalent - Calculated	NA
16065-83-1_EST	Chromium, Trivalent - Estimated	79 / 79	16065-83-1_EST	Chromium, Trivalent - Estimated	278 / 278	16065-83-1	Chromium, Trivalent - Estimated	11 / 11	16065-83-1	Chromium, Trivalent - Estimated	28 / 28
7440-48-4	Cobalt	82 / 82	7440-48-4	Cobalt	283 / 283	7440-48-4	Cobalt	11 / 11	7440-48-4	Cobalt	28 / 28
7440-50-8	Copper	82 / 82	7440-50-8	Copper	283 / 283	7440-50-8	Copper	11 / 11	7440-50-8	Copper	28 / 28
7439-89-6	Iron	82 / 82	7439-89-6	Iron	283 / 283	7439-89-6	Iron	11 / 11	7439-89-6	Iron	28 / 28
7439-92-1	Lead	82 / 82	7439-92-1	Lead	283 / 283	7439-92-1	Lead	11 / 11	7439-92-1	Lead	28 / 28
7439-95-4	Magnesium	82 / 82	7439-95-4	Magnesium	283 / 283	7439-95-4	Magnesium	11 / 11	7439-95-4	Magnesium	28 / 28
7439-96-5	Manganese	82 / 82	7439-96-5	Manganese	283 / 283	7439-96-5	Manganese	11 / 11	7439-96-5	Manganese	28 / 28
7439-97-6	Mercury	74 / 82	7439-97-6	Mercury	239 / 283	7439-97-6	Mercury	5 / 11	7439-97-6	Mercury	12 / 28
7440-02-0	Nickel	82 / 82	7440-02-0	Nickel	283 / 283	7440-02-0	Nickel	11 / 11	7440-02-0	Nickel	28 / 28
7440-09-7	Potassium	82 / 82	7440-09-7	Potassium	283 / 283	7440-09-7	Potassium	11 / 11	7440-09-7	Potassium	28 / 28
7782-49-2	Selenium	4 / 82	7782-49-2	Selenium	10 / 283	7782-49-2	Selenium	11 / 11	7782-49-2	Selenium	28 / 28
7440-22-4	Silver	2 / 82	7440-22-4	Silver	4 / 283	7440-22-4	Silver	11 / 11	7440-22-4	Silver	28 / 28
7440-23-5	Sodium	63 / 82	7440-23-5	Sodium	191 / 280	7440-23-5	Sodium	11 / 11	7440-23-5	Sodium	28 / 28
7440-28-0	Thallium	0 / 82	7440-28-0	Thallium	4 / 283	7440-28-0	Thallium	11 / 11	7440-28-0	Thallium	28 / 28
7440-62-2	Vanadium	82 / 82	7440-62-2	Vanadium	283 / 283	7440-62-2	Vanadium	11 / 11	7440-62-2	Vanadium	28 / 28
7440-66-6	Zinc	82 / 82	7440-66-6	Zinc	283 / 283	7440-66-6	Zinc	11 / 11	7440-66-6	Zinc	28 / 28
309-00-2	Aldrin	0 / 23	309-00-2	Aldrin	0 / 23	309-00-2	Aldrin	0 / 11	309-00-2	Aldrin	0 / 14
319-84-6	Alpha Bhc (Alpha Hexachlorocyclohexane)	0 / 23	319-84-6	Alpha Bhc (Alpha Hexachlorocyclohexane)	0 / 23	319-84-6	Alpha Bhc (Alpha Hexachlorocyclohexane)	0 / 11	319-84-6	Alpha Bhc (Alpha Hexachlorocyclohexane)	0 / 14
959-98-8	Alpha Endosulfan	0 / 23	959-98-8	Alpha Endosulfan	0 / 23	959-98-8	Alpha Endosulfan	0 / 11	959-98-8	Alpha Endosulfan	0 / 14
319-85-7	Beta Bhc (Beta Hexachlorocyclohexane)	0 / 23	319-85-7	Beta Bhc (Beta Hexachlorocyclohexane)	0 / 23	319-85-7	Beta Bhc (Beta Hexachlorocyclohexane)	0 / 11	319-85-7	Beta Bhc (Beta Hexachlorocyclohexane)	0 / 14
33213-65-9	Beta Endosulfan	0 / 23	33213-65-9	Beta Endosulfan	0 / 23	33213-65-9	Beta Endosulfan	0 / 11	33213-65-9	Beta Endosulfan	0 / 14
5103-71-9	cis-Chlordane	0 / 23	5103-71-9	cis-Chlordane	0 / 23	5103-71-9	cis-Chlordane	0 / 11	5103-71-9	cis-Chlordane	0 / 14
319-86-8	Delta BHC (Delta Hexachlorocyclohexane)	0 / 23	319-86-8	Delta BHC (Delta Hexachlorocyclohexane)	0 / 23	319-86-8	Delta BHC (Delta Hexachlorocyclohexane)	0 / 11	319-86-8	Delta BHC (Delta Hexachlorocyclohexane)	0 / 14
60-57-1	Dieldrin	0 / 23	60-57-1	Dieldrin	0 / 23	60-57-1	Dieldrin	0 / 11	60-57-1	Dieldrin	0 / 14
1031-07-8	Endosulfan Sulfate	0 / 23	1031-07-8	Endosulfan Sulfate	0 / 23	1031-07-8	Endosulfan Sulfate	0 / 11	1031-07-8	Endosulfan Sulfate	0 / 14
72-20-8	Endrin	0 / 23	72-20-8	Endrin	0 / 23	72-20-8	Endrin	0 / 11	72-20-8	Endrin	0 / 14
7421-93-4	Endrin Aldehyde	0 / 23	7421-93-4	Endrin Aldehyde	0 / 23	7421-93-4	Endrin Aldehyde	0 / 11	7421-93-4	Endrin Aldehyde	0 / 14
53494-70-5	Endrin Ketone	0 / 23	53494-70-5	Endrin Ketone	0 / 23	53494-70-5	Endrin Ketone	0 / 11	53494-70-5	Endrin Ketone	0 / 14
58-89-9	Gamma Bhc (Lindane)	0 / 23	58-89-9	Gamma Bhc (Lindane)	0 / 23	58-89-9	Gamma Bhc (Lindane)	0 / 11	58-89-9	Gamma Bhc (Lindane)	0 / 14
76-44-8	Heptachlor	0 / 23	76-44-8	Heptachlor	0 / 23	76-44-8	Heptachlor	0 / 11	76-44-8	Heptachlor	0 / 14
1024-57-3	Heptachlor Epoxide	0 / 23	1024-57-3	Heptachlor Epoxide	0 / 23	1024-57-3	Heptachlor Epoxide	0 / 11	1024-57-3	Heptachlor Epoxide	0 / 14
72-43-5	Methoxychlor	0 / 23	72-43-5	Methoxychlor	0 / 23	72-43-5	Methoxychlor	0 / 11	72-43-5	Methoxychlor	0 / 14
72-54-8	P,P'-DDD	0 / 23	72-54-8	P,P'-DDD	0 / 23	72-54-8	P,P'-DDD	0 / 11	72-54-8	P,P'-DDD	0 / 14
72-55-9	P,P'-DDE	0 / 23	72-55-9	P,P'-DDE	0 / 23	72-55-9	P,P'-DDE	0 / 11	72-55-9	P,P'-DDE	0 / 14
50-29-3	P,P'-DDT	0 / 23	50-29-3	P,P'-DDT	0 / 23	50-29-3	P,P'-DDT	0 / 11	50-29-3	P,P'-DDT	0 / 14
8001-35-2	Toxaphene	0 / 23	8001-35-2	Toxaphene	0 / 23	8001-35-2	Toxaphene	0 / 11	8001-35-2	Toxaphene	0 / 14
5103-74-2	trans-Chlordane	0 / 23	5103-74-2	trans-Chlordane	0 / 23	5103-74-2	trans-Chlordane	0 / 11	5103-74-2	trans-Chlordane	0 / 14
12674-11-2	PCB-1016 (Aroclor 1016)	0 / 71	12674-11-2	PCB-1016 (Aroclor 1016)	0 / 222	12674-11-2	PCB-1016 (Aroclor 1016)	0 / 11	12674-11-2	PCB-1016 (Aroclor 1016)	0 / 28
11104-28-2	PCB-1221 (Aroclor 1221)	0 / 71	11104-28-2	PCB-1221 (Aroclor 1221)	0 / 222	11104-28-2	PCB-1221 (Aroclor 1221)	0 / 11	11104-28-2	PCB-1221 (Aroclor 1221)	0 / 28
11141-16-5	PCB-1232 (Aroclor 1232)	0 / 71	11141-16-5	PCB-1232 (Aroclor 1232)	0 / 222	11141-16-5	PCB-1232 (Aroclor 1232)	0 / 11	11141-16-5	PCB-1232 (Aroclor 1232)	0 / 28
53469-21-9	PCB-1242 (Aroclor 1242)	0 / 71	53469-21-9	PCB-1242 (Aroclor 1242)	0 / 222	53469-21-9	PCB-1242 (Aroclor 1242)	0 / 11	53469-21-9	PCB-1242 (Aroclor 1242)	0 / 28
12672-29-6	PCB-1248 (Aroclor 1248)	0 / 71	12672-29-6	PCB-1248 (Aroclor 1248)	0 / 222	12672-29-6	PCB-1248 (Aroclor 1248)	0 / 11	12672-29-6	PCB-1248 (Aroclor 1248)	0 / 28
11097-69-1	PCB-1254 (Aroclor 1254)	3 / 71	11097-69-1	PCB-1254 (Aroclor 1254)	4 / 222	11097-69-1	PCB-1254 (Aroclor 1254)	0 / 11	11097-69-1	PCB-1254 (Aroclor 1254)	0 / 28
11096-82-5	PCB-1260 (Aroclor 1260)	0 / 71	11096-82-5	PCB-1260 (Aroclor 1260)	0 / 222	11096-82-5	PCB-1260 (Aroclor 1260)	0 / 11	11096-82-5	PCB-1260 (Aroclor 1260)	0 / 28
37324-23-5	PCB-1262 (Aroclor 1262)	0 / 71	37324-23-5	PCB-1262 (Aroclor 1262)	0 / 222	37324-23-5	PCB-1262 (Aroclor 1262)	0 / 11	37324-23-5	PCB-1262 (Aroclor 1262)	0 / 28

Table A1-1
Comparison of Discrete and ISM Sample Detected Consitutents (Main Plant Area)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Main Plant Area Discrete (0 to 0.5 ft-bgs)			Main Plant Area Discrete (0 to 12 ft-bgs)			Main Plant Area ISM (0 to 0.5 ft-bgs)			Main Plant Area ISM (0 to 12 ft-bgs)		
CAS Number	Chemical Name	Detection Frequency	CAS Number	Chemical Name	Detection Frequency	CAS Number	Chemical Name	Detection Frequency	CAS Number	Chemical Name	Detection Frequency
11100-14-4	PCB-1268 (Aroclor 1268)	0 / 71	11100-14-4	PCB-1268 (Aroclor 1268)	0 / 222	11100-14-4	PCB-1268 (Aroclor 1268)	0 / 11	11100-14-4	PCB-1268 (Aroclor 1268)	0 / 28
1336-36-3	Polychlorinated Biphenyl (PCBs)	3 / 71	1336-36-3	Polychlorinated Biphenyl (PCBs)	4 / 222	1336-36-3	Polychlorinated Biphenyl (PCBs)	0 / 11	1336-36-3	Polychlorinated Biphenyl (PCBs)	0 / 28
95-94-3	1,2,4,5-Tetrachlorobenzene	0 / 82	95-94-3	1,2,4,5-Tetrachlorobenzene	0 / 283	95-94-3	1,2,4,5-Tetrachlorobenzene	0 / 11	95-94-3	1,2,4,5-Tetrachlorobenzene	0 / 28
123-91-1	1,4-Dioxane (P-Dioxane)	0 / 82	123-91-1	1,4-Dioxane (P-Dioxane)	0 / 281	123-91-1	1,4-Dioxane (P-Dioxane)	0 / 11	123-91-1	1,4-Dioxane (P-Dioxane)	0 / 28
58-90-2	2,3,4,6-Tetrachlorophenol	0 / 82	58-90-2	2,3,4,6-Tetrachlorophenol	0 / 281	58-90-2	2,3,4,6-Tetrachlorophenol	0 / 11	58-90-2	2,3,4,6-Tetrachlorophenol	0 / 28
95-95-4	2,4,5-Trichlorophenol	0 / 82	95-95-4	2,4,5-Trichlorophenol	0 / 281	95-95-4	2,4,5-Trichlorophenol	0 / 11	95-95-4	2,4,5-Trichlorophenol	0 / 28
88-06-2	2,4,6-Trichlorophenol	0 / 82	88-06-2	2,4,6-Trichlorophenol	0 / 281	88-06-2	2,4,6-Trichlorophenol	0 / 11	88-06-2	2,4,6-Trichlorophenol	0 / 28
120-83-2	2,4-Dichlorophenol	0 / 82	120-83-2	2,4-Dichlorophenol	0 / 281	120-83-2	2,4-Dichlorophenol	0 / 11	120-83-2	2,4-Dichlorophenol	0 / 28
105-67-9	2,4-Dimethylphenol	0 / 82	105-67-9	2,4-Dimethylphenol	0 / 281	105-67-9	2,4-Dimethylphenol	0 / 11	105-67-9	2,4-Dimethylphenol	0 / 28
51-28-5	2,4-Dinitrophenol	0 / 82	51-28-5	2,4-Dinitrophenol	0 / 278	51-28-5	2,4-Dinitrophenol	0 / 11	51-28-5	2,4-Dinitrophenol	0 / 28
121-14-2	2,4-Dinitrotoluene	0 / 82	121-14-2	2,4-Dinitrotoluene	0 / 283	121-14-2	2,4-Dinitrotoluene	0 / 11	121-14-2	2,4-Dinitrotoluene	0 / 28
606-20-2	2,6-Dinitrotoluene	0 / 82	606-20-2	2,6-Dinitrotoluene	0 / 283	606-20-2	2,6-Dinitrotoluene	0 / 11	606-20-2	2,6-Dinitrotoluene	0 / 28
91-58-7	2-Chloronaphthalene	0 / 82	91-58-7	2-Chloronaphthalene	0 / 283	91-58-7	2-Chloronaphthalene	0 / 11	91-58-7	2-Chloronaphthalene	0 / 28
95-57-8	2-Chlorophenol	0 / 82	95-57-8	2-Chlorophenol	0 / 281	95-57-8	2-Chlorophenol	0 / 11	95-57-8	2-Chlorophenol	0 / 28
91-57-6	2-Methylnaphthalene	44 / 82	91-57-6	2-Methylnaphthalene	93 / 283	91-57-6	2-Methylnaphthalene	8 / 11	91-57-6	2-Methylnaphthalene	21 / 28
95-48-7	2-Methylphenol (O-Cresol)	0 / 82	95-48-7	2-Methylphenol (O-Cresol)	0 / 281	95-48-7	2-Methylphenol (O-Cresol)	0 / 11	95-48-7	2-Methylphenol (O-Cresol)	0 / 28
88-74-4	2-Nitroaniline	0 / 82	88-74-4	2-Nitroaniline	0 / 283	88-74-4	2-Nitroaniline	0 / 11	88-74-4	2-Nitroaniline	0 / 28
88-75-5	2-Nitrophenol	0 / 82	88-75-5	2-Nitrophenol	0 / 281	88-75-5	2-Nitrophenol	0 / 11	88-75-5	2-Nitrophenol	0 / 28
91-94-1	3,3'-Dichlorobenzidine	0 / 82	91-94-1	3,3'-Dichlorobenzidine	0 / 283	91-94-1	3,3'-Dichlorobenzidine	0 / 11	91-94-1	3,3'-Dichlorobenzidine	0 / 28
MEPH3MEPH4	3- And 4- Methylphenol (Total)	1 / 62	MEPH3MEPH4	3- And 4- Methylphenol (Total)	4 / 203	MEPH3MEPH4	3- And 4- Methylphenol (Total)	0 / 11	MEPH3MEPH4	3- And 4- Methylphenol (Total)	1 / 28
99-09-2	3-Nitroaniline	0 / 82	99-09-2	3-Nitroaniline	0 / 283	99-09-2	3-Nitroaniline	0 / 11	99-09-2	3-Nitroaniline	0 / 28
534-52-1	4,6-Dinitro-2-Methylphenol	0 / 82	534-52-1	4,6-Dinitro-2-Methylphenol	0 / 281	534-52-1	4,6-Dinitro-2-Methylphenol	0 / 11	534-52-1	4,6-Dinitro-2-Methylphenol	0 / 28
101-55-3	4-Bromophenyl Phenyl Ether	0 / 82	101-55-3	4-Bromophenyl Phenyl Ether	0 / 283	101-55-3	4-Bromophenyl Phenyl Ether	0 / 11	101-55-3	4-Bromophenyl Phenyl Ether	0 / 28
59-50-7	4-Chloro-3-Methylphenol	0 / 82	59-50-7	4-Chloro-3-Methylphenol	0 / 281	59-50-7	4-Chloro-3-Methylphenol	0 / 11	59-50-7	4-Chloro-3-Methylphenol	0 / 28
106-47-8	4-Chloroaniline	0 / 82	106-47-8	4-Chloroaniline	0 / 283	106-47-8	4-Chloroaniline	0 / 11	106-47-8	4-Chloroaniline	0 / 28
7005-72-3	4-Chlorophenyl Phenyl Ether	0 / 82	7005-72-3	4-Chlorophenyl Phenyl Ether	0 / 283	7005-72-3	4-Chlorophenyl Phenyl Ether	0 / 11	7005-72-3	4-Chlorophenyl Phenyl Ether	0 / 28
100-01-6	4-Nitroaniline	0 / 82	100-01-6	4-Nitroaniline	0 / 283	100-01-6	4-Nitroaniline	0 / 11	100-01-6	4-Nitroaniline	0 / 28
100-02-7	4-Nitrophenol	0 / 82	100-02-7	4-Nitrophenol	0 / 281	100-02-7	4-Nitrophenol	0 / 11	100-02-7	4-Nitrophenol	0 / 28
83-32-9	Acenaphthene	68 / 82	83-32-9	Acenaphthene	149 / 283	83-32-9	Acenaphthene	11 / 11	83-32-9	Acenaphthene	28 / 28
208-96-8	Acenaphthylene	11 / 82	208-96-8	Acenaphthylene	21 / 283	208-96-8	Acenaphthylene	1 / 11	208-96-8	Acenaphthylene	5 / 28
98-86-2	Acetophenone	3 / 82	98-86-2	Acetophenone	8 / 283	98-86-2	Acetophenone	0 / 11	98-86-2	Acetophenone	2 / 28
120-12-7	Anthracene	65 / 82	120-12-7	Anthracene	129 / 283	120-12-7	Anthracene	11 / 11	120-12-7	Anthracene	27 / 28
1912-24-9	Atrazine	0 / 82	1912-24-9	Atrazine	0 / 283	1912-24-9	Atrazine	0 / 11	1912-24-9	Atrazine	0 / 28
100-52-7	Benzaldehyde	4 / 68	100-52-7	Benzaldehyde	6 / 218	100-52-7	Benzaldehyde	0 / 11	100-52-7	Benzaldehyde	0 / 28
56-55-3	Benzo(A)Anthracene	78 / 82	56-55-3	Benzo(A)Anthracene	205 / 283	56-55-3	Benzo(A)Anthracene	11 / 11	56-55-3	Benzo(A)Anthracene	28 / 28
50-32-8	Benzo(A)Pyrene	80 / 82	50-32-8	Benzo(A)Pyrene	222 / 283	50-32-8	Benzo(A)Pyrene	11 / 11	50-32-8	Benzo(A)Pyrene	28 / 28
205-99-2	Benzo(B)Fluoranthene	81 / 82	205-99-2	Benzo(B)Fluoranthene	227 / 283	205-99-2	Benzo(B)Fluoranthene	11 / 11	205-99-2	Benzo(B)Fluoranthene	28 / 28
191-24-2	Benzo(G,H,I)Perylene	81 / 82	191-24-2	Benzo(G,H,I)Perylene	214 / 283	191-24-2	Benzo(G,H,I)Perylene	11 / 11	191-24-2	Benzo(G,H,I)Perylene	28 / 28
207-08-9	Benzo(K)Fluoranthene	78 / 82	207-08-9	Benzo(K)Fluoranthene	197 / 283	207-08-9	Benzo(K)Fluoranthene	11 / 11	207-08-9	Benzo(K)Fluoranthene	28 / 28
85-68-7	Benzyl Butyl Phthalate	19 / 82	85-68-7	Benzyl Butyl Phthalate	36 / 283	85-68-7	Benzyl Butyl Phthalate	4 / 11	85-68-7	Benzyl Butyl Phthalate	9 / 28
92-52-4	Biphenyl (Diphenyl)	3 / 82	92-52-4	Biphenyl (Diphenyl)	17 / 283	92-52-4	Biphenyl (Diphenyl)	0 / 11	92-52-4	Biphenyl (Diphenyl)	1 / 28
111-91-1	Bis(2-Chloroethoxy) Methane	0 / 82	111-91-1	Bis(2-Chloroethoxy) Methane	0 / 283	111-91-1	Bis(2-Chloroethoxy) Methane	0 / 11	111-91-1	Bis(2-Chloroethoxy) Methane	0 / 28
111-44-4	Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0 / 82	111-44-4	Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0 / 283	111-44-4	Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0 / 11	111-44-4	Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0 / 28
108-60-1	Bis(2-Chloroisopropyl) Ether	0 / 82	108-60-1	Bis(2-Chloroisopropyl) Ether	0 / 282	108-60-1	Bis(2-Chloroisopropyl) Ether	0 / 11	108-60-1	Bis(2-Chloroisopropyl) Ether	0 / 28
117-81-7	Bis(2-Ethylhexyl) Phthalate	30 / 82	117-81-7	Bis(2-Ethylhexyl) Phthalate	62 / 283	117-81-7	Bis(2-Ethylhexyl) Phthalate	1 / 11	117-81-7	Bis(2-Ethylhexyl) Phthalate	3 / 28
105-60-2	Caprolactam	0 / 82	105-60-2	Caprolactam	0 / 283	105-60-2	Caprolactam	0 / 11	105-60-2	Caprolactam	0 / 28
86-74-8	Carbazole	74 / 82	86-74-8	Carbazole	171 / 283	86-74-8	Carbazole	11 / 11	86-74-8	Carbazole	28 / 28
218-01-9	Chrysene	81 / 82	218-01-9	Chrysene	231 / 283	218-01-9	Chrysene	11 / 11	218-01-9	Chrysene	28 / 28
84-74-2	Di-N-Butyl Phthalate	12 / 82	84-74-2	Di-N-Butyl Phthalate	35 / 283	84-74-2	Di-N-Butyl Phthalate	2 / 11	84-74-2	Di-N-Butyl Phthalate	12 / 28
117-84-0	Di-N-Octylphthalate	0 / 82	117-84-0	Di-N-Octylphthalate	1 / 283	117-84-0	Di-N-Octylphthalate	0 / 11	117-84-0	Di-N-Octylphthalate	0 / 28
53-70-3	Dibenz(A,H)Anthracene	72 / 82	53-70-3	Dibenz(A,H)Anthracene	161 / 283	53-70-3	Dibenz(A,H)Anthracene	11 / 11	53-70-3	Dibenz(A,H)Anthracene	27 / 28
132-64-9	Dibenzofuran	56 / 82	132-64-9	Dibenzofuran	111 / 283	132-64-9	Dibenzofuran	11 / 11	132-64-9	Dibenzofuran	25 / 28
84-66-2	Diethyl Phthalate	0 / 82	84-66-2	Diethyl Phthalate	0 / 283	84-66-2	Diethyl Phthalate	0 / 11	84-66-2	Diethyl Phthalate	0 / 28
131-11-3	Dimethyl Phthalate	0 / 82	131-11-3	Dimethyl Phthalate	0 / 283	131-11-3	Dimethyl Phthalate	0 / 11	131-11-3	Dimethyl Phthalate	0 / 28
206-44-0	Fluoranthene	81 / 82	206-44-0	Fluoranthene	235 / 283	206-44-0	Fluoranthene	11 / 11	206-44-0	Fluoranthene	28 / 28
86-73-7	Fluorene	64 / 82	86-73-7	Fluorene	140 / 283	86-73-7	Fluorene	11 / 11	86-73-7	Fluorene	28 / 28
118-74-1	Hexachlorobenzene	0 / 82	118-74-1	Hexachlorobenzene	1 / 283	118-74-1	Hexachlorobenzene	0 / 11	118-74-1	Hexachlorobenzene	0 / 28

Table A1-1
Comparison of Discrete and ISM Sample Detected Consitutents (Main Plant Area)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Main Plant Area Discrete (0 to 0.5 ft-bgs)			Main Plant Area Discrete (0 to 12 ft-bgs)			Main Plant Area ISM (0 to 0.5 ft-bgs)			Main Plant Area ISM (0 to 12 ft-bgs)		
CAS Number	Chemical Name	Detection Frequency	CAS Number	Chemical Name	Detection Frequency	CAS Number	Chemical Name	Detection Frequency	CAS Number	Chemical Name	Detection Frequency
87-68-3	Hexachlorobutadiene	0 / 82	87-68-3	Hexachlorobutadiene	0 / 283	87-68-3	Hexachlorobutadiene	0 / 11	87-68-3	Hexachlorobutadiene	0 / 28
77-47-4	Hexachlorocyclopentadiene	0 / 82	77-47-4	Hexachlorocyclopentadiene	0 / 283	77-47-4	Hexachlorocyclopentadiene	0 / 11	77-47-4	Hexachlorocyclopentadiene	0 / 28
67-72-1	Hexachloroethane	0 / 82	67-72-1	Hexachloroethane	0 / 283	67-72-1	Hexachloroethane	0 / 11	67-72-1	Hexachloroethane	0 / 28
193-39-5	Indeno(1,2,3-C,D)Pyrene	81 / 82	193-39-5	Indeno(1,2,3-C,D)Pyrene	210 / 283	193-39-5	Indeno(1,2,3-C,D)Pyrene	11 / 11	193-39-5	Indeno(1,2,3-C,D)Pyrene	28 / 28
78-59-1	Isophorone	4 / 82	78-59-1	Isophorone	13 / 283	78-59-1	Isophorone	0 / 11	78-59-1	Isophorone	0 / 28
621-64-7	N-Nitrosodi-N-Propylamine	0 / 82	621-64-7	N-Nitrosodi-N-Propylamine	0 / 283	621-64-7	N-Nitrosodi-N-Propylamine	0 / 11	621-64-7	N-Nitrosodi-N-Propylamine	0 / 28
86-30-6	N-Nitrosodiphenylamine	0 / 82	86-30-6	N-Nitrosodiphenylamine	0 / 283	86-30-6	N-Nitrosodiphenylamine	0 / 11	86-30-6	N-Nitrosodiphenylamine	0 / 28
91-20-3	Naphthalene	56 / 82	91-20-3	Naphthalene	115 / 283	91-20-3	Naphthalene	8 / 11	91-20-3	Naphthalene	23 / 28
98-95-3	Nitrobenzene	0 / 82	98-95-3	Nitrobenzene	0 / 283	98-95-3	Nitrobenzene	0 / 11	98-95-3	Nitrobenzene	0 / 28
87-86-5	Pentachlorophenol	3 / 82	87-86-5	Pentachlorophenol	5 / 281	87-86-5	Pentachlorophenol	1 / 11	87-86-5	Pentachlorophenol	1 / 28
85-01-8	Phenanthrene	81 / 82	85-01-8	Phenanthrene	228 / 283	85-01-8	Phenanthrene	11 / 11	85-01-8	Phenanthrene	28 / 28
108-95-2	Phenol	0 / 82	108-95-2	Phenol	1 / 281	108-95-2	Phenol	1 / 11	108-95-2	Phenol	3 / 28
129-00-0	Pyrene	81 / 82	129-00-0	Pyrene	230 / 283	129-00-0	Pyrene	11 / 11	129-00-0	Pyrene	28 / 28

CAS = chemical abstract service
NA = not applicable
XX Indicates chemical detected in ISM sample(s), but not discrete sample(s)
XX Indicates chemical detected in discrete sample(s), but not ISM sample(s)

Table A1-2
Comparison of Discrete and ISM Sample Detected Consitutents (Central Landfill Area)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Central Landfill Area Discrete (0 to 0.5 ft-bgs)			Central Landfill Area Discrete (0 to 2 ft-bgs)			Central Landfill Area ISM (0 to 0.5 ft-bgs)			Central Landfill Area ISM (0 to 2 ft-bgs)		
CAS Number	Chemical	Detection Frequency	CAS Number	Chemical	Detection Frequency	CAS Number	Chemical	Detection Frequency	CAS Number	Chemical	Detection Frequency
57-12-5	Cyanide	44 / 59	57-12-5	Cyanide	81 / 118	57-12-5	Cyanide	36 / 36	57-12-5	Cyanide	66 / 68
16984-48-8	Fluoride	59 / 59	16984-48-8	Fluoride	118 / 118	16984-48-8	Fluoride	36 / 36	16984-48-8	Fluoride	68 / 68
7440-47-3_EST	Chromium, Hexavalent - Estimated	59 / 59	7440-47-3_EST	Chromium, Hexavalent - Estimated	118 / 118	7440-47-3_EST	Chromium, Hexavalent - Estimated	32 / 32	7440-47-3_EST	Chromium, Hexavalent - Estimated	61 / 61
16065-83-1_CALC	Chromium, Trivalent - Calculated	2 / 3	16065-83-1_CALC	Chromium, Trivalent - Calculated	5 / 6	16065-83-1_CALC	Chromium, Trivalent - Calculated	NA	16065-83-1_CALC	Chromium, Trivalent - Calculated	NA
16065-83-1_EST	Chromium, Trivalent - Estimated	59 / 59	16065-83-1_EST	Chromium, Trivalent - Estimated	118 / 118	16065-83-1_EST	Chromium, Trivalent - Estimated	32 / 32	16065-83-1_EST	Chromium, Trivalent - Estimated	61 / 61
7429-90-5	Aluminum	59 / 59	7429-90-5	Aluminum	118 / 118	7429-90-5	Aluminum	36 / 36	7429-90-5	Aluminum	68 / 68
7440-36-0	Antimony	2 / 59	7440-36-0	Antimony	4 / 118	7440-36-0	Antimony	30 / 36	7440-36-0	Antimony	50 / 68
7440-38-2	Arsenic	59 / 59	7440-38-2	Arsenic	118 / 118	7440-38-2	Arsenic	36 / 36	7440-38-2	Arsenic	68 / 68
7440-39-3	Barium	59 / 59	7440-39-3	Barium	118 / 118	7440-39-3	Barium	36 / 36	7440-39-3	Barium	68 / 68
7440-41-7	Beryllium	59 / 59	7440-41-7	Beryllium	116 / 118	7440-41-7	Beryllium	36 / 36	7440-41-7	Beryllium	68 / 68
7440-43-9	Cadmium	1 / 59	7440-43-9	Cadmium	5 / 118	7440-43-9	Cadmium	32 / 36	7440-43-9	Cadmium	61 / 68
7440-70-2	Calcium	59 / 59	7440-70-2	Calcium	118 / 118	7440-70-2	Calcium	36 / 36	7440-70-2	Calcium	68 / 68
18540-29-9	Chromium, Hexavalent	0 / 3	18540-29-9	Chromium, Hexavalent	0 / 6	18540-29-9	Chromium, Hexavalent - Estimated	32 / 32	18540-29-9	Chromium, Hexavalent - Estimated	61 / 61
7440-47-3	Chromium, Total	61 / 62	7440-47-3	Chromium, Total	123 / 124	7440-47-3	Chromium, Total	36 / 36	7440-47-3	Chromium, Total	68 / 68
7440-48-4	Cobalt	59 / 59	7440-48-4	Cobalt	118 / 118	7440-48-4	Cobalt	36 / 36	7440-48-4	Cobalt	68 / 68
7440-50-8	Copper	59 / 59	7440-50-8	Copper	118 / 118	7440-50-8	Copper	36 / 36	7440-50-8	Copper	68 / 68
7439-89-6	Iron	59 / 59	7439-89-6	Iron	118 / 118	7439-89-6	Iron	36 / 36	7439-89-6	Iron	68 / 68
7439-92-1	Lead	59 / 59	7439-92-1	Lead	118 / 118	7439-92-1	Lead	36 / 36	7439-92-1	Lead	68 / 68
7439-95-4	Magnesium	59 / 59	7439-95-4	Magnesium	118 / 118	7439-95-4	Magnesium	36 / 36	7439-95-4	Magnesium	68 / 68
7439-96-5	Manganese	59 / 59	7439-96-5	Manganese	118 / 118	7439-96-5	Manganese	36 / 36	7439-96-5	Manganese	68 / 68
7439-97-6	Mercury	49 / 59	7439-97-6	Mercury	96 / 118	7439-97-6	Mercury	28 / 36	7439-97-6	Mercury	57 / 68
7440-02-0	Nickel	59 / 59	7440-02-0	Nickel	118 / 118	7440-02-0	Nickel	36 / 36	7440-02-0	Nickel	68 / 68
7440-09-7	Potassium	59 / 59	7440-09-7	Potassium	118 / 118	7440-09-7	Potassium	36 / 36	7440-09-7	Potassium	68 / 68
7782-49-2	Selenium	12 / 59	7782-49-2	Selenium	18 / 118	7782-49-2	Selenium	32 / 36	7782-49-2	Selenium	61 / 68
7440-22-4	Silver	0 / 59	7440-22-4	Silver	0 / 118	7440-22-4	Silver	32 / 36	7440-22-4	Silver	61 / 68
7440-23-5	Sodium	39 / 59	7440-23-5	Sodium	80 / 118	7440-23-5	Sodium	34 / 36	7440-23-5	Sodium	64 / 68
7440-28-0	Thallium	7 / 59	7440-28-0	Thallium	16 / 118	7440-28-0	Thallium	33 / 36	7440-28-0	Thallium	63 / 68
7440-62-2	Vanadium	59 / 59	7440-62-2	Vanadium	118 / 118	7440-62-2	Vanadium	36 / 36	7440-62-2	Vanadium	68 / 68
7440-66-6	Zinc	59 / 59	7440-66-6	Zinc	118 / 118	7440-66-6	Zinc	36 / 36	7440-66-6	Zinc	68 / 68
309-00-2	Aldrin	0 / 10	309-00-2	Aldrin	0 / 10	309-00-2	Aldrin	0 / 36	309-00-2	Aldrin	0 / 36
319-84-6	Alpha Bhc (Alpha Hexachlorocyclohexane)	0 / 10	319-84-6	Alpha Bhc (Alpha Hexachlorocyclohexane)	0 / 10	319-84-6	Alpha Bhc (Alpha Hexachlorocyclohexane)	0 / 36	319-84-6	Alpha Bhc (Alpha Hexachlorocyclohexane)	0 / 36
959-98-8	Alpha Endosulfan	0 / 10	959-98-8	Alpha Endosulfan	0 / 10	959-98-8	Alpha Endosulfan	0 / 36	959-98-8	Alpha Endosulfan	0 / 36
319-85-7	Beta Bhc (Beta Hexachlorocyclohexane)	0 / 10	319-85-7	Beta Bhc (Beta Hexachlorocyclohexane)	0 / 10	319-85-7	Beta Bhc (Beta Hexachlorocyclohexane)	0 / 36	319-85-7	Beta Bhc (Beta Hexachlorocyclohexane)	0 / 36
33213-65-9	Beta Endosulfan	0 / 10	33213-65-9	Beta Endosulfan	0 / 10	33213-65-9	Beta Endosulfan	0 / 36	33213-65-9	Beta Endosulfan	0 / 36
5103-71-9	cis-Chlordane	0 / 10	5103-71-9	cis-Chlordane	0 / 10	5103-71-9	cis-Chlordane	0 / 36	5103-71-9	cis-Chlordane	0 / 36
319-86-8	Delta BHC (Delta Hexachlorocyclohexane)	0 / 10	319-86-8	Delta BHC (Delta Hexachlorocyclohexane)	0 / 10	319-86-8	Delta BHC (Delta Hexachlorocyclohexane)	0 / 36	319-86-8	Delta BHC (Delta Hexachlorocyclohexane)	0 / 36
60-57-1	Dieldrin	0 / 9	60-57-1	Dieldrin	0 / 9	60-57-1	Dieldrin	0 / 36	60-57-1	Dieldrin	0 / 36
1031-07-8	Endosulfan Sulfate	0 / 10	1031-07-8	Endosulfan Sulfate	0 / 10	1031-07-8	Endosulfan Sulfate	0 / 36	1031-07-8	Endosulfan Sulfate	0 / 36
72-20-8	Endrin	0 / 10	72-20-8	Endrin	0 / 10	72-20-8	Endrin	0 / 36	72-20-8	Endrin	0 / 36
7421-93-4	Endrin Aldehyde	0 / 10	7421-93-4	Endrin Aldehyde	0 / 10	7421-93-4	Endrin Aldehyde	0 / 36	7421-93-4	Endrin Aldehyde	0 / 36
53494-70-5	Endrin Ketone	0 / 10	53494-70-5	Endrin Ketone	0 / 10	53494-70-5	Endrin Ketone	0 / 36	53494-70-5	Endrin Ketone	0 / 36
58-89-9	Gamma Bhc (Lindane)	0 / 10	58-89-9	Gamma Bhc (Lindane)	0 / 10	58-89-9	Gamma Bhc (Lindane)	0 / 36	58-89-9	Gamma Bhc (Lindane)	0 / 36
76-44-8	Heptachlor	0 / 10	76-44-8	Heptachlor	0 / 10	76-44-8	Heptachlor	0 / 36	76-44-8	Heptachlor	0 / 36
1024-57-3	Heptachlor Epoxide	0 / 10	1024-57-3	Heptachlor Epoxide	0 / 10	1024-57-3	Heptachlor Epoxide	0 / 36	1024-57-3	Heptachlor Epoxide	0 / 36
72-43-5	Methoxychlor	0 / 10	72-43-5	Methoxychlor	0 / 10	72-43-5	Methoxychlor	0 / 36	72-43-5	Methoxychlor	0 / 36
72-54-8	P,P'-DDD	0 / 10	72-54-8	P,P'-DDD	0 / 10	72-54-8	P,P'-DDD	0 / 36	72-54-8	P,P'-DDD	0 / 36
72-55-9	P,P'-DDE	0 / 10	72-55-9	P,P'-DDE	0 / 10	72-55-9	P,P'-DDE	0 / 36	72-55-9	P,P'-DDE	0 / 36
50-29-3	P,P'-DDT	0 / 10	50-29-3	P,P'-DDT	0 / 10	50-29-3	P,P'-DDT	0 / 36	50-29-3	P,P'-DDT	0 / 36
8001-35-2	Toxaphene	0 / 10	8001-35-2	Toxaphene	0 / 10	8001-35-2	Toxaphene	0 / 36	8001-35-2	Toxaphene	0 / 36
5103-74-2	trans-Chlordane	0 / 10	5103-74-2	trans-Chlordane	0 / 10	5103-74-2	trans-Chlordane	0 / 36	5103-74-2	trans-Chlordane	0 / 36
12674-11-2	PCB-1016 (Aroclor 1016)	0 / 37	12674-11-2	PCB-1016 (Aroclor 1016)	0 / 76	12674-11-2	PCB-1016 (Aroclor 1016)	0 / 36	12674-11-2	PCB-1016 (Aroclor 1016)	0 / 68
11104-28-2	PCB-1221 (Aroclor 1221)	0 / 37	11104-28-2	PCB-1221 (Aroclor 1221)	0 / 76	11104-28-2	PCB-1221 (Aroclor 1221)	0 / 36	11104-28-2	PCB-1221 (Aroclor 1221)	0 / 68
11141-16-5	PCB-1232 (Aroclor 1232)	0 / 37	11141-16-5	PCB-1232 (Aroclor 1232)	0 / 76	11141-16-5	PCB-1232 (Aroclor 1232)	0 / 36	11141-16-5	PCB-1232 (Aroclor 1232)	0 / 68
53469-21-9	PCB-1242 (Aroclor 1242)	0 / 37	53469-21-9	PCB-1242 (Aroclor 1242)	0 / 76	53469-21-9	PCB-1242 (Aroclor 1242)	0 / 36	53469-21-9	PCB-1242 (Aroclor 1242)	0 / 68
12672-29-6	PCB-1248 (Aroclor 1248)	0 / 37	12672-29-6	PCB-1248 (Aroclor 1248)	0 / 76	12672-29-6	PCB-1248 (Aroclor 1248)	1 / 36	12672-29-6	PCB-1248 (Aroclor 1248)	1 / 68
11097-69-1	PCB-1254 (Aroclor 1254)	2 / 37	11097-69-1	PCB-1254 (Aroclor 1254)	6 / 76	11097-69-1	PCB-1254 (Aroclor 1254)	8 / 36	11097-69-1	PCB-1254 (Aroclor 1254)	14 / 68
11096-82-5	PCB-1260 (Aroclor 1260)	0 / 37	11096-82-5	PCB-1260 (Aroclor 1260)	0 / 76	11096-82-5	PCB-1260 (Aroclor 1260)	0 / 36	11096-82-5	PCB-1260 (Aroclor 1260)	0 / 68
37324-23-5	PCB-1262 (Aroclor 1262)	0 / 37	37324-23-5	PCB-1262 (Aroclor 1262)	0 / 76	37324-23-5	PCB-1262 (Aroclor 1262)	0 / 36	37324-23-5	PCB-1262 (Aroclor 1262)	0 / 68

Table A1-2
Comparison of Discrete and ISM Sample Detected Consitutents (Central Landfill Area)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Central Landfill Area Discrete (0 to 0.5 ft-bgs)			Central Landfill Area Discrete (0 to 2 ft-bgs)			Central Landfill Area ISM (0 to 0.5 ft-bgs)			Central Landfill Area ISM (0 to 2 ft-bgs)		
CAS Number	Chemical	Detection Frequency	CAS Number	Chemical	Detection Frequency	CAS Number	Chemical	Detection Frequency	CAS Number	Chemical	Detection Frequency
11100-14-4	PCB-1268 (Aroclor 1268)	0 / 37	11100-14-4	PCB-1268 (Aroclor 1268)	0 / 76	11100-14-4	PCB-1268 (Aroclor 1268)	0 / 36	11100-14-4	PCB-1268 (Aroclor 1268)	0 / 68
1336-36-3	Polychlorinated Biphenyl (PCBs)	2 / 37	1336-36-3	Polychlorinated Biphenyl (PCBs)	6 / 76	1336-36-3	Polychlorinated Biphenyl (PCBs)	9 / 36	1336-36-3	Polychlorinated Biphenyl (PCBs)	15 / 68
95-94-3	1,2,4,5-Tetrachlorobenzene	0 / 59	95-94-3	1,2,4,5-Tetrachlorobenzene	0 / 118	95-94-3	1,2,4,5-Tetrachlorobenzene	0 / 36	95-94-3	1,2,4,5-Tetrachlorobenzene	0 / 68
123-91-1	1,4-Dioxane (P-Dioxane)	0 / 59	123-91-1	1,4-Dioxane (P-Dioxane)	0 / 118	123-91-1	1,4-Dioxane (P-Dioxane)	0 / 36	123-91-1	1,4-Dioxane (P-Dioxane)	0 / 68
58-90-2	2,3,4,6-Tetrachlorophenol	0 / 59	58-90-2	2,3,4,6-Tetrachlorophenol	0 / 118	58-90-2	2,3,4,6-Tetrachlorophenol	0 / 36	58-90-2	2,3,4,6-Tetrachlorophenol	0 / 68
95-95-4	2,4,5-Trichlorophenol	0 / 59	95-95-4	2,4,5-Trichlorophenol	0 / 118	95-95-4	2,4,5-Trichlorophenol	0 / 36	95-95-4	2,4,5-Trichlorophenol	0 / 68
88-06-2	2,4,6-Trichlorophenol	0 / 59	88-06-2	2,4,6-Trichlorophenol	0 / 118	88-06-2	2,4,6-Trichlorophenol	0 / 36	88-06-2	2,4,6-Trichlorophenol	0 / 68
120-83-2	2,4-Dichlorophenol	0 / 59	120-83-2	2,4-Dichlorophenol	0 / 118	120-83-2	2,4-Dichlorophenol	0 / 36	120-83-2	2,4-Dichlorophenol	0 / 68
105-67-9	2,4-Dimethylphenol	0 / 59	105-67-9	2,4-Dimethylphenol	0 / 118	105-67-9	2,4-Dimethylphenol	1 / 36	105-67-9	2,4-Dimethylphenol	2 / 68
51-28-5	2,4-Dinitrophenol	0 / 58	51-28-5	2,4-Dinitrophenol	0 / 117	51-28-5	2,4-Dinitrophenol	0 / 36	51-28-5	2,4-Dinitrophenol	0 / 67
121-14-2	2,4-Dinitrotoluene	0 / 59	121-14-2	2,4-Dinitrotoluene	0 / 118	121-14-2	2,4-Dinitrotoluene	0 / 36	121-14-2	2,4-Dinitrotoluene	0 / 68
606-20-2	2,6-Dinitrotoluene	0 / 59	606-20-2	2,6-Dinitrotoluene	0 / 118	606-20-2	2,6-Dinitrotoluene	0 / 36	606-20-2	2,6-Dinitrotoluene	0 / 68
91-58-7	2-Chloronaphthalene	0 / 59	91-58-7	2-Chloronaphthalene	0 / 118	91-58-7	2-Chloronaphthalene	0 / 36	91-58-7	2-Chloronaphthalene	0 / 68
95-57-8	2-Chlorophenol	0 / 59	95-57-8	2-Chlorophenol	0 / 118	95-57-8	2-Chlorophenol	0 / 36	95-57-8	2-Chlorophenol	0 / 68
91-57-6	2-Methylnaphthalene	23 / 59	91-57-6	2-Methylnaphthalene	29 / 118	91-57-6	2-Methylnaphthalene	34 / 36	91-57-6	2-Methylnaphthalene	59 / 68
95-48-7	2-Methylphenol (O-Cresol)	0 / 59	95-48-7	2-Methylphenol (O-Cresol)	0 / 118	95-48-7	2-Methylphenol (O-Cresol)	0 / 36	95-48-7	2-Methylphenol (O-Cresol)	0 / 68
88-74-4	2-Nitroaniline	0 / 59	88-74-4	2-Nitroaniline	0 / 118	88-74-4	2-Nitroaniline	0 / 36	88-74-4	2-Nitroaniline	0 / 68
88-75-5	2-Nitrophenol	0 / 59	88-75-5	2-Nitrophenol	0 / 118	88-75-5	2-Nitrophenol	0 / 36	88-75-5	2-Nitrophenol	0 / 68
91-94-1	3,3'-Dichlorobenzidine	0 / 57	91-94-1	3,3'-Dichlorobenzidine	0 / 116	91-94-1	3,3'-Dichlorobenzidine	0 / 36	91-94-1	3,3'-Dichlorobenzidine	0 / 68
MEPH3MEPH4	3- And 4- Methylphenol (Total)	2 / 28	MEPH3MEPH4	3- And 4- Methylphenol (Total)	4 / 59	MEPH3MEPH4	3- And 4- Methylphenol (Total)	1 / 24	MEPH3MEPH4	3- And 4- Methylphenol (Total)	1 / 44
99-09-2	3-Nitroaniline	0 / 59	99-09-2	3-Nitroaniline	0 / 118	99-09-2	3-Nitroaniline	0 / 36	99-09-2	3-Nitroaniline	0 / 68
534-52-1	4,6-Dinitro-2-Methylphenol	0 / 59	534-52-1	4,6-Dinitro-2-Methylphenol	0 / 118	534-52-1	4,6-Dinitro-2-Methylphenol	0 / 36	534-52-1	4,6-Dinitro-2-Methylphenol	0 / 68
101-55-3	4-Bromophenyl Phenyl Ether	0 / 59	101-55-3	4-Bromophenyl Phenyl Ether	0 / 118	101-55-3	4-Bromophenyl Phenyl Ether	0 / 36	101-55-3	4-Bromophenyl Phenyl Ether	0 / 68
59-50-7	4-Chloro-3-Methylphenol	0 / 59	59-50-7	4-Chloro-3-Methylphenol	0 / 118	59-50-7	4-Chloro-3-Methylphenol	0 / 36	59-50-7	4-Chloro-3-Methylphenol	0 / 68
106-47-8	4-Chloroaniline	0 / 59	106-47-8	4-Chloroaniline	0 / 118	106-47-8	4-Chloroaniline	0 / 36	106-47-8	4-Chloroaniline	0 / 68
7005-72-3	4-Chlorophenyl Phenyl Ether	0 / 59	7005-72-3	4-Chlorophenyl Phenyl Ether	0 / 118	7005-72-3	4-Chlorophenyl Phenyl Ether	0 / 36	7005-72-3	4-Chlorophenyl Phenyl Ether	0 / 68
100-01-6	4-Nitroaniline	0 / 59	100-01-6	4-Nitroaniline	0 / 118	100-01-6	4-Nitroaniline	0 / 36	100-01-6	4-Nitroaniline	0 / 68
100-02-7	4-Nitrophenol	0 / 59	100-02-7	4-Nitrophenol	0 / 118	100-02-7	4-Nitrophenol	0 / 36	100-02-7	4-Nitrophenol	0 / 68
83-32-9	Acenaphthene	49 / 59	83-32-9	Acenaphthene	74 / 118	83-32-9	Acenaphthene	36 / 36	83-32-9	Acenaphthene	65 / 68
208-96-8	Acenaphthylene	5 / 59	208-96-8	Acenaphthylene	7 / 118	208-96-8	Acenaphthylene	14 / 36	208-96-8	Acenaphthylene	23 / 68
98-86-2	Acetophenone	4 / 59	98-86-2	Acetophenone	7 / 118	98-86-2	Acetophenone	7 / 36	98-86-2	Acetophenone	19 / 68
120-12-7	Anthracene	48 / 59	120-12-7	Anthracene	75 / 118	120-12-7	Anthracene	35 / 36	120-12-7	Anthracene	61 / 68
1912-24-9	Atrazine	0 / 59	1912-24-9	Atrazine	0 / 118	1912-24-9	Atrazine	0 / 36	1912-24-9	Atrazine	0 / 68
100-52-7	Benzaldehyde	8 / 48	100-52-7	Benzaldehyde	11 / 95	100-52-7	Benzaldehyde	3 / 25	100-52-7	Benzaldehyde	8 / 48
56-55-3	Benzo(A)Anthracene	57 / 59	56-55-3	Benzo(A)Anthracene	108 / 118	56-55-3	Benzo(A)Anthracene	36 / 36	56-55-3	Benzo(A)Anthracene	66 / 68
50-32-8	Benzo(A)Pyrene	57 / 59	50-32-8	Benzo(A)Pyrene	111 / 118	50-32-8	Benzo(A)Pyrene	36 / 36	50-32-8	Benzo(A)Pyrene	67 / 68
205-99-2	Benzo(B)Fluoranthene	57 / 59	205-99-2	Benzo(B)Fluoranthene	112 / 118	205-99-2	Benzo(B)Fluoranthene	36 / 36	205-99-2	Benzo(B)Fluoranthene	68 / 68
191-24-2	Benzo(G,H,I)Perylene	57 / 59	191-24-2	Benzo(G,H,I)Perylene	108 / 118	191-24-2	Benzo(G,H,I)Perylene	36 / 36	191-24-2	Benzo(G,H,I)Perylene	67 / 68
207-08-9	Benzo(K)Fluoranthene	52 / 59	207-08-9	Benzo(K)Fluoranthene	104 / 118	207-08-9	Benzo(K)Fluoranthene	36 / 36	207-08-9	Benzo(K)Fluoranthene	67 / 68
85-68-7	Benzyl Butyl Phthalate	4 / 59	85-68-7	Benzyl Butyl Phthalate	7 / 118	85-68-7	Benzyl Butyl Phthalate	3 / 36	85-68-7	Benzyl Butyl Phthalate	7 / 68
92-52-4	Biphenyl (Diphenyl)	2 / 59	92-52-4	Biphenyl (Diphenyl)	3 / 118	92-52-4	Biphenyl (Diphenyl)	10 / 36	92-52-4	Biphenyl (Diphenyl)	19 / 62
111-91-1	Bis(2-Chloroethoxy) Methane	0 / 59	111-91-1	Bis(2-Chloroethoxy) Methane	0 / 118	111-91-1	Bis(2-Chloroethoxy) Methane	0 / 36	111-91-1	Bis(2-Chloroethoxy) Methane	0 / 60
111-44-4	Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0 / 59	111-44-4	Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0 / 118	111-44-4	Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0 / 36	111-44-4	Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0 / 60
108-60-1	Bis(2-Chloroisopropyl) Ether	0 / 59	108-60-1	Bis(2-Chloroisopropyl) Ether	0 / 118	108-60-1	Bis(2-Chloroisopropyl) Ether	0 / 36	108-60-1	Bis(2-Chloroisopropyl) Ether	0 / 60
117-81-7	Bis(2-Ethylhexyl) Phthalate	13 / 59	117-81-7	Bis(2-Ethylhexyl) Phthalate	16 / 118	117-81-7	Bis(2-Ethylhexyl) Phthalate	9 / 36	117-81-7	Bis(2-Ethylhexyl) Phthalate	14 / 60
105-60-2	Caprolactam	1 / 59	105-60-2	Caprolactam	2 / 118	105-60-2	Caprolactam	0 / 36	105-60-2	Caprolactam	0 / 60
86-74-8	Carbazole	56 / 59	86-74-8	Carbazole	97 / 118	86-74-8	Carbazole	36 / 36	86-74-8	Carbazole	65 / 68
218-01-9	Chrysene	59 / 59	218-01-9	Chrysene	115 / 118	218-01-9	Chrysene	36 / 36	218-01-9	Chrysene	68 / 68
84-74-2	Di-N-Butyl Phthalate	4 / 59	84-74-2	Di-N-Butyl Phthalate	6 / 118	84-74-2	Di-N-Butyl Phthalate	7 / 36	84-74-2	Di-N-Butyl Phthalate	11 / 60
117-84-0	Di-N-Octylphthalate	1 / 59	117-84-0	Di-N-Octylphthalate	2 / 118	117-84-0	Di-N-Octylphthalate	0 / 36	117-84-0	Di-N-Octylphthalate	0 / 68
53-70-3	Dibenz(A,H)Anthracene	54 / 59	53-70-3	Dibenz(A,H)Anthracene	94 / 118	53-70-3	Dibenz(A,H)Anthracene	35 / 36	53-70-3	Dibenz(A,H)Anthracene	63 / 68
132-64-9	Dibenzofuran	37 / 59	132-64-9	Dibenzofuran	55 / 118	132-64-9	Dibenzofuran	35 / 36	132-64-9	Dibenzofuran	61 / 68
84-66-2	Diethyl Phthalate	1 / 59	84-66-2	Diethyl Phthalate	1 / 118	84-66-2	Diethyl Phthalate	0 / 36	84-66-2	Diethyl Phthalate	2 / 68
131-11-3	Dimethyl Phthalate	0 / 59	131-11-3	Dimethyl Phthalate	0 / 118	131-11-3	Dimethyl Phthalate	0 / 36	131-11-3	Dimethyl Phthalate	0 / 68
206-44-0	Fluoranthene	58 / 59	206-44-0	Fluoranthene	114 / 118	206-44-0	Fluoranthene	36 / 36	206-44-0	Fluoranthene	68 / 68
86-73-7	Fluorene	48 / 59	86-73-7	Fluorene	74 / 118	86-73-7	Fluorene	36 / 36	86-73-7	Fluorene	64 / 68
118-74-1	Hexachlorobenzene	0 / 59	118-74-1	Hexachlorobenzene	0 / 118	118-74-1	Hexachlorobenzene	0 / 36	118-74-1	Hexachlorobenzene	0 / 68
87-68-3	Hexachlorobutadiene	0 / 59	87-68-3	Hexachlorobutadiene	0 / 118	87-68-3	Hexachlorobutadiene	0 / 36	87-68-3	Hexachlorobutadiene	0 / 68

Table A1-2
Comparison of Discrete and ISM Sample Detected Consitutents (Central Landfill Area)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Central Landfill Area Discrete (0 to 0.5 ft-bgs)			Central Landfill Area Discrete (0 to 2 ft-bgs)			Central Landfill Area ISM (0 to 0.5 ft-bgs)			Central Landfill Area ISM (0 to 2 ft-bgs)		
CAS Number	Chemical	Detection Frequency	CAS Number	Chemical	Detection Frequency	CAS Number	Chemical	Detection Frequency	CAS Number	Chemical	Detection Frequency
77-47-4	Hexachlorocyclopentadiene	0 / 59	77-47-4	Hexachlorocyclopentadiene	0 / 118	77-47-4	Hexachlorocyclopentadiene	0 / 36	77-47-4	Hexachlorocyclopentadiene	0 / 68
67-72-1	Hexachloroethane	0 / 59	67-72-1	Hexachloroethane	0 / 118	67-72-1	Hexachloroethane	0 / 36	67-72-1	Hexachloroethane	0 / 68
193-39-5	Indeno(1,2,3-C,D)Pyrene	57 / 59	193-39-5	Indeno(1,2,3-C,D)Pyrene	107 / 118	193-39-5	Indeno(1,2,3-C,D)Pyrene	36 / 36	193-39-5	Indeno(1,2,3-C,D)Pyrene	66 / 68
78-59-1	Isophorone	9 / 59	78-59-1	Isophorone	15 / 118	78-59-1	Isophorone	6 / 36	78-59-1	Isophorone	13 / 68
621-64-7	N-Nitrosodi-N-Propylamine	0 / 59	621-64-7	N-Nitrosodi-N-Propylamine	0 / 118	621-64-7	N-Nitrosodi-N-Propylamine	0 / 36	621-64-7	N-Nitrosodi-N-Propylamine	0 / 68
86-30-6	N-Nitrosodiphenylamine	0 / 59	86-30-6	N-Nitrosodiphenylamine	0 / 118	86-30-6	N-Nitrosodiphenylamine	0 / 36	86-30-6	N-Nitrosodiphenylamine	0 / 68
91-20-3	Naphthalene	35 / 59	91-20-3	Naphthalene	50 / 118	91-20-3	Naphthalene	35 / 36	91-20-3	Naphthalene	61 / 68
98-95-3	Nitrobenzene	0 / 59	98-95-3	Nitrobenzene	0 / 118	98-95-3	Nitrobenzene	0 / 36	98-95-3	Nitrobenzene	0 / 68
87-86-5	Pentachlorophenol	0 / 59	87-86-5	Pentachlorophenol	0 / 118	87-86-5	Pentachlorophenol	0 / 36	87-86-5	Pentachlorophenol	0 / 68
85-01-8	Phenanthrene	58 / 59	85-01-8	Phenanthrene	112 / 118	85-01-8	Phenanthrene	36 / 36	85-01-8	Phenanthrene	68 / 68
108-95-2	Phenol	3 / 59	108-95-2	Phenol	4 / 118	108-95-2	Phenol	3 / 36	108-95-2	Phenol	6 / 68
129-00-0	Pyrene	57 / 59	129-00-0	Pyrene	111 / 118	129-00-0	Pyrene	36 / 36	129-00-0	Pyrene	68 / 68

XX Indicates chemical detected in ISM sample(s), but not discrete sample(s)
XX Indicates chemical detected in discrete sample(s), but not ISM sample(s)

Appendix A2 ISM Triplicate Calculations

Appendix A2
Summary of ITRC UCL Results for Triplicate ISM Soil Samples
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Name	CFISS-011-SO-0.0-0.5					CFISS-011-SO-0.5-2					CFISS-015-SO-0.5-2				
Constituent	**Rep 1**	**Rep 2**	**Rep 3**	**UCL Type**	**UCL Value**	**Rep 1**	**Rep 2**	**Rep 3**	**UCL Type**	**UCL Value**	**Rep 1**	**Rep 2**	**Rep 3**	**UCL Type**	**UCL Value**
TAL Metals (mg/kg)															
Aluminum	15,100	18,100	16,200	Student's-t 95% UCL	19,025	12,400	12,900	12,700	Student's-t 95% UCL	13,091	17,600	20,200	16,400	Student's-t 95% UCL	21,341
Antimony	0.16	0.25	0.18	Chebychev 95% UCL	0.32	--	--	--	--	--	0.085	0.18	0.090	Chebychev 95% UCL	0.25
Arsenic	4.30	4.50	4.90	Student's-t 95% UCL	5.08	4.40	4.30	4.20	Student's-t 95% UCL	4.47	5.10	5.50	5.50	Student's-t 95% UCL	5.76
Barium	76.7	81.1	81.7	Student's-t 95% UCL	84.4	104.0	117.0	102.0	Student's-t 95% UCL	121.4	106.0	132.0	105.0	Student's-t 95% UCL	140.1
Beryllium	0.52	0.56	0.54	Student's-t 95% UCL	0.57	0.48	0.49	0.49	Student's-t 95% UCL	0.50	0.68	0.76	0.65	Student's-t 95% UCL	0.79
Cadmium	0.30	0.25	0.22	Student's-t 95% UCL	0.32	0.095	0.094	0.083	Student's-t 95% UCL	0.10	0.071	0.075	0.073	Student's-t 95% UCL	0.076
Chromium, Hexavalent	0.50	0.40	0.66	Chebychev 95% UCL	0.85	0.39	0.38	0.40	Student's-t 95% UCL	0.40	0.40	0.52	0.64	Chebychev 95% UCL	0.82
Chromium, Total	18.5	14.8	24.5	Chebychev 95% UCL	31.6	14.6	14.2	14.8	Student's-t 95% UCL	15.0	14.8	19.6	23.8	Chebychev 95% UCL	30.7
Chromium, Trivalent	18.0	14.4	23.8	Chebychev 95% UCL	30.7	14.2	13.8	14.4	Student's-t 95% UCL	14.6	14.4	19.1	23.2	Chebychev 95% UCL	29.9
Cobalt	5.60	5.80	5.80	Student's-t 95% UCL	5.93	5.70	5.80	5.80	Student's-t 95% UCL	5.86	5.80	6.10	6.10	Student's-t 95% UCL	6.29
Copper	21.1	29.9	22.3	Student's-t 95% UCL	32.5	16.1	17.6	16.1	Student's-t 95% UCL	18.1	15.2	15.9	15.8	Student's-t 95% UCL	16.3
Iron	14,900	15,200	14,900	Student's-t 95% UCL	15,292	15,800	16,900	15,900	Student's-t 95% UCL	17,225	15,400	16,200	16,100	Student's-t 95% UCL	16,635
Lead	40.7	19.4	15.2	Chebychev 95% UCL	59.5	11.3	10.8	10.2	Student's-t 95% UCL	11.7	10.4	9.70	10.6	Student's-t 95% UCL	11.0
Manganese	385.0	379.0	359.0	Student's-t 95% UCL	397.3	459.0	480.0	437.0	Student's-t 95% UCL	494.9	430.0	528.0	452.0	Student's-t 95% UCL	556.7
Mercury	0.010	0.019	0.020	Chebychev 95% UCL	0.031	0.023	0.021	0.010	Chebychev 95% UCL	0.036	0.021	0.027	0.024	Student's-t 95% UCL	0.029
Nickel	28.2	32.1	30.4	Student's-t 95% UCL	33.5	12.3	13.4	13.7	Student's-t 95% UCL	14.4	13.2	16.2	17.3	Student's-t 95% UCL	19.1
Selenium	0.22	0.21	0.27	Student's-t 95% UCL	0.29	0.22	0.23	0.18	Student's-t 95% UCL	0.25	0.20	0.26	0.17	Student's-t 95% UCL	0.29
Silver	0.041	0.060	0.052	Student's-t 95% UCL	0.067	0.045	0.039	0.040	Student's-t 95% UCL	0.047	0.038	0.039	0.031	Student's-t 95% UCL	0.043
Thallium	0.067	0.070	0.067	Student's-t 95% UCL	0.071	0.064	0.073	0.067	Student's-t 95% UCL	0.076	0.091	0.11	0.089	Student's-t 95% UCL	0.12
Vanadium	14.4	15.8	16.0	Student's-t 95% UCL	16.9	11.3	11.4	11.5	Student's-t 95% UCL	11.6	12.5	14.4	13.4	Student's-t 95% UCL	15.0
Zinc	70.7	93.1	68.1	Student's-t 95% UCL	100.5	62.1	60.4	73.0	Student's-t 95% UCL	76.7	46.7	49.8	48.5	Student's-t 95% UCL	51.0
Other Inorganic Parameters (mg/kg unless otherwise noted)															
Cyanide	0.17	0.15	0.14	Student's-t 95% UCL	0.18	0.032	0.080	0.065	Chebychev 95% UCL	0.12	1.30	1.30	0.85	Chebychev 95% UCL	1.80
Fluoride	45.7	34.1	32.9	Student's-t 95% UCL	49.5	30.6	20.4	31.2	Student's-t 95% UCL	37.6	597.0	531.0	392.0	Student's-t 95% UCL	683.1
Essential Nutrients (mg/kg)															
Calcium	25,400	23,200	24,100	Student's-t 95% UCL	26,098	23,800	21,200	23,200	Student's-t 95% UCL	25,028	28,200	26,800	21,100	Student's-t 95% UCL	31,707
Magnesium	10,900	10,500	10,600	Student's-t 95% UCL	11,018	10,900	10,500	11,200	Student's-t 95% UCL	11,459	11,200	11,600	11,300	Student's-t 95% UCL	11,718
Potassium	1,060	1,060	1,080	Student's-t 95% UCL	1,086	1,030	1,020	978.0	Student's-t 95% UCL	1,056	1,560	2,250	1,810	Student's-t 95% UCL	2,462
Sodium	90.8	128.0	120.0	Student's-t 95% UCL	145.9	--	--	--	--	--	1,810	2,520	1,310	Chebychev 95% UCL	3,410
Polychlorinated Biphenyls (PCBs) (mg/kg)															
PCB-1254 (Aroclor 1254)	0.005	0.059	0.005	Chebychev 95% UCL	0.10	1.30	0.72	0.97	Chebychev 95% UCL	1.73	--	--	--	--	--
Polychlorinated Biphenyl (PCBs)	0.005	0.059	0.005	Chebychev 95% UCL	0.10	1.30	0.72	0.97	Chebychev 95% UCL	1.73	--	--	--	--	--
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)															
Naphthalene	0.057	0.062	0.057	Student's-t 95% UCL	0.064	0.015	0.011	0.010	Chebychev 95% UCL	0.019	0.003	0.004	0.003	Chebychev 95% UCL	0.005
2-Methylnaphthalene	--	--	--	--	--	0.015	0.006	0.007	Chebychev 95% UCL	0.022	0.003	0.003	0.002	Student's-t 95% UCL	0.003
Acenaphthene	0.17	0.30	0.19	Chebychev 95% UCL	0.40	0.13	0.027	0.040	Chebychev 95% UCL	0.21	0.014	0.005	0.005	Chebychev 95% UCL	0.021
Acenaphthylene	--	--	--	--	--	0.004	0.002	0.003	Chebychev 95% UCL	0.005	0.002	0.002	0.002	Student's-t 95% UCL	0.002
Anthracene	0.39	0.57	0.38	Chebychev 95% UCL	0.72	0.25	0.053	0.077	Chebychev 95% UCL	0.40	0.036	0.015	0.013	Chebychev 95% UCL	0.053
Benzo(A)Anthracene	2.20	4.40	2.20	Chebychev 95% UCL	6.13	0.58	0.24	0.33	Chebychev 95% UCL	0.83	0.11	0.086	0.059	Chebychev 95% UCL	0.15
Benzo(A)Pyrene	2.70	5.20	2.60	Chebychev 95% UCL	7.21	0.53	0.27	0.36	Chebychev 95% UCL	0.72	0.10	0.072	0.050	Chebychev 95% UCL	0.14
Benzo(B)Fluoranthene	3.30	6.00	3.40	Chebychev 95% UCL	8.09	0.64	0.34	0.46	Chebychev 95% UCL	0.86	0.19	0.21	0.15	Student's-t 95% UCL	0.23
Benzo(G,H,I)Perylene	3.30	5.60	3.40	Chebychev 95% UCL	7.37	0.39	0.28	0.36	Student's-t 95% UCL	0.44	0.11	0.11	0.073	Student's-t 95% UCL	0.13
Benzo(K)Fluoranthene	1.30	3.00	1.40	Chebychev 95% UCL	4.30	0.26	0.15	0.18	Chebychev 95% UCL	0.34	0.079	0.088	0.045	Chebychev 95% UCL	0.13
Chrysene	3.30	6.00	3.30	Chebychev 95% UCL	8.12	0.65	0.32	0.46	Chebychev 95% UCL	0.89	0.17	0.18	0.12	Student's-t 95% UCL	0.21
Dibenz(A,H)Anthracene	0.62	1.40	0.75	Chebychev 95% UCL	1.98	0.11	0.065	0.080	Chebychev 95% UCL	0.14	0.033	0.037	0.023	Chebychev 95% UCL	0.049
Fluoranthene	4.00	6.10	3.70	Chebychev 95% UCL	7.89	1.10	0.39	0.64	Chebychev 95% UCL	1.62	0.20	0.13	0.094	Chebychev 95% UCL	0.28
Fluorene	0.11	0.13	0.13	Student's-t 95% UCL	0.14	0.068	0.020	0.029	Chebychev 95% UCL	0.10	0.011	0.004	0.004	Chebychev 95% UCL	0.017
Indeno(1,2,3-C,D)Pyrene	2.40	4.50	2.50	Chebychev 95% UCL	6.11	0.35	0.21	0.27	Chebychev 95% UCL	0.45	0.091	0.091	0.062	Student's-t 95% UCL	0.11
Phenanthrene	2.10	2.60	1.90	Student's-t 95% UCL	2.81	1.10	0.26	0.41	Chebychev 95% UCL	1.72	0.13	0.063	0.052	Chebychev 95% UCL	0.19
Pyrene	4.30	6.90	4.00	Chebychev 95% UCL	9.08	1.10	0.41	0.63	Chebychev 95% UCL	1.60	0.20	0.13	0.094	Chebychev 95% UCL	0.28

Appendix A2
Summary of ITRC UCL Results for Triplicate ISM Soil Samples
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Name	CFISS-011-SO-0.0-0.5					CFISS-011-SO-0.5-2					CFISS-015-SO-0.5-2				
Constituent	**Rep 1**	**Rep 2**	**Rep 3**	**UCL Type**	**UCL Value**	**Rep 1**	**Rep 2**	**Rep 3**	**UCL Type**	**UCL Value**	**Rep 1**	**Rep 2**	**Rep 3**	**UCL Type**	**UCL Value**
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)															
Acetophenone	--	--	--	--	--	0.005	0.003	0.004	Chebychev 95% UCL	0.006	0.002	0.003	9.50E-04	Chebychev 95% UCL	0.004
Benzyl Butyl Phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Biphenyl (Diphenyl)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Carbazole	0.49	0.68	0.49	Student's-t 95% UCL	0.74	0.17	0.044	0.073	Chebychev 95% UCL	0.26	0.023	0.014	0.010	Chebychev 95% UCL	0.032
Dibenzofuran	0.055	0.075	0.067	Student's-t 95% UCL	0.083	0.051	0.013	0.016	Chebychev 95% UCL	0.080	0.005	0.003	0.003	Chebychev 95% UCL	0.006
Isophorone	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Footnotes:

-- - No data or not available

Gray - Non-detect. Replaced with 1/2 the MDL.

mg/kg - milligram per kilogram

MDL - Method Detection Limit

PAH - Polycyclic Aromatic Hydrocarbons

PCB - Polychlorinated Biphenyls

SVOC - Semi-volatile organic compound

TAL - Target Analyte List

TCL - Target Compound List

UCL - Upper confidence limit

Appendix A2
Summary of ITRC UCL Results for Triplicate ISM Soil Samples
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Name	CFISS-015-SO-0-0.5					CFISS-01-SO-0.5-2					CFISS-01-SO-0-0.5				
Constituent	**Rep 1**	**Rep 2**	**Rep 3**	**UCL Type**	**UCL Value**	**Rep 1**	**Rep 2**	**Rep 3**	**UCL Type**	**UCL Value**	**Rep 1**	**Rep 2**	**Rep 3**	**UCL Type**	**UCL Value**
TAL Metals (mg/kg)															
Aluminum	28,300	30,100	30,800	Student's-t 95% UCL	31,908	24,300	22,100	23,400	Student's-t 95% UCL	25,131	26,000	27,700	26,200	Student's-t 95% UCL	28,200
Antimony	0.43	0.39	0.65	Chebychev 95% UCL	0.84	0.40	0.085	0.085	Chebychev 95% UCL	0.65	0.28	0.23	0.34	Student's-t 95% UCL	0.38
Arsenic	6.90	6.50	9.00	Student's-t 95% UCL	9.73	9.30	6.80	7.10	Student's-t 95% UCL	10.0	6.30	5.70	9.50	Chebychev 95% UCL	12.3
Barium	126.0	123.0	119.0	Student's-t 95% UCL	128.6	184.0	153.0	164.0	Student's-t 95% UCL	193.5	204.0	206.0	191.0	Student's-t 95% UCL	214.1
Beryllium	0.95	0.97	1.10	Student's-t 95% UCL	1.14	0.90	0.80	0.85	Student's-t 95% UCL	0.93	1.10	1.20	1.10	Student's-t 95% UCL	1.23
Cadmium	0.23	0.22	0.34	Chebychev 95% UCL	0.43	0.10	0.10	0.11	Student's-t 95% UCL	0.11	0.23	0.25	0.29	Student's-t 95% UCL	0.31
Chromium, Hexavalent	0.53	0.60	0.54	Student's-t 95% UCL	0.62	0.45	0.40	0.43	Student's-t 95% UCL	0.46	0.46	0.48	0.44	Student's-t 95% UCL	0.49
Chromium, Total	19.7	22.5	20.0	Student's-t 95% UCL	23.3	16.7	15.1	15.9	Student's-t 95% UCL	17.2	17.2	18.0	16.6	Student's-t 95% UCL	18.5
Chromium, Trivalent	19.2	21.9	19.5	Student's-t 95% UCL	22.7	16.3	14.7	15.5	Student's-t 95% UCL	16.8	16.7	17.5	16.2	Student's-t 95% UCL	18.0
Cobalt	6.10	6.30	6.70	Student's-t 95% UCL	6.88	6.50	6.30	6.10	Student's-t 95% UCL	6.64	6.20	6.20	6.90	Student's-t 95% UCL	7.11
Copper	17.8	21.5	20.3	Student's-t 95% UCL	23.0	14.3	15.0	16.0	Student's-t 95% UCL	16.5	17.9	20.1	22.2	Student's-t 95% UCL	23.7
Iron	16,500	17,700	16,500	Student's-t 95% UCL	18,068	19,800	18,900	19,300	Student's-t 95% UCL	20,094	18,100	19,800	17,500	Student's-t 95% UCL	20,478
Lead	14.6	14.5	19.8	Student's-t 95% UCL	21.4	13.7	14.4	13.8	Student's-t 95% UCL	14.6	29.6	19.1	152.0	Chebychev 95% UCL	252.8
Manganese	424.0	425.0	418.0	Student's-t 95% UCL	428.7	597.0	538.0	530.0	Student's-t 95% UCL	616.7	657.0	632.0	588.0	Student's-t 95% UCL	684.6
Mercury	0.011	0.031	0.025	Chebychev 95% UCL	0.049	0.025	0.020	0.027	Student's-t 95% UCL	0.030	0.018	0.010	0.084	Chebychev 95% UCL	0.14
Nickel	37.7	35.8	64.1	Chebychev 95% UCL	85.7	15.3	17.0	15.4	Student's-t 95% UCL	17.5	36.9	34.8	28.9	Student's-t 95% UCL	40.5
Selenium	1.80	1.80	4.10	Chebychev 95% UCL	5.91	0.51	0.33	0.35	Chebychev 95% UCL	0.64	0.40	0.36	0.37	Student's-t 95% UCL	0.41
Silver	0.045	0.048	0.044	Student's-t 95% UCL	0.049	0.056	0.039	0.047	Student's-t 95% UCL	0.062	0.058	0.066	0.061	Student's-t 95% UCL	0.068
Thallium	0.14	0.15	0.28	Chebychev 95% UCL	0.39	0.16	0.14	0.16	Student's-t 95% UCL	0.17	0.16	0.15	0.17	Student's-t 95% UCL	0.18
Vanadium	20.4	22.1	29.4	Student's-t 95% UCL	32.0	18.4	17.2	17.8	Student's-t 95% UCL	18.8	23.6	23.5	21.2	Student's-t 95% UCL	25.1
Zinc	69.6	73.7	67.3	Student's-t 95% UCL	75.7	55.4	53.4	56.1	Student's-t 95% UCL	57.3	69.7	67.8	100.0	Chebychev 95% UCL	124.6
Other Inorganic Parameters (mg/kg unless otherwise noted)															
Cyanide	2.30	1.60	3.40	Chebychev 95% UCL	4.72	0.90	0.80	1.80	Chebychev 95% UCL	2.55	0.82	2.60	3.70	Chebychev 95% UCL	6.03
Fluoride	730.0	639.0	721.0	Student's-t 95% UCL	781.2	208.0	260.0	310.0	Student's-t 95% UCL	345.3	117.0	175.0	110.0	Chebychev 95% UCL	223.8
Essential Nutrients (mg/kg)															
Calcium	25,400	21,600	20,600	Student's-t 95% UCL	26,803	3,110	3,110	5,360	Chebychev 95% UCL	7,129	12,400	13,200	12,100	Student's-t 95% UCL	13,525
Magnesium	10,500	10,600	10,600	Student's-t 95% UCL	10,664	12,400	12,200	12,800	Student's-t 95% UCL	12,982	10,900	10,500	10,000	Student's-t 95% UCL	11,227
Potassium	2,260	2,870	2,530	Student's-t 95% UCL	3,069	1,660	1,510	1,600	Student's-t 95% UCL	1,717	1,790	1,790	1,670	Student's-t 95% UCL	1,867
Sodium	4,630	5,910	4,660	Student's-t 95% UCL	6,298	596.0	629.0	834.0	Student's-t 95% UCL	903.7	439.0	744.0	437.0	Chebychev 95% UCL	984.6
Polychlorinated Biphenyls (PCBs) (mg/kg)															
PCB-1254 (Aroclor 1254)	--	--	--	--	--	--	--	--	--	--	0.068	0.005	0.005	Chebychev 95% UCL	0.12
Polychlorinated Biphenyl (PCBs)	--	--	--	--	--	--	--	--	--	--	0.068	0.005	0.005	Chebychev 95% UCL	0.12
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)															
Naphthalene	0.009	0.011	0.013	Student's-t 95% UCL	0.014	0.005	0.006	0.006	Student's-t 95% UCL	0.007	0.11	0.031	0.017	Chebychev 95% UCL	0.18
2-Methylnaphthalene	0.006	0.009	0.008	Student's-t 95% UCL	0.010	0.003	0.004	0.003	Student's-t 95% UCL	0.004	0.048	0.027	0.013	Chebychev 95% UCL	0.074
Acenaphthene	0.021	0.044	0.023	Chebychev 95% UCL	0.061	0.008	0.012	0.009	Chebychev 95% UCL	0.015	0.20	0.11	0.059	Chebychev 95% UCL	0.30
Acenaphthylene	0.014	0.030	0.015	Chebychev 95% UCL	0.042	--	--	--	--	--	0.029	0.033	0.014	Chebychev 95% UCL	0.051
Anthracene	0.14	0.27	0.16	Chebychev 95% UCL	0.37	0.012	0.020	0.018	Chebychev 95% UCL	0.027	0.50	0.28	0.15	Chebychev 95% UCL	0.76
Benzo(A)Anthracene	1.80	3.00	1.70	Chebychev 95% UCL	3.99	0.048	0.10	0.071	Chebychev 95% UCL	0.14	1.60	1.10	0.64	Chebychev 95% UCL	2.32
Benzo(A)Pyrene	0.59	1.10	0.60	Chebychev 95% UCL	1.50	0.047	0.12	0.083	Chebychev 95% UCL	0.18	1.70	1.20	0.73	Chebychev 95% UCL	2.43
Benzo(B)Fluoranthene	9.20	8.70	13.0	Chebychev 95% UCL	16.2	0.10	0.18	0.15	Chebychev 95% UCL	0.25	2.80	3.10	1.20	Chebychev 95% UCL	4.94
Benzo(G,H,I)Perylene	2.20	2.40	4.30	Chebychev 95% UCL	5.88	0.058	0.15	0.084	Chebychev 95% UCL	0.22	2.20	2.30	1.10	Chebychev 95% UCL	3.54
Benzo(K)Fluoranthene	1.90	2.20	2.40	Student's-t 95% UCL	2.59	0.033	0.065	0.044	Chebychev 95% UCL	0.088	1.10	1.10	0.41	Chebychev 95% UCL	1.87
Chrysene	5.10	12.0	6.80	Chebychev 95% UCL	17.0	0.092	0.17	0.12	Chebychev 95% UCL	0.23	2.50	2.40	1.10	Chebychev 95% UCL	3.97
Dibenz(A,H)Anthracene	1.00	1.00	2.50	Chebychev 95% UCL	3.68	0.013	0.036	0.025	Chebychev 95% UCL	0.054	0.58	0.60	0.25	Chebychev 95% UCL	0.97
Fluoranthene	1.50	4.20	2.00	Chebychev 95% UCL	6.18	0.091	0.18	0.15	Chebychev 95% UCL	0.25	3.10	2.10	1.20	Chebychev 95% UCL	4.53
Fluorene	0.017	0.029	0.021	Chebychev 95% UCL	0.038	0.007	0.010	0.007	Student's-t 95% UCL	0.011	0.16	0.079	0.040	Chebychev 95% UCL	0.25
Indeno(1,2,3-C,D)Pyrene	2.00	2.10	3.50	Chebychev 95% UCL	4.64	0.048	0.12	0.072	Chebychev 95% UCL	0.17	1.60	1.70	0.74	Chebychev 95% UCL	2.67
Phenanthrene	0.37	0.65	0.56	Chebychev 95% UCL	0.89	0.068	0.11	0.092	Chebychev 95% UCL	0.14	1.80	1.00	0.69	Chebychev 95% UCL	2.60
Pyrene	1.50	4.40	1.50	Chebychev 95% UCL	6.68	0.078	0.18	0.13	Chebychev 95% UCL	0.26	3.20	2.10	1.20	Chebychev 95% UCL	4.69

Appendix A2
Summary of ITRC UCL Results for Triplicate ISM Soil Samples
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Name	CFISS-015-SO-0-0.5					CFISS-01-SO-0.5-2					CFISS-01-SO-0-0.5				
Constituent	**Rep 1**	**Rep 2**	**Rep 3**	**UCL Type**	**UCL Value**	**Rep 1**	**Rep 2**	**Rep 3**	**UCL Type**	**UCL Value**	**Rep 1**	**Rep 2**	**Rep 3**	**UCL Type**	**UCL Value**
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)															
Acetophenone	--	--	--	--	--	0.008	0.013	0.010	Chebychev 95% UCL	0.017	0.018	0.026	0.010	Chebychev 95% UCL	0.038
Benzyl Butyl Phthalate	--	--	--	--	--	0.039	0.023	0.046	Chebychev 95% UCL	0.066	--	--	--	--	--
Biphenyl (Diphenyl)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Carbazole	0.12	0.16	0.15	Student's-t 95% UCL	0.18	0.010	0.020	0.017	Chebychev 95% UCL	0.029	0.34	0.22	0.11	Chebychev 95% UCL	0.51
Dibenzofuran	0.012	0.016	0.018	Student's-t 95% UCL	0.020	0.005	0.006	0.003	Chebychev 95% UCL	0.008	0.090	0.045	0.024	Chebychev 95% UCL	0.14
Isophorone	--	--	--	--	--	0.003	0.005	0.003	Chebychev 95% UCL	0.006	--	--	--	--	--

Footnotes:

-- - No data or not available

Gray - Non-detect. Replaced with 1/2 the MDL.

mg/kg - milligram per kilogram

MDL - Method Detection Limit

PAH - Polycyclic Aromatic Hydrocarbons

PCB - Polychlorinated Biphenyls

SVOC - Semi-volatile organic compound

TAL - Target Analyte List

TCL - Target Compound List

UCL - Upper confidence limit

Appendix A2
Summary of ITRC UCL Results for Triplicate ISM Soil Samples
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Name	CFISS-04-SO-0.5-2					CFISS-04-SO-0-0.5				
Constituent	**Rep 1**	**Rep 2**	**Rep 3**	**UCL Type**	**UCL Value**	**Rep 1**	**Rep 2**	**Rep 3**	**UCL Type**	**UCL Value**
TAL Metals (mg/kg)										
Aluminum	21,300	21,600	21,300	Student's-t 95% UCL	21,692	23,600	24,400	23,900	Student's-t 95% UCL	24,648
Antimony	--	--	--	--	--	0.20	0.19	0.085	Chebychev 95% UCL	0.32
Arsenic	6.90	6.20	6.40	Student's-t 95% UCL	7.11	5.30	5.50	5.30	Student's-t 95% UCL	5.56
Barium	129.0	120.0	137.0	Student's-t 95% UCL	143.0	182.0	197.0	204.0	Student's-t 95% UCL	213.3
Beryllium	0.73	0.69	0.67	Student's-t 95% UCL	0.75	0.89	0.98	0.83	Student's-t 95% UCL	1.03
Cadmium	0.071	0.067	0.079	Student's-t 95% UCL	0.083	0.20	0.21	0.23	Student's-t 95% UCL	0.24
Chromium, Hexavalent	0.41	0.41	0.41	Student's-t 95% UCL	0.42	0.39	0.42	0.38	Student's-t 95% UCL	0.43
Chromium, Total	15.5	15.4	15.3	Student's-t 95% UCL	15.6	14.5	15.7	14.2	Student's-t 95% UCL	16.1
Chromium, Trivalent	15.1	15.0	14.9	Student's-t 95% UCL	15.2	14.1	15.3	13.8	Student's-t 95% UCL	15.7
Cobalt	6.30	6.40	6.30	Student's-t 95% UCL	6.43	6.20	6.10	6.10	Student's-t 95% UCL	6.23
Copper	15.3	14.6	16.2	Student's-t 95% UCL	16.7	14.6	17.1	14.6	Student's-t 95% UCL	17.9
Iron	19,600	19,700	19,900	Student's-t 95% UCL	19,991	18,600	18,000	18,600	Student's-t 95% UCL	18,984
Lead	13.1	13.1	13.3	Student's-t 95% UCL	13.4	20.5	19.1	16.6	Student's-t 95% UCL	22.1
Manganese	492.0	464.0	527.0	Student's-t 95% UCL	547.5	651.0	752.0	836.0	Student's-t 95% UCL	902.5
Mercury	0.009	0.020	0.020	Chebychev 95% UCL	0.033	0.021	0.031	0.018	Chebychev 95% UCL	0.040
Nickel	14.5	14.3	14.6	Student's-t 95% UCL	14.7	22.1	22.9	20.9	Student's-t 95% UCL	23.7
Selenium	0.56	0.44	0.62	Student's-t 95% UCL	0.69	0.44	0.52	0.46	Student's-t 95% UCL	0.54
Silver	0.039	0.039	0.040	Student's-t 95% UCL	0.040	0.039	0.043	0.044	Student's-t 95% UCL	0.046
Thallium	0.13	0.13	0.13	Student's-t 95% UCL	0.13	0.16	0.16	0.14	Student's-t 95% UCL	0.17
Vanadium	15.6	15.8	16.2	Student's-t 95% UCL	16.4	21.0	22.0	19.8	Student's-t 95% UCL	22.8
Zinc	51.6	51.1	56.3	Student's-t 95% UCL	57.8	67.1	71.5	75.1	Student's-t 95% UCL	78.0
Other Inorganic Parameters (mg/kg unless otherwise noted)										
Cyanide	0.36	0.34	0.48	Student's-t 95% UCL	0.52	1.40	3.10	1.30	Chebychev 95% UCL	4.48
Fluoride	55.8	76.2	30.8	Chebychev 95% UCL	111.5	58.6	62.5	34.3	Chebychev 95% UCL	90.3
Essential Nutrients (mg/kg)										
Calcium	2,800	2,510	2,540	Student's-t 95% UCL	2,886	5,310	6,450	4,090	Chebychev 95% UCL	8,254
Magnesium	12,600	12,800	12,500	Student's-t 95% UCL	12,891	10,700	9,850	10,600	Student's-t 95% UCL	11,167
Potassium	1,150	1,150	1,120	Student's-t 95% UCL	1,169	1,470	1,710	1,530	Student's-t 95% UCL	1,781
Sodium	243.0	268.0	210.0	Student's-t 95% UCL	289.4	209.0	674.0	344.0	Chebychev 95% UCL	1,011
Polychlorinated Biphenyls (PCBs) (mg/kg)										
PCB-1254 (Aroclor 1254)	--	--	--	--	--	--	--	--	--	--
Polychlorinated Biphenyl (PCBs)	--	--	--	--	--	--	--	--	--	--
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)										
Naphthalene	0.051	0.062	0.015	Chebychev 95% UCL	0.10	0.21	0.45	0.14	Chebychev 95% UCL	0.68
2-Methylnaphthalene	0.007	0.036	0.006	Chebychev 95% UCL	0.059	0.087	0.23	0.088	Chebychev 95% UCL	0.34
Acenaphthene	1.70	0.16	0.022	Chebychev 95% UCL	2.97	0.73	1.50	1.40	Chebychev 95% UCL	2.26
Acenaphthylene	0.028	7.00E-04	7.00E-04	Chebychev 95% UCL	0.049	0.022	0.035	0.033	Chebychev 95% UCL	0.048
Anthracene	4.00	0.18	0.037	Chebychev 95% UCL	7.06	1.60	2.60	3.20	Chebychev 95% UCL	4.50
Benzo(A)Anthracene	13.0	0.38	0.13	Chebychev 95% UCL	23.0	9.50	9.60	11.0	Student's-t 95% UCL	11.4
Benzo(A)Pyrene	7.70	0.38	0.13	Chebychev 95% UCL	13.6	6.70	9.80	11.0	Chebychev 95% UCL	14.8
Benzo(B)Fluoranthene	21.0	0.57	0.21	Chebychev 95% UCL	37.2	21.0	15.0	20.0	Student's-t 95% UCL	24.1
Benzo(G,H,I)Perylene	6.60	0.34	0.13	Chebychev 95% UCL	11.6	6.80	7.40	9.30	Student's-t 95% UCL	10.0
Benzo(K)Fluoranthene	5.80	0.18	0.065	Chebychev 95% UCL	10.3	4.50	6.10	6.30	Student's-t 95% UCL	7.30
Chrysene	24.0	0.56	0.18	Chebychev 95% UCL	42.6	22.0	14.0	18.0	Student's-t 95% UCL	24.7
Dibenz(A,H)Anthracene	2.20	0.097	0.035	Chebychev 95% UCL	3.88	2.10	2.10	2.70	Student's-t 95% UCL	2.88
Fluoranthene	27.0	0.70	0.23	Chebychev 95% UCL	47.9	17.0	14.0	21.0	Student's-t 95% UCL	23.3
Fluorene	1.40	0.15	0.019	Chebychev 95% UCL	2.44	0.60	1.30	1.10	Chebychev 95% UCL	1.91
Indeno(1,2,3-C,D)Pyrene	5.60	0.28	0.11	Chebychev 95% UCL	9.85	5.40	6.20	7.20	Student's-t 95% UCL	7.79
Phenanthrene	19.0	0.74	0.17	Chebychev 95% UCL	33.6	8.30	10.0	15.0	Chebychev 95% UCL	19.9
Pyrene	23.0	0.64	0.22	Chebychev 95% UCL	40.8	17.0	15.0	19.0	Student's-t 95% UCL	20.4

Appendix A2
Summary of ITRC UCL Results for Triplicate ISM Soil Samples
Columbia Falls Aluminum Company
Columbia Falls, Montana

Sample Name	CFISS-04-SO-0.5-2					CFISS-04-SO-0-0.5				
Constituent	**Rep 1**	**Rep 2**	**Rep 3**	**UCL Type**	**UCL Value**	**Rep 1**	**Rep 2**	**Rep 3**	**UCL Type**	**UCL Value**
TCL Semi-Volatile Organic Compounds (TCL SVOCs) (mg/kg)										
Acetophenone	0.007	0.002	0.003	Chebychev 95% UCL	0.011	--	--	--	--	--
Benzyl Butyl Phthalate	--	--	--	--	--	--	--	--	--	--
Biphenyl (Diphenyl)	0.024	0.009	0.002	Chebychev 95% UCL	0.040	0.035	0.075	0.033	Chebychev 95% UCL	0.11
Carbazole	2.30	0.12	0.024	Chebychev 95% UCL	4.05	0.93	1.50	2.00	Chebychev 95% UCL	2.82
Dibenzofuran	0.65	0.083	0.012	Chebychev 95% UCL	1.13	0.38	0.77	0.53	Chebychev 95% UCL	1.06
Isophorone	--	--	--	--	--	--	--	--	--	--

Footnotes:

-- - No data or not available

Gray - Non-detect. Replaced with 1/2 the MDL.

mg/kg - milligram per kilogram

MDL - Method Detection Limit

PAH - Polycyclic Aromatic Hydrocarbons

PCB - Polychlorinated Biphenyls

SVOC - Semi-volatile organic compound

TAL - Target Analyte List

TCL - Target Compound List

UCL - Upper confidence limit

Appendix B VISL Output for Trichloroethene

APPENDIX CC

USEPA VISL Calculator Output

1. VISL Output – 1,1,1-Trichloroethane
2. VISL Output – 1,1-Dichloroethane
3. VISL Output – 2-Butanone
4. VISL Output – Acetone
5. VISL Output – Benzene
6. VISL Output – Carbon Disulfide
7. VISL Output – Methylene Chloride
8. VISL Output – Tetrachloroethene
9. VISL Output – Toluene
10. VISL Output – Trichloroethene

APPENDIX CC1

VISL Output – 1,1,1-Trichloroethane

Site-specific VISL Results
Resident Equation Inputs

*** Inputted values different from Resident defaults are highlighted.**
Output generated 16JAN2019:10:01:47

Variable	Resident Air Default Value	Value
AF_{gw} (Attenuation Factor Groundwater) unitless	0.001	0.001
AF_{ss} (Attenuation Factor Sub-Slab) unitless	0.03	0.03
ED_{res} (exposure duration) years	26	26
ED_{0-2} (mutagenic exposure duration first phase) years	2	2
ED_{2-6} (mutagenic exposure duration second phase) years	4	4
ED_{6-16} (mutagenic exposure duration third phase) years	10	10
ED_{16-26} (mutagenic exposure duration fourth phase) years	10	10
EF_{res} (exposure frequency) days/year	350	350
EF_{0-2} (mutagenic exposure frequency first phase) days/year	350	350
EF_{2-6} (mutagenic exposure frequency second phase) days/year	350	350
EF_{6-16} (mutagenic exposure frequency third phase) days/year	350	350
EF_{16-26} (mutagenic exposure frequency fourth phase) days/year	350	350
ET_{res} (exposure time) hours/day	24	24
ET_{0-2} (mutagenic exposure time first phase) hours/day	24	24
ET_{2-6} (mutagenic exposure time second phase) hours/day	24	24
ET_{6-16} (mutagenic exposure time third phase) hours/day	24	24
ET_{16-26} (mutagenic exposure time fourth phase) hours/day	24	24
THQ (target hazard quotient) unitless	0.1	0.1
LT (lifetime) years	70	70
TR (target risk) unitless	1.0E-06	1.0E-06

Resident Vapor Intrusion Screening Levels (VISL)

Key: I = IRIS; P = PPRTV; O = OPP; A = ATSDR; C = Cal EPA; X = APPENDIX PPRTV SCREEN; H = HEAST; W = see RSL user guide Section 2.3.5; E = see RSL user guide Section 2.3.6; S = see RSL user's guide Section 5.

Chemical	CAS Number	Does the chemical meet the definition for volatility? (HLC>1E-5 or VP>1)	Does the chemical have inhalation toxicity data? (IUR and/or RfC)	Is Chemical Sufficiently Volatile and Toxic to Pose Inhalation Risk Via Vapor Intrusion from Soil Source? ($C_{vp} > C_{i,a}$,Target?)	Is Chemical Sufficiently Volatile and Toxic to Pose Inhalation Risk Via Vapor Intrusion from Groundwater Source? ($C_{hc} > C_{i,a}$,Target?)	Target Indoor Air Concentration (TCR=1E-06 or THQ=0.1) MIN($C_{ia,c}$,$C_{ia,nc}$) (µg/m³)	Toxicity Basis
Trichloroethane, 1,1,1-	71-55-6	Yes	Yes	Yes	Yes	5.21E+02	NC

Chemical	Target Sub-Slab and Near-source Soil Gas Concentration (TCR=1E-06 or THQ=0.1) C_{sg},Target (µg/m³)	Target Groundwater Concentration (TCR=1E-06 or THQ=0.1) C_{gw},Target (µg/L)	Is Target Groundwater Concentration < MCL? (C_{gw} < MCL?)	Pure Phase Vapor Concentration C_{vp} \ (10.13 °C)\ (µg/m³)	Maximum Groundwater Vapor Concentration C_{hc} \ (µg/m³)	Temperature for Maximum Groundwater Vapor Concentration (°C)	Lower Explosive Limit LEL (% by volume)
Trichloroethane, 1,1,1-	1.74E+04	1.42E+03	No (200)	8.90E+08	4.75E+08	10.13	8.00

Chemical	LEL Ref	IUR (ug/m³)$^{-1}$	IUR Ref	RfC (mg/m³)	RfC Ref	Mutagenic Indicator	Carcinogenic VISL TCR=1E-06 $C_{ia,c}$ (µg/m³)	Noncarcinogenic VISL THQ=0.1 $C_{ia,nc}$ (µg/m³)
Trichloroethane, 1,1,1-	U			5.00E+00	U	No		5.21E+02

Chemical	CAS Number	Site Groundwater Concentration C_{gw} \ (μg/L)	Site Indoor Air Concentration $C_{i,a}$ \ (μg/m³)	VI Carcinogenic Risk CR	VI Hazard HQ	IUR $(ug/m^3)^{-1}$	IUR Ref	Chronic RfC (mg/m^3)
Trichloroethane, 1,1,1-	71-55-6	3.8	1.40E+00		2.68E-04			5.00E+00
**Sum*					*2.68E-04*			

Chemical	RfC Ref	Temperature (℃)\ for Groundwater Vapor Concentration	Mutagen?
Trichloroethane, 1,1,1-	U	10.13	No
**Sum*			

Chemical Properties
Output generated 16JAN2019:10:01:47

Chemical	CAS Number	Does the chemical meet the definition for volatility? (HLC>1E-5 or VP>1)	Does the chemical have inhalation toxicity data? (IUR and/or RfC)	MW	MW Ref	Vapor Pressure VP (mm Hg)	VP Ref	S (mg/L)	S Ref	MCL (ug/L)	HLC (atm-m^3/mole)	Henry's Law Constant (unitless)
Trichloroethane, 1,1,1-	71-55-6	Yes	Yes	133.41	U	1.24E+02	U	1.29E+03	U	200	1.72E-02	7.03E-01

Chemical	Henry's Law Constant (10.13 ℃)	Henry's Law Constant Used in Calcs (unitless)	H` and HLC Ref	Enthalpy of vaporization @ groundwater temperature $\Delta H_{v,gw}$ \ (cal/mol)	Exponent for $\Delta H_{v,gw}$	Vapor Pressure VP (10.13 ℃)\ (mm Hg)	D_{ia} \ (cm^2/s)	D_{ia} \ (10.13 ℃)\ (cm^2/s)	D_{ia} \ Used in Calcs (cm^2/s)	D_{ia} \ Ref	D_{iw} \ (cm^2/s)
Trichloroethane, 1,1,1-	3.68E-01	3.68E-01	U	7886.33	0.36	4.66E+08	6.00E-02	0.0600458	0.0600458	U	9.12E-06

Chemical	D_{iw} \ (10.13 ℃)\ (cm^2/s)	D_{iw} \ Used in Calcs (cm^2/s)	D_{iw} \ Ref	Normal Boiling Point BP (K)	BP Ref	Critical Temperature TC (K)	TC Ref	Enthalpy of vaporization at the normal boiling point $\Delta H_{v,b}$ \ (cal/mol)	$\Delta H_{v,b}$ \ Ref	K_{oc} \ (cm^3/g)	K_{oc} \ Ref	Lower Explosive Limit LEL (% by volume)	LEL Ref
Trichloroethane, 1,1,1-	9.1241E-6	9.1241E-6	U	347.15	U	5.45E+02	U	7140.00	U	43.9	U	8.00	U

APPENDIX CC2

VISL Output – 1,1-Dichloroethane

Site-specific VISL Results
Resident Equation Inputs

*** Inputted values different from Resident defaults are highlighted.**
Output generated 16JAN2019:10:23:48

Variable	Resident Air Default Value	Value
AF_{gw} (Attenuation Factor Groundwater) unitless	0.001	0.001
AF_{ss} (Attenuation Factor Sub-Slab) unitless	0.03	0.03
ED_{res} (exposure duration) years	26	26
ED_{0-2} (mutagenic exposure duration first phase) years	2	2
ED_{2-6} (mutagenic exposure duration second phase) years	4	4
ED_{6-16} (mutagenic exposure duration third phase) years	10	10
ED_{16-26} (mutagenic exposure duration fourth phase) years	10	10
EF_{res} (exposure frequency) days/year	350	350
EF_{0-2} (mutagenic exposure frequency first phase) days/year	350	350
EF_{2-6} (mutagenic exposure frequency second phase) days/year	350	350
EF_{6-16} (mutagenic exposure frequency third phase) days/year	350	350
EF_{16-26} (mutagenic exposure frequency fourth phase) days/year	350	350
ET_{res} (exposure time) hours/day	24	24
ET_{0-2} (mutagenic exposure time first phase) hours/day	24	24
ET_{2-6} (mutagenic exposure time second phase) hours/day	24	24
ET_{6-16} (mutagenic exposure time third phase) hours/day	24	24
ET_{16-26} (mutagenic exposure time fourth phase) hours/day	24	24
THQ (target hazard quotient) unitless	0.1	0.1
LT (lifetime) years	70	70
TR (target risk) unitless	1.0E-06	1.0E-06

Resident Vapor Intrusion Screening Levels (VISL)

Key: I = IRIS; P = PPRTV; O = OPP; A = ATSDR; C = Cal EPA; X = APPENDIX PPRTV SCREEN; H = HEAST; W = see RSL user guide Section 2.3.5; E = see RSL user guide Section 2.3.6; S = see RSL user's guide Section 5.

Chemical	CAS Number	Does the chemical meet the definition for volatility? (HLC>1E-5 or VP>1)	Does the chemical have inhalation toxicity data? (IUR and/or RfC)	Is Chemical Sufficiently Volatile and Toxic to Pose Inhalation Risk Via Vapor Intrusion from Soil Source? ($C_{vp} > C_{i,a}$,Target?)	Is Chemical Sufficiently Volatile and Toxic to Pose Inhalation Risk Via Vapor Intrusion from Groundwater Source? ($C_{hc} > C_{i,a}$,Target?)	Target Indoor Air Concentration (TCR=1E-06 or THQ=0.1) MIN($C_{ia,c}$,$C_{ia,nc}$) (µg/m³)	Toxicity Basis
Dichloroethane, 1,1-	75-34-3	Yes	Yes	Yes	Yes	1.75E+00	CA

Chemical	Target Sub-Slab and Near-source Soil Gas Concentration (TCR=1E-06 or THQ=0.1) C_{sg},Target (µg/m³)	Target Groundwater Concentration (TCR=1E-06 or THQ=0.1) C_{gw},Target (µg/L)	Is Target Groundwater Concentration < MCL? (C_{gw} < MCL?)	Pure Phase Vapor Concentration C_{vp}\ (7.29 °C)\ (µg/m³)	Maximum Groundwater Vapor Concentration C_{hc}\ (µg/m³)	Temperature for Maximum Groundwater Vapor Concentration (°C)	Lower Explosive Limit LEL (% by volume)
Dichloroethane, 1,1-	5.85E+01	1.60E+01	--	1.21E+09	5.54E+08	7.29	5.40

Chemical	LEL Ref	IUR (ug/m³)$^{-1}$	IUR Ref	RfC (mg/m³)	RfC Ref	Mutagenic Indicator	Carcinogenic VISL TCR=1E-06 $C_{ia,c}$ (µg/m³)	Noncarcinogenic VISL THQ=0.1 $C_{ia,nc}$ (µg/m³)
Dichloroethane, 1,1-	U	1.60E-06	U			No	1.75E+00	

Chemical	CAS Number	Site Groundwater Concentration C_{gw} \ (μg/L)	Site Indoor Air Concentration $C_{i,a}$ \ (μg/m³)	VI Carcinogenic Risk CR	VI Hazard HQ	IUR (ug/m³)$^{-1}$	IUR Ref	Chronic RfC (mg/m³)	RfC Ref	Temperature (℃)\ for Groundwater Vapor Concentration	Mutagen?
Dichloroethane, 1,1-	75-34-3	0.95	1.04E-01	5.95E-08		1.60E-06	U			7.29	No
**Sum*				*5.95E-08*							

Chemical Properties
Output generated 16JAN2019:10:23:48

Chemical	CAS Number	Does the chemical meet the definition for volatility? (HLC>1E-5 or VP>1)	Does the chemical have inhalation toxicity data? (IUR and/or RfC)	MW	MW Ref	Vapor Pressure VP (mm Hg)	VP Ref	S (mg/L)	S Ref	MCL (ug/L)	HLC (atm-m^3/mole)	Henry's Law Constant (unitless)
Dichloroethane, 1,1-	75-34-3	Yes	Yes	98.96	U	2.27E+02	U	5.04E+03	U		5.62E-03	2.30E-01

Chemical	Henry's Law Constant (7.29 ℃)	Henry's Law Constant Used in Calcs (unitless)	H` and HLC Ref	Enthalpy of vaporization @ groundwater temperature $\Delta H_{v,gw}$ \ (cal/mol)	Exponent for $\Delta H_{v,gw}$	Vapor Pressure VP (7.29 ℃)\ (mm Hg)	D_{ia} \ (cm^2/s)	D_{ia} \ (7.29 ℃)\ (cm^2/s)	D_{ia} \ Used in Calcs (cm^2/s)	D_{ia} \ Ref	D_{iw} \ (cm^2/s)
Dichloroethane, 1,1-	1.10E-01	1.10E-01	U	7485.06	0.35	5.78E+08	7.64E-02	0.076419	0.076419	U	1.00E-05

Chemical	D_{iw} \ (7.29 ℃)\ (cm^2/s)	D_{iw} \ Used in Calcs (cm^2/s)	D_{iw} \ Ref	Normal Boiling Point BP (K)	BP Ref	Critical Temperature TC (K)	TC Ref	Enthalpy of vaporization at the normal boiling point $\Delta H_{v,b}$ \ (cal/mol)	$\Delta H_{v,b}$ \ Ref	K_{oc} \ (cm^3/g)	K_{oc} \ Ref	Lower Explosive Limit LEL (% by volume)	LEL Ref
Dichloroethane, 1,1-	0.00001	0.00001	U	330.55	U	5.23E+02	U	6900.00	U	31.8	U	5.40	U

APPENDIX CC3

VISL Output – 2-Butanone

Site-specific VISL Results
Resident Equation Inputs

*** Inputted values different from Resident defaults are highlighted.**
Output generated 16JAN2019:10:28:51

Variable	Resident Air Default Value	Value
AF_{gw} (Attenuation Factor Groundwater) unitless	0.001	0.001
AF_{ss} (Attenuation Factor Sub-Slab) unitless	0.03	0.03
ED_{res} (exposure duration) years	26	26
ED_{0-2} (mutagenic exposure duration first phase) years	2	2
ED_{2-6} (mutagenic exposure duration second phase) years	4	4
ED_{6-16} (mutagenic exposure duration third phase) years	10	10
ED_{16-26} (mutagenic exposure duration fourth phase) years	10	10
EF_{res} (exposure frequency) days/year	350	350
EF_{0-2} (mutagenic exposure frequency first phase) days/year	350	350
EF_{2-6} (mutagenic exposure frequency second phase) days/year	350	350
EF_{6-16} (mutagenic exposure frequency third phase) days/year	350	350
EF_{16-26} (mutagenic exposure frequency fourth phase) days/year	350	350
ET_{res} (exposure time) hours/day	24	24
ET_{0-2} (mutagenic exposure time first phase) hours/day	24	24
ET_{2-6} (mutagenic exposure time second phase) hours/day	24	24
ET_{6-16} (mutagenic exposure time third phase) hours/day	24	24
ET_{16-26} (mutagenic exposure time fourth phase) hours/day	24	24
THQ (target hazard quotient) unitless	0.1	0.1
LT (lifetime) years	70	70
TR (target risk) unitless	1.0E-06	1.0E-06

Resident Vapor Intrusion Screening Levels (VISL)

Key: I = IRIS; P = PPRTV; O = OPP; A = ATSDR; C = Cal EPA; X = APPENDIX PPRTV SCREEN; H = HEAST; W = see RSL user guide Section 2.3.5; E = see RSL user guide Section 2.3.6; S = see RSL user's guide Section 5.

Chemical	CAS Number	Does the chemical meet the definition for volatility? (HLC>1E-5 or VP>1)	Does the chemical have inhalation toxicity data? (IUR and/or RfC)	Is Chemical Sufficiently Volatile and Toxic to Pose Inhalation Risk Via Vapor Intrusion from Soil Source? (C_{vp} > $C_{i,a}$,Target?)	Is Chemical Sufficiently Volatile and Toxic to Pose Inhalation Risk Via Vapor Intrusion from Groundwater Source? (C_{hc} > $C_{i,a}$,Target?)	Target Indoor Air Concentration (TCR=1E-06 or THQ=0.1) MIN($C_{ia,c}$,$C_{ia,nc}$) (µg/m³)	Toxicity Basis
Methyl Ethyl Ketone (2-Butanone)	78-93-3	Yes	Yes	Yes	Yes	5.21E+02	NC

Chemical	Target Sub-Slab and Near-source Soil Gas Concentration (TCR=1E-06 or THQ=0.1) C_{sg},Target (µg/m³)	Target Groundwater Concentration (TCR=1E-06 or THQ=0.1) C_{gw},Target (µg/L)	Is Target Groundwater Concentration < MCL? (C_{gw} < MCL?)	Pure Phase Vapor Concentration C_{vp}\ (7.91 ℃)\ (µg/m³)	Maximum Groundwater Vapor Concentration C_{hc}\ (µg/m³)	Temperature for Maximum Groundwater Vapor Concentration (℃)
Methyl Ethyl Ketone (2-Butanone)	1.74E+04	5.03E+05	--	3.51E+08	2.31E+08	7.91

Chemical	Lower Explosive Limit LEL (% by volume)	LEL Ref	IUR (ug/m³)$^{-1}$	IUR Ref	RfC (mg/m³)	RfC Ref	Mutagenic Indicator	Carcinogenic VISL TCR=1E-06 $C_{ia,c}$ (µg/m³)	Noncarcinogenic VISL THQ=0.1 $C_{ia,nc}$ (µg/m³)
Methyl Ethyl Ketone (2-Butanone)	1.40	U			5.00E+00	U	No		5.21E+02

Chemical	CAS Number	Site Groundwater Concentration C_{gw}\ (μg/L)	Site Indoor Air Concentration $C_{i,a}$\ (μg/m³)	VI Carcinogenic Risk CR	VI Hazard HQ	IUR $(ug/m^3)^{-1}$	IUR Ref	Chronic RfC (mg/m^3)	RfC Ref	Temperature (℃)\ for Groundwater Vapor Concentration	Mutagen?
Methyl Ethyl Ketone (2-Butanone)	78-93-3	2.3	2.39E-03		4.57E-07			5.00E+00	U	7.91	No
**Sum*					*4.57E-07*						

Chemical	CAS Number	Does the chemical meet the definition for volatility? (HLC>1E-5 or VP>1)	Does the chemical have inhalation toxicity data? (IUR and/or RfC)	MW	MW Ref	Vapor Pressure VP (mm Hg)	VP Ref	S (mg/L)	S Ref	MCL (ug/L)	HLC (atm-m^3/mole)	Henry's Law Constant (unitless)
Methyl Ethyl Ketone (2-Butanone)	78-93-3	Yes	Yes	72.11	U	9.06E+01	U	2.23E+05	U		5.69E-05	2.33E-03

Chemical	Henry's Law Constant (7.91 ℃)	Henry's Law Constant Used in Calcs (unitless)	H` and HLC Ref	Enthalpy of vaporization @ groundwater temperature $\Delta H_{v,gw}$ \ (cal/mol)	Exponent for $\Delta H_{v,gw}$	Vapor Pressure VP (7.91 ℃)\ (mm Hg)	D_{ia} \ (cm^2/s)	D_{ia} \ (7.91 ℃)\ (cm^2/s)	D_{ia} \ Used in Calcs (cm^2/s)	D_{ia} \ Ref	D_{iw} \ (cm^2/s)
Methyl Ethyl Ketone (2-Butanone)	1.04E-03	1.04E-03	U	8445.38	0.37	1.56E+08	8.37E-02	0.0836977	0.0836977	U	9.61E-06

Chemical	D_{iw} \ (7.91 ℃)\ (cm^2/s)	D_{iw} \ Used in Calcs (cm^2/s)	D_{iw} \ Ref	Normal Boiling Point BP (K)	BP Ref	Critical Temperature TC (K)	TC Ref	Enthalpy of vaporization at the normal boiling point $\Delta H_{v,b}$ \ (cal/mol)	$\Delta H_{v,b}$ \ Ref	K_{oc} \ (cm^3/g)	K_{oc} \ Ref	Lower Explosive Limit LEL (% by volume)	LEL Ref
Methyl Ethyl Ketone (2-Butanone)	9.6092E-6	9.6092E-6	U	352.65	U	5.37E+02	U	7480.00	U	4.51	U	1.40	U

APPENDIX CC4

VISL Output – Acetone

Site-specific VISL Results
Resident Equation Inputs

*** Inputted values different from Resident defaults are highlighted.**
Output generated 16JAN2019:10:30:09

Variable	Resident Air Default Value	Value
AF_{gw} (Attenuation Factor Groundwater) unitless	0.001	0.001
AF_{ss} (Attenuation Factor Sub-Slab) unitless	0.03	0.03
ED_{res} (exposure duration) years	26	26
ED_{0-2} (mutagenic exposure duration first phase) years	2	2
ED_{2-6} (mutagenic exposure duration second phase) years	4	4
ED_{6-16} (mutagenic exposure duration third phase) years	10	10
ED_{16-26} (mutagenic exposure duration fourth phase) years	10	10
EF_{res} (exposure frequency) days/year	350	350
EF_{0-2} (mutagenic exposure frequency first phase) days/year	350	350
EF_{2-6} (mutagenic exposure frequency second phase) days/year	350	350
EF_{6-16} (mutagenic exposure frequency third phase) days/year	350	350
EF_{16-26} (mutagenic exposure frequency fourth phase) days/year	350	350
ET_{res} (exposure time) hours/day	24	24
ET_{0-2} (mutagenic exposure time first phase) hours/day	24	24
ET_{2-6} (mutagenic exposure time second phase) hours/day	24	24
ET_{6-16} (mutagenic exposure time third phase) hours/day	24	24
ET_{16-26} (mutagenic exposure time fourth phase) hours/day	24	24
THQ (target hazard quotient) unitless	0.1	0.1
LT (lifetime) years	70	70
TR (target risk) unitless	1.0E-06	1.0E-06

Resident Vapor Intrusion Screening Levels (VISL)

Key: I = IRIS; P = PPRTV; O = OPP; A = ATSDR; C = Cal EPA; X = APPENDIX PPRTV SCREEN; H = HEAST; W = see RSL user guide Section 2.3.5; E = see RSL user guide Section 2.3.6; S = see RSL user's guide Section 5.

Chemical	CAS Number	Does the chemical meet the definition for volatility? (HLC>1E-5 or VP>1)	Does the chemical have inhalation toxicity data? (IUR and/or RfC)	Is Chemical Sufficiently Volatile and Toxic to Pose Inhalation Risk Via Vapor Intrusion from Soil Source? (C_{vp} > $C_{i,a}$,Target?)	Is Chemical Sufficiently Volatile and Toxic to Pose Inhalation Risk Via Vapor Intrusion from Groundwater Source? (C_{hc} > $C_{i,a}$,Target?)	Target Indoor Air Concentration (TCR=1E-06 or THQ=0.1) MIN($C_{ia,c}$,$C_{ia,nc}$) (µg/m³)	Toxicity Basis
Acetone	67-64-1	Yes	Yes	Yes	Yes	3.22E+03	NC

Chemical	Target Sub-Slab and Near-source Soil Gas Concentration (TCR=1E-06 or THQ=0.1) C_{sg},Target (µg/m³)	Target Groundwater Concentration (TCR=1E-06 or THQ=0.1) C_{gw},Target (µg/L)	Is Target Groundwater Concentration < MCL? (C_{gw} < MCL?)	Pure Phase Vapor Concentration C_{vp}\ (10.91 °C)\ (µg/m³)	Maximum Groundwater Vapor Concentration C_{hc}\ (µg/m³)	Temperature for Maximum Groundwater Vapor Concentration (°C)	Lower Explosive Limit LEL (% by volume)	LEL Ref
Acetone	1.07E+05	4.04E+06	--	7.25E+08	7.98E+08	10.91	2.50	U

Chemical	IUR (ug/m³)$^{-1}$	IUR Ref	RfC (mg/m³)	RfC Ref	Mutagenic Indicator	Carcinogenic VISL TCR=1E-06 $C_{ia,c}$ (µg/m³)	Noncarcinogenic VISL THQ=0.1 $C_{ia,nc}$ (µg/m³)
Acetone			3.09E+01	U	No		3.22E+03

Chemical	CAS Number	Site Groundwater Concentration C_{gw} \ (μg/L)	Site Indoor Air Concentration $C_{i,a}$ \ (μg/m³)	VI Carcinogenic Risk CR	VI Hazard HQ	IUR $(ug/m^3)^{-1}$	IUR Ref	Chronic RfC (mg/m^3)	RfC Ref	Temperature (℃)\ for Groundwater Vapor Concentration	Mutagen?
Acetone	67-64-1	13	1.04E-02		3.22E-07			3.09E+01	U	10.91	No
**Sum*					*3.22E-07*						

Chemical Properties
Output generated 16JAN2019:10:30:09

Chemical	CAS Number	Does the chemical meet the definition for volatility? (HLC>1E-5 or VP>1)	Does the chemical have inhalation toxicity data? (IUR and/or RfC)	MW	MW Ref	Vapor Pressure VP (mm Hg)	VP Ref	S (mg/L)	S Ref	MCL (ug/L)	HLC (atm-m^3/mole)	Henry's Law Constant (unitless)
Acetone	67-64-1	Yes	Yes	58.08	U	2.32E+02	U	1.00E+06	U		3.50E-05	1.43E-03

Chemical	Henry's Law Constant (10.91 °C)	Henry's Law Constant Used in Calcs (unitless)	H` and HLC Ref	Enthalpy of vaporization @ groundwater temperature $\Delta H_{v,gw}$ \ (cal/mol)	Exponent for $\Delta H_{v,gw}$	Vapor Pressure VP (10.91 °C)\ (mm Hg)	D_{ia} \ (cm^2/s)	D_{ia} \ (10.91 °C)\ (cm^2/s)	D_{ia} \ Used in Calcs (cm^2/s)	D_{ia} \ Ref	D_{iw} \ (cm^2/s)
Acetone	7.98E-04	7.98E-04	U	7552.65	0.36	4.04E+08	9.85E-02	0.0984711	0.0984711	U	1.09E-05

Chemical	D_{iw} \ (10.91 °C)\ (cm^2/s)	D_{iw} \ Used in Calcs (cm^2/s)	D_{iw} \ Ref	Normal Boiling Point BP (K)	BP Ref	Critical Temperature TC (K)	TC Ref	Enthalpy of vaporization at the normal boiling point $\Delta H_{v,b}$ \ (cal/mol)	$\Delta H_{v,b}$ \ Ref	K_{oc} \ (cm^3/g)	K_{oc} \ Ref	Lower Explosive Limit LEL (% by volume)	LEL Ref
Acetone	0.0000109	0.0000109	U	329.15	U	5.08E+02	U	6960.00	U	2.36	U	2.50	U

APPENDIX CC5

VISL Output - Benzene

Site-specific VISL Results
Resident Equation Inputs

*** Inputted values different from Resident defaults are highlighted.**
Output generated 16JAN2019:10:31:14

Variable	Resident Air Default Value	Value
AF_{gw} (Attenuation Factor Groundwater) unitless	0.001	0.001
AF_{ss} (Attenuation Factor Sub-Slab) unitless	0.03	0.03
ED_{res} (exposure duration) years	26	26
ED_{0-2} (mutagenic exposure duration first phase) years	2	2
ED_{2-6} (mutagenic exposure duration second phase) years	4	4
ED_{6-16} (mutagenic exposure duration third phase) years	10	10
ED_{16-26} (mutagenic exposure duration fourth phase) years	10	10
EF_{res} (exposure frequency) days/year	350	350
EF_{0-2} (mutagenic exposure frequency first phase) days/year	350	350
EF_{2-6} (mutagenic exposure frequency second phase) days/year	350	350
EF_{6-16} (mutagenic exposure frequency third phase) days/year	350	350
EF_{16-26} (mutagenic exposure frequency fourth phase) days/year	350	350
ET_{res} (exposure time) hours/day	24	24
ET_{0-2} (mutagenic exposure time first phase) hours/day	24	24
ET_{2-6} (mutagenic exposure time second phase) hours/day	24	24
ET_{6-16} (mutagenic exposure time third phase) hours/day	24	24
ET_{16-26} (mutagenic exposure time fourth phase) hours/day	24	24
THQ (target hazard quotient) unitless	0.1	0.1
LT (lifetime) years	70	70
TR (target risk) unitless	1.0E-06	1.0E-06

Resident Vapor Intrusion Screening Levels (VISL)

Key: I = IRIS; P = PPRTV; O = OPP; A = ATSDR; C = Cal EPA; X = APPENDIX PPRTV SCREEN; H = HEAST; W = see RSL user guide Section 2.3.5; E = see RSL user guide Section 2.3.6; S = see RSL user's guide Section 5.

Chemical	CAS Number	Does the chemical meet the definition for volatility? (HLC>1E-5 or VP>1)	Does the chemical have inhalation toxicity data? (IUR and/or RfC)	Is Chemical Sufficiently Volatile and Toxic to Pose Inhalation Risk Via Vapor Intrusion from Soil Source? (C_{vp} > $C_{i,a}$,Target?)	Is Chemical Sufficiently Volatile and Toxic to Pose Inhalation Risk Via Vapor Intrusion from Groundwater Source? (C_{hc} > $C_{i,a}$,Target?)	Target Indoor Air Concentration (TCR=1E-06 or THQ=0.1) MIN($C_{ia,c}$,$C_{ia,nc}$) (µg/m³)	Toxicity Basis
Benzene	71-43-2	Yes	Yes	Yes	Yes	3.60E-01	CA

Chemical	Target Sub-Slab and Near-source Soil Gas Concentration (TCR=1E-06 or THQ=0.1) C_{sg},Target (µg/m³)	Target Groundwater Concentration (TCR=1E-06 or THQ=0.1) C_{gw},Target (µg/L)	Is Target Groundwater Concentration < MCL? (C_{gw} < MCL?)	Pure Phase Vapor Concentration C_{vp}\ (10.91 °C)\ (µg/m³)	Maximum Groundwater Vapor Concentration C_{hc}\ (µg/m³)	Temperature for Maximum Groundwater Vapor Concentration (°C)	Lower Explosive Limit LEL (% by volume)	LEL Ref
Benzene	1.20E+01	2.98E+00	Yes (5)	3.98E+08	2.16E+08	10.91	1.20	U

Chemical	IUR (ug/m³)$^{-1}$	IUR Ref	RfC (mg/m³)	RfC Ref	Mutagenic Indicator	Carcinogenic VISL TCR=1E-06 $C_{ia,c}$ (µg/m³)	Noncarcinogenic VISL THQ=0.1 $C_{ia,nc}$ (µg/m³)
Benzene	7.80E-06	U	3.00E-02	U	No	3.60E-01	3.13E+00

Chemical	CAS Number	Site Groundwater Concentration C_{gw} \ (μg/L)	Site Indoor Air Concentration $C_{i,a}$ \ (μg/m³)	VI Carcinogenic Risk CR	VI Hazard HQ	IUR (ug/m³)$^{-1}$	IUR Ref	Chronic RfC (mg/m³)	RfC Ref	Temperature (℃)\ for Groundwater Vapor Concentration	Mutagen?
Benzene	71-43-2	0.17	2.05E-02	5.70E-08	6.56E-04	7.80E-06	U	3.00E-02	U	10.91	No
**Sum*				*5.70E-08*	*6.56E-04*						

Chemical Properties
Output generated 16JAN2019:10:31:14

Chemical	CAS Number	Does the chemical meet the definition for volatility? (HLC>1E-5 or VP>1)	Does the chemical have inhalation toxicity data? (IUR and/or RfC)	MW	MW Ref	Vapor Pressure VP (mm Hg)	VP Ref	S (mg/L)	S Ref	MCL (ug/L)	HLC (atm-m^3/mole)	Henry's Law Constant (unitless)
Benzene	71-43-2	Yes	Yes	78.12	U	9.48E+01	U	1.79E+03	U	5	5.55E-03	2.27E-01

Chemical	Henry's Law Constant (10.91 ℃)	Henry's Law Constant Used in Calcs (unitless)	H` and HLC Ref	Enthalpy of vaporization @ groundwater temperature $\Delta H_{v,gw}$ \ (cal/mol)	Exponent for $\Delta H_{v,gw}$	Vapor Pressure VP (10.91 ℃)\ (mm Hg)	D_{ia} \ (cm^2/s)	D_{ia} \ (10.91 ℃)\ (cm^2/s)	D_{ia} \ Used in Calcs (cm^2/s)	D_{ia} \ Ref	D_{iw} \ (cm^2/s)
Benzene	1.21E-01	1.21E-01	U	8109.85	0.35	2.12E+08	8.32E-02	0.0832382	0.0832382	U	9.77E-06

Chemical	D_{iw} \ (10.91 ℃)\ (cm^2/s)	D_{iw} \ Used in Calcs (cm^2/s)	D_{iw} \ Ref	Normal Boiling Point BP (K)	BP Ref	Critical Temperature TC (K)	TC Ref	Enthalpy of vaporization at the normal boiling point $\Delta H_{v,b}$ \ (cal/mol)	$\Delta H_{v,b}$ \ Ref	K_{oc} \ (cm^3/g)	K_{oc} \ Ref	Lower Explosive Limit LEL (% by volume)	LEL Ref
Benzene	9.7745E-6	9.7745E-6	U	353.15	U	5.62E+02	U	7340.00	U	146	U	1.20	U

APPENDIX CC6

VISL Output – Carbon Disulfide

Site-specific VISL Results
Resident Equation Inputs

*** Inputted values different from Resident defaults are highlighted.**
Output generated 16JAN2019:10:32:14

Variable	Resident Air Default Value	Value
AF_{gw} (Attenuation Factor Groundwater) unitless	0.001	0.001
AF_{ss} (Attenuation Factor Sub-Slab) unitless	0.03	0.03
ED_{res} (exposure duration) years	26	26
ED_{0-2} (mutagenic exposure duration first phase) years	2	2
ED_{2-6} (mutagenic exposure duration second phase) years	4	4
ED_{6-16} (mutagenic exposure duration third phase) years	10	10
ED_{16-26} (mutagenic exposure duration fourth phase) years	10	10
EF_{res} (exposure frequency) days/year	350	350
EF_{0-2} (mutagenic exposure frequency first phase) days/year	350	350
EF_{2-6} (mutagenic exposure frequency second phase) days/year	350	350
EF_{6-16} (mutagenic exposure frequency third phase) days/year	350	350
EF_{16-26} (mutagenic exposure frequency fourth phase) days/year	350	350
ET_{res} (exposure time) hours/day	24	24
ET_{0-2} (mutagenic exposure time first phase) hours/day	24	24
ET_{2-6} (mutagenic exposure time second phase) hours/day	24	24
ET_{6-16} (mutagenic exposure time third phase) hours/day	24	24
ET_{16-26} (mutagenic exposure time fourth phase) hours/day	24	24
THQ (target hazard quotient) unitless	0.1	0.1
LT (lifetime) years	70	70
TR (target risk) unitless	1.0E-06	1.0E-06

Resident Vapor Intrusion Screening Levels (VISL)

Key: I = IRIS; P = PPRTV; O = OPP; A = ATSDR; C = Cal EPA; X = APPENDIX PPRTV SCREEN; H = HEAST; W = see RSL user guide Section 2.3.5; E = see RSL user guide Section 2.3.6; S = see RSL user's guide Section 5.

Chemical	CAS Number	Does the chemical meet the definition for volatility? (HLC>1E-5 or VP>1)	Does the chemical have inhalation toxicity data? (IUR and/or RfC)	Is Chemical Sufficiently Volatile and Toxic to Pose Inhalation Risk Via Vapor Intrusion from Soil Source? (C_{vp} > $C_{i,a}$,Target?)	Is Chemical Sufficiently Volatile and Toxic to Pose Inhalation Risk Via Vapor Intrusion from Groundwater Source? (C_{hc} > $C_{i,a}$,Target?)	Target Indoor Air Concentration (TCR=1E-06 or THQ=0.1) MIN($C_{ia,c}$,$C_{ia,nc}$) (µg/m³)	Toxicity Basis	Target Sub-Slab and Near-source Soil Gas Concentration (TCR=1E-06 or THQ=0.1) C_{sg},Target (µg/m³)
Carbon Disulfide	75-15-0	Yes	Yes	Yes	Yes	7.30E+01	NC	2.43E+03

Chemical	Target Groundwater Concentration (TCR=1E-06 or THQ=0.1) C_{gw},Target (µg/L)	Is Target Groundwater Concentration < MCL? (C_{gw} < MCL?)	Pure Phase Vapor Concentration C_{vp} \ (10.13 ℃)\ (µg/m³)	Maximum Groundwater Vapor Concentration C_{hc} \ (µg/m³)	Temperature for Maximum Groundwater Vapor Concentration (℃)	Lower Explosive Limit LEL (% by volume)	LEL Ref	IUR (ug/m³)$^{-1}$	IUR Ref
Carbon Disulfide	2.13E+02	--	1.47E+09	7.40E+08	10.13	1.30	U		

Chemical	RfC (mg/m³)	RfC Ref	Mutagenic Indicator	Carcinogenic VISL TCR=1E-06 $C_{ia,c}$ (µg/m³)	Noncarcinogenic VISL THQ=0.1 $C_{ia,nc}$ (µg/m³)
Carbon Disulfide	7.00E-01	U	No		7.30E+01

Chemical	CAS Number	Site Groundwater Concentration C_{gw} \ (μg/L)	Site Indoor Air Concentration $C_{i,a}$ \ (μg/m³)	VI Carcinogenic Risk CR	VI Hazard HQ	IUR $(ug/m^3)^{-1}$	IUR Ref	Chronic RfC (mg/m^3)	RfC Ref	Temperature (℃)\ for Groundwater Vapor Concentration	Mutagen?
Carbon Disulfide	75-15-0	3	1.03E+00		1.41E-03			7.00E-01	U	10.13	No
**Sum*					*1.41E-03*						

Chemical Properties
Output generated 16JAN2019:10:32:14

Chemical	CAS Number	Does the chemical meet the definition for volatility? (HLC>1E-5 or VP>1)	Does the chemical have inhalation toxicity data? (IUR and/or RfC)	MW	MW Ref	Vapor Pressure VP (mm Hg)	VP Ref	S (mg/L)	S Ref	MCL (ug/L)	HLC (atm-m^3/mole)	Henry's Law Constant (unitless)
Carbon Disulfide	75-15-0	Yes	Yes	76.14	U	3.59E+02	U	2.16E+03	U		1.44E-02	5.89E-01

Chemical	Henry's Law Constant (10.13 ℃)	Henry's Law Constant Used in Calcs (unitless)	H` and HLC Ref	Enthalpy of vaporization @ groundwater temperature $\Delta H_{v,gw}$ \ (cal/mol)	Exponent for $\Delta H_{v,gw}$	Vapor Pressure VP (10.13 ℃)\ (mm Hg)	D_{ia} \ (cm^2/s)	D_{ia} \ (10.13 ℃)\ (cm^2/s)	D_{ia} \ Used in Calcs (cm^2/s)	D_{ia} \ Ref	D_{iw} \ (cm^2/s)
Carbon Disulfide	3.43E-01	3.43E-01	U	6681.98	0.31	8.55E+08	9.85E-02	0.0984673	0.0984673	U	1.23E-05

Chemical	D_{iw} \ (10.13 ℃)\ (cm^2/s)	D_{iw} \ Used in Calcs (cm^2/s)	D_{iw} \ Ref	Normal Boiling Point BP (K)	BP Ref	Critical Temperature TC (K)	TC Ref	Enthalpy of vaporization at the normal boiling point $\Delta H_{v,b}$ \ (cal/mol)	$\Delta H_{v,b}$ \ Ref	K_{oc} \ (cm^3/g)	K_{oc} \ Ref	Lower Explosive Limit LEL (% by volume)	LEL Ref
Carbon Disulfide	0.0000123	0.0000123	U	319.15	U	5.52E+02	U	6390.00	U	21.7	U	1.30	U

APPENDIX CC7

VISL Output – Methylene Chloride

Site-specific VISL Results
Resident Equation Inputs

*** Inputted values different from Resident defaults are highlighted.**
Output generated 16JAN2019:10:33:19

Variable	Resident Air Default Value	Value
AF_{gw} (Attenuation Factor Groundwater) unitless	0.001	0.001
AF_{ss} (Attenuation Factor Sub-Slab) unitless	0.03	0.03
ED_{res} (exposure duration) years	26	26
ED_{0-2} (mutagenic exposure duration first phase) years	2	2
ED_{2-6} (mutagenic exposure duration second phase) years	4	4
ED_{6-16} (mutagenic exposure duration third phase) years	10	10
ED_{16-26} (mutagenic exposure duration fourth phase) years	10	10
EF_{res} (exposure frequency) days/year	350	350
EF_{0-2} (mutagenic exposure frequency first phase) days/year	350	350
EF_{2-6} (mutagenic exposure frequency second phase) days/year	350	350
EF_{6-16} (mutagenic exposure frequency third phase) days/year	350	350
EF_{16-26} (mutagenic exposure frequency fourth phase) days/year	350	350
ET_{res} (exposure time) hours/day	24	24
ET_{0-2} (mutagenic exposure time first phase) hours/day	24	24
ET_{2-6} (mutagenic exposure time second phase) hours/day	24	24
ET_{6-16} (mutagenic exposure time third phase) hours/day	24	24
ET_{16-26} (mutagenic exposure time fourth phase) hours/day	24	24
THQ (target hazard quotient) unitless	0.1	0.1
LT (lifetime) years	70	70
TR (target risk) unitless	1.0E-06	1.0E-06

Resident Vapor Intrusion Screening Levels (VISL)

Key: I = IRIS; P = PPRTV; O = OPP; A = ATSDR; C = Cal EPA; X = APPENDIX PPRTV SCREEN; H = HEAST; W = see RSL user guide Section 2.3.5; E = see RSL user guide Section 2.3.6; S = see RSL user's guide Section 5.

Chemical	CAS Number	Does the chemical meet the definition for volatility? (HLC>1E-5 or VP>1)	Does the chemical have inhalation toxicity data? (IUR and/or RfC)	Is Chemical Sufficiently Volatile and Toxic to Pose Inhalation Risk Via Vapor Intrusion from Soil Source? ($C_{vp} > C_{i,a}$,Target?)	Is Chemical Sufficiently Volatile and Toxic to Pose Inhalation Risk Via Vapor Intrusion from Groundwater Source? ($C_{hc} > C_{i,a}$,Target?)	Target Indoor Air Concentration (TCR=1E-06 or THQ=0.1) MIN($C_{ia,c}$,$C_{ia,nc}$) (µg/m³)	Toxicity Basis
Methylene Chloride	75-09-2	Yes	Yes	Yes	Yes	6.26E+01	NC

Chemical	Target Sub-Slab and Near-source Soil Gas Concentration (TCR=1E-06 or THQ=0.1) C_{sg},Target (µg/m³)	Target Groundwater Concentration (TCR=1E-06 or THQ=0.1) C_{gw},Target (µg/L)	Is Target Groundwater Concentration < MCL? (C_{gw} < MCL?)	Pure Phase Vapor Concentration C_{vp}\ (7.29 °C)\ (µg/m³)	Maximum Groundwater Vapor Concentration C_{hc}\ (µg/m³)	Temperature for Maximum Groundwater Vapor Concentration (°C)
Methylene Chloride	2.09E+03	9.42E+02	No (5)	1.99E+09	8.64E+08	7.29

Chemical	Lower Explosive Limit LEL (% by volume)	LEL Ref	IUR $(ug/m^3)^{-1}$	IUR Ref	RfC (mg/m³)	RfC Ref	Mutagenic Indicator	Carcinogenic VISL TCR=1E-06 $C_{ia,c}$ (µg/m³)	Noncarcinogenic VISL THQ=0.1 $C_{ia,nc}$ (µg/m³)
Methylene Chloride	13.00	U	1.00E-08	U	6.00E-01	U	Mut	1.01E+02	6.26E+01

Chemical	CAS Number	Site Groundwater Concentration C_{gw} \ (μg/L)	Site Indoor Air Concentration $C_{i,a}$ \ (μg/m³)	VI Carcinogenic Risk CR	VI Hazard HQ	IUR $(ug/m^3)^{-1}$	IUR Ref	Chronic RfC (mg/m^3)	RfC Ref	Temperature (℃)\ for Groundwater Vapor Concentration	Mutagen?
Methylene Chloride	75-09-2	1.8	1.20E-01	1.18E-09	1.91E-04	1.00E-08	U	6.00E-01	U	7.29	Mut
**Sum*				*1.18E-09*	*1.91E-04*						

Chemical Properties
Output generated 16JAN2019:10:33:19

Chemical	CAS Number	Does the chemical meet the definition for volatility? (HLC>1E-5 or VP>1)	Does the chemical have inhalation toxicity data? (IUR and/or RfC)	MW	MW Ref	Vapor Pressure VP (mm Hg)	VP Ref	S (mg/L)	S Ref	MCL (ug/L)	HLC (atm-m^3/mole)	Henry's Law Constant (unitless)
Methylene Chloride	75-09-2	Yes	Yes	84.93	U	4.35E+02	U	1.30E+04	U	5	3.25E-03	1.33E-01

Chemical	Henry's Law Constant (7.29 ℃)	Henry's Law Constant Used in Calcs (unitless)	H` and HLC Ref	Enthalpy of vaporization @ groundwater temperature $\Delta H_{v,gw}$ \ (cal/mol)	Exponent for $\Delta H_{v,gw}$	Vapor Pressure VP (7.29 ℃)\ (mm Hg)	D_{ia} \ (cm^2/s)	D_{ia} \ (7.29 ℃)\ (cm^2/s)	D_{ia} \ Used in Calcs (cm^2/s)	D_{ia} \ Ref	D_{iw} \ (cm^2/s)
Methylene Chloride	6.65E-02	6.65E-02	U	7073.72	0.34	9.93E+08	9.13E-02	0.0912574	0.0912574	U	1.18E-05

Chemical	D_{iw} \ (7.29 ℃)\ (cm^2/s)	D_{iw} \ Used in Calcs (cm^2/s)	D_{iw} \ Ref	Normal Boiling Point BP (K)	BP Ref	Critical Temperature TC (K)	TC Ref	Enthalpy of vaporization at the normal boiling point $\Delta H_{v,b}$ \ (cal/mol)	$\Delta H_{v,b}$ \ Ref	K_{oc} \ (cm^3/g)	K_{oc} \ Ref	Lower Explosive Limit LEL (% by volume)	LEL Ref
Methylene Chloride	0.0000118	0.0000118	U	313.15	U	5.08E+02	U	6710.00	U	21.7	U	13.00	U

APPENDIX CC8

VISL Output - Tetrachloroethene

Site-specific VISL Results
Resident Equation Inputs

*** Inputted values different from Resident defaults are highlighted.**
Output generated 16JAN2019:10:34:08

Variable	Resident Air Default Value	Value
AF_{gw} (Attenuation Factor Groundwater) unitless	0.001	0.001
AF_{ss} (Attenuation Factor Sub-Slab) unitless	0.03	0.03
ED_{res} (exposure duration) years	26	26
ED_{0-2} (mutagenic exposure duration first phase) years	2	2
ED_{2-6} (mutagenic exposure duration second phase) years	4	4
ED_{6-16} (mutagenic exposure duration third phase) years	10	10
ED_{16-26} (mutagenic exposure duration fourth phase) years	10	10
EF_{res} (exposure frequency) days/year	350	350
EF_{0-2} (mutagenic exposure frequency first phase) days/year	350	350
EF_{2-6} (mutagenic exposure frequency second phase) days/year	350	350
EF_{6-16} (mutagenic exposure frequency third phase) days/year	350	350
EF_{16-26} (mutagenic exposure frequency fourth phase) days/year	350	350
ET_{res} (exposure time) hours/day	24	24
ET_{0-2} (mutagenic exposure time first phase) hours/day	24	24
ET_{2-6} (mutagenic exposure time second phase) hours/day	24	24
ET_{6-16} (mutagenic exposure time third phase) hours/day	24	24
ET_{16-26} (mutagenic exposure time fourth phase) hours/day	24	24
THQ (target hazard quotient) unitless	0.1	0.1
LT (lifetime) years	70	70
TR (target risk) unitless	1.0E-06	1.0E-06

Resident Vapor Intrusion Screening Levels (VISL)

Key: I = IRIS; P = PPRTV; O = OPP; A = ATSDR; C = Cal EPA; X = APPENDIX PPRTV SCREEN; H = HEAST; W = see RSL user guide Section 2.3.5; E = see RSL user guide Section 2.3.6; S = see RSL user's guide Section 5.

Chemical	CAS Number	Does the chemical meet the definition for volatility? (HLC>1E-5 or VP>1)	Does the chemical have inhalation toxicity data? (IUR and/or RfC)	Is Chemical Sufficiently Volatile and Toxic to Pose Inhalation Risk Via Vapor Intrusion from Soil Source? ($C_{vp} > C_{i,a}$,Target?)	Is Chemical Sufficiently Volatile and Toxic to Pose Inhalation Risk Via Vapor Intrusion from Groundwater Source? ($C_{hc} > C_{i,a}$,Target?)	Target Indoor Air Concentration (TCR=1E-06 or THQ=0.1) MIN($C_{ia,c}$,$C_{ia,nc}$) (µg/m³)	Toxicity Basis
Tetrachloroethylene	127-18-4	Yes	Yes	Yes	Yes	4.17E+00	NC

Chemical	Target Sub-Slab and Near-source Soil Gas Concentration (TCR=1E-06 or THQ=0.1) C_{sg},Target (µg/m³)	Target Groundwater Concentration (TCR=1E-06 or THQ=0.1) C_{gw},Target (µg/L)	Is Target Groundwater Concentration < MCL? (C_{gw} < MCL?)	Pure Phase Vapor Concentration C_{vp}\ (7.91 °C)\ (µg/m³)	Maximum Groundwater Vapor Concentration C_{hc}\ (µg/m³)	Temperature for Maximum Groundwater Vapor Concentration (°C)	Lower Explosive Limit LEL (% by volume)
Tetrachloroethylene	1.39E+02	1.45E+01	No (5)	1.65E+08	5.92E+07	7.91	

Chemical	LEL Ref	IUR $(ug/m^3)^{-1}$	IUR Ref	RfC (mg/m³)	RfC Ref	Mutagenic Indicator	Carcinogenic VISL TCR=1E-06 $C_{ia,c}$ (µg/m³)	Noncarcinogenic VISL THQ=0.1 $C_{ia,nc}$ (µg/m³)
Tetrachloroethylene		2.60E-07	U	4.00E-02	U	No	1.08E+01	4.17E+00

Chemical	CAS Number	Site Groundwater Concentration C_{gw}\ (µg/L)	Site Indoor Air Concentration $C_{i,a}$\ (µg/m³)	VI Carcinogenic Risk CR	VI Hazard HQ	IUR $(ug/m^3)^{-1}$	IUR Ref
Tetrachloroethylene	127-18-4	0.69	1.98E-01	1.84E-08	4.75E-03	2.60E-07	U
**Sum*				*1.84E-08*	*4.75E-03*		

Chemical	Chronic RfC (mg/m³)	RfC Ref	Temperature (℃)\ for Groundwater Vapor Concentration	Mutagen?
Tetrachloroethylene	4.00E-02	U	7.91	No
**Sum*				

Chemical Properties
Output generated 16JAN2019:10:34:08

Chemical	CAS Number	Does the chemical meet the definition for volatility? (HLC>1E-5 or VP>1)	Does the chemical have inhalation toxicity data? (IUR and/or RfC)	MW	MW Ref	Vapor Pressure VP (mm Hg)	VP Ref	S (mg/L)	S Ref	MCL (ug/L)	HLC (atm-m^3/mole)	Henry's Law Constant (unitless)
Tetrachloroethylene	127-18-4	Yes	Yes	165.83	U	1.85E+01	U	2.06E+02	U	5	1.77E-02	7.24E-01

Chemical	Henry's Law Constant (7.91 ℃)	Henry's Law Constant Used in Calcs (unitless)	H` and HLC Ref	Enthalpy of vaporization @ groundwater temperature $\Delta H_{v,gw}$ \ (cal/mol)	Exponent for $\Delta H_{v,gw}$	Vapor Pressure VP (7.91 ℃)\ (mm Hg)	D_{ia} \ (cm^2/s)	D_{ia} \ (7.91 ℃)\ (cm^2/s)	D_{ia} \ Used in Calcs (cm^2/s)	D_{ia} \ Ref	D_{iw} \ (cm^2/s)
Tetrachloroethylene	2.87E-01	2.87E-01	U	9572.88	0.35	6.55E+07	4.62E-02	0.0461504	0.0461504	U	8.90E-06

Chemical	D_{iw} \ (7.91 ℃)\ (cm^2/s)	D_{iw} \ Used in Calcs (cm^2/s)	D_{iw} \ Ref	Normal Boiling Point BP (K)	BP Ref	Critical Temperature TC (K)	TC Ref	Enthalpy of vaporization at the normal boiling point $\Delta H_{v,b}$ \ (cal/mol)	$\Delta H_{v,b}$ \ Ref	K_{oc} \ (cm^3/g)	K_{oc} \ Ref	Lower Explosive Limit LEL (% by volume)	LEL Ref
Tetrachloroethylene	8.9029E-6	8.9029E-6	U	394.15	U	6.20E+02	U	8290.00	U	94.9	U		

APPENDIX CC9

VISL Output – Toluene

Site-specific VISL Results
Resident Equation Inputs

*** Inputted values different from Resident defaults are highlighted.**
Output generated 16JAN2019:10:34:56

Variable	Resident Air Default Value	Value
AF_{gw} (Attenuation Factor Groundwater) unitless	0.001	0.001
AF_{ss} (Attenuation Factor Sub-Slab) unitless	0.03	0.03
ED_{res} (exposure duration) years	26	26
ED_{0-2} (mutagenic exposure duration first phase) years	2	2
ED_{2-6} (mutagenic exposure duration second phase) years	4	4
ED_{6-16} (mutagenic exposure duration third phase) years	10	10
ED_{16-26} (mutagenic exposure duration fourth phase) years	10	10
EF_{res} (exposure frequency) days/year	350	350
EF_{0-2} (mutagenic exposure frequency first phase) days/year	350	350
EF_{2-6} (mutagenic exposure frequency second phase) days/year	350	350
EF_{6-16} (mutagenic exposure frequency third phase) days/year	350	350
EF_{16-26} (mutagenic exposure frequency fourth phase) days/year	350	350
ET_{res} (exposure time) hours/day	24	24
ET_{0-2} (mutagenic exposure time first phase) hours/day	24	24
ET_{2-6} (mutagenic exposure time second phase) hours/day	24	24
ET_{6-16} (mutagenic exposure time third phase) hours/day	24	24
ET_{16-26} (mutagenic exposure time fourth phase) hours/day	24	24
THQ (target hazard quotient) unitless	0.1	0.1
LT (lifetime) years	70	70
TR (target risk) unitless	1.0E-06	1.0E-06

Resident Vapor Intrusion Screening Levels (VISL)

Key: I = IRIS; P = PPRTV; O = OPP; A = ATSDR; C = Cal EPA; X = APPENDIX PPRTV SCREEN; H = HEAST; W = see RSL user guide Section 2.3.5; E = see RSL user guide Section 2.3.6; S = see RSL user's guide Section 5.

Chemical	CAS Number	Does the chemical meet the definition for volatility? (HLC>1E-5 or VP>1)	Does the chemical have inhalation toxicity data? (IUR and/or RfC)	Is Chemical Sufficiently Volatile and Toxic to Pose Inhalation Risk Via Vapor Intrusion from Soil Source? (C_{vp} > $C_{i,a}$,Target?)	Is Chemical Sufficiently Volatile and Toxic to Pose Inhalation Risk Via Vapor Intrusion from Groundwater Source? (C_{hc} > $C_{i,a}$,Target?)	Target Indoor Air Concentration (TCR=1E-06 or THQ=0.1) MIN($C_{ia,c}$,$C_{ia,nc}$) (µg/m³)	Toxicity Basis
Toluene	108-88-3	Yes	Yes	Yes	Yes	5.21E+02	NC

Chemical	Target Sub-Slab and Near-source Soil Gas Concentration (TCR=1E-06 or THQ=0.1) C_{sg},Target (µg/m³)	Target Groundwater Concentration (TCR=1E-06 or THQ=0.1) C_{gw},Target (µg/L)	Is Target Groundwater Concentration < MCL? (C_{gw} < MCL?)	Pure Phase Vapor Concentration C_{vp}\ (10.13 °C)\ (µg/m³)	Maximum Groundwater Vapor Concentration C_{hc}\ (µg/m³)	Temperature for Maximum Groundwater Vapor Concentration (°C)	Lower Explosive Limit LEL (% by volume)	LEL Ref
Toluene	1.74E+04	4.11E+03	No (1000)	1.41E+08	6.67E+07	10.13	1.10	U

Chemical	IUR $(ug/m^3)^{-1}$	IUR Ref	RfC (mg/m³)	RfC Ref	Mutagenic Indicator	Carcinogenic VISL TCR=1E-06 $C_{ia,c}$ (µg/m³)	Noncarcinogenic VISL THQ=0.1 $C_{ia,nc}$ (µg/m³)
Toluene			5.00E+00	U	No		5.21E+02

Chemical	CAS Number	Site Groundwater Concentration C_{gw} \ (μg/L)	Site Indoor Air Concentration $C_{i,a}$ \ ($\mu g/m^3$)	VI Carcinogenic Risk CR	VI Hazard HQ	IUR $(ug/m^3)^{-1}$	IUR Ref	Chronic RfC (mg/m^3)	RfC Ref	Temperature (°C)\ for Groundwater Vapor Concentration	Mutagen?
Toluene	108-88-3	2.2	2.79E-01		5.35E-05			5.00E+00	U	10.13	No
**Sum*					*5.35E-05*						

Chemical Properties
Output generated 16JAN2019:10:34:56

Chemical	CAS Number	Does the chemical meet the definition for volatility? (HLC>1E-5 or VP>1)	Does the chemical have inhalation toxicity data? (IUR and/or RfC)	MW	MW Ref	Vapor Pressure VP (mm Hg)	VP Ref	S (mg/L)	S Ref	MCL (ug/L)	HLC (atm-m^3/mole)	Henry's Law Constant (unitless)
Toluene	108-88-3	Yes	Yes	92.14	U	2.84E+01	U	5.26E+02	U	1000	6.64E-03	2.71E-01

Chemical	Henry's Law Constant (10.13 ℃)	Henry's Law Constant Used in Calcs (unitless)	H` and HLC Ref	Enthalpy of vaporization @ groundwater temperature $\Delta H_{v,gw}$ \ (cal/mol)	Exponent for $\Delta H_{v,gw}$	Vapor Pressure VP (10.13 ℃)\ (mm Hg)	D_{ia} \ (cm^2/s)	D_{ia} \ (10.13 ℃)\ (cm^2/s)	D_{ia} \ Used in Calcs (cm^2/s)	D_{ia} \ Ref	D_{iw} \ (cm^2/s)
Toluene	1.27E-01	1.27E-01	U	9158.96	0.36	6.59E+07	7.20E-02	0.0720418	0.0720418	U	8.74E-06

Chemical	D_{iw} \ (10.13 ℃)\ (cm^2/s)	D_{iw} \ Used in Calcs (cm^2/s)	D_{iw} \ Ref	Normal Boiling Point BP (K)	BP Ref	Critical Temperature TC (K)	TC Ref	Enthalpy of vaporization at the normal boiling point $\Delta H_{v,b}$ \ (cal/mol)	$\Delta H_{v,b}$ \ Ref	K_{oc} \ (cm^3/g)	K_{oc} \ Ref	Lower Explosive Limit LEL (% by volume)	LEL Ref
Toluene	8.7432E-6	8.7432E-6	U	384.15	U	5.92E+02	U	7930.00	U	234	U	1.10	U

APPENDIX CC10

VISL Output – Trichloroethene

Site-specific VISL Results
Resident Equation Inputs

*** Inputted values different from Resident defaults are highlighted.**
Output generated 16JAN2019:10:35:48

Variable	Resident Air Default Value	Value
AF_{gw} (Attenuation Factor Groundwater) unitless	0.001	0.001
AF_{ss} (Attenuation Factor Sub-Slab) unitless	0.03	0.03
ED_{res} (exposure duration) years	26	26
ED_{0-2} (mutagenic exposure duration first phase) years	2	2
ED_{2-6} (mutagenic exposure duration second phase) years	4	4
ED_{6-16} (mutagenic exposure duration third phase) years	10	10
ED_{16-26} (mutagenic exposure duration fourth phase) years	10	10
EF_{res} (exposure frequency) days/year	350	350
EF_{0-2} (mutagenic exposure frequency first phase) days/year	350	350
EF_{2-6} (mutagenic exposure frequency second phase) days/year	350	350
EF_{6-16} (mutagenic exposure frequency third phase) days/year	350	350
EF_{16-26} (mutagenic exposure frequency fourth phase) days/year	350	350
ET_{res} (exposure time) hours/day	24	24
ET_{0-2} (mutagenic exposure time first phase) hours/day	24	24
ET_{2-6} (mutagenic exposure time second phase) hours/day	24	24
ET_{6-16} (mutagenic exposure time third phase) hours/day	24	24
ET_{16-26} (mutagenic exposure time fourth phase) hours/day	24	24
THQ (target hazard quotient) unitless	0.1	0.1
LT (lifetime) years	70	70
TR (target risk) unitless	1.0E-06	1.0E-06

Resident Vapor Intrusion Screening Levels (VISL)

Key: I = IRIS; P = PPRTV; O = OPP; A = ATSDR; C = Cal EPA; X = APPENDIX PPRTV SCREEN; H = HEAST; W = see RSL user guide Section 2.3.5; E = see RSL user guide Section 2.3.6; S = see RSL user's guide Section 5.

Chemical	CAS Number	Does the chemical meet the definition for volatility? (HLC>1E-5 or VP>1)	Does the chemical have inhalation toxicity data? (IUR and/or RfC)	Is Chemical Sufficiently Volatile and Toxic to Pose Inhalation Risk Via Vapor Intrusion from Soil Source? ($C_{vp} > C_{i,a}$,Target?)	Is Chemical Sufficiently Volatile and Toxic to Pose Inhalation Risk Via Vapor Intrusion from Groundwater Source? ($C_{hc} > C_{i,a}$,Target?)	Target Indoor Air Concentration (TCR=1E-06 or THQ=0.1) MIN($C_{ia,c}$,$C_{ia,nc}$) (µg/m³)	Toxicity Basis
Trichloroethylene	79-01-6	Yes	Yes	Yes	Yes	2.09E-01	NC

Chemical	Target Sub-Slab and Near-source Soil Gas Concentration (TCR=1E-06 or THQ=0.1) C_{sg},Target (µg/m³)	Target Groundwater Concentration (TCR=1E-06 or THQ=0.1) C_{gw},Target (µg/L)	Is Target Groundwater Concentration < MCL? (C_{gw} < MCL?)	Pure Phase Vapor Concentration C_{vp}\ (10.13 °C)\ (µg/m³)	Maximum Groundwater Vapor Concentration C_{hc}\ (µg/m³)	Temperature for Maximum Groundwater Vapor Concentration (°C)	Lower Explosive Limit LEL (% by volume)
Trichloroethylene	6.95E+00	1.03E+00	Yes (5)	4.88E+08	2.58E+08	10.13	8.00

Chemical	LEL Ref	IUR (ug/m³)$^{-1}$	IUR Ref	RfC (mg/m³)	RfC Ref	Mutagenic Indicator	Carcinogenic VISL TCR=1E-06 $C_{ia,c}$ (µg/m³)	Noncarcinogenic VISL THQ=0.1 $C_{ia,nc}$ (µg/m³)
Trichloroethylene	U	4.10E-06	U	2.00E-03	U	Mut	4.78E-01	2.09E-01

Chemical	CAS Number	Site Groundwater Concentration C_{gw} \ (µg/L)	Site Indoor Air Concentration $C_{i,a}$ \ (µg/m³)	VI Carcinogenic Risk CR	VI Hazard HQ	IUR $(ug/m^3)^{-1}$	IUR Ref	Chronic RfC (mg/m³)
Trichloroethylene	79-01-6	0.76	1.53E-01	3.21E-07	7.36E-02	4.10E-06	U	2.00E-03
**Sum*				*3.21E-07*	*7.36E-02*			

Chemical	RfC Ref	Temperature (°C)\ for Groundwater Vapor Concentration	Mutagen?
Trichloroethylene	U	10.13	Mut
**Sum*			

Chemical	CAS Number	Does the chemical meet the definition for volatility? (HLC>1E-5 or VP>1)	Does the chemical have inhalation toxicity data? (IUR and/or RfC)	MW	MW Ref	Vapor Pressure VP (mm Hg)	VP Ref	S (mg/L)	S Ref	MCL (ug/L)	HLC (atm-m^3/mole)	Henry's Law Constant (unitless)
Trichloroethylene	79-01-6	Yes	Yes	131.39	U	6.90E+01	U	1.28E+03	U	5	9.85E-03	4.03E-01

Chemical	Henry's Law Constant (10.13 ℃)	Henry's Law Constant Used in Calcs (unitless)	H` and HLC Ref	Enthalpy of vaporization @ groundwater temperature $\Delta H_{v,gw}$ \ (cal/mol)	Exponent for $\Delta H_{v,gw}$	Vapor Pressure VP (10.13 ℃)\ (mm Hg)	D_{ia} \ (cm^2/s)	D_{ia} \ (10.13 ℃)\ (cm^2/s)	D_{ia} \ Used in Calcs (cm^2/s)	D_{ia} \ Ref	D_{iw} \ (cm^2/s)
Trichloroethylene	2.02E-01	2.02E-01	U	8367.39	0.35	2.44E+08	6.35E-02	0.0635079	0.0635079	U	9.69E-06

Chemical	D_{iw} \ (10.13 ℃)\ (cm^2/s)	D_{iw} \ Used in Calcs (cm^2/s)	D_{iw} \ Ref	Normal Boiling Point BP (K)	BP Ref	Critical Temperature TC (K)	TC Ref	Enthalpy of vaporization at the normal boiling point $\Delta H_{v,b}$ \ (cal/mol)	$\Delta H_{v,b}$ \ Ref	K_{oc} \ (cm^3/g)	K_{oc} \ Ref	Lower Explosive Limit LEL (% by volume)	LEL Ref
Trichloroethylene	9.6942E-6	9.6942E-6	U	360.35	U	5.71E+02	U	7500.00	U	60.7	U	8.00	U

Appendix C Surficial Soil Sampling Results from Asbestos Landfills Report

ENVIRONMENTAL CONSULTING & MANAGEMENT
ROUX ASSOCIATES INC

209 SHAFTER STREET
ISLANDIA, NEW YORK 11749 TEL 631-232-2600 FAX 631-232-9898

October 19, 2017

Mike Cirian, P.E.
United States Environmental Protection Agency
108 East 9th Street
Libby, Montana 59923

Re: Surficial Soil Sampling Results from Asbestos Landfills
Columbia Falls Aluminum Company, Columbia Falls, Montana

Dear Mr. Cirian:

Roux Associates, Inc. (Roux Associates), on behalf of Columbia Falls Aluminum Company (CFAC) has prepared this letter to the United States Environmental Protection Agency (USEPA) to describe the surficial soil sampling activities performed in the Asbestos Landfills as part of the Phase I Site Characterization and to summarize the analytical results of those activities.

Background

As described in the Remedial Investigation/Feasibility Study Work Plan (RI/FS Work Plan), two areas were identified as being former asbestos landfills based on historic information. The areas are referred to as the North Asbestos Landfills and the South Asbestos Landfills. The North Asbestos Landfills are located north of the West Landfill and consist of two separate areas (i.e., North-West and North-East Asbestos Landfills); the South Asbestos Landfills are located south of the East Landfill, near the eastern boundary of the Site, and also consist of two separate areas (i.e., South-West and South-East Asbestos Landfills). Together, the four landfills are referred to as the Asbestos Landfills.

The asbestos landfills were constructed as early as the late 1970s or early 1980 based upon historical records reviewed during preparation of the RI/FS Work Plan. Disposal records available in CFAC's files for the North Asbestos Landfills indicate that these landfills were in use from 1993 to 2009. Details regarding landfill construction are unknown; however, based on the Phase I observations during field reconnaissance and test pitting activities described below, the landfills have a natural soil cover that overlies the asbestos materials within the landfills. There is no evidence of an engineered cap or liner. The approximate boundaries of the landfills are presented on Plate 1. These boundaries were initially determined based upon historical aerial photograph review; and then

updated based upon observations and GPS mapping during field reconnaissance and test pitting activities.

During the Phase I Site Characterization, a test pitting investigation was performed to define the extent and contents of the Asbestos Landfills. Cascade Drilling (Cascade), under Roux Associates oversight, conducted test pitting activities from August 15 to 18, 2016 within the Asbestos Landfills. A certified asbestos inspector provided by Hydrometrics (Subcontractor to Roux Associates) was present throughout the duration of the test pit activities. The test pitting consisted of seven test pits excavated to approximately 10 feet below land surface (ft-bls) within the South Asbestos Landfill and eight test pits excavated to approximately 10 ft-bls within the North Asbestos Landfill. Asbestos containing material, including asbestos pipe and asbestos bags, were observed at depth during test pitting. No samples were collected during this investigation. The test pitting activities and the contents observed in each test pit are described in detail in the Phase I Site Characterization Data Summary Report. Based on the results of this investigation and additional Site reconnaissance, the approximate horizontal extent of the Asbestos Landfills was mapped using hand-held GPS with sub-meter accuracy, with the results used to more accurately depict the landfill locations and extents on site maps and figures.

The historical knowledge of asbestos landfill operations at the Site and previous Site reconnaissance and test pitting activities indicated that asbestos containing materials were buried in the landfills underneath a soil cover. However, it could not be determined from visual field inspection if asbestos is present in the surface soil. During a Project Update Meeting on November 3, 2016, USEPA requested that CFAC perform sampling of surface soil within the four asbestos landfills to determine the presence, or lack thereof, of asbestos in the surface soil, and the extent of the asbestos, if present. CFAC agreed to perform the sampling as requested by USEPA.

Sampling Scope of Work

Surface soil sampling at the Asbestos Landfills began on July 31, 2017 and was completed by Roux Associates, with support of Hydrometrics, on August 10, 2017, in accordance with the scope of work described in the Phase I SAP Modification #10, which was submitted to USEPA on May 24, 2017 and approved via email concurrence by USEPA on June 23, 2017. The sampling procedure is described in Roux Associates' Standard Operating Procedure (SOP) titled, "Standard Operating Procedure 5.13 for Collection of Composite Soil Samples for Laboratory Analysis of Asbestos via CARB 435."

A total of 56 grid cells were sampled across the four landfills as presented in the attached Plate 1. As requested by USEPA, the sampling was conducted at the frequency of 30 surface soil sub-samples per grid cell (approximately 3,000 square feet per cell). The 30 locations were randomly distributed using the random distribution function in ArcGIS and field personnel utilized a hand-held GPS (with submeter accuracy) to navigate to each location for sample collection. At each of the 30 locations

within a grid, a sub-sample of soil of approximately 100 grams was collected from the surface (0-0.5 ft-bls) using a stainless-steel trowel and placed in a Ziploc bag.

During the sampling activities, the landfill surface around each sampling location was inspected for any evidence of potential ACM (including, but not limited to building materials, piping/conduits, etc.), so that, if encountered, such materials could also be sampled. A wire with insulation was identified by Hydrometrics (State of Montana certified asbestos inspector) as potential ACM and was collected for asbestos analysis from the surface of grid CFAS-55 in the southeast corner of the North-East asbestos landfill. This sample was collected separately from the underlying soil sample collected in grid cell CFAS-55.

A total of 56 soil samples were sent to TestAmerica, Inc's EMLab P&K laboratory in Arvada, Colorado for laboratory analysis. Surficial soil samples were analyzed via the California Air Resources Board (CARB) 435 method using polarized light microscopy (PLM). As part of the preparation for the CARB 435 analysis, the laboratory homogenized the 30 soil sub-samples for each grid to be analyzed as one composite sample. The preparation and laboratory procedures for the CARB 435 analysis is described in the laboratory SOP titled "Asbestos Analysis in Soils and Rock: CARB 435 using PLM," submitted with Phase I SAP Modification #10. The wire sample collected from grid CFAS-55 was also sent to the TestAmerica EMLab P&K laboratory and analyzed for EPA Method 600 using PLM.

Laboratory Analytical Results

The laboratory analytical data for the 56 surficial soil samples collected from the 56 grids across the Asbestos Landfills are summarized in Table 1. The analytical data for the potential ACM wire sample collected during the investigation is summarized in Table 2. Analytical data for surficial soils were compared to the laboratory method detection limit.

The surficial soil sampling results from the Asbestos Landfills indicate the following:

- Surficial soil was non-detect for asbestos in 55 of the 56 surficial soil samples collected from the Asbestos Landfills based upon the asbestos concentration. Point counting was not performed on these samples because no asbestos fibers were detected.

- One surficial soil sample, CFAS-03-SO-0-0.5, had a chrysotile asbestos concentration less than 0.25% but there were no asbestos fibers identified for counting during the point count. This sample was collected from grid CFAS-03 located in the northeast corner of the south-west asbestos landfill.

- One potential ACM sample, CFAS-55-Wire, had an asbestos concentration of 90% chrysotile asbestos. The surficial soil sample collected from the same grid cell, CFAS-55-SO-0-0.5, was determined to be non-detect for asbestos.

The results from the surficial soil sampling conducted at each landfill will be considered and further evaluated during development of the Human Health Baseline Risk Assessment Work Plan.

Sincerely,

ROUX ASSOCIATES, INC.

Michael Ritorto
Principal Hydrogeologist

Andrew Baris
Principal Hydrogeologist/
Vice President

Enclosures:

Table 1 – Asbestos in Surficial Soil Samples from Asbestos Landfill Sampling Locations
Table 2 – Asbestos in Asbestos Containing Material Sample from Asbestos Landfill Sampling Locations
Plate 1 – Asbestos Landfill Surface Soil Sampling Locations

cc: John Stroiazzo, Glencore
Steve Wright, Columbia Falls Aluminum Company
Lisa DeWitt, Montana Department of Environmental Quality
Richard Sloan, Montana Department of Environmental Quality

TABLES

1. Asbestos in Surficial Soil Samples from Asbestos Landfill Sampling Locations
2. Asbestos in Asbestos Containing Material Sample from Asbestos Landfill Sampling Locations

Table 1. Asbestos in Surficial Soil Samples from Asbestos Landfill Sampling Locations
Columbia Falls Aluminum Company, LLC, Phase I Site Characterization, 2000 Aluminum Drive, Columbia Falls, MT

Location:	CFAS-01-SO-0-0.5		
Total Points Counted:	400		
Lab ID-Version :	8281005-1		
Sample Layers	Asbestos Type	Asbestos Points Counted	Asbestos Concentration (%)
Gray Soil	-	-	ND
Layer Totals:		-	-

Comments: Point counting as stated under "Total Points Counted" was not performed as no asbestos fibers were detected.

Location:	CFAS-02-SO-0-0.5		
Total Points Counted:	400		
Lab ID-Version :	8281006-1		
Sample Layers	Asbestos Type	Asbestos Points Counted	Asbestos Concentration (%)
Gray Soil	-	-	ND
Layer Totals:		-	-

Comments: Point counting as stated under "Total Points Counted" was not performed as no asbestos fibers were detected.

Location:	CFAS-03-SO-0-0.5		
Total Points Counted:	400		
Lab ID-Version :	8281007-1		
Sample Layers	Asbestos Type	Asbestos Points Counted	Asbestos Concentration (%)
Gray Soil	Chrysotile	0	< 0.25
Layer Totals:		0	NA

Comments: Asbestos was detected, but no points counted.

Location:	CFAS-04-SO-0-0.5		
Total Points Counted:	400		
Lab ID-Version :	8281008-1		
Sample Layers	Asbestos Type	Asbestos Points Counted	Asbestos Concentration (%)
Tan Soil	-	-	ND
Layer Totals:		-	-

Comments: Point counting as stated under "Total Points Counted" was not performed as no asbestos fibers were detected.

Location:	CFAS-05-SO-0-0.5		
Total Points Counted:	400		
Lab ID-Version :	8281009-1		
Sample Layers	Asbestos Type	Asbestos Points Counted	Asbestos Concentration (%)
Gray Soil	-	-	ND
Layer Totals:		-	-

Comments: Point counting as stated under "Total Points Counted" was not performed as no asbestos fibers were detected.

Table 1. Asbestos in Surficial Soil Samples from Asbestos Landfill Sampling Locations
Columbia Falls Aluminum Company, LLC, Phase I Site Characterization, 2000 Aluminum Drive, Columbia Falls, MT

Location:	CFAS-06-SO-0-0.5		
Total Points Counted:	400		
Lab ID-Version :	8281010-1		
Sample Layers	Asbestos Type	Asbestos Points Counted	Asbestos Concentration (%)
Tan Soil	-	-	ND
Layer Totals:		-	-

Comments: Point counting as stated under "Total Points Counted" was not performed as no asbestos fibers were detected.

Location:	CFAS-07-SO-0-0.5		
Total Points Counted:	400		
Lab ID-Version :	8281011-1		
Sample Layers	Asbestos Type	Asbestos Points Counted	Asbestos Concentration (%)
Tan Soil	-	-	ND
Layer Totals:		-	-

Comments: Point counting as stated under "Total Points Counted" was not performed as no asbestos fibers were detected.

Location:	CFAS-08-SO-0-0.5		
Total Points Counted:	400		
Lab ID-Version :	8281012-1		
Sample Layers	Asbestos Type	Asbestos Points Counted	Asbestos Concentration (%)
Tan Soil	-	-	ND
Layer Totals:		-	-

Comments: Point counting as stated under "Total Points Counted" was not performed as no asbestos fibers were detected.

Location:	CFAS-09-SO-0-0.5		
Total Points Counted:	400		
Lab ID-Version :	8281013-1		
Sample Layers	Asbestos Type	Asbestos Points Counted	Asbestos Concentration (%)
Tan Soil	-	-	ND
Layer Totals:		-	-

Comments: Point counting as stated under "Total Points Counted" was not performed as no asbestos fibers were detected.

Location:	CFAS-10-SO-0-0.5		
Total Points Counted:	400		
Lab ID-Version :	8281014-1		
Sample Layers	Asbestos Type	Asbestos Points Counted	Asbestos Concentration (%)
Tan Soil	-	-	ND
Layer Totals:		-	-

Comments: Point counting as stated under "Total Points Counted" was not performed as no asbestos fibers were detected.

Table 1. Asbestos in Surficial Soil Samples from Asbestos Landfill Sampling Locations
Columbia Falls Aluminum Company, LLC, Phase I Site Characterization, 2000 Aluminum Drive, Columbia Falls, MT

Location:	CFAS-11-SO-0-0.5		
Total Points Counted:	400		
Lab ID-Version :	8281015-1		
Sample Layers	Asbestos Type	Asbestos Points Counted	Asbestos Concentration (%)
Tan Soil	-	-	ND
Layer Totals:		-	-

Comments: Point counting as stated under "Total Points Counted" was not performed as no asbestos fibers were detected.

Location:	CFAS-12-SO-0-0.5		
Total Points Counted:	400		
Lab ID-Version :	8281016-1		
Sample Layers	Asbestos Type	Asbestos Points Counted	Asbestos Concentration (%)
Tan Soil	-	-	ND
Layer Totals:		-	-

Comments: Point counting as stated under "Total Points Counted" was not performed as no asbestos fibers were detected.

Location:	CFAS-13-SO-0-0.5		
Total Points Counted:	400		
Lab ID-Version :	8281017-1		
Sample Layers	Asbestos Type	Asbestos Points Counted	Asbestos Concentration (%)
Tan Soil	-	-	ND
Layer Totals:		-	-

Comments: Point counting as stated under "Total Points Counted" was not performed as no asbestos fibers were detected.

Location:	CFAS-14-SO-0-0.5		
Total Points Counted:	400		
Lab ID-Version :	8296116-1		
Sample Layers	Asbestos Type	Asbestos Points Counted	Asbestos Concentration (%)
Brown Soil	-	-	ND
Layer Totals:		-	-

Comments: Point counting as stated under "Total Points Counted" was not performed as no asbestos fibers were detected.

Location:	CFAS-15-SO-0-0.5		
Total Points Counted:	400		
Lab ID-Version :	8296110-1		
Sample Layers	Asbestos Type	Asbestos Points Counted	Asbestos Concentration (%)
Brown Soil	-	-	ND
Layer Totals:		-	-

Comments: Point counting as stated under "Total Points Counted" was not performed as no asbestos fibers were detected.

Table 1. Asbestos in Surficial Soil Samples from Asbestos Landfill Sampling Locations
Columbia Falls Aluminum Company, LLC, Phase I Site Characterization, 2000 Aluminum Drive, Columbia Falls, MT

Location:	CFAS-16-SO-0-0.5		
Total Points Counted:	400		
Lab ID-Version :	8296105-1		
Sample Layers	Asbestos Type	Asbestos Points Counted	Asbestos Concentration (%)
Brown Soil	-	-	ND
Layer Totals:		-	-

Comments: Point counting as stated under "Total Points Counted" was not performed as no asbestos fibers were detected.

Location:	CFAS-DUP3-SO (CFAS-16- SO-0-0.5)		
Total Points Counted:	400		
Lab ID-Version :	8296109-1		
Sample Layers	Asbestos Type	Asbestos Points Counted	Asbestos Concentration (%)
Brown Soil	-	-	ND
Layer Totals:		-	-

Comments: Point counting as stated under "Total Points Counted" was not performed as no asbestos fibers were detected.

Location:	CFAS-17-SO-0-0.5		
Total Points Counted:	400		
Lab ID-Version :	8281034-1		
Sample Layers	Asbestos Type	Asbestos Points Counted	Asbestos Concentration (%)
Tan Soil	-	-	ND
Layer Totals:		-	-

Comments: Point counting as stated under "Total Points Counted" was not performed as no asbestos fibers were detected.

Location:	CFAS-18-SO-0-0.5		
Total Points Counted:	400		
Lab ID-Version :	8296121-1		
Sample Layers	Asbestos Type	Asbestos Points Counted	Asbestos Concentration (%)
Brown Soil	-	-	ND
Layer Totals:		-	-

Comments: Point counting as stated under "Total Points Counted" was not performed as no asbestos fibers were detected.

Location:	CFAS-19-SO-0-0.5		
Total Points Counted:	400		
Lab ID-Version :	8296111-1		
Sample Layers	Asbestos Type	Asbestos Points Counted	Asbestos Concentration (%)
Brown Soil	-	-	ND
Layer Totals:		-	-

Comments: Point counting as stated under "Total Points Counted" was not performed as no asbestos fibers were detected.

Table 1. Asbestos in Surficial Soil Samples from Asbestos Landfill Sampling Locations
Columbia Falls Aluminum Company, LLC, Phase I Site Characterization, 2000 Aluminum Drive, Columbia Falls, MT

Location:	CFAS-20-SO-0-0.5		
Total Points Counted:	400		
Lab ID-Version :	8296104-1		
Sample Layers	Asbestos Type	Asbestos Points Counted	Asbestos Concentration (%)
Brown Soil	-	-	ND
Layer Totals:		-	-

Comments: Point counting as stated under "Total Points Counted" was not performed as no asbestos fibers were detected.

Location:	CFAS-21-SO-0-0.5		
Total Points Counted:	400		
Lab ID-Version :	8296106-1		
Sample Layers	Asbestos Type	Asbestos Points Counted	Asbestos Concentration (%)
Brown Soil	-	-	ND
Layer Totals:		-	-

Comments: Point counting as stated under "Total Points Counted" was not performed as no asbestos fibers were detected.

Location:	CFAS-22-SO-0-0.5		
Total Points Counted:	400		
Lab ID-Version :	8281035-1		
Sample Layers	Asbestos Type	Asbestos Points Counted	Asbestos Concentration (%)
Tan Soil	-	-	ND
Layer Totals:		-	-

Comments: Point counting as stated under "Total Points Counted" was not performed as no asbestos fibers were detected.

Location:	CFAS-23-SO-0-0.5		
Total Points Counted:	400		
Lab ID-Version :	8296120-1		
Sample Layers	Asbestos Type	Asbestos Points Counted	Asbestos Concentration (%)
Brown Soil	-	-	ND
Layer Totals:		-	-

Comments: Point counting as stated under "Total Points Counted" was not performed as no asbestos fibers were detected.

Location:	CFAS-24-SO-0-0.5		
Total Points Counted:	400		
Lab ID-Version :	8296112-1		
Sample Layers	Asbestos Type	Asbestos Points Counted	Asbestos Concentration (%)
Brown Soil	-	-	ND
Layer Totals:		-	-

Comments: Point counting as stated under "Total Points Counted" was not performed as no asbestos fibers were detected.

Table 1. Asbestos in Surficial Soil Samples from Asbestos Landfill Sampling Locations
Columbia Falls Aluminum Company, LLC, Phase I Site Characterization, 2000 Aluminum Drive, Columbia Falls, MT

Location:	CFAS-25-SO-0-0.5		
Total Points Counted:	400		
Lab ID-Version :	8296103-1		
Sample Layers	Asbestos Type	Asbestos Points Counted	Asbestos Concentration (%)
Brown Soil	-	-	ND
Layer Totals:		-	-

Comments: Point counting as stated under "Total Points Counted" was not performed as no asbestos fibers were detected.

Location:	CFAS-26-SO-0-0.5		
Total Points Counted:	400		
Lab ID-Version :	8296101-1		
Sample Layers	Asbestos Type	Asbestos Points Counted	Asbestos Concentration (%)
Brown Soil	-	-	ND
Layer Totals:		-	-

Comments: Point counting as stated under "Total Points Counted" was not performed as no asbestos fibers were detected.

Location:	CFAS-27-SO-0-0.5		
Total Points Counted:	400		
Lab ID-Version :	8296095-1		
Sample Layers	Asbestos Type	Asbestos Points Counted	Asbestos Concentration (%)
Brown Soil	-	-	ND
Layer Totals:		-	-

Comments: Point counting as stated under "Total Points Counted" was not performed as no asbestos fibers were detected.

Location:	CFAS-28-SO-0-0.5		
Total Points Counted:	400		
Lab ID-Version :	8296119-1		
Sample Layers	Asbestos Type	Asbestos Points Counted	Asbestos Concentration (%)
Brown Soil	-	-	ND
Layer Totals:		-	-

Comments: Point counting as stated under "Total Points Counted" was not performed as no asbestos fibers were detected.

Location:	CFAS-30-SO-0-0.5		
Total Points Counted:	400		
Lab ID-Version :	8296102-1		
Sample Layers	Asbestos Type	Asbestos Points Counted	Asbestos Concentration (%)
Brown Soil	-	-	ND
Layer Totals:		-	-

Comments: Point counting as stated under "Total Points Counted" was not performed as no asbestos fibers were detected.

Table 1. Asbestos in Surficial Soil Samples from Asbestos Landfill Sampling Locations
Columbia Falls Aluminum Company, LLC, Phase I Site Characterization, 2000 Aluminum Drive, Columbia Falls, MT

Location:	CFAS-31-SO-0-0.5		
Total Points Counted:	400		
Lab ID-Version :	8296100-1		
Sample Layers	Asbestos Type	Asbestos Points Counted	Asbestos Concentration (%)
Brown Soil	-	-	ND
Layer Totals:		-	-

Comments: Point counting as stated under "Total Points Counted" was not performed as no asbestos fibers were detected.

Location:	CFAS-32-SO-0-0.5		
Total Points Counted:	400		
Lab ID-Version :	8296096-1		
Sample Layers	Asbestos Type	Asbestos Points Counted	Asbestos Concentration (%)
Brown Soil	-	-	ND
Layer Totals:		-	-

Comments: Point counting as stated under "Total Points Counted" was not performed as no asbestos fibers were detected.

Location:	CFAS-36-SO-0-0.5		
Total Points Counted:	400		
Lab ID-Version :	8296099-1		
Sample Layers	Asbestos Type	Asbestos Points Counted	Asbestos Concentration (%)
Brown Soil	-	-	ND
Layer Totals:		-	-

Comments: Point counting as stated under "Total Points Counted" was not performed as no asbestos fibers were detected.

Location:	CFAS-37-SO-0-0.5		
Total Points Counted:	400		
Lab ID-Version :	8296097-1		
Sample Layers	Asbestos Type	Asbestos Points Counted	Asbestos Concentration (%)
Brown Soil	-	-	ND
Layer Totals:		-	-

Comments: Point counting as stated under "Total Points Counted" was not performed as no asbestos fibers were detected.

Location:	CFAS-38-SO-0-0.5		
Total Points Counted:	400		
Lab ID-Version :	8296117-1		
Sample Layers	Asbestos Type	Asbestos Points Counted	Asbestos Concentration (%)
Brown Soil	-	-	ND
Layer Totals:		-	-

Comments: Point counting as stated under "Total Points Counted" was not performed as no asbestos fibers were detected.

Table 1. Asbestos in Surficial Soil Samples from Asbestos Landfill Sampling Locations
Columbia Falls Aluminum Company, LLC, Phase I Site Characterization, 2000 Aluminum Drive, Columbia Falls, MT

Location:	CFAS-40-SO-0-0.5		
Total Points Counted:	400		
Lab ID-Version :	8296098-1		
Sample Layers	Asbestos Type	Asbestos Points Counted	Asbestos Concentration (%)
Brown Soil	-	-	ND
Layer Totals:		-	-

Comments: Point counting as stated under "Total Points Counted" was not performed as no asbestos fibers were detected.

Location:	CFAS-41-SO-0-0.5		
Total Points Counted:	400		
Lab ID-Version :	8296107-1		
Sample Layers	Asbestos Type	Asbestos Points Counted	Asbestos Concentration (%)
Brown Soil	-	-	ND
Layer Totals:		-	-

Comments: Point counting as stated under "Total Points Counted" was not performed as no asbestos fibers were detected.

Location:	CFAS-42-SO-0-0.5		
Total Points Counted:	400		
Lab ID-Version :	8281033-1		
Sample Layers	Asbestos Type	Asbestos Points Counted	Asbestos Concentration (%)
Tan Soil	-	-	ND
Layer Totals:		-	-

Comments: Point counting as stated under "Total Points Counted" was not performed as no asbestos fibers were detected.

Location:	CFAS-43-SO-0-0.5		
Total Points Counted:	400		
Lab ID-Version :	8281028-1		
Sample Layers	Asbestos Type	Asbestos Points Counted	Asbestos Concentration (%)
Tan Soil	-	-	ND
Layer Totals:		-	-

Comments: Point counting as stated under "Total Points Counted" was not performed as no asbestos fibers were detected.

Location:	CFAS-44-SO-0-0.5		
Total Points Counted:	400		
Lab ID-Version :	8281025-1		
Sample Layers	Asbestos Type	Asbestos Points Counted	Asbestos Concentration (%)
Tan Soil	-	-	ND
Layer Totals:		-	-

Comments: Point counting as stated under "Total Points Counted" was not performed as no asbestos fibers were detected.

Table 1. Asbestos in Surficial Soil Samples from Asbestos Landfill Sampling Locations
Columbia Falls Aluminum Company, LLC, Phase I Site Characterization, 2000 Aluminum Drive, Columbia Falls, MT

Location:	CFAS-45-SO-0-0.5		
Total Points Counted:	400		
Lab ID-Version :	8281023-1		
Sample Layers	Asbestos Type	Asbestos Points Counted	Asbestos Concentration (%)
Tan Soil	-	-	ND
Layer Totals:		-	-

Comments: Point counting as stated under "Total Points Counted" was not performed as no asbestos fibers were detected.

Location:	CFAS-46-SO-0-0.5		
Total Points Counted:	400		
Lab ID-Version :	8281032-1		
Sample Layers	Asbestos Type	Asbestos Points Counted	Asbestos Concentration (%)
Tan Soil	-	-	ND
Layer Totals:		-	-

Comments: Point counting as stated under "Total Points Counted" was not performed as no asbestos fibers were detected.

Location:	CFAS-47-SO-0-0.5		
Total Points Counted:	400		
Lab ID-Version :	8281027-1		
Sample Layers	Asbestos Type	Asbestos Points Counted	Asbestos Concentration (%)
Tan Soil	-	-	ND
Layer Totals:		-	-

Comments: Point counting as stated under "Total Points Counted" was not performed as no asbestos fibers were detected.

Location:	CFAS-48-SO-0-0.5		
Total Points Counted:	400		
Lab ID-Version :	8281024-1		
Sample Layers	Asbestos Type	Asbestos Points Counted	Asbestos Concentration (%)
Tan Soil	-	-	ND
Layer Totals:		-	-

Comments: Point counting as stated under "Total Points Counted" was not performed as no asbestos fibers were detected.

Location:	CFAS-49-SO-0-0.5		
Total Points Counted:	400		
Lab ID-Version :	8281030-1		
Sample Layers	Asbestos Type	Asbestos Points Counted	Asbestos Concentration (%)
Tan Soil	-	-	ND
Layer Totals:		-	-

Comments: Point counting as stated under "Total Points Counted" was not performed as no asbestos fibers were detected.

Table 1. Asbestos in Surficial Soil Samples from Asbestos Landfill Sampling Locations
Columbia Falls Aluminum Company, LLC, Phase I Site Characterization, 2000 Aluminum Drive, Columbia Falls, MT

Location:	CFAS-50-SO-0-0.5		
Total Points Counted:	400		
Lab ID-Version :	8286004-1		
Sample Layers	Asbestos Type	Asbestos Points Counted	Asbestos Concentration (%)
Tan Soil	-	-	ND
Layer Totals:		-	-

Comments: Point counting as stated under "Total Points Counted" was not performed as no asbestos fibers were detected.

Location:	CFAS-51-SO-0-0.5		
Total Points Counted:	400		
Lab ID-Version :	8281022-1		
Sample Layers	Asbestos Type	Asbestos Points Counted	Asbestos Concentration (%)
Tan Soil	-	-	ND
Layer Totals:		-	-

Comments: Point counting as stated under "Total Points Counted" was not performed as no asbestos fibers were detected.

Location:	CFAS-52-SO-0-0.5		
Total Points Counted:	400		
Lab ID-Version :	8281021-1		
Sample Layers	Asbestos Type	Asbestos Points Counted	Asbestos Concentration (%)
Tan Soil	-	-	ND
Layer Totals:		-	-

Comments: Point counting as stated under "Total Points Counted" was not performed as no asbestos fibers were detected.

Location:	CFAS-53-SO-0-0.5		
Total Points Counted:	400		
Lab ID-Version :	8281029-1		
Sample Layers	Asbestos Type	Asbestos Points Counted	Asbestos Concentration (%)
Tan Soil	-	-	ND
Layer Totals:		-	-

Comments: Point counting as stated under "Total Points Counted" was not performed as no asbestos fibers were detected.

Location:	CFAS-DUP2-SO (CFAS-53- SO-0-0.5)		
Total Points Counted:	400		
Lab ID-Version :	8281031-1		
Sample Layers	Asbestos Type	Asbestos Points Counted	Asbestos Concentration (%)
Tan Soil	-	-	ND
Layer Totals:		-	-

Comments: Point counting as stated under "Total Points Counted" was not performed as no asbestos fibers were detected.

Table 1. Asbestos in Surficial Soil Samples from Asbestos Landfill Sampling Locations
Columbia Falls Aluminum Company, LLC, Phase I Site Characterization, 2000 Aluminum Drive, Columbia Falls, MT

Location:	CFAS-54-SO-0-0.5		
Total Points Counted:	400		
Lab ID-Version :	8281026-1		
Sample Layers	Asbestos Type	Asbestos Points Counted	Asbestos Concentration (%)
Tan Soil	-	-	ND
Layer Totals:		-	-

Comments: Point counting as stated under "Total Points Counted" was not performed as no asbestos fibers were detected.

Location:	CFAS-55-SO-0-0.5		
Total Points Counted:	400		
Lab ID-Version :	8281020-1		
Sample Layers	Asbestos Type	Asbestos Points Counted	Asbestos Concentration (%)
Tan Soil	-	-	ND
Layer Totals:		-	-

Comments: Point counting as stated under "Total Points Counted" was not performed as no asbestos fibers were detected.

Location:	CFAS-56-SO-0-0.5		
Total Points Counted:	400		
Lab ID-Version :	8281018-1		
Sample Layers	Asbestos Type	Asbestos Points Counted	Asbestos Concentration (%)
Tan Soil	-	-	ND
Layer Totals:		-	-

Comments: Point counting as stated under "Total Points Counted" was not performed as no asbestos fibers were detected.

Location:	CFAS-DUP1-SO (CFAS-56- SO-0-0.5)		
Total Points Counted:	400		
Lab ID-Version :	8281019-1		
Sample Layers	Asbestos Type	Asbestos Points Counted	Asbestos Concentration (%)
Tan Soil	-	-	ND
Layer Totals:		-	-

Comments: Point counting as stated under "Total Points Counted" was not performed as no asbestos fibers were detected.

EMLab P&K, LLC
EMLab Id: 1771895

Table 2. Asbestos in Asbestos Containing Material Sample from Asbestos Landfill Sampling Locations
Columbia Falls Aluminum Company, LLC, Phase I Site Characterization, 2000 Aluminum Drive, Columbia Falls, MT

Sample ID	Sample Layers	Asbestos Concentration	Asbestos Content	Composite Non-Asbestos Content
CFAS-55-Wire	Off-White Wiring Insulation	90%	Chrysotile	
CFAS-55-Wire	Composite Non-Asbestos Content			7% Synthetic Fibers

EMLab P&K, LLC
EMLab Id: 1775235

PLATE

1. Asbestos Landfill Surface Soil Sampling Locations



LEGEND

- RANDOMLY GENERATED SOIL SAMPLE LOCATIONS
- 1 SAMPLING GRID LESS THAN 3,000 SQ FT AND GRID DESIGNATION

NOTES

1. EACH GRID CONTAINS 30 SUB SAMPLES TO COMPRISE ONE COMPOSITE SAMPLE
2. COMPOSITE SAMPLE WAS NAMED WITH THE FOLLOWING EXAMPLE NOMENCLATURE: CFAS–01–SO–0–0.5

N

50 0 50 Feet

Title:

ASBESTOS LANDFILL SURFACE SOIL SAMPLING LOCATIONS

2000 ALUMINUM DRIVE
COLUMBIA FALLS, MONTANA

Prepared For:
COLUMBIA FALLS ALUMINUM COMPANY, LLC

ROUX ASSOCIATES, INC.
Environmental Consulting & Management

Compiled by: M.R.	Date: 17OCT17	PLATE 1
Prepared by: M.R.	Scale: AS SHOWN	
Project Mgr: M.R.	Project: 2476.0001Y002	
File: 2476.0001Y185.1.mxd		

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Appendix D Summary of Samples Used in the BHHRA

Table D-1
Main Plant Area Soil Samples (0-0.5 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Location	Sample	Sample Date
CFMW-025A	CFMW-025a-SO-0-0.5	7/13/2016
CFMW-026	CFMW-026-SO-0-0.5	6/14/2016
CFMW-028A	CFMW-028a-SO-0-0.5	6/30/2016
CFMW-032A	CFMW-032a-SO-0-0.5	8/8/2016
CFMW-033	CFMW-033-SO-0-0.5	7/1/2016
CFMW-034	CFMW-034-SO-0-0.5	5/31/2016
CFMW-035	CFMW-035-SO-0-0.5	6/1/2016
CFMW-035	CFMW-DUP11-SO	6/1/2016
CFMW-037	CFMW-037-SO-0-0.5	6/24/2016
CFMW-038	CFMW-038-SO-0-0.5	6/25/2016
CFMW-042	CFMW-042-SO-0-0.5	6/16/2016
CFMW-043	CFMW-043-SO-0-0.5	6/15/2016
CFMW-044A	CFMW-044a-SO-0-0.5	7/20/2016
CFMW-045A	CFMW-045a-SO-0-0.5	8/12/2016
CFMW-047	CFMW-047-SO-0-0.5	6/21/2016
CFMW-049	CFMW-049-SO-0-0.5	8/20/2016
CFMW-050	CFMW-050-SO-0-0.5	6/22/2016
CFMW-053A	CFMW-053a-SO-0-0.5	8/17/2016
CFMW-054	CFMW-054-SO-0-0.5	6/20/2016
CFMW-070	CFMW-070-SO-0-0.5	5/16/2018
CFSB-038	CFSB-038-SO-0-0.5	5/21/2016
CFSB-040	CFSB-040-SO-0-0.5	5/20/2016
CFSB-042	CFSB-042-SO-0-0.5	5/20/2016
CFSB-044	CFSB-044-SO-0-0.5	5/20/2016
CFSB-045	CFSB-045-SO-0-0.5	5/21/2016
CFSB-046	CFSB-046-SO-0-0.5	5/20/2016
CFSB-048	CFSB-048-SO-0-0.5	5/20/2016
CFSB-050	CFSB-050-SO-0-0.5	5/21/2016
CFSB-051	CFSB-051-SO-0-0.5	5/21/2016
CFSB-054	CFSB-054-SO-0-0.5	5/28/2016
CFSB-060	CFSB-060-SO-0-0.5	5/27/2016
CFSB-062	CFSB-062-SO-0-0.5	6/2/2016
CFSB-064	CFSB-064-SO-0-0.5	6/3/2016
CFSB-065	CFSB-065-SO-0-0.5	6/2/2016
CFSB-066	CFSB-066-SO-0-0.5	5/27/2016
CFSB-069	CFSB-069-SO-0-0.5	5/27/2016
CFSB-071	CFSB-071-SO-0-0.5	5/27/2016
CFSB-095	CFSB-095-SO-0-0.5	5/24/2016
CFSB-097	CFSB-097-SO-0-0.5	5/24/2016
CFSB-098	CFSB-098-SO-0-0.5	5/24/2016
CFSB-099	CFSB-099-SO-0-0.5	5/24/2016
CFSB-100	CFSB-100-SO-0-0.5	5/24/2016
CFSB-121	CFSB-121-SO-0-0.5	5/18/2016
CFSB-121	CFSB-DUP1-SO	5/18/2016
CFSB-128	CFSB-128-SO-0-0.5	5/24/2016
CFSB-189	CFSB-189-SO-0-0.5	6/27/2018
CFSB-189	CFSB-189-SO-0-0.5	9/27/2018
CFSB-190	CFSB-190-SO-0-0.5	6/27/2018
CFSB-190	CFSB-190-SO-0-0.5	9/27/2018
CFSB-205	CFSB-205-SO-0-0.5	6/27/2018
CFSB-205	CFSB-DUP45-SO	6/27/2018
CFSB-205	CFSB-205-SO-0-0.5	9/26/2018
CFSB-206	CFSB-206-SO-0-0.5	6/22/2018
CFSB-207	CFSB-207-SO-0-0.5	4/28/2018
CFSB-213	CFSB-213-SO-0-0.5	6/22/2018
CFSB-232	CFSB-232-SO-0-0.5	4/28/2018
CFSB-233	CFSB-233-SO-0-0.5	4/28/2018
CFSB-234	CFSB-234-SO-0-0.5	4/28/2018
CFSB-235	CFSB-235-SO-0-0.5	4/28/2018
CFSB-236	CFSB-236-SO-0-0.5	4/28/2018
CFSB-240	CFSB-240-SO-0-0.5	5/10/2018
CFSB-242	CFSB-242-SO-0-0.5	5/10/2018
CFSB-243	CFSB-243-SO-0-0.5	5/10/2018
CFSB-246	CFSB-246-SO-0-0.5	5/9/2018
CFSB-247	CFSB-247-SO-0-0.5	5/9/2018
CFSB-266	CFSB-266-SO-0-0.5	5/10/2018

Table D-1
Main Plant Area Soil Samples (0-0.5 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Location	Sample	Sample Date
CFSB-274	CFSB-274-SO-0-0.5	5/11/2018
CFSB-274	CFSB-274-SO-0-0.5	9/28/2018
CFSB-276	CFSB-276-SO-0-0.5	5/11/2018
CFSB-276	CFSB-276-SO-0-0.5	9/28/2018
CFSB-288	CFSB-288-SO-0-0.5	6/28/2018
CFSB-288	CFSB-288-SO-0-0.5	9/27/2018
CFSB-293	CFSB-293-SO-0-0.5	9/27/2018
CFSB-294	CFSB-294-SO-0-0.5	9/27/2018

Table D-2
Main Plant Area Soil Samples (0-12 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Location	Sample	Sample Date
CFDS-003	CFDS-003-SO-2-3	04/12/2016
CFDS-005	CFDS-005-SO-2-3	04/12/2016
CFDS-005	CFDS-DUP-SO-1	04/12/2016
CFDS-005	CFDS-005-SO-6-8	07/15/2016
CFDS-007	CFDS-007-SO-3-4	04/12/2016
CFDS-007	CFDS-007-SO-8-10	07/14/2016
CFDS-013	CFDS-013-SO-2-3	04/15/2016
CFDS-013	CFDS-013-SO-5-7	07/14/2016
CFMW-025A	CFMW-025a-SO-0.5-2	07/13/2016
CFMW-025A	CFMW-025a-SO-0-0.5	07/13/2016
CFMW-025A	CFMW-025a-SO-10-12	07/13/2016
CFMW-026	CFMW-026-SO-0.5-2	06/14/2016
CFMW-026	CFMW-DUP15-SO	06/14/2016
CFMW-026	CFMW-026-SO-0-0.5	06/14/2016
CFMW-026	CFMW-026-SO-10-12	06/14/2016
CFMW-028A	CFMW-028a-SO-0.5-2	06/30/2016
CFMW-028A	CFMW-028a-SO-0-0.5	06/30/2016
CFMW-028A	CFMW-028a-SO-10-12	06/30/2016
CFMW-028A	CFMW-DUP19-SO	06/30/2016
CFMW-028A	CFMW-028a-SO-4.5-6	06/30/2016
CFMW-032A	CFMW-032a-SO-0.5-2	08/08/2016
CFMW-032A	CFMW-032a-SO-0-0.5	08/08/2016
CFMW-032A	CFMW-032a-SO-10-12	08/08/2016
CFMW-032A	CFMW-Dup21-SO	08/08/2016
CFMW-033	CFMW-033-SO-0.5-2	07/01/2016
CFMW-033	CFMW-033-SO-0-0.5	07/01/2016
CFMW-033	CFMW-033-SO-10-12	07/01/2016
CFMW-034	CFMW-034-SO-0.5-2	05/31/2016
CFMW-034	CFMW-DUP10-SO	05/31/2016
CFMW-034	CFMW-034-SO-0-0.5	05/31/2016
CFMW-034	CFMW-034-SO-10-12	05/31/2016
CFMW-035	CFMW-035-SO-0.5-2	06/01/2016
CFMW-035	CFMW-035-SO-0-0.5	06/01/2016
CFMW-035	CFMW-DUP11-SO	06/01/2016
CFMW-035	CFMW-035-SO-10-12	06/01/2016
CFMW-037	CFMW-037-SO-0.5-2	06/24/2016
CFMW-037	CFMW-037-SO-0-0.5	06/24/2016
CFMW-037	CFMW-037-SO-10-12	06/24/2016
CFMW-038	CFMW-038-SO-0.5-2	06/25/2016
CFMW-038	CFMW-038-SO-0-0.5	06/25/2016
CFMW-038	CFMW-038-SO-10-12	06/25/2016
CFMW-040	CFMW-040-SO-0.5-2	06/28/2016
CFMW-040	CFMW-040-SO-0-0.5	06/28/2016
CFMW-040	CFMW-040-SO-10-12	06/28/2016
CFMW-042	CFMW-042-SO-0.5-2	06/16/2016
CFMW-042	CFMW-DUP16-SO	06/16/2016
CFMW-042	CFMW-042-SO-0-0.5	06/16/2016
CFMW-042	CFMW-042-SO-10-12	06/16/2016
CFMW-043	CFMW-043-SO-0.5-2	06/15/2016
CFMW-043	CFMW-043-SO-0-0.5	06/15/2016
CFMW-043	CFMW-043-SO-10-12	06/15/2016
CFMW-044A	CFMW-044a-SO-0.5-2	07/20/2016
CFMW-044A	CFMW-044a-SO-0-0.5	07/20/2016
CFMW-044A	CFMW-044a-SO-10-12	07/20/2016
CFMW-045A	CFMW-045a-SO-0.5-2	08/12/2016
CFMW-045A	CFMW-045a-SO-0-0.5	08/12/2016
CFMW-045A	CFMW-045a-SO-10-12	08/12/2016
CFMW-047	CFMW-047-SO-0.5-2	06/21/2016
CFMW-047	CFMW-047-SO-0-0.5	06/21/2016
CFMW-047	CFMW-047-SO-10-12	06/21/2016
CFMW-049	CFMW-049-SO-0-0.5	08/20/2016
CFMW-049A	CFMW-049a-SO-0.5-2	08/20/2016
CFMW-049A	CFMW-049a-SO-10-12	08/20/2016
CFMW-050	CFMW-050-SO-0.5-2	06/22/2016
CFMW-050	CFMW-DUP17-SO	06/22/2016
CFMW-050	CFMW-050-SO-0-0.5	06/22/2016

Table D-2
Main Plant Area Soil Samples (0-12 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Location	Sample	Sample Date
CFMW-050	CFMW-050-SO-10-12	06/22/2016
CFMW-053A	CFMW-053a-SO-0.5-2	08/17/2016
CFMW-053A	CFMW-DUP22-SO	08/17/2016
CFMW-053A	CFMW-053a-SO-0-0.5	08/17/2016
CFMW-053A	CFMW-053a-SO-10-12	08/17/2016
CFMW-054	CFMW-054-SO-0.5-2	06/20/2016
CFMW-054	CFMW-054-SO-0-0.5	06/20/2016
CFMW-054	CFMW-054-SO-10-12	06/20/2016
CFMW-070	CFMW-DUP39-SO	05/16/2018
CFMW-070	CFMW-070-SO-0-0.5	05/16/2018
CFMW-070	CFMW-070-SO-0.5-2	05/16/2018
CFMW-070	CFMW-070-SO-10-12	05/16/2018
CFSB-010	CFSB-010-SO-0.5-2	05/21/2016
CFSB-010	CFSB-010-SO-10-12	05/21/2016
CFSB-012	CFSB-012-SO-0.5-2	05/28/2016
CFSB-012	CFSB-012-SO-10-12	05/28/2016
CFSB-038	CFSB-038-SO-0.5-2	05/21/2016
CFSB-038	CFSB-038-SO-0-0.5	05/21/2016
CFSB-038	CFSB-038-SO-10-12	05/21/2016
CFSB-040	CFSB-040-SO-0.5-2	05/20/2016
CFSB-040	CFSB-040-SO-0-0.5	05/20/2016
CFSB-040	CFSB-040-SO-10-12	05/20/2016
CFSB-042	CFSB-042-SO-0.5-2	05/20/2016
CFSB-042	CFSB-042-SO-0-0.5	05/20/2016
CFSB-042	CFSB-042-SO-10-12	05/20/2016
CFSB-044	CFSB-044-SO-0.5-2.0	05/20/2016
CFSB-044	CFSB-044-SO-0-0.5	05/20/2016
CFSB-044	CFSB-044-SO-10-12	05/20/2016
CFSB-045	CFSB-045-SO-0.5-2	05/21/2016
CFSB-045	CFSB-045-SO-0-0.5	05/21/2016
CFSB-045	CFSB-045-SO-10-12	05/21/2016
CFSB-046	CFSB-046-SO-0.5-2.0	05/20/2016
CFSB-046	CFSB-046-SO-0-0.5	05/20/2016
CFSB-046	CFSB-046-SO-10-12	05/20/2016
CFSB-048	CFSB-048-SO-0.5-2.0	05/20/2016
CFSB-048	CFSB-048-SO-0-0.5	05/20/2016
CFSB-048	CFSB-048-SO-10-12	05/20/2016
CFSB-049	CFSB-049-SO-0.5-2	05/28/2016
CFSB-049	CFSB-049-SO-10-12	05/28/2016
CFSB-050	CFSB-050-SO-0.5-2	05/21/2016
CFSB-050	CFSB-050-SO-0-0.5	05/21/2016
CFSB-050	CFSB-050-SO-10-12	05/21/2016
CFSB-051	CFSB-051-SO-0.5-2	05/21/2016
CFSB-051	CFSB-051-SO-0-0.5	05/21/2016
CFSB-051	CFSB-051-SO-10-12	05/21/2016
CFSB-052	CFSB-052-SO-0.5-2	05/20/2016
CFSB-052	CFSB-052-SO-10-12	05/20/2016
CFSB-053	CFSB-053-SO-0.5-2	05/31/2016
CFSB-053	CFSB-053-SO-10-12	05/31/2016
CFSB-054	CFSB-054-SO-0.5-2	05/28/2016
CFSB-054	CFSB-054-SO-0-0.5	05/28/2016
CFSB-054	CFSB-054-SO-10-12	05/28/2016
CFSB-055	CFSB-055-SO-0.5-2	05/28/2016
CFSB-055	CFSB-055-SO-0-0.5	05/28/2016
CFSB-055	CFSB-055-SO-10-12	05/28/2016
CFSB-057	CFSB-057-SO-0.5-2	05/28/2016
CFSB-057	CFSB-057-SO-0-0.5	05/28/2016
CFSB-057	CFSB-057-SO-10-12	05/28/2016
CFSB-059	CFSB-059-SO-0.5-2	05/28/2016
CFSB-059	CFSB-059-SO-0-0.5	05/28/2016
CFSB-059	CFSB-DUP8-SO	05/28/2016
CFSB-059	CFSB-059-SO-10-12	05/28/2016
CFSB-060	CFSB-060-SO-0.5-2	05/27/2016
CFSB-060	CFSB-060-SO-0-0.5	05/27/2016
CFSB-060	CFSB-060-SO-10-12	05/27/2016
CFSB-062	CFSB-062-SO-0.5-2	06/02/2016

Table D-2
Main Plant Area Soil Samples (0-12 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Location	Sample	Sample Date
CFSB-062	CFSB-062-SO-0-0.5	06/02/2016
CFSB-062	CFSB-062-SO-10-12	06/02/2016
CFSB-064	CFSB-064-SO-0.5-2	06/03/2016
CFSB-064	CFSB-064-SO-0-0.5	06/03/2016
CFSB-064	CFSB-064-SO-10-12	06/03/2016
CFSB-065	CFSB-065-SO-0.5-2	06/02/2016
CFSB-065	CFSB-065-SO-0-0.5	06/02/2016
CFSB-065	CFSB-065-SO-10-12	06/02/2016
CFSB-066	CFSB-066-SO-0.5-2	05/27/2016
CFSB-066	CFSB-066-SO-0-0.5	05/27/2016
CFSB-066	CFSB-066-SO-10-12	05/27/2016
CFSB-068	CFSB-068-SO-0.5-2	05/27/2016
CFSB-068	CFSB-068-SO-10-12	05/27/2016
CFSB-069	CFSB-069-SO-0.5-2	05/27/2016
CFSB-069	CFSB-069-SO-0-0.5	05/27/2016
CFSB-069	CFSB-069-SO-10-12	05/27/2016
CFSB-071	CFSB-071-SO-0.5-2	05/27/2016
CFSB-071	CFSB-071-SO-0-0.5	05/27/2016
CFSB-071	CFSB-071-SO-10-12	05/27/2016
CFSB-071	CFSB-DUP7-SO	05/27/2016
CFSB-073	CFSB-073-SO-0.5-2	06/01/2016
CFSB-073	CFSB-073-SO-0-0.5	06/01/2016
CFSB-073	CFSB-073-SO-10-12	06/01/2016
CFSB-074	CFSB-074-SO-0.5-2	06/01/2016
CFSB-074	CFSB-074-SO-0-0.5	06/01/2016
CFSB-074	CFSB-074-SO-10-12	06/01/2016
CFSB-075	CFSB-075-SO-0.5-2	06/01/2016
CFSB-075	CFSB-075-SO-0-0.5	06/01/2016
CFSB-075	CFSB-075-SO-10-12	06/01/2016
CFSB-079	CFSB-079-SO-0.5-2	06/01/2016
CFSB-079	CFSB-079-SO-0-0.5	06/01/2016
CFSB-079	CFSB-079-SO-10-12	06/01/2016
CFSB-080	CFSB-080-SO-0.5-2	06/01/2016
CFSB-080	CFSB-080-SO-0-0.5	06/01/2016
CFSB-080	CFSB-080-SO-10-12	06/01/2016
CFSB-082	CFSB-082-SO-0.5-2	06/01/2016
CFSB-082	CFSB-082-SO-0-0.5	06/01/2016
CFSB-082	CFSB-082-SO-10-12	06/01/2016
CFSB-084	CFSB-084-SO-0.5-2	05/27/2016
CFSB-084	CFSB-084-SO-0-0.5	05/27/2016
CFSB-084	CFSB-084-SO-10-12	05/27/2016
CFSB-086	CFSB-086-SO-0.5-2	05/26/2016
CFSB-086	CFSB-086-SO-0-0.5	05/26/2016
CFSB-086	CFSB-086-SO-10-12	05/26/2016
CFSB-087	CFSB-087-SO-0.5-2	05/26/2016
CFSB-087	CFSB-087-SO-0-0.5	05/26/2016
CFSB-087	CFSB-087-SO-10-12	05/26/2016
CFSB-088	CFSB-088-SO-0.5-2	05/26/2016
CFSB-088	CFSB-088-SO-0-0.5	05/26/2016
CFSB-088	CFSB-088-SO-10-12	05/26/2016
CFSB-092	CFSB-092-SO-0.5-2	05/26/2016
CFSB-092	CFSB-092-SO-0-0.5	05/26/2016
CFSB-092	CFSB-092-SO-10-12	05/26/2016
CFSB-094	CFSB-094-SO-0.5-2.0	05/24/2016
CFSB-094	CFSB-094-SO-0-0.5	05/24/2016
CFSB-094	CFSB-094-SO-10-12	05/24/2016
CFSB-095	CFSB-095-SO-0.5-2.0	05/24/2016
CFSB-095	CFSB-095-SO-0-0.5	05/24/2016
CFSB-095	CFSB-095-SO-10-12	05/24/2016
CFSB-097	CFSB-097-SO-0.5-2	05/24/2016
CFSB-097	CFSB-097-SO-0-0.5	05/24/2016
CFSB-097	CFSB-097-SO-10-12	05/24/2016
CFSB-098	CFSB-098-SO-0.5-2	05/24/2016
CFSB-098	CFSB-098-SO-0-0.5	05/24/2016
CFSB-098	CFSB-098-SO-10-12	05/24/2016
CFSB-099	CFSB-099-SO-0.5-2	05/24/2016

Table D-2
Main Plant Area Soil Samples (0-12 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Location	Sample	Sample Date
CFSB-099	CFSB-099-SO-0-0.5	05/24/2016
CFSB-099	CFSB-099-SO-10-12	05/24/2016
CFSB-100	CFSB-100-SO-0.5-2	05/24/2016
CFSB-100	CFSB-100-SO-0-0.5	05/24/2016
CFSB-100	CFSB-100-SO-10-12	05/24/2016
CFSB-121	CFSB-121-SO-0.5-2.0	05/18/2016
CFSB-121	CFSB-121-SO-0-0.5	05/18/2016
CFSB-121	CFSB-DUP1-SO	05/18/2016
CFSB-121	CFSB-121-SO-10-12	05/18/2016
CFSB-128	CFSB-128-SO-0.5-2.0	05/24/2016
CFSB-128	CFSB-128-SO-0-0.5	05/24/2016
CFSB-128	CFSB-128-SO-10-12	05/24/2016
CFSB-129	CFSB-129-SO-0.5-2.0	05/24/2016
CFSB-129	CFSB-129-SO-0-0.5	05/24/2016
CFSB-129	CFSB-129-SO-10-12	05/24/2016
CFSB-130	CFSB-130-SO-0.5-2	06/17/2016
CFSB-130	CFSB-130-SO-10-12	06/17/2016
CFSB-131	CFSB-131-SO-0.5-2	06/17/2016
CFSB-131	CFSB-131-SO-10-12	06/17/2016
CFSB-154	CFSB-154-SO-0.5-2.5	05/15/2018
CFSB-154	CFSB-154-SO-5.5-7.5	05/15/2018
CFSB-154	CFSB-154-SO-10.5-12.5	05/15/2018
CFSB-155	CFSB-155-SO-0.5-2.5	05/15/2018
CFSB-155	CFSB-155-SO-5.5-7.5	05/15/2018
CFSB-155	CFSB-155-SO-10.5-12.5	05/15/2018
CFSB-156	CFSB-156-SO-0.5-2.5	05/15/2018
CFSB-156	CFSB-156-SO-5.5-7.5	05/15/2018
CFSB-156	CFSB-156-SO-10.5-12.5	05/15/2018
CFSB-157	CFSB-DUP36-SO	05/12/2018
CFSB-157	CFSB-157-SO-0.5-2.5	05/12/2018
CFSB-157	CFSB-157-SO-5.5-7.5	05/12/2018
CFSB-157	CFSB-157-SO-10.5-12.5	05/12/2018
CFSB-158	CFSB-158-SO-0.5-2.5	05/12/2018
CFSB-158	CFSB-158-SO-5.5-7.5	05/12/2018
CFSB-158	CFSB-158-SO-10.5-12.5	05/12/2018
CFSB-161	CFSB-161-SO-0.5-2.5	05/12/2018
CFSB-161	CFSB-161-SO-5.5-7.5	05/12/2018
CFSB-161	CFSB-161-SO-10.5-12.5	05/12/2018
CFSB-162	CFSB-162-SO-0.5-2.5	05/12/2018
CFSB-162	CFSB-162-SO-5.5-7.5	05/12/2018
CFSB-167	CFSB-167-SO-1-3	05/15/2018
CFSB-167	CFSB-167-SO-6-8	05/15/2018
CFSB-189	CFSB-189-SO-0-0.5	06/27/2018
CFSB-189	CFSB-189-SO-0.5-2	06/27/2018
CFSB-189	CFSB-189-SO-0-0.5	09/27/2018
CFSB-189	CFSB-189-SO-0.5-2	09/27/2018
CFSB-190	CFSB-190-SO-0-0.5	06/27/2018
CFSB-190	CFSB-190-SO-0.5-2	06/27/2018
CFSB-190	CFSB-190-SO-0-0.5	09/27/2018
CFSB-190	CFSB-190-SO-0.5-2	09/27/2018
CFSB-205	CFSB-205-SO-0-0.5	06/27/2018
CFSB-205	CFSB-205-SO-0.5-2	06/27/2018
CFSB-205	CFSB-DUP45-SO	06/27/2018
CFSB-205	CFSB-205-SO-0-0.5	09/26/2018
CFSB-205	CFSB-205-SO-0.5-2	09/26/2018
CFSB-206	CFSB-206-SO-0-0.5	06/22/2018
CFSB-206	CFSB-206-SO-0.5-2	06/22/2018
CFSB-207	CFSB-207-SO-0-0.5	04/28/2018
CFSB-207	CFSB-207-SO-0.5-2	04/28/2018
CFSB-208	CFSB-208-SO-0-0.5	04/28/2018
CFSB-208	CFSB-208-SO-0.5-2	04/28/2018
CFSB-208	CFSB-DUP25-SO	04/28/2018
CFSB-213	CFSB-213-SO-0-0.5	06/22/2018
CFSB-213	CFSB-213-SO-0.5-2	06/22/2018
CFSB-231	CFSB-231-SO-0-0.5	04/28/2018
CFSB-231	CFSB-231-SO-0.5-2	04/28/2018

Table D-2
Main Plant Area Soil Samples (0-12 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Location	Sample	Sample Date
CFSB-232	CFSB-232-SO-0-0.5	04/28/2018
CFSB-232	CFSB-232-SO-0.5-2	04/28/2018
CFSB-233	CFSB-233-SO-0-0.5	04/28/2018
CFSB-233	CFSB-233-SO-0.5-2	04/28/2018
CFSB-234	CFSB-234-SO-0-0.5	04/28/2018
CFSB-234	CFSB-234-SO-0.5-2	04/28/2018
CFSB-235	CFSB-235-SO-0-0.5	04/28/2018
CFSB-235	CFSB-235-SO-0.5-2	04/28/2018
CFSB-236	CFSB-236-SO-0-0.5	04/28/2018
CFSB-236	CFSB-236-SO-0.5-2	04/28/2018
CFSB-240	CFSB-240-SO-0-0.5	05/10/2018
CFSB-240	CFSB-240-SO-0.5-2	05/10/2018
CFSB-240	CFSB-240-SO-10-12	05/10/2018
CFSB-242	CFSB-242-SO-0-0.5	05/10/2018
CFSB-242	CFSB-242-SO-0.5-2	05/10/2018
CFSB-242	CFSB-242-SO-10-12	05/10/2018
CFSB-243	CFSB-243-SO-0.5-2	05/10/2018
CFSB-243	CFSB-243-SO-0-0.5	05/10/2018
CFSB-243	CFSB-243-SO-10-12	05/10/2018
CFSB-246	CFSB-246-SO-0-0.5	05/09/2018
CFSB-246	CFSB-246-SO-0.5-2	05/09/2018
CFSB-246	CFSB-246-SO-10-12	05/09/2018
CFSB-247	CFSB-247-SO-0-0.5	05/09/2018
CFSB-247	CFSB-247-SO-0.5-2	05/09/2018
CFSB-247	CFSB-247-SO-10-12	05/09/2018
CFSB-266	CFSB-266-SO-0-0.5	05/10/2018
CFSB-266	CFSB-266-SO-0.5-2	05/10/2018
CFSB-266	CFSB-266-SO-10-12	05/10/2018
CFSB-274	CFSB-274-SO-0-0.5	05/11/2018
CFSB-274	CFSB-274-SO-0.5-2	05/11/2018
CFSB-274	CFSB-274-SO-6-8	05/11/2018
CFSB-274	CFSB-274-SO-10-12	05/11/2018
CFSB-274	CFSB-274-SO-0-0.5	09/28/2018
CFSB-274	CFSB-274-SO-0.5-2	09/28/2018
CFSB-275	CFSB-275-SO-0-0.5	05/11/2018
CFSB-275	CFSB-275-SO-0.5-2	05/11/2018
CFSB-275	CFSB-275-SO-6-8	05/11/2018
CFSB-275	CFSB-275-SO-10-12	05/11/2018
CFSB-275	CFSB-DUP51-SO	09/28/2018
CFSB-275	CFSB-275-SO-0-0.5	09/28/2018
CFSB-275	CFSB-275-SO-0.5-2	09/28/2018
CFSB-276	CFSB-276-SO-0-0.5	05/11/2018
CFSB-276	CFSB-276-SO-0.5-2	05/11/2018
CFSB-276	CFSB-276-SO-6-8	05/11/2018
CFSB-276	CFSB-276-SO-10-12	05/11/2018
CFSB-276	CFSB-276-SO-0-0.5	09/28/2018
CFSB-276	CFSB-276-SO-0.5-2	09/28/2018
CFSB-278	CFSB-278-SO-0-0.5	05/11/2018
CFSB-278	CFSB-278-SO-0.5-2	05/11/2018
CFSB-278	CFSB-278-SO-6-8	05/11/2018
CFSB-278	CFSB-278-SO-10-12	05/11/2018
CFSB-278	CFSB-278-SO-0-0.5	09/28/2018
CFSB-278	CFSB-278-SO-0.5-2	09/28/2018
CFSB-287	CFSB-287-SO-8-10	05/18/2018
CFSB-288	CFSB-288-SO-0-0.5	06/28/2018
CFSB-288	CFSB-288-SO-0.5-2	06/28/2018
CFSB-288	CFSB-288-SO-0-0.5	09/27/2018
CFSB-288	CFSB-288-SO-0.5-2	09/27/2018
CFSB-293	CFSB-293-SO-0-0.5	09/27/2018
CFSB-293	CFSB-293-SO-0.5-2	09/27/2018
CFSB-294	CFSB-294-SO-0-0.5	09/27/2018
CFSB-294	CFSB-294-SO-0.5-2	09/27/2018

Table D-3
North Percolation Pond Area Soil Samples (0-0.5 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Location	Sample	Sample Date
CFMW-027	CFMW-027-SO-0-0.5	06/30/2016
CFSB-014	CFSB-014-SO-0-0.5	06/02/2016
CFSB-016	CFSB-016-SO-0-0.5	06/02/2016
CFSB-019	CFSB-019-SO-0-0.5	06/04/2016
CFSB-025	CFSB-025-SO-0-0.5	06/13/2016
CFSB-026	CFSB-026-SO-0-0.5	06/13/2016
CFSB-027	CFSB-027-SO-0-0.5	06/13/2016
CFSB-028	CFSB-028-SO-0-0.5	07/18/2016
CFSB-030	CFSB-030-SO-0-0.5	06/13/2016
CFSB-199	CFSB-199-SO-0-0.5	06/28/2018
CFSB-201	CFSB-201-SO-0-0.5	06/22/2018
CFSB-201	CFSB-201-SO-0-0.5	06/29/2018
CFSB-202	CFSB-202-SO-0-0.5	06/22/2018
CFSB-202	CFSB-202-SO-0-0.5	06/29/2018
CFSB-203	CFSB-203-SO-0-0.5	06/28/2018
CFSB-204	CFSB-204-SO-0-0.5	06/22/2018
CFSB-214	CFSB-214-SO-0-0.5	06/22/2018
CFSB-272	CFSB-272-SO-0-0.5	05/04/2018
CFSB-272	CFSB-272-SO-0-0.5	06/28/2018
CFSB-273	CFSB-273-SO-0-0.5	05/04/2018
CFSB-273	CFSB-273-SO-0-0.5	06/22/2018
CFSB-279	CFSB-279-SO-0-0.5	05/08/2018
CFSB-279	CFSB-279-SO-0-0.5	06/22/2018
CFSB-280	CFSB-280-SO-0-0.5	05/08/2018
CFSB-280	CFSB-280-SO-0-0.5	06/22/2018
CFSB-281	CFSB-281-SO-0-0.5	05/04/2018
CFSB-281	CFSB-281-SO-0-0.5	06/22/2018

Table D-4
North Percolation Pond Area Soil Samples (0-2 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Location	Sample	Sample Date
CFMW-027	CFMW-027-SO-0.5-2	06/30/2016
CFMW-027	CFMW-027-SO-0-0.5	06/30/2016
CFSB-014	CFSB-014-SO-0.5-2	06/02/2016
CFSB-014	CFSB-014-SO-0-0.5	06/02/2016
CFSB-016	CFSB-016-SO-0.5-2	06/02/2016
CFSB-016	CFSB-016-SO-0-0.5	06/02/2016
CFSB-019	CFSB-019-SO-0.5-2	06/04/2016
CFSB-019	CFSB-DUP13-SO	06/04/2016
CFSB-019	CFSB-019-SO-0-0.5	06/04/2016
CFSB-025	CFSB-025-SO-0.5-2	06/13/2016
CFSB-025	CFSB-025-SO-0-0.5	06/13/2016
CFSB-026	CFSB-026-SO-0.5-2	06/13/2016
CFSB-026	CFSB-026-SO-0-0.5	06/13/2016
CFSB-027	CFSB-027-SO-0.5-2	06/13/2016
CFSB-027	CFSB-027-SO-0-0.5	06/13/2016
CFSB-028	CFSB-028-SO-0.5-2	07/18/2016
CFSB-028	CFSB-028-SO-0-0.5	07/18/2016
CFSB-030	CFSB-030-SO-0.5-2	06/13/2016
CFSB-030	CFSB-030-SO-0-0.5	06/13/2016
CFSB-199	CFSB-199-SO-0-0.5	06/28/2018
CFSB-199	CFSB-199-SO-0.5-2	06/28/2018
CFSB-199	CFSB-DUP46-SO	06/28/2018
CFSB-201	CFSB-201-SO-0-0.5	06/22/2018
CFSB-201	CFSB-201-SO-0.5-2	06/22/2018
CFSB-201	CFSB-201-SO-0-0.5	06/29/2018
CFSB-202	CFSB-202-SO-0-0.5	06/22/2018
CFSB-202	CFSB-202-SO-0.5-2	06/22/2018
CFSB-202	CFSB-202-SO-0-0.5	06/29/2018
CFSB-203	CFSB-203-SO-0-0.5	06/28/2018
CFSB-203	CFSB-203-SO-0.5-2	06/28/2018
CFSB-203	CFSB-DUP47-SO	06/28/2018
CFSB-204	CFSB-204-SO-0-0.5	06/22/2018
CFSB-204	CFSB-204-SO-0.5-2	06/22/2018
CFSB-214	CFSB-214-SO-0-0.5	06/22/2018
CFSB-214	CFSB-214-SO-0.5-2	06/22/2018
CFSB-272	CFSB-272-SO-0-0.5	05/04/2018
CFSB-272	CFSB-272-SO-0.5-2	05/04/2018
CFSB-272	CFSB-272-SO-0-0.5	06/28/2018
CFSB-272	CFSB-272-SO-0.5-2	06/28/2018
CFSB-273	CFSB-273-SO-0-0.5	05/04/2018
CFSB-273	CFSB-273-SO-0.5-2	05/04/2018
CFSB-273	CFSB-273-SO-0-0.5	06/22/2018
CFSB-273	CFSB-273-SO-0.5-2	06/22/2018
CFSB-279	CFSB-279-SO-0-0.5	05/08/2018
CFSB-279	CFSB-279-SO-0.5-2	05/08/2018
CFSB-279	CFSB-279-SO-0-0.5	06/22/2018
CFSB-279	CFSB-279-SO-0.5-2	06/22/2018
CFSB-280	CFSB-280-SO-0-0.5	05/08/2018
CFSB-280	CFSB-280-SO-0.5-2	05/08/2018
CFSB-280	CFSB-280-SO-0-0.5	06/22/2018
CFSB-280	CFSB-280-SO-0.5-2	06/22/2018
CFSB-281	CFSB-281-SO-0-0.5	05/04/2018
CFSB-281	CFSB-281-SO-0.5-2	05/04/2018
CFSB-281	CFSB-281-SO-0-0.5	06/22/2018
CFSB-281	CFSB-281-SO-0.5-2	06/22/2018

Table D-5
North Percolation Pond Area Surface Water Samples
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Location	Sample	Sample Date
CFSWP-023	CFSWP-023-SW	04/03/2017
CFSWP-024	CFSWP-024-SW	06/15/2017

Table D-6
North Percolation Pond Area Sediment Samples
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Location	Sample	Sample Date
CFSDP-023	CFSDP-023-SD	9/7/2016
CFSDP-023	CFSDP-DUP2-SD	9/7/2016
CFSDP-024	CFSDP-024-SD	9/7/2016

Table D-7
Central Landfill Area Soil Samples (0-0.5 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Location	Sample	Sample Date
CFLP-007	CFLP-007-SO-0-0.5	06/09/2018
CFLP-008	CFLP-008-SO-0-0.5	06/09/2018
CFLP-009	CFLP-009-SO-0-0.5	06/09/2018
CFLP-010	CFLP-010-SO-0-0.5	06/09/2018
CFLP-011	CFLP-011-SO-0-0.5	06/09/2018
CFLP-012	CFLP-012-SO-0-0.5	06/09/2018
CFLP-013	CFLP-013-SO-0-0.5	06/09/2018
CFLP-014	CFLP-014-SO-0-0.5	06/09/2018
CFLP-015	CFLP-015-SO-0-0.5	06/16/2018
CFLP-016	CFLP-016-SO-0-0.5	06/16/2018
CFLP-017	CFLP-017-SO-0-0.5	06/16/2018
CFLP-018	CFLP-018-SO-0-0.5	06/16/2018
CFMW-002	CFMW-002-SO-0-0.5	06/13/2016
CFMW-008A	CFMW-008a-SO-0-0.5	06/13/2016
CFMW-010	CFMW-010-SO-0-0.5	05/18/2016
CFMW-012A	CFMW-012A-SO-0-0.5	05/20/2016
CFMW-016A	CFMW-016a-SO-0-0.5	06/21/2016
CFMW-018	CFMW-018-SO-0-0.5	05/19/2016
CFMW-019A	CFMW-019a-SO-0-0.5	05/25/2016
CFMW-022	CFMW-022-SO-0-0.5	06/02/2016
CFMW-023A	CFMW-023a-SO-0-0.5	06/17/2016
CFMW-029	CFMW-029-SO-0-0.5	05/18/2016
CFSB-001	CFSB-001-SO-0-0.5	05/25/2016
CFSB-002	CFSB-002-SO-0-0.5	05/25/2016
CFSB-003	CFSB-003-SO-0-0.5	05/25/2016
CFSB-004	CFSB-004-SO-0-0.5	05/25/2016
CFSB-005	CFSB-005-SO-0-0.5	05/25/2016
CFSB-006	CFSB-006-SO-0-0.5	05/23/2016
CFSB-007	CFSB-007-SO-0-0.5	05/25/2016
CFSB-008	CFSB-008-SO-0-0.5	05/23/2016
CFSB-009	CFSB-009-SO-0-0.5	05/23/2016
CFSB-009	CFSB-DUP6-SO	05/24/2016
CFSB-021	CFSB-021-SO-0-0.5	05/23/2016
CFSB-022	CFSB-022-SO-0-0.5	05/23/2016
CFSB-029	CFSB-029-SO-0-0.5	05/23/2016
CFSB-033	CFSB-033-SO-0-0.5	05/23/2016
CFSB-034	CFSB-034-SO-0-0.5	05/31/2016
CFSB-035	CFSB-035-SO-0-0.5	05/31/2016
CFSB-036	CFSB-036-SO-0-0.5	05/31/2016
CFSB-037	CFSB-037-SO-0-0.5	05/31/2016
CFSB-177	CFSB-177-SO-0-0.5	06/25/2018
CFSB-177	CFSB-DUP42-SO	06/25/2018
CFSB-178	CFSB-178-SO-0-0.5	06/25/2018
CFSB-179	CFSB-179-SO-0-0.5	06/25/2018
CFSB-180	CFSB-180-SO-0-0.5	06/25/2018
CFSB-219	CFSB-219-SO-0-0.5	06/16/2018
CFSB-220	CFSB-220-SO-0-0.5	06/22/2018
CFSB-221	CFSB-221-SO-0-0.5	05/07/2018
CFSB-222	CFSB-222-SO-0-0.5	05/07/2018
CFSB-223	CFSB-223-SO-0-0.5	05/07/2018
CFSB-224	CFSB-224-SO-0-0.5	05/07/2018
CFSB-225	CFSB-225-SO-0-0.5	05/07/2018
CFSB-226	CFSB-226-SO-0-0.5	05/07/2018
CFSB-227	CFSB-227-SO-0-0.5	05/07/2018
CFSB-228	CFSB-228-SO-0-0.5	05/07/2018
CFSB-229	CFSB-229-SO-0-0.5	05/07/2018
CFSB-230	CFSB-230-SO-0-0.5	05/07/2018
CFSB-230	CFSB-DUP34-SO	05/07/2018
CFSB-261	CFSB-261-SO-0-0.5	05/02/2018
CFSB-262	CFSB-262-SO-0-0.5	05/02/2018
CFSB-263	CFSB-263-SO-0-0.5	05/02/2018
CFSB-264	CFSB-264-SO-0-0.5	05/03/2018
CFSB-265	CFSB-265-SO-0-0.5	05/03/2018
CFSB-270	CFSB-270-SO-0-0.5	05/02/2018
CFSB-271	CFSB-271-SO-0-0.5	05/02/2018
CFSB-277	CFSB-277-SO-0-0.5	05/03/2018

Table D-7
Central Landfill Area Soil Samples (0-0.5 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Location	Sample	Sample Date
CFSB-283	CFSB-283-SO-0-0.5	06/16/2018
CFSB-284	CFSB-284-SO-0-0.5	06/16/2018
CFSB-289	CFSB-289-SO-0-0.5	06/28/2018
CFSB-289	CFSB-289-SO-0-0.5	09/27/2018
CFSB-290	CFSB-290-SO-0-0.5	06/28/2018
CFSB-290	CFSB-290-SO-0-0.5	09/27/2018
CFSB-291	CFSB-291-SO-0-0.5	06/22/2018
CFSB-292	CFSB-292-SO-0-0.5	06/22/2018

Table D-8
Central Landfill Area Soil Samples (0-2 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Location	Sample	Sample Date
CFLP-007	CFLP-007-SO-0-0.5	06/09/2018
CFLP-007	CFLP-007-SO-0.5-2	06/09/2018
CFLP-008	CFLP-008-SO-0-0.5	06/09/2018
CFLP-008	CFLP-008-SO-0.5-2	06/09/2018
CFLP-009	CFLP-009-SO-0-0.5	06/09/2018
CFLP-009	CFLP-009-SO-0.5-2	06/09/2018
CFLP-010	CFLP-010-SO-0-0.5	06/09/2018
CFLP-010	CFLP-010-SO-0.5-2	06/09/2018
CFLP-011	CFLP-011-SO-0-0.5	06/09/2018
CFLP-011	CFLP-011-SO-0.5-2	06/09/2018
CFLP-012	CFLP-012-SO-0-0.5	06/09/2018
CFLP-012	CFLP-012-SO-0.5-2	06/09/2018
CFLP-013	CFLP-013-SO-0-0.5	06/09/2018
CFLP-013	CFLP-013-SO-0.5-2	06/09/2018
CFLP-014	CFLP-014-SO-0-0.5	06/09/2018
CFLP-014	CFLP-014-SO-0.5-2	06/09/2018
CFLP-015	CFLP-015-SO-0-0.5	06/16/2018
CFLP-015	CFLP-015-SO-0.5-2	06/16/2018
CFLP-016	CFLP-016-SO-0-0.5	06/16/2018
CFLP-016	CFLP-016-SO-0.5-2	06/16/2018
CFLP-017	CFLP-017-SO-0-0.5	06/16/2018
CFLP-017	CFLP-017-SO-0.5-2	06/16/2018
CFLP-018	CFLP-018-SO-0-0.5	06/16/2018
CFLP-018	CFLP-018-SO-0.5-2	06/16/2018
CFMW-002	CFMW-002-SO-0.5-2	06/13/2016
CFMW-002	CFMW-002-SO-0-0.5	06/13/2016
CFMW-008A	CFMW-008a-SO-0.5-2	06/13/2016
CFMW-008A	CFMW-008a-SO-0-0.5	06/13/2016
CFMW-010	CFMW-010-SO-0.5-2.0	05/18/2016
CFMW-010	CFMW-010-SO-0-0.5	05/18/2016
CFMW-012A	CFMW-012A-SO-0.5-2	05/20/2016
CFMW-012A	CFMW-DUP3-SO	05/20/2016
CFMW-012A	CFMW-012A-SO-0-0.5	05/20/2016
CFMW-016A	CFMW-016a-SO-0.5-2	06/21/2016
CFMW-016A	CFMW-016a-SO-0-0.5	06/21/2016
CFMW-018	CFMW-018-SO-0.5-2.0	05/19/2016
CFMW-018	CFMW-018-SO-0-0.5	05/19/2016
CFMW-019A	CFMW-019a-SO-0.5-2	05/25/2016
CFMW-019A	CFMW-DUP5-SO	05/25/2016
CFMW-019A	CFMW-019a-SO-0-0.5	05/25/2016
CFMW-022	CFMW-022-SO-0.5-2	06/02/2016
CFMW-022	CFMW-DUP12-SO	06/02/2016
CFMW-022	CFMW-022-SO-0-0.5	06/02/2016
CFMW-023A	CFMW-023a-SO-0.5-2	06/17/2016
CFMW-023A	CFMW-023a-SO-0-0.5	06/17/2016
CFMW-029	CFMW-029-SO-0.5-2.0	05/18/2016
CFMW-029	CFMW-029-SO-0-0.5	05/18/2016
CFSB-001	CFSB-001-SO-0.5-2	05/25/2016
CFSB-001	CFSB-001-SO-0-0.5	05/25/2016
CFSB-002	CFSB-002-SO-0.5-2	05/25/2016
CFSB-002	CFSB-002-SO-0-0.5	05/25/2016
CFSB-003	CFSB-003-SO-0.5-2	05/25/2016
CFSB-003	CFSB-003-SO-0-0.5	05/25/2016
CFSB-004	CFSB-004-SO-0.5-2	05/25/2016
CFSB-004	CFSB-004-SO-0-0.5	05/25/2016
CFSB-005	CFSB-005-SO-0.5-2	05/25/2016
CFSB-005	CFSB-005-SO-0-0.5	05/25/2016
CFSB-006	CFSB-006-SO-0.5-2	05/23/2016
CFSB-006	CFSB-006-SO-0-0.5	05/23/2016
CFSB-007	CFSB-007-SO-0.5-2	05/25/2016
CFSB-007	CFSB-007-SO-0-0.5	05/25/2016
CFSB-008	CFSB-008-SO-0.5-2	05/23/2016
CFSB-008	CFSB-DUP4-SO	05/23/2016
CFSB-008	CFSB-008-SO-0-0.5	05/23/2016
CFSB-009	CFSB-009-SO-0.5-2	05/23/2016
CFSB-009	CFSB-009-SO-0-0.5	05/23/2016

Table D-8
Central Landfill Area Soil Samples (0-2 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Location	Sample	Sample Date
CFSB-009	CFSB-DUP6-SO	05/24/2016
CFSB-021	CFSB-021-SO-0.5-2	05/23/2016
CFSB-021	CFSB-021-SO-0-0.5	05/23/2016
CFSB-022	CFSB-022-SO-0.5-2	05/23/2016
CFSB-022	CFSB-022-SO-0-0.5	05/23/2016
CFSB-029	CFSB-029-SO-0.5-2	05/23/2016
CFSB-029	CFSB-029-SO-0-0.5	05/23/2016
CFSB-033	CFSB-033-SO-0.5-2	05/23/2016
CFSB-033	CFSB-033-SO-0-0.5	05/23/2016
CFSB-034	CFSB-034-SO-0.5-2	05/31/2016
CFSB-034	CFSB-034-SO-0-0.5	05/31/2016
CFSB-035	CFSB-035-SO-0.5-2	05/31/2016
CFSB-035	CFSB-035-SO-0-0.5	05/31/2016
CFSB-036	CFSB-036-SO-0.5-2	05/31/2016
CFSB-036	CFSB-036-SO-0-0.5	05/31/2016
CFSB-037	CFSB-037-SO-0.5-2	05/31/2016
CFSB-037	CFSB-037-SO-0-0.5	05/31/2016
CFSB-177	CFSB-177-SO-0-0.5	06/25/2018
CFSB-177	CFSB-177-SO-0.5-2	06/25/2018
CFSB-177	CFSB-DUP42-SO	06/25/2018
CFSB-178	CFSB-178-SO-0-0.5	06/25/2018
CFSB-178	CFSB-178-SO-0.5-2	06/25/2018
CFSB-179	CFSB-179-SO-0-0.5	06/25/2018
CFSB-179	CFSB-179-SO-0.5-2	06/25/2018
CFSB-180	CFSB-180-SO-0-0.5	06/25/2018
CFSB-180	CFSB-180-SO-0.5-2	06/25/2018
CFSB-219	CFSB-219-SO-0-0.5	06/16/2018
CFSB-219	CFSB-219-SO-0.5-2	06/16/2018
CFSB-220	CFSB-220-SO-0-0.5	06/22/2018
CFSB-220	CFSB-220-SO-0.5-2	06/22/2018
CFSB-221	CFSB-221-SO-0-0.5	05/07/2018
CFSB-221	CFSB-221-SO-0.5-2	05/07/2018
CFSB-222	CFSB-222-SO-0-0.5	05/07/2018
CFSB-222	CFSB-222-SO-0.5-2	05/07/2018
CFSB-223	CFSB-223-SO-0-0.5	05/07/2018
CFSB-223	CFSB-223-SO-0.5-2	05/07/2018
CFSB-224	CFSB-224-SO-0-0.5	05/07/2018
CFSB-224	CFSB-224-SO-0.5-2	05/07/2018
CFSB-225	CFSB-225-SO-0-0.5	05/07/2018
CFSB-225	CFSB-225-SO-0.5-2	05/07/2018
CFSB-226	CFSB-226-SO-0-0.5	05/07/2018
CFSB-226	CFSB-226-SO-0.5-2	05/07/2018
CFSB-227	CFSB-227-SO-0-0.5	05/07/2018
CFSB-227	CFSB-227-SO-0.5-2	05/07/2018
CFSB-228	CFSB-228-SO-0-0.5	05/07/2018
CFSB-228	CFSB-228-SO-0.5-2	05/07/2018
CFSB-229	CFSB-229-SO-0-0.5	05/07/2018
CFSB-229	CFSB-229-SO-0.5-2	05/07/2018
CFSB-230	CFSB-230-SO-0-0.5	05/07/2018
CFSB-230	CFSB-230-SO-0.5-2	05/07/2018
CFSB-230	CFSB-DUP34-SO	05/07/2018
CFSB-261	CFSB-261-SO-0-0.5	05/02/2018
CFSB-261	CFSB-261-SO-0.5-2	05/02/2018
CFSB-262	CFSB-262-SO-0-0.5	05/02/2018
CFSB-262	CFSB-262-SO-0.5-2	05/02/2018
CFSB-263	CFSB-263-SO-0-0.5	05/02/2018
CFSB-263	CFSB-263-SO-0.5-2	05/02/2018
CFSB-264	CFSB-264-SO-0-0.5	05/03/2018
CFSB-264	CFSB-264-SO-0.5-2	05/03/2018
CFSB-265	CFSB-265-SO-0-0.5	05/03/2018
CFSB-265	CFSB-265-SO-0.5-2	05/03/2018
CFSB-270	CFSB-270-SO-0-0.5	05/02/2018
CFSB-270	CFSB-270-SO-0.5-2	05/02/2018
CFSB-271	CFSB-271-SO-0-0.5	05/02/2018
CFSB-271	CFSB-271-SO-0.5-2	05/02/2018
CFSB-277	CFSB-277-SO-0-0.5	05/03/2018

Table D-8
Central Landfill Area Soil Samples (0-2 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Location	Sample	Sample Date
CFSB-277	CFSB-277-SO-0.5-2	05/03/2018
CFSB-283	CFSB-283-SO-0-0.5	06/16/2018
CFSB-284	CFSB-284-SO-0-0.5	06/16/2018
CFSB-289	CFSB-289-SO-0-0.5	06/28/2018
CFSB-289	CFSB-289-SO-0.5-2	06/28/2018
CFSB-289	CFSB-289-SO-0-0.5	09/27/2018
CFSB-289	CFSB-289-SO-0.5-2	09/27/2018
CFSB-290	CFSB-290-SO-0-0.5	06/28/2018
CFSB-290	CFSB-290-SO-0.5-2	06/28/2018
CFSB-290	CFSB-290-SO-0-0.5	09/27/2018
CFSB-290	CFSB-290-SO-0.5-2	09/27/2018
CFSB-291	CFSB-291-SO-0-0.5	06/22/2018
CFSB-291	CFSB-291-SO-0.5-2	06/22/2018
CFSB-292	CFSB-292-SO-0-0.5	06/22/2018
CFSB-292	CFSB-292-SO-0.5-2	06/22/2018

Table D-9
Central Landfill Area Soil Samples (0-12 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Location	Sample	Sample Date
CFLP-007	CFLP-007-SO-0-0.5	06/09/2018
CFLP-007	CFLP-007-SO-0.5-2	06/09/2018
CFLP-008	CFLP-008-SO-0-0.5	06/09/2018
CFLP-008	CFLP-008-SO-0.5-2	06/09/2018
CFLP-009	CFLP-009-SO-0-0.5	06/09/2018
CFLP-009	CFLP-009-SO-0.5-2	06/09/2018
CFLP-010	CFLP-010-SO-0-0.5	06/09/2018
CFLP-010	CFLP-010-SO-0.5-2	06/09/2018
CFLP-011	CFLP-011-SO-0-0.5	06/09/2018
CFLP-011	CFLP-011-SO-0.5-2	06/09/2018
CFLP-012	CFLP-012-SO-0-0.5	06/09/2018
CFLP-012	CFLP-012-SO-0.5-2	06/09/2018
CFLP-013	CFLP-013-SO-0-0.5	06/09/2018
CFLP-013	CFLP-013-SO-0.5-2	06/09/2018
CFLP-014	CFLP-014-SO-0-0.5	06/09/2018
CFLP-014	CFLP-014-SO-0.5-2	06/09/2018
CFLP-015	CFLP-015-SO-0-0.5	06/16/2018
CFLP-015	CFLP-015-SO-0.5-2	06/16/2018
CFLP-016	CFLP-016-SO-0-0.5	06/16/2018
CFLP-016	CFLP-016-SO-0.5-2	06/16/2018
CFLP-017	CFLP-017-SO-0-0.5	06/16/2018
CFLP-017	CFLP-017-SO-0.5-2	06/16/2018
CFLP-018	CFLP-018-SO-0-0.5	06/16/2018
CFLP-018	CFLP-018-SO-0.5-2	06/16/2018
CFMW-002	CFMW-002-SO-0.5-2	06/13/2016
CFMW-002	CFMW-002-SO-0-0.5	06/13/2016
CFMW-002	CFMW-002-SO-10-12	06/13/2016
CFMW-008A	CFMW-008a-SO-0.5-2	06/13/2016
CFMW-008A	CFMW-008a-SO-0-0.5	06/13/2016
CFMW-008A	CFMW-008a-SO-10-12	06/13/2016
CFMW-008A	CFMW-DUP14-SO	06/13/2016
CFMW-010	CFMW-010-SO-0.5-2.0	05/18/2016
CFMW-010	CFMW-010-SO-0-0.5	05/18/2016
CFMW-010	CFMW-010-SO-10-12	05/18/2016
CFMW-012A	CFMW-012A-SO-0.5-2	05/20/2016
CFMW-012A	CFMW-DUP3-SO	05/20/2016
CFMW-012A	CFMW-012A-SO-0-0.5	05/20/2016
CFMW-012A	CFMW-012A-SO-10-12	05/20/2016
CFMW-016A	CFMW-016a-SO-0.5-2	06/21/2016
CFMW-016A	CFMW-016a-SO-0-0.5	06/21/2016
CFMW-016A	CFMW-016a-SO-10-12	06/21/2016
CFMW-018	CFMW-018-SO-0.5-2.0	05/19/2016
CFMW-018	CFMW-018-SO-0-0.5	05/19/2016
CFMW-018	CFMW-018-SO-10-12	05/19/2016
CFMW-018	CFMW-DUP2-SO	05/19/2016
CFMW-019A	CFMW-019a-SO-0.5-2	05/25/2016
CFMW-019A	CFMW-DUP5-SO	05/25/2016
CFMW-019A	CFMW-019a-SO-0-0.5	05/25/2016
CFMW-019A	CFMW-019a-SO-10-12	05/25/2016
CFMW-022	CFMW-022-SO-0.5-2	06/02/2016
CFMW-022	CFMW-DUP12-SO	06/02/2016
CFMW-022	CFMW-022-SO-0-0.5	06/02/2016
CFMW-022	CFMW-022-SO-10-12	06/02/2016
CFMW-023A	CFMW-023a-SO-0.5-2	06/17/2016
CFMW-023A	CFMW-023a-SO-0-0.5	06/17/2016
CFMW-023A	CFMW-023a-SO-10-12	06/17/2016
CFMW-029	CFMW-029-SO-0.5-2.0	05/18/2016
CFMW-029	CFMW-029-SO-0-0.5	05/18/2016
CFMW-029	CFMW-029-SO-10-12	05/18/2016
CFSB-001	CFSB-001-SO-0.5-2	05/25/2016
CFSB-001	CFSB-001-SO-0-0.5	05/25/2016
CFSB-001	CFSB-001-SO-10-12	05/25/2016
CFSB-002	CFSB-002-SO-0.5-2	05/25/2016
CFSB-002	CFSB-002-SO-0-0.5	05/25/2016
CFSB-002	CFSB-002-SO-10-12	05/25/2016
CFSB-003	CFSB-003-SO-0.5-2	05/25/2016

Table D-9
Central Landfill Area Soil Samples (0-12 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Location	Sample	Sample Date
CFSB-003	CFSB-003-SO-0-0.5	05/25/2016
CFSB-003	CFSB-003-SO-10-12	05/25/2016
CFSB-004	CFSB-004-SO-0.5-2	05/25/2016
CFSB-004	CFSB-004-SO-0-0.5	05/25/2016
CFSB-004	CFSB-004-SO-10-12	05/25/2016
CFSB-005	CFSB-005-SO-0.5-2	05/25/2016
CFSB-005	CFSB-005-SO-0-0.5	05/25/2016
CFSB-005	CFSB-005-SO-10-12	05/25/2016
CFSB-006	CFSB-006-SO-0.5-2	05/23/2016
CFSB-006	CFSB-006-SO-0-0.5	05/23/2016
CFSB-006	CFSB-006-SO-10-12	05/23/2016
CFSB-007	CFSB-007-SO-0.5-2	05/25/2016
CFSB-007	CFSB-007-SO-0-0.5	05/25/2016
CFSB-007	CFSB-007-SO-10-12	05/25/2016
CFSB-008	CFSB-008-SO-0.5-2	05/23/2016
CFSB-008	CFSB-DUP4-SO	05/23/2016
CFSB-008	CFSB-008-SO-0-0.5	05/23/2016
CFSB-008	CFSB-008-SO-10-12	05/23/2016
CFSB-009	CFSB-009-SO-0.5-2	05/23/2016
CFSB-009	CFSB-009-SO-0-0.5	05/23/2016
CFSB-009	CFSB-009-SO-10-12	05/23/2016
CFSB-009	CFSB-DUP6-SO	05/24/2016
CFSB-021	CFSB-021-SO-0.5-2	05/23/2016
CFSB-021	CFSB-021-SO-0-0.5	05/23/2016
CFSB-021	CFSB-021-SO-10-12	05/23/2016
CFSB-022	CFSB-022-SO-0.5-2	05/23/2016
CFSB-022	CFSB-022-SO-0-0.5	05/23/2016
CFSB-022	CFSB-022-SO-10-12	05/23/2016
CFSB-029	CFSB-029-SO-0.5-2	05/23/2016
CFSB-029	CFSB-029-SO-0-0.5	05/23/2016
CFSB-029	CFSB-029-SO-10-12	05/23/2016
CFSB-033	CFSB-033-SO-0.5-2	05/23/2016
CFSB-033	CFSB-033-SO-0-0.5	05/23/2016
CFSB-033	CFSB-033-SO-10-12	05/23/2016
CFSB-034	CFSB-034-SO-0.5-2	05/31/2016
CFSB-034	CFSB-034-SO-0-0.5	05/31/2016
CFSB-034	CFSB-034-SO-10-12	05/31/2016
CFSB-035	CFSB-035-SO-0.5-2	05/31/2016
CFSB-035	CFSB-035-SO-0-0.5	05/31/2016
CFSB-035	CFSB-035-SO-10-12	05/31/2016
CFSB-036	CFSB-036-SO-0.5-2	05/31/2016
CFSB-036	CFSB-036-SO-0-0.5	05/31/2016
CFSB-036	CFSB-036-SO-10-12	05/31/2016
CFSB-037	CFSB-037-SO-0.5-2	05/31/2016
CFSB-037	CFSB-037-SO-0-0.5	05/31/2016
CFSB-037	CFSB-037-SO-10-12	05/31/2016
CFSB-177	CFSB-177-SO-0-0.5	06/25/2018
CFSB-177	CFSB-177-SO-0.5-2	06/25/2018
CFSB-177	CFSB-DUP42-SO	06/25/2018
CFSB-178	CFSB-178-SO-0-0.5	06/25/2018
CFSB-178	CFSB-178-SO-0.5-2	06/25/2018
CFSB-179	CFSB-179-SO-0-0.5	06/25/2018
CFSB-179	CFSB-179-SO-0.5-2	06/25/2018
CFSB-180	CFSB-180-SO-0-0.5	06/25/2018
CFSB-180	CFSB-180-SO-0.5-2	06/25/2018
CFSB-219	CFSB-219-SO-0-0.5	06/16/2018
CFSB-219	CFSB-219-SO-0.5-2	06/16/2018
CFSB-220	CFSB-220-SO-0-0.5	06/22/2018
CFSB-220	CFSB-220-SO-0.5-2	06/22/2018
CFSB-221	CFSB-221-SO-0-0.5	05/07/2018
CFSB-221	CFSB-221-SO-0.5-2	05/07/2018
CFSB-221	CFSB-221a-SO-2.5-3.5	06/28/2018
CFSB-222	CFSB-222-SO-0-0.5	05/07/2018
CFSB-222	CFSB-222-SO-0.5-2	05/07/2018
CFSB-223	CFSB-223-SO-0-0.5	05/07/2018
CFSB-223	CFSB-223-SO-0.5-2	05/07/2018

Table D-9
Central Landfill Area Soil Samples (0-12 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Location	Sample	Sample Date
CFSB-224	CFSB-224-SO-0-0.5	05/07/2018
CFSB-224	CFSB-224-SO-0.5-2	05/07/2018
CFSB-225	CFSB-225-SO-0-0.5	05/07/2018
CFSB-225	CFSB-225-SO-0.5-2	05/07/2018
CFSB-226	CFSB-226-SO-0-0.5	05/07/2018
CFSB-226	CFSB-226-SO-0.5-2	05/07/2018
CFSB-227	CFSB-227-SO-0-0.5	05/07/2018
CFSB-227	CFSB-227-SO-0.5-2	05/07/2018
CFSB-228	CFSB-228-SO-0-0.5	05/07/2018
CFSB-228	CFSB-228-SO-0.5-2	05/07/2018
CFSB-229	CFSB-229-SO-0-0.5	05/07/2018
CFSB-229	CFSB-229-SO-0.5-2	05/07/2018
CFSB-230	CFSB-230-SO-0-0.5	05/07/2018
CFSB-230	CFSB-230-SO-0.5-2	05/07/2018
CFSB-230	CFSB-DUP34-SO	05/07/2018
CFSB-261	CFSB-261-SO-0-0.5	05/02/2018
CFSB-261	CFSB-261-SO-0.5-2	05/02/2018
CFSB-261	CFSB-261-SO-10-12	05/02/2018
CFSB-262	CFSB-262-SO-0-0.5	05/02/2018
CFSB-262	CFSB-262-SO-0.5-2	05/02/2018
CFSB-262	CFSB-262-SO-6-8	05/02/2018
CFSB-262	CFSB-262-SO-10-12	05/02/2018
CFSB-263	CFSB-263-SO-0-0.5	05/02/2018
CFSB-263	CFSB-263-SO-0.5-2	05/02/2018
CFSB-263	CFSB-263-SO-6-8	05/02/2018
CFSB-263	CFSB-263-SO-10-12	05/02/2018
CFSB-264	CFSB-264-SO-0-0.5	05/03/2018
CFSB-264	CFSB-264-SO-0.5-2	05/03/2018
CFSB-264	CFSB-264-SO-6-8	05/03/2018
CFSB-264	CFSB-264-SO-10-12	05/03/2018
CFSB-265	CFSB-265-SO-0-0.5	05/03/2018
CFSB-265	CFSB-265-SO-0.5-2	05/03/2018
CFSB-265	CFSB-265-SO-6-8	05/03/2018
CFSB-265	CFSB-265-SO-10-12	05/03/2018
CFSB-270	CFSB-270-SO-0-0.5	05/02/2018
CFSB-270	CFSB-270-SO-0.5-2	05/02/2018
CFSB-270	CFSB-270-SO-6-8	05/02/2018
CFSB-270	CFSB-270-SO-10-12	05/02/2018
CFSB-271	CFSB-271-SO-0-0.5	05/02/2018
CFSB-271	CFSB-271-SO-0.5-2	05/02/2018
CFSB-271	CFSB-271-SO-10-12	05/02/2018
CFSB-277	CFSB-277-SO-0-0.5	05/03/2018
CFSB-277	CFSB-277-SO-0.5-2	05/03/2018
CFSB-277	CFSB-277-SO-6-8	05/03/2018
CFSB-277	CFSB-277-SO-10-12	05/03/2018
CFSB-283	CFSB-283-SO-0-0.5	06/16/2018
CFSB-284	CFSB-284-SO-0-0.5	06/16/2018
CFSB-289	CFSB-289-SO-0-0.5	06/28/2018
CFSB-289	CFSB-289-SO-0.5-2	06/28/2018
CFSB-289	CFSB-289-SO-0-0.5	09/27/2018
CFSB-289	CFSB-289-SO-0.5-2	09/27/2018
CFSB-290	CFSB-290-SO-0-0.5	06/28/2018
CFSB-290	CFSB-290-SO-0.5-2	06/28/2018
CFSB-290	CFSB-290-SO-0-0.5	09/27/2018
CFSB-290	CFSB-290-SO-0.5-2	09/27/2018
CFSB-291	CFSB-291-SO-0-0.5	06/22/2018
CFSB-291	CFSB-291-SO-0.5-2	06/22/2018
CFSB-292	CFSB-292-SO-0-0.5	06/22/2018
CFSB-292	CFSB-292-SO-0.5-2	06/22/2018

Table D-10
Central Landfill Area Surface Water Samples
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Location	Sample	Sample Date
CFSWP-010	CFSWP-010-SW	6/7/2016
CFSWP-010	CFSWP-010-SW	3/15/2017
CFSWP-010	CFSWP-010-SW	6/12/2017
CFSWP-010	CFSWP-010-SW	6/14/2018
CFSWP-011	CFSWP-011-SW	6/7/2016
CFSWP-011	CFSWP-011-SW	4/3/2017
CFSWP-011	CFSWP-011-SW	6/12/2017
CFSWP-011	CFSWP-011-SW	6/14/2018
CFSWP-012	CFSWP-012-SW	6/7/2016
CFSWP-012	CFSWP-012-SW	4/3/2017
CFSWP-012	CFSWP-DUP5-SW	4/3/2017
CFSWP-012	CFSWP-012-SW	6/12/2017
CFSWP-012	CFSWP-012-SW	6/14/2018
CFSWP-041	CFSWP-041-SW	6/14/2018
CFSWP-041	CFSWP-DUP11-SW	6/14/2018

Table D-11
Central Landfill Area Sediment Samples
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Location	Sample	Sample Date
CFSDP-010	CFSDP-010-SO	09/06/2016
CFSDP-011	CFSDP-011-SO	09/06/2016
CFSDP-012	CFSDP-012-SO	09/06/2016
CFSDP-012	CFSDP-DUP1-SO	09/06/2016

Table D-12
Industrial Landfill Area Soil Samples (0-0.5 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Location	Sample	Sample Date
CFLP-001	CFLP-001-SO-0-0.5	05/05/2018
CFLP-002	CFLP-002-SO-0-0.5	05/05/2018
CFLP-002	CFLP-DUP30-SO	05/05/2018
CFLP-003	CFLP-003-SO-0-0.5	05/05/2018
CFLP-003	CFLP-DUP31-SO	05/05/2018
CFLP-004	CFLP-004-SO-0-0.5	05/05/2018
CFLP-005	CFLP-005-SO-0-0.5	05/05/2018
CFLP-005	CFLP-DUP32-SO	05/05/2018
CFLP-006	CFLP-006-SO-0-0.5	05/05/2018
CFMW-003A	CFMW-003a-SO-0-0.5	05/31/2016
CFMW-066	CFMW-066-SO-0-0.5	04/30/2018
CFSB-191	CFSB-191-SO-0-0.5	06/22/2018
CFSB-192	CFSB-192-SO-0-0.5	06/22/2018
CFSB-194	CFSB-194-SO-0-0.5	06/27/2018
CFSB-195	CFSB-195-SO-0-0.5	06/27/2018
CFSB-250	CFSB-250-SO-0-0.5	05/01/2018
CFSB-252	CFSB-252-SO-0-0.5	05/01/2018
CFSB-253	CFSB-253-SO-0-0.5	05/01/2018

Table D-13
Industrial Landfill Area Soil Samples (0-2 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Location	Sample	Sample Date
CFLP-001	CFLP-001-SO-0-0.5	05/05/2018
CFLP-001	CFLP-001-SO-0.5-2	05/05/2018
CFLP-002	CFLP-002-SO-0-0.5	05/05/2018
CFLP-002	CFLP-002-SO-0.5-2	05/05/2018
CFLP-002	CFLP-DUP30-SO	05/05/2018
CFLP-003	CFLP-003-SO-0-0.5	05/05/2018
CFLP-003	CFLP-003-SO-0.5-2	05/05/2018
CFLP-003	CFLP-DUP31-SO	05/05/2018
CFLP-004	CFLP-004-SO-0-0.5	05/05/2018
CFLP-004	CFLP-004-SO-0.5-2	05/05/2018
CFLP-005	CFLP-005-SO-0-0.5	05/05/2018
CFLP-005	CFLP-005-SO-0.5-2	05/05/2018
CFLP-005	CFLP-DUP32-SO	05/05/2018
CFLP-006	CFLP-006-SO-0-0.5	05/05/2018
CFLP-006	CFLP-006-SO-0.5-2	05/05/2018
CFMW-003A	CFMW-003a-SO-0.5-2	05/31/2016
CFMW-003A	CFMW-003a-SO-0-0.5	05/31/2016
CFMW-066	CFMW-066-SO-0-0.5	04/30/2018
CFMW-066	CFMW-066-SO-0.5-2	04/30/2018
CFSB-191	CFSB-191-SO-0-0.5	06/22/2018
CFSB-191	CFSB-191-SO-0.5-2	06/22/2018
CFSB-192	CFSB-192-SO-0-0.5	06/22/2018
CFSB-192	CFSB-192-SO-0.5-2	06/22/2018
CFSB-194	CFSB-194-SO-0-0.5	06/27/2018
CFSB-194	CFSB-194-SO-0.5-2	06/27/2018
CFSB-194	CFSB-DUP44-SO	06/27/2018
CFSB-195	CFSB-195-SO-0-0.5	06/27/2018
CFSB-195	CFSB-195-SO-0.5-2	06/27/2018
CFSB-250	CFSB-250-SO-0-0.5	05/01/2018
CFSB-250	CFSB-250-SO-0.5-2	05/01/2018
CFSB-252	CFSB-252-SO-0-0.5	05/01/2018
CFSB-252	CFSB-252-SO-0.5-2	05/01/2018
CFSB-253	CFSB-253-SO-0-0.5	05/01/2018
CFSB-253	CFSB-253-SO-0.5-2	05/01/2018

Table D-14
Eastern Undeveloped Area Soil Samples (0-0.5 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Location	Sample	Sample Date
CFSB-181	CFSB-181-SO-0-0.5	06/26/2018
CFSB-182	CFSB-182-SO-0-0.5	06/26/2018
CFSB-183	CFSB-183-SO-0-0.5	06/26/2018
CFSB-184	CFSB-184-SO-0-0.5	06/26/2018
CFSB-185	CFSB-185-SO-0-0.5	06/26/2018
CFSB-186	CFSB-186-SO-0-0.5	06/26/2018
CFSB-187	CFSB-187-SO-0-0.5	06/27/2018
CFSB-188	CFSB-188-SO-0-0.5	06/26/2018
CFSB-209	CFSB-209-SO-0-0.5	06/26/2018
CFSB-210	CFSB-210-SO-0-0.5	06/26/2018
CFSB-211	CFSB-211-SO-0-0.5	06/26/2018
CFSB-212	CFSB-212-SO-0-0.5	06/26/2018
CFSB-267	CFSB-267-SO-0-0.5	05/10/2018
CFSB-268	CFSB-268-SO-0-0.5	05/10/2018
CFSB-269	CFSB-269-SO-0-0.5	05/09/2018
CFSB-282	CFSB-282-SO-0-0.5	06/16/2018

Table D-15
Eastern Undeveloped Area Soil Samples (0-2 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Location	Sample	Sample Date
CFSB-181	CFSB-181-SO-0-0.5	06/26/2018
CFSB-181	CFSB-181-SO-0.5-2	06/26/2018
CFSB-182	CFSB-182-SO-0-0.5	06/26/2018
CFSB-182	CFSB-182-SO-0.5-2	06/26/2018
CFSB-183	CFSB-183-SO-0-0.5	06/26/2018
CFSB-183	CFSB-183-SO-0.5-2	06/26/2018
CFSB-184	CFSB-184-SO-0-0.5	06/26/2018
CFSB-184	CFSB-184-SO-0.5-2	06/26/2018
CFSB-185	CFSB-185-SO-0-0.5	06/26/2018
CFSB-185	CFSB-185-SO-0.5-2	06/26/2018
CFSB-186	CFSB-186-SO-0-0.5	06/26/2018
CFSB-186	CFSB-186-SO-0.5-2	06/26/2018
CFSB-187	CFSB-187-SO-0-0.5	06/27/2018
CFSB-187	CFSB-187-SO-0.5-2	06/27/2018
CFSB-188	CFSB-188-SO-0-0.5	06/26/2018
CFSB-188	CFSB-188-SO-0.5-2	06/26/2018
CFSB-209	CFSB-209-SO-0-0.5	06/26/2018
CFSB-209	CFSB-209-SO-0.5-2	06/26/2018
CFSB-210	CFSB-210-SO-0-0.5	06/26/2018
CFSB-210	CFSB-210-SO-0.5-2	06/26/2018
CFSB-211	CFSB-211-SO-0-0.5	06/26/2018
CFSB-211	CFSB-211-SO-0.5-2	06/26/2018
CFSB-212	CFSB-212-SO-0-0.5	06/26/2018
CFSB-212	CFSB-212-SO-0.5-2	06/26/2018
CFSB-212	CFSB-DUP43-SO	06/26/2018
CFSB-267	CFSB-267-SO-0-0.5	05/10/2018
CFSB-267	CFSB-267-SO-0.5-2	05/10/2018
CFSB-267	CFSB-267-SO-10-12	05/10/2018
CFSB-268	CFSB-268-SO-0-0.5	05/10/2018
CFSB-268	CFSB-268-SO-0.5-2	05/10/2018
CFSB-268	CFSB-268-SO-10-12	05/10/2018
CFSB-269	CFSB-269-SO-0-0.5	05/09/2018
CFSB-269	CFSB-269-SO-0.5-2	05/09/2018
CFSB-269	CFSB-269-SO-10-12	05/09/2018
CFSB-282	CFSB-282-SO-0-0.5	06/16/2018

Table D-16
Eastern Undeveloped Area Surface Water Samples
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Location	Sample	Sample Date
CFSWP-009	CFSWP-009-SW	06/07/2016
CFSWP-009	CFSWP-009-SW	04/03/2017
CFSWP-009	CFSWP-009-SW	06/12/2017
CFSWP-009	CFSWP-009-SW	06/14/2018
CFSWP-039	CFSWP-039-SW	06/15/2018
CFSWP-039	CFSWP-039-SW	10/11/2018
CFSWP-040	CFSWP-040-SW	06/15/2018

Table D-17
Eastern Undeveloped Area Sediment Samples
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Location	Sample	Sample Date
CFSDP-009	CFSDP-009-SO	09/06/2016

Table D-18
North-Central Undeveloped Area Soil Samples (0-0.5 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Location	Sample	Sample Date
CFMW-011A	CFMW-011a-SO-0-0.5	06/25/2016
CFMW-067	CFMW-067-SO-0-0.5	05/01/2018
CFSB-011	CFSB-011-SO-0-0.5	05/19/2016
CFSB-013	CFSB-013-SO-0-0.5	05/19/2016
CFSB-122	CFSB-122-SO-0-0.5	05/19/2016
CFSB-173	CFSB-173-SO-0-0.5	06/25/2018
CFSB-174	CFSB-174-0-0.5	06/25/2018
CFSB-175	CFSB-175-SO-0-0.5	06/25/2018
CFSB-176	CFSB-176-SO-0-0.5	06/16/2018
CFSB-193	CFSB-193-SO-0-0.5	06/27/2018
CFSB-197	CFSB-197-SO-0-0.5	06/21/2018
CFSB-198	CFSB-198-SO-0-0.5	06/21/2018
CFSB-200	CFSB-DUP48-SO	06/28/2018
CFSB-200	CFSB-200-SO-0-0.5	06/28/2018
CFSB-241	CFSB-241-SO-0-0.5	05/05/2018
CFSB-248	CFSB-248-SO-0-0.5	05/01/2018
CFSB-251	CFSB-251-SO-0-0.5	05/01/2018
CFSB-254	CFSB-254-SO-0-0.5	04/30/2018
CFSB-255	CFSB-255-SO-0-0.5	04/30/2018
CFSB-256	CFSB-256-SO-0-0.5	04/30/2018
CFSB-257	CFSB-257-SO-0-0.5	04/30/2018
CFSB-258	CFSB-258-SO-0-0.5	04/30/2018
CFSB-259	CFSB-259-SO-0-0.5	04/30/2018
CFSB-260	CFSB-260-SO-0-0.5	05/05/2018

Table D-19
North-Central Undeveloped Area Soil Samples (0-12 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Location	Sample	Sample Date
CFMW-011A	CFMW-011a-SO-0.5-2	06/25/2016
CFMW-011A	CFMW-Dup18-SO	06/25/2016
CFMW-011A	CFMW-011a-SO-0-0.5	06/25/2016
CFMW-011A	CFMW-011a-SO-10-12	06/25/2016
CFMW-067	CFMW-DUP26-SO	05/01/2018
CFMW-067	CFMW-067-SO-0-0.5	05/01/2018
CFMW-067	CFMW-067-SO-0.5-2	05/01/2018
CFMW-067	CFMW-067-SO-10-12	05/01/2018
CFSB-011	CFSB-011-SO-0.5-2.0	05/19/2016
CFSB-011	CFSB-011-SO-0-0.5	05/19/2016
CFSB-011	CFSB-011-SO-10-12	05/19/2016
CFSB-013	CFSB-013-SO-0.5-2.0	05/19/2016
CFSB-013	CFSB-013-SO-0-0.5	05/19/2016
CFSB-013	CFSB-013-SO-10-12	05/19/2016
CFSB-122	CFSB-122-SO-0.5-2.0	05/19/2016
CFSB-122	CFSB-122-SO-0-0.5	05/19/2016
CFSB-122	CFSB-122-SO-10-12	05/19/2016
CFSB-173	CFSB-173-SO-0-0.5	06/25/2018
CFSB-173	CFSB-173-SO-0.5-2	06/25/2018
CFSB-174	CFSB-174-0-0.5	06/25/2018
CFSB-174	CFSB-174-0.5-2	06/25/2018
CFSB-175	CFSB-175-SO-0-0.5	06/25/2018
CFSB-175	CFSB-175-SO-0.5-2	06/25/2018
CFSB-176	CFSB-176-SO-0-0.5	06/16/2018
CFSB-176	CFSB-176-SO-0.5-2	06/16/2018
CFSB-193	CFSB-193-SO-0-0.5	06/27/2018
CFSB-193	CFSB-193-SO-0.5-2	06/27/2018
CFSB-197	CFSB-197-SO-0-0.5	06/21/2018
CFSB-197	CFSB-197-SO-0.5-2	06/21/2018
CFSB-198	CFSB-198-SO-0-0.5	06/21/2018
CFSB-198	CFSB-198-SO-0.5-2	06/21/2018
CFSB-200	CFSB-DUP48-SO	06/28/2018
CFSB-200	CFSB-DUP49-SO	06/28/2018
CFSB-200	CFSB-200-SO-0-0.5	06/28/2018
CFSB-200	CFSB-200-SO-0.5-2	06/28/2018
CFSB-241	CFSB-241-SO-0-0.5	05/05/2018
CFSB-241	CFSB-241-SO-0.5-2	05/05/2018
CFSB-241	CFSB-241-SO-10-12	05/05/2018
CFSB-248	CFSB-248-SO-0-0.5	05/01/2018
CFSB-248	CFSB-248-SO-0.5-2	05/01/2018
CFSB-248	CFSB-248-SO-10-12	05/01/2018
CFSB-251	CFSB-251-SO-0-0.5	05/01/2018
CFSB-251	CFSB-251-SO-0.5-2	05/01/2018
CFSB-251	CFSB-251-SO-10-12	05/01/2018
CFSB-254	CFSB-254-SO-0-0.5	04/30/2018
CFSB-254	CFSB-254-SO-0.5-2	04/30/2018
CFSB-254	CFSB-254-SO-10-12	04/30/2018
CFSB-255	CFSB-255-SO-0-0.5	04/30/2018
CFSB-255	CFSB-255-SO-0.5-2	04/30/2018
CFSB-255	CFSB-255-SO-10-12	04/30/2018
CFSB-256	CFSB-256-SO-0-0.5	04/30/2018
CFSB-256	CFSB-256-SO-0.5-2	04/30/2018
CFSB-256	CFSB-256-SO-10-12	04/30/2018
CFSB-257	CFSB-257-SO-0-0.5	04/30/2018
CFSB-257	CFSB-257-SO-0.5-2	04/30/2018
CFSB-257	CFSB-257-SO-10-12	04/30/2018
CFSB-258	CFSB-258-SO-0-0.5	04/30/2018
CFSB-258	CFSB-258-SO-0.5-2	04/30/2018
CFSB-258	CFSB-258-SO-10-12	04/30/2018
CFSB-259	CFSB-259-SO-0-0.5	04/30/2018
CFSB-259	CFSB-259-SO-0.5-2	04/30/2018
CFSB-259	CFSB-259-SO-10-12	04/30/2018
CFSB-260	CFSB-260-SO-0-0.5	05/05/2018
CFSB-260	CFSB-260-SO-0.5-2	05/05/2018
CFSB-260	CFSB-260-SO-10-12	05/05/2018

Table D-20
North-Central Undeveloped Area Surface Water Samples
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Location	Sample	Sample Date
CFSWP-013	CFSWP-DUP1-SW	06/07/2016
CFSWP-013	CFSWP-013-SW	11/30/2016
CFSWP-013	CFSWP-013-SW	06/07/2016
CFSWP-013	CFSWP-013-SW	03/15/2017
CFSWP-013	CFSWP-013-SW	06/12/2017
CFSWP-013	CFSWP-013-SW	06/14/2018
CFSWP-021	CFSWP-021-SW	06/06/2016
CFSWP-021	CFSWP-021-SW	11/30/2016
CFSWP-021	CFSWP-021-SW	03/15/2017
CFSWP-021	CFSWP-021-SW	06/15/2017
CFSWP-021	CFSWP-021-SW	06/19/2018
CFSWP-022	CFSWP-022-SW	06/06/2016
CFSWP-022	CFSWP-022-SW	04/03/2017
CFSWP-022	CFSWP-022-SW	06/20/2018
CFSWP-042	CFSWP-042-SW	06/14/2018
CFSWP-043	CFSWP-043-SW	06/14/2018
CFSWP-043	CFSWP-043-SW	06/18/2018
CFSWP-046	CFSWP-046-SW	06/19/2018
CFSWP-047	CFSWP-047-SW	06/19/2018
CFSWP-048	CFSWP-048-SW	06/20/2018
CFSWP-049	CFSWP-049-SW	06/20/2018
CFSWP-050	CFSWP-050-SW	06/21/2018
CFSWP-051	CFSWP-051-SW	06/21/2018
CFSWP-052	CFSWP-052-SW	06/18/2018
CFSWP-053	CFSWP-053-SW	06/18/2018

Table D-21
North-Central Undeveloped Area Sediment Samples
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Location	Sample	Sample Date
CFSDP-013	CFSDP-013-SO	09/06/2016
CFSDP-021	CFSDP-021-SO	09/06/2016
CFSDP-021	CFSDP-021-SD	06/19/2018
CFSDP-022	CFSDP-022-SO	09/06/2016
CFSDP-022	CFSDP-022-SD	06/20/2018
CFSDP-046	CFSDP-046-SD	06/19/2018
CFSDP-047	CFSDP-047-SD	06/19/2018
CFSDP-048	CFSDP-048-SD	06/20/2018
CFSDP-049	CFSDP-049-SD	06/20/2018
CFSDP-050	CFSDP-050-SD	06/21/2018
CFSDP-050	CFSDP-DUP3-SD	06/21/2018
CFSDP-051	CFSDP-051-SD	06/21/2018
CFSDP-052	CFSDP-052-SD	06/18/2018
CFSDP-053	CFSDP-053-SD	06/18/2018

Table D-22
Western Undeveloped Area Soil Samples (0-0.5 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Location	Sample	Sample Date
CFMW-056A	CFMW-056a-SO-0-0.5	07/15/2016
CFMW-056A	CFMW-DUP20-SO	07/15/2016
CFMW-057A	CFMW-057a-SO-0-0.5	07/27/2016
CFMW-059A	CFMW-059a-SO-0-0.5	07/22/2016
CFMW-065	CFMW-065-SO-0-0.5	05/02/2018
CFMW-068	CFMW-068-SO-0-0.5	05/10/2018
CFMW-069	CFMW-069-SO-0-0.5	05/08/2018
CFMW-071	CFMW-071-SO-0-0.5	05/03/2018
CFSB-120	CFSB-120-SO-0-0.5	05/18/2016
CFSB-123	CFSB-123-SO-0-0.5	05/19/2016
CFSB-124	CFSB-124-SO-0-0.5	05/19/2016
CFSB-125	CFSB-125-SO-0-0.5	05/18/2016
CFSB-126	CFSB-126-SO-0-0.5	05/18/2016
CFSB-127	CFSB-127-SO-0-0.5	05/18/2016
CFSB-132	CFSB-132-SO-0-0.5	06/03/2016
CFSB-133	CFSB-133-SO-0-0.5	06/03/2016
CFSB-168	CFSB-168-SO-0-0.5	06/27/2018
CFSB-168	CFSB-168-SO-0-0.5	09/27/2018
CFSB-169	CFSB-169-SO-0-0.5	06/27/2018
CFSB-170	CFSB-170-SO-0-0.5	06/27/2018
CFSB-171	CFSB-171-SO-0-0.5	06/27/2018
CFSB-172	CFSB-172-SO-0-0.5	06/27/2018
CFSB-172	CFSB-172-SO-0-0.5	09/26/2018
CFSB-196	CFSB-196-SO-0-0.5	06/27/2018
CFSB-196	CFSB-DUP50-SO	09/27/2018
CFSB-196	CFSB-196-SO-0-0.5	09/27/2018
CFSB-215	CFSB-215-SO-0-0.5	06/21/2018
CFSB-216	CFSB-216-SO-0-0.5	06/21/2018
CFSB-217	CFSB-217-SO-0-0.5	06/21/2018
CFSB-218	CFSB-218-SO-0-0.5	06/21/2018
CFSB-237	CFSB-237-SO-0-0.5	06/21/2018
CFSB-238	CFSB-238-SO-0-0.5	06/27/2018
CFSB-238	CFSB-238-SO-0-0.5	09/25/2018
CFSB-238	CFSB-238a-SO-0-0.5	09/25/2018
CFSB-239	CFSB-239-SO-0-0.5	06/27/2018
CFSB-239	CFSB-239-SO-0-0.5	09/27/2018
CFSB-244	CFSB-244-SO-0-0.5	05/09/2018
CFSB-245	CFSB-245-SO-0-0.5	05/08/2018
CFSB-249	CFSB-249-SO-0-0.5	05/01/2018

Table D-23
Western Undeveloped Area Soil Samples (0-12 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Location	Sample	Sample Date
CFMW-056A	CFMW-056a-SO-0.5-2	07/15/2016
CFMW-056A	CFMW-056a-SO-0-0.5	07/15/2016
CFMW-056A	CFMW-DUP20-SO	07/15/2016
CFMW-056A	CFMW-056a-SO-10-12	07/15/2016
CFMW-057A	CFMW-057a-SO-0.5-2	07/27/2016
CFMW-057A	CFMW-057a-SO-0-0.5	07/27/2016
CFMW-057A	CFMW-057a-SO-10-12	07/27/2016
CFMW-059A	CFMW-059a-SO-0.5-2	07/22/2016
CFMW-059A	CFMW-059a-SO-0-0.5	07/22/2016
CFMW-059A	CFMW-059a-SO-10-12	07/22/2016
CFMW-065	CFMW-DUP27-S0	05/02/2018
CFMW-065	CFMW-DUP27-SO	05/02/2018
CFMW-065	CFMW-065-SO-0-0.5	05/02/2018
CFMW-065	CFMW-065-SO-0.5-2	05/02/2018
CFMW-065	CFMW-065-SO-10-12	05/02/2018
CFMW-068	CFMW-068-SO-0-0.5	05/10/2018
CFMW-068	CFMW-068-SO-0.5-2	05/10/2018
CFMW-068	CFSB-DUP33-SO	05/10/2018
CFMW-068	CFMW-068-SO-10-12	05/10/2018
CFMW-069	CFMW-069-SO-0-0.5	05/08/2018
CFMW-069	CFMW-069-SO-0.5-2	05/08/2018
CFMW-069	CFMW-069-SO-10-12	05/08/2018
CFMW-071	CFMW-DUP28-SO	05/03/2018
CFMW-071	CFMW-071-SO-0-0.5	05/03/2018
CFMW-071	CFMW-071-SO-0.5-2	05/03/2018
CFMW-071	CFMW-071-SO-10-12	05/03/2018
CFSB-120	CFSB-120-SO-0.5-2.0	05/18/2016
CFSB-120	CFSB-120-SO-0-0.5	05/18/2016
CFSB-120	CFSB-120-SO-10-12	05/18/2016
CFSB-123	CFSB-123-SO-0.5-2.0	05/19/2016
CFSB-123	CFSB-123-SO-0-0.5	05/19/2016
CFSB-123	CFSB-123-SO-10-12	05/19/2016
CFSB-124	CFSB-124-SO-0.5-2.0	05/19/2016
CFSB-124	CFSB-124-SO-0-0.5	05/19/2016
CFSB-124	CFSB-124-SO-10-12	05/19/2016
CFSB-125	CFSB-125-SO-0.5-2.0	05/18/2016
CFSB-125	CFSB-125-SO-0-0.5	05/18/2016
CFSB-125	CFSB-125-SO-10-12	05/18/2016
CFSB-126	CFSB-126-SO-0.5-2.0	05/18/2016
CFSB-126	CFSB-126-SO-0-0.5	05/18/2016
CFSB-126	CFSB-126-SO-10-12	05/18/2016
CFSB-127	CFSB-127-SO-0.5-2.0	05/18/2016
CFSB-127	CFSB-127-SO-0-0.5	05/18/2016
CFSB-127	CFSB-127-SO-10-12	05/18/2016
CFSB-132	CFSB-132-SO-0.5-2	06/03/2016
CFSB-132	CFSB-132-SO-0-0.5	06/03/2016
CFSB-132	CFSB-132-SO-10-12	06/03/2016
CFSB-133	CFSB-133-SO-0.5-2	06/03/2016
CFSB-133	CFSB-133-SO-0-0.5	06/03/2016
CFSB-133	CFSB-133-SO-10-12	06/03/2016
CFSB-168	CFSB-168-SO-0-0.5	06/27/2018
CFSB-168	CFSB-168-SO-0.5-2	06/27/2018
CFSB-168	CFSB-168-SO-0-0.5	09/27/2018
CFSB-168	CFSB-168-SO-0.5-2	09/27/2018
CFSB-169	CFSB-169-SO-0-0.5	06/27/2018
CFSB-169	CFSB-169-SO-0.5-2	06/27/2018
CFSB-170	CFSB-170-SO-0-0.5	06/27/2018
CFSB-170	CFSB-170-SO-0.5-2	06/27/2018
CFSB-171	CFSB-171-SO-0-0.5	06/27/2018
CFSB-171	CFSB-171-SO-0.5-2	06/27/2018
CFSB-172	CFSB-172-SO-0-0.5	06/27/2018
CFSB-172	CFSB-172-SO-0.5-2	06/27/2018
CFSB-172	CFSB-172-SO-0-0.5	09/26/2018
CFSB-172	CFSB-172-SO-0.5-2	09/26/2018
CFSB-196	CFSB-196-SO-0-0.5	06/27/2018
CFSB-196	CFSB-196-SO-0.5-2	06/27/2018

Table D-23
Western Undeveloped Area Soil Samples (0-12 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Location	Sample	Sample Date
CFSB-196	CFSB-DUP50-SO	09/27/2018
CFSB-196	CFSB-196-SO-0-0.5	09/27/2018
CFSB-196	CFSB-196-SO-0.5-2	09/27/2018
CFSB-215	CFSB-215-SO-0-0.5	06/21/2018
CFSB-215	CFSB-215-SO-0.5-2	06/21/2018
CFSB-216	CFSB-216-SO-0-0.5	06/21/2018
CFSB-216	CFSB-216-SO-0.5-2	06/21/2018
CFSB-217	CFSB-217-SO-0-0.5	06/21/2018
CFSB-217	CFSB-217-SO-0.5-2	06/21/2018
CFSB-218	CFSB-218-SO-0-0.5	06/21/2018
CFSB-218	CFSB-218-SO-0.5-2	06/21/2018
CFSB-237	CFSB-237-SO-0-0.5	06/21/2018
CFSB-237	CFSB-237-SO-0.5-2	06/21/2018
CFSB-238	CFSB-238-SO-0-0.5	06/27/2018
CFSB-238	CFSB-238-SO-0.5-2	06/27/2018
CFSB-238	CFSB-238-SO-0-0.5	09/25/2018
CFSB-238	CFSB-238-SO-0.5-2	09/25/2018
CFSB-238	CFSB-238a-SO-0-0.5	09/25/2018
CFSB-238	CFSB-238a-SO-0.5-2	09/25/2018
CFSB-238	CFSB-238a-SO-3.5-4	09/25/2018
CFSB-239	CFSB-239-SO-0-0.5	06/27/2018
CFSB-239	CFSB-239-SO-0.5-2	06/27/2018
CFSB-239	CFSB-239-SO-0-0.5	09/27/2018
CFSB-239	CFSB-239-SO-0.5-2	09/27/2018
CFSB-244	CFSB-244-SO-0-0.5	05/09/2018
CFSB-244	CFSB-244-SO-0.5-2	05/09/2018
CFSB-244	CFSB-244-SO-10-12	05/09/2018
CFSB-245	CFSB-245-SO-0-0.5	05/08/2018
CFSB-245	CFSB-245-SO-0.5-2	05/08/2018
CFSB-245	CFSB-245-SO-10-12	05/08/2018
CFSB-249	CFSB-249-SO-0-0.5	05/01/2018
CFSB-249	CFSB-249-SO-0.5-2	05/01/2018
CFSB-249	CFSB-249-SO-10-12	05/01/2018

Table D-24
Western Undeveloped Area Surface Water Samples
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Location	Sample	Sample Date
CFSWP-014	CFSWP-014-SW	08/29/2016
CFSWP-014	CFSWP-014-SW	03/13/2017
CFSWP-014	CFSWP-014-SW	06/13/2017
CFSWP-014	CFSWP-014-SW	06/11/2018
CFSWP-014	CFSWP-014-SW	10/10/2018
CFSWP-014	CFSWP-014-SW	10/16/2018
CFSWP-014	CFSWP-014-SW	11/30/2016
CFSWP-014	CFSWP-DUP3-SW	11/30/2016
CFSWP-014	CFSWP-Dup4-SW	03/13/2017
CFSWP-015	CFSWP-015-SW	08/29/2016
CFSWP-015	CFSWP-DUP2-SW	08/29/2016
CFSWP-015	CFSWP-015-SW	11/30/2016
CFSWP-015	CFSWP-015-SW	12/20/2016
CFSWP-015	CFSWP-015-SW	03/13/2017
CFSWP-015	CFSWP-015-SW	06/13/2017
CFSWP-015	CFSWP-DUP7-SW	06/13/2017
CFSWP-015	CFSWP-015-SW	06/11/2018
CFSWP-015	CFSWP-015-SW	10/09/2018
CFSWP-015	CFSWP-015-SW	10/16/2018
CFSWP-016	CFSWP-016-SW	08/29/2016
CFSWP-016	CFSWP-016-SW	11/30/2016
CFSWP-016	CFSWP-016-SW	03/13/2017
CFSWP-016	CFSWP-016-SW	06/12/2017
CFSWP-016	CFSWP-DUP6-SW	06/12/2017
CFSWP-016	CFSWP-016-SW	06/12/2018
CFSWP-016	CFSWP-016-SW	10/09/2018
CFSWP-025	CFSWP-025-SW	12/20/2016
CFSWP-025	CFSWP-025-SW	03/13/2017
CFSWP-025	CFSWP-025-SW	06/13/2017
CFSWP-025	CFSWP-025-SW	06/12/2018
CFSWP-025	CFSWP-025-SW	10/10/2018
CFSWP-044	CFSWP-044-SW	06/11/2018
CFSWP-044	CFSWP-044-SW	10/10/2018
CFSWP-044	CFSWP-DUP14-SW	10/10/2018
CFSWP-044	CFSWP-044-SW	10/16/2018
CFSWP-045	CFSWP-045-SW	06/11/2018
CFSWP-045	CFSWP-045-SW	10/09/2018
CFSWP-045	CFSWP-045-SW	10/16/2018

Table D-25
Western Undeveloped Area Sediment Samples
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Location	Sample	Sample Date
CFSDP-014	CFSDP-014-SD	8/29/2016
CFSDP-014	CFSDP-014-SD	10/10/2018
CFSDP-015	CFSDP-015-SD	8/29/2016
CFSDP-015	CFSDP-015-SD	10/9/2018
CFSDP-016	CFSDP-016-SD	8/29/2016
CFSDP-016	CFSDP-016-SD	10/9/2018
CFSDP-016	CFSDP-DUP4-SD	10/9/2018
CFSDP-025	CFSDP-025-SD	10/10/2018
CFSDP-025	CFSDP-DUP5-SD	10/10/2018
CFSDP-044	CFSDP-044-SD	10/10/2018
CFSDP-045	CFSDP-045-SD	10/9/2018

Table D-26
South Percolation Pond Area Soil Samples (0-0.5 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Location	Sample	Sample Date
CFMW-061	CFMW-061-SO-0-0.5	07/12/2016
CFMW-064	CFMW-064-SO-0-0.5	07/11/2016
CFSB-101	CFSB-101-SO-0-0.5	07/21/2016
CFSB-102	CFSB-102-SO-0-0.5	07/13/2016
CFSB-104	CFSB-104-SO-0-0.5	07/13/2016
CFSB-109	CFSB-109-SO-0-0.5	07/13/2016
CFSB-110	CFSB-110-SO-0-0.5	07/14/2016
CFSB-113	CFSB-113-SO-0-0.5	08/31/2016
CFSB-114	CFSB-114-SO-0-0.5	07/12/2016
CFSB-115	CFSB-115-SO-0-0.5	08/31/2016
CFSB-116	CFSB-116-SO-0-0.5	07/22/2016
CFSB-118	CFSB-118-SO-0-0.5	07/21/2016
CFSB-119	CFSB-119-SO-0-0.5	07/12/2016
CFSB-142	CFSB-142-SO-0-0.5	11/02/2017
CFSB-143	CFSB-143-SO-0-0.5	11/02/2017
CFSB-144	CFSB-144-SO-0-0.5	11/03/2017
CFSB-145	CFSB-145-SO-0-0.5	11/06/2017
CFSB-146	CFSB-146-SO-0-0.5	11/06/2017
CFSB-147	CFSB-147-SO-0-0.5	11/06/2017
CFSB-147	CFSB-DUP16-SO	11/06/2017
CFSB-148	CFSB-148-SO-0-0.5	11/06/2017
CFSB-151	CFSB-151-SO-0-0.5	11/07/2017
CFSB-152	CFSB-152-SO-0-0.5	11/07/2017
CFSB-153	CFSB-153-SO-0-0.5	11/06/2017

Table D-27
South Percolation Pond Area Soil Samples (0-2 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Location	Sample	Sample Date
CFMW-061	CFMW-061-SO-0.5-2	07/12/2016
CFMW-061	CFMW-061-SO-0-0.5	07/12/2016
CFMW-064	CFMW-064-SO-0.5-2	07/11/2016
CFMW-064	CFMW-064-SO-0-0.5	07/11/2016
CFSB-101	CFSB-101-SO-0.5-2	07/21/2016
CFSB-101	CFSB-101-SO-0-0.5	07/21/2016
CFSB-102	CFSB-102-SO-0.5-2	07/13/2016
CFSB-102	CFSB-102-SO-0-0.5	07/13/2016
CFSB-104	CFSB-104-SO-0.5-2	07/13/2016
CFSB-104	CFSB-104-SO-0-0.5	07/13/2016
CFSB-109	CFSB-109-SO-0.5-2	07/13/2016
CFSB-109	CFSB-109-SO-0-0.5	07/13/2016
CFSB-110	CFSB-110-SO-0.5-2	07/14/2016
CFSB-110	CFSB-110-SO-0-0.5	07/14/2016
CFSB-113	CFSB-113-SO-0.5-2	08/31/2016
CFSB-113	CFSB-113-SO-0-0.5	08/31/2016
CFSB-114	CFSB-114-SO-0.5-2	07/12/2016
CFSB-114	CFSB-114-SO-0-0.5	07/12/2016
CFSB-115	CFSB-115-SO-0.5-2	08/31/2016
CFSB-115	CFSB-115-SO-0-0.5	08/31/2016
CFSB-116	CFSB-116-SO-0.5-2	07/22/2016
CFSB-116	CFSB-116-SO-0-0.5	07/22/2016
CFSB-118	CFSB-118-SO-0.5-2	07/21/2016
CFSB-118	CFSB-118-SO-0-0.5	07/21/2016
CFSB-119	CFSB-119-SO-0.5-2	07/12/2016
CFSB-119	CFSB-119-SO-0-0.5	07/12/2016
CFSB-142	CFSB-142-SO-0-0.5	11/02/2017
CFSB-142	CFSB-142-SO-0.5-2	11/02/2017
CFSB-143	CFSB-143-SO-0-0.5	11/02/2017
CFSB-143	CFSB-143-SO-0.5-2	11/02/2017
CFSB-143	CFSB-DUP15-SO	11/02/2017
CFSB-144	CFSB-144-SO-0-0.5	11/03/2017
CFSB-144	CFSB-144-SO-0.5-2	11/03/2017
CFSB-145	CFSB-145-SO-0-0.5	11/06/2017
CFSB-145	CFSB-145-SO-0.5-2	11/06/2017
CFSB-146	CFSB-146-SO-0-0.5	11/06/2017
CFSB-146	CFSB-146-SO-0.5-2	11/06/2017
CFSB-147	CFSB-147-SO-0-0.5	11/06/2017
CFSB-147	CFSB-147-SO-0.5-2	11/06/2017
CFSB-147	CFSB-DUP16-SO	11/06/2017
CFSB-148	CFSB-148-SO-0-0.5	11/06/2017
CFSB-148	CFSB-148-SO-0.5-2	11/06/2017
CFSB-151	CFSB-151-SO-0-0.5	11/07/2017
CFSB-151	CFSB-151-SO-0.5-2	11/07/2017
CFSB-152	CFSB-152-SO-0-0.5	11/07/2017
CFSB-152	CFSB-152-SO-0.5-2	11/07/2017
CFSB-153	CFSB-153-SO-0-0.5	11/06/2017
CFSB-153	CFSB-153-SO-0.5-2	11/06/2017

Table D-28
South Percolation Pond Area Soil Samples (0-12 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Location	Sample	Sample Date
CFMW-061	CFMW-061-SO-10-12	07/12/2016
CFMW-061	CFMW-061-SO-0.5-2	07/12/2016
CFMW-061	CFMW-061-SO-0-0.5	07/12/2016
CFMW-064	CFMW-064-SO-10-12	07/11/2016
CFMW-064	CFMW-064-SO-0.5-2	07/11/2016
CFMW-064	CFMW-064-SO-0-0.5	07/11/2016
CFSB-101	CFSB-101-SO-10-12	07/21/2016
CFSB-101	CFSB-101-SO-0.5-2	07/21/2016
CFSB-101	CFSB-101-SO-0-0.5	07/21/2016
CFSB-102	CFSB-102-SO-10-12	07/13/2016
CFSB-102	CFSB-102-SO-0.5-2	07/13/2016
CFSB-102	CFSB-102-SO-0-0.5	07/13/2016
CFSB-104	CFSB-104-SO-10-12	07/13/2016
CFSB-104	CFSB-104-SO-0.5-2	07/13/2016
CFSB-104	CFSB-104-SO-0-0.5	07/13/2016
CFSB-109	CFSB-109-SO-10-12	07/13/2016
CFSB-109	CFSB-109-SO-0.5-2	07/13/2016
CFSB-109	CFSB-109-SO-0-0.5	07/13/2016
CFSB-110	CFSB-110-SO-10-12	07/14/2016
CFSB-110	CFSB-110-SO-0.5-2	07/14/2016
CFSB-110	CFSB-110-SO-0-0.5	07/14/2016
CFSB-113	CFSB-113-SO-2-4	08/31/2016
CFSB-113	CFSB-113-SO-0.5-2	08/31/2016
CFSB-113	CFSB-113-SO-0-0.5	08/31/2016
CFSB-114	CFSB-114-SO-10-12	07/12/2016
CFSB-114	CFSB-114-SO-0.5-2	07/12/2016
CFSB-114	CFSB-114-SO-0-0.5	07/12/2016
CFSB-115	CFSB-115-SO-2-4	08/31/2016
CFSB-115	CFSB-115-SO-0.5-2	08/31/2016
CFSB-115	CFSB-115-SO-0-0.5	08/31/2016
CFSB-116	CFSB-116-SO-10-12	07/22/2016
CFSB-116	CFSB-116-SO-0.5-2	07/22/2016
CFSB-116	CFSB-116-SO-0-0.5	07/22/2016
CFSB-118	CFSB-118-SO-10-12	07/21/2016
CFSB-118	CFSB-118-SO-0.5-2	07/21/2016
CFSB-118	CFSB-118-SO-0-0.5	07/21/2016
CFSB-119	CFSB-119-SO-10-12	07/12/2016
CFSB-119	CFSB-119-SO-0.5-2	07/12/2016
CFSB-119	CFSB-119-SO-0-0.5	07/12/2016
CFSB-142	CFSB-142-SO-0-0.5	11/02/2017
CFSB-142	CFSB-142-SO-0.5-2	11/02/2017
CFSB-142	CFSB-142-SO-2-4	11/02/2017
CFSB-143	CFSB-143-SO-0-0.5	11/02/2017
CFSB-143	CFSB-143-SO-0.5-2	11/02/2017
CFSB-143	CFSB-DUP15-SO	11/02/2017
CFSB-143	CFSB-143-SO-2-4	11/02/2017
CFSB-144	CFSB-144-SO-0-0.5	11/03/2017
CFSB-144	CFSB-144-SO-0.5-2	11/03/2017
CFSB-144	CFSB-144-SO-2-4	11/03/2017
CFSB-145	CFSB-145-SO-0-0.5	11/06/2017
CFSB-145	CFSB-145-SO-0.5-2	11/06/2017
CFSB-145	CFSB-145-SO-2-4	11/06/2017
CFSB-146	CFSB-146-SO-0-0.5	11/06/2017
CFSB-146	CFSB-146-SO-0.5-2	11/06/2017
CFSB-146	CFSB-146-SO-2-4	11/06/2017
CFSB-147	CFSB-147-SO-0-0.5	11/06/2017
CFSB-147	CFSB-147-SO-0.5-2	11/06/2017
CFSB-147	CFSB-147-SO-2-4	11/06/2017
CFSB-147	CFSB-DUP16-SO	11/06/2017
CFSB-148	CFSB-148-SO-0-0.5	11/06/2017
CFSB-148	CFSB-148-SO-0.5-2	11/06/2017
CFSB-148	CFSB-148-SO-2-4	11/06/2017
CFSB-151	CFSB-151-SO-0-0.5	11/07/2017
CFSB-151	CFSB-151-SO-0.5-2	11/07/2017
CFSB-152	CFSB-152-SO-0-0.5	11/07/2017
CFSB-152	CFSB-152-SO-0.5-2	11/07/2017

Table D-28
South Percolation Pond Area Soil Samples (0-12 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Location	Sample	Sample Date
CFSB-153	CFSB-153-SO-0-0.5	11/06/2017
CFSB-153	CFSB-153-SO-0.5-2	11/06/2017

Table D-29
South Percolation Pond Area Surface Water Samples
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Location	Sample	Sample Date
CFSWP-018	CFSWP-018-SW	06/06/2016
CFSWP-018	CFSWP-018-SW	12/01/2016
CFSWP-018	CFSWP-018-SW	04/03/2017
CFSWP-018	CFSWP-018-SW	06/15/2017
CFSWP-018	CFSWP-018-SW	06/21/2018
CFSWP-018	CFSWP-018-SW	10/17/2018
CFSWP-019	CFSWP-019-SW	06/06/2016
CFSWP-019	CFSWP-019-SW	12/01/2016
CFSWP-019	CFSWP-019-SW	04/03/2017
CFSWP-019	CFSWP-019-SW	06/15/2017
CFSWP-019	CFSWP-019-SW	11/07/2017
CFSWP-019	CFSWP-019-SW	06/21/2018
CFSWP-019	CFSWP-019-SW	10/16/2018
CFSWP-020	CFSWP-020-SW	06/06/2016
CFSWP-020	CFSWP-020-SW	12/01/2016
CFSWP-020	CFSWP-020-SW	03/16/2017
CFSWP-020	CFSWP-020-SW	06/15/2017
CFSWP-020	CFSWP-020-SW	11/07/2017
CFSWP-020	CFSWP-020-SW	06/21/2018
CFSWP-020	CFSWP-020-SW	10/11/2018
CFSWP-030	CFSWP-030-SW	11/03/2017
CFSWP-030	CFSWP-030-SW	06/22/2018
CFSWP-030	CFSWP-030-SW	10/18/2018
CFSWP-031	CFSWP-031-SW	11/03/2017
CFSWP-031	CFSWP-031-SW	06/22/2018
CFSWP-031	CFSWP-031-SW	10/18/2018
CFSWP-032	CFSWP-032-SW	11/03/2017
CFSWP-032	CFSWP-032-SW	06/22/2018
CFSWP-032	CFSWP-032-SW	10/17/2018
CFSWP-058	CFSWP-058-SW	06/21/2018
CFSWP-058	CFSWP-058-SW	10/11/2018
CFSWP-059	CFSWP-DUP12-SW	06/22/2018
CFSWP-059	CFSWP-059-SW	06/22/2018
CFSWP-059	CFSWP-059-SW	10/11/2018
CFSWP-060	CFSWP-060-SW	06/22/2018
CFSWP-060	CFSWP-060-SW	10/16/2018

Table D-30
South Percolation Pond Area Sediment Samples
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Location	Sample	Sample Date
CFSB-149	CFSB-149-SD-0-0.5	11/07/2017
CFSB-150	CFSB-150-SD-0-0.5	11/07/2017
CFSDP-018	CFSDP-018-SD	09/07/2016
CFSDP-018	CFSDP-018-SD	11/07/2017
CFSDP-018	CFSDP-018-SD	10/17/2018
CFSDP-019	CFSDP-019-SD	09/07/2016
CFSDP-019	CFSDP-019-SD	11/07/2017
CFSDP-019	CFSDP-019-SD	10/16/2018
CFSDP-020	CFSDP-020-SD	09/07/2016
CFSDP-020	CFSDP-020-SD	11/07/2017
CFSDP-020	CFSDP-020-SD	10/11/2018
CFSDP-030	CFSDP-030-SD	11/03/2017
CFSDP-030	CFSDP-030-SD	10/18/2018
CFSDP-031	CFSDP-031-SD	11/03/2017
CFSDP-031	CFSDP-031-SD	10/18/2018
CFSDP-032	CFSDP-032-SD	11/03/2017
CFSDP-032	CFSDP-032-SD	10/17/2018
CFSDP-058	CFSDP-058-SD	10/11/2018
CFSDP-059	CFSDP-059-SD	10/11/2018
CFSDP-060	CFSDP-060-SD	10/16/2018

Table D-31
Flathead River Area Surface Water Samples
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Location	Sample	Sample Date
CFSWP-001	CFSWP-001-SW	09/16/2016
CFSWP-001	CFSWP-001-SW	12/02/2016
CFSWP-001	CFSWP-001-SW	04/04/2017
CFSWP-001	CFSWP-001-SW	06/14/2017
CFSWP-001	CFSWP-001-SW	06/07/2018
CFSWP-001	CFSWP-001-SW	10/05/2018
CFSWP-002	CFSWP-002-SW	09/16/2016
CFSWP-002	CFSWP-002-SW	12/02/2016
CFSWP-002	CFSWP-002-SW	04/04/2017
CFSWP-002	CFSWP-002-SW	06/14/2017
CFSWP-002	CFSWP-002-SW	06/07/2018
CFSWP-002	CFSWP-DUP9-SW	06/07/2018
CFSWP-002	CFSWP-002-SW	10/05/2018
CFSWP-006	CFSWP-006-SW	09/09/2016
CFSWP-006	CFSWP-006-SW	12/01/2016
CFSWP-006	CFSWP-006-SW	03/16/2017
CFSWP-006	CFSWP-006-SW	06/14/2017
CFSWP-006	CFSWP-006-SW	06/06/2018
CFSWP-006	CFSWP-006-SW	10/04/2018
CFSWP-006	CFSWP-DUP13-SW	10/04/2018
CFSWP-007	CFSWP-007-SW	09/16/2016
CFSWP-007	CFSWP-007-SW	12/02/2016
CFSWP-007	CFSWP-007-SW	03/16/2017
CFSWP-007	CFSWP-007-SW	06/14/2017
CFSWP-007	CFSWP-007-SW	06/07/2018
CFSWP-007	CFSWP-007-SW	10/03/2018
CFSWP-008	CFSWP-008-SW	09/16/2016
CFSWP-008	CFSWP-008-SW	12/02/2016
CFSWP-008	CFSWP-008-SW	04/04/2017
CFSWP-008	CFSWP-008-SW	06/14/2017
CFSWP-008	CFSWP-008-SW	06/07/2018
CFSWP-008	CFSWP-008-SW	10/03/2018
CFSWP-017	CFSWP-017-SW	09/16/2016
CFSWP-017	CFSWP-017-SW	12/02/2016
CFSWP-017	CFSWP-017-SW	04/04/2017
CFSWP-017	CFSWP-017-SW	06/14/2017
CFSWP-017	CFSWP-017-SW	06/07/2018
CFSWP-017	CFSWP-017-SW	10/03/2018
CFSWP-026	CFSWP-026-SW	10/31/2017
CFSWP-026	CFSWP-026-SW	06/07/2018
CFSWP-026	CFSWP-026-SW	10/05/2018
CFSWP-033	CFSWP-033-SW	11/03/2017
CFSWP-033	CFSWP-033-SW	06/22/2018
CFSWP-033	CFSWP-033-SW	10/17/2018
CFSWP-034	CFSWP-034-SW	06/07/2018
CFSWP-034	CFSWP-034-SW	10/05/2018
CFSWP-035	CFSWP-035-SW	06/07/2018
CFSWP-035	CFSWP-035-SW	10/05/2018
CFSWP-036	CFSWP-036-SW	06/06/2018
CFSWP-036	CFSWP-036-SW	10/04/2018
CFSWP-037	CFSWP-037-SW	06/06/2018
CFSWP-037	CFSWP-037-SW	10/03/2018
CFSWP-038	CFSWP-038-SW	06/07/2018
CFSWP-038	CFSWP-038-SW	10/03/2018

Table D-32
Flathead River Area Sediment Samples
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Location	Sample	Sample Date
CFSDP-001	CFSDP-001-SO	09/08/2016
CFSDP-001	CFSDP-001-SD	10/05/2018
CFSDP-002	CFSDP-002-SO	09/08/2016
CFSDP-002	CFSDP-002-SO	09/16/2016
CFSDP-002	CFSDP-002-SD	10/05/2018
CFSDP-006	CFSDP-006-SO	09/09/2016
CFSDP-006	CFSDP-006-SD	09/09/2016
CFSDP-006	CFSDP-006-SD	10/04/2018
CFSDP-007	CFSDP-007-SO	09/08/2016
CFSDP-007	CFSDP-007-SD	10/03/2018
CFSDP-008	CFSDP-008-SO	09/08/2016
CFSDP-008	CFSDP-008-SD	10/03/2018
CFSDP-017	CFSDP-017-SO	09/08/2016
CFSDP-017	CFSDP-017-SD	10/03/2018
CFSDP-026	CFSDP-026-SD	10/31/2017
CFSDP-026	CFSDP-026-SD	10/05/2018
CFSDP-033	CFSDP-033-SD	11/03/2017
CFSDP-033	CFSDP-033-SD	10/17/2018
CFSDP-034	CFSDP-034-SD	10/05/2018
CFSDP-035	CFSDP-035-SD	10/05/2018
CFSDP-036	CFSDP-036-SD	10/04/2018
CFSDP-037	CFSDP-037-SD	10/03/2018
CFSDP-038	CFSDP-038-SD	10/03/2018

Table D-33
Backwater Seep Sampling Area Soil Samples (0-0.5 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Location	Sample	Sample Date
CFSB-134	CFSB-134-SO-0-0.5	10/31/2017
CFSB-135	CFSB-135-SO-0-0.5	10/31/2017
CFSB-136	CFSB-136-SO-0-0.5	10/31/2017
CFSB-137	CFSB-137-SO-0-0.5	11/01/2017
CFSB-138	CFSB-138-SO-0-0.5	11/01/2017
CFSB-139	CFSB-139-SO-0-0.5	10/31/2017
CFSB-140	CFSB-140-SO-0-0.5	10/31/2017
CFSB-141	CFSB-141-SO-0-0.5	11/01/2017

Table D-34
Backwater Seep Sampling Area Soil Samples (0-2 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Location	Sample	Sample Date
CFSB-134	CFSB-134-SO-0-0.5	10/31/2017
CFSB-134	CFSB-134-SO-0.5-2	10/31/2017
CFSB-135	CFSB-135-SO-0-0.5	10/31/2017
CFSB-135	CFSB-135-SO-0.5-2	10/31/2017
CFSB-136	CFSB-136-SO-0-0.5	10/31/2017
CFSB-136	CFSB-136-SO-0.5-2	10/31/2017
CFSB-137	CFSB-137-SO-0-0.5	11/01/2017
CFSB-137	CFSB-137-SO-0.5-2	11/01/2017
CFSB-137	CFSB-137-SO-0.5-2	11/02/2017
CFSB-138	CFSB-138-SO-0-0.5	11/01/2017
CFSB-138	CFSB-138-SO-0.5-2	11/01/2017
CFSB-138	CFSB-DUP14-SO	11/01/2017
CFSB-139	CFSB-139-SO-0-0.5	10/31/2017
CFSB-139	CFSB-139-SO-0.5-2	10/31/2017
CFSB-140	CFSB-140-SO-0-0.5	10/31/2017
CFSB-140	CFSB-140-SO-0.5-2	10/31/2017
CFSB-141	CFSB-141-SO-0-0.5	11/01/2017
CFSB-141	CFSB-141-SO-0.5-2	11/01/2017
CFSB-141	CFSB-141-SO-0.5-2	11/02/2017

Table D-35
Backwater Seep Sampling Area Surface Water Samples
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Location	Sample	Sample Date
CFSWP-003	CFSWP-003-SW	09/09/2016
CFSWP-003	CFSWP-003-SW	12/01/2016
CFSWP-003	CFSWP-003-SW	03/16/2017
CFSWP-003	CFSWP-003-SW	06/14/2017
CFSWP-003	CFSWP-003-SW	10/31/2017
CFSWP-003	CFSWP-003-SW	06/06/2018
CFSWP-003	CFSWP-003-SW	10/04/2018
CFSWP-004	CFSWP-004-SW	09/09/2016
CFSWP-004	CFSWP-004-SW	12/01/2016
CFSWP-004	CFSWP-004-SW	03/16/2017
CFSWP-004	CFSWP-004-SW	06/14/2017
CFSWP-004	CFSWP-004-SW	10/31/2017
CFSWP-004	CFSWP-004-SW	06/06/2018
CFSWP-004	CFSWP-004-SW	10/04/2018
CFSWP-005	CFSWP-005-SW	09/09/2016
CFSWP-005	CFSWP-005-SW	12/01/2016
CFSWP-005	CFSWP-005-SW	03/16/2017
CFSWP-005	CFSWP-005-SW	06/14/2017
CFSWP-005	CFSWP-DUP8-SW	11/01/2017
CFSWP-005	CFSWP-005-SW	11/01/2017
CFSWP-005	CFSWP-005-SW	06/06/2018
CFSWP-005	CFSWP-005-SW	10/18/2018
CFSWP-027	CFSWP-027-SW	10/31/2017
CFSWP-027	CFSWP-027-SW	06/06/2018
CFSWP-027	CFSWP-027-SW	10/05/2018
CFSWP-028	CFSWP-028-SW	10/31/2017
CFSWP-028	CFSWP-028-SW	06/06/2018
CFSWP-028	CFSWP-028-SW	10/04/2018
CFSWP-029	CFSWP-029-SW	11/01/2017
CFSWP-029	CFSWP-029-SW	06/22/2018
CFSWP-029	CFSWP-029-SW	10/18/2018

Table D-36
Backwater Seep Sampling Area Sediment Samples
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Location	Sample	Sample Date
CFSDP-003	CFSDP-003-SD	09/09/2016
CFSDP-003	CFSDP-003-SD	10/31/2017
CFSDP-003	CFSDP-003-SD	10/04/2018
CFSDP-004	CFSDP-004-SD	09/09/2016
CFSDP-004	CFSDP-004-SD	10/31/2017
CFSDP-004	CFSDP-004-SD	10/04/2018
CFSDP-005	CFSDP-005-SD	09/09/2016
CFSDP-005	CFSDP-005-SD	11/01/2017
CFSDP-005	CFSDP-DUP3-SD	11/01/2017
CFSDP-005	CFSDP-DUP3-SD	11/02/2017
CFSDP-005	CFSDP-005-SD	11/02/2017
CFSDP-005	CFSDP-005-SD	10/18/2018
CFSDP-027	CFSDP-027-SD	10/31/2017
CFSDP-027	CFSDP-027-SD	10/05/2018
CFSDP-028	CFSDP-028-SD	10/31/2017
CFSDP-028	CFSDP-028-SD	10/04/2018
CFSDP-029	CFSDP-029-SD	11/01/2017
CFSDP-029	CFSDP-029-SD	10/18/2018

Table D-37
Western Undeveloped Area Upper Hydrogeologic Unit Groundwater
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Location	Sample	Sample Date	Depth Range
CFMW-056B	CFMW-0566-GW	03/21/2017	NULL
CFMW-056B	CFMW-056b-GW	09/13/2016	NULL
CFMW-056B	CFMW-056b-GW	12/12/2016	NULL
CFMW-056B	CFMW-Dup7-GW	03/21/2017	NULL
CFMW-056B	CFMW-056b-GW	06/22/2017	NULL
CFMW-056B	CFMW-056b-GW	06/14/2018	NULL
CFMW-056B	CFMW-DUP17-GW	06/14/2018	NULL
CFMW-056B	CFMW-DUP23-GW	10/16/2018	NULL
CFMW-056B	CFMW-056b-GW	10/16/2018	NULL
CFMW-057b	CFMW-057B-GW	06/12/2018	NULL
CFMW-057b	CFMW-057b-GW	10/16/2018	NULL
CFMW-059	CFMW-059-GW	09/15/2016	NULL
CFMW-059	CFMW-059-GW	12/12/2016	NULL
CFMW-059	CFMW-059-GW	03/23/2017	NULL
CFMW-059	CFMW-059-GW	06/21/2017	NULL
CFMW-059	CFMW-059-GW	06/12/2018	NULL
CFMW-059	CFMW-059-GW	10/09/2018	NULL
CFMW-065	CFMW-065-GW	06/14/2018	NULL
CFMW-065	CFMW-065-GW	10/15/2018	NULL
CFMW-068	CFMW-068-GW	06/12/2018	NULL
CFMW-068	CFMW-DUP21-GW	10/09/2018	NULL
CFMW-068	CFMW-068-GW	10/09/2018	NULL
CFMW-069	CFMW-069-GW	06/14/2018	NULL
CFMW-069	CFMW-069-GW	10/16/2018	NULL
CFMW-071	CFMW-071-GW	06/12/2018	NULL
CFMW-071	CFMW-071-GW	10/09/2018	NULL

Table D-38
Plume Area Upper Hydrogeologic Unit Groundwater
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Location	Sample	Sample Date	Depth Range
CFMW-002	CFMW-002-GW	09/12/2016	NULL
CFMW-002	CFMW-002-GW	03/24/2017	NULL
CFMW-002	CFMW-002-GW	06/27/2017	NULL
CFMW-002	CFMW-002-GW	06/11/2018	NULL
CFMW-010	CFMW-010-GW	09/12/2016	NULL
CFMW-010	CFMW-010-GW	12/15/2016	NULL
CFMW-010	CFMW-010-GW	03/24/2017	NULL
CFMW-010	CFMW-010-GW	06/27/2017	NULL
CFMW-010	CFMW-010-GW	06/11/2018	NULL
CFMW-010	CFMW-010-GW	10/03/2018	NULL
CFMW-011	CFMW-011-GW	09/13/2016	NULL
CFMW-011	CFMW-011-GW	12/08/2016	NULL
CFMW-011	CFMW-011-GW	03/27/2017	NULL
CFMW-011	CFMW-011-GW	06/28/2017	NULL
CFMW-011	CFMW-DUP15-GW	06/28/2017	NULL
CFMW-011	CFMW-011-GW	06/07/2018	NULL
CFMW-011	CFMW-011-GW	10/11/2018	NULL
CFMW-011	CFMW-DUP22-GW	10/11/2018	NULL
CFMW-012	CFMW-012-GW	09/12/2016	NULL
CFMW-012	CFMW-012-GW	12/14/2016	NULL
CFMW-012	CFMW-012-GW	03/22/2017	NULL
CFMW-012	CFMW-012-GW	06/23/2017	NULL
CFMW-012	CFMW-012-GW	06/08/2018	NULL
CFMW-012	CFMW-012-GW	10/03/2018	NULL
CFMW-014	CFMW-014-GW	09/12/2016	NULL
CFMW-014	CFMW-014-GW	12/15/2016	NULL
CFMW-014	CFMW-014-GW	03/29/2017	NULL
CFMW-014	CFMW-014-GW	06/27/2017	NULL
CFMW-014	CFMW-014-GW	06/11/2018	NULL
CFMW-014	CFMW-014-GW	10/11/2018	NULL
CFMW-015	CFMW-015-GW	09/12/2016	NULL
CFMW-015	CFMW-015-GW	12/15/2016	NULL
CFMW-015	CFMW-015-GW	03/29/2017	NULL
CFMW-015	CFMW-015-GW	06/27/2017	NULL
CFMW-015	CFMW-015-GW	06/11/2018	NULL
CFMW-015	CFMW-015-GW	10/11/2018	NULL
CFMW-016	CFMW-016-GW	03/28/2017	NULL
CFMW-016	CFMW-DUP10-GW	03/28/2017	NULL
CFMW-016	CFMW-016-GW	06/29/2017	NULL
CFMW-016	CFMW-016-GW	06/15/2018	NULL
CFMW-016A	CFMW-016a-GW	09/21/2016	NULL
CFMW-016A	CFMW-016a-GW	12/14/2016	NULL
CFMW-016A	CFMW-016a-GW	03/27/2017	NULL
CFMW-016A	CFMW-016a-GW	06/26/2017	NULL
CFMW-016A	CFMW-016a-GW	06/12/2018	NULL
CFMW-016A	CFMW-016a-GW	10/05/2018	NULL
CFMW-016A	CFMW-DUP20-GW	10/05/2018	NULL
CFMW-017	CFMW-017-GW	03/28/2017	NULL
CFMW-017	CFMW-017-GW	06/26/2017	NULL
CFMW-017	CFMW-017-GW	06/06/2018	NULL
CFMW-019	CFMW-019-GW	09/12/2016	NULL
CFMW-019	CFMW-019-GW	12/15/2016	NULL
CFMW-019	CFMW-019-GW	03/29/2017	NULL
CFMW-019	CFMW-019-GW	06/29/2017	NULL
CFMW-019	CFMW-019-GW	06/14/2018	NULL
CFMW-019	CFMW-019-GW	10/15/2018	NULL
CFMW-021	CFMW-021-GW	09/12/2016	NULL
CFMW-021	CFMW-021-GW	12/14/2016	NULL
CFMW-021	CFMW-021-GW	03/29/2017	NULL
CFMW-021	CFMW-021-GW	06/26/2017	NULL
CFMW-021	CFMW-021-GW	06/07/2018	NULL
CFMW-021	CFMW-021-GW	10/15/2018	NULL
CFMW-022	CFMW-022-GW	09/13/2016	NULL
CFMW-022	CFMW-022-GW	12/09/2016	NULL
CFMW-022	CFMW-022-GW	03/28/2017	NULL
CFMW-022	CFMW-022-GW	06/26/2017	NULL

Table D-38
Plume Area Upper Hydrogeologic Unit Groundwater
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Location	Sample	Sample Date	Depth Range
CFMW-022	CFMW-022-GW	06/07/2018	NULL
CFMW-022	CFMW-022-GW	10/04/2018	NULL
CFMW-027	CFMW-027-GW	09/13/2016	NULL
CFMW-027	CFMW-027-GW	12/14/2016	NULL
CFMW-027	CFMW-027-GW	03/27/2017	NULL
CFMW-027	CFMW-027-GW	06/26/2017	NULL
CFMW-027	CFMW-027-GW	06/13/2018	NULL
CFMW-027	CFMW-027-GW	10/11/2018	NULL
CFMW-028	CFMW-028-GW	09/13/2016	NULL
CFMW-028	CFMW-028-GW	12/05/2016	NULL
CFMW-028	CFMW-028-GW	03/20/2017	NULL
CFMW-028	CFMW-028-GW	06/26/2017	NULL
CFMW-028	CFMW-028-GW	06/14/2018	NULL
CFMW-028	CFMW-028-GW	10/17/2018	NULL
CFMW-028A	CFMW-028a-GW	09/20/2016	NULL
CFMW-028A	CFMW-028a-GW	12/09/2016	NULL
CFMW-028A	CFMW-028a-GW	03/21/2017	NULL
CFMW-028A	CFMW-028a-GW	06/27/2017	NULL
CFMW-028A	CFMW-028a-GW	06/07/2018	NULL
CFMW-028A	CFMW-DUP16-GW	06/07/2018	NULL
CFMW-028A	CFMW-028a-GW	10/08/2018	NULL
CFMW-029	CFMW-029-GW	09/13/2016	NULL
CFMW-029	CFMW-DUP1-GW	09/13/2016	NULL
CFMW-029	CFMW-029-GW	12/14/2016	NULL
CFMW-029	CFMW-029-GW	03/24/2017	NULL
CFMW-029	CFMW-029-GW	06/26/2017	NULL
CFMW-029	CFMW-029-GW	06/08/2018	NULL
CFMW-029	CFMW-029-GW	10/04/2018	NULL
CFMW-031	CFMW-031-GW	09/15/2016	NULL
CFMW-031	CFMW-031-GW	12/09/2016	NULL
CFMW-031	CFMW-031-GW	03/21/2017	NULL
CFMW-031	CFMW-031-GW	06/21/2017	NULL
CFMW-031	CFMW-DUP13-GW	06/21/2017	NULL
CFMW-031	CFMW-031-GW	06/15/2018	NULL
CFMW-031	CFMW-031-GW	10/05/2018	NULL
CFMW-032	CFMW-032-GW	09/15/2016	NULL
CFMW-032	CFMW-032-GW	12/13/2016	NULL
CFMW-032	CFMW-032-GW	03/27/2017	NULL
CFMW-032	CFMW-032-GW	06/20/2017	NULL
CFMW-032	CFMW-DUP12-GW	06/20/2017	NULL
CFMW-032	CFMW-032-GW	06/15/2018	NULL
CFMW-032	CFMW-032-GW	10/04/2018	NULL
CFMW-033	CFMW-033-GW	09/15/2016	NULL
CFMW-033	CFMW-033-GW	12/06/2016	NULL
CFMW-033	CFMW-033-GW	03/21/2017	NULL
CFMW-033	CFMW-033-GW	06/19/2017	NULL
CFMW-033	CFMW-033-GW	06/15/2018	NULL
CFMW-033	CFMW-033-GW	10/16/2018	NULL
CFMW-034	CFMW-034-GW	09/14/2016	NULL
CFMW-034	CFMW-034-GW	12/13/2016	NULL
CFMW-034	CFMW-034-GW	03/21/2017	NULL
CFMW-034	CFMW-034-GW	06/19/2017	NULL
CFMW-034	CFMW-034-GW	06/15/2018	NULL
CFMW-034	CFMW-034-GW	10/12/2018	NULL
CFMW-038	CFMW-038-GW	09/14/2016	NULL
CFMW-038	CFMW-038-GW	12/09/2016	NULL
CFMW-038	CFMW-038-GW	03/24/2017	NULL
CFMW-038	CFMW-038-GW	06/27/2017	NULL
CFMW-038	CFMW-038-GW	06/08/2018	NULL
CFMW-038	CFMW-038-GW	10/09/2018	NULL
CFMW-040	CFMW-040-GW	09/14/2016	NULL
CFMW-040	CFMW-040-GW	12/13/2016	NULL
CFMW-040	CFMW-040-GW	03/30/2017	NULL
CFMW-040	CFMW-040-GW	06/20/2017	NULL
CFMW-040	CFMW-040-GW	06/08/2018	NULL
CFMW-040	CFMW-040-GW	10/08/2018	NULL

Table D-38
Plume Area Upper Hydrogeologic Unit Groundwater
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Location	Sample	Sample Date	Depth Range
CFMW-042	CFMW-042-GW	09/14/2016	NULL
CFMW-042	CFMW-042-GW	06/20/2017	NULL
CFMW-042	CFMW-042-GW	06/12/2018	NULL
CFMW-042	CFMW-042-GW	10/04/2018	NULL
CFMW-043	CFMW-043-GW	09/13/2016	NULL
CFMW-043	CFMW-043-GW	12/14/2016	NULL
CFMW-043	CFMW-043-GW	03/20/2017	NULL
CFMW-043	CFMW-043-GW	06/21/2017	NULL
CFMW-043	CFMW-043-GW	06/11/2018	NULL
CFMW-043	CFMW-043-GW	10/11/2018	NULL
CFMW-044	CFMW-044-GW	09/15/2016	NULL
CFMW-044	CFMW-044-GW	12/09/2016	NULL
CFMW-044	CFMW-044-GW	03/28/2017	NULL
CFMW-044	CFMW-044-GW	06/21/2017	NULL
CFMW-044	CFMW-044-GW	06/11/2018	NULL
CFMW-044	CFMW-044-GW	10/03/2018	NULL
CFMW-044A	CFMW-044a-GW	09/19/2016	NULL
CFMW-044A	CFMW-044a-GW	12/19/2016	NULL
CFMW-044A	CFMW-044a-GW	03/21/2017	NULL
CFMW-044A	CFMW-044a-GW	06/23/2017	NULL
CFMW-044A	CFMW-044a-GW	06/07/2018	NULL
CFMW-044A	CFMW-044a-GW	10/16/2018	NULL
CFMW-045	CFMW-045-GW	09/15/2016	NULL
CFMW-045	CFMW-045-GW	12/14/2016	NULL
CFMW-045	CFMW-045-GW	03/23/2017	NULL
CFMW-045	CFMW-045-GW	06/28/2017	NULL
CFMW-045	CFMW-045-GW	06/18/2018	NULL
CFMW-045	CFMW-045-GW	10/08/2018	NULL
CFMW-045A	CFMW-045a-GW	09/19/2016	NULL
CFMW-045A	CFMW-045a-GW	12/09/2016	NULL
CFMW-045A	CFMW-045a-GW	03/24/2017	NULL
CFMW-045A	CFMW-045a-GW	06/23/2017	NULL
CFMW-045A	CFMW-045a-GW	06/13/2018	NULL
CFMW-045A	CFMW-045a-GW	10/16/2018	NULL
CFMW-047	CFMW-047-GW	09/14/2016	NULL
CFMW-047	CFMW-047-GW	12/15/2016	NULL
CFMW-047	CFMW-047-GW	03/23/2017	NULL
CFMW-047	CFMW-047-GW	06/21/2017	NULL
CFMW-047	CFMW-047-GW	06/08/2018	NULL
CFMW-047	CFMW-047-GW	10/04/2018	NULL
CFMW-053	CFMW-053-GW	09/14/2016	NULL
CFMW-053	CFMW-053-GW	12/12/2016	NULL
CFMW-053	CFMW-053-GW	06/28/2017	NULL
CFMW-053	CFMW-053-GW	06/18/2018	NULL
CFMW-053	CFMW-053-GW	10/17/2018	NULL
CFMW-054	CFMW-054-GW	09/14/2016	NULL
CFMW-054	CFMW-054-GW	12/12/2016	NULL
CFMW-054	CFMW-054-GW	03/22/2017	NULL
CFMW-054	CFMW-054-GW	06/21/2017	NULL
CFMW-054	CFMW-054-GW	06/18/2018	NULL
CFMW-054	CFMW-054-GW	10/05/2018	NULL
CFMW-070	CFMW-070-GW	06/18/2018	NULL
CFMW-070	CFMW-070-GW	10/05/2018	NULL

Table D-39
Site-Wide Below Upper Hydrogeologic Unit Groundwater
Columbia Falls Aluminum Facility
Columbia Falls, Montana

loc_name	sample_name	sample_date	depth_range
CFMW-003A	CFMW-003a-GW	09/20/2016	NULL
CFMW-003A	CFMW-003a-GW	12/12/2016	NULL
CFMW-003A	CFMW-003a-GW	03/20/2017	NULL
CFMW-003A	CFMW-003a-GW	06/19/2017	NULL
CFMW-003A	CFMW-003a-GW	06/15/2018	NULL
CFMW-003A	CFMW-003a-GW	10/23/2018	NULL
CFMW-011A	CFMW-011a-GW	09/20/2016	NULL
CFMW-011A	CFMW-011a-GW	12/14/2016	NULL
CFMW-011A	CFMW-011a-GW	03/21/2017	NULL
CFMW-011A	CFMW-011a-GW	06/29/2017	NULL
CFMW-011A	CFMW-011a-GW	06/14/2018	NULL
CFMW-011A	CFMW-011a-GW	10/08/2018	NULL
CFMW-012A	CFMW-012a-GW	09/15/2016	NULL
CFMW-012A	CFMW-DUP2-GW	09/15/2016	NULL
CFMW-012A	CFMW-012a-GW	12/13/2016	NULL
CFMW-012A	CFMW-012a-GW	03/20/2017	NULL
CFMW-012A	CFMW-012a-GW	06/20/2017	NULL
CFMW-012A	CFMW-012a-GW	06/11/2018	NULL
CFMW-012A	CFMW-012a-GW	10/23/2018	NULL
CFMW-019A	CFMW-019a-GW	09/20/2016	NULL
CFMW-019A	CFMW-019a-GW	12/14/2016	NULL
CFMW-019A	CFMW-019a-GW	03/27/2017	NULL
CFMW-019A	CFMW-DUP9-GW	03/27/2017	NULL
CFMW-019A	CFMW-019a-GW	06/26/2017	NULL
CFMW-019A	CFMW-019a-GW	06/19/2018	NULL
CFMW-019A	CFMW-019a-GW	10/23/2018	NULL
CFMW-025A	CFMW-025a-GW	09/13/2016	NULL
CFMW-025A	CFMW-025a-GW	12/05/2016	NULL
CFMW-025A	CFMW-025a-GW	03/24/2017	NULL
CFMW-025A	CFMW-025a-GW	06/22/2017	NULL
CFMW-025A	CFMW-025a-GW	06/07/2018	NULL
CFMW-025A	CFMW-025a-GW	10/10/2018	NULL
CFMW-032A	CFMW-032a-GW	09/16/2016	NULL
CFMW-032A	CFMW-032a-GW	12/16/2016	NULL
CFMW-032A	CFMW-032a-GW	03/29/2017	NULL
CFMW-032A	CFMW-032a-GW	06/27/2017	NULL
CFMW-032A	CFMW-032a-GW	06/14/2018	NULL
CFMW-032A	CFMW-032a-GW	10/04/2018	NULL
CFMW-044B	CFMW-044b-GW	09/19/2016	NULL
CFMW-044B	CFMW-044b-GW	12/19/2016	NULL
CFMW-044B	CFMW-044b-GW	03/24/2017	NULL
CFMW-044B	CFMW-044b-GW	06/23/2017	NULL
CFMW-044B	CFMW-044b-GW	06/14/2018	NULL
CFMW-044B	CFMW-044b-GW	10/11/2018	NULL
CFMW-053A	CFMW-053a-GW	09/19/2016	NULL
CFMW-053A	CFMW-053a-GW	12/19/2016	NULL
CFMW-053A	CFMW-053a-GW	03/27/2017	NULL
CFMW-053A	CFMW-053a-GW	06/28/2017	NULL
CFMW-053A	CFMW-053a-GW	06/13/2018	NULL
CFMW-053A	CFMW-053a-GW	10/11/2018	NULL
CFMW-056	CFMW-056-GW	09/20/2016	NULL
CFMW-056	CFMW-DUP3-GW	09/20/2016	NULL
CFMW-056	CFMW-056-GW	12/13/2016	NULL
CFMW-056	CFMW-056-GW	03/22/2017	NULL
CFMW-056	CFMW-056-GW	06/22/2017	NULL
CFMW-056	CFMW-056-GW	06/12/2018	NULL
CFMW-056	CFMW-056-GW	10/09/2018	NULL
CFMW-056A	CFMW-056a-GW	09/20/2016	NULL
CFMW-056A	CFMW-056a-GW	12/06/2016	NULL
CFMW-056A	CFMW-DUP4-GW	12/06/2016	NULL
CFMW-056A	CFMW-056a-GW	03/30/2017	NULL
CFMW-056A	CFMW-056a-GW	06/22/2017	NULL
CFMW-056A	CFMW-056a-GW	06/12/2018	NULL
CFMW-056A	CFMW-056a-GW	10/09/2018	NULL
CFMW-057	CFMW-057-GW	09/19/2016	NULL
CFMW-057	CFMW-057-GW	12/05/2016	NULL

Table D-39
Site-Wide Below Upper Hydrogeologic Unit Groundwater
Columbia Falls Aluminum Facility
Columbia Falls, Montana

loc_name	sample_name	sample_date	depth_range
CFMW-057	CFMW-057-GW	03/29/2017	NULL
CFMW-057	CFMW-DUP11-GW	03/29/2017	NULL
CFMW-057	CFMW-057-GW	06/28/2017	NULL
CFMW-057	CFMW-057-GW	06/18/2018	NULL
CFMW-057	CFMW-057-GW	10/10/2018	NULL
CFMW-057A	CFMW-057a-GW	09/19/2016	NULL
CFMW-057A	CFMW-057a-GW	12/16/2016	NULL
CFMW-057A	CFMW-057a-GW	03/22/2017	NULL
CFMW-057A	CFMW-057a-GW	06/28/2017	NULL
CFMW-057A	CFMW-057a-GW	06/18/2018	NULL
CFMW-057A	CFMW-057a-GW	10/10/2018	NULL
CFMW-059A	CFMW-059a-GW	09/19/2016	NULL
CFMW-059A	CFMW-059a-GW	12/16/2016	NULL
CFMW-059A	CFMW-059a-GW	03/29/2017	NULL
CFMW-059A	CFMW-059a-GW	06/28/2017	NULL
CFMW-059A	CFMW-059a-GW	06/13/2018	NULL
CFMW-059A	CFMW-59a-GW	10/15/2018	NULL

Table D-40
Main Plant Area ISM Soil Samples (0-0.5 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Location	Sample	Sample Date
CFISS-030	CFISS-030-SO-0-0.5	07/25/2016
CFISS-031	CFISS-031-S0-0-0.5	07/13/2016
CFISS-032	CFISS-032-SO-0-0.5	07/12/2016
CFISS-033	CFISS-033-SO-0-0.5	07/12/2016
CFISS-034	CFISS-034-SO-0-0.5	07/11/2016
CFISS-035	CFISS-035-SO-0-0.5	07/11/2016
CFISS-036	CFISS-036-SO-0-0.5	07/15/2016
CFISS-037	CFISS-037-SO-0-0.5	07/15/2016
CFISS-038	CFISS-038-S0-0-0.5	07/14/2016
CFISS-039	CFISS-039-S0-0-0.5	07/14/2016
CFISS-040	CFISS-040-S0-0-0.5	07/13/2016
CFISS-041	CFISS-41-SO-0-0.5	07/16/2016
CFISS-042	CFISS-042-SO-0-0.5	07/18/2016
CFISS-043	CFISS-043-SO-0-0.5	07/18/2016

Table D-41
Main Plant Area ISM Soil Samples (0-2 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Location	Sample	Sample Date
CFISS-030	CFISS-030-SO-0.5-2	07/25/2016
CFISS-030	CFISS-030-SO-0-0.5	07/25/2016
CFISS-031	CFISS-031-S0-0.5-2	07/13/2016
CFISS-031	CFISS-031-S0-0-0.5	07/13/2016
CFISS-032	CFISS-032-SO-0.5-2	07/12/2016
CFISS-032	CFISS-032-SO-0-0.5	07/12/2016
CFISS-033	CFISS-033-SO-0.5-2	07/12/2016
CFISS-033	CFISS-033-SO-0-0.5	07/12/2016
CFISS-034	CFISS-034-SO-0.5-2	07/11/2016
CFISS-034	CFISS-034-SO-0-0.5	07/11/2016
CFISS-035	CFISS-035-SO-0.5-2	07/11/2016
CFISS-035	CFISS-035-SO-0-0.5	07/11/2016
CFISS-036	CFISS-036-SO-0.5-2	07/15/2016
CFISS-036	CFISS-036-SO-0-0.5	07/15/2016
CFISS-037	CFISS-037-SO-0.5-2	07/15/2016
CFISS-037	CFISS-037-SO-0-0.5	07/15/2016
CFISS-038	CFISS-038-S0-0.5-2	07/14/2016
CFISS-038	CFISS-038-S0-0-0.5	07/14/2016
CFISS-039	CFISS-039-S0-0.5-2	07/14/2016
CFISS-039	CFISS-039-S0-0-0.5	07/14/2016
CFISS-040	CFISS-040-S0-0.5-2	07/13/2016
CFISS-040	CFISS-040-S0-0-0.5	07/13/2016
CFISS-041	CFISS-41-SO-0.5-2	07/16/2016
CFISS-041	CFISS-41-SO-0-0.5	07/16/2016
CFISS-042	CFISS-042-SO-0.5-2	07/18/2016
CFISS-042	CFISS-042-SO-0-0.5	07/18/2016
CFISS-043	CFISS-043-SO-0.5-2	07/18/2016
CFISS-043	CFISS-043-SO-0-0.5	07/18/2016

Table D-42
Central Landfill Area ISM Soil Samples (0-0.5 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Location	Sample	Sample Date
CFISS-002	CFISS-002-SO-0-0.5	06/14/2016
CFISS-002	CFISS-002-SO-0-0.5	07/19/2016
CFISS-006	CFISS-006-SO-0-0.5	06/17/2016
CFISS-006	CFISS-DUP1-SO	06/17/2016
CFISS-006	CFISS-006-SO-0-0.5	07/19/2016
CFISS-006	CFISS-DUP1-SO	07/19/2016
CFISS-008	CFISS-008-SO-0-0.5	06/18/2016
CFISS-008	CFISS-008-SO-0-0.5	07/26/2016
CFISS-016	CFISS-016-SO-0-0.5	06/23/2016
CFISS-017	CFISS-017-SO-0-0.5	06/29/2016
CFISS-018	CFISS-018-SO-0-0.5	06/24/2016
CFISS-019	CFISS-019-SO-0-0.5	06/24/2016
CFISS-020	CFISS-020-SO-0-0.5	06/25/2016
CFISS-020	CFISS-DUP2-SO	06/25/2016
CFISS-021	CFISS-021-SO-0-0.5	06/25/2016
CFISS-022	CFISS-022-SO-0-0.5	06/27/2016
CFISS-023	CFISS-023-SO-0-0.5	06/27/2016
CFISS-024	CFISS-024-SO-0-0.5	06/29/2016
CFISS-025	CFISS-025-SO-0-0.5	06/30/2016
CFISS-026	CFISS-026-SO-0-0.5	06/30/2016
CFISS-027	CFISS-027-SO-0-0.5	07/01/2016
CFISS-027	CFISS-DUP3-SO	07/01/2016
CFISS-028	CFISS-028-SO-0-0.5	07/01/2016
CFISS-029	CFISS-029-SO-0-0.5	06/27/2016

Table D-43
Central Landfill Area ISM Soil Samples (0-2 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Location	Sample	Sample Date
CFISS-002	CFISS-002-SO-0.5-2	06/14/2016
CFISS-002	CFISS-002-SO-0-0.5	06/14/2016
CFISS-002	CFISS-002-SO-0.5-2	07/19/2016
CFISS-002	CFISS-002-SO-0-0.5	07/19/2016
CFISS-006	CFISS-006-SO-0.5-2	06/17/2016
CFISS-006	CFISS-006-SO-0-0.5	06/17/2016
CFISS-006	CFISS-DUP1-SO	06/17/2016
CFISS-006	CFISS-006-SO-0.5-2	07/19/2016
CFISS-006	CFISS-006-SO-0-0.5	07/19/2016
CFISS-006	CFISS-DUP1-SO	07/19/2016
CFISS-008	CFISS-008-SO-0.5-2	06/18/2016
CFISS-008	CFISS-008-SO-0-0.5	06/18/2016
CFISS-008	CFISS-008-SO-0.5-2	07/26/2016
CFISS-008	CFISS-008-SO-0-0.5	07/26/2016
CFISS-016	CFISS-016-SO-0-0.5	06/23/2016
CFISS-016	CFISS-016-SO-0.5-2	06/28/2016
CFISS-017	CFISS-017-SO-0.5-2	06/23/2016
CFISS-017	CFISS-017-SO-0-0.5	06/29/2016
CFISS-018	CFISS-018-SO-0.5-2	06/24/2016
CFISS-018	CFISS-018-SO-0-0.5	06/24/2016
CFISS-019	CFISS-019-SO-0.5-2	06/24/2016
CFISS-019	CFISS-019-SO-0-0.5	06/24/2016
CFISS-020	CFISS-020-SO-0.5-2	06/25/2016
CFISS-020	CFISS-020-SO-0-0.5	06/25/2016
CFISS-020	CFISS-DUP2-SO	06/25/2016
CFISS-021	CFISS-021-SO-0.5-2	06/25/2016
CFISS-021	CFISS-021-SO-0-0.5	06/25/2016
CFISS-022	CFISS-022-SO-0.5-2	06/27/2016
CFISS-022	CFISS-022-SO-0-0.5	06/27/2016
CFISS-023	CFISS-023-SO-0.5-2	06/27/2016
CFISS-023	CFISS-023-SO-0-0.5	06/27/2016
CFISS-024	CFISS-024-SO-0.5-2	06/29/2016
CFISS-024	CFISS-024-SO-0-0.5	06/29/2016
CFISS-025	CFISS-025-SO-0.5-2	06/30/2016
CFISS-025	CFISS-025-SO-0-0.5	06/30/2016
CFISS-026	CFISS-026-SO-0.5-2	06/30/2016
CFISS-026	CFISS-026-SO-0-0.5	06/30/2016
CFISS-027	CFISS-027-SO-0.5-2	07/01/2016
CFISS-027	CFISS-027-SO-0-0.5	07/01/2016
CFISS-027	CFISS-DUP3-SO	07/01/2016
CFISS-028	CFISS-028-SO-0.5-2	07/01/2016
CFISS-028	CFISS-028-SO-0-0.5	07/01/2016
CFISS-029	CFISS-029-SO-0.5-2	06/27/2016
CFISS-029	CFISS-029-SO-0-0.5	06/27/2016

Table D-44
Recreational Trespasser (ATV Riding) Surface Water Samples
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Location	Sample	Sample Date
CFSWP-010	CFSWP-010-SW	06/07/2016
CFSWP-010	CFSWP-010-SW	03/15/2017
CFSWP-010	CFSWP-010-SW	06/12/2017
CFSWP-010	CFSWP-010-SW	06/14/2018
CFSWP-011	CFSWP-011-SW	06/07/2016
CFSWP-011	CFSWP-011-SW	04/03/2017
CFSWP-011	CFSWP-011-SW	06/12/2017
CFSWP-011	CFSWP-011-SW	06/14/2018
CFSWP-012	CFSWP-012-SW	06/07/2016
CFSWP-012	CFSWP-012-SW	04/03/2017
CFSWP-012	CFSWP-DUP5-SW	04/03/2017
CFSWP-012	CFSWP-012-SW	06/12/2017
CFSWP-012	CFSWP-012-SW	06/14/2018
CFSWP-013	CFSWP-013-SW	06/07/2016
CFSWP-013	CFSWP-DUP1-SW	06/07/2016
CFSWP-013	CFSWP-013-SW	11/30/2016
CFSWP-013	CFSWP-013-SW	03/15/2017
CFSWP-013	CFSWP-013-SW	06/12/2017
CFSWP-013	CFSWP-013-SW	06/14/2018
CFSWP-014	CFSWP-014-SW	08/29/2016
CFSWP-014	CFSWP-014-SW	11/30/2016
CFSWP-014	CFSWP-DUP3-SW	11/30/2016
CFSWP-014	CFSWP-014-SW	03/13/2017
CFSWP-014	CFSWP-Dup4-SW	03/13/2017
CFSWP-014	CFSWP-014-SW	06/13/2017
CFSWP-014	CFSWP-014-SW	06/11/2018
CFSWP-014	CFSWP-014-SW	10/10/2018
CFSWP-014	CFSWP-014-SW	10/16/2018
CFSWP-015	CFSWP-015-SW	08/29/2016
CFSWP-015	CFSWP-DUP2-SW	08/29/2016
CFSWP-015	CFSWP-015-SW	11/30/2016
CFSWP-015	CFSWP-015-SW	12/20/2016
CFSWP-015	CFSWP-015-SW	03/13/2017
CFSWP-015	CFSWP-015-SW	06/13/2017
CFSWP-015	CFSWP-DUP7-SW	06/13/2017
CFSWP-015	CFSWP-015-SW	06/11/2018
CFSWP-015	CFSWP-015-SW	10/09/2018
CFSWP-015	CFSWP-015-SW	10/16/2018
CFSWP-016	CFSWP-016-SW	08/29/2016
CFSWP-016	CFSWP-016-SW	11/30/2016
CFSWP-016	CFSWP-016-SW	03/13/2017
CFSWP-016	CFSWP-016-SW	06/12/2017
CFSWP-016	CFSWP-DUP6-SW	06/12/2017
CFSWP-016	CFSWP-016-SW	06/12/2018
CFSWP-016	CFSWP-016-SW	10/09/2018
CFSWP-021	CFSWP-021-SW	06/06/2016
CFSWP-021	CFSWP-021-SW	11/30/2016
CFSWP-021	CFSWP-021-SW	03/15/2017
CFSWP-021	CFSWP-021-SW	06/15/2017
CFSWP-021	CFSWP-021-SW	06/19/2018
CFSWP-022	CFSWP-022-SW	06/06/2016
CFSWP-022	CFSWP-022-SW	04/03/2017
CFSWP-022	CFSWP-022-SW	06/20/2018
CFSWP-025	CFSWP-025-SW	12/20/2016
CFSWP-025	CFSWP-025-SW	03/13/2017
CFSWP-025	CFSWP-025-SW	06/13/2017
CFSWP-025	CFSWP-025-SW	06/12/2018
CFSWP-025	CFSWP-025-SW	10/10/2018
CFSWP-041	CFSWP-041-SW	06/14/2018
CFSWP-041	CFSWP-DUP11-SW	06/14/2018
CFSWP-042	CFSWP-042-SW	06/14/2018
CFSWP-043	CFSWP-043-SW	06/14/2018
CFSWP-043	CFSWP-043-SW	06/18/2018
CFSWP-044	CFSWP-044-SW	06/11/2018
CFSWP-044	CFSWP-044-SW	10/10/2018
CFSWP-044	CFSWP-DUP14-SW	10/10/2018

Table D-44
Recreational Trespasser (ATV Riding) Surface Water Samples
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Location	Sample	Sample Date
CFSWP-044	CFSWP-044-SW	10/16/2018
CFSWP-045	CFSWP-045-SW	06/11/2018
CFSWP-045	CFSWP-045-SW	10/09/2018
CFSWP-045	CFSWP-045-SW	10/16/2018
CFSWP-046	CFSWP-046-SW	06/19/2018
CFSWP-047	CFSWP-047-SW	06/19/2018
CFSWP-048	CFSWP-048-SW	06/20/2018
CFSWP-049	CFSWP-049-SW	06/20/2018
CFSWP-050	CFSWP-050-SW	06/21/2018
CFSWP-051	CFSWP-051-SW	06/21/2018
CFSWP-052	CFSWP-052-SW	06/18/2018
CFSWP-053	CFSWP-053-SW	06/18/2018

Table D-45
Recreational Trespasser (ATV Riding) Sediment Samples
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Location	Sample	Sample Date
CFSDP-010	CFSDP-010-SO	09/06/2016
CFSDP-011	CFSDP-011-SO	09/06/2016
CFSDP-012	CFSDP-012-SO	09/06/2016
CFSDP-012	CFSDP-DUP1-SO	09/06/2016
CFSDP-013	CFSDP-013-SO	09/06/2016
CFSDP-014	CFSDP-014-SD	08/29/2016
CFSDP-014	CFSDP-014-SD	10/10/2018
CFSDP-015	CFSDP-015-SD	08/29/2016
CFSDP-015	CFSDP-015-SD	10/09/2018
CFSDP-016	CFSDP-016-SD	08/29/2016
CFSDP-016	CFSDP-016-SD	10/09/2018
CFSDP-016	CFSDP-DUP4-SD	10/09/2018
CFSDP-021	CFSDP-021-SO	09/06/2016
CFSDP-021	CFSDP-021-SD	06/19/2018
CFSDP-022	CFSDP-022-SO	09/06/2016
CFSDP-022	CFSDP-022-SD	06/20/2018
CFSDP-025	CFSDP-025-SD	10/10/2018
CFSDP-025	CFSDP-DUP5-SD	10/10/2018
CFSDP-044	CFSDP-044-SD	10/10/2018
CFSDP-045	CFSDP-045-SD	10/09/2018
CFSDP-046	CFSDP-046-SD	06/19/2018
CFSDP-047	CFSDP-047-SD	06/19/2018
CFSDP-048	CFSDP-048-SD	06/20/2018
CFSDP-049	CFSDP-049-SD	06/20/2018
CFSDP-050	CFSDP-050-SD	06/21/2018
CFSDP-050	CFSDP-DUP3-SD	06/21/2018
CFSDP-051	CFSDP-051-SD	06/21/2018
CFSDP-052	CFSDP-052-SD	06/18/2018
CFSDP-053	CFSDP-053-SD	06/18/2018

Table D-46
Recreational Trespasser (Hunting) Surface Water Samples
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Location	Sample	Sample Date
CFSWP-013	CFSWP-013-SW	06/07/2016
CFSWP-013	CFSWP-DUP1-SW	06/07/2016
CFSWP-013	CFSWP-013-SW	11/30/2016
CFSWP-013	CFSWP-013-SW	03/15/2017
CFSWP-013	CFSWP-013-SW	06/12/2017
CFSWP-013	CFSWP-013-SW	06/14/2018
CFSWP-014	CFSWP-014-SW	08/29/2016
CFSWP-014	CFSWP-014-SW	11/30/2016
CFSWP-014	CFSWP-DUP3-SW	11/30/2016
CFSWP-014	CFSWP-014-SW	03/13/2017
CFSWP-014	CFSWP-Dup4-SW	03/13/2017
CFSWP-014	CFSWP-014-SW	06/13/2017
CFSWP-014	CFSWP-014-SW	06/11/2018
CFSWP-014	CFSWP-014-SW	10/10/2018
CFSWP-014	CFSWP-014-SW	10/16/2018
CFSWP-015	CFSWP-015-SW	08/29/2016
CFSWP-015	CFSWP-DUP2-SW	08/29/2016
CFSWP-015	CFSWP-015-SW	11/30/2016
CFSWP-015	CFSWP-015-SW	12/20/2016
CFSWP-015	CFSWP-015-SW	03/13/2017
CFSWP-015	CFSWP-015-SW	06/13/2017
CFSWP-015	CFSWP-DUP7-SW	06/13/2017
CFSWP-015	CFSWP-015-SW	06/11/2018
CFSWP-015	CFSWP-015-SW	10/09/2018
CFSWP-015	CFSWP-015-SW	10/16/2018
CFSWP-016	CFSWP-016-SW	08/29/2016
CFSWP-016	CFSWP-016-SW	11/30/2016
CFSWP-016	CFSWP-016-SW	03/13/2017
CFSWP-016	CFSWP-016-SW	06/12/2017
CFSWP-016	CFSWP-DUP6-SW	06/12/2017
CFSWP-016	CFSWP-016-SW	06/12/2018
CFSWP-016	CFSWP-016-SW	10/09/2018
CFSWP-021	CFSWP-021-SW	06/06/2016
CFSWP-021	CFSWP-021-SW	11/30/2016
CFSWP-021	CFSWP-021-SW	03/15/2017
CFSWP-021	CFSWP-021-SW	06/15/2017
CFSWP-021	CFSWP-021-SW	06/19/2018
CFSWP-022	CFSWP-022-SW	06/06/2016
CFSWP-022	CFSWP-022-SW	04/03/2017
CFSWP-022	CFSWP-022-SW	06/20/2018
CFSWP-025	CFSWP-025-SW	12/20/2016
CFSWP-025	CFSWP-025-SW	03/13/2017
CFSWP-025	CFSWP-025-SW	06/13/2017
CFSWP-025	CFSWP-025-SW	06/12/2018
CFSWP-025	CFSWP-025-SW	10/10/2018
CFSWP-042	CFSWP-042-SW	06/14/2018
CFSWP-043	CFSWP-043-SW	06/14/2018
CFSWP-043	CFSWP-043-SW	06/18/2018
CFSWP-044	CFSWP-044-SW	06/11/2018
CFSWP-044	CFSWP-044-SW	10/10/2018
CFSWP-044	CFSWP-DUP14-SW	10/10/2018
CFSWP-044	CFSWP-044-SW	10/16/2018
CFSWP-045	CFSWP-045-SW	06/11/2018
CFSWP-045	CFSWP-045-SW	10/09/2018
CFSWP-045	CFSWP-045-SW	10/16/2018
CFSWP-046	CFSWP-046-SW	06/19/2018
CFSWP-047	CFSWP-047-SW	06/19/2018
CFSWP-048	CFSWP-048-SW	06/20/2018
CFSWP-049	CFSWP-049-SW	06/20/2018
CFSWP-050	CFSWP-050-SW	06/21/2018
CFSWP-051	CFSWP-051-SW	06/21/2018
CFSWP-052	CFSWP-052-SW	06/18/2018
CFSWP-053	CFSWP-053-SW	06/18/2018

Table D-47
Recreational Trespasser (Hunting) Sediment Samples
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Location	Sample	Sample Date
CFSDP-013	CFSDP-013-SO	09/06/2016
CFSDP-014	CFSDP-014-SD	08/29/2016
CFSDP-014	CFSDP-014-SD	10/10/2018
CFSDP-015	CFSDP-015-SD	08/29/2016
CFSDP-015	CFSDP-015-SD	10/09/2018
CFSDP-016	CFSDP-016-SD	08/29/2016
CFSDP-016	CFSDP-016-SD	10/09/2018
CFSDP-016	CFSDP-DUP4-SD	10/09/2018
CFSDP-021	CFSDP-021-SO	09/06/2016
CFSDP-021	CFSDP-021-SD	06/19/2018
CFSDP-022	CFSDP-022-SO	09/06/2016
CFSDP-022	CFSDP-022-SD	06/20/2018
CFSDP-025	CFSDP-025-SD	10/10/2018
CFSDP-025	CFSDP-DUP5-SD	10/10/2018
CFSDP-044	CFSDP-044-SD	10/10/2018
CFSDP-045	CFSDP-045-SD	10/09/2018
CFSDP-046	CFSDP-046-SD	06/19/2018
CFSDP-047	CFSDP-047-SD	06/19/2018
CFSDP-048	CFSDP-048-SD	06/20/2018
CFSDP-049	CFSDP-049-SD	06/20/2018
CFSDP-050	CFSDP-050-SD	06/21/2018
CFSDP-050	CFSDP-DUP3-SD	06/21/2018
CFSDP-051	CFSDP-051-SD	06/21/2018
CFSDP-052	CFSDP-052-SD	06/18/2018
CFSDP-053	CFSDP-053-SD	06/18/2018

Appendix E Analytical Data Tables

Table E-1
Summary of Data Used in Risk Assessment
Main Plant Area Soil (0-0.5 ft-bgs) - Current
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-025A	CFMW-026	CFMW-028A	CFMW-032A	CFMW-033	CFMW-034	CFMW-035	CFMW-035-DUP	CFMW-037	CFMW-042	CFMW-043	CFMW-044A	CFMW-045A	CFMW-047
Sample Lab IDs	460-117124-1	460-115528-27	460-116402-2	460-118466-1	460-116402-16	460-114793-41	460-114828-22	460-114828-23	460-116119-2	460-115648-15	460-115648-3	460-117381-5	460-118613-2	460-115886-20
Sample Name	CFMW-025a-SO-0-0.5	CFMW-026-SO-0-0.5	CFMW-028a-SO-0-0.5	CFMW-032a-SO-0-0.5	CFMW-033-SO-0-0.5	CFMW-034-SO-0-0.5	CFMW-035-SO-0-0.5	CFMW-DUP11-SO	CFMW-037-SO-0-0.5	CFMW-042-SO-0-0.5	CFMW-043-SO-0-0.5	CFMW-044a-SO-0-0.5	CFMW-045a-SO-0-0.5	CFMW-047-SO-0-0.5
Sample Depth	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft
Chemical	7/13/2016	6/14/2016	6/30/2016	8/8/2016	7/1/2016	5/31/2016	6/1/2016	6/1/2016	6/24/2016	6/16/2016	6/15/2016	7/20/2016	8/12/2016	6/21/2016
GENERAL CHEMISTRY (mg/kg)														
Fluoride	16.7 J	4.25 J	6.47 J+	78.1 J	8.12 J+	42.8 J	98.3 J	123 J	192 J	47.5 J-	84.9 J-	59.8 J+	74.8 J	22.2 J
Cyanide	0.2	0.33	0.043 J	0.31	0.097 J	0.11	0.22 J	0.13 J	0.09 J	0.87	0.11	0.068 J	0.1 J	0.037 J
METALS (mg/kg)														
"Chromium, Hexavalent - Estimated"	0.278345	0.160584	0.302433	0.291727	0.203406	0.195377	0.406813	0.404136	0.331873	0.757421	0.318491	0.302433	0.318491	0.275669
"Chromium, Trivalent - Calculated"	--	--	--	--	--	--	--	--	--	--	--	--	--	--
"Chromium, Trivalent - Estimated"	10.1217	5.83942	10.9976	10.6083	7.39659	7.10462	14.7932	14.6959	12.0681	27.5426	11.5815	10.9976	11.5815	10.0243
Aluminum	23400	11500	14200	19600	8530	5610	27200	18500	51200	32000	14700	22900	29500	14100
Antimony	0.46 UJ	0.48 UJ	0.38 UJ	0.46 UJ	0.4 UJ	0.41 U	0.41 UJ	0.44 UJ	0.46 U	0.54 UJ	0.34 UJ	0.44 UJ	0.46 U	0.41 UJ
Arsenic	7.1	3.1	5.4	6.1	5.3	3.2	5.1	5	5.2	5.5	5	3.7	4.1	4.7
Barium	333	305	96.8 J	258	56.6 J	53.4	93.4	81.2	76.3	376	131	196	101	108 J
Beryllium	0.64	0.41 J	0.48	0.72	0.23 J	0.21 J	0.85	0.62	0.7	0.89	0.43	0.6	0.61	0.42
Cadmium	0.35 U	0.66 J	0.29 U	0.35 U	0.3 U	0.31 U	0.44 J	0.33 U	0.65 J	1.2 J	0.26 U	0.33 U	0.54 J	0.31 U
Calcium	5920	8020	8390	20500	44600	37600	14000	21000	7820	9850	21500	3150	9260	23800 J
Chromium, Total	10.4 J	6	11.3	10.9	7.6	7.3	15.2	15.1	12.4	28.3	11.9	11.3 J+	11.9	10.3 J
Cobalt	6.6	3.4	5.2	6	5	4	6.2	6.2	4.4	6.1	4.9	6.6	4.6	5.4
Copper	20	14.5 J+	15.5 J	17.7	10.3 J	8.9	25.8	26.7	14.3	23.8 J+	17.3 J+	11.4 J+	16.3	19.9
Iron	18200 J	7940	17000	15400	12200	9540	16400	20500	8560	16700	14100	18400	10500	14700
Lead	18.5	44.8 J+	9.7	13.7	9.2	6.7	21.7	21	20.1	28.2 J+	23.2 J+	10.5 J	47.6 J	11.6 J
Magnesium	7000	3030	10800	8850	12100	9240	8430	10100	4610	7240	8590	7130	7590	9580
Manganese	778 J	631 J	319	524	354	305	364	390	178	548 J	569 J	455	269	385
Mercury	0.027	0.025	0.017 J+	0.03	0.025 J+	0.026	0.025	0.021	0.013 U	0.031	0.018 J	0.014 U	0.013 U	0.023
Nickel	13.9 J	17.4	11.8	12.6	9.3	10	47.4	29.9	81.8	27.5	18.9	12.4	59.9	16.4
Potassium	1140	1530	948 J+	918	698 J+	388	956	823	425	1450	889	858 J+	596	864
Selenium	0.43 U	0.45 U	0.36 U	0.43 U	0.37 U	0.39 U	0.38 U	0.41 U	0.43 U	0.5 U	0.32 U	0.41 U	0.43 UJ	0.39 U
Silver	0.85 U	0.88 U	0.7 U	0.84 U	0.72 U	0.76 U	0.75 UJ	1.5 J	0.84 U	0.99 U	0.63 U	0.8 U	0.85 U	0.75 U
Sodium	157	45.1 U	35.8 U	117	37 U	38.7 U	133	84.9 J	182	67.1 J	32.2 U	60.3 J	198	42.7 J
Thallium	0.17 U	0.18 U	0.14 U	0.17 U	0.15 U	0.16 U	0.15 U	0.17 U	0.17 U	0.2 U	0.13 U	0.17 U	0.17 U	0.16 U
Vanadium	16.3 J	11.6	10.8	12.3	6.3	6	21.1	16.4	25.1	31.6	12.4	19.7 J	24.7 J-	11.4
Zinc	84.9	238	48	65.3	34.6	26.7	151 J	55.6 J	64.2	106	57.8	48.5	85.3	64.3
METALS|HEXAVALENT CHROMIUM (mg/kg)														
Chromium, Hexavalent	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PESTICIDES (mg/kg)														
Aldrin	0.001 U	0.0012 U	0.00096 U	0.00092 U	--	0.00087 U	0.00089 U	0.00087 U	0.00094 U	0.0013 U	0.0009 U	0.00092 U	0.00092 U	0.00088 U
Alpha Bhc (Alpha Hexachlorocyclohexane)	0.00079 U	0.00089 U	0.00072 U	0.0007 U	--	0.00066 U	0.00067 U	0.00066 U	0.00071 U	0.00097 U	0.00068 U	0.00069 U	0.0007 U	0.00066 U
Alpha Endosulfan	0.0012 U	0.0014 U	0.0011 U	0.0011 U	--	0.001 U	0.001 U	0.001 U	0.0011 U	0.0015 U	0.001 U	0.0011 U	0.0011 U	0.001 U
Beta Bhc (Beta Hexachlorocyclohexane)	0.00084 U	0.00095 U	0.00077 U	0.00074 U	--	0.0007 U	0.00072 U	0.0007 U	0.00076 U	0.001 U	0.00072 U	0.00074 U	0.00074 U	0.0007 U
Beta Endosulfan	0.0014 U	0.0015 U	0.0012 U	0.0012 U	--	0.0011 U	0.0012 U	0.0011 U	0.0012 U	0.0017 U	0.0012 U	0.0012 U	0.0012 U	0.0011 U
cis-Chlordane	0.0014 U	0.0016 U	0.0013 U	0.0012 U	--	0.0012 U	0.0012 U	0.0012 U	0.0013 U	0.0017 U	0.0012 U	0.0012 U	0.0012 U	0.0012 U
Delta BHC (Delta Hexachlorocyclohexane)	0.00094 U	0.0011 U	0.00086 U	0.00083 U	--	0.00079 U	0.00081 U	0.00078 U	0.00085 U	0.0012 U	0.00081 U	0.00083 U	0.00083 U	0.00079 U
Dieldrin	0.0011 U	0.0013 U	0.001 U	0.00099 U	--	0.00094 U	0.00096 U	0.00094 U	0.001 U	0.0014 U	0.00097 U	0.00098 U	0.00099 U	0.00094 U
Endosulfan Sulfate	0.001 U	0.0011 U	0.00092 U	0.00089 U	--	0.00084 U	0.00086 U	0.00084 U	0.00091 U	0.0012 U	0.00087 U	0.00088 U	0.00089 U	0.00084 U
Endrin	0.0011 U	0.0012 U	0.001 U	0.00097 U	--	0.00092 U	0.00094 U	0.00091 U	0.00099 U	0.0013 U	0.00095 U	0.00096 U	0.00097 U	0.00092 U
Endrin Aldehyde	0.0011 U	0.0012 U	0.00098 U	0.00095 U	--	0.0009 U	0.00092 U	0.00089 U	0.00097 U	0.0013 U	0.00093 U	0.00094 U	0.00095 U	0.0009 U
Endrin Ketone	0.0012 U	0.0014 U	0.0011 U	0.0011 U	--	0.001 U	0.001 U	0.001 U	0.0011 U	0.0015 U	0.001 U	0.0011 U	0.0011 U	0.001 U
Gamma Bhc (Lindane)	0.00078 U	0.00087 U	0.00071 U	0.00068 U	--	0.00065 U	0.00066 U	0.00065 U	0.0007 U	0.00095 U	0.00067 U	0.00068 U	0.00068 U	0.00065 U
Heptachlor	0.0011 U	0.0013 U	0.001 U	0.00098 U	--	0.00093 U	0.00095 U	0.00092 U	0.001 U	0.0014 U	0.00096 U	0.00097 U	0.00098 U	0.00093 U
Heptachlor Epoxide	0.0017 U	0.0019 U	0.0015 U	0.0015 U	--	0.0014 U	0.0014 U	0.0014 U	0.0015 U	0.0021 U	0.0015 U	0.0015 U	0.0015 U	0.0014 U
Methoxychlor	0.0018 U	0.0021 U	0.0017 U	0.0016 U	--	0.0015 U	0.0016 U	0.0015 U	0.0017 U	0.0023 U	0.0016 U	0.0016 U	0.0016 U	0.0015 U
P,P'-DDD	0.0011 U	0.0013 U	0.001 U	0.001 U	--	0.00095 U	0.00097 U	0.00095 U	0.001 U	0.0014 U	0.00098 U	0.001 U	0.001 U	0.00095 U
P,P'-DDE	0.0013 U	0.0014 U	0.0011 U	0.0011 U	--	0.001 U	0.0011 U	0.001 U	0.0011 U	0.0015 U	0.0011 U	0.0011 U	0.0011 U	0.001 U
P,P'-DDT	0.00089 U	0.001 U	0.00082 U	0.00079 U	--	0.00074 U	0.00076 U	0.00074 U	0.0008 U	0.0011 U	0.00077 U	0.00078 U	0.00079 U	0.00075 U
Toxaphene	0.025 U	0.028 U	0.023 U	0.022 U	--	0.021 U	0.022 U	0.021 U	0.023 U	0.031 U	0.022 U	0.022 U	0.022 U	0.021 U
trans-Chlordane	0.0019 U	0.0021 U	0.0017 U	0.0017 U	--	0.0016 U	0.0016 U	0.0016 U	0.0017 U	0.0023 U	0.0016 U	0.0016 U	0.0017 U	0.0016 U
POLYCHLORINATED BIPHENYLS (mg/kg)														
PCB-1016 (Aroclor 1016)	0.012 U	0.013 U	0.011 U	0.01 U	0.011 U	0.0096 U	0.0098 U	0.0096 U	0.01 U	0.014 U	0.0099 U	0.01 U	0.01 U	0.0096 U
PCB-1221 (Aroclor 1221)	0.012 U	0.013 U	0.011 U	0.01 U	0.011 U	0.0096 U	0.0098 U	0.0096 U	0.01 U	0.014 U	0.0099 U	0.01 U	0.01 U	0.0096 U
PCB-1232 (Aroclor 1232)	0.012 U	0.013 U	0.011 U	0.01 U	0.011 U	0.0096 U	0.0098 U	0.0096 U	0.01 U	0.014 U	0.0099 U	0.01 U	0.01 U	0.0096 U

Table E-1
Summary of Data Used in Risk Assessment
Main Plant Area Soil (0-0.5 ft-bgs) - Current
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-025A	CFMW-026	CFMW-028A	CFMW-032A	CFMW-033	CFMW-034	CFMW-035	CFMW-035-DUP	CFMW-037	CFMW-042	CFMW-043	CFMW-044A	CFMW-045A	CFMW-047
Sample Lab IDs	460-117124-1	460-115528-27	460-116402-2	460-118466-1	460-116402-16	460-114793-41	460-114828-22	460-114828-23	460-116119-2	460-115648-15	460-115648-3	460-117381-5	460-118613-2	460-115886-20
Sample Name	CFMW-025a-SO-0-0.5	CFMW-026-SO-0-0.5	CFMW-028a-SO-0-0.5	CFMW-032a-SO-0-0.5	CFMW-033-SO-0-0.5	CFMW-034-SO-0-0.5	CFMW-035-SO-0-0.5	CFMW-DUP11-SO	CFMW-037-SO-0-0.5	CFMW-042-SO-0-0.5	CFMW-043-SO-0-0.5	CFMW-044a-SO-0-0.5	CFMW-045a-SO-0-0.5	CFMW-047-SO-0-0.5
Sample Depth	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft
Chemical	7/13/2016	6/14/2016	6/30/2016	8/8/2016	7/1/2016	5/31/2016	6/1/2016	6/1/2016	6/24/2016	6/16/2016	6/15/2016	7/20/2016	8/12/2016	6/21/2016
PCB-1242 (Aroclor 1242)	0.012 U	0.013 U	0.011 U	0.01 U	0.011 U	0.0096 U	0.0098 U	0.0096 U	0.01 U	0.014 U	0.0099 U	0.01 U	0.01 U	0.0096 U
PCB-1248 (Aroclor 1248)	0.012 U	0.013 U	0.011 U	0.01 U	0.011 U	0.0096 U	0.0098 U	0.0096 U	0.01 U	0.014 U	0.0099 U	0.01 U	0.01 U	0.0096 U
PCB-1254 (Aroclor 1254)	0.012 U	0.013 U	0.011 U	0.01 U	0.011 U	0.0099 U	0.01 U	0.0099 U	0.011 U	0.015 U	0.01 U	0.01 U	0.01 U	0.0099 U
PCB-1260 (Aroclor 1260)	0.012 U	0.013 U	0.011 U	0.01 U	0.011 U	0.0099 U	0.01 U	0.0099 U	0.011 U	0.015 U	0.01 U	0.01 U	0.01 U	0.0099 U
PCB-1262 (Aroclor 1262)	0.012 U	0.013 U	0.011 U	0.01 U	0.011 U	0.0099 U	0.01 U	0.0099 U	0.011 U	0.015 U	0.01 U	0.01 U	0.01 U	0.0099 U
PCB-1268 (Aroclor 1268)	0.012 U	0.013 U	0.011 U	0.01 U	0.011 U	0.0099 U	0.01 U	0.0099 U	0.011 U	0.015 U	0.01 U	0.01 U	0.01 U	0.0099 U
Polychlorinated Biphenyl (PCBs)	0.012 U	0.013 U	0.011 U	0.01 U	0.011 U	0.0099 U	0.01 U	0.0099 U	0.011 U	0.015 U	0.01 U	0.01 U	0.01 U	0.0099 U
SEMIVOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,2,4,5-Tetrachlorobenzene	0.032 U	0.036 U	0.029 U	0.028 U	0.03 U	0.026 U	0.14 U	0.13 U	0.14 U	0.039 U	0.027 U	0.028 U	0.056 U	0.027 U
1,4-Dioxane (P-Dioxane)	0.11 U	0.13 U	0.1 U	0.1 U	0.11 U	0.095 U	0.49 U	0.47 U	0.51 U	0.14 U	0.098 U	0.1 U	0.2 U	0.095 U
2,3,4,6-Tetrachlorophenol	0.04 U	0.045 U	0.037 U	0.035 U	0.038 U	0.034 U	0.17 U	0.17 U	0.18 U	0.049 U	0.035 U	0.035 U	0.071 U	0.034 U
2,4,5-Trichlorophenol	0.043 U	0.048 U	0.039 U	0.037 U	0.04 U	0.035 U	0.18 U	0.18 U	0.19 U	0.052 U	0.037 U	0.037 U	0.075 U	0.036 U
2,4,6-Trichlorophenol	0.012 U	0.014 U	0.011 U	0.011 U	0.011 U	0.01 U	0.052 U	0.05 U	0.055 U	0.015 U	0.01 U	0.011 U	0.021 U	0.01 U
2,4-Dichlorophenol	0.01 U	0.011 U	0.0092 U	0.0089 U	0.0094 U	0.0084 U	0.043 U	0.042 U	0.045 U	0.012 U	0.0087 U	0.0088 U	0.018 U	0.0084 U
2,4-Dimethylphenol	0.094 U	0.11 U	0.086 U	0.083 U	0.088 U	0.078 U	0.4 U	0.39 U	0.42 U	0.12 U	0.081 U	0.082 U	0.17 U	0.078 U
2,4-Dinitrophenol	0.32 U	0.36 U	0.3 U	0.28 U	0.3 U	0.27 U	1.4 U	1.3 U	1.5 U	0.4 U	0.28 U	0.28 U	0.57 U	0.27 U
2,4-Dinitrotoluene	0.017 U	0.019 U	0.015 U	0.015 U	0.016 U	0.014 U	0.072 U	0.07 U	0.076 U	0.021 U	0.015 U	0.015 U	0.03 U	0.014 U
2,6-Dinitrotoluene	0.023 U	0.026 U	0.021 U	0.02 U	0.021 U	0.019 U	0.097 U	0.094 U	0.1 U	0.028 U	0.02 U	0.02 U	0.04 U	0.019 U
2-Chloronaphthalene	0.0097 U	0.011 U	0.0089 U	0.0085 U	0.0091 U	0.0081 U	0.041 U	0.04 U	0.044 U	0.012 U	0.0084 U	0.0085 U	0.017 U	0.0081 U
2-Chlorophenol	0.011 U	0.012 U	0.0099 U	0.0096 U	0.01 U	0.009 U	0.046 U	0.045 U	0.049 U	0.013 U	0.0094 U	0.0095 U	0.019 U	0.0091 U
2-Methylnaphthalene	0.0094 U	0.011 U	0.0086 U	0.0083 U	0.0088 U	0.008 J	0.09 J	0.054 J	0.096 J	0.022 J	0.11 J	0.0083 U	0.15 J	0.0079 U
2-Methylphenol (O-Cresol)	0.019 U	0.021 U	0.017 U	0.016 U	0.017 U	0.016 U	0.079 U	0.077 U	0.084 U	0.023 U	0.016 U	0.016 U	0.033 U	0.016 U
2-Nitroaniline	0.014 U	0.016 U	0.013 U	0.012 U	0.013 U	0.012 U	0.06 U	0.059 U	0.063 U	0.017 U	0.012 U	0.012 U	0.025 U	0.012 U
2-Nitrophenol	0.014 U	0.016 U	0.013 U	0.013 U	0.013 U	0.012 U	0.061 U	0.06 U	0.064 U	0.018 U	0.012 U	0.013 U	0.025 U	0.012 U
3- And 4- Methylphenol (Total)	0.011 U	0.013 U	0.01 U	0.01 U	0.011 U	0.0095 U	0.048 U	0.047 U	0.051 U	0.014 U	0.0098 U	0.01 U	0.02 U	0.0095 U
3,3'-Dichlorobenzidine	0.048 U	0.054 U	0.044 U	0.042 U	0.045 U	0.04 U	0.2 U	0.2 U	0.21 U	0.058 U	0.041 U	0.042 U	0.084 U	0.04 U
3-Nitroaniline	0.013 U	0.014 U	0.012 U	0.011 U	0.012 U	0.011 U	0.054 U	0.053 U	0.057 U	0.016 U	0.011 U	0.011 U	0.022 U	0.011 U
4,6-Dinitro-2-Methylphenol	0.11 U	0.13 U	0.1 U	0.1 U	0.11 U	0.095 U	0.49 U	0.47 U	0.51 U	0.14 U	0.098 U	0.1 U	0.2 U	0.095 U
4-Bromophenyl Phenyl Ether	0.013 U	0.015 U	0.012 U	0.012 U	0.013 U	0.011 U	0.057 U	0.056 U	0.06 U	0.016 U	0.012 U	0.012 U	0.024 U	0.011 U
4-Chloro-3-Methylphenol	0.018 U	0.021 U	0.017 U	0.016 U	0.017 U	0.015 U	0.078 U	0.076 U	0.083 U	0.022 U	0.016 U	0.016 U	0.032 U	0.015 U
4-Chloroaniline	0.011 U	0.012 U	0.01 U	0.0097 U	0.01 U	0.0092 U	0.047 U	0.046 U	0.049 U	0.013 U	0.0095 U	0.0096 U	0.019 U	0.0092 U
4-Chlorophenyl Phenyl Ether	0.013 UJ	0.014 U	0.012 U	0.011 U	0.012 U	0.011 U	0.055 U	0.053 U	0.058 U	0.016 U	0.011 U	0.011 U	0.023 U	0.011 U
4-Nitroaniline	0.016 U	0.018 U	0.015 U	0.014 U	0.015 U	0.013 U	0.069 U	0.067 U	0.073 U	0.02 U	0.014 U	0.014 U	0.028 U	0.013 U
4-Nitrophenol	0.21 U	0.23 U	0.19 U	0.18 U	0.19 U	0.17 U	0.88 U	0.85 U	0.92 U	0.25 U	0.18 U	0.18 U	0.36 U	0.17 U
Acenaphthene	0.01 U	0.012 J	0.036 J	0.0091 U	0.0097 U	0.064 J	0.9 J	0.47 J	0.9 J	0.11 J	0.28 J	0.009 U	0.46 J	0.011 J
Acenaphthylene	0.011 U	0.012 U	0.01 U	0.0097 U	0.01 U	0.0092 U	0.047 U	0.046 U	0.049 U	0.013 U	0.013 J	0.0096 U	0.039 J	0.0092 U
Acetophenone	0.0093 U	0.01 U	0.0085 U	0.0082 U	0.0087 U	0.0078 U	0.04 U	0.039 U	0.042 U	0.011 U	0.008 U	0.0081 U	0.016 U	0.0078 U
Anthracene	0.041 U	0.046 U	0.08 J	0.036 U	0.038 U	0.1 J	1.7 J	0.93 J	2	0.2 J	0.93	0.036 U	1	0.034 U
Atrazine	0.019 U	0.021 U	0.017 U	0.017 U	0.018 U	0.016 U	0.081 U	0.079 U	0.085 U	0.023 U	0.016 U	0.017 U	0.033 U	0.016 U
Benzaldehyde	0.033 U	0.037 U	0.03 U	0.029 U	0.031 U	0.027 U	0.14 U	0.14 U	0.15 U	0.04 U	0.028 U	0.093 J	0.057 U	0.027 U
Benzo(A)Anthracene	0.078	0.2	0.57	0.052	0.033 U	0.43	10 J	5.6 J	17	1	3	0.031 U	4.7	0.18
Benzo(A)Pyrene	0.088	0.24	0.74	0.062	0.012 U	0.43	14 J	7.5 J	19	1.3	3.7	0.033 J	5.7	0.23
Benzo(B)Fluoranthene	0.18	0.52	1.1	0.13	0.016 U	1.1	18 J	9 J	27	2.4	4.5	0.03 J	9.2	0.33
Benzo(G,H,I)Perylene	0.11 J	0.28 J	0.71	0.075 J	0.023 U	0.45	13 J	6.5 J	21	1.7	4.4	0.035 J	7.5	0.34 J
Benzo(K)Fluoranthene	0.056	0.19	0.41	0.035 J	0.017 U	0.38	6.5	4.1	10	0.87	2.1	0.016 J	3.8	0.12
Benzyl Butyl Phthalate	0.013 U	0.015 U	0.012 U	0.012 U	0.012 U	0.21 J	0.056 U	0.055 U	5.6	0.04 J	0.011 U	0.045 J	0.63 J+	0.011 U
Biphenyl (Diphenyl)	0.036 U	0.041 U	0.033 U	0.032 U	0.034 U	0.03 U	0.16 U	0.15 U	0.16 U	0.045 U	0.031 U	0.032 U	0.064 U	0.03 U
Bis(2-Chloroethoxy) Methane	0.013 U	0.015 U	0.012 U	0.012 U	0.012 U	0.011 U	0.057 U	0.055 U	0.06 U	0.016 U	0.011 U	0.012 U	0.023 U	0.011 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.01 U	0.011 U	0.0092 U	0.0089 U	0.0094 U	0.0084 U	0.043 U	0.042 U	0.045 U	0.012 U	0.0087 U	0.0088 U	0.018 U	0.0084 U
Bis(2-Chloroisopropyl) Ether	0.018 U	0.02 U	0.016 U	0.015 U	0.016 U	0.015 U	0.075 U	0.073 U	0.079 U	0.022 U	0.015 U	0.015 U	0.031 U	0.015 U
Bis(2-Ethylhexyl) Phthalate	0.017 U	0.13 J	0.015 U	0.16 J	0.016 U	0.014 U	0.2 J	0.069 U	2	0.049 J	0.055 J	0.015 U	0.14 J	0.33 J
Caprolactam	0.031 U	0.035 U	0.028 U	0.027 U	0.029 U	0.026 U	0.13 U	0.13 U	0.14 U	0.038 U	0.027 U	0.027 U	0.054 U	0.026 U
Carbazole	0.014 J	0.031 J	0.069 J	0.0093 U	0.0099 U	0.074 J	1.8 J	0.97 J	2.3	0.23 J	0.86	0.0093 U	1.4	0.023 J
Chrysene	0.14 J	0.37 J	0.77	0.09 J	0.011 U	0.75	14 J	7.4 J	21	1.6	4	0.037 J	6.8	0.27 J
Dibenz(A,H)Anthracene	0.023 J	0.059	0.19	0.02 U	0.021 U	0.17	3 J	1.4 J	5.1	0.39	1	0.019 U	1.4	0.079
Dibenzofuran	0.013 U	0.015 U	0.014 J	0.011 U	0.012 U	0.02 J	0.24 J	0.14 J	0.25 J	0.049 J	0.15 J	0.011 U	0.29 J	0.011 U
Diethyl Phthalate	0.012 U	0.014 U	0.011 U	0.011 U	0.011 U	0.01 U	0.052 U	0.05 U	0.055 U	0.015 U	0.01 U	0.011 U	0.021 U	0.01 U
Dimethyl Phthalate	0.012 U	0.014 U	0.011 U	0.011 U	0.012 U	0.01 U	0.053 U	0.052 U	0.056 U	0.015 U	0.011 U	0.011 U	0.022 U	0.01 U

Table E-1
Summary of Data Used in Risk Assessment
Main Plant Area Soil (0-0.5 ft-bgs) - Current
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-025A	CFMW-026	CFMW-028A	CFMW-032A	CFMW-033	CFMW-034	CFMW-035	CFMW-035-DUP	CFMW-037	CFMW-042	CFMW-043	CFMW-044A	CFMW-045A	CFMW-047
Sample Lab IDs	460-117124-1	460-115528-27	460-116402-2	460-118466-1	460-116402-16	460-114793-41	460-114828-22	460-114828-23	460-116119-2	460-115648-15	460-115648-3	460-117381-5	460-118613-2	460-115886-20
Sample Name	CFMW-025a-SO-0-0.5	CFMW-026-SO-0-0.5	CFMW-028a-SO-0-0.5	CFMW-032a-SO-0-0.5	CFMW-033-SO-0-0.5	CFMW-034-SO-0-0.5	CFMW-035-SO-0-0.5	CFMW-DUP11-SO	CFMW-037-SO-0-0.5	CFMW-042-SO-0-0.5	CFMW-043-SO-0-0.5	CFMW-044a-SO-0-0.5	CFMW-045a-SO-0-0.5	CFMW-047-SO-0-0.5
Sample Depth	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft
Chemical	7/13/2016	6/14/2016	6/30/2016	8/8/2016	7/1/2016	5/31/2016	6/1/2016	6/1/2016	6/24/2016	6/16/2016	6/15/2016	7/20/2016	8/12/2016	6/21/2016
Di-N-Butyl Phthalate	0.013 J	0.014 U	0.022 J	0.011 U	0.022 J	0.011 U	0.055 U	0.053 U	0.058 U	0.016 J	0.011 U	0.011 U	0.039 J	0.044 J
Di-N-Octylphthalate	0.022 U	0.024 U	0.02 U	0.019 U	0.02 U	0.018 U	0.093 U	0.09 U	0.098 U	0.027 U	0.019 U	0.019 U	0.038 U	0.018 U
Fluoranthene	0.13 J	0.35 J	0.9	0.079 J	0.012 U	0.71	20 J	11 J	22	1.8	8.1	0.038 J	9	0.27 J
Fluorene	0.0093 UJ	0.01 U	0.023 J	0.0082 U	0.0087 U	0.044 J	0.54 J	0.31 J	0.53 J	0.091 J	0.29 J	0.0081 U	0.44 J	0.0078 U
Hexachlorobenzene	0.017 U	0.019 U	0.016 U	0.015 U	0.016 U	0.014 U	0.074 U	0.072 U	0.078 U	0.021 U	0.015 U	0.015 U	0.031 U	0.014 U
Hexachlorobutadiene	0.012 UJ	0.014 U	0.011 U	0.011 U	0.011 U	0.01 U	0.051 U	0.05 U	0.054 U	0.015 U	0.01 U	0.011 U	0.021 U	0.01 U
Hexachlorocyclopentadiene	0.027 U	0.03 U	0.024 U	0.023 U	0.025 U	0.022 U	0.11 U	0.11 U	0.12 U	0.033 U	0.023 U	0.023 U	0.047 U	0.022 U
Hexachloroethane	0.016 U	0.018 U	0.014 U	0.014 U	0.015 U	0.013 U	0.067 U	0.065 U	0.07 U	0.019 U	0.013 U	0.014 U	0.028 U	0.013 U
Indeno(1,2,3-C,D)Pyrene	0.1	0.3	0.71	0.091	0.027 U	0.47	13 J	6.6 J	20	1.8	4.5	0.028 J	6	0.32
Isophorone	0.0092 U	0.01 U	0.0084 U	0.0081 U	0.0086 U	0.0076 U	0.039 U	0.038 U	0.041 U	0.011 U	0.0079 U	0.008 U	0.016 U	0.0077 U
Naphthalene	0.011 U	0.012 U	0.012 J	0.0096 U	0.01 U	0.014 J	0.16 J	0.1 J	0.22 J	0.055 J	0.15 J	0.0095 U	0.75	0.0091 U
Nitrobenzene	0.013 U	0.015 U	0.012 U	0.012 U	0.013 U	0.011 U	0.057 U	0.056 U	0.06 U	0.016 U	0.012 U	0.012 U	0.024 U	0.011 U
N-Nitrosodi-N-Propylamine	0.014 U	0.016 U	0.013 U	0.013 U	0.013 U	0.012 U	0.061 U	0.06 U	0.064 U	0.018 U	0.012 U	0.013 U	0.025 U	0.012 U
N-Nitrosodiphenylamine	0.039 U	0.044 U	0.035 U	0.034 U	0.036 U	0.032 U	0.17 U	0.16 U	0.17 U	0.048 U	0.033 U	0.034 U	0.068 U	0.032 U
Pentachlorophenol	0.052 U	0.058 U	0.047 U	0.046 U	0.048 U	0.043 U	0.22 U	0.21 U	0.23 U	0.063 U	0.045 U	0.045 U	0.091 U	0.043 U
Phenanthrene	0.072 J	0.14 J	0.47	0.049 J	0.011 U	0.45	12 J	6.4 J	11	1.1	6.4	0.022 J	6	0.13 J
Phenol	0.014 U	0.016 U	0.013 U	0.012 U	0.013 U	0.012 U	0.06 U	0.058 U	0.063 U	0.017 U	0.012 U	0.012 U	0.025 U	0.012 U
Pyrene	0.11 J	0.34 J	1.1	0.094 J	0.018 U	0.65	23 J	13 J	35	2.1	7.4	0.044 J	9.9	0.3 J

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-1
Summary of Data Used in Risk Assessment
Main Plant Area Soil (0-0.5 ft-bgs) - Current
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-049	CFMW-050	CFMW-053A	CFMW-054	CFMW-070	CFSB-038	CFSB-040	CFSB-042	CFSB-044	CFSB-045	CFSB-046	CFSB-048	CFSB-050	CFSB-051
Sample Lab IDs	460-119134-1	460-116014-7	460-118952-2	460-115886-3	180-77944-1, 460-156665-1	460-114275-23	460-114275-10	460-114275-7	460-114141-46	460-114275-27	460-114141-44	460-114141-49	460-114275-24	460-114275-16
Sample Name	CFMW-049-SO-0-0.5	CFMW-050-SO-0-0.5	CFMW-053a-SO-0-0.5	CFMW-054-SO-0-0.5	CFMW-070-SO-0-0.5	CFSB-038-SO-0-0.5	CFSB-040-SO-0-0.5	CFSB-042-SO-0-0.5	CFSB-044-SO-0-0.5	CFSB-045-SO-0-0.5	CFSB-046-SO-0-0.5	CFSB-048-SO-0-0.5	CFSB-050-SO-0-0.5	CFSB-051-SO-0-0.5
Sample Depth	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft
Chemical	8/20/2016	6/22/2016	8/17/2016	6/20/2016	5/16/2018	5/21/2016	5/20/2016	5/20/2016	5/20/2016	5/21/2016	5/20/2016	5/20/2016	5/21/2016	5/21/2016
GENERAL CHEMISTRY (mg/kg)														
Fluoride	11.4 J+	21.2 J+	8.82	231 J	277 J	87.3	203 J-	50.7 J-	330 J-	199	31.7 J-	109 J-	126	77 J-
Cyanide	0.066 J	0.8	0.19	0.027 J	0.62 J-	0.07 J	0.044 J	0.055 J	0.17	0.14	0.015 U	0.16	0.048 J	0.026 J
METALS (mg/kg)														
"Chromium, Hexavalent - Estimated"	0.17129	0.331873	0.2382	0.302433	2.16253	0.259611	0.286375	0.369343	0.281022	0.254258	1.98589	0.240876	0.20073	0.746715
"Chromium, Trivalent - Calculated"	--	--	--	--	--	--	--	--	--	--	--	--	--	--
"Chromium, Trivalent - Estimated"	6.22871	12.0681	8.6618	10.9976	78.6375	9.44039	10.4136	13.4307	10.219	9.24574	72.2141	8.75912	7.29927	27.1533
Aluminum	6580	19500	14500	18600	31200	10300 J	12500	9540	12900	9500 J	9230	12700	6780 J	7960
Antimony	0.28 UJ	0.52 U	0.47 U	0.43 UJ	0.61 J	0.45 UJ	0.44 J-	0.57 J-	0.48 J-	0.42 UJ	0.41 UJ	0.46 UJ	0.44 UJ	0.44 UJ
Arsenic	4.1 J	5.9	5.5	6	7.4	7.6	4.9 J	4.8 J	5.5	4.3	4.6	4.3	2.7	4.5 J
Barium	70.9 J	239	259	104 J	102	113	70	76.6	104 J+	91.2	83.2 J+	78.5 J+	54.3	72.7
Beryllium	0.26 J	0.69	0.54	0.61	0.91	0.39 J	0.4 J	0.37 J	0.59	0.41	0.35 J	0.56	0.26 J	0.3 J
Cadmium	0.3 U	0.39 U	0.35 U	0.33 U	0.6 J	0.34 U	0.39 J	0.31 U	0.39 J	0.32 U	0.31 U	0.35 U	0.34 U	0.33 U
Calcium	6920 J	4040	4510 J	3640 J	25200	12900 J	18500 J	17500 J	23900	33000 J	54700	17300	12400 J	31000 J
Chromium, Total	6.4	12.4	8.9	11.3 J	80.8	9.7 J	10.7	13.8	10.5	9.5 J	74.2	9	7.5 J	27.9
Cobalt	3.3	6.3	6.7	6.2	5.9	6.3	5.2	4.7	5.4	4.1	5.4	4.8	3.7	5.1
Copper	13.2 J	17.5 J	14.9	13.7	34.5	23.4 J	20.7 J+	19.8 J+	18.6	13.4 J	23.4	15.5	14.7 J	13.1 J+
Iron	8070	15800	16400	19700	21500	16000 J	13100	14900	13200	11900 J	14300	11400	9380 J	13500
Lead	5.8 J	31.7	12.2 J+	9.1 J	31.5	16.3 J	27.2 J	16.4 J	14.5	41.9 J	32.1	16.2	22 J	39.4 J
Magnesium	5960	6760	7140 J	11000	7740	8020 J	7660 J	12200 J	8290	10300 J	14100	8960	6350 J	8550 J
Manganese	332	739	1270	413	377	560	332	425	358	353	510	301	261	374
Mercury	0.021	0.031	0.019	0.021	0.01 U	0.019	0.025	0.029	0.022	0.024	0.02	0.021	0.019	0.015 J
Nickel	7.6	26.3	13.9	15	75	16 J	18.2 J+	12.8 J+	46.1	12 J	13.4	31.4	11.8 J	13.4 J+
Potassium	408 J+	1510	929	1070	1580	863	895 J	754 J	980	1040	1410	783	552	700 J
Selenium	0.26 U	0.48 U	0.44 U	0.41 U	0.31 U	0.42 J	0.39 U	0.38 U	0.63 J	0.39 U	0.38 U	0.43 U	0.42 U	0.41 U
Silver	0.55 U	0.95 U	0.85 U	0.79 U	0.65 U	0.82 U	0.77 U	0.75 U	0.76 U	0.77 U	0.75 U	0.96 J	0.81 U	0.8 U
Sodium	38 U	48.3 U	214	676	4750	61.9 J	256	95 J	576	256	75.3 J	124	68.1 J	197
Thallium	0.11 U	0.19 U	0.18 U	0.16 U	0.13 U	0.17 U	0.16 U	0.15 U	0.16 U	0.16 U	0.15 U	0.17 U	0.17 U	0.16 U
Vanadium	6.1	19.2 J	15	14.5	20.2	11.6 J	12.7	9.5	23.1	11.8 J	7.9	15.8	9 J	12
Zinc	26.3	76.7	49.5	52.8	96.1	47.7 J	72.9 J	53.5 J	57.3	51.6 J	39.3	50.1	63.8 J	81.6 J
METALS|HEXAVALENT CHROMIUM (mg/kg)														
Chromium, Hexavalent	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PESTICIDES (mg/kg)														
Aldrin	0.00091 U	0.0011 U	0.00094 U	0.00089 U	--	--	--	0.00092 U	0.00089 U	--	--	--	--	--
Alpha Bhc (Alpha Hexachlorocyclohexane)	0.00069 U	0.0008 U	0.0007 U	0.00067 U	--	--	--	0.0007 U	0.00067 U	--	--	--	--	--
Alpha Endosulfan	0.001 U	0.0012 U	0.0011 U	0.001 U	--	--	--	0.0011 U	0.001 U	--	--	--	--	--
Beta Bhc (Beta Hexachlorocyclohexane)	0.00073 U	0.00085 U	0.00075 U	0.00071 U	--	--	--	0.00074 U	0.00071 U	--	--	--	--	--
Beta Endosulfan	0.0012 U	0.0014 U	0.0012 U	0.0012 U	--	--	--	0.0012 U	0.0012 U	--	--	--	--	--
cis-Chlordane	0.0012 U	0.0014 U	0.0013 U	0.0012 U	--	--	--	0.0012 U	0.0012 U	--	--	--	--	--
Delta BHC (Delta Hexachlorocyclohexane)	0.00082 U	0.00095 U	0.00084 U	0.0008 U	--	--	--	0.00083 U	0.0008 U	--	--	--	--	--
Dieldrin	0.00098 U	0.0011 U	0.001 U	0.00095 U	--	--	--	0.00099 U	0.00095 U	--	--	--	--	--
Endosulfan Sulfate	0.00088 U	0.001 U	0.0009 U	0.00085 U	--	--	--	0.00089 U	0.00086 U	--	--	--	--	--
Endrin	0.00096 U	0.0011 U	0.00098 U	0.00093 U	--	--	--	0.00097 U	0.00093 U	--	--	--	--	--
Endrin Aldehyde	0.00093 U	0.0011 U	0.00096 U	0.00091 U	--	--	--	0.00095 U	0.00091 U	--	--	--	--	--
Endrin Ketone	0.001 U	0.0012 U	0.0011 U	0.001 U	--	--	--	0.0011 U	0.001 U	--	--	--	--	--
Gamma Bhc (Lindane)	0.00068 U	0.00078 U	0.00069 U	0.00066 U	--	--	--	0.00068 U	0.00066 U	--	--	--	--	--
Heptachlor	0.00097 U	0.0011 U	0.00099 U	0.00094 U	--	--	--	0.00098 U	0.00094 U	--	--	--	--	--
Heptachlor Epoxide	0.0015 U	0.0017 U	0.0015 U	0.0014 U	--	--	--	0.0015 U	0.0014 U	--	--	--	--	--
Methoxychlor	0.0016 U	0.0019 U	0.0016 U	0.0016 U	--	--	--	0.0016 U	0.0016 U	--	--	--	--	--
P,P'-DDD	0.00099 U	0.0012 U	0.001 U	0.00096 U	--	--	--	0.001 U	0.00096 U	--	--	--	--	--
P,P'-DDE	0.0011 U	0.0013 U	0.0011 U	0.0011 U	--	--	--	0.0011 U	0.0011 U	--	--	--	--	--
P,P'-DDT	0.00078 U	0.0009 U	0.0008 U	0.00076 U	--	--	--	0.00079 U	0.00076 U	--	--	--	--	--
Toxaphene	0.022 U	0.025 U	0.023 U	0.021 U	--	--	--	0.022 U	0.021 U	--	--	--	--	--
trans-Chlordane	0.0016 U	0.0019 U	0.0017 U	0.0016 U	--	--	--	0.0017 U	0.0016 U	--	--	--	--	--
POLYCHLORINATED BIPHENYLS (mg/kg)														
PCB-1016 (Aroclor 1016)	0.01 U	0.012 U	0.01 U	0.0097 U	--	0.0098 U	0.0096 U	0.01 U	0.0098 U	0.0093 U	0.0093 U	0.01 U	0.0099 U	0.0095 U
PCB-1221 (Aroclor 1221)	0.01 U	0.012 U	0.01 U	0.0097 U	--	0.0098 U	0.0096 U	0.01 U	0.0098 U	0.0093 U	0.0093 U	0.01 U	0.0099 U	0.0095 U
PCB-1232 (Aroclor 1232)	0.01 U	0.012 U	0.01 U	0.0097 U	--	0.0098 U	0.0096 U	0.01 U	0.0098 U	0.0093 U	0.0093 U	0.01 U	0.0099 U	0.0095 U

Table E-1
Summary of Data Used in Risk Assessment
Main Plant Area Soil (0-0.5 ft-bgs) - Current
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-049	CFMW-050	CFMW-053A	CFMW-054	CFMW-070	CFSB-038	CFSB-040	CFSB-042	CFSB-044	CFSB-045	CFSB-046	CFSB-048	CFSB-050	CFSB-051
Sample Lab IDs	460-119134-1	460-116014-7	460-118952-2	460-115886-3	180-77944-1, 460-156665-1	460-114275-23	460-114275-10	460-114275-7	460-114141-46	460-114275-27	460-114141-44	460-114141-49	460-114275-24	460-114275-16
Sample Name	CFMW-049-SO-0-0.5	CFMW-050-SO-0-0.5	CFMW-053a-SO-0-0.5	CFMW-054-SO-0-0.5	CFMW-070-SO-0-0.5	CFSB-038-SO-0-0.5	CFSB-040-SO-0-0.5	CFSB-042-SO-0-0.5	CFSB-044-SO-0-0.5	CFSB-045-SO-0-0.5	CFSB-046-SO-0-0.5	CFSB-048-SO-0-0.5	CFSB-050-SO-0-0.5	CFSB-051-SO-0-0.5
Sample Depth	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft
Chemical	8/20/2016	6/22/2016	8/17/2016	6/20/2016	5/16/2018	5/21/2016	5/20/2016	5/20/2016	5/20/2016	5/21/2016	5/20/2016	5/20/2016	5/21/2016	5/21/2016
PCB-1242 (Aroclor 1242)	0.01 U	0.012 U	0.01 U	0.0097 U	--	0.0098 U	0.0096 U	0.01 U	0.0098 U	0.0093 U	0.0093 U	0.01 U	0.0099 U	0.0095 U
PCB-1248 (Aroclor 1248)	0.01 U	0.012 U	0.01 U	0.0097 U	--	0.0098 U	0.0096 U	0.01 U	0.0098 U	0.0093 U	0.0093 U	0.01 U	0.0099 U	0.0095 U
PCB-1254 (Aroclor 1254)	0.01 U	0.012 U	0.011 U	0.01 U	--	0.01 U	0.0099 U	0.01 U	0.01 U	0.0096 U	0.0096 U	0.011 U	0.01 U	0.0098 U
PCB-1260 (Aroclor 1260)	0.01 U	0.012 U	0.011 U	0.01 U	--	0.01 U	0.0099 U	0.01 U	0.01 U	0.0096 U	0.0096 U	0.011 U	0.01 U	0.0098 U
PCB-1262 (Aroclor 1262)	0.01 U	0.012 U	0.011 U	0.01 U	--	0.01 U	0.0099 U	0.01 U	0.01 U	0.0096 U	0.0096 U	0.011 U	0.01 U	0.0098 U
PCB-1268 (Aroclor 1268)	0.01 U	0.012 U	0.011 U	0.01 U	--	0.01 U	0.0099 U	0.01 U	0.01 U	0.0096 U	0.0096 U	0.011 U	0.01 U	0.0098 U
Polychlorinated Biphenyl (PCBs)	0.01 U	0.012 U	0.011 U	0.01 U	--	0.01 U	0.0099 U	0.01 U	0.01 U	0.0096 U	0.0096 U	0.011 U	0.01 U	0.0098 U
SEMIVOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,2,4,5-Tetrachlorobenzene	0.028 U	0.032 U	0.028 U	0.027 U	0.077 U	0.027 U	1.3 U	0.28 U	0.54 U	0.13 U	0.026 U	0.28 U	0.027 U	0.026 U
1,4-Dioxane (P-Dioxane)	0.1 U	0.12 U	0.1 U	0.097 U	0.55 U	0.098 U	4.7 U	1 U	1.9 U	0.46 U	0.092 U	1 U	0.098 U	0.094 U
2,3,4,6-Tetrachlorophenol	0.035 U	0.041 U	0.036 U	0.034 U	0.74 U	0.034 U	1.7 U	0.35 U	0.68 U	0.16 U	0.032 U	0.36 U	0.035 U	0.033 U
2,4,5-Trichlorophenol	0.037 U	0.043 U	0.038 U	0.036 U	0.13 U	0.036 U	1.8 U	0.37 U	0.72 U	0.17 U	0.034 U	0.38 U	0.037 U	0.035 U
2,4,6-Trichlorophenol	0.011 U	0.012 U	0.011 U	0.01 U	0.098 U	0.01 U	0.5 U	0.11 U	0.21 U	0.049 U	0.0098 U	0.11 U	0.01 U	0.01 U
2,4-Dichlorophenol	0.0088 U	0.01 U	0.009 U	0.0085 U	0.14 U	0.0086 U	0.42 U	0.089 U	0.17 U	0.041 U	0.0081 U	0.09 U	0.0087 U	0.0083 U
2,4-Dimethylphenol	0.082 U	0.095 U	0.084 U	0.08 U	0.11 U	0.08 U	3.9 U	0.83 U	1.6 U	0.38 U	0.076 U	0.84 U	0.081 U	0.078 U
2,4-Dinitrophenol	0.28 U	0.33 U	0.29 U	0.27 U	4.8 UJ	0.28 U	13 U	2.8 U	5.5 U	1.3 U	0.26 U	2.9 U	0.28 U	0.27 U
2,4-Dinitrotoluene	0.015 U	0.017 U	0.015 U	0.014 U	0.089 U	0.014 U	0.7 U	0.15 U	0.29 U	0.069 U	0.014 U	0.15 U	0.015 U	0.014 U
2,6-Dinitrotoluene	0.02 U	0.023 U	0.02 U	0.019 U	0.11 U	0.019 U	0.94 U	0.2 U	0.38 U	0.092 U	0.018 U	0.2 U	0.02 U	0.019 U
2-Chloronaphthalene	0.0085 U	0.0098 U	0.0086 U	0.0082 U	0.082 U	0.0083 U	0.4 U	0.085 U	0.16 U	0.039 U	0.0078 U	0.087 U	0.0083 U	0.008 U
2-Chlorophenol	0.0095 U	0.011 U	0.0097 U	0.0092 U	0.083 U	0.0093 U	0.45 U	0.096 U	0.18 U	0.044 U	0.0087 U	0.097 U	0.0093 U	0.009 U
2-Methylnaphthalene	0.0083 U	0.01 J	0.0084 U	0.008 U	0.087 J	0.03 J	1.4 J	0.4 J	1.7 J	0.1 J	0.014 J	0.26 J	0.1 J	0.027 J
2-Methylphenol (O-Cresol)	0.016 U	0.019 U	0.017 U	0.016 U	0.51 U	0.016 U	0.77 U	0.16 U	0.31 U	0.076 U	0.015 U	0.17 U	0.016 U	0.015 U
2-Nitroaniline	0.012 U	0.014 U	0.013 U	0.012 U	0.81 U	0.012 U	0.59 U	0.12 U	0.24 U	0.057 U	0.011 U	0.13 U	0.012 U	0.012 U
2-Nitrophenol	0.013 U	0.014 U	0.013 U	0.012 U	0.1 U	0.012 U	0.6 U	0.13 U	0.24 U	0.058 U	0.012 U	0.13 U	0.012 U	0.012 U
3- And 4- Methylphenol (Total)	0.0099 U	0.036 J	0.01 U	0.0096 U	--	0.0097 U	0.47 U	0.1 U	0.19 U	0.046 U	0.0092 U	0.1 U	0.0098 U	0.0094 U
3,3'-Dichlorobenzidine	0.042 U	0.048 U	0.043 U	0.04 U	1.7 U	0.041 U	2 U	0.42 U	0.81 U	0.19 U	0.038 U	0.43 U	0.041 U	0.039 U
3-Nitroaniline	0.011 U	0.013 U	0.011 U	0.011 U	0.45 U	0.011 U	0.53 U	0.11 U	0.21 U	0.051 U	0.01 U	0.11 U	0.011 U	0.01 U
4,6-Dinitro-2-Methylphenol	0.1 U	0.12 U	0.1 U	0.096 U	3.1 U	0.097 U	4.7 U	1 U	1.9 U	0.46 U	0.092 U	1 U	0.098 U	0.094 U
4-Bromophenyl Phenyl Ether	0.012 U	0.014 U	0.012 U	0.011 U	0.12 U	0.011 U	0.56 U	0.12 U	0.23 U	0.055 U	0.011 U	0.12 U	0.012 U	0.011 U
4-Chloro-3-Methylphenol	0.016 U	0.019 U	0.016 U	0.016 U	0.084 U	0.016 U	0.76 U	0.16 U	0.31 U	0.074 U	0.015 U	0.16 U	0.016 U	0.015 U
4-Chloroaniline	0.0096 U	0.011 U	0.0098 U	0.0093 U	0.059 U	0.0094 U	0.46 U	0.097 U	0.19 U	0.045 U	0.0088 U	0.098 U	0.0095 U	0.0091 U
4-Chlorophenyl Phenyl Ether	0.011 U	0.013 U	0.011 U	0.011 U	0.11 U	0.011 U	0.53 U	0.11 U	0.22 U	0.052 U	0.01 U	0.11 U	0.011 U	0.011 U
4-Nitroaniline	0.014 U	0.016 U	0.014 U	0.014 U	0.086 U	0.014 U	0.67 U	0.14 U	0.27 U	0.066 U	0.013 U	0.14 U	0.014 U	0.013 U
4-Nitrophenol	0.18 U	0.21 U	0.18 U	0.17 U	1.2 UJ	0.18 U	8.5 U	1.8 U	3.5 U	0.83 U	0.17 U	1.8 U	0.18 U	0.17 U
Acenaphthene	0.009 U	0.014 J	0.015 J	0.0087 U	0.76	0.22 J	15 J	2.2 J	3.7 J	0.82 J	0.097 J	1.6 J	0.58	0.21 J
Acenaphthylene	0.0096 U	0.011 U	0.0098 U	0.0093 U	0.078 U	0.0094 U	0.46 U	0.097 U	0.19 U	0.045 U	0.0088 U	0.098 U	0.0095 U	0.0091 U
Acetophenone	0.0081 U	0.0094 U	0.0083 U	0.0079 U	0.097 U	0.0079 U	0.39 U	0.082 U	0.16 U	0.038 U	0.0075 U	0.083 U	0.008 U	0.0077 U
Anthracene	0.035 U	0.041 U	0.036 U	0.034 U	2.2	0.33 J	22	9.5	7.6	1.4 J	0.22 J	4.2	0.9	0.47
Atrazine	0.017 U	0.019 U	0.017 U	0.016 U	0.78 UJ	0.016 U	0.79 U	0.17 U	0.32 U	0.077 U	0.015 U	0.17 U	0.016 U	0.016 U
Benzaldehyde	0.028 U	0.033 U	0.037 J	0.028 U	0.22 UR	0.028 U	1.4 U	0.29 U	0.55 U	0.13 U	0.026 U	0.29 U	0.028 U	0.027 U
Benzo(A)Anthracene	0.031 U	0.23	0.21	0.053	17	1.2	110	21	46	8.2	1.6	29	3.3	3.4
Benzo(A)Pyrene	0.11	0.32	0.24	0.063	22	1.3	130	24	42	11	2	37	4.6	3.6
Benzo(B)Fluoranthene	0.21	0.75	0.49	0.14	27	2.9	150	31	62	14	2.8	47	5.3	5.4
Benzo(G,H,I)Perylene	0.18 J	0.4 J	0.3 J	0.068 J	36	1.4	99	20	33	19 J+	2.1	35 J+	4.5	3.5 J+
Benzo(K)Fluoranthene	0.071	0.22	0.15	0.051	8.6	0.97	68	13	23	5	1	17	2.2	2
Benzyl Butyl Phthalate	0.012 U	0.013 U	0.012 U	0.011 U	1.2 U	0.011 U	0.55 U	0.12 U	0.22 U	0.31 J	0.011 U	0.12 U	3.3	0.098 J
Biphenyl (Diphenyl)	0.032 U	0.037 U	0.033 U	0.031 U	0.075 U	0.031 U	1.5 U	0.32 U	0.62 U	0.15 U	0.029 U	0.33 U	0.034 J	0.03 U
Bis(2-Chloroethoxy) Methane	0.012 U	0.013 U	0.012 U	0.011 U	0.085 U	0.011 U	0.55 U	0.12 U	0.23 U	0.054 U	0.011 U	0.12 U	0.011 U	0.011 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.0088 U	0.01 U	0.009 U	0.0085 U	0.065 U	0.0086 U	0.42 U	0.089 U	0.17 U	0.041 U	0.0081 U	0.09 U	0.0087 U	0.0083 U
Bis(2-Chloroisopropyl) Ether	0.015 U	0.018 U	0.016 U	0.015 U	0.13 U	0.015 U	0.73 U	0.15 U	0.3 U	0.071 U	0.014 U	0.16 U	0.015 U	0.015 U
Bis(2-Ethylhexyl) Phthalate	0.015 U	5.8	0.055 J	0.1 J	1.9 U	0.014 U	0.69 U	0.15 U	0.28 U	0.26 J	0.013 U	0.15 U	0.014 U	0.096 J
Caprolactam	0.027 U	0.031 U	0.027 U	0.026 U	1.2 U	0.026 U	1.3 U	0.27 U	0.52 U	0.12 UJ	0.025 U	0.27 U	0.026 U	0.025 UJ
Carbazole	0.0093 U	0.036 J	0.038 J	0.009 U	2.4	0.2 J	17 J	6.5	6.8 J	1.2 J	0.22 J	3.2 J	0.65	0.4
Chrysene	0.18 J	0.45	0.34 J	0.098 J	22	1.9	130	28	57	10	2.1	34	3.8	4.4
Dibenz(A,H)Anthracene	0.019 U	0.088	0.048	0.019 U	6	0.42	28	5.4	8.3 J+	3.1 J+	0.52 J+	8.6 J+	1.2	0.95 J+
Dibenzofuran	0.011 U	0.013 U	0.012 U	0.011 U	0.24 J	0.081 J	4.8 J	0.88 J	1.5 J	0.37 J	0.041 J	0.48 J	0.3 J	0.085 J
Diethyl Phthalate	0.011 U	0.012 U	0.011 U	0.01 U	0.53 U	0.01 U	0.5 U	0.11 U	0.21 U	0.049 U	0.0098 U	0.11 U	0.01 U	0.01 U
Dimethyl Phthalate	0.011 U	0.013 U	0.011 U	0.01 U	0.065 U	0.011 U	0.52 U	0.11 U	0.21 U	0.05 U	0.01 U	0.11 U	0.011 U	0.01 U

Table E-1
Summary of Data Used in Risk Assessment
Main Plant Area Soil (0-0.5 ft-bgs) - Current
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-049	CFMW-050	CFMW-053A	CFMW-054	CFMW-070	CFSB-038	CFSB-040	CFSB-042	CFSB-044	CFSB-045	CFSB-046	CFSB-048	CFSB-050	CFSB-051
Sample Lab IDs	460-119134-1	460-116014-7	460-118952-2	460-115886-3	180-77944-1, 460-156665-1	460-114275-23	460-114275-10	460-114275-7	460-114141-46	460-114275-27	460-114141-44	460-114141-49	460-114275-24	460-114275-16
Sample Name	CFMW-049-SO-0-0.5	CFMW-050-SO-0-0.5	CFMW-053a-SO-0-0.5	CFMW-054-SO-0-0.5	CFMW-070-SO-0-0.5	CFSB-038-SO-0-0.5	CFSB-040-SO-0-0.5	CFSB-042-SO-0-0.5	CFSB-044-SO-0-0.5	CFSB-045-SO-0-0.5	CFSB-046-SO-0-0.5	CFSB-048-SO-0-0.5	CFSB-050-SO-0-0.5	CFSB-051-SO-0-0.5
Sample Depth	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft
Chemical	8/20/2016	6/22/2016	8/17/2016	6/20/2016	5/16/2018	5/21/2016	5/20/2016	5/20/2016	5/20/2016	5/21/2016	5/20/2016	5/20/2016	5/21/2016	5/21/2016
Di-N-Butyl Phthalate	0.011 U	0.013 U	0.021 J	0.042 J	0.78 U	0.011 U	0.53 U	0.11 U	0.22 U	0.052 U	0.01 U	0.11 U	0.08 J	0.014 J
Di-N-Octylphthalate	0.019 U	0.022 U	0.019 U	0.018 U	1 U	0.019 U	0.9 U	0.19 U	0.37 U	0.088 U	0.017 U	0.19 U	0.019 U	0.018 U
Fluoranthene	0.086 J	0.45	0.37 J	0.086 J	23	2.2	170	46	75	14	2.3	36	5.5	5.4
Fluorene	0.0081 U	0.0094 U	0.012 J	0.0079 U	0.46	0.17 J	10 J	1.9 J	2.2 J	0.62 J	0.074 J	0.88 J	0.46	0.14 J
Hexachlorobenzene	0.015 U	0.017 U	0.015 U	0.015 U	0.13 U	0.015 U	0.72 U	0.15 U	0.29 U	0.07 U	0.014 U	0.15 U	0.015 U	0.014 U
Hexachlorobutadiene	0.011 U	0.012 U	0.011 U	0.01 U	0.1 U	0.01 U	0.5 U	0.11 U	0.2 U	0.049 U	0.0097 U	0.11 U	0.01 U	0.0099 U
Hexachlorocyclopentadiene	0.023 U	0.027 U	0.024 U	0.023 U	0.091 UJ	0.023 U	1.1 U	0.23 U	0.45 U	0.11 U	0.021 U	0.24 U	0.023 U	0.022 U
Hexachloroethane	0.014 U	0.016 U	0.014 U	0.013 U	0.092 U	0.013 U	0.65 U	0.14 U	0.26 U	0.063 U	0.013 U	0.14 U	0.013 U	0.013 U
Indeno(1,2,3-C,D)Pyrene	0.15	0.42	0.29	0.064	23	1.4	100 J+	21 J+	37 J+	16 J+	2 J+	35 J+	4.4	3.6 J+
Isophorone	0.008 U	0.046 J	0.0082 U	0.0078 U	0.091 U	0.0078 U	0.38 U	0.081 U	0.16 U	0.076 J	0.0074 U	0.082 U	0.035 J	0.0076 U
Naphthalene	0.0095 U	0.02 J	0.015 J	0.0092 U	0.15 J	0.062 J	3 J	0.72 J	4 J	0.29 J	0.038 J	0.74 J	0.68	0.068 J
Nitrobenzene	0.012 U	0.014 U	0.012 U	0.011 U	0.65 U	0.011 U	0.56 U	0.12 U	0.23 U	0.055 U	0.011 U	0.12 U	0.012 U	0.011 U
N-Nitrosodi-N-Propylamine	0.013 U	0.014 U	0.013 U	0.012 U	0.12 U	0.012 U	0.6 UJ	0.13 UJ	0.24 U	0.058 U	0.012 U	0.13 U	0.012 U	0.012 U
N-Nitrosodiphenylamine	0.034 U	0.039 U	0.035 U	0.033 U	0.59 U	0.033 U	1.6 U	0.34 U	0.66 U	0.16 U	0.031 U	0.35 U	0.033 U	0.032 U
Pentachlorophenol	0.045 U	0.052 U	0.046 U	0.044 U	2.9 UJ	0.044 U	2.1 U	0.46 U	0.87 U	0.21 U	0.042 U	0.46 U	0.044 U	0.043 U
Phenanthrene	0.047 J	0.2 J	0.19 J	0.041 J	11	1.5	120	32	39	6.9	1.3	18	4	2.2
Phenol	0.012 U	0.014 U	0.012 U	0.012 U	0.54 U	0.012 U	0.58 U	0.12 U	0.24 U	0.057 U	0.011 U	0.12 U	0.012 U	0.012 U
Pyrene	0.11 J	0.43	0.36 J	0.096 J	27	2.4	220	57	86	12	2.6	45	5.1	5.2

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-1
Summary of Data Used in Risk Assessment
Main Plant Area Soil (0-0.5 ft-bgs) - Current
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-054	CFSB-060	CFSB-062	CFSB-064	CFSB-065	CFSB-066	CFSB-069	CFSB-071	CFSB-095	CFSB-097	CFSB-098	CFSB-099	CFSB-100	CFSB-121
Sample Lab IDs	460-114793-20	460-114793-8	460-114828-40	460-115008-7	460-114828-34	460-114793-12	460-114793-14	460-114793-4	460-114456-37	460-114456-25	460-114456-27	460-114456-23	460-114456-26	460-114141-20
Sample Name	CFSB-054-SO-0-0.5	CFSB-060-SO-0-0.5	CFSB-062-SO-0-0.5	CFSB-064-SO-0-0.5	CFSB-065-SO-0-0.5	CFSB-066-SO-0-0.5	CFSB-069-SO-0-0.5	CFSB-071-SO-0-0.5	CFSB-095-SO-0-0.5	CFSB-097-SO-0-0.5	CFSB-098-SO-0-0.5	CFSB-099-SO-0-0.5	CFSB-100-SO-0-0.5	CFSB-121-SO-0-0.5
Sample Depth	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft
Chemical	5/28/2016	5/27/2016	6/2/2016	6/3/2016	6/2/2016	5/27/2016	5/27/2016	5/27/2016	5/24/2016	5/24/2016	5/24/2016	5/24/2016	5/24/2016	5/18/2016
GENERAL CHEMISTRY (mg/kg)														
Fluoride	44 J	16.4 J	25.9 J	33.3 J	46.8 J	571 J	36.3 J	47.3 J	19.5 J-	80.1 J-	93.3 J-	41.7 J+	39.2 J+	13.5 J-
Cyanide	0.083 J-	0.046 J	0.075 J	0.084 J	0.29	0.19	0.034 J	0.072 J	0.053 J	0.089 J	0.077 J	0.29	0.023 J	0.1 J
METALS (mg/kg)														
"Chromium, Hexavalent - Estimated"	0.259611	0.195377	0.294404	0.256934	0.331873	1.24453	0.299757	0.17129	0.235523	0.206083	0.173966	0.388078	0.141849	0.26764
"Chromium, Trivalent - Calculated"	--	--	--	--	--	--	--	--	--	--	--	--	--	--
"Chromium, Trivalent - Estimated"	9.44039	7.10462	10.7056	9.34307	12.0681	45.2555	10.9002	6.22871	8.56448	7.49392	6.32603	14.1119	5.15815	9.73236
Aluminum	13200	6800	14600 J	14500	16600 J	22700	13800	10100	12100	15900	6560	15100	6420	18100
Antimony	0.35 U	0.34 U	0.44 UJ	0.38 UJ	0.47 UJ	0.48 J	0.43 UJ	0.32 U	0.34 UJ	0.39 UJ	0.37 UJ	0.4 UJ	0.34 UJ	0.37 UJ
Arsenic	4.8 J	2.9 J	6.8 J	3.6	5.5 J	6.8 J	4.5	5.7 J	4.4	3.7	2.4	7.6	2.3	5
Barium	89.4 J	92.9 J	149 J	134	208 J	67.7 J	75.8	40.3 J	123	199	52.3	200	59.7	195
Beryllium	0.47	0.29 J	0.63	0.54	0.66	0.75	0.39 J	0.32	0.42	0.57	0.21 J	0.68	0.26 J	0.66
Cadmium	0.27 U	0.26 U	0.34 U	0.29 U	0.35 U	1.7	0.33 U	0.24 U	0.25 U	0.3 U	0.28 U	0.3 U	0.26 U	0.28 U
Calcium	20800 J	26200 J	4730	4270	1940	25400 J	17200	51700 J	12900	4750	31500	36200 J	28200	2570
Chromium, Total	9.7 J	7.3 J	11 J	9.6	12.4 J	46.5 J	11.2	6.4 J	8.8	7.7	6.5	14.5	5.3	10
Cobalt	5.6	4.1	6.4	5.2	7	7.8	5.2	3.5	5.4	5.5	3.5	6.6	2.8	6.4
Copper	11.5	19.3	24.4	12.5 J	22.6	26.5	15.8	9.4	15.2 J+	11.5 J+	8.9 J+	19.9 J+	8.6 J+	12.6
Iron	13200	9790	16400 J	13100	17500 J	19600	15500	13300	12700	13600	11200	15600	6170	16500
Lead	11.1	4.9	14.6 J	10.5 J	14.5 J	18.4	12.4	9.3	11	9.2	4.1	16.9	6.2	11.5
Magnesium	11700 J	13900 J	8100	6980	7960	11300 J	9690	27500 J	8530	7980	10600	16900	7260	7030
Manganese	419 J	364 J	507 J	360	429 J	405 J	361	460 J	411	597	328	506	191	529
Mercury	0.021	0.013 J	0.02	0.015 J	0.069	0.02 J+	0.015 J+	0.025	0.015 J	0.013 U	0.015 J	0.042	0.015 J	0.013 J
Nickel	14.9 J	10.5 J	17.1	14.1	29.2	140 J	15.3	11.2 J	10.6	10.3	6.3	11	10	13
Potassium	861 J	585 J	781	1150 J+	705	1320 J	664	766 J	953 J+	916 J+	492 J+	1090 J+	433 J+	1080
Selenium	0.33 U	0.32 U	0.41 U	0.35 U	0.44 U	0.44 J	0.4 U	0.3 U	0.31 U	0.37 U	0.35 U	0.66 J	0.32 U	0.34 U
Silver	0.65 U	0.63 U	0.81 U	0.69 U	0.85 U	0.6 U	0.79 U	0.59 U	0.61 U	0.72 U	0.68 U	0.73 U	0.63 U	0.67 U
Sodium	56.3 J	32 U	57.1 J	51.2 J	89.4 J	1590	55.8 J	38.5 J	31.3 U	58.1 J	102	52.4 J	57.4 J	39.6 J
Thallium	0.13 U	0.13 U	0.17 U	0.14 U	0.18 U	0.12 U	0.16 U	0.12 U	0.13 U	0.15 U	0.14 U	0.15 U	0.13 U	0.14 U
Vanadium	11.1 J	6 J	15.8 J	14.1	19.7 J	17.7 J	10.7	6.6 J	11.7	12.2	7.4	10.8	6	15.9
Zinc	39.9	27.7	60.5 J	43.3	85.3 J	59.6	46.2	32.9	41.8	45.9	22.2	47.8	22.6	57.9
METALS|HEXAVALENT CHROMIUM (mg/kg)														
Chromium, Hexavalent	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PESTICIDES (mg/kg)														
Aldrin	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00092 U
Alpha Bhc (Alpha Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00069 U
Alpha Endosulfan	--	--	--	--	--	--	--	--	--	--	--	--	--	0.0011 U
Beta Bhc (Beta Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00074 U
Beta Endosulfan	--	--	--	--	--	--	--	--	--	--	--	--	--	0.0012 U
cis-Chlordane	--	--	--	--	--	--	--	--	--	--	--	--	--	0.0012 U
Delta BHC (Delta Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00083 U
Dieldrin	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00099 U
Endosulfan Sulfate	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00089 U
Endrin	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00097 U
Endrin Aldehyde	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00095 U
Endrin Ketone	--	--	--	--	--	--	--	--	--	--	--	--	--	0.0011 U
Gamma Bhc (Lindane)	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00068 U
Heptachlor	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00098 U
Heptachlor Epoxide	--	--	--	--	--	--	--	--	--	--	--	--	--	0.0015 U
Methoxychlor	--	--	--	--	--	--	--	--	--	--	--	--	--	0.0016 U
P,P'-DDD	--	--	--	--	--	--	--	--	--	--	--	--	--	0.001 U
P,P'-DDE	--	--	--	--	--	--	--	--	--	--	--	--	--	0.0011 U
P,P'-DDT	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00079 U
Toxaphene	--	--	--	--	--	--	--	--	--	--	--	--	--	0.022 U
trans-Chlordane	--	--	--	--	--	--	--	--	--	--	--	--	--	0.0017 U
POLYCHLORINATED BIPHENYLS (mg/kg)														
PCB-1016 (Aroclor 1016)	0.0096 U	0.0095 U	0.01 U	0.01 U	0.011 U	0.0096 U	0.0096 U	0.0096 U	0.01 U	0.01 U	0.01 U	0.012 U	0.0093 U	0.01 U
PCB-1221 (Aroclor 1221)	0.0096 U	0.0095 U	0.01 U	0.01 U	0.011 U	0.0096 U	0.0096 U	0.0096 U	0.01 U	0.01 U	0.01 U	0.012 U	0.0093 U	0.01 U
PCB-1232 (Aroclor 1232)	0.0096 U	0.0095 U	0.01 U	0.01 U	0.011 U	0.0096 U	0.0096 U	0.0096 U	0.01 U	0.01 U	0.01 U	0.012 U	0.0093 U	0.01 U

Table E-1
Summary of Data Used in Risk Assessment
Main Plant Area Soil (0-0.5 ft-bgs) - Current
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-054	CFSB-060	CFSB-062	CFSB-064	CFSB-065	CFSB-066	CFSB-069	CFSB-071	CFSB-095	CFSB-097	CFSB-098	CFSB-099	CFSB-100	CFSB-121
Sample Lab IDs	460-114793-20	460-114793-8	460-114828-40	460-115008-7	460-114828-34	460-114793-12	460-114793-14	460-114793-4	460-114456-37	460-114456-25	460-114456-27	460-114456-23	460-114456-26	460-114141-20
Sample Name	CFSB-054-SO-0-0.5	CFSB-060-SO-0-0.5	CFSB-062-SO-0-0.5	CFSB-064-SO-0-0.5	CFSB-065-SO-0-0.5	CFSB-066-SO-0-0.5	CFSB-069-SO-0-0.5	CFSB-071-SO-0-0.5	CFSB-095-SO-0-0.5	CFSB-097-SO-0-0.5	CFSB-098-SO-0-0.5	CFSB-099-SO-0-0.5	CFSB-100-SO-0-0.5	CFSB-121-SO-0-0.5
Sample Depth	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft
Chemical	5/28/2016	5/27/2016	6/2/2016	6/3/2016	6/2/2016	5/27/2016	5/27/2016	5/27/2016	5/24/2016	5/24/2016	5/24/2016	5/24/2016	5/24/2016	5/18/2016
PCB-1242 (Aroclor 1242)	0.0096 U	0.0095 U	0.01 U	0.01 U	0.011 U	0.0096 U	0.0096 U	0.0096 U	0.01 U	0.01 U	0.01 U	0.012 U	0.0093 U	0.01 U
PCB-1248 (Aroclor 1248)	0.0096 U	0.0095 U	0.01 U	0.01 U	0.011 U	0.0096 U	0.0096 U	0.0096 U	0.01 U	0.01 U	0.01 U	0.012 U	0.0093 U	0.01 U
PCB-1254 (Aroclor 1254)	0.0099 U	0.0098 U	0.011 U	0.011 U	0.011 U	0.0099 U	0.0099 U	0.01 U	0.01 U	0.011 U	0.01 U	0.012 U	0.0096 U	0.01 U
PCB-1260 (Aroclor 1260)	0.0099 U	0.0098 U	0.011 U	0.011 U	0.011 U	0.0099 U	0.0099 U	0.01 U	0.01 U	0.011 U	0.01 U	0.012 U	0.0096 U	0.01 U
PCB-1262 (Aroclor 1262)	0.0099 U	0.0098 U	0.011 U	0.011 U	0.011 U	0.0099 U	0.0099 U	0.01 U	0.01 U	0.011 U	0.01 U	0.012 U	0.0096 U	0.01 U
PCB-1268 (Aroclor 1268)	0.0099 U	0.0098 U	0.011 U	0.011 U	0.011 U	0.0099 U	0.0099 U	0.01 U	0.01 U	0.011 U	0.01 U	0.012 U	0.0096 U	0.01 U
Polychlorinated Biphenyl (PCBs)	0.0099 U	0.0098 U	0.011 U	0.011 U	0.011 U	0.0099 U	0.0099 U	0.01 U	0.01 U	0.011 U	0.01 U	0.012 U	0.0096 U	0.01 U
SEMIVOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,2,4,5-Tetrachlorobenzene	0.026 U	0.026 U	0.029 U	0.028 U	0.029 U	0.13 U	0.027 U	0.027 U	0.028 U	0.029 U	0.028 U	0.033 U	0.026 U	0.028 U
1,4-Dioxane (P-Dioxane)	0.095 U	0.094 U	0.1 U	0.1 U	0.1 U	0.47 U	0.095 U	0.096 U	0.099 U	0.1 U	0.1 U	0.12 U	0.093 U	0.1 U
2,3,4,6-Tetrachlorophenol	0.033 U	0.033 U	0.036 U	0.036 U	0.037 U	0.17 U	0.034 U	0.034 U	0.035 U	0.036 U	0.035 U	0.041 U	0.033 U	0.035 U
2,4,5-Trichlorophenol	0.035 U	0.035 U	0.038 U	0.038 U	0.039 U	0.18 U	0.036 U	0.036 U	0.037 U	0.038 U	0.037 U	0.044 U	0.034 U	0.037 U
2,4,6-Trichlorophenol	0.01 U	0.01 U	0.011 U	0.011 U	0.011 U	0.05 U	0.01 U	0.01 U	0.011 U	0.011 U	0.011 U	0.012 U	0.0098 U	0.011 U
2,4-Dichlorophenol	0.0084 U	0.0083 U	0.0091 U	0.0089 U	0.0092 U	0.042 U	0.0084 U	0.0084 U	0.0088 U	0.0091 U	0.0088 U	0.01 U	0.0082 U	0.0089 U
2,4-Dimethylphenol	0.078 U	0.077 U	0.085 U	0.083 U	0.086 U	0.39 U	0.078 U	0.079 U	0.082 U	0.084 U	0.082 U	0.096 U	0.076 U	0.083 U
2,4-Dinitrophenol	0.27 U	0.27 U	0.29 U	0.29 U	0.3 U	1.3 U	0.27 U	0.27 U	0.28 U	0.29 U	0.28 U	0.33 U	0.26 U	0.28 U
2,4-Dinitrotoluene	0.014 U	0.014 U	0.015 U	0.015 U	0.015 U	0.07 U	0.014 U	0.014 U	0.015 U	0.015 U	0.015 U	0.017 U	0.014 U	0.015 U
2,6-Dinitrotoluene	0.019 U	0.019 U	0.021 U	0.02 U	0.021 U	0.094 U	0.019 U	0.019 U	0.02 U	0.02 U	0.02 U	0.023 U	0.018 U	0.02 U
2-Chloronaphthalene	0.008 U	0.008 U	0.0088 U	0.0086 U	0.0089 U	0.04 U	0.0081 U	0.0081 U	0.0084 U	0.0087 U	0.0085 U	0.0099 U	0.0079 U	0.0085 U
2-Chlorophenol	0.009 U	0.009 U	0.0098 U	0.0096 U	0.0099 U	0.045 U	0.0091 U	0.0091 U	0.0094 U	0.0098 U	0.0095 U	0.011 U	0.0088 U	0.0096 U
2-Methylnaphthalene	0.011 J	0.0078 U	0.009 J	0.025 J	0.0086 U	0.078 J	0.0085 J	0.011 J	0.0082 U	0.0085 U	0.013 J	0.0097 U	0.0076 U	0.0083 U
2-Methylphenol (O-Cresol)	0.015 U	0.015 U	0.017 U	0.016 U	0.017 U	0.077 U	0.016 U	0.016 U	0.016 U	0.017 U	0.016 U	0.019 U	0.015 U	0.016 U
2-Nitroaniline	0.012 U	0.012 U	0.013 U	0.012 U	0.013 U	0.058 U	0.012 U	0.012 U	0.012 U	0.013 U	0.012 U	0.014 U	0.011 U	0.012 U
2-Nitrophenol	0.012 U	0.012 U	0.013 U	0.013 U	0.013 U	0.059 U	0.012 U	0.012 U	0.012 U	0.013 U	0.013 U	0.015 U	0.012 U	0.013 U
3- And 4- Methylphenol (Total)	0.0094 U	0.0094 U	0.01 U	0.01 U	0.01 U	0.047 U	0.0095 U	0.0095 U	0.0099 U	0.01 U	0.01 U	0.012 U	0.0092 U	0.01 U
3,3'-Dichlorobenzidine	0.04 U	0.039 U	0.043 U	0.042 U	0.044 U	0.2 U	0.04 U	0.04 U	0.042 U	0.043 U	0.042 U	0.049 U	0.039 U	0.042 U
3-Nitroaniline	0.011 U	0.01 U	0.011 U	0.011 U	0.012 U	0.052 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.013 U	0.01 U	0.011 U
4,6-Dinitro-2-Methylphenol	0.095 U	0.094 U	0.1 U	0.1 U	0.1 U	0.47 U	0.095 U	0.095 U	0.099 U	0.1 U	0.1 U	0.12 U	0.092 U	0.1 U
4-Bromophenyl Phenyl Ether	0.011 U	0.011 U	0.012 U	0.012 U	0.012 U	0.056 U	0.011 U	0.011 U	0.012 U	0.012 U	0.012 U	0.014 U	0.011 U	0.012 U
4-Chloro-3-Methylphenol	0.015 U	0.015 U	0.017 U	0.016 U	0.017 U	0.076 U	0.015 U	0.015 U	0.016 U	0.016 U	0.016 U	0.019 U	0.015 U	0.016 U
4-Chloroaniline	0.0091 U	0.0091 U	0.0099 U	0.0097 U	0.01 U	0.046 U	0.0092 U	0.0092 U	0.0096 U	0.0099 U	0.0096 U	0.011 U	0.0089 U	0.0097 U
4-Chlorophenyl Phenyl Ether	0.011 U	0.011 U	0.012 U	0.011 U	0.012 U	0.053 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.013 U	0.01 U	0.011 U
4-Nitroaniline	0.013 U	0.013 U	0.015 U	0.014 U	0.015 U	0.067 U	0.013 U	0.014 U	0.014 U	0.015 U	0.014 U	0.017 U	0.013 U	0.014 U
4-Nitrophenol	0.17 U	0.17 U	0.19 U	0.18 U	0.19 U	0.85 U	0.17 U	0.17 U	0.18 U	0.18 U	0.18 U	0.21 U	0.17 U	0.18 U
Acenaphthene	0.1 J	0.15 J	0.048 J	0.049 J	0.04 J	0.41 J	0.061 J	0.037 J	0.029 J	0.0095 J	0.067 J	0.011 U	0.0084 U	0.0091 U
Acenaphthylene	0.0091 U	0.0091 U	0.0099 U	0.0097 U	0.01 U	0.046 U	0.01 J	0.0092 U	0.0096 U	0.0099 U	0.0096 U	0.011 U	0.0089 U	0.0097 U
Acetophenone	0.0077 U	0.0077 U	0.0084 U	0.0082 U	0.0085 U	0.046 J	0.0078 U	0.0078 U	0.0081 U	0.0084 U	0.0082 U	0.0095 U	0.0075 U	0.0082 U
Anthracene	0.18 J	0.42	0.094 J	0.089 J	0.085 J	0.93 J	0.12 J	0.077 J	0.052 J	0.036 U	0.17 J	0.042 U	0.033 U	0.036 U
Atrazine	0.016 U	0.016 U	0.017 U	0.017 U	0.017 U	0.079 U	0.016 U	0.016 U	0.017 U	0.017 U	0.017 U	0.019 U	0.015 U	0.017 U
Benzaldehyde	0.027 U	0.027 U	0.029 U	0.031 J	0.03 U	0.13 U	0.027 U	0.027 U	0.028 U	0.029 U	0.029 U	0.033 U	0.026 U	0.029 U
Benzo(A)Anthracene	1.2	3.8	0.45	0.43	0.68	8	0.64	0.51	0.3	0.032 U	1.5	0.045 J	0.14	0.091 J
Benzo(A)Pyrene	1.6	4.5	0.58	0.54	0.91	9	0.81	0.59	0.4	0.012 U	2	0.055 J	0.15	0.11 J
Benzo(B)Fluoranthene	2.1	5.7	1.1	0.87	1.8	15	1.1	0.84	0.78	0.028 J	2.9	0.12 J	0.28	0.24 J
Benzo(G,H,I)Perylene	1.8	3.6	0.53	0.55	1.4	6.8	0.71	0.67	0.59	0.032 J	2.8	0.058 J	0.27 J	0.11 J
Benzo(K)Fluoranthene	0.72	2.1	0.45	0.3	0.65	5.2	0.39	0.37	0.32	0.017 U	0.96	0.019 UJ	0.077	0.072 J
Benzyl Butyl Phthalate	0.011 U	0.011 U	0.012 U	0.012 U	0.012 U	0.055 U	0.011 U	0.3 J+	0.011 U	0.012 U	0.012 U	0.014 U	0.011 U	0.012 U
Biphenyl (Diphenyl)	0.03 U	0.03 U	0.033 U	0.032 U	0.033 U	0.15 U	0.03 U	0.03 U	0.032 U	0.033 U	0.032 U	0.037 U	0.03 U	0.032 U
Bis(2-Chloroethoxy) Methane	0.011 U	0.011 U	0.012 U	0.012 U	0.012 U	0.055 U	0.011 U	0.011 U	0.012 U	0.012 U	0.012 U	0.014 U	0.011 U	0.012 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.0084 U	0.0083 U	0.0091 U	0.0089 U	0.0092 U	0.042 U	0.0084 U	0.0084 U	0.0088 U	0.0091 U	0.0088 U	0.01 U	0.0082 U	0.0089 U
Bis(2-Chloroisopropyl) Ether	0.015 U	0.014 U	0.016 U	0.016 U	0.016 U	0.073 U	0.015 U	0.015 U	0.015 U	0.016 UJ	0.015 UJ	0.018 U	0.014 UJ	0.015 UJ
Bis(2-Ethylhexyl) Phthalate	0.049 J	0.014 U	0.031 J	0.015 U	0.015 U	0.069 U	0.028 J	0.038 J	0.046 J	0.015 U	0.065 J	0.038 J	0.016 J	0.015 U
Caprolactam	0.026 U	0.025 U	0.028 U	0.027 U	0.028 U	0.13 U	0.026 U	0.026 U	0.027 U	0.028 U	0.027 U	0.032 U	0.025 U	0.027 U
Carbazole	0.19 J	0.4	0.11 J	0.088 J	0.16 J	1.7 J	0.13 J	0.088 J	0.069 J	0.0095 U	0.2 J	0.011 J	0.02 J	0.014 J
Chrysene	1.5	4.2	0.84	0.61	1.3	13	0.83	0.68	0.55	0.022 J	2.2	0.089 J	0.18 J	0.15 J
Dibenz(A,H)Anthracene	0.46	0.97	0.1	0.12	0.25	1.9	0.16	0.16	0.12 J+	0.02 U	0.53	0.023 UJ	0.053	0.02 U
Dibenzofuran	0.032 J	0.022 J	0.023 J	0.022 J	0.019 J	0.12 J	0.023 J	0.013 J	0.013 J	0.012 U	0.036 J	0.013 U	0.01 U	0.011 U
Diethyl Phthalate	0.01 U	0.01 U	0.011 U	0.011 U	0.011 U	0.05 U	0.01 U	0.01 U	0.011 U	0.011 U	0.011 U	0.012 U	0.0098 U	0.011 U
Dimethyl Phthalate	0.01 U	0.01 U	0.011 U	0.011 U	0.011 U	0.051 U	0.01 U	0.01 U	0.011 U	0.011 U	0.011 U	0.013 U	0.01 U	0.011 U

Table E-1
Summary of Data Used in Risk Assessment
Main Plant Area Soil (0-0.5 ft-bgs) - Current
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-054	CFSB-060	CFSB-062	CFSB-064	CFSB-065	CFSB-066	CFSB-069	CFSB-071	CFSB-095	CFSB-097	CFSB-098	CFSB-099	CFSB-100	CFSB-121
Sample Lab IDs	460-114793-20	460-114793-8	460-114828-40	460-115008-7	460-114828-34	460-114793-12	460-114793-14	460-114793-4	460-114456-37	460-114456-25	460-114456-27	460-114456-23	460-114456-26	460-114141-20
Sample Name	CFSB-054-SO-0-0.5	CFSB-060-SO-0-0.5	CFSB-062-SO-0-0.5	CFSB-064-SO-0-0.5	CFSB-065-SO-0-0.5	CFSB-066-SO-0-0.5	CFSB-069-SO-0-0.5	CFSB-071-SO-0-0.5	CFSB-095-SO-0-0.5	CFSB-097-SO-0-0.5	CFSB-098-SO-0-0.5	CFSB-099-SO-0-0.5	CFSB-100-SO-0-0.5	CFSB-121-SO-0-0.5
Sample Depth	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft
Chemical	5/28/2016	5/27/2016	6/2/2016	6/3/2016	6/2/2016	5/27/2016	5/27/2016	5/27/2016	5/24/2016	5/24/2016	5/24/2016	5/24/2016	5/24/2016	5/18/2016
Di-N-Butyl Phthalate	0.011 U	0.011 U	0.012 U	0.011 U	0.012 U	0.053 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.013 U	0.01 U	0.011 U
Di-N-Octylphthalate	0.018 U	0.018 U	0.02 U	0.019 U	0.02 U	0.09 U	0.018 U	0.018 U	0.019 U	0.02 U	0.019 U	0.022 U	0.018 U	0.019 U
Fluoranthene	1.9	5.3	1	0.89	1.4	15	1.1	0.74	0.57	0.051 J	2.5	0.079 J	0.21 J	0.17 J
Fluorene	0.051 J	0.053 J	0.044 J	0.044 J	0.029 J	0.24 J	0.038 J	0.023 J	0.022 J	0.0085 J	0.049 J	0.0095 U	0.0075 U	0.0082 U
Hexachlorobenzene	0.014 U	0.014 UJ	0.016 U	0.015 U	0.016 U	0.072 UJ	0.014 U	0.014 U	0.015 U	0.016 U	0.015 U	0.018 U	0.014 U	0.015 U
Hexachlorobutadiene	0.01 U	0.0099 U	0.011 U	0.011 U	0.011 U	0.05 U	0.01 U	0.01 U	0.01 U	0.011 U	0.011 U	0.012 U	0.0097 U	0.011 U
Hexachlorocyclopentadiene	0.022 U	0.022 UJ	0.024 U	0.024 U	0.024 U	0.11 UJ	0.022 U	0.022 U	0.023 UJ	0.024 U	0.023 U	0.027 UJ	0.022 U	0.023 U
Hexachloroethane	0.013 U	0.013 U	0.014 U	0.014 U	0.014 U	0.065 U	0.013 U	0.013 U	0.014 U	0.014 U	0.014 U	0.016 U	0.013 U	0.014 U
Indeno(1,2,3-C,D)Pyrene	1.7	3.7	0.57	0.6 J+	1.4	6.8	0.69	0.59	0.55 J+	0.029 J	2.9	0.06 J	0.27	0.11 J
Isophorone	0.0076 U	0.0076 U	0.0083 U	0.0081 U	0.0084 U	0.059 J	0.0077 U	0.0077 U	0.008 U	0.0082 U	0.008 U	0.0094 U	0.0074 U	0.0081 U
Naphthalene	0.023 J	0.025 J	0.017 J	0.024 J	0.014 J	0.11 J	0.022 J	0.017 J	0.01 J	0.0098 U	0.032 J	0.011 U	0.0088 U	0.0096 U
Nitrobenzene	0.011 U	0.011 U	0.012 U	0.012 U	0.012 U	0.056 U	0.011 U	0.011 U	0.012 U	0.012 U	0.012 U	0.014 U	0.011 U	0.012 U
N-Nitrosodi-N-Propylamine	0.012 U	0.012 U	0.013 U	0.013 U	0.013 U	0.059 U	0.012 U	0.012 U	0.012 U	0.013 U	0.013 U	0.015 U	0.012 U	0.013 U
N-Nitrosodiphenylamine	0.032 U	0.032 U	0.035 U	0.034 U	0.035 U	0.16 U	0.032 U	0.032 U	0.034 U	0.035 U	0.034 U	0.04 U	0.031 U	0.034 U
Pentachlorophenol	0.043 U	0.043 U	0.047 U	0.046 U	0.047 U	0.21 U	0.043 U	0.043 U	0.045 U	0.046 U	0.045 U	0.053 U	0.042 U	0.045 U
Phenanthrene	0.97	1.6	0.49	0.51	0.52	5.8	0.58	0.41	0.31 J	0.047 J	1.2	0.056 J	0.093 J	0.083 J
Phenol	0.012 U	0.012 U	0.013 U	0.012 U	0.013 U	0.058 U	0.012 U	0.012 U	0.012 U	0.013 U	0.012 U	0.014 U	0.011 U	0.012 U
Pyrene	2.1 J+	6.1	0.92	0.81	1.3	16	0.91	1 J+	0.62	0.043 J	2.4	0.078 J	0.21 J	0.17 J

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-1
Summary of Data Used in Risk Assessment
Main Plant Area Soil (0-0.5 ft-bgs) - Current
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-121-DUP	CFSB-128	CFSB-129	CFSB-189	CFSB-189	CFSB-190	CFSB-190	CFSB-205	CFSB-205-DUP	CFSB-205	CFSB-206	CFSB-207	CFSB-213	CFSB-232
Sample Lab IDs	460-114141-23	460-114456-39	460-114456-44	180-79434-1, 460-159377-1	320-43709-10	180-79434-29, 460-159377-29	320-43709-14	180-79434-3, 460-159377-3	180-79434-5, 460-159377-5	320-43646-3	180-79204-1, 320-40608-1, 460-159044-1	180-77302-1, 320-38708-1, 460-155040-1	180-79204-3, 320-40608-4, 460-159044-3	320-38708-7, 460-155040-7
Sample Name	CFSB-DUP1-SO	CFSB-128-SO-0-0.5	CFSB-129-SO-0-0.5	CFSB-189-SO-0-0.5	CFSB-189-SO-0-0.5	CFSB-190-SO-0-0.5	CFSB-190-SO-0-0.5	CFSB-205-SO-0-0.5	CFSB-DUP45-SO	CFSB-205-SO-0-0.5	CFSB-206-SO-0-0.5	CFSB-207-SO-0-0.5	CFSB-213-SO-0-0.5	CFSB-232-SO-0-0.5
Sample Depth	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft
Chemical	5/18/2016	5/24/2016	5/24/2016	6/27/2018	9/27/2018	6/27/2018	9/27/2018	6/27/2018	6/27/2018	9/26/2018	6/22/2018	4/28/2018	6/22/2018	4/28/2018
GENERAL CHEMISTRY (mg/kg)														
Fluoride	9.05 J-	46.7 J-	214 J-	1.97 J-	--	7.21	--	11.1 J-	12.4 J-	--	13.3 J-	13.4 J+	6.09 J-	--
Cyanide	0.091 J	0.04 J	0.065 J	0.066 U	--	0.47 J+	--	0.064 U	0.1 J+	--	0.06 U	0.069 U	0.058 U	--
METALS (mg/kg)														
"Chromium, Hexavalent - Estimated"	0.248905	0.235523	0.2382	--	--	0.2382	--	--	--	--	0.222141	0.286375	0.259611	--
"Chromium, Trivalent - Calculated"	--	--	--	5.09	--	--	--	7.815	5.515	--	--	--	--	--
"Chromium, Trivalent - Estimated"	9.05109	8.56448	8.6618	--	--	8.6618	--	--	--	--	8.07786	10.4136	9.44039	--
Aluminum	15500 J	14500	11700	6530	--	18200	--	13100	8950	--	10700	11300	9710	--
Antimony	0.37 UJ	0.34 UJ	0.37 UJ	0.24 UJ	--	0.3 U	--	0.26 UJ	0.26 UJ	--	0.25 U	0.32 UJ	0.23 U	--
Arsenic	4.8 J	4.3	5	3.9	--	4.5	--	4.2	3.2	--	4.3	5.2	4.6	--
Barium	187	93.3	77.3	57.2	--	178	--	147	94.5	--	89.9	109	56.9	--
Beryllium	0.59	0.42	0.47	0.29 J	--	0.63	--	0.56	0.34 J	--	0.4	0.52	0.41	--
Cadmium	0.28 U	0.26 U	0.28 U	0.27 U	--	0.34 U	--	0.29 U	0.3 U	--	0.28 U	0.37 U	0.39 J	--
Calcium	2700	19000	27400	21400	--	4350	--	3890	2730	--	21000	7450	19500	--
Chromium, Total	9.3	8.8	8.9	5.3	--	8.9	--	7.9	5.6	--	8.3	10.7 J-	9.7	--
Cobalt	5.9	4.6	4.8	4.3	--	5.3	--	5.1	3.5	--	4.7	5	4.5	--
Copper	11.6 J	14.1 J+	13.2 J	11.2	--	16.8	--	12.2	9.4	--	11.7	17.1 J-	15.1	--
Iron	15900	12000	12800	8930	--	13500	--	12800	8760	--	11600	13500	11800	--
Lead	10.7	14.8	12.5 J	9.1	--	16.2	--	10.1	10.9	--	11.2	25.4	16.9	--
Magnesium	6400	10300	9530	7120	--	6080	--	6330	4590	--	8870	7450	9720	--
Manganese	492 J	341	370	291	--	507	--	392	266	--	347	402	318	--
Mercury	0.014 J	0.016 J	0.016 J	0.01 J-	--	0.016 J	--	0.017 J-	0.012 J-	--	0.02	0.012 J	0.023	--
Nickel	13.2	16	13.2	8.3	--	37.9	--	11.4	7.2	--	13.7	13.6 J-	18.1	--
Potassium	1180	910 J+	866	551	--	1260	--	861	591	--	593	695 J-	631	--
Selenium	0.34 U	0.32 U	0.35 U	0.23 U	--	0.3 U	--	0.25 U	0.26 U	--	0.24 U	0.32 U	0.23 U	--
Silver	0.67 U	0.63 U	0.68 U	0.5 U	--	0.63 U	--	0.54 U	0.55 U	--	0.52 U	0.68 U	0.48 U	--
Sodium	38 J	77.5 J	123	28.4 J	--	71.1 J	--	58.2 J	44.4 J	--	52.6 J	49.5 J	45.8 J	--
Thallium	0.14 U	0.13 U	0.14 U	0.1 U	--	0.13 U	--	0.11 U	0.11 U	--	0.1 U	0.14 U	0.098 U	--
Vanadium	15.6	12.4	9.6	4.1	--	18.2	--	12.2	7.7	--	9.8	11.7 J-	10.1	--
Zinc	54	43.3	46.1	32.2	--	65.1	--	40.5	25.9	--	41.2	47.6	49.1	--
METALS|HEXAVALENT CHROMIUM (mg/kg)														
Chromium, Hexavalent	--	--	--	0.21 J-	--	--	--	0.17 UJ	0.17 UJ	--	--	--	--	--
PESTICIDES (mg/kg)														
Aldrin	0.00093 U	--	--	--	--	--	--	--	--	--	--	--	--	--
Alpha Bhc (Alpha Hexachlorocyclohexane)	0.0007 U	--	--	--	--	--	--	--	--	--	--	--	--	--
Alpha Endosulfan	0.0011 U	--	--	--	--	--	--	--	--	--	--	--	--	--
Beta Bhc (Beta Hexachlorocyclohexane)	0.00075 U	--	--	--	--	--	--	--	--	--	--	--	--	--
Beta Endosulfan	0.0012 U	--	--	--	--	--	--	--	--	--	--	--	--	--
cis-Chlordane	0.0013 U	--	--	--	--	--	--	--	--	--	--	--	--	--
Delta BHC (Delta Hexachlorocyclohexane)	0.00084 U	--	--	--	--	--	--	--	--	--	--	--	--	--
Dieldrin	0.001 U	--	--	--	--	--	--	--	--	--	--	--	--	--
Endosulfan Sulfate	0.0009 U	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin	0.00098 U	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin Aldehyde	0.00095 U	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin Ketone	0.0011 U	--	--	--	--	--	--	--	--	--	--	--	--	--
Gamma Bhc (Lindane)	0.00069 U	--	--	--	--	--	--	--	--	--	--	--	--	--
Heptachlor	0.00099 U	--	--	--	--	--	--	--	--	--	--	--	--	--
Heptachlor Epoxide	0.0015 U	--	--	--	--	--	--	--	--	--	--	--	--	--
Methoxychlor	0.0016 U	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDD	0.001 U	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDE	0.0011 U	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDT	0.00079 U	--	--	--	--	--	--	--	--	--	--	--	--	--
Toxaphene	0.022 U	--	--	--	--	--	--	--	--	--	--	--	--	--
trans-Chlordane	0.0017 U	--	--	--	--	--	--	--	--	--	--	--	--	--
POLYCHLORINATED BIPHENYLS (mg/kg)														
PCB-1016 (Aroclor 1016)	0.01 U	0.0098 U	0.0096 U	--	--	--	--	--	--	--	--	0.0097 U	--	0.0096 U
PCB-1221 (Aroclor 1221)	0.01 U	0.0098 U	0.0096 U	--	--	--	--	--	--	--	--	0.0097 U	--	0.0096 U
PCB-1232 (Aroclor 1232)	0.01 U	0.0098 U	0.0096 U	--	--	--	--	--	--	--	--	0.0097 U	--	0.0096 U

Table E-1
Summary of Data Used in Risk Assessment
Main Plant Area Soil (0-0.5 ft-bgs) - Current
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-121-DUP	CFSB-128	CFSB-129	CFSB-189	CFSB-189	CFSB-190	CFSB-190	CFSB-205	CFSB-205-DUP	CFSB-205	CFSB-206	CFSB-207	CFSB-213	CFSB-232
Sample Lab IDs	460-114141-23	460-114456-39	460-114456-44	180-79434-1, 460-159377-1	320-43709-10	180-79434-29, 460-159377-29	320-43709-14	180-79434-3, 460-159377-3	180-79434-5, 460-159377-5	320-43646-3	180-79204-1, 320-40608-1, 460-159044-1	180-77302-1, 320-38708-1, 460-155040-1	180-79204-3, 320-40608-4, 460-159044-3	320-38708-7, 460-155040-7
Sample Name	CFSB-DUP1-SO	CFSB-128-SO-0-0.5	CFSB-129-SO-0-0.5	CFSB-189-SO-0-0.5	CFSB-189-SO-0-0.5	CFSB-190-SO-0-0.5	CFSB-190-SO-0-0.5	CFSB-205-SO-0-0.5	CFSB-DUP45-SO	CFSB-205-SO-0-0.5	CFSB-206-SO-0-0.5	CFSB-207-SO-0-0.5	CFSB-213-SO-0-0.5	CFSB-232-SO-0-0.5
Sample Depth	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft
Chemical	5/18/2016	5/24/2016	5/24/2016	6/27/2018	9/27/2018	6/27/2018	9/27/2018	6/27/2018	6/27/2018	9/26/2018	6/22/2018	4/28/2018	6/22/2018	4/28/2018
PCB-1242 (Aroclor 1242)	0.01 U	0.0098 U	0.0096 U	--	--	--	--	--	--	--	--	0.0097 U	--	0.0096 U
PCB-1248 (Aroclor 1248)	0.01 U	0.0098 U	0.0096 U	--	--	--	--	--	--	--	--	0.0097 U	--	0.0096 U
PCB-1254 (Aroclor 1254)	0.011 U	0.01 U	0.0099 U	--	--	--	--	--	--	--	--	0.01 U	--	0.064 J
PCB-1260 (Aroclor 1260)	0.011 U	0.01 U	0.0099 U	--	--	--	--	--	--	--	--	0.01 U	--	0.01 U
PCB-1262 (Aroclor 1262)	0.011 U	0.01 U	0.0099 U	--	--	--	--	--	--	--	--	0.01 U	--	0.01 U
PCB-1268 (Aroclor 1268)	0.011 U	0.01 U	0.0099 U	--	--	--	--	--	--	--	--	0.01 U	--	0.01 U
Polychlorinated Biphenyl (PCBs)	0.011 U	0.01 U	0.0099 U	--	--	--	--	--	--	--	--	0.01 U	--	0.064 J
SEMIVOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,2,4,5-Tetrachlorobenzene	0.028 U	0.027 U	0.026 U	0.0015 U	--	0.0063 U	--	0.0033 U	0.0032 U	--	0.006 U	0.002 UT	0.015 U	--
1,4-Dioxane (P-Dioxane)	0.1 U	0.098 U	0.095 U	0.011 U	--	0.046 U	--	0.024 U	0.023 U	--	0.044 U	0.014 U	0.11 U	--
2,3,4,6-Tetrachlorophenol	0.036 U	0.034 U	0.033 U	0.014 U	--	0.061 U	--	0.032 U	0.03 U	--	0.058 UJ	0.019 U	0.14 UJ	--
2,4,5-Trichlorophenol	0.038 U	0.036 U	0.035 U	0.0024 U	--	0.01 U	--	0.0054 U	0.0052 U	--	0.01 U	0.0033 U	0.025 U	--
2,4,6-Trichlorophenol	0.011 U	0.01 U	0.01 U	0.0019 U	--	0.008 U	--	0.0042 U	0.004 U	--	0.0077 U	0.0025 U	0.019 U	--
2,4-Dichlorophenol	0.0089 U	0.0086 U	0.0084 U	0.0026 U	--	0.011 U	--	0.0059 U	0.0056 U	--	0.011 U	0.0036 U	0.027 U	--
2,4-Dimethylphenol	0.083 U	0.08 U	0.078 U	0.0021 U	--	0.0091 U	--	0.0047 U	0.0045 U	--	0.0087 U	0.0029 U	0.021 U	--
2,4-Dinitrophenol	0.29 U	0.28 U	0.27 U	0.092 U	--	0.39 U	--	0.2 U	0.2 U	--	0.38 UJ	0.12 UJ	0.93 UJ	--
2,4-Dinitrotoluene	0.015 U	0.014 U	0.014 U	0.0017 U	--	0.0073 U	--	0.0038 U	0.0036 U	--	0.007 U	0.0023 U	0.017 U	--
2,6-Dinitrotoluene	0.02 U	0.019 U	0.019 U	0.0021 U	--	0.0091 U	--	0.0047 U	0.0045 U	--	0.0086 U	0.0029 U	0.021 U	--
2-Chloronaphthalene	0.0086 U	0.0083 U	0.0081 U	0.0016 U	--	0.0067 U	--	0.0035 U	0.0034 U	--	0.0064 U	0.0021 U	0.016 U	--
2-Chlorophenol	0.0096 U	0.0093 U	0.009 U	0.0016 U	--	0.0068 U	--	0.0035 U	0.0034 U	--	0.0065 U	0.0022 UT	0.016 U	--
2-Methylnaphthalene	0.0084 U	0.06 J	0.0087 J	0.0016 U	--	0.007 U	--	0.0044 J	0.0043 J	--	0.0079 J	0.0046 J	0.017 U	--
2-Methylphenol (O-Cresol)	0.017 U	0.016 U	0.016 U	0.0098 U	--	0.042 U	--	0.022 U	0.021 U	--	0.04 U	0.013 U	0.099 U	--
2-Nitroaniline	0.012 U	0.012 U	0.012 U	0.016 U	--	0.067 U	--	0.035 U	0.033 U	--	0.064 U	0.021 U	0.16 U	--
2-Nitrophenol	0.013 U	0.012 U	0.012 U	0.002 U	--	0.0084 U	--	0.0044 U	0.0042 U	--	0.008 U	0.0027 U	0.02 U	--
3- And 4- Methylphenol (Total)	0.01 U	0.0097 U	0.0095 U	--	--	--	--	--	--	--	--	--	--	--
3,3'-Dichlorobenzidine	0.042 U	0.041 U	0.04 U	0.032 U	--	0.14 U	--	0.071 U	0.068 U	--	0.13 U	0.043 UJ	0.32 U	--
3-Nitroaniline	0.011 U	0.011 U	0.011 U	0.0087 U	--	0.037 U	--	0.019 U	0.019 U	--	0.036 U	0.012 U	0.087 U	--
4,6-Dinitro-2-Methylphenol	0.1 U	0.097 U	0.095 U	0.059 U	--	0.25 U	--	0.13 U	0.13 U	--	0.24 U	0.08 U	0.59 U	--
4-Bromophenyl Phenyl Ether	0.012 U	0.011 U	0.011 U	0.0024 U	--	0.01 U	--	0.0053 U	0.0051 U	--	0.0098 U	0.0032 U	0.024 U	--
4-Chloro-3-Methylphenol	0.016 U	0.016 U	0.015 U	0.0016 U	--	0.0069 U	--	0.0036 U	0.0034 U	--	0.0066 U	0.0022 U	0.016 U	--
4-Chloroaniline	0.0097 U	0.0094 U	0.0092 U	0.0011 U	--	0.0049 U	--	0.0025 U	0.0024 U	--	0.0047 U	0.0015 U	0.011 U	--
4-Chlorophenyl Phenyl Ether	0.011 U	0.011 U	0.011 U	0.0021 U	--	0.0089 U	--	0.0046 U	0.0044 U	--	0.0085 U	0.0028 U	0.021 U	--
4-Nitroaniline	0.014 U	0.014 U	0.013 U	0.0017 U	--	0.0071 U	--	0.0037 U	0.0036 U	--	0.0068 U	0.0022 U	0.017 U	--
4-Nitrophenol	0.18 U	0.18 U	0.17 U	0.024 U	--	0.1 U	--	0.053 U	0.051 U	--	0.098 UJ	0.032 U	0.24 UJ	--
Acenaphthene	0.0092 U	0.27 J	0.083 J	0.002 U	--	0.028 J	--	0.029	0.035	--	0.049	0.031	0.024 J	--
Acenaphthylene	0.0097 U	0.012 J	0.0092 U	0.0015 U	--	0.0064 U	--	0.0033 U	0.0032 U	--	0.0061 U	0.0029 J	0.015 U	--
Acetophenone	0.0083 U	0.0079 U	0.0078 U	0.0026 J	--	0.008 U	--	0.0041 U	0.004 U	--	0.0076 U	0.0025 U	0.019 U	--
Anthracene	0.036 U	0.57	0.16 J	0.002 J	--	0.055	--	0.047	0.059	--	0.091	0.066	0.055 J	--
Atrazine	0.017 U	0.016 U	0.016 U	0.015 U	--	0.064 UJ	--	0.033 U	0.032 U	--	0.061 UJ	0.02 U	0.15 UJ	--
Benzaldehyde	0.029 U	0.028 U	0.027 U	0.0049 J	--	0.018 U	--	0.0094 U	0.0091 U	--	0.017 UR	0.0057 UR	0.043 UR	--
Benzo(A)Anthracene	0.043 J	2.6	1	0.019	--	0.44	--	0.22	0.29	--	0.53	0.41	0.29	--
Benzo(A)Pyrene	0.048 J	3	1.3	0.027	--	0.56	--	0.27	0.37	--	0.77	0.47 J+	0.39	--
Benzo(B)Fluoranthene	0.1 J	4	1.6	0.057	--	1	--	0.49	0.62	--	1.1	0.74	0.56	--
Benzo(G,H,I)Perylene	0.043 J	3	1.4	0.035	--	0.86	--	0.3	0.43	--	0.68	0.48 J+	0.37	--
Benzo(K)Fluoranthene	0.026 J	1.3	0.73	0.016	--	0.34	--	0.19 J	0.32 J	--	0.35	0.33 J+	0.18	--
Benzyl Butyl Phthalate	0.012 U	0.26 J	0.011 U	0.024 U	--	0.1 U	--	0.052 U	0.05 U	--	0.096 U	0.032 U	0.24 U	--
Biphenyl (Diphenyl)	0.032 U	0.031 U	0.03 U	0.0014 U	--	0.0062 U	--	0.0032 U	0.0031 U	--	0.0059 U	0.0019 UT	0.014 U	--
Bis(2-Chloroethoxy) Methane	0.012 U	0.011 U	0.011 U	0.0016 U	--	0.007 U	--	0.0036 U	0.0035 U	--	0.0067 U	0.0022 U	0.016 U	--
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.0089 U	0.0086 U	0.0084 U	0.0012 U	--	0.0053 U	--	0.0028 U	0.0027 U	--	0.0051 U	0.0017 U	0.012 U	--
Bis(2-Chloroisopropyl) Ether	0.016 U	0.015 U	0.015 U	0.0025 U	--	0.011 U	--	0.0056 U	0.0054 U	--	0.01 U	0.0034 U	0.025 U	--
Bis(2-Ethylhexyl) Phthalate	0.015 U	0.014 U	0.014 U	0.037 U	--	0.16 U	--	0.081 UJ	0.59 J	--	0.46 J	0.049 U	0.37 U	--
Caprolactam	0.027 U	0.026 U	0.026 U	0.022 U	--	0.095 U	--	0.049 U	0.048 U	--	0.091 U	0.03 UT	0.22 U	--
Carbazole	0.0094 U	0.63	0.17 J	0.0046 J	--	0.091	--	0.061	0.081	--	0.11	0.1	0.067 J	--
Chrysene	0.07 J	3.6	1.5	0.049	--	0.72	--	0.34	0.48	--	0.82	0.69	0.53	--
Dibenz(A,H)Anthracene	0.02 U	0.75 J+	0.34 J+	0.0073	--	0.19	--	0.074	0.11	--	0.16	0.095 J+	0.062 J	--
Dibenzofuran	0.011 U	0.12 J	0.024 J	0.0017 J	--	0.0074 J	--	0.014 J	0.014 J	--	0.019 J	0.012 J	0.015 U	--
Diethyl Phthalate	0.011 U	0.01 U	0.01 U	0.01 U	--	0.044 U	--	0.023 U	0.022 U	--	0.042 U	0.014 U	0.1 U	--
Dimethyl Phthalate	0.011 U	0.011 U	0.01 U	0.0012 U	--	0.0053 U	--	0.0028 U	0.0027 U	--	0.0051 U	0.0017 U	0.012 U	--

Table E-1
Summary of Data Used in Risk Assessment
Main Plant Area Soil (0-0.5 ft-bgs) - Current
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-121-DUP	CFSB-128	CFSB-129	CFSB-189	CFSB-189	CFSB-190	CFSB-190	CFSB-205	CFSB-205-DUP	CFSB-205	CFSB-206	CFSB-207	CFSB-213	CFSB-232
Sample Lab IDs	460-114141-23	460-114456-39	460-114456-44	180-79434-1, 460-159377-1	320-43709-10	180-79434-29, 460-159377-29	320-43709-14	180-79434-3, 460-159377-3	180-79434-5, 460-159377-5	320-43646-3	180-79204-1, 320-40608-1, 460-159044-1	180-77302-1, 320-38708-1, 460-155040-1	180-79204-3, 320-40608-4, 460-159044-3	320-38708-7, 460-155040-7
Sample Name	CFSB-DUP1-SO	CFSB-128-SO-0-0.5	CFSB-129-SO-0-0.5	CFSB-189-SO-0-0.5	CFSB-189-SO-0-0.5	CFSB-190-SO-0-0.5	CFSB-190-SO-0-0.5	CFSB-205-SO-0-0.5	CFSB-DUP45-SO	CFSB-205-SO-0-0.5	CFSB-206-SO-0-0.5	CFSB-207-SO-0-0.5	CFSB-213-SO-0-0.5	CFSB-232-SO-0-0.5
Sample Depth	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft
Chemical	5/18/2016	5/24/2016	5/24/2016	6/27/2018	9/27/2018	6/27/2018	9/27/2018	6/27/2018	6/27/2018	9/26/2018	6/22/2018	4/28/2018	6/22/2018	4/28/2018
Di-N-Butyl Phthalate	0.011 U	0.011 U	0.011 U	0.015 U	--	0.064 U	--	0.033 U	0.032 U	--	0.061 U	0.02 U	0.15 U	--
Di-N-Octylphthalate	0.019 U	0.019 U	0.018 U	0.02 U	--	0.085 U	--	0.044 U	0.043 U	--	0.081 U	0.027 U	0.2 U	--
Fluoranthene	0.07 J	5.5	1.8	0.047	--	0.72	--	0.56	0.61	--	1.1	0.93	0.62	--
Fluorene	0.0083 U	0.21 J	0.048 J	0.002 J	--	0.015 J	--	0.025	0.027	--	0.035	0.023	0.018 J	--
Hexachlorobenzene	0.015 U	0.015 U	0.014 U	0.0025 U	--	0.011 U	--	0.0055 U	0.0052 U	--	0.01 U	0.0033 U	0.025 U	--
Hexachlorobutadiene	0.011 U	0.01 U	0.01 U	0.002 U	--	0.0086 U	--	0.0044 U	0.0043 U	--	0.0082 U	0.0027 U	0.02 U	--
Hexachlorocyclopentadiene	0.024 U	0.023 UJ	0.022 UJ	0.0017 U	--	0.0075 U	--	0.0039 U	0.0037 U	--	0.0071 UJ	0.0024 U	0.018 UJ	--
Hexachloroethane	0.014 U	0.013 U	0.013 U	0.0018 U	--	0.0076 U	--	0.0039 U	0.0038 U	--	0.0072 U	0.0024 U	0.018 U	--
Indeno(1,2,3-C,D)Pyrene	0.043 J	2.8 J+	1.3 J+	0.03	--	0.65	--	0.26	0.37	--	0.57	0.38 J+	0.3	--
Isophorone	0.0081 U	0.0078 U	0.0076 U	0.0017 U	--	0.0075 U	--	0.0039 U	0.0037 U	--	0.0071 U	0.0024 U	0.018 U	--
Naphthalene	0.0096 U	0.19 J	0.014 J	0.0013 U	--	0.0057 U	--	0.0084 J	0.0096 J	--	0.016 J	0.014	0.013 U	--
Nitrobenzene	0.012 U	0.011 U	0.011 U	0.013 U	--	0.054 U	--	0.028 U	0.027 U	--	0.051 U	0.017 U	0.13 U	--
N-Nitrosodi-N-Propylamine	0.013 U	0.012 U	0.012 U	0.0023 U	--	0.0099 U	--	0.0052 U	0.005 U	--	0.0095 U	0.0031 U	0.023 U	--
N-Nitrosodiphenylamine	0.034 U	0.033 U	0.032 U	0.011 U	--	0.049 U	--	0.025 U	0.024 U	--	0.047 U	0.015 U	0.11 U	--
Pentachlorophenol	0.046 U	0.044 U	0.043 U	0.055 U	--	0.24 U	--	0.12 U	0.12 U	--	0.22 UJ	0.074 UJ	0.55 UJ	--
Phenanthrene	0.037 J	3.2	1	0.017	--	0.32	--	0.23	0.29	--	0.53	0.33	0.35	--
Phenol	0.012 U	0.012 U	0.012 U	0.01 U	--	0.044 U	--	0.023 U	0.022 U	--	0.042 U	0.014 UT	0.1 U	--
Pyrene	0.069 J	3.9	1.9	0.039	--	0.83	--	0.42	0.51	--	1	0.88	0.57	--

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-1
Summary of Data Used in Risk Assessment
Main Plant Area Soil (0-0.5 ft-bgs) - Current
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-233	CFSB-234	CFSB-235	CFSB-236	CFSB-240	CFSB-242	CFSB-243	CFSB-246	CFSB-247	CFSB-266	CFSB-274	CFSB-274	CFSB-276	CFSB-276
Sample Lab IDs	320-38708-9, 460-155040-9	320-38708-11, 460-155040-11	320-38708-13, 460-155040-13	320-38708-15, 460-155040-15	180-77673-45, 460-155989-67	180-77673-39, 460-155989-61	180-77673-42, 460-155989-64	180-77673-20, 460-155989-42	180-77673-23, 460-155989-45	180-77673-48, 460-155989-70	180-77782-67, 460-156162-17	460-165781-2	180-77782-73, 460-156162-23	460-165781-6
Sample Name	CFSB-233-SO-0-0.5	CFSB-234-SO-0-0.5	CFSB-235-SO-0-0.5	CFSB-236-SO-0-0.5	CFSB-240-SO-0-0.5	CFSB-242-SO-0-0.5	CFSB-243-SO-0-0.5	CFSB-246-SO-0-0.5	CFSB-247-SO-0-0.5	CFSB-266-SO-0-0.5	CFSB-274-SO-0-0.5	CFSB-274-SO-0-0.5	CFSB-276-SO-0-0.5	CFSB-276-SO-0-0.5
Sample Depth	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft
Chemical	4/28/2018	4/28/2018	4/28/2018	4/28/2018	5/10/2018	5/10/2018	5/10/2018	5/9/2018	5/9/2018	5/10/2018	5/11/2018	9/28/2018	5/11/2018	9/28/2018
GENERAL CHEMISTRY (mg/kg)														
Fluoride	--	--	--	--	9.46 J-	13.1 J	3.74 J-	10 J	19.6 J	18.8 J-	32.5	--	208 J+	--
Cyanide	--	--	--	--	0.13 J	0.14 J	0.11 J	0.15 J	0.14 J	0.11 J	--	0.13 J	--	0.99 J+
METALS (mg/kg)														
"Chromium, Hexavalent - Estimated"	--	--	--	--	0.256934	0.195377	0.206083	0.307786	0.259611	0.321168	0.20073	--	0.40146	--
"Chromium, Trivalent - Calculated"	--	--	--	--	--	--	--	--	--	--	--	--	--	--
"Chromium, Trivalent - Estimated"	--	--	--	--	9.34307	7.10462	7.49392	11.1922	9.44039	11.6788	7.29927	--	14.5985	--
Aluminum	--	--	--	--	13100	9070	7490	21900	9650	15300	6020	--	8800	--
Antimony	--	--	--	--	0.32 U	0.26 UJ	0.26 UJ	0.3 U	0.25 U	0.33 U	0.29 UJ	--	0.31 UJ	--
Arsenic	--	--	--	--	5.2	3.1	2.8	4.9	5.8	7	3	--	4 J	--
Barium	--	--	--	--	119	88.4	44.2	254	154	132	92.9	--	119	--
Beryllium	--	--	--	--	0.42 J	0.42	0.25 J	0.77	0.33 J	0.65	0.38 J	--	0.38 J	--
Cadmium	--	--	--	--	0.37 U	0.3 U	0.3 U	0.34 U	0.29 U	0.38 U	0.35 J	--	0.36 U	--
Calcium	--	--	--	--	18100	3610 J	14500 J	2830	31900	14300	14300 J	--	32400	--
Chromium, Total	--	--	--	--	9.6	7.3	7.7	11.5	9.7	12	7.5	--	15	--
Cobalt	--	--	--	--	5.1	4.5	4.1	5.5	4.6	6.2	4.2	--	5.9	--
Copper	--	--	--	--	11.8	7.7 J	9.7 J	16.3	12.9	19.1	9.4	--	12.4	--
Iron	--	--	--	--	14900	9950	11300	15000	13900	17400	9510	--	14800	--
Lead	--	--	--	--	9.9	9.7 J	6.6 J	10	10.2	10.8	14.4 J+	--	9.9 J+	--
Magnesium	--	--	--	--	9920	6620 J	8480 J	5500	18300	8630	8150	--	12100	--
Manganese	--	--	--	--	441	379	248	598	812	439	330	--	379	--
Mercury	--	--	--	--	0.022	0.016 J	0.033	0.023	0.029	0.015 J	0.013 J+	--	0.017 J	--
Nickel	--	--	--	--	17.2	11.7	9.6	11.9	11.3	15.2	11.3	--	10.3	--
Potassium	--	--	--	--	966	639 J+	492 J+	989	604	1220	654	--	758	--
Selenium	--	--	--	--	0.32 U	0.26 U	0.26 U	0.29 U	0.25 U	0.33 U	0.29 U	--	0.31 U	--
Silver	--	--	--	--	0.68 U	0.55 U	0.55 U	0.63 U	0.53 U	0.7 U	0.62 U	--	0.66 U	--
Sodium	--	--	--	--	48.2 J	28.1 U	27.9 U	73.7 J	26.8 U	47.8 J	50.3 J	--	40.7 J	--
Thallium	--	--	--	--	0.14 U	0.11 U	0.11 U	0.13 U	0.11 U	0.14 U	0.12 U	--	0.13 U	--
Vanadium	--	--	--	--	12.4	7.6	7	15.7	9.3	14.7	6.8	--	10.2	--
Zinc	--	--	--	--	49.6	36.8	29.1	60.9	40.4	70.9	136	--	48	--
METALS|HEXAVALENT CHROMIUM (mg/kg)														
Chromium, Hexavalent	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PESTICIDES (mg/kg)														
Aldrin	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Alpha Bhc (Alpha Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Alpha Endosulfan	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Beta Bhc (Beta Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Beta Endosulfan	--	--	--	--	--	--	--	--	--	--	--	--	--	--
cis-Chlordane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Delta BHC (Delta Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dieldrin	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endosulfan Sulfate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin Aldehyde	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin Ketone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Gamma Bhc (Lindane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Heptachlor	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Heptachlor Epoxide	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methoxychlor	--	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDD	--	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDT	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Toxaphene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
trans-Chlordane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
POLYCHLORINATED BIPHENYLS (mg/kg)														
PCB-1016 (Aroclor 1016)	0.01 U	0.01 U	0.0098 U	0.0094 U	--	--	--	--	--	--	--	--	--	--
PCB-1221 (Aroclor 1221)	0.01 U	0.01 U	0.0098 U	0.0094 U	--	--	--	--	--	--	--	--	--	--
PCB-1232 (Aroclor 1232)	0.01 U	0.01 U	0.0098 U	0.0094 U	--	--	--	--	--	--	--	--	--	--

Table E-1
Summary of Data Used in Risk Assessment
Main Plant Area Soil (0-0.5 ft-bgs) - Current
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-233	CFSB-234	CFSB-235	CFSB-236	CFSB-240	CFSB-242	CFSB-243	CFSB-246	CFSB-247	CFSB-266	CFSB-274	CFSB-274	CFSB-276	CFSB-276
Sample Lab IDs	320-38708-9, 460-155040-9	320-38708-11, 460-155040-11	320-38708-13, 460-155040-13	320-38708-15, 460-155040-15	180-77673-45, 460-155989-67	180-77673-39, 460-155989-61	180-77673-42, 460-155989-64	180-77673-20, 460-155989-42	180-77673-23, 460-155989-45	180-77673-48, 460-155989-70	180-77782-67, 460-156162-17	460-165781-2	180-77782-73, 460-156162-23	460-165781-6
Sample Name	CFSB-233-SO-0-0.5	CFSB-234-SO-0-0.5	CFSB-235-SO-0-0.5	CFSB-236-SO-0-0.5	CFSB-240-SO-0-0.5	CFSB-242-SO-0-0.5	CFSB-243-SO-0-0.5	CFSB-246-SO-0-0.5	CFSB-247-SO-0-0.5	CFSB-266-SO-0-0.5	CFSB-274-SO-0-0.5	CFSB-274-SO-0-0.5	CFSB-276-SO-0-0.5	CFSB-276-SO-0-0.5
Sample Depth	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft
Chemical	4/28/2018	4/28/2018	4/28/2018	4/28/2018	5/10/2018	5/10/2018	5/10/2018	5/9/2018	5/9/2018	5/10/2018	5/11/2018	9/28/2018	5/11/2018	9/28/2018
PCB-1242 (Aroclor 1242)	0.01 U	0.01 U	0.0098 U	0.0094 U	--	--	--	--	--	--	--	--	--	--
PCB-1248 (Aroclor 1248)	0.01 U	0.01 U	0.0098 U	0.0094 U	--	--	--	--	--	--	--	--	--	--
PCB-1254 (Aroclor 1254)	0.056 J	0.01 U	0.01 U	0.0097 U	--	--	--	--	--	--	--	--	--	--
PCB-1260 (Aroclor 1260)	0.011 U	0.01 U	0.01 U	0.0097 U	--	--	--	--	--	--	--	--	--	--
PCB-1262 (Aroclor 1262)	0.011 U	0.01 U	0.01 U	0.0097 U	--	--	--	--	--	--	--	--	--	--
PCB-1268 (Aroclor 1268)	0.011 U	0.01 U	0.01 U	0.0097 U	--	--	--	--	--	--	--	--	--	--
Polychlorinated Biphenyl (PCBs)	0.056 J	0.01 U	0.01 U	0.0097 U	--	--	--	--	--	--	--	--	--	--
SEMIVOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,2,4,5-Tetrachlorobenzene	--	--	--	--	0.0016 U	0.0016 U	0.0016 U	0.0018 U	0.0016 U	0.0016 U	0.075 U	--	0.062 U	--
1,4-Dioxane (P-Dioxane)	--	--	--	--	0.012 U	0.012 U	0.011 U	0.013 U	0.012 U	0.012 U	0.54 U	--	0.45 U	--
2,3,4,6-Tetrachlorophenol	--	--	--	--	0.016 U	0.016 U	0.015 U	0.017 U	0.016 U	0.016 U	0.72 U	--	0.6 U	--
2,4,5-Trichlorophenol	--	--	--	--	0.0027 U	0.0027 U	0.0026 U	0.0029 U	0.0027 U	0.0027 U	0.12 U	--	0.1 U	--
2,4,6-Trichlorophenol	--	--	--	--	0.0021 U	0.0021 U	0.002 U	0.0022 U	0.0021 U	0.002 U	0.095 U	--	0.079 U	--
2,4-Dichlorophenol	--	--	--	--	0.0029 U	0.0029 U	0.0028 U	0.0031 U	0.0029 U	0.0029 U	0.13 U	--	0.11 U	--
2,4-Dimethylphenol	--	--	--	--	0.0023 U	0.0024 U	0.0023 U	0.0025 U	0.0023 U	0.0023 U	0.11 U	--	0.089 U	--
2,4-Dinitrophenol	--	--	--	--	0.1 UJ	0.1 UJ	0.098 UJ	0.11 U	0.1 U	0.1 U	4.7 UJ	--	3.9 UJ	--
2,4-Dinitrotoluene	--	--	--	--	0.0019 U	0.0019 U	0.0018 U	0.002 U	0.0019 U	0.0019 U	0.086 U	--	0.072 U	--
2,6-Dinitrotoluene	--	--	--	--	0.0023 U	0.0024 U	0.0023 U	0.0025 U	0.0023 U	0.0023 U	0.11 U	--	0.089 U	--
2-Chloronaphthalene	--	--	--	--	0.0017 U	0.0018 U	0.0017 U	0.0019 U	0.0017 U	0.0017 U	0.08 U	--	0.066 U	--
2-Chlorophenol	--	--	--	--	0.0017 U	0.0018 U	0.0017 U	0.0019 U	0.0018 U	0.0017 U	0.081 U	--	0.067 U	--
2-Methylnaphthalene	--	--	--	--	0.0064 J	0.0018 U	0.004 J	0.002 U	0.0018 U	0.0018 U	0.43	--	0.12 J	--
2-Methylphenol (O-Cresol)	--	--	--	--	0.011 U	0.011 U	0.01 U	0.012 U	0.011 U	0.011 U	0.5 U	--	0.41 U	--
2-Nitroaniline	--	--	--	--	0.017 U	0.017 U	0.017 U	0.019 U	0.017 U	0.017 U	0.79 U	--	0.66 U	--
2-Nitrophenol	--	--	--	--	0.0021 U	0.0022 U	0.0021 U	0.0023 U	0.0022 U	0.0021 U	0.099 U	--	0.082 U	--
3- And 4- Methylphenol (Total)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3,3'-Dichlorobenzidine	--	--	--	--	0.035 U	0.036 U	0.034 U	0.038 U	0.035 U	0.035 U	1.6 U	--	1.3 U	--
3-Nitroaniline	--	--	--	--	0.0095 U	0.0097 U	0.0093 U	0.01 U	0.0096 U	0.0095 U	0.44 U	--	0.37 U	--
4,6-Dinitro-2-Methylphenol	--	--	--	--	0.065 U	0.066 U	0.063 U	0.07 U	0.065 U	0.064 U	3 U	--	2.5 U	--
4-Bromophenyl Phenyl Ether	--	--	--	--	0.0026 U	0.0027 U	0.0026 U	0.0028 U	0.0026 U	0.0026 U	0.12 U	--	0.1 U	--
4-Chloro-3-Methylphenol	--	--	--	--	0.0018 U	0.0018 U	0.0017 U	0.0019 U	0.0018 U	0.0018 U	0.082 U	--	0.068 U	--
4-Chloroaniline	--	--	--	--	0.0012 U	0.0013 U	0.0012 U	0.0014 U	0.0013 U	0.0012 U	0.058 U	--	0.048 U	--
4-Chlorophenyl Phenyl Ether	--	--	--	--	0.0023 U	0.0023 U	0.0022 U	0.0025 U	0.0023 U	0.0023 U	0.11 U	--	0.087 U	--
4-Nitroaniline	--	--	--	--	0.0018 U	0.0019 U	0.0018 U	0.002 U	0.0018 U	0.0018 U	0.084 U	--	0.07 U	--
4-Nitrophenol	--	--	--	--	0.026 U	0.027 U	0.026 U	0.029 U	0.026 U	0.026 U	1.2 UJ	--	1 UJ	--
Acenaphthene	--	--	--	--	0.016	0.0061 J	0.023	0.0023 U	0.0087	0.0026 J	2.8	--	1	--
Acenaphthylene	--	--	--	--	0.052	0.0017 U	0.0016 U	0.0018 U	0.0017 U	0.0016 U	0.076 U	--	0.063 U	--
Acetophenone	--	--	--	--	0.002 U	0.0021 U	0.002 U	0.0022 U	0.002 U	0.002 U	0.094 U	--	0.078 U	--
Anthracene	--	--	--	--	0.067	0.01	0.026	0.0064 J	0.018	0.0056 J	6.2	--	2.2	--
Atrazine	--	--	--	--	0.016 U	0.017 U	0.016 U	0.018 U	0.017 UJ	0.016 U	0.76 UJ	--	0.63 UJ	--
Benzaldehyde	--	--	--	--	0.0047 UR	0.0047 UR	0.0045 UR	0.0051 U	0.0047 U	0.0046 UR	0.22 UR	--	0.18 UR	--
Benzo(A)Anthracene	--	--	--	--	0.3	0.081	0.094	0.043	0.14	0.053	28	--	11	--
Benzo(A)Pyrene	--	--	--	--	0.46	0.12	0.13	0.051	0.16	0.087	31	--	13	--
Benzo(B)Fluoranthene	--	--	--	--	0.7	0.2	0.17	0.12	0.27	0.16	34	--	12	--
Benzo(G,H,I)Perylene	--	--	--	--	0.44	0.14	0.13	0.058	0.22	0.13	24	--	11	--
Benzo(K)Fluoranthene	--	--	--	--	0.29	0.053	0.085	0.045	0.092	0.07	13	--	7.4	--
Benzyl Butyl Phthalate	--	--	--	--	0.026 U	0.026 U	0.025 U	0.028 U	0.026 U	0.026 U	1.2 U	--	0.99 U	--
Biphenyl (Diphenyl)	--	--	--	--	0.0016 U	0.0016 U	0.0015 U	0.0017 U	0.0016 U	0.0016 U	0.1 J	--	0.06 U	--
Bis(2-Chloroethoxy) Methane	--	--	--	--	0.0018 U	0.0018 U	0.0017 U	0.0019 U	0.0018 U	0.0018 U	0.083 U	--	0.069 U	--
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	--	--	--	--	0.0014 U	0.0014 U	0.0013 U	0.0015 U	0.0014 U	0.0014 U	0.063 U	--	0.052 U	--
Bis(2-Chloroisopropyl) Ether	--	--	--	--	0.0028 UJ	0.0028 UJ	0.0027 UJ	0.003 U	0.0028 U	0.0028 U	0.13 U	--	0.11 U	--
Bis(2-Ethylhexyl) Phthalate	--	--	--	--	0.04 U	0.041 U	0.039 U	0.043 U	0.04 U	0.04 U	1.8 U	--	1.5 U	--
Caprolactam	--	--	--	--	0.024 U	0.025 U	0.024 U	0.027 U	0.025 U	0.024 U	1.1 U	--	0.94 U	--
Carbazole	--	--	--	--	0.038	0.014	0.022	0.0047 J	0.024	0.014	5.5	--	2.2	--
Chrysene	--	--	--	--	0.51	0.13	0.14	0.059	0.22	0.12	35	--	14	--
Dibenz(A,H)Anthracene	--	--	--	--	0.094	0.023	0.025	0.015	0.042	0.023	6.4	--	2.3	--
Dibenzofuran	--	--	--	--	0.0054 J	0.0021 J	0.0093 J	0.0018 U	0.0027 J	0.0016 U	1.2 J	--	0.32 J	--
Diethyl Phthalate	--	--	--	--	0.011 U	0.011 U	0.011 U	0.012 U	0.011 U	0.011 U	0.52 U	--	0.43 U	--
Dimethyl Phthalate	--	--	--	--	0.0014 U	0.0014 U	0.0013 U	0.0015 U	0.0014 U	0.0014 U	0.063 U	--	0.052 U	--

Table E-1
Summary of Data Used in Risk Assessment
Main Plant Area Soil (0-0.5 ft-bgs) - Current
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-233	CFSB-234	CFSB-235	CFSB-236	CFSB-240	CFSB-242	CFSB-243	CFSB-246	CFSB-247	CFSB-266	CFSB-274	CFSB-274	CFSB-276	CFSB-276
Sample Lab IDs	320-38708-9, 460-155040-9	320-38708-11, 460-155040-11	320-38708-13, 460-155040-13	320-38708-15, 460-155040-15	180-77673-45, 460-155989-67	180-77673-39, 460-155989-61	180-77673-42, 460-155989-64	180-77673-20, 460-155989-42	180-77673-23, 460-155989-45	180-77673-48, 460-155989-70	180-77782-67, 460-156162-17	460-165781-2	180-77782-73, 460-156162-23	460-165781-6
Sample Name	CFSB-233-SO-0-0.5	CFSB-234-SO-0-0.5	CFSB-235-SO-0-0.5	CFSB-236-SO-0-0.5	CFSB-240-SO-0-0.5	CFSB-242-SO-0-0.5	CFSB-243-SO-0-0.5	CFSB-246-SO-0-0.5	CFSB-247-SO-0-0.5	CFSB-266-SO-0-0.5	CFSB-274-SO-0-0.5	CFSB-274-SO-0-0.5	CFSB-276-SO-0-0.5	CFSB-276-SO-0-0.5
Sample Depth	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft
Chemical	4/28/2018	4/28/2018	4/28/2018	4/28/2018	5/10/2018	5/10/2018	5/10/2018	5/9/2018	5/9/2018	5/10/2018	5/11/2018	9/28/2018	5/11/2018	9/28/2018
Di-N-Butyl Phthalate	--	--	--	--	0.016 U	0.017 U	0.016 U	0.018 U	0.017 U	0.016 U	0.76 U	--	0.63 U	--
Di-N-Octylphthalate	--	--	--	--	0.022 U	0.022 U	0.021 U	0.024 U	0.022 U	0.022 U	1 U	--	0.84 U	--
Fluoranthene	--	--	--	--	0.49	0.16	0.24	0.071	0.24	0.11	46	--	21	--
Fluorene	--	--	--	--	0.018	0.0035 J	0.016	0.0016 U	0.0055 J	0.0015 U	2.2	--	0.66	--
Hexachlorobenzene	--	--	--	--	0.0027 U	0.0027 U	0.0026 U	0.0029 U	0.0027 U	0.0027 U	0.12 U	--	0.1 U	--
Hexachlorobutadiene	--	--	--	--	0.0022 U	0.0022 U	0.0021 U	0.0024 U	0.0022 U	0.0022 U	0.1 U	--	0.084 U	--
Hexachlorocyclopentadiene	--	--	--	--	0.0019 U	0.0019 U	0.0019 U	0.0021 U	0.0019 U	0.0019 U	0.088 UJ	--	0.073 UJ	--
Hexachloroethane	--	--	--	--	0.0019 U	0.002 U	0.0019 U	0.0021 U	0.0019 U	0.0019 U	0.089 U	--	0.074 U	--
Indeno(1,2,3-C,D)Pyrene	--	--	--	--	0.36	0.1	0.11	0.05	0.17	0.091	19	--	8.3	--
Isophorone	--	--	--	--	0.0019 U	0.0019 U	0.0019 U	0.0021 U	0.0019 U	0.0019 U	0.088 U	--	0.073 U	--
Naphthalene	--	--	--	--	0.0054 J	0.0017 J	0.012	0.0016 U	0.0022 J	0.0015 U	0.96	--	0.28 J	--
Nitrobenzene	--	--	--	--	0.014 U	0.014 U	0.013 U	0.015 U	0.014 U	0.014 U	0.63 U	--	0.53 U	--
N-Nitrosodi-N-Propylamine	--	--	--	--	0.0025 U	0.0026 U	0.0025 U	0.0028 U	0.0026 U	0.0025 U	0.12 U	--	0.097 U	--
N-Nitrosodiphenylamine	--	--	--	--	0.012 U	0.013 U	0.012 U	0.014 U	0.013 U	0.012 U	0.58 U	--	0.48 U	--
Pentachlorophenol	--	--	--	--	0.06 UJ	0.061 UJ	0.059 UJ	0.066 U	0.061 U	0.06 U	2.8 U	--	2.3 U	--
Phenanthrene	--	--	--	--	0.2	0.06	0.14	0.024	0.1	0.034	30	--	12	--
Phenol	--	--	--	--	0.011 U	0.012 U	0.011 U	0.012 U	0.011 U	0.011 U	0.53 U	--	0.44 U	--
Pyrene	--	--	--	--	0.49	0.13	0.2	0.064	0.32	0.11	52	--	21	--

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-1
Summary of Data Used in Risk Assessment
Main Plant Area Soil (0-0.5 ft-bgs) - Current
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-288	CFSB-288	CFSB-293	CFSB-294
Sample Lab IDs	460-159538-14	320-43709-20	320-43709-16	320-43709-12
Sample Name	CFSB-288-SO-0-0.5	CFSB-288-SO-0-0.5	CFSB-293-SO-0-0.5	CFSB-294-SO-0-0.5
Sample Depth	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft
Chemical	6/28/2018	9/27/2018	9/27/2018	9/27/2018
GENERAL CHEMISTRY (mg/kg)				
Fluoride	--	--	--	--
Cyanide	--	--	--	--
METALS (mg/kg)				
"Chromium, Hexavalent - Estimated"	--	--	--	--
"Chromium, Trivalent - Calculated"	34.66	--	--	--
"Chromium, Trivalent - Estimated"	--	--	--	--
Aluminum	--	--	--	--
Antimony	--	--	--	--
Arsenic	--	--	--	--
Barium	--	--	--	--
Beryllium	--	--	--	--
Cadmium	--	--	--	--
Calcium	--	--	--	--
Chromium, Total	34.9	--	--	--
Cobalt	--	--	--	--
Copper	--	--	--	--
Iron	--	--	--	--
Lead	--	--	--	--
Magnesium	--	--	--	--
Manganese	--	--	--	--
Mercury	--	--	--	--
Nickel	--	--	--	--
Potassium	--	--	--	--
Selenium	--	--	--	--
Silver	--	--	--	--
Sodium	--	--	--	--
Thallium	--	--	--	--
Vanadium	--	--	--	--
Zinc	--	--	--	--
METALS|HEXAVALENT CHROMIUM (mg/kg)				
Chromium, Hexavalent	0.24 J-	--	--	--
PESTICIDES (mg/kg)				
Aldrin	--	--	--	--
Alpha Bhc (Alpha Hexachlorocyclohexane)	--	--	--	--
Alpha Endosulfan	--	--	--	--
Beta Bhc (Beta Hexachlorocyclohexane)	--	--	--	--
Beta Endosulfan	--	--	--	--
cis-Chlordane	--	--	--	--
Delta BHC (Delta Hexachlorocyclohexane)	--	--	--	--
Dieldrin	--	--	--	--
Endosulfan Sulfate	--	--	--	--
Endrin	--	--	--	--
Endrin Aldehyde	--	--	--	--
Endrin Ketone	--	--	--	--
Gamma Bhc (Lindane)	--	--	--	--
Heptachlor	--	--	--	--
Heptachlor Epoxide	--	--	--	--
Methoxychlor	--	--	--	--
P,P'-DDD	--	--	--	--
P,P'-DDE	--	--	--	--
P,P'-DDT	--	--	--	--
Toxaphene	--	--	--	--
trans-Chlordane	--	--	--	--
POLYCHLORINATED BIPHENYLS (mg/kg)				
PCB-1016 (Aroclor 1016)	--	--	--	--
PCB-1221 (Aroclor 1221)	--	--	--	--
PCB-1232 (Aroclor 1232)	--	--	--	--

Table E-1
Summary of Data Used in Risk Assessment
Main Plant Area Soil (0-0.5 ft-bgs) - Current
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-288	CFSB-288	CFSB-293	CFSB-294
Sample Lab IDs	460-159538-14	320-43709-20	320-43709-16	320-43709-12
Sample Name	CFSB-288-SO-0-0.5	CFSB-288-SO-0-0.5	CFSB-293-SO-0-0.5	CFSB-294-SO-0-0.5
Sample Depth	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft
Chemical	6/28/2018	9/27/2018	9/27/2018	9/27/2018
PCB-1242 (Aroclor 1242)	--	--	--	--
PCB-1248 (Aroclor 1248)	--	--	--	--
PCB-1254 (Aroclor 1254)	--	--	--	--
PCB-1260 (Aroclor 1260)	--	--	--	--
PCB-1262 (Aroclor 1262)	--	--	--	--
PCB-1268 (Aroclor 1268)	--	--	--	--
Polychlorinated Biphenyl (PCBs)	--	--	--	--
SEMIVOLATILE ORGANIC COMPOUNDS (mg/kg)				
1,2,4,5-Tetrachlorobenzene	--	--	--	--
1,4-Dioxane (P-Dioxane)	--	--	--	--
2,3,4,6-Tetrachlorophenol	--	--	--	--
2,4,5-Trichlorophenol	--	--	--	--
2,4,6-Trichlorophenol	--	--	--	--
2,4-Dichlorophenol	--	--	--	--
2,4-Dimethylphenol	--	--	--	--
2,4-Dinitrophenol	--	--	--	--
2,4-Dinitrotoluene	--	--	--	--
2,6-Dinitrotoluene	--	--	--	--
2-Chloronaphthalene	--	--	--	--
2-Chlorophenol	--	--	--	--
2-Methylnaphthalene	--	--	--	--
2-Methylphenol (O-Cresol)	--	--	--	--
2-Nitroaniline	--	--	--	--
2-Nitrophenol	--	--	--	--
3- And 4- Methylphenol (Total)	--	--	--	--
3,3'-Dichlorobenzidine	--	--	--	--
3-Nitroaniline	--	--	--	--
4,6-Dinitro-2-Methylphenol	--	--	--	--
4-Bromophenyl Phenyl Ether	--	--	--	--
4-Chloro-3-Methylphenol	--	--	--	--
4-Chloroaniline	--	--	--	--
4-Chlorophenyl Phenyl Ether	--	--	--	--
4-Nitroaniline	--	--	--	--
4-Nitrophenol	--	--	--	--
Acenaphthene	--	--	--	--
Acenaphthylene	--	--	--	--
Acetophenone	--	--	--	--
Anthracene	--	--	--	--
Atrazine	--	--	--	--
Benzaldehyde	--	--	--	--
Benzo(A)Anthracene	--	--	--	--
Benzo(A)Pyrene	--	--	--	--
Benzo(B)Fluoranthene	--	--	--	--
Benzo(G,H,I)Perylene	--	--	--	--
Benzo(K)Fluoranthene	--	--	--	--
Benzyl Butyl Phthalate	--	--	--	--
Biphenyl (Diphenyl)	--	--	--	--
Bis(2-Chloroethoxy) Methane	--	--	--	--
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	--	--	--	--
Bis(2-Chloroisopropyl) Ether	--	--	--	--
Bis(2-Ethylhexyl) Phthalate	--	--	--	--
Caprolactam	--	--	--	--
Carbazole	--	--	--	--
Chrysene	--	--	--	--
Dibenz(A,H)Anthracene	--	--	--	--
Dibenzofuran	--	--	--	--
Diethyl Phthalate	--	--	--	--
Dimethyl Phthalate	--	--	--	--

Table E-1
Summary of Data Used in Risk Assessment
Main Plant Area Soil (0-0.5 ft-bgs) - Current
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-288	CFSB-288	CFSB-293	CFSB-294
Sample Lab IDs	460-159538-14	320-43709-20	320-43709-16	320-43709-12
Sample Name	CFSB-288-SO-0-0.5	CFSB-288-SO-0-0.5	CFSB-293-SO-0-0.5	CFSB-294-SO-0-0.5
Sample Depth	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft
Chemical	6/28/2018	9/27/2018	9/27/2018	9/27/2018
Di-N-Butyl Phthalate	--	--	--	--
Di-N-Octylphthalate	--	--	--	--
Fluoranthene	--	--	--	--
Fluorene	--	--	--	--
Hexachlorobenzene	--	--	--	--
Hexachlorobutadiene	--	--	--	--
Hexachlorocyclopentadiene	--	--	--	--
Hexachloroethane	--	--	--	--
Indeno(1,2,3-C,D)Pyrene	--	--	--	--
Isophorone	--	--	--	--
Naphthalene	--	--	--	--
Nitrobenzene	--	--	--	--
N-Nitrosodi-N-Propylamine	--	--	--	--
N-Nitrosodiphenylamine	--	--	--	--
Pentachlorophenol	--	--	--	--
Phenanthrene	--	--	--	--
Phenol	--	--	--	--
Pyrene	--	--	--	--

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-2
Summary of Data Used in Risk Assessment
Main Plant Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFDS-003	CFDS-005	CFDS-005-DUP	CFDS-005	CFDS-007	CFDS-007	CFMW-025A	CFMW-025A	CFMW-025A	CFMW-026	CFMW-026	CFMW-026-DUP	CFMW-026
Sample Lab IDs	460-112270-1	460-112270-2	460-112270-4	460-117126-5	460-112270-3	460-117126-3	460-117124-1	460-117124-3	460-117124-4	460-115528-27	460-115528-26	460-115528-25	460-115528-28
Sample Name	CFDS-003-SO-2-3	CFDS-005-SO-2-3	CFDS-DUP-SO-1	CFDS-005-SO-6-8	CFDS-007-SO-3-4	CFDS-007-SO-8-10	CFMW-025a-SO-0-0.5	CFMW-025a-SO-0.5-2	CFMW-025a-SO-10-12	CFMW-026-SO-0-0.5	CFMW-026-SO-0.5-2	CFMW-DUP15-SO	CFMW-026-SO-10-12
Sample Depth	2-3 ft	2-3 ft	2-3 ft	6-8 ft	3-4 ft	8-10 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	0.5-2 ft	10-12 ft
Chemical	4/12/2016	4/12/2016	4/12/2016	7/15/2016	4/12/2016	7/14/2016	7/13/2016	7/13/2016	7/13/2016	6/14/2016	6/14/2016	6/14/2016	6/14/2016
GENERAL CHEMISTRY (mg/kg)													
Fluoride	298 J	830 J	869 J	303 J+	485 J	493 J+	16.7 J	7.99 J	2.06 J	4.25 J	4.09 J	84.1 J	51.7 J
Cyanide	0.023 UR	0.42 J	0.32 J	0.11 J	0.33 J	1.8 J	0.2	0.069 J	0.018 J	0.33	0.057 J	0.06 J	0.014 U
METALS (mg/kg)													
"Chromium, Hexavalent - Estimated"	0.16326	0.733333	0.599513	0.382725	1.08929	0.719951	0.278345	0.323844	0.187348	0.160584	0.256934	0.235523	0.216788
"Chromium, Trivalent - Calculated"	--	--	--	--	--	--	--	--	--	--	--	--	--
"Chromium, Trivalent - Estimated"	5.93674	26.6667	21.8005	13.9173	39.6107	26.18	10.1217	11.7762	6.81265	5.83942	9.34307	8.56448	7.88321
Aluminum	11300	75200	96000	18900	90900	52600	23400	20800	5790	11500	19000	18100	7850
Antimony	0.41 UJ	0.67 J-	0.61 J-	0.46 U	3.3 J-	0.5 U	0.46 UJ	0.44 UJ	0.39 UJ	0.48 UJ	0.37 UJ	0.36 UJ	0.34 UJ
Arsenic	1.6	6	4.1	5.8	11.5	6.8	7.1	3.9	3.4	3.1	4	4.3	4.1
Barium	50.5	94.6	106	86.2	99.7	128	333	206	44.7	305	187	173	62.5
Beryllium	0.43	1.5 J	2.8 J	0.74	1.3	3.4	0.64	0.62	0.37 J	0.41 J	0.46	0.48	0.36
Cadmium	0.31 J	1.1 J	0.59 J	0.35 U	2.5	1.4	0.35 U	0.33 U	0.29 U	0.66 J	0.28 U	0.28 U	0.26 U
Calcium	7240	8610	8030	4230	11100	27500	5920	2110	20400	8020	1790	1590	29500
Chromium, Total	6.1	27.4	22.4	14.3	40.7	26.9	10.4 J	12.1 J	7 J	6	9.6	8.8	8.1
Cobalt	3	4.1	2.9	6.7	6.7	7.7	6.6	6.6	5.8	3.4	5.7	5	5.3
Copper	9.1	48.2 J	27.3 J	23.4	74.8	40.9	20	16	12.5	14.5 J+	10.1 J+	8.8 J+	14.4 J+
Iron	6870	10100	13300	15800	21800	15700	18200 J	18400 J	11500 J	7940	15800	15200	13200
Lead	28.1	66.2 J	15.5 J	14.7	71.7	249	18.5	10.4	9.7	44.8 J+	11.4 J+	10.2 J+	5.7 J+
Magnesium	7000	5410 J	2880 J	8830	5360	9060	7000	8050	7590	3030	7290	6970	11100
Manganese	338	194	151	359	221	192	778 J	526 J	227 J	631 J	523 J	473 J	432 J
Mercury	0.03	0.024	0.021 J	0.03	0.041	0.059	0.027	0.013 U	0.014 J	0.025	0.013 U	0.013 U	0.012 U
Nickel	11.8	56.5	46.6	24.5	171	150	13.9 J	11.8 J	8 J	17.4	11.6	9.9	9.3
Potassium	499	1110	1710	944	1030	2330	1140	779	478	1530	1070	1000	672
Selenium	0.39 UJ	0.41 UJ	0.45 UJ	0.44 U	0.89 J-	0.47 U	0.43 U	0.41 U	0.36 U	0.45 U	0.34 U	0.34 U	0.32 U
Silver	0.76 U	0.84 J	0.92 J	0.85 U	1.8	0.92 U	0.85 U	0.8 U	0.71 U	0.88 U	0.67 U	0.66 U	0.63 U
Sodium	1060	7760 J	45900 J	450	2250	1420	157	63 J	36.2 U	45.1 U	34.3 U	33.9 U	32.1 U
Thallium	0.16 U	0.16 U	0.18 U	0.18 U	0.19 J	0.19 U	0.17 U	0.16 U	0.15 U	0.18 U	0.14 U	0.14 U	0.13 U
Vanadium	5.2	23.5	17.5	17.2	57	64.4	16.3 J	18.3 J	7.2 J	11.6	14.4	13.5	9.3
Zinc	272	685 J	254 J	88.4	408	178	84.9	48.4	24.8	238	140	112	61.5
METALS|HEXAVALENT CHROMIUM (mg/kg)													
Chromium, Hexavalent	--	--	--	--	--	--	--	--	--	--	--	--	--
PESTICIDES (mg/kg)													
Aldrin	0.0011 U	0.0011 U	0.0012 U	0.00093 U	0.0012 U	0.0012 U	0.001 U	--	--	0.0012 U	--	--	--
Alpha Bhc (Alpha Hexachlorocyclohexane)	0.00083 U	0.00084 U	0.00089 U	0.0007 U	0.0009 U	0.00089 U	0.00079 U	--	--	0.00089 U	--	--	--
Alpha Endosulfan	0.0013 U	0.0013 U	0.0014 U	0.0011 U	0.0014 U	0.0014 U	0.0012 U	--	--	0.0014 U	--	--	--
Beta Bhc (Beta Hexachlorocyclohexane)	0.00088 U	0.00089 U	0.00095 U	0.00075 U	0.00095 U	0.00094 U	0.00084 U	--	--	0.00095 U	--	--	--
Beta Endosulfan	0.0014 U	0.0014 U	0.0015 U	0.0012 U	0.0015 U	0.0015 U	0.0014 U	--	--	0.0015 U	--	--	--
cis-Chlordane	0.0015 U	0.0015 U	0.0016 U	0.0013 U	0.0016 U	0.0016 U	0.0014 U	--	--	0.0016 U	--	--	--
Delta BHC (Delta Hexachlorocyclohexane)	0.00099 U	0.001 U	0.0011 U	0.00084 U	0.0011 U	0.0011 U	0.00094 U	--	--	0.0011 U	--	--	--
Dieldrin	0.0012 U	0.0012 U	0.0013 U	0.001 U	0.0013 U	0.0013 U	0.0011 U	--	--	0.0013 U	--	--	--
Endosulfan Sulfate	0.0011 U	0.0011 U	0.0011 U	0.0009 U	0.0011 U	0.0011 U	0.001 U	--	--	0.0011 U	--	--	--
Endrin	0.0012 U	0.0012 U	0.0012 U	0.00098 U	0.0012 U	0.0012 U	0.0011 U	--	--	0.0012 U	--	--	--
Endrin Aldehyde	0.0011 U	0.0011 U	0.0012 U	0.00095 U	0.0012 U	0.0012 U	0.0011 U	--	--	0.0012 U	--	--	--
Endrin Ketone	0.0013 U	0.0013 U	0.0014 U	0.0011 U	0.0014 U	0.0014 U	0.0012 U	--	--	0.0014 U	--	--	--
Gamma Bhc (Lindane)	0.00082 U	0.00082 U	0.00088 U	0.00069 U	0.00088 U	0.00087 U	0.00078 U	--	--	0.00087 U	--	--	--
Heptachlor	0.0012 U	0.0012 U	0.0013 U	0.00099 U	0.0013 U	0.0012 U	0.0011 U	--	--	0.0013 U	--	--	--
Heptachlor Epoxide	0.0018 U	0.0018 U	0.0019 U	0.0015 U	0.0019 U	0.0019 U	0.0017 U	--	--	0.0019 U	--	--	--
Methoxychlor	0.0019 U	0.0019 U	0.0021 U	0.0016 U	0.0021 U	0.0021 U	0.0018 U	--	--	0.0021 U	--	--	--
P,P'-DDD	0.0012 U	0.0012 U	0.0013 U	0.001 U	0.0013 U	0.0013 U	0.0011 U	--	--	0.0013 U	--	--	--
P,P'-DDE	0.0013 U	0.0013 U	0.0014 U	0.0011 U	0.0014 U	0.0014 U	0.0013 U	--	--	0.0014 U	--	--	--
P,P'-DDT	0.00094 U	0.00095 U	0.001 U	0.00079 U	0.001 U	0.001 U	0.00089 U	--	--	0.001 U	--	--	--
Toxaphene	0.027 U	0.027 U	0.028 U	0.022 U	0.029 U	0.028 U	0.025 U	--	--	0.028 U	--	--	--
trans-Chlordane	0.002 U	0.002 U	0.0021 U	0.0017 U	0.0021 U	0.0021 U	0.0019 U	--	--	0.0021 U	--	--	--
POLYCHLORINATED BIPHENYLS (mg/kg)													
PCB-1016 (Aroclor 1016)	0.012 U	0.012 U	0.013 U	0.01 U	0.013 U	0.013 U	0.012 U	0.0098 U	0.0093 U	0.013 U	0.01 U	0.01 U	0.0094 U
PCB-1221 (Aroclor 1221)	0.012 U	0.012 U	0.013 U	0.01 U	0.013 U	0.013 U	0.012 U	0.0098 U	0.0093 U	0.013 U	0.01 U	0.01 U	0.0094 U

Table E-2
Summary of Data Used in Risk Assessment
Main Plant Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFDS-003	CFDS-005	CFDS-005-DUP	CFDS-005	CFDS-007	CFDS-007	CFMW-025A	CFMW-025A	CFMW-025A	CFMW-026	CFMW-026	CFMW-026-DUP	CFMW-026
Sample Lab IDs	460-112270-1	460-112270-2	460-112270-4	460-117126-5	460-112270-3	460-117126-3	460-117124-1	460-117124-3	460-117124-4	460-115528-27	460-115528-26	460-115528-25	460-115528-28
Sample Name	CFDS-003-SO-2-3	CFDS-005-SO-2-3	CFDS-DUP-SO-1	CFDS-005-SO-6-8	CFDS-007-SO-3-4	CFDS-007-SO-8-10	CFMW-025a-SO-0-0.5	CFMW-025a-SO-0.5-2	CFMW-025a-SO-10-12	CFMW-026-SO-0-0.5	CFMW-026-SO-0.5-2	CFMW-DUP15-SO	CFMW-026-SO-10-12
Sample Depth	2-3 ft	2-3 ft	2-3 ft	6-8 ft	3-4 ft	8-10 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	0.5-2 ft	10-12 ft
Chemical	4/12/2016	4/12/2016	4/12/2016	7/15/2016	4/12/2016	7/14/2016	7/13/2016	7/13/2016	7/13/2016	6/14/2016	6/14/2016	6/14/2016	6/14/2016
PCB-1232 (Aroclor 1232)	0.012 U	0.012 U	0.013 U	0.01 U	0.013 U	0.013 U	0.012 U	0.0098 U	0.0093 U	0.013 U	0.01 U	0.01 U	0.0094 U
PCB-1242 (Aroclor 1242)	0.012 U	0.012 U	0.013 U	0.01 U	0.013 U	0.013 U	0.012 U	0.0098 U	0.0093 U	0.013 U	0.01 U	0.01 U	0.0094 U
PCB-1248 (Aroclor 1248)	0.012 U	0.012 U	0.013 U	0.01 U	0.013 U	0.013 U	0.012 U	0.0098 U	0.0093 U	0.013 U	0.01 U	0.01 U	0.0094 U
PCB-1254 (Aroclor 1254)	0.013 U	0.013 U	0.013 U	0.011 U	0.014 U	0.013 U	0.012 U	0.01 U	0.0096 U	0.013 U	0.01 U	0.01 U	0.0097 U
PCB-1260 (Aroclor 1260)	0.013 U	0.013 U	0.013 U	0.011 U	0.014 U	0.013 U	0.012 U	0.01 U	0.0096 U	0.013 U	0.01 U	0.01 U	0.0097 U
PCB-1262 (Aroclor 1262)	0.013 U	0.013 U	0.013 U	0.011 U	0.014 U	0.013 U	0.012 U	0.01 U	0.0096 U	0.013 U	0.01 U	0.01 U	0.0097 U
PCB-1268 (Aroclor 1268)	0.013 U	0.013 U	0.013 U	0.011 U	0.014 U	0.013 U	0.012 U	0.01 U	0.0096 U	0.013 U	0.01 U	0.01 U	0.0097 U
Polychlorinated Biphenyl (PCBs)	0.013 U	0.013 U	0.013 U	0.011 U	0.014 U	0.013 U	0.012 U	0.01 U	0.0096 U	0.013 U	0.01 U	0.01 U	0.0097 U
SEMIVOLATILE ORGANIC COMPOUNDS (mg/kg)													
1,2,4,5-Tetrachlorobenzene	0.17 U	0.17 U	0.072 U	0.028 U	0.36 UT	1.8 U	0.032 U	0.027 U	0.026 UJ	0.036 U	0.028 U	0.028 U	0.026 U
1,4-Dioxane (P-Dioxane)	0.6 U	0.61 U	0.26 U	0.1 U	1.3 U	6.4 U	0.11 U	0.098 U	0.092 U	0.13 U	0.1 U	0.1 U	0.093 U
2,3,4,6-Tetrachlorophenol	0.21 U	0.21 U	0.091 U	0.036 U	0.46 UT	2.3 U	0.04 U	0.034 U	0.032 UJ	0.045 U	0.035 U	0.035 U	0.033 U
2,4,5-Trichlorophenol	0.22 U	0.23 U	0.096 U	0.038 U	0.48 UT	2.4 U	0.043 U	0.036 U	0.034 UJ	0.048 U	0.037 U	0.037 U	0.035 U
2,4,6-Trichlorophenol	0.064 U	0.064 U	0.027 U	0.011 U	0.14 UT	0.68 U	0.012 U	0.01 U	0.0098 UJ	0.014 U	0.011 U	0.011 U	0.0099 U
2,4-Dichlorophenol	0.053 U	0.053 U	0.023 U	0.009 U	0.11 UT	0.57 U	0.01 U	0.0086 U	0.0081 UJ	0.011 U	0.0088 U	0.0088 U	0.0082 U
2,4-Dimethylphenol	0.49 U	0.5 U	0.21 U	0.084 U	1.1 UT	5.3 U	0.094 U	0.08 U	0.076 UJ	0.11 U	0.082 U	0.082 U	0.076 U
2,4-Dinitrophenol	1.7 U	1.7 U	0.73 U	0.29 U	3.7 UT	18 U	0.32 U	0.28 U	0.26 UR	0.36 U	0.28 U	0.28 U	0.26 UJ
2,4-Dinitrotoluene	0.089 U	0.09 U	0.038 U	0.015 U	0.19 U	0.95 U	0.017 U	0.014 U	0.014 UJ	0.019 U	0.015 U	0.015 U	0.014 U
2,6-Dinitrotoluene	0.12 U	0.12 U	0.051 U	0.02 U	0.26 U	1.3 U	0.023 U	0.019 U	0.018 UJ	0.026 U	0.02 U	0.02 U	0.018 U
2-Chloronaphthalene	0.051 U	0.051 U	0.022 U	0.0086 U	0.11 UT	0.54 U	0.0097 U	0.0083 U	0.0078 UJ	0.011 U	0.0085 U	0.0084 U	0.0079 U
2-Chlorophenol	0.057 U	0.057 U	0.024 U	0.0097 U	0.12 UT	0.61 U	0.011 U	0.0093 U	0.0088 UJ	0.012 U	0.0095 U	0.0095 U	0.0088 U
2-Methylnaphthalene	0.22 J	0.3 J	0.079 J	0.036 J	0.45 DJT	1.3 J	0.0094 U	0.0081 U	0.0076 UJ	0.011 U	0.0083 U	0.0082 U	0.0077 U
2-Methylphenol (O-Cresol)	0.098 U	0.099 U	0.042 U	0.017 U	0.21 UT	1 U	0.019 U	0.016 U	0.015 U	0.021 U	0.016 U	0.016 U	0.015 U
2-Nitroaniline	0.074 U	0.075 U	0.032 U	0.013 U	0.16 U	0.79 U	0.014 U	0.012 U	0.011 U	0.016 U	0.012 U	0.012 U	0.011 U
2-Nitrophenol	0.075 U	0.076 U	0.032 U	0.013 U	0.16 UT	0.81 U	0.014 U	0.012 U	0.012 UJ	0.016 U	0.013 U	0.013 U	0.012 U
3- And 4- Methylphenol (Total)	0.06 U	0.06 U	0.026 U	0.01 U	0.13 U	0.64 U	0.011 U	0.0097 U	0.0092 U	0.013 U	0.01 U	0.0099 U	0.0092 U
3,3'-Dichlorobenzidine	0.25 U	0.25 U	0.11 U	0.042 U	0.54 UT	2.7 U	0.048 U	0.041 U	0.038 U	0.054 U	0.042 U	0.042 U	0.039 U
3-Nitroaniline	0.067 U	0.067 U	0.029 U	0.011 U	0.14 U	0.71 U	0.013 U	0.011 U	0.01 U	0.014 U	0.011 U	0.011 U	0.01 U
4,6-Dinitro-2-Methylphenol	0.6 U	0.6 U	0.26 U	0.1 U	1.3 UT	6.4 U	0.11 U	0.097 U	0.092 UJ	0.13 U	0.1 U	0.099 U	0.093 UJ
4-Bromophenyl Phenyl Ether	0.071 U	0.071 U	0.03 U	0.012 U	0.15 U	0.75 U	0.013 U	0.011 U	0.011 UJ	0.015 U	0.012 U	0.012 U	0.011 U
4-Chloro-3-Methylphenol	0.097 U	0.097 U	0.041 U	0.016 U	0.21 UT	1 U	0.018 U	0.016 U	0.015 U	0.021 U	0.016 U	0.016 U	0.015 U
4-Chloroaniline	0.058 U	0.058 U	0.025 U	0.0098 U	0.12 U	0.62 U	0.011 U	0.0094 U	0.0089 U	0.012 U	0.0096 U	0.0096 U	0.0089 U
4-Chlorophenyl Phenyl Ether	0.067 U	0.068 U	0.029 U	0.011 U	0.15 UT	0.72 U	0.013 UJ	0.011 UJ	0.01 UJ	0.014 U	0.011 U	0.011 U	0.01 U
4-Nitroaniline	0.085 U	0.086 U	0.036 U	0.014 U	0.18 U	0.91 U	0.016 U	0.014 U	0.013 U	0.018 U	0.014 U	0.014 U	0.013 U
4-Nitrophenol	1.1 U	1.1 U	0.46 U	0.18 U	2.3 UT	12 U	0.21 U	0.18 U	0.17 U	0.23 U	0.18 U	0.18 U	0.17 U
Acenaphthene	0.99 J	1.4 J	0.65 J	0.16 J	2.6 DJT	5.7 J	0.01 U	0.0088 U	0.0083 UJ	0.012 J	0.0091 U	0.009 U	0.0084 U
Acenaphthylene	0.11 J	0.074 J	0.025 UJ	0.0098 U	0.12 UT	0.62 U	0.011 U	0.0094 U	0.0089 UJ	0.012 U	0.0096 U	0.0096 U	0.0089 U
Acetophenone	0.049 U	0.049 U	0.021 U	0.0083 U	0.11 UT	0.52 U	0.0093 U	0.0079 U	0.0075 U	0.01 U	0.0083 J	0.0081 U	0.0076 U
Anthracene	2.6	4 J	1.2 J	0.48	5.1 D	22 J	0.041 U	0.035 U	0.033 UJ	0.046 U	0.036 U	0.035 U	0.033 U
Atrazine	0.1 U	0.1 U	0.043 U	0.017 U	0.22 U	1.1 U	0.019 U	0.016 U	0.015 U	0.021 U	0.017 U	0.017 U	0.015 U
Benzaldehyde	0.17 U	0.17 U	0.073 U	0.029 U	0.37 UT	1.8 U	0.033 U	0.028 U	0.026 UJ	0.037 U	0.029 U	0.028 U	0.026 U
Benzo(A)Anthracene	8.4	11 J	6.4 J	1.8	37 D	130	0.078	0.03 U	0.029 UJ	0.2	0.031 U	0.031 U	0.029 U
Benzo(A)Pyrene	7.9	13 J	7 J	1.6	38 D	67	0.088	0.011 U	0.01 UJ	0.24	0.011 U	0.012 J	0.011 U
Benzo(B)Fluoranthene	14	18	11	2.5	71 D	160	0.18	0.014 U	0.013 UJ	0.52	0.021 J	0.031 J	0.014 U
Benzo(G,H,I)Perylene	11	12	9.3	1.8	50 D	53	0.11 J	0.021 U	0.02 U	0.28 J	0.022 U	0.021 U	0.02 U
Benzo(K)Fluoranthene	4.9	7.5 J	4.1 J	1.2	21 D	62	0.056	0.016 U	0.015 UJ	0.19	0.016 U	0.016 U	0.015 U
Benzyl Butyl Phthalate	1.3 J	0.07 U	0.03 U	0.012 U	3.3 DJ	0.74 U	0.013 U	0.011 U	0.011 U	0.015 U	0.012 U	0.011 U	0.011 U
Biphenyl (Diphenyl)	0.19 U	0.19 U	0.082 U	0.032 U	0.41 UT	2 U	0.036 U	0.031 U	0.029 UJ	0.041 U	0.032 U	0.032 U	0.03 U
Bis(2-Chloroethoxy) Methane	0.07 U	0.07 U	0.03 U	0.012 U	0.15 U	0.75 U	0.013 U	0.011 U	0.011 U	0.015 U	0.012 U	0.012 U	0.011 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.053 U	0.053 U	0.023 U	0.009 U	0.11 UT	0.57 U	0.01 U	0.0086 U	0.0081 U	0.011 U	0.0088 U	0.0088 U	0.0082 U
Bis(2-Chloroisopropyl) Ether	0.092 U	0.093 U	0.04 U	0.016 U	0.2 U	0.99 U	0.018 U	0.015 U	0.014 U	0.02 U	0.015 U	0.015 U	0.014 U
Bis(2-Ethylhexyl) Phthalate	4.1	1.7 J	1.7	0.13 J	4 DJT	0.94 U	0.017 U	0.014 U	0.013 UJ	0.13 J	0.015 U	0.015 U	0.014 U
Caprolactam	0.16 U	0.16 U	0.069 U	0.027 U	0.35 U	1.7 U	0.031 U	0.026 U	0.025 UJ	0.035 U	0.027 UJ	0.027 UJ	0.025 U
Carbazole	2.7	3.3 J	1.2 J	0.46	7.8 D	32	0.014 J	0.009 U	0.0086 UJ	0.031 J	0.0093 U	0.0092 U	0.0086 U
Chrysene	17	19 J	11 J	3.2	68 D	330	0.14 J	0.0099 U	0.0094 UJ	0.37 J	0.018 J	0.023 J	0.0095 U
Dibenz(A,H)Anthracene	3.1	3.8	2.6	0.5	14 D	20	0.023 J	0.019 U	0.018 U	0.059	0.019 U	0.019 U	0.018 U
Dibenzofuran	0.59 J	0.79 J	0.3 J	0.084 J	1.1 DJT	3.6 J	0.013 U	0.011 U	0.01 UJ	0.015 U	0.011 U	0.011 U	0.011 U

Table E-2
Summary of Data Used in Risk Assessment
Main Plant Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFDS-003	CFDS-005	CFDS-005-DUP	CFDS-005	CFDS-007	CFDS-007	CFMW-025A	CFMW-025A	CFMW-025A	CFMW-026	CFMW-026	CFMW-026-DUP	CFMW-026
Sample Lab IDs	460-112270-1	460-112270-2	460-112270-4	460-117126-5	460-112270-3	460-117126-3	460-117124-1	460-117124-3	460-117124-4	460-115528-27	460-115528-26	460-115528-25	460-115528-28
Sample Name	CFDS-003-SO-2-3	CFDS-005-SO-2-3	CFDS-DUP-SO-1	CFDS-005-SO-6-8	CFDS-007-SO-3-4	CFDS-007-SO-8-10	CFMW-025a-SO-0-0.5	CFMW-025a-SO-0.5-2	CFMW-025a-SO-10-12	CFMW-026-SO-0-0.5	CFMW-026-SO-0.5-2	CFMW-DUP15-SO	CFMW-026-SO-10-12
Sample Depth	2-3 ft	2-3 ft	2-3 ft	6-8 ft	3-4 ft	8-10 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	0.5-2 ft	10-12 ft
Chemical	4/12/2016	4/12/2016	4/12/2016	7/15/2016	4/12/2016	7/14/2016	7/13/2016	7/13/2016	7/13/2016	6/14/2016	6/14/2016	6/14/2016	6/14/2016
Diethyl Phthalate	0.064 U	0.064 U	0.027 U	0.011 U	0.14 U	0.68 U	0.012 U	0.01 U	0.0098 UJ	0.014 U	0.011 U	0.011 U	0.0099 U
Dimethyl Phthalate	0.065 U	0.066 U	0.028 U	0.011 U	0.14 U	0.7 U	0.012 U	0.011 U	0.01 UJ	0.014 U	0.011 U	0.011 U	0.01 U
Di-N-Butyl Phthalate	0.25 J	0.068 U	0.029 U	0.029 J	1.9 DJT	0.72 U	0.013 J	0.011 U	0.01 UJ	0.014 U	0.011 U	0.011 U	0.01 U
Di-N-Octylphthalate	0.11 U	0.11 U	0.049 U	0.019 U	0.25 UT	1.2 U	0.022 U	0.019 U	0.018 U	0.024 U	0.019 U	0.027 J	0.018 U
Fluoranthene	27	26 J	13 J	4.2	82 D	470	0.13 J	0.011 U	0.011 J-	0.35 J	0.019 J	0.026 J	0.01 U
Fluorene	1 J	1.1 J	0.5 J	0.19 J	1.7 DJT	8.2 J	0.0093 UJ	0.0079 UJ	0.0075 UJ	0.01 U	0.0082 U	0.0081 U	0.0076 U
Hexachlorobenzene	0.091 U	0.092 U	0.039 U	0.015 U	0.2 UT	0.97 U	0.017 U	0.015 U	0.014 UJ	0.019 U	0.015 U	0.015 U	0.014 U
Hexachlorobutadiene	0.063 U	0.064 U	0.027 U	0.011 U	0.14 UT	0.67 U	0.012 UJ	0.01 UJ	0.0097 UJ	0.014 U	0.011 U	0.01 U	0.0098 U
Hexachlorocyclopentadiene	0.14 U	0.14 U	0.06 U	0.024 U	0.3 UT	1.5 U	0.027 U	0.023 U	0.021 U	0.03 U	0.023 U	0.023 U	0.022 UJ
Hexachloroethane	0.082 U	0.083 U	0.035 U	0.014 U	0.18 UT	0.88 U	0.016 U	0.013 U	0.013 UJ	0.018 U	0.014 U	0.014 U	0.013 U
Indeno(1,2,3-C,D)Pyrene	12	14	10	2	56 D	62	0.1	0.024 U	0.023 U	0.3	0.025 U	0.025 U	0.023 U
Isophorone	0.048 U	0.049 U	0.021 U	0.0082 U	0.1 U	0.52 U	0.0092 U	0.0078 U	0.0074 U	0.01 U	0.008 U	0.008 U	0.0075 U
Naphthalene	0.6 J	1.1 J	0.2 J	0.071 J	0.96 DJT	4.6 J	0.011 U	0.0093 U	0.0088 UJ	0.012 U	0.0095 U	0.0095 U	0.0088 U
Nitrobenzene	0.071 U	0.071 U	0.03 U	0.012 U	0.15 U	0.75 U	0.013 U	0.011 U	0.011 UJ	0.015 U	0.012 U	0.012 U	0.011 U
N-Nitrosodi-N-Propylamine	0.075 U	0.076 U	0.032 U	0.013 U	0.16 U	0.81 U	0.014 U	0.012 U	0.012 U	0.016 U	0.013 U	0.013 U	0.012 U
N-Nitrosodiphenylamine	0.2 U	0.21 U	0.087 U	0.035 U	0.44 UT	2.2 U	0.039 U	0.033 U	0.031 UJ	0.044 U	0.034 U	0.034 U	0.032 UJ
Pentachlorophenol	0.27 U	0.27 U	0.12 U	0.046 U	0.59 UT	2.9 U	0.052 U	0.044 U	0.042 UJ	0.058 U	0.045 U	0.045 U	0.042 UJ
Phenanthrene	12	16 J	7.6 J	2	28 D	130	0.072 J	0.01 J	0.0092 UJ	0.14 J	0.015 J	0.021 J	0.0092 U
Phenol	0.073 U	0.074 U	0.031 U	0.012 U	0.16 UT	0.78 U	0.014 U	0.012 U	0.011 U	0.016 U	0.012 U	0.012 U	0.011 U
Pyrene	18	19 J	11 J	4.5	56 D	340	0.11 J	0.017 U	0.016 U	0.34 J	0.022 J	0.029 J	0.016 U
VOLATILE ORGANIC COMPOUNDS (mg/kg)													
1,1,1-Trichloroethane	0.00052 U	0.00071 U	0.0005 U	0.00023 U	0.00048 UJ	0.0065 U	--	0.00035 U	0.00032 U	--	0.0004 U	0.00039 U	0.0003 U
1,1,2,2-Tetrachloroethane	0.00023 U	0.00032 U	0.00022 U	0.00011 U	0.00021 UJ	0.0044 U	--	0.00016 U	0.00014 U	--	0.00018 U	0.00017 U	0.00014 U
1,1,2-Trichloro-1,2,2-Trifluoroethane	0.0006 U	0.00083 U	0.00058 U	0.00027 UJ	0.00055 UJ	0.0079 U	--	0.00041 U	0.00037 U	--	0.00046 U	0.00045 U	0.00035 U
1,1,2-Trichloroethane	0.00038 U	0.00053 U	0.00037 U	0.00017 U	0.00035 UJ	0.0019 U	--	0.00026 U	0.00024 U	--	0.00029 U	0.00029 U	0.00022 U
1,1-Dichloroethane	0.00047 U	0.00064 U	0.00045 U	0.00021 U	0.00043 UJ	0.0056 U	--	0.00032 U	0.00029 U	--	0.00036 U	0.00035 U	0.00027 U
1,1-Dichloroethene	0.00056 U	0.00077 U	0.00054 U	0.00025 U	0.00052 UJ	0.0079 U	--	0.00038 U	0.00035 U	--	0.00043 U	0.00042 U	0.00033 U
1,2,3-Trichlorobenzene	0.00015 U	0.00021 U	0.00014 U	0.000068 U	0.00014 UJ	0.0081 U	--	0.0001 U	0.000093 U	--	0.00011 U	0.00011 U	0.000088 UJ
1,2,4-Trichlorobenzene	0.00044 U	0.0006 U	0.00042 U	0.0002 U	0.0004 UJ	0.0063 U	--	0.0003 U	0.00027 U	--	0.00033 U	0.00033 U	0.00026 UJ
1,2-Dibromo-3-Chloropropane	0.00065 U	0.00088 U	0.00062 U	0.00029 U	0.00059 UJ	0.0053 U	--	0.00044 U	0.0004 U	--	0.00049 U	0.00048 U	0.00038 U
1,2-Dibromoethane (Ethylene Dibromide)	0.00016 U	0.00023 U	0.00016 U	0.000074 U	0.00015 UJ	0.0044 U	--	0.00011 U	0.0001 U	--	0.00013 U	0.00012 U	0.000096 U
1,2-Dichlorobenzene	0.00019 U	0.00026 U	0.00018 U	0.00065	0.00018 UJ	0.0051 U	--	0.00013 U	0.00012 U	--	0.00015 U	0.00014 U	0.00011 U
1,2-Dichloroethane	0.00015 U	0.00021 U	0.00014 U	0.000068 U	0.00014 UJ	0.0058 U	--	0.0001 U	0.000093 U	--	0.00011 U	0.00011 U	0.000088 U
1,2-Dichloropropane	0.00023 U	0.00032 U	0.00022 U	0.00011 U	0.00021 UJ	0.0042 U	--	0.00016 U	0.00014 U	--	0.00018 U	0.00017 U	0.00014 U
1,3-Dichlorobenzene	0.00016 U	0.00023 U	0.00016 U	0.000074 U	0.00015 UJ	0.0077 U	--	0.00011 U	0.0001 U	--	0.00013 U	0.00012 U	0.000096 U
1,4-Dichlorobenzene	0.00018 U	0.00024 U	0.00017 U	0.00016 J	0.00016 UJ	0.0077 U	--	0.00012 U	0.00011 U	--	0.00014 U	0.00013 U	0.0001 U
2-Hexanone	0.0013 J	0.0018 U	0.0015 J	0.00058 U	0.0012 UJ	0.017 U	--	0.00087 U	0.00079 U	--	0.00098 U	0.00096 U	0.00075 U
Acetone	0.12	0.18	0.14	0.019	0.12 T	0.025 U	--	0.034	0.0057	--	0.11 J+	0.17 J+	0.022 J+
Benzene	0.00052 J	0.0011 J	0.00082 J	0.00028 J	0.00051 J-	0.0044 U	--	0.00019 U	0.0003 J	--	0.00034 J	0.001 J	0.00069 J
Bromochloromethane	0.00023 U	0.00032 U	0.00022 U	0.00011 U	0.00021 UJ	0.007 U	--	0.00016 U	0.00014 U	--	0.00018 U	0.00017 U	0.00014 U
Bromodichloromethane	0.00052 U	0.00071 U	0.0005 U	0.00023 U	0.00048 UJ	0.0035 U	--	0.00035 U	0.00032 U	--	0.0004 U	0.00039 U	0.0003 U
Bromoform	0.00018 U	0.00024 U	0.00017 U	0.00008 U	0.00016 UJ	0.0042 UJ	--	0.00012 U	0.00011 U	--	0.00014 U	0.00013 U	0.0001 U
Bromomethane	0.00044 U	0.0006 U	0.00042 U	0.0002 UJ	0.0004 UJ	0.0042 U	--	0.0003 U	0.00027 U	--	0.00033 U	0.00033 U	0.00026 U
Carbon Disulfide	0.00059 U	0.0012 J	0.00056 UJ	0.00095 J-	0.00086 J-	0.0051 UJ	--	0.0004 U	0.00036 U	--	0.00045 UJ	0.0016 J	0.0004 J
Carbon Tetrachloride	0.00059 U	0.00081 U	0.00056 U	0.00027 U	0.00054 UJ	0.0077 U	--	0.0004 U	0.00036 U	--	0.00045 U	0.00044 U	0.00034 U
Chlorobenzene	0.00019 U	0.00026 U	0.00018 U	0.000087 U	0.00018 UJ	0.0056 U	--	0.00013 U	0.00012 U	--	0.00015 U	0.00014 U	0.00011 U
Chloroethane	0.00048 U	0.00066 U	0.00046 U	0.00022 U	0.00044 UJ	0.0086 U	--	0.00033 U	0.0003 U	--	0.00037 U	0.00036 U	0.00028 U
Chloroform	0.00029 U	0.00039 U	0.00028 U	0.00013 U	0.00026 UJ	0.0051 U	--	0.0002 U	0.00018 U	--	0.00022 U	0.00021 U	0.00017 U
Chloromethane	0.00052 UT	0.00071 UT	0.0005 UT	0.00023 U	0.00048 UT	0.0051 U	--	0.00035 U	0.00032 U	--	0.0004 U	0.00039 U	0.0003 U
Cis-1,2-Dichloroethylene	0.0003 U	0.00041 U	0.00029 U	0.00014 U	0.00028 UJ	0.006 U	--	0.0002 U	0.00019 U	--	0.00023 U	0.00023 U	0.00018 U
Cis-1,3-Dichloropropene	0.00021 U	0.00028 U	0.0002 U	0.000093 U	0.00019 UJ	0.0037 U	--	0.00014 U	0.00013 U	--	0.00016 U	0.00015 U	0.00012 U
Cyclohexane	0.00063 U	0.00086 U	0.0006 U	0.00028 UJ	0.00058 UJ	0.006 U	--	0.00043 U	0.00086	--	0.00048 U	0.00047 U	0.0021 J+
Dibromochloromethane	0.00021 U	0.00028 U	0.0002 U	0.000093 U	0.00019 UJ	0.0051 UJ	--	0.00014 U	0.00013 U	--	0.00016 U	0.00015 U	0.00012 U
Dichlorodifluoromethane	0.00044 U	0.0006 U	0.00042 U	0.0002 U	0.0004 UJ	0.0033 U	--	0.0003 U	0.00027 U	--	0.00033 U	0.00033 U	0.00026 U
Ethylbenzene	0.00025 U	0.00034 U	0.00024 U	0.00011 U	0.00023 UJ	0.095	--	0.00017 U	0.00044 J	--	0.00019 U	0.00018 U	0.001
Isopropylbenzene (Cumene)	0.00023 U	0.00032 U	0.00022 U	0.00011 U	0.00021 UJ	0.0074 U	--	0.00016 U	0.00014 U	--	0.00018 U	0.00017 U	0.00014 U
M,P-Xylene	0.00015 U	0.00021 U	0.00014 U	0.00015 J	0.00014 UJ	0.48	--	0.0001 U	0.0016	--	0.00011 U	0.00011 U	0.0036

Table E-2
Summary of Data Used in Risk Assessment
Main Plant Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFDS-003	CFDS-005	CFDS-005-DUP	CFDS-005	CFDS-007	CFDS-007	CFMW-025A	CFMW-025A	CFMW-025A	CFMW-026	CFMW-026	CFMW-026-DUP	CFMW-026
Sample Lab IDs	460-112270-1	460-112270-2	460-112270-4	460-117126-5	460-112270-3	460-117126-3	460-117124-1	460-117124-3	460-117124-4	460-115528-27	460-115528-26	460-115528-25	460-115528-28
Sample Name	CFDS-003-SO-2-3	CFDS-005-SO-2-3	CFDS-DUP-SO-1	CFDS-005-SO-6-8	CFDS-007-SO-3-4	CFDS-007-SO-8-10	CFMW-025a-SO-0-0.5	CFMW-025a-SO-0.5-2	CFMW-025a-SO-10-12	CFMW-026-SO-0-0.5	CFMW-026-SO-0.5-2	CFMW-DUP15-SO	CFMW-026-SO-10-12
Sample Depth	2-3 ft	2-3 ft	2-3 ft	6-8 ft	3-4 ft	8-10 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	0.5-2 ft	10-12 ft
Chemical	4/12/2016	4/12/2016	4/12/2016	7/15/2016	4/12/2016	7/14/2016	7/13/2016	7/13/2016	7/13/2016	6/14/2016	6/14/2016	6/14/2016	6/14/2016
Methyl Acetate	0.0012 U	0.0017 UJ	0.0087 J	0.0072	0.004 J+	0.013 U	--	0.0024 J	0.00076 U	--	0.023 J	0.0018 J	0.00072 U
Methyl Ethyl Ketone (2-Butanone)	0.019	0.022	0.024	0.0028 J	0.018 T	0.051 U	--	0.0025 J	0.00065 U	--	0.0053	0.0065	0.0037 J
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	0.0036 J	0.0042 U	0.0029 U	0.0014 U	0.0065 J-	0.015 U	--	0.0021 U	0.0019 U	--	0.0023 U	0.0023 U	0.0018 U
Methylcyclohexane	0.00069 U	0.00094 U	0.00066 U	0.00031 U	0.00063 UJ	0.0051 U	--	0.00046 U	0.0016	--	0.00052 U	0.00051 U	0.0032 J
Methylene Chloride	0.0032	0.0006 U	0.00042 U	0.0002 U	0.00084 J-	0.0049 U	--	0.0003 U	0.00027 U	--	0.00033 U	0.00033 U	0.00026 U
O-Xylene (1,2-Dimethylbenzene)	0.00022 U	0.0003 U	0.00021 U	0.000099 U	0.0002 UJ	0.15	--	0.00015 U	0.00052 J	--	0.00017 U	0.00016 U	0.0011
Styrene	0.00021 U	0.00028 U	0.0002 U	0.000093 U	0.00019 UJ	0.004 U	--	0.00014 U	0.00013 U	--	0.00016 U	0.00015 U	0.00012 U
Tert-Butyl Methyl Ether	0.00023 U	0.00032 U	0.00022 U	0.00011 U	0.00021 UT	0.003 U	--	0.00016 U	0.00014 U	--	0.00018 U	0.00017 U	0.00014 U
Tetrachloroethylene (PCE)	0.00038 U	0.00053 U	0.00037 U	0.00017 U	0.00035 UJ	0.0084 U	--	0.00026 U	0.00024 U	--	0.00029 U	0.00029 U	0.00022 U
Toluene	0.00068 J	0.00095 J	0.00076 J	0.00027 J	0.00054 J-	0.0058 U	--	0.00018 U	0.0019	--	0.0002 UJ	0.00034 J	0.0043
Trans-1,2-Dichloroethene	0.00054 U	0.00073 U	0.00051 U	0.00024 U	0.00049 UJ	0.0042 U	--	0.00036 U	0.00033 U	--	0.00041 U	0.0004 U	0.00031 U
Trans-1,3-Dichloropropene	0.00014 U	0.00019 U	0.00013 U	0.000062 U	0.00013 UJ	0.0044 U	--	0.000093 U	0.000084 U	--	0.0001 U	0.0001 U	0.00008 U
Trichloroethylene (TCE)	0.00036 U	0.00049 U	0.00034 U	0.00016 U	0.00033 UJ	0.0051 U	--	0.00024 U	0.00022 U	--	0.00027 U	0.00027 U	0.00021 U
Trichlorofluoromethane	0.00047 U	0.00064 U	0.00045 U	0.00021 UJ	0.00043 UJ	0.0035 U	--	0.00032 U	0.00029 U	--	0.00036 U	0.00035 U	0.00027 U
Vinyl Chloride	0.00054 U	0.00073 U	0.00051 U	0.00024 U	0.00049 UJ	0.0047 U	--	0.00036 U	0.00033 U	--	0.00041 U	0.0004 U	0.00031 U

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-2
Summary of Data Used in Risk Assessment
Main Plant Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-028A	CFMW-028A	CFMW-028A	CFMW-028A	CFMW-028A-DUP	CFMW-032A	CFMW-032A	CFMW-032A	CFMW-032A-DUP	CFMW-033	CFMW-033	CFMW-033	CFMW-034	CFMW-034
Sample Lab IDs	460-116402-2	460-116402-3	460-116402-10	460-116402-4	460-116402-6	460-118466-1	460-118466-3	460-118466-4	460-118466-6	460-116402-16	460-116402-17	460-116402-18	460-114793-41	460-114793-42
Sample Name	CFMW-028a-SO-0-0.5	CFMW-028a-SO-0.5-2	CFMW-028a-SO-4.5-6	CFMW-028a-SO-10-12	CFMW-DUP19-SO	CFMW-032a-SO-0-0.5	CFMW-032a-SO-0.5-2	CFMW-032a-SO-10-12	CFMW-Dup21-SO	CFMW-033-SO-0-0.5	CFMW-033-SO-0.5-2	CFMW-033-SO-10-12	CFMW-034-SO-0-0.5	CFMW-034-SO-0.5-2
Sample Depth	0-0.5 ft	0.5-2 ft	4.5-6 ft	10-12 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft
Chemical	6/30/2016	6/30/2016	6/30/2016	6/30/2016	6/30/2016	8/8/2016	8/8/2016	8/8/2016	8/8/2016	7/1/2016	7/1/2016	7/1/2016	5/31/2016	5/31/2016
GENERAL CHEMISTRY (mg/kg)														
Fluoride	6.47 J+	20.1 J+	293 J+	13.8 J+	14.9 J+	78.1 J	61.6 J	1.57 J	1.59 J	8.12 J+	36.8 J+	11.3 J+	42.8 J	42.4 J
Cyanide	0.043 J	0.054 J	15.3	0.37	0.27	0.31	0.1 J	0.063 J	0.057 J	0.097 J	0.035 J	0.017 U	0.11	0.13
METALS (mg/kg)														
"Chromium, Hexavalent - Estimated"	0.302433	0.310462	0.73601	0.184672	0.224818	0.291727	0.23017	0.235523	0.26764	0.203406	0.195377	0.235523	0.195377	0.195377
"Chromium, Trivalent - Calculated"	--	--	--	--	--	--	--	--	--	--	--	--	--	--
"Chromium, Trivalent - Estimated"	10.9976	11.2895	26.764	6.71533	8.17518	10.6083	8.36983	8.56448	9.73236	7.39659	7.10462	8.56448	7.10462	7.10462
Aluminum	14200	14900	85500	5370	8260	19600	10600	9740	10500	8530	9780	6930	5610	6850
Antimony	0.38 UJ	0.39 UJ	0.88 J-	0.33 UJ	0.31 UJ	0.46 UJ	0.4 UJ	0.42 UJ	0.41 UJ	0.4 UJ	0.36 UJ	0.33 UJ	0.41 U	0.42 U
Arsenic	5.4	5.1	34.2	2.6	3.6	6.1	5.3	4.4	4.2	5.3	2.9	3.4	3.2	3.7
Barium	96.8 J	107 J	510 J	52 J	148 J	258	95.6	54	56.4	56.6 J	100 J	59.9 J	53.4	66.4
Beryllium	0.48	0.41	32.7	0.22 J	0.35	0.72	0.38 J	0.31 J	0.44	0.23 J	0.29 J	0.29 J	0.21 J	0.3 J
Cadmium	0.29 U	0.29 U	8	0.25 U	0.24 U	0.35 U	0.3 U	0.32 U	0.31 U	0.3 U	0.27 U	0.25 U	0.31 U	0.32 U
Calcium	8390	8080	69600	115000 J	30200 J	20500	27100	1100	1160	44600	9670	31200	37600	41900
Chromium, Total	11.3	11.6	27.5	6.9	8.4	10.9	8.6	8.8	10	7.6	7.3	8.8	7.3	7.3
Cobalt	5.2	5.2	8	2.7 J	5.2 J	6	5.1	6	5.9	5	4.1	4.5	4	4.1
Copper	15.5 J	13.7 J	19.3 J	7.5 J	13.2 J	17.7	15.9	14.4	13.5	10.3 J	17 J	9.7 J	8.9	9.4
Iron	17000	17700	11000	8250	13100	15400	12300	13400	14800	12200	10600	11900	9540	10300
Lead	9.7	9.6	104	3.6 J	7.4 J	13.7	8.7	7.3	7.1	9.2	6	4.5	6.7	9.6
Magnesium	10800	11900	9420	24800 J	12200 J	8850	11000	8300	8990	12100	6400	12200	9240	10500
Manganese	319	416	73.4	667 J	319 J	524	350	304	300	354	328	324	305	310
Mercury	0.017 J+	0.022 J+	0.035 J+	0.011 J+	0.011 U	0.03	0.014 J	0.012 J	0.015 J	0.025 J+	0.015 J+	0.014 J+	0.026	0.018
Nickel	11.8	12.1	252	6.9	11	12.6	11	12	12.1	9.3	8	8.8	10	11
Potassium	948 J+	853 J+	5050 J+	473 J+	695 J+	918	739	622	595	698 J+	634 J+	693 J+	388	440
Selenium	0.36 U	0.36 U	1.4 J	0.31 U	0.29 U	0.43 U	0.37 U	0.4 U	0.39 U	0.37 U	0.34 U	0.31 U	0.39 U	0.39 U
Silver	0.7 U	0.71 U	1.1 U	0.6 U	0.57 U	0.84 U	0.73 U	0.78 U	0.76 U	0.72 U	0.66 U	0.61 U	0.76 U	0.77 U
Sodium	35.8 U	36.3 U	2820	54.6 J	29.3 UJ	117	94 J	168	184	37 U	33.6 U	33.2 J	38.7 U	107
Thallium	0.14 U	0.15 U	2.2	0.12 U	0.12 U	0.17 U	0.15 U	0.16 U	0.16 U	0.15 U	0.14 U	0.13 U	0.16 U	0.16 U
Vanadium	10.8	11	166	6.3	8.2	12.3	7.4	9.8	8.8	6.3	7.6	6.3	6	7.6
Zinc	48	49.6	403	25.9	37.3	65.3	39.7	35.6	36.1	34.6	31.4	29.3	26.7	29
METALS|HEXAVALENT CHROMIUM (mg/kg)														
Chromium, Hexavalent	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PESTICIDES (mg/kg)														
Aldrin	0.00096 U	--	--	--	--	0.00092 U	--	--	--	--	--	--	0.00087 U	--
Alpha Bhc (Alpha Hexachlorocyclohexane)	0.00072 U	--	--	--	--	0.0007 U	--	--	--	--	--	--	0.00066 U	--
Alpha Endosulfan	0.0011 U	--	--	--	--	0.0011 U	--	--	--	--	--	--	0.001 U	--
Beta Bhc (Beta Hexachlorocyclohexane)	0.00077 U	--	--	--	--	0.00074 U	--	--	--	--	--	--	0.0007 U	--
Beta Endosulfan	0.0012 U	--	--	--	--	0.0012 U	--	--	--	--	--	--	0.0011 U	--
cis-Chlordane	0.0013 U	--	--	--	--	0.0012 U	--	--	--	--	--	--	0.0012 U	--
Delta BHC (Delta Hexachlorocyclohexane)	0.00086 U	--	--	--	--	0.00083 U	--	--	--	--	--	--	0.00079 U	--
Dieldrin	0.001 U	--	--	--	--	0.00099 U	--	--	--	--	--	--	0.00094 U	--
Endosulfan Sulfate	0.00092 U	--	--	--	--	0.00089 U	--	--	--	--	--	--	0.00084 U	--
Endrin	0.001 U	--	--	--	--	0.00097 U	--	--	--	--	--	--	0.00092 U	--
Endrin Aldehyde	0.00098 U	--	--	--	--	0.00095 U	--	--	--	--	--	--	0.0009 U	--
Endrin Ketone	0.0011 U	--	--	--	--	0.0011 U	--	--	--	--	--	--	0.001 U	--
Gamma Bhc (Lindane)	0.00071 U	--	--	--	--	0.00068 U	--	--	--	--	--	--	0.00065 U	--
Heptachlor	0.001 U	--	--	--	--	0.00098 U	--	--	--	--	--	--	0.00093 U	--
Heptachlor Epoxide	0.0015 U	--	--	--	--	0.0015 U	--	--	--	--	--	--	0.0014 U	--
Methoxychlor	0.0017 U	--	--	--	--	0.0016 U	--	--	--	--	--	--	0.0015 U	--
P,P'-DDD	0.001 U	--	--	--	--	0.001 U	--	--	--	--	--	--	0.00095 U	--
P,P'-DDE	0.0011 U	--	--	--	--	0.0011 U	--	--	--	--	--	--	0.001 U	--
P,P'-DDT	0.00082 U	--	--	--	--	0.00079 U	--	--	--	--	--	--	0.00074 U	--
Toxaphene	0.023 U	--	--	--	--	0.022 U	--	--	--	--	--	--	0.021 U	--
trans-Chlordane	0.0017 U	--	--	--	--	0.0017 U	--	--	--	--	--	--	0.0016 U	--
POLYCHLORINATED BIPHENYLS (mg/kg)														
PCB-1016 (Aroclor 1016)	0.011 U	0.0099 U	0.016 U	0.0094 U	0.0094 U	0.01 U	0.0093 U	0.0096 U	0.0097 U	0.011 U	0.0099 U	0.0094 U	0.0096 U	0.0097 U
PCB-1221 (Aroclor 1221)	0.011 U	0.0099 U	0.016 U	0.0094 U	0.0094 U	0.01 U	0.0093 U	0.0096 U	0.0097 U	0.011 U	0.0099 U	0.0094 U	0.0096 U	0.0097 U

Table E-2
Summary of Data Used in Risk Assessment
Main Plant Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-028A	CFMW-028A	CFMW-028A	CFMW-028A	CFMW-028A-DUP	CFMW-032A	CFMW-032A	CFMW-032A	CFMW-032A-DUP	CFMW-033	CFMW-033	CFMW-033	CFMW-034	CFMW-034
Sample Lab IDs	460-116402-2	460-116402-3	460-116402-10	460-116402-4	460-116402-6	460-118466-1	460-118466-3	460-118466-4	460-118466-6	460-116402-16	460-116402-17	460-116402-18	460-114793-41	460-114793-42
Sample Name	CFMW-028a-SO-0-0.5	CFMW-028a-SO-0.5-2	CFMW-028a-SO-4.5-6	CFMW-028a-SO-10-12	CFMW-DUP19-SO	CFMW-032a-SO-0-0.5	CFMW-032a-SO-0.5-2	CFMW-032a-SO-10-12	CFMW-Dup21-SO	CFMW-033-SO-0-0.5	CFMW-033-SO-0.5-2	CFMW-033-SO-10-12	CFMW-034-SO-0-0.5	CFMW-034-SO-0.5-2
Sample Depth	0-0.5 ft	0.5-2 ft	4.5-6 ft	10-12 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft
Chemical	6/30/2016	6/30/2016	6/30/2016	6/30/2016	6/30/2016	8/8/2016	8/8/2016	8/8/2016	8/8/2016	7/1/2016	7/1/2016	7/1/2016	5/31/2016	5/31/2016
PCB-1232 (Aroclor 1232)	0.011 U	0.0099 U	0.016 U	0.0094 U	0.0094 U	0.01 U	0.0093 U	0.0096 U	0.0097 U	0.011 U	0.0099 U	0.0094 U	0.0096 U	0.0097 U
PCB-1242 (Aroclor 1242)	0.011 U	0.0099 U	0.016 U	0.0094 U	0.0094 U	0.01 U	0.0093 U	0.0096 U	0.0097 U	0.011 U	0.0099 U	0.0094 U	0.0096 U	0.0097 U
PCB-1248 (Aroclor 1248)	0.011 U	0.0099 U	0.016 U	0.0094 U	0.0094 U	0.01 U	0.0093 U	0.0096 U	0.0097 U	0.011 U	0.0099 U	0.0094 U	0.0096 U	0.0097 U
PCB-1254 (Aroclor 1254)	0.011 U	0.01 U	0.017 U	0.0097 U	0.0097 U	0.01 U	0.0097 U	0.01 U	0.01 U	0.011 U	0.01 U	0.0097 U	0.0099 U	0.01 U
PCB-1260 (Aroclor 1260)	0.011 U	0.01 U	0.017 U	0.0097 U	0.0097 U	0.01 U	0.0097 U	0.01 U	0.01 U	0.011 U	0.01 U	0.0097 U	0.0099 U	0.01 U
PCB-1262 (Aroclor 1262)	0.011 U	0.01 U	0.017 U	0.0097 U	0.0097 U	0.01 U	0.0097 U	0.01 U	0.01 U	0.011 U	0.01 U	0.0097 U	0.0099 U	0.01 U
PCB-1268 (Aroclor 1268)	0.011 U	0.01 U	0.017 U	0.0097 U	0.0097 U	0.01 U	0.0097 U	0.01 U	0.01 U	0.011 U	0.01 U	0.0097 U	0.0099 U	0.01 U
Polychlorinated Biphenyl (PCBs)	0.011 U	0.01 U	0.017 U	0.0097 U	0.0097 U	0.01 U	0.0097 U	0.01 U	0.01 U	0.011 U	0.01 U	0.0097 U	0.0099 U	0.01 U
SEMIVOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,2,4,5-Tetrachlorobenzene	0.029 U	0.027 U	9 U	0.026 U	0.026 U	0.028 U	0.026 UJ	0.027 U	0.027 U	0.03 U	0.027 U	0.026 U	0.026 U	0.027 U
1,4-Dioxane (P-Dioxane)	0.1 U	0.098 UR	32 U	0.093 U	0.093 U	0.1 U	0.093 U	0.096 U	0.096 U	0.11 U	0.099 U	0.094 U	0.095 U	0.096 U
2,3,4,6-Tetrachlorophenol	0.037 U	0.035 UJ	11 U	0.033 U	0.033 U	0.035 U	0.033 UJ	0.034 U	0.034 U	0.038 U	0.035 U	0.033 U	0.034 U	0.034 U
2,4,5-Trichlorophenol	0.039 U	0.037 U	12 U	0.035 U	0.035 U	0.037 U	0.035 U	0.036 U	0.036 U	0.04 U	0.037 U	0.035 U	0.035 U	0.036 U
2,4,6-Trichlorophenol	0.011 U	0.01 U	3.4 U	0.0099 U	0.0099 U	0.011 U	0.0099 U	0.01 U	0.01 U	0.011 U	0.01 U	0.01 U	0.01 U	0.01 U
2,4-Dichlorophenol	0.0092 U	0.0087 U	2.9 U	0.0082 U	0.0082 U	0.0089 U	0.0082 U	0.0084 U	0.0085 U	0.0094 U	0.0087 U	0.0083 U	0.0084 U	0.0085 U
2,4-Dimethylphenol	0.086 U	0.081 UJ	27 U	0.076 U	0.077 U	0.083 U	0.076 U	0.079 U	0.079 U	0.088 U	0.081 U	0.077 U	0.078 U	0.079 U
2,4-Dinitrophenol	0.3 U	0.28 UR	91 U	0.26 U	0.26 U	0.28 U	0.26 UJ	0.27 U	0.27 U	0.3 U	0.28 U	0.26 U	0.27 U	0.27 U
2,4-Dinitrotoluene	0.015 U	0.015 U	4.8 U	0.014 U	0.014 U	0.015 U	0.014 U	0.014 U	0.014 U	0.016 U	0.015 U	0.014 U	0.014 U	0.014 U
2,6-Dinitrotoluene	0.021 U	0.02 U	6.4 U	0.018 U	0.019 U	0.02 U	0.018 U	0.019 U	0.019 U	0.021 U	0.02 U	0.019 U	0.019 U	0.019 U
2-Chloronaphthalene	0.0089 U	0.0083 U	2.7 U	0.0079 U	0.0079 U	0.0085 U	0.0079 U	0.0081 U	0.0082 U	0.0091 U	0.0084 U	0.0079 U	0.0081 U	0.0081 U
2-Chlorophenol	0.0099 U	0.0093 U	3.1 U	0.0088 U	0.0088 U	0.0096 U	0.0088 U	0.0091 U	0.0091 U	0.01 U	0.0094 U	0.0089 U	0.009 U	0.0091 U
2-Methylnaphthalene	0.0086 U	0.0081 U	4.4 J	0.0077 U	0.0077 U	0.0083 U	0.0077 U	0.0079 U	0.0079 U	0.0088 U	0.0082 U	0.0077 U	0.008 J	0.0079 U
2-Methylphenol (O-Cresol)	0.017 U	0.016 U	5.3 U	0.015 U	0.015 U	0.016 U	0.015 U	0.016 U	0.016 U	0.017 U	0.016 U	0.015 U	0.016 U	0.016 U
2-Nitroaniline	0.013 U	0.012 U	4 U	0.011 U	0.011 U	0.012 U	0.011 U	0.012 U	0.012 U	0.013 U	0.012 U	0.012 U	0.012 U	0.012 U
2-Nitrophenol	0.013 U	0.012 UJ	4.1 U	0.012 U	0.012 U	0.013 U	0.012 U	0.012 U	0.012 U	0.013 U	0.012 U	0.012 U	0.012 U	0.012 U
3- And 4- Methylphenol (Total)	0.01 U	0.0098 U	3.2 U	0.0092 U	0.0093 U	0.01 U	0.0092 U	0.0095 U	0.0096 U	0.011 U	0.0098 U	0.0093 U	0.0095 U	0.0096 U
3,3'-Dichlorobenzidine	0.044 U	0.041 U	13 U	0.039 U	0.039 U	0.042 U	0.039 U	0.04 U	0.04 U	0.045 U	0.041 U	0.039 U	0.04 U	0.04 U
3-Nitroaniline	0.012 U	0.011 U	3.6 U	0.01 U	0.01 U	0.011 U	0.01 U	0.011 U	0.011 U	0.012 U	0.011 U	0.01 U	0.011 U	0.011 U
4,6-Dinitro-2-Methylphenol	0.1 U	0.098 UJ	32 U	0.093 U	0.093 U	0.1 U	0.093 UJ	0.096 U	0.096 U	0.11 U	0.098 U	0.093 U	0.095 U	0.096 U
4-Bromophenyl Phenyl Ether	0.012 U	0.012 U	3.8 U	0.011 U	0.011 U	0.012 U	0.011 U	0.011 U	0.011 U	0.013 U	0.012 U	0.011 U	0.011 U	0.011 U
4-Chloro-3-Methylphenol	0.017 U	0.016 U	5.2 U	0.015 U	0.015 U	0.016 U	0.015 U	0.015 U	0.015 U	0.017 U	0.016 U	0.015 U	0.015 U	0.015 U
4-Chloroaniline	0.01 U	0.0095 U	3.1 U	0.0089 U	0.0089 U	0.0097 U	0.0089 U	0.0092 U	0.0092 U	0.01 U	0.0095 U	0.009 U	0.0092 U	0.0092 U
4-Chlorophenyl Phenyl Ether	0.012 U	0.011 U	3.6 U	0.01 U	0.01 U	0.011 U	0.01 U	0.011 U	0.011 U	0.012 U	0.011 U	0.01 U	0.011 U	0.011 U
4-Nitroaniline	0.015 U	0.014 U	4.6 U	0.013 U	0.013 U	0.014 U	0.013 U	0.014 U	0.014 U	0.015 U	0.014 U	0.013 U	0.013 U	0.014 U
4-Nitrophenol	0.19 U	0.18 U	58 U	0.17 U	0.17 U	0.18 U	0.17 U	0.17 U	0.17 U	0.19 U	0.18 U	0.17 U	0.17 U	0.17 U
Acenaphthene	0.036 J	0.0089 U	55 J	0.0084 U	0.0084 U	0.0091 U	0.0084 U	0.0087 U	0.0087 U	0.0097 U	0.0097 J	0.0085 U	0.064 J	0.04 J
Acenaphthylene	0.01 U	0.0095 U	3.1 U	0.0089 U	0.0089 U	0.0097 U	0.0089 U	0.0092 U	0.0092 U	0.01 U	0.0095 U	0.009 U	0.0092 U	0.0092 U
Acetophenone	0.0085 U	0.008 U	2.6 U	0.0076 U	0.0076 U	0.0082 U	0.0076 U	0.0078 U	0.0078 U	0.0087 U	0.008 U	0.0076 U	0.0078 U	0.0078 U
Anthracene	0.08 J	0.035 U	100 J	0.033 U	0.033 U	0.036 U	0.033 U	0.034 U	0.034 U	0.038 U	0.035 U	0.033 U	0.1 J	0.06 J
Atrazine	0.017 U	0.016 U	5.4 U	0.015 U	0.015 U	0.017 U	0.015 U	0.016 U	0.016 U	0.018 U	0.016 U	0.016 U	0.016 U	0.016 U
Benzaldehyde	0.03 U	0.028 U	9.2 U	0.026 U	0.027 U	0.029 U	0.026 U	0.027 U	0.027 U	0.031 U	0.028 U	0.027 U	0.027 U	0.027 U
Benzo(A)Anthracene	0.57	0.031 U	400	0.036	0.044	0.052	0.031 J	0.03 U	0.03 U	0.033 U	0.034 J	0.029 U	0.43	0.24 J
Benzo(A)Pyrene	0.74	0.012 J	450	0.034 J	0.054	0.062	0.029 J	0.011 U	0.011 U	0.012 U	0.044	0.024 J	0.43	0.25 J
Benzo(B)Fluoranthene	1.1	0.02 J	570	0.043 J	0.075 J	0.13	0.044	0.014 U	0.014 U	0.016 U	0.052	0.03 J	1.1	0.63 J
Benzo(G,H,I)Perylene	0.71	0.021 U	290	0.023 J	0.042 J	0.075 J	0.026 J	0.021 U	0.021 U	0.023 U	0.034 J	0.02 U	0.45	0.26 J
Benzo(K)Fluoranthene	0.41	0.016 U	210	0.021 J	0.029 J	0.035 J	0.021 J	0.016 U	0.016 U	0.017 U	0.025 J	0.015 U	0.38	0.19 J
Benzyl Butyl Phthalate	0.012 U	0.011 U	3.7 U	0.011 U	0.011 U	0.012 U	0.011 U	0.011 U	0.011 U	0.012 U	0.011 U	0.011 U	0.21 J	0.011 U
Biphenyl (Diphenyl)	0.033 U	0.031 U	10 U	0.03 U	0.03 U	0.032 U	0.03 U	0.031 U	0.031 U	0.034 U	0.031 U	0.03 U	0.03 U	0.031 U
Bis(2-Chloroethoxy) Methane	0.012 U	0.011 U	3.8 U	0.011 U	0.011 U	0.012 U	0.011 U	0.011 U	0.011 U	0.012 U	0.012 U	0.011 U	0.011 U	0.011 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.0092 U	0.0087 U	2.9 U	0.0082 U	0.0082 U	0.0089 U	0.0082 U	0.0084 U	0.0085 U	0.0094 U	0.0087 U	0.0083 U	0.0084 U	0.0085 U
Bis(2-Chloroisopropyl) Ether	0.016 U	0.015 U	5 U	0.014 U	0.014 U	0.015 U	0.014 U	0.015 U	0.015 U	0.016 U	0.015 U	0.014 U	0.015 U	0.015 U
Bis(2-Ethylhexyl) Phthalate	0.015 U	0.014 U	5.1 J	0.014 U	0.014 U	0.16 J	0.014 U	0.014 U	0.014 U	0.016 U	0.014 U	0.014 U	0.014 U	0.014 U
Caprolactam	0.028 U	0.026 UJ	8.7 U	0.025 U	0.025 U	0.027 U	0.025 U	0.026 U	0.026 U	0.029 U	0.027 U	0.025 U	0.026 U	0.026 U
Carbazole	0.069 J	0.0091 U	42 J	0.0086 U	0.0086 U	0.0093 U	0.0086 U	0.0089 U	0.0089 U	0.0099 U	0.0092 U	0.0087 U	0.074 J	0.044 J
Chrysene	0.77	0.012 J	500	0.031 J	0.057 J	0.09 J	0.035 J	0.0097 U	0.0098 U	0.011 U	0.038 J	0.026 J	0.75	0.41 J
Dibenz(A,H)Anthracene	0.19	0.019 U	6.3 U	0.018 U	0.018 U	0.02 U	0.018 U	0.019 U	0.019 U	0.021 U	0.019 U	0.018 U	0.17	0.1 J
Dibenzofuran	0.014 J	0.011 U	15 J	0.01 U	0.011 U	0.011 U	0.01 U	0.011 U	0.011 U	0.012 U	0.011 U	0.011 U	0.02 J	0.014 J

Table E-2
Summary of Data Used in Risk Assessment
Main Plant Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-028A	CFMW-028A	CFMW-028A	CFMW-028A	CFMW-028A-DUP	CFMW-032A	CFMW-032A	CFMW-032A	CFMW-032A-DUP	CFMW-033	CFMW-033	CFMW-033	CFMW-034	CFMW-034
Sample Lab IDs	460-116402-2	460-116402-3	460-116402-10	460-116402-4	460-116402-6	460-118466-1	460-118466-3	460-118466-4	460-118466-6	460-116402-16	460-116402-17	460-116402-18	460-114793-41	460-114793-42
Sample Name	CFMW-028a-SO-0-0.5	CFMW-028a-SO-0.5-2	CFMW-028a-SO-4.5-6	CFMW-028a-SO-10-12	CFMW-DUP19-SO	CFMW-032a-SO-0-0.5	CFMW-032a-SO-0.5-2	CFMW-032a-SO-10-12	CFMW-Dup21-SO	CFMW-033-SO-0-0.5	CFMW-033-SO-0.5-2	CFMW-033-SO-10-12	CFMW-034-SO-0-0.5	CFMW-034-SO-0.5-2
Sample Depth	0-0.5 ft	0.5-2 ft	4.5-6 ft	10-12 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft
Chemical	6/30/2016	6/30/2016	6/30/2016	6/30/2016	6/30/2016	8/8/2016	8/8/2016	8/8/2016	8/8/2016	7/1/2016	7/1/2016	7/1/2016	5/31/2016	5/31/2016
Diethyl Phthalate	0.011 U	0.01 U	3.4 U	0.0099 U	0.0099 U	0.011 U	0.0099 U	0.01 U	0.01 U	0.011 U	0.01 U	0.01 U	0.01 U	0.01 U
Dimethyl Phthalate	0.011 U	0.011 U	3.5 U	0.01 U	0.01 U	0.011 U	0.01 U	0.01 U	0.01 U	0.012 U	0.011 U	0.01 U	0.01 U	0.01 U
Di-N-Butyl Phthalate	0.022 J	0.011 U	3.6 U	0.013 J	0.015 J	0.011 U	0.015 J	0.035 J	0.02 J	0.022 J	0.013 J	0.02 J	0.011 U	0.011 U
Di-N-Octylphthalate	0.02 U	0.019 U	6.1 U	0.018 U	0.018 U	0.019 U	0.018 U	0.018 U	0.018 U	0.02 U	0.019 U	0.018 U	0.018 U	0.018 U
Fluoranthene	0.9	0.013 J	1000	0.049 J	0.089 J	0.079 J	0.033 J	0.011 U	0.011 U	0.012 U	0.065 J	0.03 J	0.71	0.44 J
Fluorene	0.023 J	0.008 U	33 J	0.0076 U	0.0076 U	0.0082 U	0.0076 U	0.0078 U	0.0078 U	0.0087 U	0.008 U	0.0076 U	0.044 J	0.027 J
Hexachlorobenzene	0.016 U	0.015 U	4.9 U	0.014 U	0.014 U	0.015 U	0.014 UJ	0.015 U	0.015 U	0.016 U	0.015 U	0.014 U	0.014 U	0.015 U
Hexachlorobutadiene	0.011 U	0.01 U	3.4 U	0.0098 U	0.0098 U	0.011 U	0.0098 UJ	0.01 U	0.01 U	0.011 U	0.01 U	0.0099 U	0.01 U	0.01 U
Hexachlorocyclopentadiene	0.024 U	0.023 U	7.5 U	0.022 U	0.022 U	0.023 U	0.022 U	0.022 U	0.022 U	0.025 U	0.023 U	0.022 U	0.022 U	0.022 U
Hexachloroethane	0.014 U	0.013 U	4.4 U	0.013 U	0.013 U	0.014 U	0.013 U	0.013 U	0.013 U	0.015 U	0.014 U	0.013 U	0.013 U	0.013 U
Indeno(1,2,3-C,D)Pyrene	0.71	0.024 U	360	0.027 J	0.044	0.091	0.023 J	0.024 U	0.024 U	0.027 U	0.037	0.023 U	0.47	0.27 J
Isophorone	0.0084 U	0.0079 U	2.6 U	0.0074 U	0.0075 U	0.0081 U	0.0074 U	0.0077 U	0.0077 U	0.0086 U	0.0079 U	0.0075 U	0.0076 U	0.0077 U
Naphthalene	0.012 J	0.0093 U	8 J	0.0088 U	0.0088 U	0.0096 U	0.0088 U	0.0091 U	0.0091 U	0.01 U	0.0094 U	0.0089 U	0.014 J	0.016 J
Nitrobenzene	0.012 U	0.012 U	3.8 U	0.011 U	0.011 U	0.012 U	0.011 U	0.011 U	0.011 U	0.013 U	0.012 U	0.011 U	0.011 U	0.011 U
N-Nitrosodi-N-Propylamine	0.013 U	0.012 U	4.1 U	0.012 U	0.012 U	0.013 U	0.012 U	0.012 U	0.012 U	0.013 U	0.012 U	0.012 U	0.012 U	0.012 U
N-Nitrosodiphenylamine	0.035 U	0.033 U	11 U	0.031 U	0.032 U	0.034 U	0.031 U	0.032 U	0.033 U	0.036 U	0.033 U	0.032 U	0.032 U	0.033 U
Pentachlorophenol	0.047 U	0.045 UJ	15 U	0.042 U	0.042 U	0.046 U	0.042 UJ	0.043 U	0.044 U	0.048 U	0.045 U	0.042 U	0.043 U	0.043 U
Phenanthrene	0.47	0.0098 U	440	0.032 J	0.049 J	0.049 J	0.018 J	0.0095 U	0.0096 U	0.011 U	0.06 J	0.015 J	0.45	0.28 J
Phenol	0.013 U	0.012 U	4 U	0.011 U	0.011 U	0.012 U	0.011 U	0.012 U	0.012 U	0.013 U	0.012 U	0.011 U	0.012 U	0.012 U
Pyrene	1.1	0.017 U	730	0.045 J	0.089 J	0.094 J	0.035 J	0.016 U	0.016 U	0.018 U	0.07 J	0.034 J	0.65	0.37 J
VOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,1,1-Trichloroethane	--	0.00034 UJ	0.00092 U	0.00036 U	0.00031 U	--	0.00032 U	0.00037 U	0.00044 U	--	0.00037 U	0.00035 U	--	0.00038 U
1,1,2,2-Tetrachloroethane	--	0.00015 UJ	0.00041 U	0.00016 U	0.00014 U	--	0.00014 U	0.00017 U	0.0002 U	--	0.00017 U	0.00016 U	--	0.00017 U
1,1,2-Trichloro-1,2,2-Trifluoroethane	--	0.0004 UJ	0.0011 U	0.00042 U	0.00036 U	--	0.00037 U	0.00043 U	0.00051 U	--	0.00043 U	0.00041 U	--	0.00044 U
1,1,2-Trichloroethane	--	0.00025 UJ	0.00068 U	0.00027 U	0.00023 U	--	0.00024 U	0.00028 U	0.00032 U	--	0.00027 U	0.00026 U	--	0.00028 U
1,1-Dichloroethane	--	0.00031 UJ	0.00082 U	0.00032 U	0.00028 U	--	0.00029 U	0.00033 U	0.00039 U	--	0.00033 U	0.00032 U	--	0.00034 U
1,1-Dichloroethene	--	0.00037 UJ	0.00099 U	0.00039 U	0.00033 U	--	0.00035 U	0.0004 U	0.00047 U	--	0.0004 U	0.00038 U	--	0.00041 U
1,2,3-Trichlorobenzene	--	0.000099 UJ	0.00027 U	0.0001 U	0.000089 U	--	0.000093 UJ	0.00011 U	0.00013 U	--	0.00011 U	0.0001 U	--	0.00011 U
1,2,4-Trichlorobenzene	--	0.00029 UJ	0.00077 U	0.0003 U	0.00026 U	--	0.00027 UJ	0.00031 U	0.00037 U	--	0.00031 U	0.0003 U	--	0.00032 U
1,2-Dibromo-3-Chloropropane	--	0.00042 UJ	0.0011 U	0.00045 U	0.00038 U	--	0.0004 U	0.00046 U	0.00054 U	--	0.00046 U	0.00044 U	--	0.00047 U
1,2-Dibromoethane (Ethylene Dibromide)	--	0.00011 UJ	0.00029 U	0.00011 U	0.000097 U	--	0.0001 U	0.00012 U	0.00014 U	--	0.00012 U	0.00011 U	--	0.00012 U
1,2-Dichlorobenzene	--	0.00013 UJ	0.00034 U	0.00013 U	0.00011 U	--	0.00012 UJ	0.00014 U	0.00016 U	--	0.00014 U	0.00013 U	--	0.00014 U
1,2-Dichloroethane	--	0.000099 U	0.00027 U	0.0001 U	0.000089 U	--	0.000093 U	0.00011 U	0.00013 U	--	0.00011 U	0.0001 U	--	0.00011 U
1,2-Dichloropropane	--	0.00015 UJ	0.00041 U	0.00016 U	0.00014 U	--	0.00014 U	0.00017 U	0.0002 U	--	0.00017 U	0.00016 U	--	0.00017 U
1,3-Dichlorobenzene	--	0.00011 UJ	0.00029 U	0.00011 U	0.000097 U	--	0.0001 UJ	0.00012 U	0.00014 U	--	0.00012 U	0.00011 U	--	0.00012 U
1,4-Dichlorobenzene	--	0.00012 UJ	0.00031 U	0.00012 U	0.00011 U	--	0.00011 UJ	0.00013 U	0.00015 U	--	0.00013 U	0.00012 U	--	0.00013 U
2-Hexanone	--	0.00084 UJ	0.0023 U	0.00089 U	0.00076 U	--	0.00079 U	0.00092 U	0.0011 U	--	0.00091 U	0.00088 U	--	0.00094 U
Acetone	--	0.033 J	0.046	0.0097	0.0081	--	0.0071	0.017	0.019	--	0.013	0.011	--	0.0096
Benzene	--	0.00018 UJ	0.00048 U	0.00032 J	0.00027 J	--	0.00017 U	0.0002 U	0.00023 U	--	0.00019 U	0.00026 J	--	0.00043 J
Bromochloromethane	--	0.00015 UJ	0.00041 U	0.00016 U	0.00014 U	--	0.00014 U	0.00017 U	0.0002 U	--	0.00017 U	0.00016 U	--	0.00017 U
Bromodichloromethane	--	0.00034 UJ	0.00092 U	0.00036 U	0.00031 U	--	0.00032 U	0.00037 U	0.00044 U	--	0.00037 U	0.00035 U	--	0.00038 U
Bromoform	--	0.00012 U	0.00031 U	0.00012 U	0.00011 U	--	0.00011 U	0.00013 U	0.00015 U	--	0.00013 U	0.00012 U	--	0.00013 U
Bromomethane	--	0.00029 U	0.00077 U	0.0003 U	0.00026 U	--	0.00027 U	0.00031 U	0.00037 U	--	0.00031 U	0.0003 U	--	0.00032 U
Carbon Disulfide	--	0.00039 U	0.001 U	0.00041 U	0.00035 U	--	0.00036 U	0.00042 UJ	0.0017 J	--	0.00042 U	0.00055 J	--	0.00043 U
Carbon Tetrachloride	--	0.00039 UJ	0.001 U	0.00041 U	0.00035 U	--	0.00036 U	0.00042 U	0.00049 U	--	0.00042 U	0.0004 U	--	0.00043 U
Chlorobenzene	--	0.00013 UJ	0.0012 J	0.00013 U	0.00011 U	--	0.00012 U	0.00014 U	0.00016 U	--	0.00014 U	0.00013 U	--	0.00014 U
Chloroethane	--	0.00031 U	0.00084 U	0.00033 U	0.00028 U	--	0.0003 U	0.00034 U	0.0004 U	--	0.00034 U	0.00033 U	--	0.00035 U
Chloroform	--	0.00019 UJ	0.00051 U	0.0002 U	0.00017 U	--	0.00018 U	0.00021 U	0.00024 U	--	0.0002 U	0.0002 U	--	0.00021 U
Chloromethane	--	0.00034 U	0.00092 U	0.00036 U	0.00031 U	--	0.00032 U	0.00037 U	0.00044 U	--	0.00037 U	0.00035 U	--	0.00038 U
Cis-1,2-Dichloroethylene	--	0.0002 UJ	0.00053 U	0.00021 U	0.00018 U	--	0.00019 U	0.00022 U	0.00025 U	--	0.00021 U	0.0002 U	--	0.00022 U
Cis-1,3-Dichloropropene	--	0.00013 UJ	0.00036 U	0.00014 U	0.00012 U	--	0.00013 U	0.00015 U	0.00017 U	--	0.00015 U	0.00014 U	--	0.00015 U
Cyclohexane	--	0.00041 UJ	0.0011 U	0.00074 J	0.0007 J	--	0.00039 U	0.00045 U	0.00053 U	--	0.00045 U	0.00072 J	--	0.00046 U
Dibromochloromethane	--	0.00013 U	0.00036 U	0.00014 U	0.00012 U	--	0.00013 U	0.00015 U	0.00017 U	--	0.00015 U	0.00014 U	--	0.00015 U
Dichlorodifluoromethane	--	0.00029 U	0.00077 U	0.0003 U	0.00026 U	--	0.00027 U	0.00031 U	0.00037 U	--	0.00031 U	0.0003 U	--	0.00032 U
Ethylbenzene	--	0.00016 UJ	0.00043 U	0.00022 J	0.00025 J	--	0.00015 U	0.00018 U	0.00021 U	--	0.00018 U	0.00017 U	--	0.00018 U
Isopropylbenzene (Cumene)	--	0.00015 UJ	0.00041 U	0.00016 U	0.00014 U	--	0.00014 U	0.00017 U	0.0002 U	--	0.00017 U	0.00016 U	--	0.00017 U
M,P-Xylene	--	0.000099 UJ	0.00037 J	0.00091 J	0.00082	--	0.000093 U	0.00011 U	0.00013 U	--	0.00021 J	0.00043 J	--	0.00024 J

Table E-2
Summary of Data Used in Risk Assessment
Main Plant Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-028A	CFMW-028A	CFMW-028A	CFMW-028A	CFMW-028A-DUP	CFMW-032A	CFMW-032A	CFMW-032A	CFMW-032A-DUP	CFMW-033	CFMW-033	CFMW-033	CFMW-034	CFMW-034
Sample Lab IDs	460-116402-2	460-116402-3	460-116402-10	460-116402-4	460-116402-6	460-118466-1	460-118466-3	460-118466-4	460-118466-6	460-116402-16	460-116402-17	460-116402-18	460-114793-41	460-114793-42
Sample Name	CFMW-028a-SO-0-0.5	CFMW-028a-SO-0.5-2	CFMW-028a-SO-4.5-6	CFMW-028a-SO-10-12	CFMW-DUP19-SO	CFMW-032a-SO-0-0.5	CFMW-032a-SO-0.5-2	CFMW-032a-SO-10-12	CFMW-Dup21-SO	CFMW-033-SO-0-0.5	CFMW-033-SO-0.5-2	CFMW-033-SO-10-12	CFMW-034-SO-0-0.5	CFMW-034-SO-0.5-2
Sample Depth	0-0.5 ft	0.5-2 ft	4.5-6 ft	10-12 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft
Chemical	6/30/2016	6/30/2016	6/30/2016	6/30/2016	6/30/2016	8/8/2016	8/8/2016	8/8/2016	8/8/2016	7/1/2016	7/1/2016	7/1/2016	5/31/2016	5/31/2016
Methyl Acetate	--	0.0023 J	0.0022 U	0.00086 U	0.00073 U	--	0.00076 U	0.00088 U	0.001 U	--	0.00088 U	0.00084 U	--	0.0009 U
Methyl Ethyl Ketone (2-Butanone)	--	0.0026 J	0.0019 U	0.00073 U	0.00062 U	--	0.00065 U	0.00076 U	0.00088 U	--	0.00075 U	0.00072 U	--	0.00077 U
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	--	0.002 UJ	0.0054 U	0.0021 U	0.0018 U	--	0.0019 U	0.0022 U	0.0025 U	--	0.0022 U	0.0021 U	--	0.0022 U
Methylcyclohexane	--	0.00045 UJ	0.0012 U	0.0012	0.0012	--	0.00042 U	0.00049 U	0.00057 U	--	0.00049 U	0.00053 J	--	0.0012
Methylene Chloride	--	0.00029 UJ	0.0026	0.0003 U	0.00026 U	--	0.00027 U	0.00031 U	0.00037 U	--	0.00031 U	0.0003 U	--	0.00032 U
O-Xylene (1,2-Dimethylbenzene)	--	0.00014 UJ	0.00039 U	0.00026 J	0.00025 J	--	0.00014 U	0.00016 U	0.00018 U	--	0.00016 U	0.00016 J	--	0.00016 U
Styrene	--	0.00013 UJ	0.00036 U	0.00014 U	0.00012 U	--	0.00013 U	0.00015 U	0.00017 U	--	0.00015 U	0.00014 U	--	0.00015 U
Tert-Butyl Methyl Ether	--	0.00015 U	0.00041 U	0.00016 U	0.00014 U	--	0.00014 U	0.00017 U	0.0002 U	--	0.00017 U	0.00016 U	--	0.00017 U
Tetrachloroethylene (PCE)	--	0.00025 UJ	0.0011 J	0.00027 U	0.00023 U	--	0.00024 U	0.00028 U	0.00032 U	--	0.00027 U	0.00026 U	--	0.00028 U
Toluene	--	0.00017 UJ	0.00053 J	0.0012	0.0011	--	0.00016 U	0.00019 U	0.00022 U	--	0.00037 J	0.00091 J	--	0.00069 J
Trans-1,2-Dichloroethene	--	0.00035 UJ	0.00094 U	0.00037 U	0.00032 U	--	0.00033 U	0.00038 U	0.00045 U	--	0.00038 U	0.00036 U	--	0.00039 U
Trans-1,3-Dichloropropene	--	0.00009 UJ	0.00024 U	0.000095 U	0.000081 U	--	0.000085 U	0.000098 U	0.00011 U	--	0.000097 U	0.000093 U	--	0.0001 U
Trichloroethylene (TCE)	--	0.00023 UJ	0.00063 U	0.00025 U	0.00021 U	--	0.00022 U	0.00026 U	0.0003 U	--	0.00025 U	0.00024 U	--	0.00026 U
Trichlorofluoromethane	--	0.00031 U	0.00082 U	0.00032 U	0.00028 U	--	0.00029 U	0.00033 U	0.00039 U	--	0.00033 U	0.00032 U	--	0.00034 U
Vinyl Chloride	--	0.00035 U	0.00094 U	0.00037 U	0.00032 U	--	0.00033 U	0.00038 U	0.00045 U	--	0.00038 U	0.00036 U	--	0.00039 U

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-2
Summary of Data Used in Risk Assessment
Main Plant Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-034-DUP	CFMW-034	CFMW-035	CFMW-035-DUP	CFMW-035	CFMW-035	CFMW-037	CFMW-037	CFMW-037	CFMW-038	CFMW-038	CFMW-038	CFMW-040	CFMW-040
Sample Lab IDs	460-114793-44	460-114793-43	460-114828-22	460-114828-23	460-114828-20	460-114828-21	460-116119-2	460-116119-3	460-116119-4	320-19945-1, 460-116119-6	320-19945-2, 460-116119-7	320-19945-3, 460-116119-8	320-19945-4, 460-116283-1	320-19945-5, 460-116283-2
Sample Name	CFMW-DUP10-SO	CFMW-034-SO-10-12	CFMW-035-SO-0-0.5	CFMW-DUP11-SO	CFMW-035-SO-0.5-2	CFMW-035-SO-10-12	CFMW-037-SO-0-0.5	CFMW-037-SO-0.5-2	CFMW-037-SO-10-12	CFMW-038-SO-0-0.5	CFMW-038-SO-0.5-2	CFMW-038-SO-10-12	CFMW-040-SO-0-0.5	CFMW-040-SO-0.5-2
Sample Depth	0.5-2 ft	10-12 ft	0-0.5 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft
Chemical	5/31/2016	5/31/2016	6/1/2016	6/1/2016	6/1/2016	6/1/2016	6/24/2016	6/24/2016	6/24/2016	6/25/2016	6/25/2016	6/25/2016	6/28/2016	6/28/2016
GENERAL CHEMISTRY (mg/kg)														
Fluoride	21.6 J-	7.39 J-	98.3 J	123 J	11.1 J	8.7 J	192 J	39.2 J+	12.3 J+	22.3 J+	25.8 J+	21.5 J+	27.6 J+	22.1 J+
Cyanide	0.019 J	0.018 J	0.22 J	0.13 J	0.017 U	0.017 U	0.09 J	0.13	0.019 U	0.024 J	0.035 J	0.029 J	0.12	0.058 J
METALS (mg/kg)														
"Chromium, Hexavalent - Estimated"	0.283698	0.219465	0.406813	0.404136	0.26764	0.256934	0.331873	0.235523	0.259611	0.246229	0.222141	0.323844	0.272993	0.315815
"Chromium, Trivalent - Calculated"	--	--	--	--	--	--	--	--	--	--	--	--	--	--
"Chromium, Trivalent - Estimated"	10.3163	7.98054	14.7932	14.6959	9.73236	9.34307	12.0681	8.56448	9.44039	8.95377	8.07786	11.7762	9.92701	11.4842
Aluminum	10200	7620	27200	18500	9430	6380	51200	8840	9270	9980	12000	8820	13700	13100
Antimony	0.33 UJ	0.32 U	0.41 UJ	0.44 UJ	0.46 UJ	0.41 UJ	0.46 U	0.47 U	0.42 U	0.44 U	0.44 U	0.43 U	0.34 UJ	0.36 UJ
Arsenic	4.1	3.1	5.1	5	3.9	3.5	5.2	3.9	4.4	4.4	3.8	3.7	3.6	5.1
Barium	88.7	51.1	93.4	81.2	42.4	42.9	76.3	108	74.9	92.6	189	114	122	116
Beryllium	0.45	0.37	0.85	0.62	0.29 J	0.28 J	0.7	0.38 J	0.44	0.4 J	0.42 J	0.37 J	0.54	0.56
Cadmium	0.25 U	0.24 U	0.44 J	0.33 U	0.35 U	0.31 U	0.65 J	0.35 U	0.32 U	0.33 U	0.33 U	0.33 U	0.26 U	0.27 U
Calcium	15200	41300	14000	21000	34000	35600	7820	35900	39400	24500	12700	27800	3720	2260
Chromium, Total	10.6	8.2	15.2	15.1	10	9.6	12.4	8.8	9.7	9.2	8.3	12.1	10.2 J-	11.8 J-
Cobalt	6.6	4.8	6.2	6.2	6.5	4.4	4.4	4.8	5	5.7	4.7	4.9	4.1 J-	6.2 J-
Copper	16.1	10.9	25.8	26.7	13.8	11.2	14.3	12.7	13.8	14.3	12.4	20	15.3 J-	11.2 J-
Iron	16000	12300	16400	20500	16600	11400	8560	11800	14700	14500	14500	13300	10100	17600
Lead	9.3	5.3	21.7	21	7.4	5.1	20.1	9.8	6.6	8.2	7	6.4	57.7 J-	22.4 J-
Magnesium	11100	11600	8430	10100	12400	11100	4610	11200	12300	9580	8820	9720	5540	9180
Manganese	472	310	364	390	417	313	178	391	436	391	445	445	753	498
Mercury	0.048 J	0.027	0.025	0.021	0.018 J	0.012 J	0.013 U	0.012 U	0.016 J	0.017 J	0.013 U	0.012 J	0.012 J	0.012 U
Nickel	12.8	9.9	47.4	29.9	13.4	8.4	81.8	10.6	10.8	10.8	9	15.1	21.8 J-	11.5 J-
Potassium	901	703 J+	956	823	502	642	425	640	656	718	764	733	621	1010
Selenium	0.31 U	0.3 U	0.38 U	0.41 U	0.43 U	0.38 U	0.43 U	0.44 U	0.4 U	0.41 U	0.41 U	0.4 U	0.32 U	0.34 U
Silver	0.6 U	0.59 U	0.75 UJ	1.5 J	0.85 U	0.75 U	0.84 U	0.85 U	0.77 U	0.8 U	0.8 U	0.79 U	0.63 U	0.66 U
Sodium	285	29.9 U	133	84.9 J	43.3 U	38.4 J	182	43.5 U	39.5 U	40.7 U	40.9 U	44.3 J	32.2 U	33.7 U
Thallium	0.12 U	0.12 U	0.15 U	0.17 U	0.17 U	0.15 U	0.17 U	0.18 U	0.16 U	0.16 U	0.17 U	0.16 U	0.13 U	0.14 U
Vanadium	10.8	9	21.1	16.4	8.2	6.6	25.1	9	8.5	10.2	10.6	8.3	11.6	13.7
Zinc	42.2	32.2	151 J	55.6 J	40.4	28.5	64.2	33.4	37.6	43.2	39.8	31	52.3	39.2
METALS|HEXAVALENT CHROMIUM (mg/kg)														
Chromium, Hexavalent	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PESTICIDES (mg/kg)														
Aldrin	--	--	0.00089 U	0.00087 U	--	--	0.00094 U	--	--	0.00087 U	--	--	0.00089 U	--
Alpha Bhc (Alpha Hexachlorocyclohexane)	--	--	0.00067 U	0.00066 U	--	--	0.00071 U	--	--	0.00066 U	--	--	0.00067 U	--
Alpha Endosulfan	--	--	0.001 U	0.001 U	--	--	0.0011 U	--	--	0.001 U	--	--	0.001 U	--
Beta Bhc (Beta Hexachlorocyclohexane)	--	--	0.00072 U	0.0007 U	--	--	0.00076 U	--	--	0.0007 U	--	--	0.00071 U	--
Beta Endosulfan	--	--	0.0012 U	0.0011 U	--	--	0.0012 U	--	--	0.0011 U	--	--	0.0012 U	--
cis-Chlordane	--	--	0.0012 U	0.0012 U	--	--	0.0013 U	--	--	0.0012 U	--	--	0.0012 U	--
Delta BHC (Delta Hexachlorocyclohexane)	--	--	0.00081 U	0.00078 U	--	--	0.00085 U	--	--	0.00079 U	--	--	0.0008 U	--
Dieldrin	--	--	0.00096 U	0.00094 U	--	--	0.001 U	--	--	0.00094 U	--	--	0.00096 U	--
Endosulfan Sulfate	--	--	0.00086 U	0.00084 U	--	--	0.00091 U	--	--	0.00084 U	--	--	0.00086 U	--
Endrin	--	--	0.00094 U	0.00091 U	--	--	0.00099 U	--	--	0.00092 U	--	--	0.00093 U	--
Endrin Aldehyde	--	--	0.00092 U	0.00089 U	--	--	0.00097 U	--	--	0.0009 U	--	--	0.00091 U	--
Endrin Ketone	--	--	0.001 U	0.001 U	--	--	0.0011 U	--	--	0.001 U	--	--	0.001 U	--
Gamma Bhc (Lindane)	--	--	0.00066 U	0.00065 U	--	--	0.0007 U	--	--	0.00065 U	--	--	0.00066 U	--
Heptachlor	--	--	0.00095 U	0.00092 U	--	--	0.001 U	--	--	0.00093 U	--	--	0.00094 U	--
Heptachlor Epoxide	--	--	0.0014 U	0.0014 U	--	--	0.0015 U	--	--	0.0014 U	--	--	0.0014 U	--
Methoxychlor	--	--	0.0016 U	0.0015 U	--	--	0.0017 U	--	--	0.0015 U	--	--	0.0016 U	--
P,P'-DDD	--	--	0.00097 U	0.00095 U	--	--	0.001 U	--	--	0.00095 U	--	--	0.00097 U	--
P,P'-DDE	--	--	0.0011 U	0.001 U	--	--	0.0011 U	--	--	0.001 U	--	--	0.0011 U	--
P,P'-DDT	--	--	0.00076 U	0.00074 U	--	--	0.0008 U	--	--	0.00074 U	--	--	0.00076 U	--
Toxaphene	--	--	0.022 U	0.021 U	--	--	0.023 U	--	--	0.021 U	--	--	0.021 U	--
trans-Chlordane	--	--	0.0016 U	0.0016 U	--	--	0.0017 U	--	--	0.0016 U	--	--	0.0016 U	--
POLYCHLORINATED BIPHENYLS (mg/kg)														
PCB-1016 (Aroclor 1016)	0.0094 U	0.0096 U	0.0098 U	0.0096 U	0.01 U	0.0093 U	0.01 U	0.01 U	0.0095 U	0.0096 U	0.0098 U	0.0094 U	0.0098 U	0.0097 U
PCB-1221 (Aroclor 1221)	0.0094 U	0.0096 U	0.0098 U	0.0096 U	0.01 U	0.0093 U	0.01 U	0.01 U	0.0095 U	0.0096 U	0.0098 U	0.0094 U	0.0098 U	0.0097 U

Table E-2
Summary of Data Used in Risk Assessment
Main Plant Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-034-DUP	CFMW-034	CFMW-035	CFMW-035-DUP	CFMW-035	CFMW-035	CFMW-037	CFMW-037	CFMW-037	CFMW-038	CFMW-038	CFMW-038	CFMW-040	CFMW-040
Sample Lab IDs	460-114793-44	460-114793-43	460-114828-22	460-114828-23	460-114828-20	460-114828-21	460-116119-2	460-116119-3	460-116119-4	320-19945-1, 460-116119-6	320-19945-2, 460-116119-7	320-19945-3, 460-116119-8	320-19945-4, 460-116283-1	320-19945-5, 460-116283-2
Sample Name	CFMW-DUP10-SO	CFMW-034-SO-10-12	CFMW-035-SO-0-0.5	CFMW-DUP11-SO	CFMW-035-SO-0.5-2	CFMW-035-SO-10-12	CFMW-037-SO-0-0.5	CFMW-037-SO-0.5-2	CFMW-037-SO-10-12	CFMW-038-SO-0-0.5	CFMW-038-SO-0.5-2	CFMW-038-SO-10-12	CFMW-040-SO-0-0.5	CFMW-040-SO-0.5-2
Sample Depth	0.5-2 ft	10-12 ft	0-0.5 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft
Chemical	5/31/2016	5/31/2016	6/1/2016	6/1/2016	6/1/2016	6/1/2016	6/24/2016	6/24/2016	6/24/2016	6/25/2016	6/25/2016	6/25/2016	6/28/2016	6/28/2016
PCB-1232 (Aroclor 1232)	0.0094 U	0.0096 U	0.0098 U	0.0096 U	0.01 U	0.0093 U	0.01 U	0.01 U	0.0095 U	0.0096 U	0.0098 U	0.0094 U	0.0098 U	0.0097 U
PCB-1242 (Aroclor 1242)	0.0094 U	0.0096 U	0.0098 U	0.0096 U	0.01 U	0.0093 U	0.01 U	0.01 U	0.0095 U	0.0096 U	0.0098 U	0.0094 U	0.0098 U	0.0097 U
PCB-1248 (Aroclor 1248)	0.0094 U	0.0096 U	0.0098 U	0.0096 U	0.01 U	0.0093 U	0.01 U	0.01 U	0.0095 U	0.0096 U	0.0098 U	0.0094 U	0.0098 U	0.0097 U
PCB-1254 (Aroclor 1254)	0.0097 U	0.0099 U	0.01 U	0.0099 U	0.01 U	0.0096 U	0.011 U	0.01 U	0.0098 U	0.0099 U	0.01 U	0.0098 U	0.01 U	0.01 U
PCB-1260 (Aroclor 1260)	0.0097 U	0.0099 U	0.01 U	0.0099 U	0.01 U	0.0096 U	0.011 U	0.01 U	0.0098 U	0.0099 U	0.01 U	0.0098 U	0.01 U	0.01 U
PCB-1262 (Aroclor 1262)	0.0097 U	0.0099 U	0.01 U	0.0099 U	0.01 U	0.0096 U	0.011 U	0.01 U	0.0098 U	0.0099 U	0.01 U	0.0098 U	0.01 U	0.01 U
PCB-1268 (Aroclor 1268)	0.0097 U	0.0099 U	0.01 U	0.0099 U	0.01 U	0.0096 U	0.011 U	0.01 U	0.0098 U	0.0099 U	0.01 U	0.0098 U	0.01 U	0.01 U
Polychlorinated Biphenyl (PCBs)	0.0097 U	0.0099 U	0.01 U	0.0099 U	0.01 U	0.0096 U	0.011 U	0.01 U	0.0098 U	0.0099 U	0.01 U	0.0098 U	0.01 U	0.01 U
SEMIVOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,2,4,5-Tetrachlorobenzene	0.026 U	0.026 U	0.14 U	0.13 U	0.028 UJ	0.026 U	0.14 U	0.028 U	0.026 U	0.027 U	0.027 U	0.026 U	0.027 U	0.027 U
1,4-Dioxane (P-Dioxane)	0.093 U	0.095 U	0.49 U	0.47 U	0.1 UR	0.092 U	0.51 U	0.1 U	0.094 U	0.095 U	0.097 U	0.094 U	0.097 U	0.096 U
2,3,4,6-Tetrachlorophenol	0.033 U	0.033 UJ	0.17 U	0.17 U	0.035 UJ	0.033 UJ	0.18 U	0.035 U	0.033 U	0.034 U	0.034 U	0.033 U	0.034 U	0.034 U
2,4,5-Trichlorophenol	0.035 U	0.035 UJ	0.18 U	0.18 U	0.037 UJ	0.034 U	0.19 U	0.037 U	0.035 U	0.035 U	0.036 U	0.035 U	0.036 U	0.036 U
2,4,6-Trichlorophenol	0.0099 U	0.01 UJ	0.052 U	0.05 U	0.011 UJ	0.0098 U	0.055 U	0.011 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
2,4-Dichlorophenol	0.0082 U	0.0084 U	0.043 U	0.042 U	0.0089 U	0.0082 U	0.045 U	0.0088 U	0.0083 U	0.0084 U	0.0085 U	0.0083 U	0.0086 U	0.0085 U
2,4-Dimethylphenol	0.076 U	0.078 U	0.4 U	0.39 U	0.083 U	0.076 U	0.42 U	0.082 U	0.078 U	0.078 U	0.08 U	0.077 U	0.08 U	0.079 U
2,4-Dinitrophenol	0.26 U	0.27 UJ	1.4 U	1.3 U	0.28 UJ	0.26 UJ	1.5 U	0.28 U	0.27 U	0.27 U	0.27 U	0.26 U	0.27 U	0.27 U
2,4-Dinitrotoluene	0.014 U	0.014 U	0.072 U	0.07 U	0.015 U	0.014 U	0.076 U	0.015 U	0.014 U	0.014 U	0.014 U	0.014 U	0.014 U	0.014 U
2,6-Dinitrotoluene	0.019 U	0.019 U	0.097 U	0.094 U	0.02 U	0.018 U	0.1 U	0.02 U	0.019 U	0.019 U	0.019 U	0.019 U	0.019 U	0.019 U
2-Chloronaphthalene	0.0079 U	0.0081 U	0.041 U	0.04 U	0.0085 U	0.0078 U	0.044 U	0.0085 U	0.008 U	0.0081 U	0.0082 U	0.0079 U	0.0082 U	0.0081 U
2-Chlorophenol	0.0088 U	0.009 U	0.046 U	0.045 U	0.0095 U	0.0088 U	0.049 U	0.0095 U	0.009 U	0.0091 U	0.0092 U	0.0089 U	0.0092 U	0.0091 U
2-Methylnaphthalene	0.0077 U	0.0078 U	0.09 J	0.054 J	0.0083 U	0.0076 U	0.096 J	0.0082 U	0.0078 U	0.0079 U	0.008 U	0.0077 U	0.031 J	0.0079 U
2-Methylphenol (O-Cresol)	0.015 U	0.015 U	0.079 U	0.077 U	0.016 U	0.015 U	0.084 U	0.016 U	0.015 U	0.016 U	0.016 U	0.015 U	0.016 U	0.016 U
2-Nitroaniline	0.011 U	0.012 U	0.06 U	0.059 U	0.012 U	0.011 U	0.063 U	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U
2-Nitrophenol	0.012 U	0.012 U	0.061 U	0.06 U	0.013 UJ	0.012 UJ	0.064 U	0.013 U	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U
3- And 4- Methylphenol (Total)	0.0093 U	0.0095 U	0.048 U	0.047 U	0.01 U	0.0092 U	0.051 U	0.0099 U	0.0094 U	0.0095 U	0.0096 U	0.0093 U	0.0097 U	0.0096 U
3,3'-Dichlorobenzidine	0.039 U	0.04 U	0.2 U	0.2 U	0.042 U	0.039 U	0.21 U	0.042 U	0.039 U	0.04 U	0.04 U	0.039 U	0.04 U	0.04 U
3-Nitroaniline	0.01 U	0.011 U	0.054 U	0.053 U	0.011 U	0.01 U	0.057 U	0.011 U	0.01 U	0.011 U	0.011 U	0.01 U	0.011 U	0.011 U
4,6-Dinitro-2-Methylphenol	0.093 U	0.095 UJ	0.49 U	0.47 U	0.1 UJ	0.092 UJ	0.51 U	0.1 U	0.094 U	0.095 U	0.097 U	0.093 U	0.097 U	0.096 U
4-Bromophenyl Phenyl Ether	0.011 U	0.011 U	0.057 U	0.056 U	0.012 UJ	0.011 U	0.06 U	0.012 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U
4-Chloro-3-Methylphenol	0.015 U	0.015 U	0.078 U	0.076 U	0.016 U	0.015 U	0.083 U	0.016 U	0.015 U	0.015 U	0.016 U	0.015 U	0.016 U	0.015 U
4-Chloroaniline	0.0089 U	0.0091 U	0.047 U	0.046 U	0.0097 U	0.0089 U	0.049 U	0.0096 U	0.0091 U	0.0092 U	0.0093 U	0.009 U	0.0093 U	0.0092 U
4-Chlorophenyl Phenyl Ether	0.01 U	0.011 U	0.055 U	0.053 U	0.011 U	0.01 U	0.058 U	0.011 U	0.011 U	0.011 U	0.011 U	0.01 U	0.011 U	0.011 U
4-Nitroaniline	0.013 U	0.013 U	0.069 U	0.067 U	0.014 U	0.013 U	0.073 U	0.014 U	0.013 U	0.013 U	0.014 U	0.013 U	0.014 U	0.014 U
4-Nitrophenol	0.17 U	0.17 U	0.88 U	0.85 U	0.18 U	0.17 U	0.92 U	0.18 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U
Acenaphthene	0.012 J	0.0086 U	0.9 J	0.47 J	0.03 J	0.0084 U	0.9 J	0.013 J	0.019 J	0.0086 U	0.0088 U	0.0085 U	0.14 J	0.0093 J
Acenaphthylene	0.0089 U	0.0091 U	0.047 U	0.046 U	0.0097 U	0.0089 U	0.049 U	0.0096 U	0.0091 U	0.0092 U	0.0093 U	0.009 U	0.0093 U	0.0092 U
Acetophenone	0.0076 U	0.0077 U	0.04 U	0.039 U	0.0082 U	0.0075 U	0.042 U	0.0081 U	0.0077 U	0.0078 U	0.0079 U	0.0076 U	0.0079 U	0.0078 U
Anthracene	0.033 UJ	0.034 U	1.7 J	0.93 J	0.053 J	0.033 U	2	0.035 U	0.034 U	0.034 U	0.034 U	0.033 U	0.26 J	0.034 U
Atrazine	0.015 U	0.016 U	0.081 U	0.079 U	0.017 U	0.015 U	0.085 U	0.017 U	0.016 U	0.016 U	0.016 U	0.016 U	0.016 U	0.016 U
Benzaldehyde	0.027 U	0.027 U	0.14 U	0.14 U	0.029 U	0.026 U	0.15 U	0.028 U	0.027 U	0.027 U	0.028 U	0.027 U	0.028 U	0.027 U
Benzo(A)Anthracene	0.066 J	0.052	10 J	5.6 J	0.28 J-	0.029 U	17	0.24	0.15	0.11	0.03 U	0.13	1.7	0.03 U
Benzo(A)Pyrene	0.073 J	0.038	14 J	7.5 J	0.39 J-	0.01 U	19	0.29	0.17	0.13	0.011 U	0.16	2.3	0.017 J
Benzo(B)Fluoranthene	0.086 J	0.14	18 J	9 J	0.49 J-	0.013 U	27	0.55	0.25	0.21	0.014 U	0.28	5.1	0.039
Benzo(G,H,I)Perylene	0.08 J	0.058 J	13 J	6.5 J	0.31 J+	0.02 U	21	0.36 J	0.12 J	0.11 J	0.021 U	0.17 J	4.4	0.025 J
Benzo(K)Fluoranthene	0.031 J	0.036	6.5	4.1	0.19	0.015 U	10	0.2	0.11	0.07	0.016 U	0.088	1.9	0.016 U
Benzyl Butyl Phthalate	0.011 U	0.011 U	0.056 U	0.055 U	0.012 U	0.011 U	5.6	0.012 U	0.011 U	0.011 U	0.011 U	0.011 U	0.038 J	0.011 U
Biphenyl (Diphenyl)	0.03 U	0.03 U	0.16 U	0.15 U	0.032 U	0.029 U	0.16 U	0.032 U	0.03 U	0.03 U	0.031 U	0.03 U	0.031 U	0.031 U
Bis(2-Chloroethoxy) Methane	0.011 U	0.011 U	0.057 U	0.055 U	0.012 U	0.011 U	0.06 U	0.012 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.0082 U	0.0084 U	0.043 U	0.042 U	0.0089 U	0.0082 U	0.045 U	0.0088 U	0.0083 U	0.0084 U	0.0085 U	0.0083 U	0.0086 U	0.0085 U
Bis(2-Chloroisopropyl) Ether	0.014 U	0.015 U	0.075 U	0.073 U	0.015 UR	0.014 U	0.079 U	0.015 U	0.015 U	0.015 U	0.015 U	0.014 U	0.015 U	0.015 U
Bis(2-Ethylhexyl) Phthalate	0.014 U	0.014 U	0.2 J	0.069 U	0.015 U	0.013 U	2	0.14 J	0.014 U	0.014 U	0.014 U	0.014 U	0.094 J	0.014 U
Caprolactam	0.025 U	0.026 U	0.13 U	0.13 U	0.027 UJ	0.025 U	0.14 U	0.027 UJ	0.025 UJ	0.026 UJ	0.026 UJ	0.025 UJ	0.026 U	0.026 U
Carbazole	0.0086 UJ	0.0088 U	1.8 J	0.97 J	0.051 J+	0.0086 U	2.3	0.048 J	0.025 J	0.0088 U	0.009 U	0.0087 U	0.78	0.0089 U
Chrysene	0.085 J	0.069 J	14 J	7.4 J	0.42 J-	0.0094 U	21	0.38	0.19 J	0.15 J	0.0099 U	0.19 J	2.9	0.019 J
Dibenz(A,H)Anthracene	0.019 J	0.023 J	3 J	1.4 J	0.061 J+	0.018 U	5.1	0.065	0.032 J	0.019 U	0.019 U	0.038	0.85	0.019 U
Dibenzofuran	0.011 U	0.011 U	0.24 J	0.14 J	0.011 U	0.01 U	0.25 J	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.059 J	0.011 U

Table E-2
Summary of Data Used in Risk Assessment
Main Plant Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-034-DUP	CFMW-034	CFMW-035	CFMW-035-DUP	CFMW-035	CFMW-035	CFMW-037	CFMW-037	CFMW-037	CFMW-038	CFMW-038	CFMW-038	CFMW-040	CFMW-040
Sample Lab IDs	460-114793-44	460-114793-43	460-114828-22	460-114828-23	460-114828-20	460-114828-21	460-116119-2	460-116119-3	460-116119-4	320-19945-1, 460-116119-6	320-19945-2, 460-116119-7	320-19945-3, 460-116119-8	320-19945-4, 460-116283-1	320-19945-5, 460-116283-2
Sample Name	CFMW-DUP10-SO	CFMW-034-SO-10-12	CFMW-035-SO-0-0.5	CFMW-DUP11-SO	CFMW-035-SO-0.5-2	CFMW-035-SO-10-12	CFMW-037-SO-0-0.5	CFMW-037-SO-0.5-2	CFMW-037-SO-10-12	CFMW-038-SO-0-0.5	CFMW-038-SO-0.5-2	CFMW-038-SO-10-12	CFMW-040-SO-0-0.5	CFMW-040-SO-0.5-2
Sample Depth	0.5-2 ft	10-12 ft	0-0.5 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft
Chemical	5/31/2016	5/31/2016	6/1/2016	6/1/2016	6/1/2016	6/1/2016	6/24/2016	6/24/2016	6/24/2016	6/25/2016	6/25/2016	6/25/2016	6/28/2016	6/28/2016
Diethyl Phthalate	0.0099 U	0.01 U	0.052 U	0.05 U	0.011 U	0.0098 U	0.055 U	0.011 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Dimethyl Phthalate	0.01 U	0.01 U	0.053 U	0.052 U	0.011 U	0.01 U	0.056 U	0.011 U	0.01 U	0.01 U	0.011 U	0.01 U	0.011 U	0.01 U
Di-N-Butyl Phthalate	0.01 U	0.011 U	0.055 U	0.053 U	0.011 U	0.01 U	0.058 U	0.011 U	0.011 U	0.011 U	0.011 U	0.01 U	0.027 J	0.011 U
Di-N-Octylphthalate	0.018 U	0.018 U	0.093 U	0.09 U	0.019 U	0.018 U	0.098 U	0.019 U	0.018 U	0.018 U	0.018 U	0.018 U	0.018 U	0.018 U
Fluoranthene	0.12 J	0.058 J	20 J	11 J	0.58	0.01 U	22	0.34 J	0.24 J	0.15 J	0.011 U	0.2 J	3	0.022 J
Fluorene	0.0076 UJ	0.0077 U	0.54 J	0.31 J	0.015 J	0.0075 U	0.53 J	0.0081 U	0.014 J	0.0078 U	0.0079 U	0.0076 U	0.11 J	0.0078 U
Hexachlorobenzene	0.014 U	0.014 UJ	0.074 U	0.072 U	0.015 UJ	0.014 U	0.078 U	0.015 U	0.014 U	0.014 U	0.015 U	0.014 U	0.015 U	0.015 U
Hexachlorobutadiene	0.0098 U	0.01 U	0.051 U	0.05 U	0.011 U	0.0097 U	0.054 U	0.011 U	0.0099 U	0.01 U	0.01 U	0.0099 U	0.01 U	0.01 U
Hexachlorocyclopentadiene	0.022 UJ	0.022 U	0.11 U	0.11 U	0.023 U	0.022 U	0.12 U	0.023 U	0.022 U	0.022 U	0.023 U	0.022 U	0.023 U	0.022 U
Hexachloroethane	0.013 U	0.013 U	0.067 U	0.065 U	0.014 U	0.013 U	0.07 U	0.014 U	0.013 U	0.013 U	0.013 U	0.013 U	0.013 U	0.013 U
Indeno(1,2,3-C,D)Pyrene	0.083 J	0.06	13 J	6.6 J	0.32 J+	0.023 U	20	0.28	0.13	0.1	0.024 U	0.15	3.6	0.028 J
Isophorone	0.0075 U	0.0076 U	0.039 U	0.038 U	0.0081 U	0.0074 U	0.041 U	0.008 U	0.0076 U	0.0077 U	0.0078 U	0.0075 U	0.0078 U	0.0077 U
Naphthalene	0.0088 UJ	0.009 U	0.16 J	0.1 J	0.012 J	0.0088 U	0.22 J	0.0095 U	0.009 U	0.0091 U	0.0092 U	0.0089 U	0.056 J	0.0091 U
Nitrobenzene	0.011 U	0.011 U	0.057 U	0.056 U	0.012 U	0.011 U	0.06 U	0.012 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U
N-Nitrosodi-N-Propylamine	0.012 U	0.012 U	0.061 U	0.06 U	0.013 U	0.012 U	0.064 U	0.013 U	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U
N-Nitrosodiphenylamine	0.032 U	0.032 U	0.17 U	0.16 U	0.034 UJ	0.031 U	0.17 U	0.034 U	0.032 U	0.032 U	0.033 U	0.032 U	0.033 U	0.033 U
Pentachlorophenol	0.042 U	0.043 UJ	0.22 U	0.21 U	0.045 UJ	0.042 UJ	0.23 U	0.045 U	0.043 U	0.043 U	0.044 U	0.042 U	0.044 U	0.043 U
Phenanthrene	0.073 J	0.034 J	12 J	6.4 J	0.32 J-	0.0092 U	11	0.16 J	0.15 J	0.068 J	0.0096 U	0.082 J	1.4	0.012 J
Phenol	0.011 U	0.012 U	0.06 U	0.058 U	0.012 U	0.011 U	0.063 U	0.012 U	0.012 U	0.012 U	0.012 U	0.011 U	0.012 U	0.012 U
Pyrene	0.13 J	0.078 J	23 J	13 J	0.69	0.016 U	35	0.44	0.26 J	0.17 J	0.016 U	0.23 J	3	0.023 J
VOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,1,1-Trichloroethane	0.00038 U	0.00032 U	--	--	0.00042 U	0.00035 U	--	0.0003 U	0.00028 U	--	0.00029 U	0.0003 U	--	0.00038 U
1,1,2,2-Tetrachloroethane	0.00017 U	0.00015 U	--	--	0.00019 U	0.00016 U	--	0.00013 U	0.00012 U	--	0.00013 U	0.00013 U	--	0.00017 U
1,1,2-Trichloro-1,2,2-Trifluoroethane	0.00044 U	0.00038 U	--	--	0.00049 U	0.0004 U	--	0.00034 U	0.00032 U	--	0.00033 U	0.00035 U	--	0.00043 U
1,1,2-Trichloroethane	0.00028 U	0.00024 U	--	--	0.00031 U	0.00026 U	--	0.00022 U	0.0002 U	--	0.00021 U	0.00022 U	--	0.00028 U
1,1-Dichloroethane	0.00034 U	0.00029 U	--	--	0.00038 U	0.00031 U	--	0.00027 U	0.00025 U	--	0.00026 U	0.00027 U	--	0.00034 U
1,1-Dichloroethene	0.00041 U	0.00035 U	--	--	0.00046 U	0.00038 U	--	0.00032 U	0.0003 U	--	0.00031 U	0.00032 U	--	0.00041 U
1,2,3-Trichlorobenzene	0.00011 U	0.000094 U	--	--	0.00012 U	0.0001 UJ	--	0.000086 U	0.00008 U	--	0.000083 U	0.000087 U	--	0.00011 U
1,2,4-Trichlorobenzene	0.00032 U	0.00027 U	--	--	0.00036 U	0.00029 UJ	--	0.00025 U	0.00023 U	--	0.00024 U	0.00025 U	--	0.00032 U
1,2-Dibromo-3-Chloropropane	0.00047 U	0.0004 U	--	--	0.00052 U	0.00043 U	--	0.00037 U	0.00034 U	--	0.00035 U	0.00037 U	--	0.00046 U
1,2-Dibromoethane (Ethylene Dibromide)	0.00012 U	0.0001 U	--	--	0.00013 U	0.00011 U	--	0.000094 U	0.000088 U	--	0.000091 U	0.000095 U	--	0.00012 U
1,2-Dichlorobenzene	0.00014 U	0.00012 U	--	--	0.00016 U	0.00013 U	--	0.00011 U	0.0001 U	--	0.00011 U	0.00011 U	--	0.00014 U
1,2-Dichloroethane	0.00011 U	0.000094 U	--	--	0.00012 U	0.0001 U	--	0.000086 U	0.00008 U	--	0.000083 U	0.000087 U	--	0.00011 U
1,2-Dichloropropane	0.00017 U	0.00015 U	--	--	0.00019 U	0.00016 U	--	0.00013 U	0.00012 U	--	0.00013 U	0.00013 U	--	0.00017 U
1,3-Dichlorobenzene	0.00012 U	0.0001 U	--	--	0.00013 U	0.00011 U	--	0.000094 U	0.000088 U	--	0.000091 U	0.000095 U	--	0.00012 U
1,4-Dichlorobenzene	0.00013 U	0.00011 U	--	--	0.00014 U	0.00012 U	--	0.0001 U	0.000095 U	--	0.000098 U	0.0001 U	--	0.00013 U
2-Hexanone	0.00095 U	0.0008 U	--	--	0.001 U	0.00086 U	--	0.00073 U	0.00069 U	--	0.00071 U	0.00074 U	--	0.00093 U
Acetone	0.01	0.00091 U	--	--	0.0012 U	0.00098 U	--	0.011	0.013	--	0.017	0.011	--	0.022 J+
Benzene	0.00041 J	0.00023 J	--	--	0.00022 U	0.00018 U	--	0.00028 J	0.00044 J	--	0.00031 J	0.00043 J	--	0.0002 U
Bromochloromethane	0.00017 U	0.00015 U	--	--	0.00019 U	0.00016 U	--	0.00013 U	0.00012 U	--	0.00013 U	0.00013 U	--	0.00017 U
Bromodichloromethane	0.00038 U	0.00032 U	--	--	0.00042 U	0.00035 U	--	0.0003 U	0.00028 U	--	0.00029 U	0.0003 U	--	0.00038 U
Bromoform	0.00013 U	0.00011 U	--	--	0.00014 U	0.00012 U	--	0.0001 U	0.000095 U	--	0.000098 U	0.0001 U	--	0.00013 U
Bromomethane	0.00032 U	0.00027 U	--	--	0.00036 U	0.00029 U	--	0.00025 U	0.00023 U	--	0.00024 U	0.00025 U	--	0.00032 U
Carbon Disulfide	0.00043 U	0.00037 U	--	--	0.00048 U	0.0004 U	--	0.00034 U	0.00031 U	--	0.00067 J	0.00044 J	--	0.00042 UJ
Carbon Tetrachloride	0.00043 U	0.00037 U	--	--	0.00048 U	0.0004 U	--	0.00034 U	0.00031 U	--	0.00032 U	0.00034 U	--	0.00042 UJ
Chlorobenzene	0.00014 U	0.00012 U	--	--	0.00016 U	0.00013 U	--	0.00011 U	0.0001 U	--	0.00011 U	0.00011 U	--	0.00014 U
Chloroethane	0.00035 U	0.0003 U	--	--	0.00039 UJ	0.00032 U	--	0.00027 U	0.00026 U	--	0.00026 U	0.00028 U	--	0.00035 U
Chloroform	0.00021 U	0.00018 U	--	--	0.00023 U	0.00019 U	--	0.00016 U	0.00015 U	--	0.00016 U	0.00017 U	--	0.00021 U
Chloromethane	0.00038 U	0.00032 U	--	--	0.00042 U	0.00035 U	--	0.0003 U	0.00028 U	--	0.00029 U	0.0003 U	--	0.00038 UJ
Cis-1,2-Dichloroethylene	0.00022 U	0.00019 U	--	--	0.00025 U	0.0002 U	--	0.00017 U	0.00016 U	--	0.00017 U	0.00017 U	--	0.00022 U
Cis-1,3-Dichloropropene	0.00015 U	0.00013 U	--	--	0.00017 U	0.00014 U	--	0.00012 U	0.00011 U	--	0.00011 U	0.00012 U	--	0.00015 U
Cyclohexane	0.00046 U	0.00078 J	--	--	0.00051 U	0.00042 U	--	0.0006 J	0.0009	--	0.00039 J	0.00081	--	0.00045 U
Dibromochloromethane	0.00015 U	0.00013 U	--	--	0.00017 U	0.00014 U	--	0.00012 U	0.00011 U	--	0.00011 U	0.00012 U	--	0.00015 U
Dichlorodifluoromethane	0.00032 U	0.00027 U	--	--	0.00036 U	0.00029 U	--	0.00025 U	0.00023 U	--	0.00024 U	0.00025 U	--	0.00032 U
Ethylbenzene	0.00018 U	0.00029 J	--	--	0.0002 U	0.00017 U	--	0.00014 U	0.00016 J	--	0.00014 U	0.00014 U	--	0.00018 U
Isopropylbenzene (Cumene)	0.00017 U	0.00015 U	--	--	0.00019 U	0.00016 U	--	0.00013 U	0.00012 U	--	0.00013 U	0.00013 U	--	0.00017 U
M,P-Xylene	0.00015 J	0.0011	--	--	0.0003 J	0.00015 J	--	0.000086 U	0.0004 J	--	0.000083 U	0.000087 U	--	0.00011 U

Table E-2
Summary of Data Used in Risk Assessment
Main Plant Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-034-DUP	CFMW-034	CFMW-035	CFMW-035-DUP	CFMW-035	CFMW-035	CFMW-037	CFMW-037	CFMW-037	CFMW-038	CFMW-038	CFMW-038	CFMW-040	CFMW-040
Sample Lab IDs	460-114793-44	460-114793-43	460-114828-22	460-114828-23	460-114828-20	460-114828-21	460-116119-2	460-116119-3	460-116119-4	320-19945-1, 460-116119-6	320-19945-2, 460-116119-7	320-19945-3, 460-116119-8	320-19945-4, 460-116283-1	320-19945-5, 460-116283-2
Sample Name	CFMW-DUP10-SO	CFMW-034-SO-10-12	CFMW-035-SO-0-0.5	CFMW-DUP11-SO	CFMW-035-SO-0.5-2	CFMW-035-SO-10-12	CFMW-037-SO-0-0.5	CFMW-037-SO-0.5-2	CFMW-037-SO-10-12	CFMW-038-SO-0-0.5	CFMW-038-SO-0.5-2	CFMW-038-SO-10-12	CFMW-040-SO-0-0.5	CFMW-040-SO-0.5-2
Sample Depth	0.5-2 ft	10-12 ft	0-0.5 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft
Chemical	5/31/2016	5/31/2016	6/1/2016	6/1/2016	6/1/2016	6/1/2016	6/24/2016	6/24/2016	6/24/2016	6/25/2016	6/25/2016	6/25/2016	6/28/2016	6/28/2016
Methyl Acetate	0.00091 U	0.00077 U	--	--	0.001 U	0.00083 U	--	0.0007 U	0.00066 U	--	0.00068 U	0.00071 U	--	0.00089 U
Methyl Ethyl Ketone (2-Butanone)	0.00078 U	0.00066 U	--	--	0.00086 U	0.00071 U	--	0.0006 U	0.0019 J	--	0.0012 J	0.0017 J	--	0.0018 J
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	0.0022 U	0.0019 U	--	--	0.0025 U	0.002 U	--	0.0017 U	0.0016 U	--	0.0017 U	0.0018 U	--	0.0022 U
Methylcyclohexane	0.00076 J	0.0015	--	--	0.00056 U	0.00046 U	--	0.00083	0.0011	--	0.00068 J	0.00049 J	--	0.00049 U
Methylene Chloride	0.00032 U	0.00027 U	--	--	0.00036 U	0.00029 U	--	0.00025 U	0.00023 U	--	0.00024 U	0.00025 U	--	0.00032 U
O-Xylene (1,2-Dimethylbenzene)	0.00016 U	0.00035 J	--	--	0.00018 U	0.00015 U	--	0.00012 U	0.00015 J	--	0.00012 U	0.00013 U	--	0.00016 U
Styrene	0.00015 U	0.00013 U	--	--	0.00017 U	0.00014 U	--	0.00012 U	0.00011 U	--	0.00011 U	0.00012 U	--	0.00015 U
Tert-Butyl Methyl Ether	0.00017 U	0.00015 U	--	--	0.00019 U	0.00016 U	--	0.00013 U	0.00012 U	--	0.00013 U	0.00013 U	--	0.00017 U
Tetrachloroethylene (PCE)	0.00032 J	0.00024 U	--	--	0.00031 U	0.00026 U	--	0.00022 U	0.0002 U	--	0.00021 U	0.00022 U	--	0.00028 U
Toluene	0.00048 J	0.0014	--	--	0.00032 J	0.00024 J	--	0.00065 J	0.00091	--	0.00048 J	0.00085	--	0.00019 U
Trans-1,2-Dichloroethene	0.00039 U	0.00033 U	--	--	0.00043 U	0.00036 U	--	0.0003 U	0.00028 U	--	0.00029 U	0.00031 U	--	0.00039 U
Trans-1,3-Dichloropropene	0.0001 U	0.000085 U	--	--	0.00011 U	0.000092 U	--	0.000078 U	0.000073 U	--	0.000076 U	0.000079 U	--	0.000099 U
Trichloroethylene (TCE)	0.00026 U	0.00022 U	--	--	0.00029 U	0.00024 U	--	0.0002 U	0.00019 U	--	0.0002 U	0.00021 U	--	0.00026 U
Trichlorofluoromethane	0.00034 U	0.00029 U	--	--	0.00038 U	0.00031 U	--	0.00027 U	0.00025 U	--	0.00026 U	0.00027 U	--	0.00034 U
Vinyl Chloride	0.00039 U	0.00033 U	--	--	0.00043 U	0.00036 U	--	0.0003 U	0.00028 U	--	0.00029 U	0.00031 U	--	0.00039 UJ

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-2
Summary of Data Used in Risk Assessment
Main Plant Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-040	CFMW-042	CFMW-042	CFMW-042-DUP	CFMW-042	CFMW-043	CFMW-043	CFMW-043	CFMW-044A	CFMW-044A	CFMW-044A	CFMW-045A	CFMW-045A	CFMW-045A
Sample Lab IDs	320-19945-6, 460-116283-3	460-115648-15	460-115648-16	460-115648-18	460-115648-17	460-115648-3	460-115648-4	460-115648-5	460-117381-5	460-117381-6	460-117381-7	460-118613-2	460-118613-3	460-118613-4
Sample Name	CFMW-040-SO-10-12	CFMW-042-SO-0-0.5	CFMW-042-SO-0.5-2	CFMW-DUP16-SO	CFMW-042-SO-10-12	CFMW-043-SO-0-0.5	CFMW-043-SO-0.5-2	CFMW-043-SO-10-12	CFMW-044a-SO-0-0.5	CFMW-044a-SO-0.5-2	CFMW-044a-SO-10-12	CFMW-045a-SO-0-0.5	CFMW-045a-SO-0.5-2	CFMW-045a-SO-10-12
Sample Depth	10-12 ft	0-0.5 ft	0.5-2 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft
Chemical	6/28/2016	6/16/2016	6/16/2016	6/16/2016	6/16/2016	6/15/2016	6/15/2016	6/15/2016	7/20/2016	7/20/2016	7/20/2016	8/12/2016	8/12/2016	8/12/2016
GENERAL CHEMISTRY (mg/kg)														
Fluoride	14 J+	47.5 J-	22.9 J	41.5 J	5.29 J	84.9 J-	86.2 J-	4.91 J-	59.8 J+	34 J+	4.02 J+	74.8 J	65.3 J	16.7 J
Cyanide	0.041 J	0.87	0.03 J	0.023 J	0.017 U	0.11	0.11 J	0.016 U	0.068 J	0.02 J	0.019 U	0.1 J	0.018 U	0.017 U
METALS (mg/kg)														
"Chromium, Hexavalent - Estimated"	0.294404	0.757421	0.248905	0.219465	0.222141	0.318491	0.262287	0.270316	0.302433	0.339903	0.179319	0.318491	0.262287	0.246229
"Chromium, Trivalent - Calculated"	--	--	--	--	--	--	--	--	--	--	--	--	--	--
"Chromium, Trivalent - Estimated"	10.7056	27.5426	9.05109	7.98054	8.07786	11.5815	9.53771	9.82968	10.9976	12.3601	6.52068	11.5815	9.53771	8.95377
Aluminum	9360	32000	10400	13700	6210	14700	28400	6730	22900	9620	5470	29500	14700	7060
Antimony	0.37 UJ	0.54 UJ	0.43 UJ	0.42 UJ	0.41 UJ	0.34 UJ	0.36 UJ	0.34 UJ	0.44 UJ	0.37 UJ	0.42 UJ	0.46 U	0.43 U	0.41 U
Arsenic	13.1	5.5	4.6 J	4.3 J	5.2 J	5	5.1	3.2	3.7	3.5	5.5	4.1	3.3	3.3
Barium	91.6	376	78.8 J	146 J	77.3	131	392	91.3	196	73.1	63	101	131	120
Beryllium	0.55	0.89	0.45	0.51	0.27 J	0.43	0.64	0.31 J	0.6	0.53	0.33 J	0.61	0.64	0.31 J
Cadmium	0.28 U	1.2 J	0.33 U	0.32 U	0.31 U	0.26 U	0.28 U	0.26 U	0.33 U	0.28 U	0.32 U	0.54 J	0.33 U	0.31 U
Calcium	5850	9850	12800 J	6480 J	32900	21500	5980	25600	3150	1560	88200	9260	6420	34500
Chromium, Total	11 J-	28.3	9.3	8.2	8.3	11.9	9.8	10.1	11.3 J+	12.7 J+	6.7 J+	11.9	9.8	9.2
Cobalt	7.5 J-	6.1	5.5	4.7	4.3	4.9	6.1	4.9	6.6	5.1	3.1	4.6	4.5	4.6
Copper	21.2 J-	23.8 J+	18.9 J	16.9 J	10.3 J	17.3 J+	16 J+	21.5 J+	11.4 J+	13.2 J+	11.4 J+	16.3	13.6	13.5
Iron	16600	16700	13900	12600	10300	14100	18100	10200	18400	13700	10900	10500	12100	13400
Lead	22 J-	28.2 J+	9.2	14.1	5.6	23.2 J+	10.9 J+	6.9 J+	10.5 J	6.7 J	5.2 J	47.6 J	19.3 J	5.8 J
Magnesium	9030	7240	10800	6670	9960	8590	6630	8660	7130	6820	15500	7590	8130	12200
Manganese	480	548 J	394	414	297	569 J	920 J	248 J	455	257	417	269	370	378
Mercury	0.017	0.031	0.041 J	0.018 J	0.011 J	0.018 J	0.014 J	0.012 U	0.014 U	0.011 U	0.012 U	0.013 U	0.013 U	0.026
Nickel	13 J-	27.5	11.1	9.2	8.1	18.9	11.8	10.3	12.4	14	6.3	59.9	20.3	10.1
Potassium	984	1450	658	745	673	889	1330	898	858 J+	519 J+	584 J+	596	609	565
Selenium	0.35 U	0.5 U	0.4 U	0.39 U	0.38 U	0.32 U	0.34 U	0.32 U	0.41 U	0.35 U	0.39 U	0.43 UJ	0.4 UJ	0.38 UJ
Silver	0.68 U	0.99 U	0.78 U	0.76 U	0.75 U	0.63 U	0.66 U	0.63 U	0.8 U	0.68 U	0.76 U	0.85 U	0.78 U	0.74 U
Sodium	34.9 U	67.1 J	43.8 J	135 J	38.7 J	32.2 U	55.3 J	33 J	60.3 J	34.7 U	38.8 U	198	78.1 J	63.7 J
Thallium	0.14 U	0.2 U	0.16 U	0.16 U	0.15 U	0.13 U	0.14 U	0.13 U	0.17 U	0.14 U	0.16 U	0.17 U	0.16 U	0.15 U
Vanadium	9.4	31.6	9.6	13.3	5.3	12.4	17.4	9.5	19.7 J	12.2 J	5.4 J	24.7 J-	14.7 J-	6.6 J-
Zinc	36.6	106	38.4	36.8	26.3	57.8	80.1	25.3	48.5	26.6	23.3	85.3	54.1	27.4
METALS|HEXAVALENT CHROMIUM (mg/kg)														
Chromium, Hexavalent	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PESTICIDES (mg/kg)														
Aldrin	--	0.0013 U	--	--	--	0.0009 U	--	--	0.00092 U	--	--	0.00092 U	--	--
Alpha Bhc (Alpha Hexachlorocyclohexane)	--	0.00097 U	--	--	--	0.00068 U	--	--	0.00069 U	--	--	0.0007 U	--	--
Alpha Endosulfan	--	0.0015 U	--	--	--	0.001 U	--	--	0.0011 U	--	--	0.0011 U	--	--
Beta Bhc (Beta Hexachlorocyclohexane)	--	0.001 U	--	--	--	0.00072 U	--	--	0.00074 U	--	--	0.00074 U	--	--
Beta Endosulfan	--	0.0017 U	--	--	--	0.0012 U	--	--	0.0012 U	--	--	0.0012 U	--	--
cis-Chlordane	--	0.0017 U	--	--	--	0.0012 U	--	--	0.0012 U	--	--	0.0012 U	--	--
Delta BHC (Delta Hexachlorocyclohexane)	--	0.0012 U	--	--	--	0.00081 U	--	--	0.00083 U	--	--	0.00083 U	--	--
Dieldrin	--	0.0014 U	--	--	--	0.00097 U	--	--	0.00098 U	--	--	0.00099 U	--	--
Endosulfan Sulfate	--	0.0012 U	--	--	--	0.00087 U	--	--	0.00088 U	--	--	0.00089 U	--	--
Endrin	--	0.0013 U	--	--	--	0.00095 U	--	--	0.00096 U	--	--	0.00097 U	--	--
Endrin Aldehyde	--	0.0013 U	--	--	--	0.00093 U	--	--	0.00094 U	--	--	0.00095 U	--	--
Endrin Ketone	--	0.0015 U	--	--	--	0.001 U	--	--	0.0011 U	--	--	0.0011 U	--	--
Gamma Bhc (Lindane)	--	0.00095 U	--	--	--	0.00067 U	--	--	0.00068 U	--	--	0.00068 U	--	--
Heptachlor	--	0.0014 U	--	--	--	0.00096 U	--	--	0.00097 U	--	--	0.00098 U	--	--
Heptachlor Epoxide	--	0.0021 U	--	--	--	0.0015 U	--	--	0.0015 U	--	--	0.0015 U	--	--
Methoxychlor	--	0.0023 U	--	--	--	0.0016 U	--	--	0.0016 U	--	--	0.0016 U	--	--
P,P'-DDD	--	0.0014 U	--	--	--	0.00098 U	--	--	0.001 U	--	--	0.001 U	--	--
P,P'-DDE	--	0.0015 U	--	--	--	0.0011 U	--	--	0.0011 U	--	--	0.0011 U	--	--
P,P'-DDT	--	0.0011 U	--	--	--	0.00077 U	--	--	0.00078 U	--	--	0.00079 U	--	--
Toxaphene	--	0.031 U	--	--	--	0.022 U	--	--	0.022 U	--	--	0.022 U	--	--
trans-Chlordane	--	0.0023 U	--	--	--	0.0016 U	--	--	0.0016 U	--	--	0.0017 U	--	--
POLYCHLORINATED BIPHENYLS (mg/kg)														
PCB-1016 (Aroclor 1016)	0.0099 U	0.014 U	0.01 U	0.0093 U	0.0092 U	0.0099 U	0.01 U	0.0093 U	0.01 U	0.0095 U	0.0096 U	0.01 U	0.0097 U	0.0092 U
PCB-1221 (Aroclor 1221)	0.0099 U	0.014 U	0.01 U	0.0093 U	0.0092 U	0.0099 U	0.01 U	0.0093 U	0.01 U	0.0095 U	0.0096 U	0.01 U	0.0097 U	0.0092 U

Table E-2
Summary of Data Used in Risk Assessment
Main Plant Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-040	CFMW-042	CFMW-042	CFMW-042-DUP	CFMW-042	CFMW-043	CFMW-043	CFMW-043	CFMW-044A	CFMW-044A	CFMW-044A	CFMW-045A	CFMW-045A	CFMW-045A
Sample Lab IDs	320-19945-6, 460-116283-3	460-115648-15	460-115648-16	460-115648-18	460-115648-17	460-115648-3	460-115648-4	460-115648-5	460-117381-5	460-117381-6	460-117381-7	460-118613-2	460-118613-3	460-118613-4
Sample Name	CFMW-040-SO-10-12	CFMW-042-SO-0-0.5	CFMW-042-SO-0.5-2	CFMW-DUP16-SO	CFMW-042-SO-10-12	CFMW-043-SO-0-0.5	CFMW-043-SO-0.5-2	CFMW-043-SO-10-12	CFMW-044a-SO-0-0.5	CFMW-044a-SO-0.5-2	CFMW-044a-SO-10-12	CFMW-045a-SO-0-0.5	CFMW-045a-SO-0.5-2	CFMW-045a-SO-10-12
Sample Depth	10-12 ft	0-0.5 ft	0.5-2 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft
Chemical	6/28/2016	6/16/2016	6/16/2016	6/16/2016	6/16/2016	6/15/2016	6/15/2016	6/15/2016	7/20/2016	7/20/2016	7/20/2016	8/12/2016	8/12/2016	8/12/2016
PCB-1232 (Aroclor 1232)	0.0099 U	0.014 U	0.01 U	0.0093 U	0.0092 U	0.0099 U	0.01 U	0.0093 U	0.01 U	0.0095 U	0.0096 U	0.01 U	0.0097 U	0.0092 U
PCB-1242 (Aroclor 1242)	0.0099 U	0.014 U	0.01 U	0.0093 U	0.0092 U	0.0099 U	0.01 U	0.0093 U	0.01 U	0.0095 U	0.0096 U	0.01 U	0.0097 U	0.0092 U
PCB-1248 (Aroclor 1248)	0.0099 U	0.014 U	0.01 U	0.0093 U	0.0092 U	0.0099 U	0.01 U	0.0093 U	0.01 U	0.0095 U	0.0096 U	0.01 U	0.0097 U	0.0092 U
PCB-1254 (Aroclor 1254)	0.01 U	0.015 U	0.01 U	0.0096 U	0.0095 U	0.01 U	0.011 U	0.0096 U	0.01 U	0.0098 U	0.0099 U	0.01 U	0.01 U	0.0095 U
PCB-1260 (Aroclor 1260)	0.01 U	0.015 U	0.01 U	0.0096 U	0.0095 U	0.01 U	0.011 U	0.0096 U	0.01 U	0.0098 U	0.0099 U	0.01 U	0.01 U	0.0095 U
PCB-1262 (Aroclor 1262)	0.01 U	0.015 U	0.01 U	0.0096 U	0.0095 U	0.01 U	0.011 U	0.0096 U	0.01 U	0.0098 U	0.0099 U	0.01 U	0.01 U	0.0095 U
PCB-1268 (Aroclor 1268)	0.01 U	0.015 U	0.01 U	0.0096 U	0.0095 U	0.01 U	0.011 U	0.0096 U	0.01 U	0.0098 U	0.0099 U	0.01 U	0.01 U	0.0095 U
Polychlorinated Biphenyl (PCBs)	0.01 U	0.015 U	0.01 U	0.0096 U	0.0095 U	0.01 U	0.011 U	0.0096 U	0.01 U	0.0098 U	0.0099 U	0.01 U	0.01 U	0.0095 U
SEMIVOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,2,4,5-Tetrachlorobenzene	0.027 U	0.039 U	0.028 U	0.026 U	0.025 U	0.027 U	0.029 U	0.026 U	0.028 U	0.026 U	0.027 U	0.056 U	0.027 U	0.025 U
1,4-Dioxane (P-Dioxane)	0.098 U	0.14 U	0.1 U	0.092 U	0.091 U	0.098 U	0.1 U	0.092 U	0.1 U	0.094 U	0.095 U	0.2 U	0.097 U	0.092 U
2,3,4,6-Tetrachlorophenol	0.034 U	0.049 U	0.035 U	0.032 U	0.032 UJ	0.035 U	0.036 U	0.032 U	0.035 U	0.033 U	0.034 U	0.071 U	0.034 U	0.032 U
2,4,5-Trichlorophenol	0.036 U	0.052 U	0.037 U	0.034 U	0.034 UJ	0.037 U	0.038 U	0.034 U	0.037 U	0.035 U	0.035 U	0.075 U	0.036 U	0.034 U
2,4,6-Trichlorophenol	0.01 U	0.015 U	0.011 U	0.0098 U	0.0097 U	0.01 U	0.011 U	0.0098 U	0.011 U	0.01 U	0.01 U	0.021 U	0.01 U	0.0097 U
2,4-Dichlorophenol	0.0086 U	0.012 U	0.0089 U	0.0081 U	0.0081 U	0.0087 U	0.0091 U	0.0081 U	0.0088 U	0.0083 U	0.0084 U	0.018 U	0.0085 U	0.0081 U
2,4-Dimethylphenol	0.08 U	0.12 U	0.083 U	0.076 U	0.075 U	0.081 U	0.085 U	0.076 U	0.082 U	0.077 U	0.078 U	0.17 U	0.079 U	0.075 U
2,4-Dinitrophenol	0.28 U	0.4 U	0.28 U	0.26 U	0.26 UJ	0.28 U	0.29 U	0.26 U	0.28 U	0.27 U	0.27 U	0.57 U	0.27 U	0.26 U
2,4-Dinitrotoluene	0.014 U	0.021 U	0.015 U	0.014 U	0.014 U	0.015 U	0.015 U	0.014 U	0.015 U	0.014 U	0.014 U	0.03 U	0.014 U	0.014 U
2,6-Dinitrotoluene	0.019 U	0.028 U	0.02 U	0.018 U	0.018 U	0.02 U	0.021 U	0.018 U	0.02 U	0.019 U	0.019 U	0.04 U	0.019 U	0.018 U
2-Chloronaphthalene	0.0083 U	0.012 U	0.0085 U	0.0078 U	0.0078 U	0.0084 U	0.0087 U	0.0078 U	0.0085 U	0.008 U	0.0081 U	0.017 U	0.0082 U	0.0078 U
2-Chlorophenol	0.0093 U	0.013 U	0.0095 U	0.0088 U	0.0087 U	0.0094 U	0.0098 U	0.0088 U	0.0095 U	0.009 U	0.0091 U	0.019 U	0.0092 U	0.0087 U
2-Methylnaphthalene	0.0081 U	0.022 J	0.0083 U	0.0076 U	0.021 J	0.11 J	0.085 J	0.078 J	0.0083 U	0.0078 U	0.0079 U	0.15 J	0.11 J	0.0076 U
2-Methylphenol (O-Cresol)	0.016 U	0.023 U	0.016 U	0.015 U	0.015 U	0.016 U	0.017 U	0.015 U	0.016 U	0.015 U	0.016 U	0.033 U	0.016 U	0.015 U
2-Nitroaniline	0.012 U	0.017 U	0.012 U	0.011 U	0.011 U	0.012 U	0.013 U	0.011 U	0.012 U	0.012 U	0.012 U	0.025 U	0.012 U	0.011 U
2-Nitrophenol	0.012 U	0.018 U	0.013 U	0.012 U	0.011 UJ	0.012 U	0.013 U	0.012 U	0.013 U	0.012 U	0.012 U	0.025 U	0.012 U	0.012 U
3- And 4- Methylphenol (Total)	0.0097 U	0.014 U	0.01 U	0.0092 U	0.0091 U	0.0098 U	0.01 U	0.0092 U	0.01 U	0.0094 U	0.0095 U	0.02 U	0.0096 U	0.0091 U
3,3'-Dichlorobenzidine	0.041 U	0.058 U	0.042 U	0.038 U	0.038 U	0.041 U	0.043 U	0.038 U	0.042 U	0.039 U	0.04 U	0.084 U	0.04 U	0.038 U
3-Nitroaniline	0.011 U	0.016 U	0.011 U	0.01 U	0.01 U	0.011 U	0.011 U	0.01 U	0.011 U	0.01 U	0.011 U	0.022 U	0.011 U	0.01 U
4,6-Dinitro-2-Methylphenol	0.098 U	0.14 U	0.1 U	0.092 U	0.091 UJ	0.098 U	0.1 U	0.092 U	0.1 U	0.094 U	0.095 U	0.2 U	0.096 U	0.091 U
4-Bromophenyl Phenyl Ether	0.012 U	0.016 U	0.012 U	0.011 U	0.011 U	0.012 U	0.012 U	0.011 U	0.012 U	0.011 U	0.011 U	0.024 U	0.011 U	0.011 U
4-Chloro-3-Methylphenol	0.016 U	0.022 U	0.016 U	0.015 U	0.015 U	0.016 U	0.017 U	0.015 U	0.016 U	0.015 U	0.015 U	0.032 U	0.016 U	0.015 U
4-Chloroaniline	0.0094 U	0.013 U	0.0097 U	0.0089 U	0.0088 U	0.0095 U	0.0099 U	0.0089 U	0.0096 U	0.0091 U	0.0092 U	0.019 U	0.0093 U	0.0088 U
4-Chlorophenyl Phenyl Ether	0.011 U	0.016 U	0.011 U	0.01 U	0.01 U	0.011 U	0.012 U	0.01 U	0.011 U	0.011 U	0.011 U	0.023 U	0.011 U	0.01 U
4-Nitroaniline	0.014 U	0.02 U	0.014 U	0.013 U	0.013 U	0.014 U	0.015 U	0.013 U	0.014 U	0.013 U	0.013 U	0.028 U	0.014 U	0.013 U
4-Nitrophenol	0.18 U	0.25 U	0.18 U	0.17 U	0.16 U	0.18 U	0.19 U	0.17 U	0.18 U	0.17 U	0.17 U	0.36 U	0.17 U	0.16 U
Acenaphthene	0.0088 U	0.11 J	0.0091 U	0.0083 U	0.0083 U	0.28 J	0.0093 U	0.0083 U	0.009 U	0.0085 U	0.0086 U	0.46 J	0.54	0.0083 U
Acenaphthylene	0.0094 U	0.013 U	0.0097 U	0.0089 U	0.0088 U	0.013 J	0.0099 U	0.0089 U	0.0096 U	0.0091 U	0.0092 U	0.039 J	0.0093 U	0.0088 U
Acetophenone	0.008 U	0.011 U	0.0082 U	0.0075 U	0.0074 U	0.008 U	0.0084 U	0.0075 U	0.0081 U	0.0077 U	0.0078 U	0.016 U	0.0079 U	0.0075 U
Anthracene	0.035 U	0.2 J	0.036 U	0.033 U	0.032 U	0.93	0.037 U	0.033 U	0.036 U	0.033 U	0.034 U	1	0.68	0.033 U
Atrazine	0.016 U	0.023 U	0.017 U	0.015 U	0.015 U	0.016 U	0.017 U	0.015 U	0.017 U	0.016 U	0.016 U	0.033 U	0.016 U	0.015 U
Benzaldehyde	0.028 U	0.04 U	0.029 U	0.026 U	0.026 U	0.028 U	0.029 U	0.026 U	0.093 J	0.027 U	0.027 U	0.057 U	0.028 U	0.026 U
Benzo(A)Anthracene	0.053	1	0.031 U	0.029 U	0.029 U	3	0.044	0.029 U	0.031 U	0.029 U	0.03 U	4.7	1.8	0.074
Benzo(A)Pyrene	0.063	1.3	0.016 J	0.015 J	0.01 U	3.7	0.05	0.01 U	0.033 J	0.011 U	0.011 U	5.7	2.1	0.09
Benzo(B)Fluoranthene	0.15	2.4	0.021 J	0.02 J	0.013 U	4.5	0.066	0.013 U	0.03 J	0.014 U	0.014 U	9.2	3.5	0.19
Benzo(G,H,I)Perylene	0.1 J	1.7	0.022 U	0.02 U	0.02 U	4.4	0.031 J	0.02 U	0.035 J	0.02 U	0.02 U	7.5	2.2	0.091 J
Benzo(K)Fluoranthene	0.047	0.87	0.016 U	0.015 U	0.015 U	2.1	0.03 J	0.015 U	0.016 J	0.015 U	0.016 U	3.8	1.4	0.075
Benzyl Butyl Phthalate	0.011 U	0.04 J	0.012 U	0.011 U	0.011 U	0.011 U	0.012 U	0.011 U	0.045 J	0.011 U	0.011 U	0.63 J+	0.18 J	0.011 U
Biphenyl (Diphenyl)	0.031 U	0.045 U	0.032 U	0.029 U	0.029 U	0.031 U	0.033 U	0.029 U	0.032 U	0.03 U	0.03 U	0.064 U	0.031 U	0.029 U
Bis(2-Chloroethoxy) Methane	0.011 U	0.016 U	0.012 U	0.011 U	0.011 U	0.011 U	0.012 U	0.011 U	0.012 U	0.011 U	0.011 U	0.023 U	0.011 U	0.011 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.0086 U	0.012 U	0.0089 U	0.0081 U	0.0081 U	0.0087 U	0.0091 U	0.0081 U	0.0088 U	0.0083 U	0.0084 U	0.018 U	0.0085 U	0.0081 U
Bis(2-Chloroisopropyl) Ether	0.015 U	0.022 U	0.015 U	0.014 U	0.014 U	0.015 U	0.016 U	0.014 U	0.015 U	0.014 U	0.015 U	0.031 U	0.015 U	0.014 U
Bis(2-Ethylhexyl) Phthalate	0.014 U	0.049 J	0.015 U	0.013 U	0.013 U	0.055 J	0.015 U	0.013 U	0.015 U	0.014 U	0.014 U	0.14 J	0.035 J	0.013 U
Caprolactam	0.026 U	0.038 U	0.027 U	0.025 U	0.025 U	0.027 U	0.028 U	0.025 U	0.027 U	0.025 U	0.026 U	0.054 U	0.026 U	0.025 U
Carbazole	0.019 J	0.23 J	0.0093 U	0.0086 U	0.0085 U	0.86	0.0096 U	0.0085 U	0.0093 U	0.0087 U	0.0088 U	1.4	0.41	0.014 J
Chrysene	0.09 J	1.6	0.017 J	0.017 J	0.0093 U	4	0.05 J	0.0094 U	0.037 J	0.0096 U	0.0097 U	6.8	2.5	0.13 J
Dibenz(A,H)Anthracene	0.019 J	0.39	0.02 U	0.018 U	0.018 U	1	0.02 U	0.018 U	0.019 U	0.018 U	0.019 U	1.4	0.51	0.018 U
Dibenzofuran	0.011 U	0.049 J	0.011 U	0.01 U	0.01 U	0.15 J	0.012 U	0.01 U	0.011 U	0.011 U	0.011 U	0.29 J	0.22 J	0.01 U

Table E-2
Summary of Data Used in Risk Assessment
Main Plant Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-040	CFMW-042	CFMW-042	CFMW-042-DUP	CFMW-042	CFMW-043	CFMW-043	CFMW-043	CFMW-044A	CFMW-044A	CFMW-044A	CFMW-045A	CFMW-045A	CFMW-045A
Sample Lab IDs	320-19945-6, 460-116283-3	460-115648-15	460-115648-16	460-115648-18	460-115648-17	460-115648-3	460-115648-4	460-115648-5	460-117381-5	460-117381-6	460-117381-7	460-118613-2	460-118613-3	460-118613-4
Sample Name	CFMW-040-SO-10-12	CFMW-042-SO-0-0.5	CFMW-042-SO-0.5-2	CFMW-DUP16-SO	CFMW-042-SO-10-12	CFMW-043-SO-0-0.5	CFMW-043-SO-0.5-2	CFMW-043-SO-10-12	CFMW-044a-SO-0-0.5	CFMW-044a-SO-0.5-2	CFMW-044a-SO-10-12	CFMW-045a-SO-0-0.5	CFMW-045a-SO-0.5-2	CFMW-045a-SO-10-12
Sample Depth	10-12 ft	0-0.5 ft	0.5-2 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft
Chemical	6/28/2016	6/16/2016	6/16/2016	6/16/2016	6/16/2016	6/15/2016	6/15/2016	6/15/2016	7/20/2016	7/20/2016	7/20/2016	8/12/2016	8/12/2016	8/12/2016
Diethyl Phthalate	0.01 U	0.015 U	0.011 U	0.0098 U	0.0097 U	0.01 U	0.011 U	0.0098 U	0.011 U	0.01 U	0.01 U	0.021 U	0.01 U	0.0097 U
Dimethyl Phthalate	0.011 U	0.015 U	0.011 U	0.01 U	0.0099 U	0.011 U	0.011 U	0.01 U	0.011 U	0.01 U	0.01 U	0.022 U	0.01 U	0.0099 U
Di-N-Butyl Phthalate	0.011 J	0.016 J	0.011 U	0.01 U	0.01 U	0.011 U	0.012 U	0.01 U	0.011 U	0.011 U	0.011 U	0.039 J	0.011 U	0.01 U
Di-N-Octylphthalate	0.019 U	0.027 U	0.019 U	0.018 U	0.017 U	0.019 U	0.02 U	0.018 U	0.019 U	0.018 U	0.018 U	0.038 U	0.018 U	0.017 U
Fluoranthene	0.085 J	1.8	0.034 J	0.039 J	0.01 U	8.1	0.079 J	0.01 U	0.038 J	0.01 U	0.011 U	9	3.9	0.17 J
Fluorene	0.008 U	0.091 J	0.0082 U	0.0075 U	0.0074 U	0.29 J	0.01 J	0.0075 U	0.0081 U	0.0077 U	0.0078 U	0.44 J	0.43	0.0075 U
Hexachlorobenzene	0.015 U	0.021 U	0.015 U	0.014 U	0.014 U	0.015 U	0.016 U	0.014 U	0.015 U	0.014 U	0.014 U	0.031 U	0.015 U	0.014 U
Hexachlorobutadiene	0.01 U	0.015 U	0.011 U	0.0097 U	0.0096 U	0.01 U	0.011 U	0.0097 U	0.011 U	0.0099 U	0.01 U	0.021 U	0.01 U	0.0096 U
Hexachlorocyclopentadiene	0.023 U	0.033 U	0.023 U	0.021 U	0.021 U	0.023 U	0.024 U	0.021 U	0.023 U	0.022 U	0.022 U	0.047 U	0.023 U	0.021 U
Hexachloroethane	0.013 U	0.019 U	0.014 U	0.013 U	0.013 U	0.013 U	0.014 U	0.013 U	0.014 U	0.013 U	0.013 U	0.028 U	0.013 U	0.013 U
Indeno(1,2,3-C,D)Pyrene	0.1	1.8	0.025 U	0.023 U	0.023 U	4.5	0.034 J	0.023 U	0.028 J	0.023 U	0.024 U	6	2.2	0.078
Isophorone	0.0079 U	0.011 U	0.0081 U	0.0074 U	0.0073 U	0.0079 U	0.0083 U	0.0074 U	0.008 U	0.0076 U	0.0077 U	0.016 U	0.0078 U	0.0074 U
Naphthalene	0.0093 U	0.055 J	0.0095 U	0.0088 U	0.022 J	0.15 J	0.1 J	0.086 J	0.0095 U	0.009 U	0.0091 U	0.75	0.26 J	0.0087 U
Nitrobenzene	0.012 U	0.016 U	0.012 U	0.011 U	0.011 U	0.012 U	0.012 U	0.011 U	0.012 U	0.011 U	0.011 U	0.024 U	0.011 U	0.011 U
N-Nitrosodi-N-Propylamine	0.012 U	0.018 U	0.013 U	0.012 U	0.011 U	0.012 U	0.013 U	0.012 U	0.013 U	0.012 U	0.012 U	0.025 U	0.012 U	0.012 U
N-Nitrosodiphenylamine	0.033 U	0.048 U	0.034 U	0.031 U	0.031 UJ	0.033 U	0.035 U	0.031 U	0.034 U	0.032 U	0.032 U	0.068 U	0.033 U	0.031 U
Pentachlorophenol	0.044 U	0.063 U	0.045 U	0.042 U	0.041 UJ	0.045 U	0.047 U	0.042 U	0.045 U	0.043 U	0.043 U	0.091 U	0.044 U	0.041 U
Phenanthrene	0.037 J	1.1	0.027 J	0.031 J	0.0091 U	6.4	0.046 J	0.0092 U	0.022 J	0.0094 U	0.0095 U	6	3.4	0.065 J
Phenol	0.012 U	0.017 U	0.012 U	0.011 U	0.011 U	0.012 U	0.013 U	0.011 U	0.012 U	0.012 U	0.012 U	0.025 U	0.012 U	0.011 U
Pyrene	0.086 J	2.1	0.024 J	0.029 J	0.016 U	7.4	0.072 J	0.016 U	0.044 J	0.016 U	0.016 U	9.9	4.6	0.16 J
VOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,1,1-Trichloroethane	0.00032 U	--	0.00037 U	0.00034 U	0.00019 U	--	0.00027 U	0.0003 U	--	0.00032 U	0.00037 U	--	0.00029 U	0.00034 U
1,1,2,2-Tetrachloroethane	0.00014 U	--	0.00016 U	0.00015 U	0.000087 U	--	0.00012 U	0.00013 U	--	0.00014 U	0.00016 U	--	0.00013 U	0.00015 U
1,1,2-Trichloro-1,2,2-Trifluoroethane	0.00037 U	--	0.00043 U	0.00039 U	0.00022 UJ	--	0.00032 U	0.00034 U	--	0.00037 U	0.00042 U	--	0.00033 U	0.00039 U
1,1,2-Trichloroethane	0.00024 U	--	0.00027 U	0.00025 U	0.00014 U	--	0.0002 U	0.00022 U	--	0.00024 U	0.00027 U	--	0.00021 U	0.00025 U
1,1-Dichloroethane	0.00029 U	--	0.00033 U	0.0003 U	0.00017 U	--	0.00024 U	0.00026 U	--	0.00029 U	0.00033 U	--	0.00026 U	0.0003 U
1,1-Dichloroethene	0.00034 U	--	0.0004 U	0.00036 U	0.00021 U	--	0.00029 U	0.00032 U	--	0.00035 U	0.00039 U	--	0.00031 U	0.00037 U
1,2,3-Trichlorobenzene	0.000092 U	--	0.00011 U	0.000098 U	0.000056 UJ	--	0.000079 U	0.000086 U	--	0.000093 UJ	0.00011 UJ	--	0.000083 U	0.000099 U
1,2,4-Trichlorobenzene	0.00027 U	--	0.00031 U	0.00028 U	0.00016 UJ	--	0.00023 U	0.00025 U	--	0.00027 U	0.00031 U	--	0.00024 U	0.00029 U
1,2-Dibromo-3-Chloropropane	0.0004 U	--	0.00046 U	0.00042 U	0.00024 U	--	0.00034 U	0.00037 U	--	0.0004 U	0.00045 U	--	0.00035 U	0.00042 U
1,2-Dibromoethane (Ethylene Dibromide)	0.0001 U	--	0.00012 U	0.00011 U	0.000061 U	--	0.000086 U	0.000094 U	--	0.0001 U	0.00012 U	--	0.00009 U	0.00011 U
1,2-Dichlorobenzene	0.00012 U	--	0.00014 U	0.00012 U	0.000072 UJ	--	0.0001 U	0.00011 U	--	0.00012 U	0.00013 U	--	0.00011 U	0.00013 U
1,2-Dichloroethane	0.000092 U	--	0.00011 U	0.000098 U	0.000056 U	--	0.000079 U	0.000086 U	--	0.000093 U	0.00011 U	--	0.000083 U	0.000099 U
1,2-Dichloropropane	0.00014 U	--	0.00016 U	0.00015 U	0.000087 U	--	0.00012 U	0.00013 U	--	0.00014 U	0.00016 U	--	0.00013 U	0.00015 U
1,3-Dichlorobenzene	0.0001 U	--	0.00012 U	0.00011 U	0.000061 UJ	--	0.000086 U	0.000094 U	--	0.0001 U	0.00012 U	--	0.00009 U	0.00011 U
1,4-Dichlorobenzene	0.00011 U	--	0.00013 U	0.00012 U	0.000066 UJ	--	0.000093 U	0.0001 U	--	0.00011 U	0.00013 U	--	0.000098 U	0.00012 U
2-Hexanone	0.00079 U	--	0.00091 U	0.00083 U	0.00048 U	--	0.00067 U	0.00073 U	--	0.0008 U	0.0009 U	--	0.00071 U	0.00084 U
Acetone	0.014 J+	--	0.041	0.039	0.0057	--	0.048	0.0063	--	0.017 J+	0.014 J+	--	0.017	0.017
Benzene	0.00035 J	--	0.00034 J	0.00018 UJ	0.00019 J	--	0.00034 J	0.00048 J	--	0.00017 U	0.00052 J	--	0.00035 J	0.00046 J
Bromochloromethane	0.00014 U	--	0.00016 U	0.00015 U	0.000087 U	--	0.00012 U	0.00013 U	--	0.00014 U	0.00016 U	--	0.00013 U	0.00015 U
Bromodichloromethane	0.00032 U	--	0.00037 U	0.00034 U	0.00019 U	--	0.00027 U	0.0003 U	--	0.00032 U	0.00037 U	--	0.00029 U	0.00034 U
Bromoform	0.00011 U	--	0.00013 U	0.00012 U	0.000066 U	--	0.000093 U	0.0001 U	--	0.00011 UJ	0.00013 UJ	--	0.000098 U	0.00012 U
Bromomethane	0.00027 U	--	0.00031 UJ	0.00028 UJ	0.00016 UJ	--	0.00023 UJ	0.00025 UJ	--	0.00027 U	0.00031 U	--	0.00024 U	0.00029 U
Carbon Disulfide	0.00037 J	--	0.00042 UJ	0.0025 J	0.00056	--	0.00031 U	0.00034 U	--	0.00037 U	0.00041 U	--	0.00032 U	0.0006 J
Carbon Tetrachloride	0.00036 UJ	--	0.00042 U	0.00038 U	0.00022 UJ	--	0.00031 U	0.00034 U	--	0.00037 U	0.00041 U	--	0.00032 U	0.00039 U
Chlorobenzene	0.00012 U	--	0.00014 U	0.00012 U	0.000072 UJ	--	0.0001 U	0.00011 U	--	0.00012 U	0.00013 U	--	0.00011 U	0.00013 U
Chloroethane	0.00029 U	--	0.00034 UJ	0.00031 UJ	0.00018 UJ	--	0.00025 UJ	0.00027 UJ	--	0.0003 U	0.00034 U	--	0.00026 U	0.00031 U
Chloroform	0.00018 U	--	0.0002 U	0.00019 U	0.00011 U	--	0.00015 U	0.00016 U	--	0.00018 U	0.0002 U	--	0.00016 U	0.00019 U
Chloromethane	0.00032 UJ	--	0.00037 UJ	0.00034 UJ	0.00019 UJ	--	0.00027 UJ	0.0003 UJ	--	0.00032 U	0.00037 U	--	0.00029 U	0.00034 U
Cis-1,2-Dichloroethylene	0.00018 U	--	0.00021 U	0.0002 U	0.00011 U	--	0.00016 U	0.00017 U	--	0.00019 U	0.00021 U	--	0.00017 U	0.0002 U
Cis-1,3-Dichloropropene	0.00013 U	--	0.00015 U	0.00013 U	0.000077 U	--	0.00011 U	0.00012 U	--	0.00013 U	0.00014 U	--	0.00011 U	0.00013 U
Cyclohexane	0.00039 U	--	0.00045 U	0.00041 U	0.00082	--	0.00033 U	0.00036 U	--	0.00039 U	0.0014	--	0.00035 U	0.0012
Dibromochloromethane	0.00013 U	--	0.00015 U	0.00013 U	0.000077 U	--	0.00011 U	0.00012 U	--	0.00013 U	0.00014 U	--	0.00011 U	0.00013 U
Dichlorodifluoromethane	0.00027 U	--	0.00031 UJ	0.00028 UJ	0.00016 UJ	--	0.00023 UJ	0.00025 UJ	--	0.00027 UJ	0.00031 UJ	--	0.00024 U	0.00029 U
Ethylbenzene	0.00015 U	--	0.00017 U	0.00016 U	0.00015 J-	--	0.00013 U	0.00052 J	--	0.00015 U	0.00034 J	--	0.00014 U	0.00043 J
Isopropylbenzene (Cumene)	0.00014 U	--	0.00016 U	0.00015 U	0.000087 UJ	--	0.00012 U	0.00013 U	--	0.00014 U	0.00016 U	--	0.00013 U	0.00015 U
M,P-Xylene	0.00021 J	--	0.00011 U	0.000098 U	0.00065 J-	--	0.000079 U	0.0018	--	0.000093 U	0.0013	--	0.000083 U	0.00092

Table E-2
Summary of Data Used in Risk Assessment
Main Plant Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-040	CFMW-042	CFMW-042	CFMW-042-DUP	CFMW-042	CFMW-043	CFMW-043	CFMW-043	CFMW-044A	CFMW-044A	CFMW-044A	CFMW-045A	CFMW-045A	CFMW-045A
Sample Lab IDs	320-19945-6, 460-116283-3	460-115648-15	460-115648-16	460-115648-18	460-115648-17	460-115648-3	460-115648-4	460-115648-5	460-117381-5	460-117381-6	460-117381-7	460-118613-2	460-118613-3	460-118613-4
Sample Name	CFMW-040-SO-10-12	CFMW-042-SO-0-0.5	CFMW-042-SO-0.5-2	CFMW-DUP16-SO	CFMW-042-SO-10-12	CFMW-043-SO-0-0.5	CFMW-043-SO-0.5-2	CFMW-043-SO-10-12	CFMW-044a-SO-0-0.5	CFMW-044a-SO-0.5-2	CFMW-044a-SO-10-12	CFMW-045a-SO-0-0.5	CFMW-045a-SO-0.5-2	CFMW-045a-SO-10-12
Sample Depth	10-12 ft	0-0.5 ft	0.5-2 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft
Chemical	6/28/2016	6/16/2016	6/16/2016	6/16/2016	6/16/2016	6/15/2016	6/15/2016	6/15/2016	7/20/2016	7/20/2016	7/20/2016	8/12/2016	8/12/2016	8/12/2016
Methyl Acetate	0.00076 U	--	0.00087 U	0.0008 U	0.00046 U	--	0.00065 U	0.0007 U	--	0.00076 U	0.00087 U	--	0.0067	0.00081 U
Methyl Ethyl Ketone (2-Butanone)	0.002 J	--	0.00075 UJ	0.004 J	0.00039 U	--	0.00055 U	0.0006 U	--	0.00065 U	0.00074 U	--	0.0023 J	0.0029 J
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	0.0019 U	--	0.0022 U	0.002 U	0.0011 U	--	0.0016 U	0.0017 U	--	0.0019 U	0.0021 U	--	0.0017 U	0.002 U
Methylcyclohexane	0.00042 J	--	0.00077 J	0.00082 J	0.00077 J-	--	0.00036 U	0.0022	--	0.00042 U	0.0018	--	0.00038 U	0.0013
Methylene Chloride	0.00027 U	--	0.00031 U	0.00028 U	0.00016 U	--	0.00023 U	0.00025 U	--	0.00027 U	0.00031 U	--	0.00024 U	0.00029 U
O-Xylene (1,2-Dimethylbenzene)	0.00013 U	--	0.00016 U	0.00014 U	0.00017 J-	--	0.00011 U	0.00052 J	--	0.00014 U	0.00038 J	--	0.00012 U	0.00036 J
Styrene	0.00013 U	--	0.00015 U	0.00013 U	0.000077 UJ	--	0.00011 U	0.00012 U	--	0.00013 U	0.00014 U	--	0.00011 U	0.00013 U
Tert-Butyl Methyl Ether	0.00014 U	--	0.00016 U	0.00015 U	0.000087 U	--	0.00012 U	0.00013 U	--	0.00014 U	0.00016 U	--	0.00013 U	0.00015 U
Tetrachloroethylene (PCE)	0.00024 U	--	0.00027 U	0.00025 U	0.00014 UJ	--	0.0002 U	0.00022 U	--	0.00024 U	0.00027 U	--	0.00021 U	0.00025 U
Toluene	0.00061 J	--	0.00059 J	0.00065 J	0.00063	--	0.00014 U	0.0022	--	0.00016 U	0.0018	--	0.00014 U	0.0015
Trans-1,2-Dichloroethene	0.00033 U	--	0.00038 U	0.00035 U	0.0002 U	--	0.00028 U	0.0003 U	--	0.00033 U	0.00038 U	--	0.00029 U	0.00035 U
Trans-1,3-Dichloropropene	0.000084 U	--	0.000097 U	0.000089 U	0.000051 U	--	0.000072 U	0.000078 U	--	0.000085 U	0.000096 U	--	0.000075 U	0.00009 U
Trichloroethylene (TCE)	0.00022 U	--	0.00025 U	0.00023 U	0.00013 UJ	--	0.00019 U	0.0002 U	--	0.00022 U	0.00025 U	--	0.0002 U	0.00023 U
Trichlorofluoromethane	0.00029 U	--	0.00033 U	0.0003 U	0.00017 U	--	0.00024 U	0.00026 U	--	0.00029 U	0.00033 U	--	0.00026 U	0.0003 U
Vinyl Chloride	0.00033 UJ	--	0.00038 U	0.00035 U	0.0002 U	--	0.00028 U	0.0003 U	--	0.00033 U	0.00038 U	--	0.00029 U	0.00035 U

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-2
Summary of Data Used in Risk Assessment
Main Plant Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-047	CFMW-047	CFMW-047	CFMW-049	CFMW-049A	CFMW-049A	CFMW-050	CFMW-050	CFMW-050-DUP	CFMW-050	CFMW-053A	CFMW-053A	CFMW-053A-DUP	CFMW-053A
Sample Lab IDs	460-115886-20	460-115886-21	460-115886-22	460-119134-1	460-119134-2	460-119134-3	460-116014-7	460-116014-8	460-116014-10	460-116014-9	460-118952-2	460-118952-4	460-118952-6	460-118952-5
Sample Name	CFMW-047-SO-0-0.5	CFMW-047-SO-0.5-2	CFMW-047-SO-10-12	CFMW-049-SO-0-0.5	CFMW-049a-SO-0.5-2	CFMW-049a-SO-10-12	CFMW-050-SO-0-0.5	CFMW-050-SO-0.5-2	CFMW-DUP17-SO	CFMW-050-SO-10-12	CFMW-053a-SO-0-0.5	CFMW-053a-SO-0.5-2	CFMW-DUP22-SO	CFMW-053a-SO-10-12
Sample Depth	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	0.5-2 ft	10-12 ft
Chemical	6/21/2016	6/21/2016	6/21/2016	8/20/2016	8/20/2016	8/20/2016	6/22/2016	6/22/2016	6/22/2016	6/22/2016	8/17/2016	8/17/2016	8/17/2016	8/17/2016
GENERAL CHEMISTRY (mg/kg)														
Fluoride	22.2 J	36.2 J	3.73 J	11.4 J+	10.9 J+	2.91 J+	21.2 J+	26 J+	33 J+	2.7 J+	8.82	8.47 J	3.85 J	3.87
Cyanide	0.037 J	0.061 J	0.023 J	0.066 J	0.056 J	0.028 U	0.8	0.11	0.099 J	0.017 U	0.19	0.038 J	0.04 J	0.033 J
METALS (mg/kg)														
"Chromium, Hexavalent - Estimated"	0.275669	0.262287	0.2382	0.1713	0.211436	0.254258	0.331873	0.264964	0.29708	0.286375	0.2382	0.259611	0.289051	0.329197
"Chromium, Trivalent - Calculated"	--	--	--	--	--	--	--	--	--	--	--	--	--	--
"Chromium, Trivalent - Estimated"	10.0243	9.53771	8.6618	6.2287	7.68856	9.24574	12.0681	9.63504	10.8029	10.4136	8.6618	9.44039	10.5109	11.9708
Aluminum	14100	13600	7150	6580	6780	8490	19500	17100	18700	9180	14500	13100	11900	8720
Antimony	0.41 UJ	0.46 UJ	0.41 UJ	0.28 UJ	0.26 UJ	0.26 UJ	0.52 U	0.44 U	0.45 U	0.44 U	0.47 U	0.42 U	0.43 U	0.36 UJ
Arsenic	4.7	6.8 J	3.3	4.1 J	2.2 J	3.9 J	5.9	7.2	7.2	4.5	5.5	4.4	4.6	3.1
Barium	108 J	148	67.7 J	70.9 J	53.3 J	66 J	239	201	220	84.6	259	168	213	110
Beryllium	0.42	0.47	0.28 J	0.26 J	0.18 J	0.25 J	0.69	0.64	0.66	0.42 J	0.54	0.52	0.48	0.37
Cadmium	0.31 U	0.35 U	0.31 U	0.3 U	0.28 U	0.28 U	0.39 U	0.34 U	0.34 U	0.33 U	0.35 U	0.32 U	0.33 U	0.27 U
Calcium	23800 J	17700 J	32100 J	6920 J	13200 J	17800 J	4040	2930	3100	36100	4510 J	16500 J	42200 J	55900
Chromium, Total	10.3 J	9.8	8.9 J	6.4	7.9	9.5	12.4	9.9	11.1	10.7	8.9	9.7	10.8	12.3
Cobalt	5.4	5.3	4.5	3.3	3.9	6	6.3	5.8	6.4	6.2	6.7	5.3	5.4	4.9
Copper	19.9	16	9.8	13.2 J	7 J	14.3 J	17.5 J	14.5 J	15.5 J	32.6 J	14.9	14.2	14.4	16.6 J-
Iron	14700	14200	10800	8070	7940	13300	15800	16100	17100	15700	16400	14400	15000	14400
Lead	11.6 J	9.6	6.6 J	5.8 J	4.4 J	6.2 J	31.7	16.4	17.6	8.6	12.2 J+	10.2 J+	10.3 J+	6.6
Magnesium	9580	9630	9830	5960	8210	11100	6760	8440	8230	12200	7140 J	8490 J	12400 J	15900
Manganese	385	481	372	332	161 J	337	739	580	584	448	1270	458	552	376
Mercury	0.023	0.026	0.017	0.021	0.022	0.018	0.031	0.029	0.018	0.017	0.019	0.023	0.029	0.022
Nickel	16.4	11.1	9.1	7.6	9.1	12.1	26.3	10.8	12.1	11.4	13.9	10.4	10.7	11.3
Potassium	864	935	802	408 J+	386 J+	702 J+	1510	1180	1260	651	929	746	796	1070 J+
Selenium	0.39 U	0.43 U	0.39 U	0.26 U	0.25 U	0.24 U	0.48 U	0.41 U	0.42 U	0.41 U	0.44 U	0.39 U	0.4 U	0.33 U
Silver	0.75 U	0.84 U	0.76 U	0.55 U	0.52 U	0.51 U	0.95 U	0.81 U	0.82 U	0.8 U	0.85 U	0.77 U	0.79 U	0.65 U
Sodium	42.7 J	42.8 U	38.6 U	38 U	35.8 U	35.4 J	48.3 U	41.3 U	42.1 U	41 U	214	44.7 J	54.2 J	59.7 J
Thallium	0.16 U	0.17 U	0.16 U	0.11 U	0.1 U	0.1 U	0.19 U	0.17 U	0.17 U	0.17 U	0.18 U	0.16 U	0.16 U	0.13 J
Vanadium	11.4	11	5.6	6.1	5.7	6.9	19.2 J	13.5 J	19.6 J	10.3 J	15	12.2	11.6	7.9
Zinc	64.3	45.3	30.3	26.3	26.3	38.1	76.7	49.4	53.7	39.5	49.5	45.3	43.1	31.5
METALS|HEXAVALENT CHROMIUM (mg/kg)														
Chromium, Hexavalent	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PESTICIDES (mg/kg)														
Aldrin	0.00088 U	--	--	0.0009 U	--	--	0.0011 U	--	--	--	0.00094 U	--	--	--
Alpha Bhc (Alpha Hexachlorocyclohexane)	0.00066 U	--	--	0.0007 U	--	--	0.0008 U	--	--	--	0.0007 U	--	--	--
Alpha Endosulfan	0.001 U	--	--	0.001 U	--	--	0.0012 U	--	--	--	0.0011 U	--	--	--
Beta Bhc (Beta Hexachlorocyclohexane)	0.0007 U	--	--	0.0007 U	--	--	0.00085 U	--	--	--	0.00075 U	--	--	--
Beta Endosulfan	0.0011 U	--	--	0.0012 U	--	--	0.0014 U	--	--	--	0.0012 U	--	--	--
cis-Chlordane	0.0012 U	--	--	0.0012 U	--	--	0.0014 U	--	--	--	0.0013 U	--	--	--
Delta BHC (Delta Hexachlorocyclohexane)	0.00079 U	--	--	0.0008 U	--	--	0.00095 U	--	--	--	0.00084 U	--	--	--
Dieldrin	0.00094 U	--	--	0.001 U	--	--	0.0011 U	--	--	--	0.001 U	--	--	--
Endosulfan Sulfate	0.00084 U	--	--	0.0009 U	--	--	0.001 U	--	--	--	0.0009 U	--	--	--
Endrin	0.00092 U	--	--	0.001 U	--	--	0.0011 U	--	--	--	0.00098 U	--	--	--
Endrin Aldehyde	0.0009 U	--	--	0.0009 U	--	--	0.0011 U	--	--	--	0.00096 U	--	--	--
Endrin Ketone	0.001 U	--	--	0.001 U	--	--	0.0012 U	--	--	--	0.0011 U	--	--	--
Gamma Bhc (Lindane)	0.00065 U	--	--	0.0007 U	--	--	0.00078 U	--	--	--	0.00069 U	--	--	--
Heptachlor	0.00093 U	--	--	0.001 U	--	--	0.0011 U	--	--	--	0.00099 U	--	--	--
Heptachlor Epoxide	0.0014 U	--	--	0.0015 U	--	--	0.0017 U	--	--	--	0.0015 U	--	--	--
Methoxychlor	0.0015 U	--	--	0.0016 U	--	--	0.0019 U	--	--	--	0.0016 U	--	--	--
P,P'-DDD	0.00095 U	--	--	0.001 U	--	--	0.0012 U	--	--	--	0.001 U	--	--	--
P,P'-DDE	0.001 U	--	--	0.0011 U	--	--	0.0013 U	--	--	--	0.0011 U	--	--	--
P,P'-DDT	0.00075 U	--	--	0.0008 U	--	--	0.0009 U	--	--	--	0.0008 U	--	--	--
Toxaphene	0.021 U	--	--	0.022 U	--	--	0.025 U	--	--	--	0.023 U	--	--	--
trans-Chlordane	0.0016 U	--	--	0.0016 U	--	--	0.0019 U	--	--	--	0.0017 U	--	--	--
POLYCHLORINATED BIPHENYLS (mg/kg)														
PCB-1016 (Aroclor 1016)	0.0096 U	0.01 U	0.0094 U	0.01 U	0.0094 U	0.0091 U	0.012 U	0.0099 U	0.0098 U	0.0095 U	0.01 U	0.0094 U	0.0093 U	0.0091 U
PCB-1221 (Aroclor 1221)	0.0096 U	0.01 U	0.0094 U	0.01 U	0.0094 U	0.0091 U	0.012 U	0.0099 U	0.0098 U	0.0095 U	0.01 U	0.0094 U	0.0093 U	0.0091 U

Table E-2
Summary of Data Used in Risk Assessment
Main Plant Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-047	CFMW-047	CFMW-047	CFMW-049	CFMW-049A	CFMW-049A	CFMW-050	CFMW-050	CFMW-050-DUP	CFMW-050	CFMW-053A	CFMW-053A	CFMW-053A-DUP	CFMW-053A
Sample Lab IDs	460-115886-20	460-115886-21	460-115886-22	460-119134-1	460-119134-2	460-119134-3	460-116014-7	460-116014-8	460-116014-10	460-116014-9	460-118952-2	460-118952-4	460-118952-6	460-118952-5
Sample Name	CFMW-047-SO-0-0.5	CFMW-047-SO-0.5-2	CFMW-047-SO-10-12	CFMW-049-SO-0-0.5	CFMW-049a-SO-0.5-2	CFMW-049a-SO-10-12	CFMW-050-SO-0-0.5	CFMW-050-SO-0.5-2	CFMW-DUP17-SO	CFMW-050-SO-10-12	CFMW-053a-SO-0-0.5	CFMW-053a-SO-0.5-2	CFMW-DUP22-SO	CFMW-053a-SO-10-12
Sample Depth	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	0.5-2 ft	10-12 ft
Chemical	6/21/2016	6/21/2016	6/21/2016	8/20/2016	8/20/2016	8/20/2016	6/22/2016	6/22/2016	6/22/2016	6/22/2016	8/17/2016	8/17/2016	8/17/2016	8/17/2016
PCB-1232 (Aroclor 1232)	0.0096 U	0.01 U	0.0094 U	0.01 U	0.0094 U	0.0091 U	0.012 U	0.0099 U	0.0098 U	0.0095 U	0.01 U	0.0094 U	0.0093 U	0.0091 U
PCB-1242 (Aroclor 1242)	0.0096 U	0.01 U	0.0094 U	0.01 U	0.0094 U	0.0091 U	0.012 U	0.0099 U	0.0098 U	0.0095 U	0.01 U	0.0094 U	0.0093 U	0.0091 U
PCB-1248 (Aroclor 1248)	0.0096 U	0.01 U	0.0094 U	0.01 U	0.0094 U	0.0091 U	0.012 U	0.0099 U	0.0098 U	0.0095 U	0.01 U	0.0094 U	0.0093 U	0.0091 U
PCB-1254 (Aroclor 1254)	0.0099 U	0.011 U	0.0097 U	0.01 U	0.0098 U	0.0094 U	0.012 U	0.01 U	0.01 U	0.0098 U	0.011 U	0.0097 U	0.0096 U	0.0094 U
PCB-1260 (Aroclor 1260)	0.0099 U	0.011 U	0.0097 U	0.01 U	0.0098 U	0.0094 U	0.012 U	0.01 U	0.01 U	0.0098 U	0.011 U	0.0097 U	0.0096 U	0.0094 U
PCB-1262 (Aroclor 1262)	0.0099 U	0.011 U	0.0097 U	0.01 U	0.0098 U	0.0094 U	0.012 U	0.01 U	0.01 U	0.0098 U	0.011 U	0.0097 U	0.0096 U	0.0094 U
PCB-1268 (Aroclor 1268)	0.0099 U	0.011 U	0.0097 U	0.01 U	0.0098 U	0.0094 U	0.012 U	0.01 U	0.01 U	0.0098 U	0.011 U	0.0097 U	0.0096 U	0.0094 U
Polychlorinated Biphenyl (PCBs)	0.0099 U	0.011 U	0.0097 U	0.01 U	0.0098 U	0.0094 U	0.012 U	0.01 U	0.01 U	0.0098 U	0.011 U	0.0097 U	0.0096 U	0.0094 U
SEMIVOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,2,4,5-Tetrachlorobenzene	0.027 U	0.028 U	0.026 U	0.028 U	0.026 U	0.025 U	0.032 U	0.027 U	0.027 U	0.026 U	0.028 U	0.026 U	0.026 U	0.025 U
1,4-Dioxane (P-Dioxane)	0.095 U	0.1 U	0.093 U	0.1 U	0.094 U	0.09 U	0.12 U	0.099 U	0.097 U	0.094 U	0.1 U	0.093 U	0.092 U	0.09 U
2,3,4,6-Tetrachlorophenol	0.034 U	0.036 U	0.033 U	0.035 U	0.033 U	0.032 UJ	0.041 U	0.035 U	0.034 U	0.033 U	0.036 U	0.033 U	0.033 U	0.032 UJ
2,4,5-Trichlorophenol	0.036 U	0.038 U	0.035 U	0.037 U	0.035 U	0.034 U	0.043 U	0.037 U	0.036 U	0.035 U	0.038 U	0.035 U	0.034 U	0.033 U
2,4,6-Trichlorophenol	0.01 U	0.011 U	0.0099 U	0.011 U	0.01 U	0.0096 U	0.012 U	0.01 U	0.01 U	0.01 U	0.011 U	0.0099 U	0.0098 U	0.0096 U
2,4-Dichlorophenol	0.0084 U	0.0089 U	0.0082 U	0.0088 U	0.0083 U	0.008 U	0.01 U	0.0087 U	0.0085 U	0.0083 U	0.009 U	0.0082 U	0.0082 U	0.0079 U
2,4-Dimethylphenol	0.078 U	0.083 U	0.077 U	0.082 U	0.077 U	0.074 U	0.095 U	0.081 U	0.08 U	0.078 U	0.084 U	0.077 U	0.076 U	0.074 U
2,4-Dinitrophenol	0.27 U	0.29 U	0.26 U	0.28 U	0.26 U	0.26 UJ	0.33 U	0.28 U	0.27 U	0.27 UJ	0.29 U	0.26 U	0.26 U	0.25 UR
2,4-Dinitrotoluene	0.014 U	0.015 U	0.014 U	0.015 U	0.014 U	0.013 U	0.017 U	0.015 U	0.014 U	0.014 U	0.015 U	0.014 U	0.014 U	0.013 U
2,6-Dinitrotoluene	0.019 U	0.02 U	0.019 U	0.02 U	0.019 U	0.018 U	0.023 U	0.02 U	0.019 U	0.019 U	0.02 U	0.019 U	0.018 U	0.018 U
2-Chloronaphthalene	0.0081 U	0.0086 U	0.0079 U	0.0085 U	0.0079 U	0.0077 U	0.0098 U	0.0084 U	0.0082 U	0.008 U	0.0086 U	0.0079 U	0.0078 U	0.0076 U
2-Chlorophenol	0.0091 U	0.0096 U	0.0089 U	0.0095 U	0.0089 U	0.0086 U	0.011 U	0.0094 U	0.0092 U	0.009 U	0.0097 U	0.0088 U	0.0088 U	0.0086 U
2-Methylnaphthalene	0.0079 U	0.0084 U	0.0077 U	0.0083 U	0.0077 U	0.0075 U	0.01 J	0.0081 U	0.008 U	0.0078 U	0.0084 U	0.0077 U	0.0076 U	0.0074 U
2-Methylphenol (O-Cresol)	0.016 U	0.017 U	0.015 U	0.016 U	0.015 U	0.015 U	0.019 U	0.016 U	0.016 U	0.015 U	0.017 U	0.015 U	0.015 U	0.015 U
2-Nitroaniline	0.012 U	0.013 U	0.011 U	0.012 U	0.012 U	0.011 U	0.014 U	0.012 U	0.012 U	0.012 U	0.013 U	0.011 U	0.011 U	0.011 U
2-Nitrophenol	0.012 U	0.013 U	0.012 U	0.013 U	0.012 U	0.011 U	0.014 U	0.012 U	0.012 U	0.012 U	0.013 U	0.012 U	0.012 U	0.011 U
3- And 4- Methylphenol (Total)	0.0095 U	0.01 U	0.0093 U	0.0099 U	0.0093 U	0.009 U	0.036 J	0.0098 U	0.0096 U	0.0094 U	0.01 U	0.0093 U	0.0092 U	0.009 U
3,3'-Dichlorobenzidine	0.04 U	0.042 U	0.039 U	0.042 U	0.039 U	0.038 U	0.048 U	0.041 U	0.04 U	0.039 U	0.043 U	0.039 U	0.039 U	0.038 U
3-Nitroaniline	0.011 U	0.011 U	0.01 U	0.011 U	0.01 U	0.01 U	0.013 U	0.011 U	0.011 U	0.01 U	0.011 U	0.01 U	0.01 U	0.01 U
4,6-Dinitro-2-Methylphenol	0.095 U	0.1 U	0.093 U	0.1 U	0.093 U	0.09 UJ	0.12 U	0.098 U	0.097 U	0.094 UJ	0.1 U	0.093 U	0.092 U	0.09 UJ
4-Bromophenyl Phenyl Ether	0.011 U	0.012 U	0.011 U	0.012 U	0.011 U	0.011 U	0.014 U	0.012 U	0.011 U	0.011 U	0.012 U	0.011 U	0.011 U	0.011 U
4-Chloro-3-Methylphenol	0.015 U	0.016 U	0.015 U	0.016 U	0.015 U	0.015 U	0.019 U	0.016 U	0.016 U	0.015 U	0.016 U	0.015 U	0.015 U	0.014 U
4-Chloroaniline	0.0092 U	0.0098 U	0.009 U	0.0096 U	0.009 U	0.0087 U	0.011 U	0.0095 U	0.0093 U	0.0091 U	0.0098 U	0.0089 U	0.0089 U	0.0087 U
4-Chlorophenyl Phenyl Ether	0.011 U	0.011 U	0.01 U	0.011 U	0.01 U	0.01 U	0.013 U	0.011 U	0.011 U	0.011 U	0.011 U	0.01 U	0.01 U	0.01 U
4-Nitroaniline	0.013 U	0.014 U	0.013 U	0.014 U	0.013 U	0.013 U	0.016 U	0.014 U	0.014 U	0.013 U	0.014 U	0.013 U	0.013 U	0.013 U
4-Nitrophenol	0.17 U	0.18 U	0.17 U	0.18 U	0.17 U	0.16 U	0.21 U	0.18 U	0.17 U	0.17 U	0.18 U	0.17 U	0.17 U	0.16 U
Acenaphthene	0.011 J	0.0092 U	0.0084 U	0.009 U	0.0085 U	0.0082 U	0.014 J	0.0089 U	0.0088 U	0.0085 U	0.015 J	0.0084 UJ	0.0084 UJ	0.0081 U
Acenaphthylene	0.0092 U	0.0098 U	0.009 U	0.0096 U	0.009 U	0.0087 U	0.011 U	0.0095 U	0.0093 U	0.0091 U	0.0098 U	0.0089 U	0.0089 U	0.0087 U
Acetophenone	0.0078 U	0.0083 U	0.0076 U	0.0081 U	0.0076 U	0.0074 U	0.0094 U	0.008 U	0.0079 U	0.0077 U	0.0083 U	0.0076 U	0.0075 U	0.0073 U
Anthracene	0.034 U	0.036 U	0.033 U	0.035 U	0.033 U	0.032 U	0.041 U	0.035 U	0.034 U	0.033 U	0.036 U	0.033 U	0.033 U	0.032 U
Atrazine	0.016 U	0.017 U	0.015 U	0.017 U	0.016 U	0.015 U	0.019 U	0.016 U	0.016 U	0.016 U	0.017 U	0.015 U	0.015 U	0.015 U
Benzaldehyde	0.027 U	0.029 U	0.027 U	0.028 U	0.027 U	0.026 U	0.033 U	0.028 U	0.028 U	0.027 U	0.037 J	0.027 U	0.026 U	0.026 U
Benzo(A)Anthracene	0.18	0.032 U	0.029 U	0.031 U	0.029 U	0.028 U	0.23	0.048	0.035 J	0.029 U	0.21	0.029 U	0.029 U	0.028 U
Benzo(A)Pyrene	0.23	0.03 J	0.011 U	0.11	0.011 U	0.01 U	0.32	0.051	0.037	0.011 U	0.24	0.015 J	0.01 U	0.01 U
Benzo(B)Fluoranthene	0.33	0.054	0.014 U	0.21	0.014 U	0.013 U	0.75	0.11	0.081	0.014 U	0.49	0.026 J	0.013 UJ	0.013 U
Benzo(G,H,I)Perylene	0.34 J	0.048 J	0.02 U	0.18 J	0.02 U	0.019 U	0.4 J	0.041 J	0.03 J	0.02 U	0.3 J	0.02 U	0.02 U	0.019 U
Benzo(K)Fluoranthene	0.12	0.017 U	0.015 U	0.071	0.015 U	0.015 UJ	0.22	0.033 J	0.024 J	0.015 U	0.15	0.015 U	0.015 U	0.015 U
Benzyl Butyl Phthalate	0.011 U	0.012 U	0.011 U	0.012 U	0.011 U	0.01 U	0.013 U	0.011 U	0.011 U	0.011 U	0.012 U	0.011 U	0.011 U	0.01 U
Biphenyl (Diphenyl)	0.03 U	0.032 U	0.03 U	0.032 U	0.03 U	0.029 U	0.037 U	0.031 U	0.031 U	0.03 U	0.033 U	0.03 U	0.029 U	0.029 U
Bis(2-Chloroethoxy) Methane	0.011 U	0.012 U	0.011 U	0.012 U	0.011 U	0.011 U	0.013 U	0.011 U	0.011 U	0.011 U	0.012 U	0.011 U	0.011 U	0.01 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.0084 U	0.0089 U	0.0082 U	0.0088 U	0.0083 U	0.008 U	0.01 U	0.0087 U	0.0085 U	0.0083 U	0.009 U	0.0082 U	0.0082 U	0.0079 U
Bis(2-Chloroisopropyl) Ether	0.015 U	0.016 U	0.014 U	0.015 U	0.014 U	0.014 U	0.018 U	0.015 U	0.015 U	0.015 U	0.016 U	0.014 U	0.014 U	0.014 U
Bis(2-Ethylhexyl) Phthalate	0.33 J	0.015 U	0.014 U	0.015 U	0.014 U	0.013 U	5.8	0.14 J	0.014 U	0.014 U	0.055 J	0.035 J	0.013 UJ	0.02 J
Caprolactam	0.026 U	0.027 U	0.025 U	0.027 U	0.025 U	0.024 U	0.031 U	0.027 U	0.026 U	0.025 UJ	0.027 U	0.025 U	0.025 U	0.024 U
Carbazole	0.023 J	0.0094 U	0.0086 U	0.0093 U	0.0087 U	0.0084 U	0.036 J	0.0092 U	0.009 U	0.0087 U	0.038 J	0.0086 U	0.0086 U	0.0083 U
Chrysene	0.27 J	0.035 J	0.0095 U	0.18 J	0.0095 U	0.0092 U	0.45	0.069 J	0.059 J	0.0096 U	0.34 J	0.018 J	0.0094 UJ	0.0092 U
Dibenz(A,H)Anthracene	0.079	0.02 U	0.018 U	0.019 U	0.018 U	0.018 U	0.088	0.019 U	0.019 U	0.018 U	0.048	0.018 U	0.018 U	0.018 U
Dibenzofuran	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.01 U	0.013 U	0.011 U	0.011 U	0.011 U	0.012 U	0.011 U	0.01 U	0.01 U

Table E-2
Summary of Data Used in Risk Assessment
Main Plant Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-047	CFMW-047	CFMW-047	CFMW-049	CFMW-049A	CFMW-049A	CFMW-050	CFMW-050	CFMW-050-DUP	CFMW-050	CFMW-053A	CFMW-053A	CFMW-053A-DUP	CFMW-053A
Sample Lab IDs	460-115886-20	460-115886-21	460-115886-22	460-119134-1	460-119134-2	460-119134-3	460-116014-7	460-116014-8	460-116014-10	460-116014-9	460-118952-2	460-118952-4	460-118952-6	460-118952-5
Sample Name	CFMW-047-SO-0-0.5	CFMW-047-SO-0.5-2	CFMW-047-SO-10-12	CFMW-049-SO-0-0.5	CFMW-049a-SO-0.5-2	CFMW-049a-SO-10-12	CFMW-050-SO-0-0.5	CFMW-050-SO-0.5-2	CFMW-DUP17-SO	CFMW-050-SO-10-12	CFMW-053a-SO-0-0.5	CFMW-053a-SO-0.5-2	CFMW-DUP22-SO	CFMW-053a-SO-10-12
Sample Depth	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	0.5-2 ft	10-12 ft
Chemical	6/21/2016	6/21/2016	6/21/2016	8/20/2016	8/20/2016	8/20/2016	6/22/2016	6/22/2016	6/22/2016	6/22/2016	8/17/2016	8/17/2016	8/17/2016	8/17/2016
Diethyl Phthalate	0.01 U	0.011 U	0.0099 U	0.011 U	0.01 U	0.0096 U	0.012 U	0.01 U	0.01 U	0.01 U	0.011 U	0.0099 U	0.0098 U	0.0096 U
Dimethyl Phthalate	0.01 U	0.011 U	0.01 U	0.011 U	0.01 U	0.0098 U	0.013 U	0.011 U	0.011 U	0.01 U	0.011 U	0.01 U	0.01 U	0.0098 U
Di-N-Butyl Phthalate	0.044 J	0.011 U	0.034 J	0.011 U	0.01 U	0.01 U	0.013 U	0.02 J	0.037 J	0.011 U	0.021 J	0.027 J	0.01 UJ	0.015 J
Di-N-Octylphthalate	0.018 U	0.019 U	0.018 U	0.019 U	0.018 U	0.017 U	0.022 U	0.019 U	0.018 U	0.018 U	0.019 U	0.018 U	0.018 U	0.017 U
Fluoranthene	0.27 J	0.039 J	0.01 U	0.086 J	0.01 U	0.01 UJ	0.45	0.076 J	0.07 J	0.01 U	0.37 J	0.025 J	0.01 J	0.01 U
Fluorene	0.0078 U	0.0083 U	0.0076 U	0.0081 U	0.0076 U	0.0074 U	0.0094 U	0.008 U	0.0079 U	0.0077 U	0.012 J	0.0076 U	0.0075 U	0.0073 U
Hexachlorobenzene	0.014 U	0.015 U	0.014 U	0.015 U	0.014 U	0.014 U	0.017 U	0.015 U	0.015 U	0.014 U	0.015 U	0.014 U	0.014 U	0.014 U
Hexachlorobutadiene	0.01 U	0.011 U	0.0098 U	0.011 U	0.0099 U	0.0095 U	0.012 U	0.01 U	0.01 U	0.0099 U	0.011 U	0.0098 U	0.0097 U	0.0095 U
Hexachlorocyclopentadiene	0.022 U	0.024 U	0.022 U	0.023 U	0.022 U	0.021 UJ	0.027 U	0.023 U	0.023 U	0.022 U	0.024 U	0.022 U	0.022 U	0.021 U
Hexachloroethane	0.013 U	0.014 U	0.013 U	0.014 U	0.013 U	0.012 U	0.016 U	0.014 U	0.013 U	0.013 U	0.014 U	0.013 U	0.013 U	0.012 U
Indeno(1,2,3-C,D)Pyrene	0.32	0.026 J	0.023 U	0.15	0.023 U	0.022 U	0.42	0.049	0.033 J	0.023 U	0.29	0.023 U	0.023 U	0.022 U
Isophorone	0.0077 U	0.0081 U	0.0075 U	0.008 U	0.0075 U	0.0073 U	0.046 J	0.0079 U	0.0078 U	0.0076 U	0.0082 U	0.0075 U	0.0074 U	0.0072 U
Naphthalene	0.0091 U	0.0096 U	0.0089 U	0.0095 U	0.0089 U	0.0086 U	0.02 J	0.0094 U	0.0092 U	0.009 U	0.015 J	0.0088 U	0.0088 U	0.0086 U
Nitrobenzene	0.011 U	0.012 U	0.011 U	0.012 U	0.011 U	0.011 U	0.014 U	0.012 U	0.011 U	0.011 U	0.012 U	0.011 U	0.011 U	0.011 U
N-Nitrosodi-N-Propylamine	0.012 U	0.013 U	0.012 U	0.013 U	0.012 U	0.011 U	0.014 U	0.012 U	0.012 U	0.012 U	0.013 U	0.012 U	0.012 U	0.011 U
N-Nitrosodiphenylamine	0.032 U	0.034 U	0.032 U	0.034 U	0.032 U	0.031 U	0.039 U	0.033 U	0.033 U	0.032 UJ	0.035 U	0.032 U	0.031 U	0.031 U
Pentachlorophenol	0.043 U	0.046 U	0.042 U	0.045 U	0.042 U	0.041 UJ	0.052 U	0.045 U	0.044 U	0.043 UJ	0.046 U	0.042 U	0.042 U	0.041 UJ
Phenanthrene	0.13 J	0.026 J	0.0093 U	0.047 J	0.0093 U	0.009 U	0.2 J	0.046 J	0.04 J	0.0094 U	0.19 J	0.019 J	0.0092 UJ	0.009 U
Phenol	0.012 U	0.012 U	0.011 U	0.012 U	0.011 U	0.011 U	0.014 U	0.012 U	0.012 U	0.012 U	0.012 U	0.011 U	0.011 U	0.011 U
Pyrene	0.3 J	0.043 J	0.016 U	0.11 J	0.016 U	0.015 U	0.43	0.073 J	0.061 J	0.016 U	0.36 J	0.024 J	0.016 U	0.015 U
VOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,1,1-Trichloroethane	--	0.00034 U	0.00031 U	--	0.0003 U	0.00037 U	--	0.00051 U	0.00033 U	0.00033 U	--	0.00045 U	0.00037 U	0.00035 UJ
1,1,2,2-Tetrachloroethane	--	0.00015 U	0.00014 U	--	0.00014 U	0.00016 U	--	0.00023 U	0.00015 U	0.00015 U	--	0.0002 U	0.00017 U	0.00016 UJ
1,1,2-Trichloro-1,2,2-Trifluoroethane	--	0.00039 U	0.00036 U	--	0.00035 U	0.00043 U	--	0.0006 U	0.00038 U	0.00038 U	--	0.00052 U	0.00043 U	0.00041 UJ
1,1,2-Trichloroethane	--	0.00025 U	0.00023 U	--	0.00022 U	0.00027 U	--	0.00038 U	0.00024 U	0.00024 U	--	0.00033 U	0.00028 U	0.00026 UJ
1,1-Dichloroethane	--	0.0003 U	0.00028 U	--	0.00027 U	0.00033 U	--	0.00046 U	0.0003 U	0.00029 U	--	0.0004 U	0.00033 U	0.00031 UJ
1,1-Dichloroethene	--	0.00037 U	0.00033 U	--	0.00033 U	0.0004 U	--	0.00056 U	0.00036 U	0.00035 U	--	0.00048 U	0.0004 U	0.00038 UJ
1,2,3-Trichlorobenzene	--	0.000098 U	0.000089 U	--	0.000088 U	0.00011 UJ	--	0.00015 U	0.000095 U	0.000094 U	--	0.00013 U	0.00011 U	0.0001 UJ
1,2,4-Trichlorobenzene	--	0.00029 U	0.00026 U	--	0.00026 U	0.00031 UJ	--	0.00043 U	0.00028 U	0.00027 U	--	0.00038 U	0.00031 U	0.00029 UJ
1,2-Dibromo-3-Chloropropane	--	0.00042 U	0.00038 U	--	0.00038 U	0.00045 U	--	0.00064 U	0.00041 U	0.0004 U	--	0.00055 U	0.00046 U	0.00043 U
1,2-Dibromoethane (Ethylene Dibromide)	--	0.00011 U	0.000098 U	--	0.000096 U	0.00012 U	--	0.00016 U	0.0001 U	0.0001 U	--	0.00014 U	0.00012 U	0.00011 UJ
1,2-Dichlorobenzene	--	0.00012 U	0.00011 U	--	0.00011 U	0.00014 UJ	--	0.00019 U	0.00012 U	0.00012 U	--	0.00017 U	0.00014 U	0.00013 UJ
1,2-Dichloroethane	--	0.000098 U	0.000089 U	--	0.000088 U	0.00011 U	--	0.00015 U	0.000095 U	0.000094 U	--	0.00013 U	0.00011 U	0.0001 U
1,2-Dichloropropane	--	0.00015 U	0.00014 U	--	0.00014 U	0.00016 U	--	0.00023 U	0.00015 U	0.00015 U	--	0.0002 U	0.00017 U	0.00016 UJ
1,3-Dichlorobenzene	--	0.00011 U	0.000098 U	--	0.000096 U	0.00012 U	--	0.00016 U	0.0001 U	0.0001 U	--	0.00014 U	0.00012 U	0.00011 UJ
1,4-Dichlorobenzene	--	0.00012 U	0.00011 U	--	0.0001 U	0.00013 U	--	0.00018 U	0.00011 U	0.00011 U	--	0.00015 UJ	0.00013 UJ	0.00012 UJ
2-Hexanone	--	0.00084 U	0.00076 U	--	0.00075 U	0.00091 U	--	0.0013 U	0.00082 U	0.00081 U	--	0.0011 U	0.00093 U	0.00087 UJ
Acetone	--	0.11 J+	0.013 J+	--	0.014	0.001 U	--	0.072 J+	0.06 J+	0.016 J+	--	0.036	0.042	0.012 J
Benzene	--	0.0009	0.00056 J	--	0.0013 J	0.00019 U	--	0.0009 J	0.00037 J	0.00065 J	--	0.00052 J	0.00064 J	0.00062 J
Bromochloromethane	--	0.00015 U	0.00014 U	--	0.00014 U	0.00016 U	--	0.00023 U	0.00015 U	0.00015 U	--	0.0002 U	0.00017 U	0.00016 UJ
Bromodichloromethane	--	0.00034 U	0.00031 U	--	0.0003 U	0.00037 U	--	0.00051 U	0.00033 U	0.00033 U	--	0.00045 U	0.00037 U	0.00035 UJ
Bromoform	--	0.00012 U	0.00011 U	--	0.0001 U	0.00013 U	--	0.00018 U	0.00011 U	0.00011 U	--	0.00015 U	0.00013 U	0.00012 U
Bromomethane	--	0.00029 U	0.00026 UJ	--	0.00026 U	0.00031 U	--	0.00043 U	0.00028 U	0.00027 U	--	0.00038 U	0.00031 U	0.00029 U
Carbon Disulfide	--	0.0006 J	0.00095	--	0.00045 J	0.00042 U	--	0.00058 U	0.00037 U	0.00037 U	--	0.00051 UJ	0.0011 J	0.0004 UJ
Carbon Tetrachloride	--	0.00038 U	0.00035 U	--	0.00034 U	0.00042 U	--	0.00058 U	0.00037 U	0.00037 U	--	0.00051 U	0.00042 U	0.0004 U
Chlorobenzene	--	0.00012 U	0.00011 U	--	0.00011 U	0.00014 U	--	0.00019 U	0.00012 U	0.00012 U	--	0.00017 U	0.00014 U	0.00013 UJ
Chloroethane	--	0.00031 U	0.00028 U	--	0.00028 U	0.00034 U	--	0.00047 U	0.0003 U	0.0003 U	--	0.00041 U	0.00034 U	0.00032 U
Chloroform	--	0.00019 U	0.00017 U	--	0.00017 U	0.0002 U	--	0.00028 U	0.00018 U	0.00018 U	--	0.00025 U	0.00021 U	0.00019 UJ
Chloromethane	--	0.00034 U	0.00031 U	--	0.0003 U	0.00037 U	--	0.00051 U	0.00033 U	0.00033 U	--	0.00045 U	0.00037 U	0.00035 U
Cis-1,2-Dichloroethylene	--	0.0002 U	0.00018 U	--	0.00018 U	0.00021 U	--	0.0003 U	0.00019 U	0.00019 U	--	0.00026 U	0.00022 U	0.0002 UJ
Cis-1,3-Dichloropropene	--	0.00013 U	0.00012 U	--	0.00012 U	0.00015 U	--	0.0002 U	0.00013 U	0.00013 U	--	0.00018 U	0.00015 U	0.00014 UJ
Cyclohexane	--	0.00041 U	0.00037 U	--	0.0055 J	0.00045 U	--	0.00062 U	0.0004 U	0.00082 J	--	0.00054 U	0.00045 U	0.00042 U
Dibromochloromethane	--	0.00013 U	0.00012 U	--	0.00012 U	0.00015 U	--	0.0002 U	0.00013 U	0.00013 U	--	0.00018 U	0.00015 U	0.00014 U
Dichlorodifluoromethane	--	0.00029 U	0.00026 U	--	0.00026 U	0.00031 U	--	0.00043 U	0.00028 U	0.00027 U	--	0.00038 U	0.00031 U	0.00029 UJ
Ethylbenzene	--	0.00016 U	0.00054 J	--	0.00039 J	0.00017 U	--	0.00024 U	0.00016 U	0.00033 J	--	0.00021 U	0.00018 U	0.00029 J
Isopropylbenzene (Cumene)	--	0.00015 U	0.00014 U	--	0.00014 U	0.00016 U	--	0.00023 U	0.00015 U	0.00015 U	--	0.0002 U	0.00017 U	0.00016 UJ
M,P-Xylene	--	0.000098 U	0.0014	--	0.0011	0.00011 U	--	0.00031 J	0.000095 UJ	0.00096	--	0.00013 U	0.00011 U	0.00044 J

Table E-2
Summary of Data Used in Risk Assessment
Main Plant Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-047	CFMW-047	CFMW-047	CFMW-049	CFMW-049A	CFMW-049A	CFMW-050	CFMW-050	CFMW-050-DUP	CFMW-050	CFMW-053A	CFMW-053A	CFMW-053A-DUP	CFMW-053A
Sample Lab IDs	460-115886-20	460-115886-21	460-115886-22	460-119134-1	460-119134-2	460-119134-3	460-116014-7	460-116014-8	460-116014-10	460-116014-9	460-118952-2	460-118952-4	460-118952-6	460-118952-5
Sample Name	CFMW-047-SO-0-0.5	CFMW-047-SO-0.5-2	CFMW-047-SO-10-12	CFMW-049-SO-0-0.5	CFMW-049a-SO-0.5-2	CFMW-049a-SO-10-12	CFMW-050-SO-0-0.5	CFMW-050-SO-0.5-2	CFMW-DUP17-SO	CFMW-050-SO-10-12	CFMW-053a-SO-0-0.5	CFMW-053a-SO-0.5-2	CFMW-DUP22-SO	CFMW-053a-SO-10-12
Sample Depth	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	0.5-2 ft	10-12 ft
Chemical	6/21/2016	6/21/2016	6/21/2016	8/20/2016	8/20/2016	8/20/2016	6/22/2016	6/22/2016	6/22/2016	6/22/2016	8/17/2016	8/17/2016	8/17/2016	8/17/2016
Methyl Acetate	--	0.0045	0.00073 U	--	0.00072 UJ	0.00087 U	--	0.0016 J	0.0025 J	0.00077 U	--	0.0011 U	0.00089 U	0.00083 U
Methyl Ethyl Ketone (2-Butanone)	--	0.0075	0.0025 J	--	0.0018 J	0.00075 U	--	0.0063 J	0.0043	0.0019 J	--	0.0034 J	0.0034 J	0.0029 J
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	--	0.002 U	0.0018 U	--	0.0018 U	0.0021 U	--	0.003 U	0.0019 U	0.0019 U	--	0.0026 U	0.0022 U	0.002 UJ
Methylcyclohexane	--	0.00045 U	0.0017	--	0.0076 J	0.00048 U	--	0.00068 U	0.00043 U	0.0011	--	0.00059 U	0.00055 J	0.0017 J
Methylene Chloride	--	0.00029 U	0.00026 U	--	0.00026 U	0.00031 U	--	0.00043 U	0.00028 U	0.00027 U	--	0.00038 U	0.00031 U	0.00029 UJ
O-Xylene (1,2-Dimethylbenzene)	--	0.00014 U	0.00057 J	--	0.00034 J	0.00015 U	--	0.00022 U	0.00014 U	0.00033 J	--	0.00019 U	0.00016 U	0.00017 J
Styrene	--	0.00013 U	0.00012 U	--	0.00012 U	0.00015 U	--	0.0002 U	0.00013 U	0.00013 U	--	0.00018 U	0.00015 U	0.00014 UJ
Tert-Butyl Methyl Ether	--	0.00015 U	0.00014 U	--	0.00014 U	0.00016 U	--	0.00023 U	0.00015 U	0.00015 U	--	0.0002 U	0.00017 U	0.00016 UJ
Tetrachloroethylene (PCE)	--	0.00025 U	0.00023 U	--	0.00022 U	0.00027 U	--	0.00038 U	0.00024 U	0.00024 U	--	0.00033 U	0.00028 U	0.00026 UJ
Toluene	--	0.00058 J	0.002	--	0.0024	0.00033 J	--	0.00094 J	0.00028 J	0.0015	--	0.00045 J	0.00044 J	0.0011 J
Trans-1,2-Dichloroethene	--	0.00035 U	0.00032 U	--	0.00031 U	0.00038 U	--	0.00053 U	0.00034 U	0.00033 U	--	0.00046 U	0.00038 U	0.00036 UJ
Trans-1,3-Dichloropropene	--	0.000089 U	0.000081 U	--	0.00008 U	0.000097 U	--	0.00014 U	0.000087 U	0.000086 U	--	0.00012 U	0.000098 U	0.000092 UJ
Trichloroethylene (TCE)	--	0.00023 U	0.00021 U	--	0.00021 U	0.00025 U	--	0.00035 U	0.00023 U	0.00022 U	--	0.00031 U	0.00026 U	0.00024 UJ
Trichlorofluoromethane	--	0.0003 U	0.00028 U	--	0.00027 U	0.00033 U	--	0.00046 U	0.0003 U	0.00029 U	--	0.0004 U	0.00033 U	0.00031 UJ
Vinyl Chloride	--	0.00035 U	0.00032 U	--	0.00031 U	0.00038 U	--	0.00053 U	0.00034 U	0.00033 UJ	--	0.00046 U	0.00038 U	0.00036 UJ

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-2
Summary of Data Used in Risk Assessment
Main Plant Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-054	CFMW-054	CFMW-054	CFMW-070	CFMW-070	CFMW-070-DUP	CFMW-070	CFSB-010	CFSB-010	CFSB-012	CFSB-012	CFSB-038	CFSB-038	CFSB-038
Sample Lab IDs	460-115886-3	460-115886-4	460-115886-5	180-77944-1, 460-156665-1	180-77944-2, 460-156665-2	180-77944-4, 460-156665-4	180-77944-3, 460-156665-3	460-114275-19	460-114275-20	460-114793-22	460-114793-23	460-114275-23	460-114275-21	460-114275-22
Sample Name	CFMW-054-SO-0-0.5	CFMW-054-SO-0.5-2	CFMW-054-SO-10-12	CFMW-070-SO-0-0.5	CFMW-070-SO-0.5-2	CFMW-DUP39-SO	CFMW-070-SO-10-12	CFSB-010-SO-0.5-2	CFSB-010-SO-10-12	CFSB-012-SO-0.5-2	CFSB-012-SO-10-12	CFSB-038-SO-0-0.5	CFSB-038-SO-0.5-2	CFSB-038-SO-10-12
Sample Depth	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	0.5-2 ft	10-12 ft	0.5-2 ft	10-12 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft
Chemical	6/20/2016	6/20/2016	6/20/2016	5/16/2018	5/16/2018	5/16/2018	5/16/2018	5/21/2016	5/21/2016	5/28/2016	5/28/2016	5/21/2016	5/21/2016	5/21/2016
GENERAL CHEMISTRY (mg/kg)														
Fluoride	231 J	355 J	14 J	277 J	23.7 J	23 J	7.31 J	37.9 J-	16.1 J-	42.4 J	7.44 J	87.3	54.4 J-	8.5
Cyanide	0.027 J	0.028 J	0.016 U	0.62 J-	0.099 J	0.28 J	0.057 UJ	0.046 J	0.024 J	0.13 J-	0.017 UJ	0.07 J	0.067 J	0.019 J
METALS (mg/kg)														
"Chromium, Hexavalent - Estimated"	0.302433	0.329197	0.463017	2.16253	0.254258	0.240876	0.246229	0.222141	0.323844	0.240876	0.374696	0.259611	0.232847	0.235523
"Chromium, Trivalent - Calculated"	--	--	--	--	--	--	--	--	--	--	--	--	--	--
"Chromium, Trivalent - Estimated"	10.9976	11.9708	16.837	78.6375	9.24574	8.75912	8.95377	8.07786	11.7762	8.75912	13.6253	9.44039	8.46715	8.56448
Aluminum	18600	17200	7550	31200	9670	9990	7580	7780	7310	9400	8110	10300 J	6880	6370 J
Antimony	0.43 UJ	0.42 UJ	0.4 UJ	0.61 J	0.3 U	0.3 U	0.31 U	0.45 UJ	0.43 UJ	0.33 U	0.35 U	0.45 UJ	0.4 UJ	0.4 UJ
Arsenic	6	5.4	2.9	7.4	3.8	4.4	5.7	4.5 J	3.1 J	3.9 J	3.7 J	7.6	3.2 J	3
Barium	104 J	92.7 J	166 J	102	74.7	77.1	55.6	83.7	121	82.6 J	62.7 J	113	77.1	83.5
Beryllium	0.61	0.53	0.29 J	0.91	0.39 J	0.44	0.33 J	0.32 J	0.33 J	0.42	0.33 J	0.39 J	0.22 J	0.25 J
Cadmium	0.33 U	0.32 U	0.3 U	0.6 J	0.35 U	0.35 U	0.35 U	0.34 U	0.32 U	0.25 U	0.26 U	0.34 U	0.3 U	0.31 U
Calcium	3640 J	2400 J	45900 J	25200	27700	30100	39800	16400 J	28800 J	27400 J	35900 J	12900 J	11600 J	19400 J
Chromium, Total	11.3 J	12.3 J	17.3 J	80.8	9.5	9	9.2	8.3	12.1	9 J	14 J	9.7 J	8.7	8.8 J
Cobalt	6.2	5.7	4.1	5.9	5.4	5.1	5.7	5.1	4.6	5.5	5.2	6.3	4.1	4.3
Copper	13.7	13.9	9.8	34.5	11.3	12.9	12.1	19 J+	11.2 J+	15.7	14.4	23.4 J	10.6 J+	9.7 J
Iron	19700	17900	12100	21500	14300	14300	15500	12900	12600	13800	13100	16000 J	10200	11400 J
Lead	9.1 J	9.4 J	4.6 J	31.5	7.8	9.6	6.8	11.4 J	5.4 J	7.4	4.7	16.3 J	8.4 J	4.9 J
Magnesium	11000	11200	13900	7740	11200	11500	11500	8730 J	9810 J	13100 J	12000 J	8020 J	5590 J	8370 J
Manganese	413	344	301	377	360	358	351	388	336	442 J	371 J	560	379	409
Mercury	0.021	0.022	0.014 J	0.01 U	0.0094 J	0.01 U	0.0097 U	0.032	0.014 J	0.024	0.015	0.019	0.016 J	0.013 J
Nickel	15	15.7	8.4	75	10.8	10.4	9.8	9 J+	10 J+	10.4 J	10.5 J	16 J	10 J+	8.5 J
Potassium	1070	971	1310	1580	659	721	602	695 J	663 J	819 J	752 J	863	526 J	723
Selenium	0.41 U	0.39 U	0.37 U	0.31 U	0.3 U	0.3 U	0.3 U	0.42 U	0.4 U	0.31 U	0.33 U	0.42 J	0.38 U	0.38 U
Silver	0.79 U	0.77 U	0.73 U	0.65 U	0.64 U	0.64 U	0.65 U	0.83 U	0.78 U	0.61 U	0.64 U	0.82 U	0.73 U	0.74 U
Sodium	676	622	106	4750	192	254	39.2 J	78.5 J	47.5 J	38.7 J	71.9 J	61.9 J	37.4 U	44 J
Thallium	0.16 U	0.16 U	0.15 U	0.13 U	0.13 U	0.13 U	0.13 U	0.17 U	0.16 U	0.13 U	0.13 U	0.17 U	0.15 U	0.15 U
Vanadium	14.5	12.4	7.5	20.2	9.6	9.1	14.6	8.8	9	9.1 J	10 J	11.6 J	7.9	7 J
Zinc	52.8	51.2	27.3	96.1	38.8	36.3	34.9	37.7 J	30.9 J	34.6	33	47.7 J	31.2 J	28.7 J
METALS|HEXAVALENT CHROMIUM (mg/kg)														
Chromium, Hexavalent	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PESTICIDES (mg/kg)														
Aldrin	0.00089 U	--	--	--	--	--	--	--	--	--	--	--	--	--
Alpha Bhc (Alpha Hexachlorocyclohexane)	0.00067 U	--	--	--	--	--	--	--	--	--	--	--	--	--
Alpha Endosulfan	0.001 U	--	--	--	--	--	--	--	--	--	--	--	--	--
Beta Bhc (Beta Hexachlorocyclohexane)	0.00071 U	--	--	--	--	--	--	--	--	--	--	--	--	--
Beta Endosulfan	0.0012 U	--	--	--	--	--	--	--	--	--	--	--	--	--
cis-Chlordane	0.0012 U	--	--	--	--	--	--	--	--	--	--	--	--	--
Delta BHC (Delta Hexachlorocyclohexane)	0.0008 U	--	--	--	--	--	--	--	--	--	--	--	--	--
Dieldrin	0.00095 U	--	--	--	--	--	--	--	--	--	--	--	--	--
Endosulfan Sulfate	0.00085 U	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin	0.00093 U	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin Aldehyde	0.00091 U	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin Ketone	0.001 U	--	--	--	--	--	--	--	--	--	--	--	--	--
Gamma Bhc (Lindane)	0.00066 U	--	--	--	--	--	--	--	--	--	--	--	--	--
Heptachlor	0.00094 U	--	--	--	--	--	--	--	--	--	--	--	--	--
Heptachlor Epoxide	0.0014 U	--	--	--	--	--	--	--	--	--	--	--	--	--
Methoxychlor	0.0016 U	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDD	0.00096 U	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDE	0.0011 U	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDT	0.00076 U	--	--	--	--	--	--	--	--	--	--	--	--	--
Toxaphene	0.021 U	--	--	--	--	--	--	--	--	--	--	--	--	--
trans-Chlordane	0.0016 U	--	--	--	--	--	--	--	--	--	--	--	--	--
POLYCHLORINATED BIPHENYLS (mg/kg)														
PCB-1016 (Aroclor 1016)	0.0097 U	0.0098 U	0.009 U	--	--	--	--	0.0098 U	0.0093 U	0.0095 U	0.0093 U	0.0098 U	0.0093 U	0.0093 U
PCB-1221 (Aroclor 1221)	0.0097 U	0.0098 U	0.009 U	--	--	--	--	0.0098 U	0.0093 U	0.0095 U	0.0093 U	0.0098 U	0.0093 U	0.0093 U

Table E-2
Summary of Data Used in Risk Assessment
Main Plant Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-054	CFMW-054	CFMW-054	CFMW-070	CFMW-070	CFMW-070-DUP	CFMW-070	CFSB-010	CFSB-010	CFSB-012	CFSB-012	CFSB-038	CFSB-038	CFSB-038
Sample Lab IDs	460-115886-3	460-115886-4	460-115886-5	180-77944-1, 460-156665-1	180-77944-2, 460-156665-2	180-77944-4, 460-156665-4	180-77944-3, 460-156665-3	460-114275-19	460-114275-20	460-114793-22	460-114793-23	460-114275-23	460-114275-21	460-114275-22
Sample Name	CFMW-054-SO-0-0.5	CFMW-054-SO-0.5-2	CFMW-054-SO-10-12	CFMW-070-SO-0-0.5	CFMW-070-SO-0.5-2	CFMW-DUP39-SO	CFMW-070-SO-10-12	CFSB-010-SO-0.5-2	CFSB-010-SO-10-12	CFSB-012-SO-0.5-2	CFSB-012-SO-10-12	CFSB-038-SO-0-0.5	CFSB-038-SO-0.5-2	CFSB-038-SO-10-12
Sample Depth	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	0.5-2 ft	10-12 ft	0.5-2 ft	10-12 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft
Chemical	6/20/2016	6/20/2016	6/20/2016	5/16/2018	5/16/2018	5/16/2018	5/16/2018	5/21/2016	5/21/2016	5/28/2016	5/28/2016	5/21/2016	5/21/2016	5/21/2016
PCB-1232 (Aroclor 1232)	0.0097 U	0.0098 U	0.009 U	--	--	--	--	0.0098 U	0.0093 U	0.0095 U	0.0093 U	0.0098 U	0.0093 U	0.0093 U
PCB-1242 (Aroclor 1242)	0.0097 U	0.0098 U	0.009 U	--	--	--	--	0.0098 U	0.0093 U	0.0095 U	0.0093 U	0.0098 U	0.0093 U	0.0093 U
PCB-1248 (Aroclor 1248)	0.0097 U	0.0098 U	0.009 U	--	--	--	--	0.0098 U	0.0093 U	0.0095 U	0.0093 U	0.0098 U	0.0093 U	0.0093 U
PCB-1254 (Aroclor 1254)	0.01 U	0.01 U	0.0093 U	--	--	--	--	0.01 U	0.0096 U	0.0098 U	0.0096 U	0.01 U	0.0096 U	0.0096 U
PCB-1260 (Aroclor 1260)	0.01 U	0.01 U	0.0093 U	--	--	--	--	0.01 U	0.0096 U	0.0098 U	0.0096 U	0.01 U	0.0096 U	0.0096 U
PCB-1262 (Aroclor 1262)	0.01 U	0.01 U	0.0093 U	--	--	--	--	0.01 U	0.0096 U	0.0098 U	0.0096 U	0.01 U	0.0096 U	0.0096 U
PCB-1268 (Aroclor 1268)	0.01 U	0.01 U	0.0093 U	--	--	--	--	0.01 U	0.0096 U	0.0098 U	0.0096 U	0.01 U	0.0096 U	0.0096 U
Polychlorinated Biphenyl (PCBs)	0.01 U	0.01 U	0.0093 U	--	--	--	--	0.01 U	0.0096 U	0.0098 U	0.0096 U	0.01 U	0.0096 U	0.0096 U
SEMIVOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,2,4,5-Tetrachlorobenzene	0.027 U	0.027 U	0.025 U	0.077 U	0.0015 U	0.0015 U	0.0014 U	0.027 U	0.026 U	0.026 U	0.026 U	0.027 U	0.026 U	0.026 U
1,4-Dioxane (P-Dioxane)	0.097 U	0.097 U	0.089 U	0.55 U	0.011 U	0.011 U	0.01 U	0.097 U	0.092 U	0.094 U	0.092 U	0.098 U	0.092 U	0.092 U
2,3,4,6-Tetrachlorophenol	0.034 U	0.034 U	0.031 U	0.74 U	0.015 U	0.014 U	0.014 U	0.034 U	0.033 U	0.033 U	0.032 U	0.034 U	0.032 U	0.032 U
2,4,5-Trichlorophenol	0.036 U	0.036 U	0.033 U	0.13 U	0.0025 U	0.0024 U	0.0024 U	0.036 U	0.034 U	0.035 U	0.034 U	0.036 U	0.034 U	0.034 U
2,4,6-Trichlorophenol	0.01 U	0.01 U	0.0095 U	0.098 U	0.0019 U	0.0019 U	0.0018 U	0.01 U	0.0098 U	0.01 U	0.0098 U	0.01 U	0.0098 U	0.0098 U
2,4-Dichlorophenol	0.0085 U	0.0086 U	0.0079 U	0.14 U	0.0027 U	0.0026 U	0.0026 U	0.0086 U	0.0082 U	0.0083 U	0.0081 U	0.0086 U	0.0081 U	0.0081 U
2,4-Dimethylphenol	0.08 U	0.08 U	0.074 U	0.11 U	0.0022 U	0.0021 U	0.0021 U	0.08 U	0.076 U	0.077 U	0.076 U	0.08 U	0.076 U	0.076 U
2,4-Dinitrophenol	0.27 U	0.28 U	0.25 U	4.8 UJ	0.094 UJ	0.092 UJ	0.09 UJ	0.27 U	0.26 U	0.27 U	0.26 U	0.28 U	0.26 U	0.26 UJ
2,4-Dinitrotoluene	0.014 U	0.014 U	0.013 U	0.089 U	0.0017 U	0.0017 U	0.0017 U	0.014 U	0.014 U	0.014 U	0.014 U	0.014 U	0.014 U	0.014 U
2,6-Dinitrotoluene	0.019 U	0.019 U	0.018 U	0.11 U	0.0022 U	0.0021 U	0.0021 U	0.019 U	0.018 U	0.019 U	0.018 U	0.019 U	0.018 U	0.018 U
2-Chloronaphthalene	0.0082 U	0.0083 U	0.0076 U	0.082 U	0.0016 U	0.0016 U	0.0015 U	0.0082 U	0.0078 U	0.008 U	0.0078 U	0.0083 U	0.0078 U	0.0078 U
2-Chlorophenol	0.0092 U	0.0092 U	0.0085 U	0.083 U	0.0016 U	0.0016 U	0.0016 U	0.0092 U	0.0088 U	0.0089 U	0.0087 U	0.0093 U	0.0087 U	0.0088 U
2-Methylnaphthalene	0.008 U	0.008 U	0.0074 U	0.087 J	0.0064 J	0.0082	0.0035 J	0.44	0.031 J	0.0077 U	0.0076 U	0.03 J	0.017 J	0.0076 U
2-Methylphenol (O-Cresol)	0.016 U	0.016 U	0.015 U	0.51 U	0.01 U	0.0098 U	0.0096 U	0.016 U	0.015 U	0.015 U	0.015 U	0.016 U	0.015 U	0.015 U
2-Nitroaniline	0.012 U	0.012 U	0.011 U	0.81 U	0.016 U	0.016 U	0.015 U	0.012 U	0.011 U	0.012 U	0.011 U	0.012 U	0.011 U	0.011 U
2-Nitrophenol	0.012 U	0.012 U	0.011 U	0.1 U	0.002 U	0.002 U	0.0019 U	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U
3- And 4- Methylphenol (Total)	0.0096 U	0.0097 U	0.0089 U	--	--	--	--	0.033 J	0.0092 U	0.0093 U	0.0092 U	0.0097 U	0.0092 U	0.0092 U
3,3'-Dichlorobenzidine	0.04 U	0.041 U	0.037 U	1.7 U	0.033 U	0.032 U	0.031 U	0.04 U	0.039 U	0.039 U	0.038 U	0.041 U	0.038 U	0.038 U
3-Nitroaniline	0.011 U	0.011 U	0.0099 U	0.45 U	0.0089 U	0.0087 U	0.0085 U	0.011 U	0.01 U	0.01 U	0.01 U	0.011 U	0.01 U	0.01 U
4,6-Dinitro-2-Methylphenol	0.096 U	0.097 U	0.089 U	3.1 U	0.06 U	0.059 U	0.058 U	0.097 U	0.092 U	0.093 U	0.092 U	0.097 U	0.092 U	0.092 UJ
4-Bromophenyl Phenyl Ether	0.011 U	0.011 U	0.011 U	0.12 U	0.0024 U	0.0024 U	0.0023 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U
4-Chloro-3-Methylphenol	0.016 U	0.016 U	0.014 U	0.084 U	0.0016 U	0.0016 U	0.0016 U	0.016 U	0.015 U	0.015 U	0.015 U	0.016 U	0.015 U	0.015 U
4-Chloroaniline	0.0093 U	0.0094 U	0.0086 U	0.059 U	0.0012 U	0.0011 U	0.0011 U	0.0093 U	0.0089 U	0.009 U	0.0089 U	0.0094 U	0.0088 U	0.0089 U
4-Chlorophenyl Phenyl Ether	0.011 U	0.011 U	0.01 U	0.11 U	0.0021 U	0.0021 U	0.002 U	0.011 U	0.01 U	0.01 U	0.01 U	0.011 U	0.01 U	0.01 U
4-Nitroaniline	0.014 U	0.014 U	0.013 U	0.086 U	0.0017 U	0.0017 U	0.0016 U	0.014 U	0.013 U	0.013 U	0.013 U	0.014 U	0.013 U	0.013 U
4-Nitrophenol	0.17 U	0.18 U	0.16 U	1.2 UJ	0.025 UJ	0.024 UJ	0.023 UJ	0.17 U	0.17 U	0.17 U	0.17 U	0.18 U	0.17 U	0.17 U
Acenaphthene	0.0087 U	0.0088 U	0.0081 U	0.76	0.034	0.037	0.013	1.1	0.045 J	0.0085 U	0.0083 U	0.22 J	0.12 J	0.0083 U
Acenaphthylene	0.0093 U	0.0094 U	0.0086 U	0.078 U	0.0015 U	0.0015 U	0.0015 U	0.025 J	0.0089 U	0.009 U	0.0089 U	0.0094 U	0.0088 U	0.0089 U
Acetophenone	0.0079 U	0.0079 U	0.0073 U	0.097 U	0.0019 U	0.0021 J	0.0018 U	0.0079 U	0.0075 U	0.0076 U	0.0075 U	0.0079 U	0.0075 U	0.0075 U
Anthracene	0.034 U	0.035 U	0.032 U	2.2	0.069	0.068	0.026	1.5	0.067 J	0.033 U	0.033 U	0.33 J	0.2 J	0.033 U
Atrazine	0.016 U	0.016 U	0.015 U	0.78 UJ	0.015 UJ	0.015 UJ	0.015 UJ	0.016 U	0.015 U	0.016 U	0.015 U	0.016 U	0.015 U	0.015 U
Benzaldehyde	0.028 U	0.028 U	0.026 U	0.22 UR	0.0043 UR	0.0043 UR	0.0041 UR	0.028 U	0.026 U	0.027 U	0.026 U	0.028 U	0.026 U	0.026 U
Benzo(A)Anthracene	0.053	0.043	0.028 U	17	0.2	0.2	0.073	2.3	0.29	0.045	0.029 U	1.2	0.83	0.029 U
Benzo(A)Pyrene	0.063	0.053	0.01 U	22	0.22	0.23	0.083	2.1	0.33	0.046	0.03 J	1.3	0.86	0.029 J
Benzo(B)Fluoranthene	0.14	0.15	0.013 U	27	0.26	0.27	0.11	2.5	0.48	0.065	0.029 J	2.9	2.2	0.11
Benzo(G,H,I)Perylene	0.068 J	0.076 J	0.019 U	36	0.18	0.19	0.058	1.8 J+	0.36	0.052 J+	0.023 J+	1.4	1.1 J+	0.028 J
Benzo(K)Fluoranthene	0.051	0.039	0.015 U	8.6	0.11	0.095	0.032	0.99	0.15	0.025 J	0.015 U	0.97	0.64	0.015 U
Benzyl Butyl Phthalate	0.011 U	0.011 U	0.01 U	1.2 U	0.024 U	0.024 U	0.023 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U
Biphenyl (Diphenyl)	0.031 U	0.031 U	0.029 U	0.075 U	0.0024 J	0.0028 J	0.0014 U	0.11 J	0.029 U	0.03 U	0.029 U	0.031 U	0.029 U	0.029 U
Bis(2-Chloroethoxy) Methane	0.011 U	0.011 U	0.01 U	0.085 U	0.0017 U	0.0016 U	0.0016 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.0085 U	0.0086 U	0.0079 U	0.065 U	0.0013 U	0.0012 U	0.0012 U	0.0086 U	0.0082 U	0.0083 U	0.0081 U	0.0086 U	0.0081 U	0.0081 U
Bis(2-Chloroisopropyl) Ether	0.015 U	0.015 U	0.014 U	0.13 U	0.0026 U	0.0025 U	0.0025 U	0.015 U	0.014 U	0.014 U	0.014 U	0.015 U	0.014 U	0.014 U
Bis(2-Ethylhexyl) Phthalate	0.1 J	0.12 J	0.013 U	1.9 U	0.037 U	0.036 U	0.036 U	0.014 U	0.013 U	0.014 U	0.013 U	0.014 U	0.013 U	0.013 U
Caprolactam	0.026 U	0.026 U	0.024 U	1.2 U	0.023 U	0.022 U	0.022 UJ	0.026 UJ	0.025 U	0.025 U	0.025 U	0.026 U	0.025 UJ	0.025 U
Carbazole	0.009 U	0.009 U	0.0083 U	2.4	0.043	0.04	0.014	0.75	0.053 J	0.0087 U	0.0085 U	0.2 J	0.12 J	0.0085 U
Chrysene	0.098 J	0.088 J	0.0091 U	22	0.25	0.24	0.083	2.2	0.63	0.045 J	0.038 J	1.9	1.4	0.062 J
Dibenz(A,H)Anthracene	0.019 U	0.019 U	0.017 U	6	0.049	0.049	0.013	0.45 J+	0.098	0.018 U	0.018 U	0.42	0.36 J+	0.018 U
Dibenzofuran	0.011 U	0.011 U	0.01 U	0.24 J	0.02 J	0.021 J	0.0085 J	0.63	0.02 J	0.011 U	0.01 U	0.081 J	0.047 J	0.01 U

Table E-2
Summary of Data Used in Risk Assessment
Main Plant Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-054	CFMW-054	CFMW-054	CFMW-070	CFMW-070	CFMW-070-DUP	CFMW-070	CFSB-010	CFSB-010	CFSB-012	CFSB-012	CFSB-038	CFSB-038	CFSB-038
Sample Lab IDs	460-115886-3	460-115886-4	460-115886-5	180-77944-1, 460-156665-1	180-77944-2, 460-156665-2	180-77944-4, 460-156665-4	180-77944-3, 460-156665-3	460-114275-19	460-114275-20	460-114793-22	460-114793-23	460-114275-23	460-114275-21	460-114275-22
Sample Name	CFMW-054-SO-0-0.5	CFMW-054-SO-0.5-2	CFMW-054-SO-10-12	CFMW-070-SO-0-0.5	CFMW-070-SO-0.5-2	CFMW-DUP39-SO	CFMW-070-SO-10-12	CFSB-010-SO-0.5-2	CFSB-010-SO-10-12	CFSB-012-SO-0.5-2	CFSB-012-SO-10-12	CFSB-038-SO-0-0.5	CFSB-038-SO-0.5-2	CFSB-038-SO-10-12
Sample Depth	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	0.5-2 ft	10-12 ft	0.5-2 ft	10-12 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft
Chemical	6/20/2016	6/20/2016	6/20/2016	5/16/2018	5/16/2018	5/16/2018	5/16/2018	5/21/2016	5/21/2016	5/28/2016	5/28/2016	5/21/2016	5/21/2016	5/21/2016
Diethyl Phthalate	0.01 U	0.01 U	0.0095 U	0.53 U	0.01 U	0.01 U	0.01 U	0.01 U	0.0098 U	0.01 U	0.0098 U	0.01 U	0.0098 U	0.0098 U
Dimethyl Phthalate	0.01 U	0.011 U	0.0097 U	0.065 U	0.0013 U	0.0012 U	0.0012 U	0.011 U	0.01 U	0.01 U	0.01 U	0.011 U	0.01 U	0.01 U
Di-N-Butyl Phthalate	0.042 J	0.021 J	0.019 J	0.78 U	0.015 U	0.015 U	0.015 U	0.011 U	0.01 U	0.01 U	0.01 U	0.011 U	0.01 U	0.01 U
Di-N-Octylphthalate	0.018 U	0.018 U	0.017 U	1 U	0.02 U	0.02 U	0.019 U	0.018 U	0.018 U	0.018 U	0.017 U	0.019 U	0.017 U	0.018 U
Fluoranthene	0.086 J	0.059 J	0.0099 U	23	0.35	0.33	0.12 J+	5.4	0.82	0.071 J	0.03 J	2.2	1.5	0.047 J
Fluorene	0.0079 U	0.0079 U	0.0073 U	0.46	0.029	0.031	0.012	1.1	0.037 J	0.0076 U	0.0075 U	0.17 J	0.09 J	0.0075 U
Hexachlorobenzene	0.015 U	0.015 U	0.014 U	0.13 U	0.0025 U	0.0025 U	0.0024 U	0.015 U	0.014 U	0.014 U	0.014 U	0.015 U	0.014 U	0.014 U
Hexachlorobutadiene	0.01 U	0.01 U	0.0094 U	0.1 U	0.002 U	0.002 U	0.002 U	0.01 U	0.0097 U	0.0099 U	0.0097 U	0.01 U	0.0097 U	0.0097 U
Hexachlorocyclopentadiene	0.023 U	0.023 U	0.021 U	0.091 UJ	0.0018 UJ	0.0017 UJ	0.0017 UJ	0.023 U	0.022 U	0.022 UJ	0.021 UJ	0.023 U	0.021 U	0.021 U
Hexachloroethane	0.013 U	0.013 U	0.012 U	0.092 U	0.0018 U	0.0018 U	0.0017 U	0.013 U	0.013 U	0.013 U	0.013 U	0.013 U	0.013 U	0.013 U
Indeno(1,2,3-C,D)Pyrene	0.064	0.075	0.022 U	23	0.15	0.16	0.051	2 J+	0.33	0.047	0.023 J	1.4	1.2 J+	0.028 J
Isophorone	0.0078 U	0.0078 U	0.0072 U	0.091 U	0.0018 U	0.0017 U	0.0017 U	0.0078 U	0.0074 U	0.0075 U	0.0074 U	0.0078 U	0.0074 U	0.0074 U
Naphthalene	0.0092 U	0.0092 U	0.0085 U	0.15 J	0.013 J	0.022 J	0.0056 J	1.5	0.019 J	0.0089 U	0.0087 U	0.062 J	0.039 J	0.0088 U
Nitrobenzene	0.011 U	0.011 U	0.011 U	0.65 U	0.013 U	0.013 U	0.012 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U
N-Nitrosodi-N-Propylamine	0.012 U	0.012 U	0.011 U	0.12 U	0.0024 U	0.0023 U	0.0023 U	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U
N-Nitrosodiphenylamine	0.033 U	0.033 U	0.03 U	0.59 U	0.012 U	0.011 U	0.011 U	0.033 U	0.031 U	0.032 U	0.031 U	0.033 U	0.031 U	0.031 U
Pentachlorophenol	0.044 U	0.044 U	0.04 U	2.9 UJ	0.056 UJ	0.055 UJ	0.054 UJ	0.044 U	0.042 U	0.042 U	0.042 U	0.044 U	0.042 U	0.042 UJ
Phenanthrene	0.041 J	0.03 J	0.0089 U	11	0.27	0.26	0.092 J+	5.8	0.5	0.035 J	0.022 J	1.5	0.93	0.023 J
Phenol	0.012 U	0.012 U	0.011 U	0.54 U	0.011 U	0.01 U	0.01 U	0.021 J	0.011 U	0.011 U	0.011 U	0.012 U	0.011 U	0.011 U
Pyrene	0.096 J	0.073 J	0.015 U	27	0.33	0.33	0.11 J+	4.9	0.83	0.077 J	0.037 J	2.4	1.3	0.055 J
VOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,1,1-Trichloroethane	--	0.00047 U	0.00029 U	--	--	--	--	0.00039 U	0.00036 U	0.00031 U	0.00047 U	--	0.00036 U	0.00086 U
1,1,2,2-Tetrachloroethane	--	0.00021 U	0.00013 U	--	--	--	--	0.00017 U	0.00016 U	0.00014 U	0.00021 U	--	0.00016 U	0.00038 U
1,1,2-Trichloro-1,2,2-Trifluoroethane	--	0.00055 U	0.00033 U	--	--	--	--	0.00045 U	0.00042 U	0.00036 U	0.00055 U	--	0.00041 U	0.00099 U
1,1,2-Trichloroethane	--	0.00035 U	0.00021 U	--	--	--	--	0.00029 U	0.00027 U	0.00023 U	0.00035 U	--	0.00026 U	0.00063 U
1,1-Dichloroethane	--	0.00042 U	0.00026 U	--	--	--	--	0.00035 U	0.00032 U	0.00028 U	0.00042 U	--	0.00032 U	0.00077 U
1,1-Dichloroethene	--	0.00051 U	0.00031 U	--	--	--	--	0.00042 U	0.00039 U	0.00034 U	0.00051 U	--	0.00039 U	0.00092 U
1,2,3-Trichlorobenzene	--	0.00014 U	0.000083 U	--	--	--	--	0.00011 U	0.0001 U	0.00009 U	0.00014 U	--	0.0001 U	0.00025 U
1,2,4-Trichlorobenzene	--	0.0004 U	0.00024 U	--	--	--	--	0.00033 U	0.0003 U	0.00026 U	0.0004 U	--	0.0003 U	0.00072 U
1,2-Dibromo-3-Chloropropane	--	0.00058 U	0.00035 U	--	--	--	--	0.00048 U	0.00044 U	0.00039 U	0.00058 U	--	0.00044 U	0.0011 U
1,2-Dibromoethane (Ethylene Dibromide)	--	0.00015 U	0.00009 U	--	--	--	--	0.00012 U	0.00011 U	0.000099 U	0.00015 U	--	0.00011 U	0.00027 U
1,2-Dichlorobenzene	--	0.00017 U	0.00011 U	--	--	--	--	0.00014 U	0.00013 U	0.00011 U	0.00017 U	--	0.00013 U	0.00032 U
1,2-Dichloroethane	--	0.00014 J	0.000083 U	--	--	--	--	0.00011 U	0.0001 U	0.00009 U	0.00014 U	--	0.0001 U	0.00025 U
1,2-Dichloropropane	--	0.00021 U	0.00013 U	--	--	--	--	0.00017 U	0.00016 U	0.00014 U	0.00021 U	--	0.00016 U	0.00038 U
1,3-Dichlorobenzene	--	0.00015 U	0.00009 U	--	--	--	--	0.00012 U	0.00011 U	0.000099 U	0.00015 U	--	0.00011 U	0.00027 U
1,4-Dichlorobenzene	--	0.00016 U	0.000098 U	--	--	--	--	0.00013 U	0.00012 U	0.00011 U	0.00016 U	--	0.00012 U	0.00029 U
2-Hexanone	--	0.0012 U	0.00071 U	--	--	--	--	0.00096 U	0.00089 U	0.00077 U	0.0012 U	--	0.00088 U	0.0021 U
Acetone	--	0.056 J+	0.011 J+	--	--	--	--	0.027	0.013	0.03	0.014	--	0.036	0.041
Benzene	--	0.00092 J	0.00072 J	--	--	--	--	0.00042 J	0.00048 J	0.00046 J	0.00031 J	--	0.00039 J	0.00082 J
Bromochloromethane	--	0.00021 U	0.00013 U	--	--	--	--	0.00017 U	0.00016 U	0.00014 U	0.00021 U	--	0.00016 U	0.00038 U
Bromodichloromethane	--	0.00047 U	0.00029 U	--	--	--	--	0.00039 U	0.00036 U	0.00031 U	0.00047 U	--	0.00036 U	0.00086 U
Bromoform	--	0.00016 U	0.000098 U	--	--	--	--	0.00013 U	0.00012 U	0.00011 U	0.00016 U	--	0.00012 U	0.00029 U
Bromomethane	--	0.0004 U	0.00024 U	--	--	--	--	0.00033 U	0.0003 U	0.00026 U	0.0004 U	--	0.0003 U	0.00072 U
Carbon Disulfide	--	0.00053 U	0.00098	--	--	--	--	0.00086 J	0.00052 J	0.00045 J	0.00063 J	--	0.0011	0.0012 J
Carbon Tetrachloride	--	0.00053 U	0.00032 U	--	--	--	--	0.00044 U	0.00041 U	0.00035 U	0.00053 U	--	0.0004 U	0.00097 U
Chlorobenzene	--	0.00017 U	0.00011 U	--	--	--	--	0.00014 U	0.00013 U	0.00011 U	0.00017 U	--	0.00013 U	0.00032 U
Chloroethane	--	0.00043 U	0.00026 U	--	--	--	--	0.00036 U	0.00033 U	0.00029 U	0.00043 U	--	0.00033 U	0.00079 U
Chloroform	--	0.00026 U	0.00016 U	--	--	--	--	0.00022 U	0.0002 U	0.00017 U	0.00026 U	--	0.0002 U	0.00047 U
Chloromethane	--	0.00047 U	0.00029 U	--	--	--	--	0.00039 U	0.00036 U	0.00031 U	0.00047 U	--	0.00036 U	0.00086 U
Cis-1,2-Dichloroethylene	--	0.00027 U	0.00017 U	--	--	--	--	0.00023 U	0.00021 U	0.00018 U	0.00027 U	--	0.00021 U	0.0005 U
Cis-1,3-Dichloropropene	--	0.00019 U	0.00011 U	--	--	--	--	0.00015 U	0.00014 U	0.00012 U	0.00019 U	--	0.00014 U	0.00034 U
Cyclohexane	--	0.00057 U	0.0027	--	--	--	--	0.00047 U	0.00074 J	0.00087 J+	0.00057 U	--	0.00058 J	0.001 U
Dibromochloromethane	--	0.00019 U	0.00011 U	--	--	--	--	0.00015 U	0.00014 U	0.00012 U	0.00019 U	--	0.00014 U	0.00034 U
Dichlorodifluoromethane	--	0.0004 U	0.00024 U	--	--	--	--	0.00033 U	0.0003 U	0.00026 U	0.0004 U	--	0.0003 U	0.00072 U
Ethylbenzene	--	0.00022 U	0.0013	--	--	--	--	0.00043 J	0.00019 J	0.00033 J	0.00022 U	--	0.00017 U	0.00041 U
Isopropylbenzene (Cumene)	--	0.00021 U	0.00019 J	--	--	--	--	0.00017 U	0.00016 U	0.00014 U	0.00021 U	--	0.00016 U	0.00038 U
M,P-Xylene	--	0.0003 J	0.0033	--	--	--	--	0.00094 J	0.00061 J	0.001	0.00049 J	--	0.00019 J	0.00035 J

Table E-2
Summary of Data Used in Risk Assessment
Main Plant Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-054	CFMW-054	CFMW-054	CFMW-070	CFMW-070	CFMW-070-DUP	CFMW-070	CFSB-010	CFSB-010	CFSB-012	CFSB-012	CFSB-038	CFSB-038	CFSB-038
Sample Lab IDs	460-115886-3	460-115886-4	460-115886-5	180-77944-1, 460-156665-1	180-77944-2, 460-156665-2	180-77944-4, 460-156665-4	180-77944-3, 460-156665-3	460-114275-19	460-114275-20	460-114793-22	460-114793-23	460-114275-23	460-114275-21	460-114275-22
Sample Name	CFMW-054-SO-0-0.5	CFMW-054-SO-0.5-2	CFMW-054-SO-10-12	CFMW-070-SO-0-0.5	CFMW-070-SO-0.5-2	CFMW-DUP39-SO	CFMW-070-SO-10-12	CFSB-010-SO-0.5-2	CFSB-010-SO-10-12	CFSB-012-SO-0.5-2	CFSB-012-SO-10-12	CFSB-038-SO-0-0.5	CFSB-038-SO-0.5-2	CFSB-038-SO-10-12
Sample Depth	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	0.5-2 ft	10-12 ft	0.5-2 ft	10-12 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft
Chemical	6/20/2016	6/20/2016	6/20/2016	5/16/2018	5/16/2018	5/16/2018	5/16/2018	5/21/2016	5/21/2016	5/28/2016	5/28/2016	5/21/2016	5/21/2016	5/21/2016
Methyl Acetate	--	0.0025 J	0.00068 U	--	--	--	--	0.00092 U	0.00085 U	0.00074 U	0.0011 U	--	0.00085 U	0.0089 J
Methyl Ethyl Ketone (2-Butanone)	--	0.0043 J	0.0019 J	--	--	--	--	0.00079 U	0.00073 U	0.0026 J	0.00096 U	--	0.00072 U	0.0017 U
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	--	0.0028 U	0.0017 U	--	--	--	--	0.0023 U	0.0021 U	0.0018 U	0.0028 U	--	0.0021 U	0.005 U
Methylcyclohexane	--	0.00062 U	0.0047	--	--	--	--	0.0006 J	0.001	0.0013	0.00062 U	--	0.0011	0.0011 U
Methylene Chloride	--	0.0004 U	0.00024 U	--	--	--	--	0.00033 U	0.0003 U	0.00026 U	0.0004 U	--	0.0003 U	0.00072 U
O-Xylene (1,2-Dimethylbenzene)	--	0.00028 J	0.0011	--	--	--	--	0.00039 J	0.00021 J	0.00036 J	0.0002 U	--	0.00015 U	0.00036 U
Styrene	--	0.00019 U	0.00011 U	--	--	--	--	0.00015 U	0.00014 U	0.00012 U	0.00019 U	--	0.00014 U	0.00034 U
Tert-Butyl Methyl Ether	--	0.00021 U	0.00013 U	--	--	--	--	0.00017 U	0.00016 U	0.00014 U	0.00021 U	--	0.00016 U	0.00038 U
Tetrachloroethylene (PCE)	--	0.00035 U	0.00021 U	--	--	--	--	0.00029 U	0.00027 U	0.00023 U	0.00035 U	--	0.00026 U	0.00063 U
Toluene	--	0.00082 J	0.0044	--	--	--	--	0.0011	0.0013	0.0015	0.00082 J	--	0.00048 J	0.001 J
Trans-1,2-Dichloroethene	--	0.00048 U	0.00029 U	--	--	--	--	0.0004 U	0.00037 U	0.00032 U	0.00048 U	--	0.00037 U	0.00088 U
Trans-1,3-Dichloropropene	--	0.00012 U	0.000075 U	--	--	--	--	0.0001 U	0.000095 U	0.000082 U	0.00012 U	--	0.000094 U	0.00023 U
Trichloroethylene (TCE)	--	0.00032 U	0.0002 U	--	--	--	--	0.00027 U	0.00025 U	0.00021 U	0.00032 U	--	0.00024 U	0.00059 U
Trichlorofluoromethane	--	0.00042 U	0.00026 U	--	--	--	--	0.00035 U	0.00032 U	0.00028 U	0.00042 U	--	0.00032 U	0.00077 U
Vinyl Chloride	--	0.00048 U	0.00029 U	--	--	--	--	0.0004 U	0.00037 U	0.00032 U	0.00048 U	--	0.00037 U	0.00088 U

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-2
Summary of Data Used in Risk Assessment
Main Plant Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-040	CFSB-040	CFSB-040	CFSB-042	CFSB-042	CFSB-042	CFSB-044	CFSB-044	CFSB-044	CFSB-045	CFSB-045	CFSB-045	CFSB-046	CFSB-046
Sample Lab IDs	460-114275-10	460-114275-11	460-114275-12	460-114275-7	460-114275-8	460-114275-9	460-114141-46	460-114141-47	460-114141-48	460-114275-27	460-114275-28	460-114275-29	460-114141-44	460-114141-45
Sample Name	CFSB-040-SO-0-0.5	CFSB-040-SO-0.5-2	CFSB-040-SO-10-12	CFSB-042-SO-0-0.5	CFSB-042-SO-0.5-2	CFSB-042-SO-10-12	CFSB-044-SO-0-0.5	CFSB-044-SO-0.5-2.0	CFSB-044-SO-10-12	CFSB-045-SO-0-0.5	CFSB-045-SO-0.5-2	CFSB-045-SO-10-12	CFSB-046-SO-0-0.5	CFSB-046-SO-0.5-2.0
Sample Depth	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft
Chemical	5/20/2016	5/20/2016	5/20/2016	5/20/2016	5/20/2016	5/20/2016	5/20/2016	5/20/2016	5/20/2016	5/21/2016	5/21/2016	5/21/2016	5/20/2016	5/20/2016
GENERAL CHEMISTRY (mg/kg)														
Fluoride	203 J-	66.8 J-	37.1 J-	50.7 J-	33.1 J-	12.8 J-	330 J-	310 J-	9.64 J-	199	140	164	31.7 J-	13.7 J-
Cyanide	0.044 J	0.032 J	0.02 J	0.055 J	0.039 J	0.016 U	0.17	0.46	0.019 U	0.14	0.076 J	0.049 J	0.015 U	0.016 U
METALS (mg/kg)														
"Chromium, Hexavalent - Estimated"	0.286375	0.262287	0.315815	0.369343	0.289051	0.211436	0.281022	0.283698	0.23017	0.254258	0.409489	0.262287	1.98589	0.570073
"Chromium, Trivalent - Calculated"	--	--	--	--	--	--	--	--	--	--	--	--	--	--
"Chromium, Trivalent - Estimated"	10.4136	9.53771	11.4842	13.4307	10.5109	7.68856	10.219	10.3163	8.36983	9.24574	14.8905	9.53771	72.2141	20.7299
Aluminum	12500	8420	8000	9540	12500	6300	12900	13900	6640	9500 J	9830 J	7280 J	9230	8110
Antimony	0.44 J-	0.42 UJ	0.43 UJ	0.57 J-	0.44 UJ	0.4 UJ	0.48 J-	0.44 UJ	0.43 UJ	0.42 UJ	0.43 UJ	0.38 UJ	0.41 UJ	0.38 UJ
Arsenic	4.9 J	4.2 J	4.3 J	4.8 J	4.7 J	4.4 J	5.5	5.2	3.9	4.3	4.8	2.9	4.6	4.6
Barium	70	71.7	56.4	76.6	132	54.1	104 J+	92.8 J+	58.5 J+	91.2	84.5	61.3	83.2 J+	51.3 J+
Beryllium	0.4 J	0.35 J	0.38 J	0.37 J	0.5	0.29 J	0.59	0.7	0.37 J	0.41	0.4 J	0.29 J	0.35 J	0.28 J
Cadmium	0.39 J	0.32 U	0.33 U	0.31 U	0.33 U	0.3 U	0.39 J	0.39 J	0.33 U	0.32 U	0.33 U	0.29 U	0.31 U	0.29 U
Calcium	18500 J	22900 J	29400 J	17500 J	4760 J	59500 J	23900	17000	39200	33000 J	14100 J	31500 J	54700	64600
Chromium, Total	10.7	9.8	11.8	13.8	10.8	7.9	10.5	10.6	8.6	9.5 J	15.3 J	9.8 J	74.2	21.3
Cobalt	5.2	5.5	5	4.7	6.4	4.4	5.4	5.7	5.3	4.1	5.3	4.2	5.4	4.5
Copper	20.7 J+	12.7 J+	12.7 J+	19.8 J+	13.6 J+	9.3 J+	18.6	15.5	9.9	13.4 J	15.3 J	11.2 J	23.4	11.6
Iron	13100	13800	13400	14900	16600	11000	13200	13900	13200	11900 J	14500 J	10900 J	14300	13900
Lead	27.2 J	9.4 J	16.1 J	16.4 J	12.3 J	9 J	14.5	15	5.4	41.9 J	29.4 J	19.2 J	32.1	6.7
Magnesium	7660 J	9560 J	9810 J	12200 J	8430 J	12100 J	8290	8770	12600	10300 J	9050 J	9720 J	14100	15600
Manganese	332	374	355	425	588	339	358	403	339	353	455	308	510	386
Mercury	0.025	0.017	0.019	0.029	0.016	0.015 J	0.022	0.02	0.015 J	0.024	0.024	0.018	0.02	0.019
Nickel	18.2 J+	12.4 J+	12.3 J+	12.8 J+	11.6 J+	8.4 J+	46.1	45.3	10.2	12 J	13.2 J	10.6 J	13.4	10.2
Potassium	895 J	704 J	768 J	754 J	851 J	545 J	980	960	548	1040	910	745	1410	880
Selenium	0.39 U	0.39 U	0.41 U	0.38 U	0.41 U	0.37 U	0.63 J	0.55 J	0.4 U	0.39 U	0.41 U	0.36 U	0.38 U	0.35 U
Silver	0.77 U	0.76 U	0.79 U	0.75 U	0.81 U	0.73 U	0.76 U	0.8 U	0.79 U	0.77 U	0.79 U	0.7 U	0.75 U	0.69 U
Sodium	256	55.1 J	150	95 J	45.9 J	37.4 U	576	618	76 J	256	214	293	75.3 J	46.1 J
Thallium	0.16 U	0.16 U	0.16 U	0.15 U	0.17 U	0.15 U	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U	0.14 U	0.15 U	0.14 U
Vanadium	12.7	9.7	9.2	9.5	13.4	5.8	23.1	23.6	10.8	11.8 J	11.6 J	8.5 J	7.9	6.5
Zinc	72.9 J	42.3 J	40.9 J	53.5 J	42.6 J	26.6 J	57.3	50	31.3	51.6 J	57.2 J	39.5 J	39.3	41.3
METALS|HEXAVALENT CHROMIUM (mg/kg)														
Chromium, Hexavalent	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PESTICIDES (mg/kg)														
Aldrin	--	--	--	0.00092 U	--	--	0.00089 U	--	--	--	--	--	--	--
Alpha Bhc (Alpha Hexachlorocyclohexane)	--	--	--	0.0007 U	--	--	0.00067 U	--	--	--	--	--	--	--
Alpha Endosulfan	--	--	--	0.0011 U	--	--	0.001 U	--	--	--	--	--	--	--
Beta Bhc (Beta Hexachlorocyclohexane)	--	--	--	0.00074 U	--	--	0.00071 U	--	--	--	--	--	--	--
Beta Endosulfan	--	--	--	0.0012 U	--	--	0.0012 U	--	--	--	--	--	--	--
cis-Chlordane	--	--	--	0.0012 U	--	--	0.0012 U	--	--	--	--	--	--	--
Delta BHC (Delta Hexachlorocyclohexane)	--	--	--	0.00083 U	--	--	0.0008 U	--	--	--	--	--	--	--
Dieldrin	--	--	--	0.00099 U	--	--	0.00095 U	--	--	--	--	--	--	--
Endosulfan Sulfate	--	--	--	0.00089 U	--	--	0.00086 U	--	--	--	--	--	--	--
Endrin	--	--	--	0.00097 U	--	--	0.00093 U	--	--	--	--	--	--	--
Endrin Aldehyde	--	--	--	0.00095 U	--	--	0.00091 U	--	--	--	--	--	--	--
Endrin Ketone	--	--	--	0.0011 U	--	--	0.001 U	--	--	--	--	--	--	--
Gamma Bhc (Lindane)	--	--	--	0.00068 U	--	--	0.00066 U	--	--	--	--	--	--	--
Heptachlor	--	--	--	0.00098 U	--	--	0.00094 U	--	--	--	--	--	--	--
Heptachlor Epoxide	--	--	--	0.0015 U	--	--	0.0014 U	--	--	--	--	--	--	--
Methoxychlor	--	--	--	0.0016 U	--	--	0.0016 U	--	--	--	--	--	--	--
P,P'-DDD	--	--	--	0.001 U	--	--	0.00096 U	--	--	--	--	--	--	--
P,P'-DDE	--	--	--	0.0011 U	--	--	0.0011 U	--	--	--	--	--	--	--
P,P'-DDT	--	--	--	0.00079 U	--	--	0.00076 U	--	--	--	--	--	--	--
Toxaphene	--	--	--	0.022 U	--	--	0.021 U	--	--	--	--	--	--	--
trans-Chlordane	--	--	--	0.0017 U	--	--	0.0016 U	--	--	--	--	--	--	--
POLYCHLORINATED BIPHENYLS (mg/kg)														
PCB-1016 (Aroclor 1016)	0.0096 U	0.0094 U	0.0094 U	0.01 U	0.0096 U	0.0093 U	0.0098 U	0.0098 U	0.0093 U	0.0093 U	0.0094 U	0.0093 U	0.0093 U	0.0094 U
PCB-1221 (Aroclor 1221)	0.0096 U	0.0094 U	0.0094 U	0.01 U	0.0096 U	0.0093 U	0.0098 U	0.0098 U	0.0093 U	0.0093 U	0.0094 U	0.0093 U	0.0093 U	0.0094 U

Table E-2
Summary of Data Used in Risk Assessment
Main Plant Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-040	CFSB-040	CFSB-040	CFSB-042	CFSB-042	CFSB-042	CFSB-044	CFSB-044	CFSB-044	CFSB-045	CFSB-045	CFSB-045	CFSB-046	CFSB-046
Sample Lab IDs	460-114275-10	460-114275-11	460-114275-12	460-114275-7	460-114275-8	460-114275-9	460-114141-46	460-114141-47	460-114141-48	460-114275-27	460-114275-28	460-114275-29	460-114141-44	460-114141-45
Sample Name	CFSB-040-SO-0-0.5	CFSB-040-SO-0.5-2	CFSB-040-SO-10-12	CFSB-042-SO-0-0.5	CFSB-042-SO-0.5-2	CFSB-042-SO-10-12	CFSB-044-SO-0-0.5	CFSB-044-SO-0.5-2.0	CFSB-044-SO-10-12	CFSB-045-SO-0-0.5	CFSB-045-SO-0.5-2	CFSB-045-SO-10-12	CFSB-046-SO-0-0.5	CFSB-046-SO-0.5-2.0
Sample Depth	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft
Chemical	5/20/2016	5/20/2016	5/20/2016	5/20/2016	5/20/2016	5/20/2016	5/20/2016	5/20/2016	5/20/2016	5/21/2016	5/21/2016	5/21/2016	5/20/2016	5/20/2016
PCB-1232 (Aroclor 1232)	0.0096 U	0.0094 U	0.0094 U	0.01 U	0.0096 U	0.0093 U	0.0098 U	0.0098 U	0.0093 U	0.0093 U	0.0094 U	0.0093 U	0.0093 U	0.0094 U
PCB-1242 (Aroclor 1242)	0.0096 U	0.0094 U	0.0094 U	0.01 U	0.0096 U	0.0093 U	0.0098 U	0.0098 U	0.0093 U	0.0093 U	0.0094 U	0.0093 U	0.0093 U	0.0094 U
PCB-1248 (Aroclor 1248)	0.0096 U	0.0094 U	0.0094 U	0.01 U	0.0096 U	0.0093 U	0.0098 U	0.0098 U	0.0093 U	0.0093 U	0.0094 U	0.0093 U	0.0093 U	0.0094 U
PCB-1254 (Aroclor 1254)	0.0099 U	0.0098 U	0.0097 U	0.01 U	0.01 U	0.0096 U	0.01 U	0.01 U	0.0096 U	0.0096 U	0.0097 U	0.0096 U	0.0096 U	0.0097 U
PCB-1260 (Aroclor 1260)	0.0099 U	0.0098 U	0.0097 U	0.01 U	0.01 U	0.0096 U	0.01 U	0.01 U	0.0096 U	0.0096 U	0.0097 U	0.0096 U	0.0096 U	0.0097 U
PCB-1262 (Aroclor 1262)	0.0099 U	0.0098 U	0.0097 U	0.01 U	0.01 U	0.0096 U	0.01 U	0.01 U	0.0096 U	0.0096 U	0.0097 U	0.0096 U	0.0096 U	0.0097 U
PCB-1268 (Aroclor 1268)	0.0099 U	0.0098 U	0.0097 U	0.01 U	0.01 U	0.0096 U	0.01 U	0.01 U	0.0096 U	0.0096 U	0.0097 U	0.0096 U	0.0096 U	0.0097 U
Polychlorinated Biphenyl (PCBs)	0.0099 U	0.0098 U	0.0097 U	0.01 U	0.01 U	0.0096 U	0.01 U	0.01 U	0.0096 U	0.0096 U	0.0097 U	0.0096 U	0.0096 U	0.0097 U
SEMIVOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,2,4,5-Tetrachlorobenzene	1.3 U	0.13 U	0.13 U	0.28 U	0.13 U	0.026 U	0.54 U	0.27 U	0.026 U	0.13 U	0.13 U	0.051 U	0.026 U	0.026 U
1,4-Dioxane (P-Dioxane)	4.7 U	0.47 U	0.47 U	1 U	0.48 U	0.092 U	1.9 U	0.97 U	0.093 U	0.46 U	0.46 U	0.18 U	0.092 U	0.093 U
2,3,4,6-Tetrachlorophenol	1.7 U	0.16 U	0.16 U	0.35 U	0.17 U	0.032 U	0.68 U	0.34 U	0.033 U	0.16 U	0.16 U	0.065 U	0.032 U	0.033 U
2,4,5-Trichlorophenol	1.8 U	0.17 U	0.17 U	0.37 U	0.18 U	0.034 U	0.72 U	0.36 U	0.035 U	0.17 U	0.17 U	0.069 U	0.034 U	0.035 U
2,4,6-Trichlorophenol	0.5 U	0.05 U	0.05 U	0.11 U	0.051 U	0.0098 U	0.21 U	0.1 U	0.0099 U	0.049 U	0.049 U	0.02 U	0.0098 U	0.0099 U
2,4-Dichlorophenol	0.42 U	0.041 U	0.041 U	0.089 U	0.042 U	0.0081 U	0.17 U	0.086 U	0.0082 U	0.041 U	0.041 U	0.016 U	0.0081 U	0.0082 U
2,4-Dimethylphenol	3.9 U	0.39 U	0.38 U	0.83 U	0.39 U	0.076 U	1.6 U	0.8 U	0.076 U	0.38 U	0.38 U	0.15 U	0.076 U	0.077 U
2,4-Dinitrophenol	13 U	1.3 U	1.3 U	2.8 U	1.4 U	0.26 U	5.5 U	2.8 U	0.26 U	1.3 U	1.3 U	0.52 U	0.26 U	0.26 U
2,4-Dinitrotoluene	0.7 U	0.069 U	0.069 U	0.15 U	0.071 U	0.014 U	0.29 U	0.14 U	0.014 U	0.069 U	0.069 U	0.027 U	0.014 U	0.014 U
2,6-Dinitrotoluene	0.94 U	0.093 U	0.093 U	0.2 U	0.095 U	0.018 U	0.38 U	0.19 U	0.018 U	0.092 U	0.093 U	0.037 U	0.018 U	0.019 U
2-Chloronaphthalene	0.4 U	0.04 U	0.04 U	0.085 U	0.041 U	0.0078 U	0.16 U	0.083 U	0.0079 U	0.039 U	0.039 U	0.016 U	0.0078 U	0.0079 U
2-Chlorophenol	0.45 U	0.045 U	0.044 U	0.096 U	0.045 U	0.0087 U	0.18 U	0.092 U	0.0088 U	0.044 U	0.044 U	0.018 U	0.0087 U	0.0089 U
2-Methylnaphthalene	1.4 J	0.29 J	0.41 J	0.4 J	0.1 J	0.0088 J	1.7 J	0.71 J	0.29 J	0.1 J	0.081 J	0.059 J	0.014 J	0.026 J
2-Methylphenol (O-Cresol)	0.77 U	0.076 U	0.076 U	0.16 U	0.078 U	0.015 U	0.31 U	0.16 U	0.015 U	0.076 U	0.076 U	0.03 U	0.015 U	0.015 U
2-Nitroaniline	0.59 U	0.058 U	0.057 U	0.12 U	0.059 U	0.011 U	0.24 U	0.12 U	0.011 U	0.057 U	0.057 U	0.023 U	0.011 U	0.011 U
2-Nitrophenol	0.6 U	0.059 U	0.058 U	0.13 U	0.06 U	0.012 U	0.24 U	0.12 U	0.012 U	0.058 U	0.058 U	0.023 U	0.012 U	0.012 U
3- And 4- Methylphenol (Total)	0.47 U	0.047 U	0.046 U	0.1 U	0.048 U	0.0092 U	0.19 U	0.097 U	0.0092 U	0.046 U	0.046 U	0.018 U	0.0092 U	0.0093 U
3,3'-Dichlorobenzidine	2 U	0.2 U	0.19 U	0.42 U	0.2 U	0.038 U	0.81 U	0.41 U	0.039 U	0.19 U	0.19 U	0.077 U	0.038 U	0.039 U
3-Nitroaniline	0.53 U	0.052 U	0.052 U	0.11 U	0.053 U	0.01 U	0.21 U	0.11 U	0.01 U	0.051 U	0.052 U	0.02 U	0.01 U	0.01 U
4,6-Dinitro-2-Methylphenol	4.7 U	0.47 U	0.46 U	1 U	0.48 U	0.092 U	1.9 U	0.97 U	0.093 U	0.46 U	0.46 U	0.18 U	0.092 U	0.093 U
4-Bromophenyl Phenyl Ether	0.56 U	0.055 U	0.055 U	0.12 U	0.056 U	0.011 U	0.23 U	0.11 U	0.011 U	0.055 U	0.055 U	0.022 U	0.011 U	0.011 U
4-Chloro-3-Methylphenol	0.76 U	0.075 U	0.075 U	0.16 U	0.077 U	0.015 U	0.31 U	0.16 U	0.015 U	0.074 U	0.075 U	0.03 U	0.015 U	0.015 U
4-Chloroaniline	0.46 U	0.045 U	0.045 U	0.097 U	0.046 U	0.0088 U	0.19 U	0.094 U	0.0089 U	0.045 U	0.045 U	0.018 U	0.0088 U	0.009 U
4-Chlorophenyl Phenyl Ether	0.53 U	0.052 U	0.052 U	0.11 U	0.054 U	0.01 U	0.22 U	0.11 U	0.01 U	0.052 U	0.052 U	0.021 U	0.01 U	0.01 U
4-Nitroaniline	0.67 U	0.066 U	0.066 U	0.14 U	0.068 U	0.013 U	0.27 U	0.14 U	0.013 U	0.066 U	0.066 U	0.026 U	0.013 U	0.013 U
4-Nitrophenol	8.5 U	0.84 U	0.84 U	1.8 U	0.86 U	0.17 U	3.5 U	1.7 UJ	0.17 U	0.83 U	0.84 U	0.33 U	0.17 U	0.17 U
Acenaphthene	15 J	2.6	3.1	2.2 J	0.74 J	0.064 J	3.7 J	3 J	0.09 J	0.82 J	0.72 J	0.49 J	0.097 J	0.021 J
Acenaphthylene	0.46 U	0.048 J	0.045 U	0.097 U	0.046 U	0.0088 U	0.19 U	0.094 U	0.0089 U	0.045 U	0.045 U	0.018 U	0.0088 U	0.009 U
Acetophenone	0.39 U	0.038 U	0.038 U	0.082 U	0.039 U	0.0075 U	0.16 U	0.079 U	0.0076 U	0.038 U	0.038 U	0.015 U	0.0075 U	0.0076 U
Anthracene	22	4.6	4.6	9.5	1.9	0.2 J	7.6	7.6	0.033 U	1.4 J	1.3 J	0.93	0.22 J	0.033 U
Atrazine	0.79 U	0.078 U	0.077 U	0.17 U	0.079 U	0.015 U	0.32 U	0.16 U	0.015 U	0.077 U	0.077 U	0.031 U	0.015 U	0.015 U
Benzaldehyde	1.4 U	0.13 U	0.13 U	0.29 U	0.14 U	0.026 U	0.55 U	0.28 U	0.026 U	0.13 U	0.13 U	0.053 U	0.026 U	0.027 U
Benzo(A)Anthracene	110	19	19	21	7.5	0.81	46	40	0.092	8.2	8	5.6	1.6	0.22
Benzo(A)Pyrene	130	24	23	24	8.6	0.97	42	34	0.091	11	10	7.6	2	0.27
Benzo(B)Fluoranthene	150	26	25	31	11	1.3	62	48	0.13	14	14	10	2.8	0.34
Benzo(G,H,I)Perylene	99	23	26 J+	20	7	0.83 J+	33	24 J+	0.06 J	19 J+	17 J+	11 J+	2.1	0.24 J
Benzo(K)Fluoranthene	68	12	12	13	4.4	0.43	23	17	0.054	5	4.9	3.3	1	0.16
Benzyl Butyl Phthalate	0.55 U	0.054 U	0.054 U	0.12 U	0.055 U	0.011 U	0.22 U	0.11 U	0.011 U	0.31 J	0.22 J	0.061 J	0.011 U	0.011 U
Biphenyl (Diphenyl)	1.5 U	0.15 U	0.15 U	0.32 U	0.15 U	0.029 U	0.62 U	0.31 U	0.054 J	0.15 U	0.15 U	0.059 U	0.029 U	0.03 U
Bis(2-Chloroethoxy) Methane	0.55 U	0.055 U	0.054 U	0.12 U	0.056 U	0.011 U	0.23 U	0.11 U	0.011 U	0.054 U	0.054 U	0.021 U	0.011 U	0.011 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.42 U	0.041 U	0.041 U	0.089 U	0.042 U	0.0081 U	0.17 U	0.086 U	0.0082 U	0.041 U	0.041 U	0.016 U	0.0081 U	0.0082 U
Bis(2-Chloroisopropyl) Ether	0.73 U	0.072 U	0.072 U	0.15 U	0.073 U	0.014 U	0.3 U	0.15 UJ	0.014 U	0.071 U	0.071 U	0.028 U	0.014 U	0.014 U
Bis(2-Ethylhexyl) Phthalate	0.69 U	0.068 U	0.068 U	0.15 U	0.07 U	0.013 U	0.28 U	0.14 U	0.014 U	0.26 J	0.068 U	0.027 U	0.013 U	0.014 U
Caprolactam	1.3 U	0.13 U	0.13 UJ	0.27 U	0.13 U	0.025 UJ	0.52 U	0.26 U	0.025 U	0.12 UJ	0.13 UJ	0.05 U	0.025 U	0.025 U
Carbazole	17 J	3	3.4	6.5	1.5 J	0.16 J	6.8 J	7.3	0.01 J	1.2 J	1.1 J	0.81	0.22 J	0.025 J
Chrysene	130	25	24	28	10	1.1	57	50	0.11 J	10	10	7.3	2.1	0.27 J
Dibenz(A,H)Anthracene	28	4 J+	6.2 J+	5.4	1.9	0.21 J+	8.3 J+	7 J+	0.018 U	3.1 J+	3.4 J+	2.3 J+	0.52 J+	0.054 J+
Dibenzofuran	4.8 J	1 J	1.1 J	0.88 J	0.26 J	0.025 J	1.5 J	1.2 J	0.068 J	0.37 J	0.34 J	0.22 J	0.041 J	0.011 U

Table E-2
Summary of Data Used in Risk Assessment
Main Plant Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-040	CFSB-040	CFSB-040	CFSB-042	CFSB-042	CFSB-042	CFSB-044	CFSB-044	CFSB-044	CFSB-045	CFSB-045	CFSB-045	CFSB-046	CFSB-046
Sample Lab IDs	460-114275-10	460-114275-11	460-114275-12	460-114275-7	460-114275-8	460-114275-9	460-114141-46	460-114141-47	460-114141-48	460-114275-27	460-114275-28	460-114275-29	460-114141-44	460-114141-45
Sample Name	CFSB-040-SO-0-0.5	CFSB-040-SO-0.5-2	CFSB-040-SO-10-12	CFSB-042-SO-0-0.5	CFSB-042-SO-0.5-2	CFSB-042-SO-10-12	CFSB-044-SO-0-0.5	CFSB-044-SO-0.5-2.0	CFSB-044-SO-10-12	CFSB-045-SO-0-0.5	CFSB-045-SO-0.5-2	CFSB-045-SO-10-12	CFSB-046-SO-0-0.5	CFSB-046-SO-0.5-2.0
Sample Depth	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft
Chemical	5/20/2016	5/20/2016	5/20/2016	5/20/2016	5/20/2016	5/20/2016	5/20/2016	5/20/2016	5/20/2016	5/21/2016	5/21/2016	5/21/2016	5/20/2016	5/20/2016
Diethyl Phthalate	0.5 U	0.05 U	0.05 U	0.11 U	0.051 U	0.0098 U	0.21 U	0.1 U	0.0099 U	0.049 U	0.049 U	0.02 U	0.0098 U	0.0099 U
Dimethyl Phthalate	0.52 U	0.051 U	0.051 U	0.11 U	0.052 U	0.01 U	0.21 U	0.11 U	0.01 U	0.05 U	0.05 U	0.02 U	0.01 U	0.01 U
Di-N-Butyl Phthalate	0.53 U	0.052 U	0.052 U	0.11 U	0.054 U	0.01 U	0.22 U	0.11 U	0.01 U	0.052 U	0.052 U	0.021 U	0.01 U	0.01 U
Di-N-Octylphthalate	0.9 U	0.089 U	0.089 U	0.19 U	0.091 U	0.017 U	0.37 U	0.18 U	0.018 U	0.088 U	0.088 U	0.035 U	0.017 U	0.018 U
Fluoranthene	170	35	38	46	14	1.7	75	87	0.12 J	14	13	11	2.3	0.28 J
Fluorene	10 J	2	2.3	1.9 J	0.5 J	0.051 J	2.2 J	1.6 J	0.043 J	0.62 J	0.52 J	0.37 J	0.074 J	0.014 J
Hexachlorobenzene	0.72 U	0.071 U	0.071 U	0.15 U	0.072 U	0.014 U	0.29 U	0.15 U	0.014 U	0.07 U	0.07 U	0.028 U	0.014 U	0.014 U
Hexachlorobutadiene	0.5 U	0.049 U	0.049 U	0.11 U	0.05 U	0.0097 U	0.2 U	0.1 U	0.0098 U	0.049 U	0.049 U	0.019 U	0.0097 U	0.0098 U
Hexachlorocyclopentadiene	1.1 U	0.11 U	0.11 U	0.23 U	0.11 U	0.021 U	0.45 U	0.23 U	0.022 U	0.11 U	0.11 U	0.043 U	0.021 U	0.022 U
Hexachloroethane	0.65 U	0.064 U	0.064 U	0.14 U	0.065 U	0.013 U	0.26 U	0.13 U	0.013 U	0.063 U	0.064 U	0.025 U	0.013 U	0.013 U
Indeno(1,2,3-C,D)Pyrene	100 J+	25 J+	25 J+	21 J+	7.1 J+	0.82 J+	37 J+	29 J+	0.06 J+	16 J+	15 J+	10 J+	2 J+	0.26 J+
Isophorone	0.38 U	0.038 U	0.037 U	0.081 U	0.038 U	0.0074 U	0.16 U	0.078 U	0.0074 U	0.076 J	0.037 U	0.015 U	0.0074 U	0.0075 U
Naphthalene	3 J	0.62 J	1.1 J	0.72 J	0.24 J	0.02 J	4 J	1.9 J	0.61	0.29 J	0.32 J	0.23 J	0.038 J	0.078 J
Nitrobenzene	0.56 U	0.055 U	0.055 U	0.12 U	0.056 U	0.011 U	0.23 U	0.11 U	0.011 U	0.055 U	0.055 U	0.022 U	0.011 U	0.011 U
N-Nitrosodi-N-Propylamine	0.6 UJ	0.059 UJ	0.058 U	0.13 UJ	0.06 UJ	0.012 U	0.24 U	0.12 U	0.012 U	0.058 U	0.058 U	0.023 U	0.012 U	0.012 U
N-Nitrosodiphenylamine	1.6 U	0.16 U	0.16 U	0.34 U	0.16 U	0.031 U	0.66 U	0.33 U	0.031 U	0.16 U	0.16 U	0.063 U	0.031 U	0.032 U
Pentachlorophenol	2.1 U	0.21 U	0.21 U	0.46 U	0.22 U	0.042 U	0.87 U	0.44 U	0.042 U	0.21 U	0.21 U	0.083 U	0.042 U	0.042 U
Phenanthrene	120	27	25	32	9.4	0.95	39	35	0.094 J	6.9	6.6	4.7	1.3	0.18 J
Phenol	0.58 U	0.057 U	0.057 U	0.12 U	0.058 U	0.011 U	0.24 U	0.12 U	0.011 U	0.057 U	0.057 U	0.023 U	0.011 U	0.011 U
Pyrene	220	39	33	57	19	1.6	86	52	0.15 J	12	13	8.8	2.6	0.36
VOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,1,1-Trichloroethane	--	0.001 U	0.00039 U	--	0.00038 U	0.0004 U	--	0.00036 U	0.00046 U	--	0.00035 U	0.00071 U	--	0.00035 U
1,1,2,2-Tetrachloroethane	--	0.00046 U	0.00018 U	--	0.00017 U	0.00018 U	--	0.00016 U	0.00021 U	--	0.00016 U	0.00032 U	--	0.00016 U
1,1,2-Trichloro-1,2,2-Trifluoroethane	--	0.0012 U	0.00046 U	--	0.00045 U	0.00046 U	--	0.00042 U	0.00054 U	--	0.00041 U	0.00082 U	--	0.0004 U
1,1,2-Trichloroethane	--	0.00076 U	0.00029 U	--	0.00028 U	0.00029 U	--	0.00027 U	0.00034 U	--	0.00026 U	0.00052 U	--	0.00026 U
1,1-Dichloroethane	--	0.00092 U	0.00035 U	--	0.00034 U	0.00035 U	--	0.00032 U	0.00041 U	--	0.00032 U	0.00064 U	--	0.00031 U
1,1-Dichloroethene	--	0.0011 U	0.00043 U	--	0.00042 U	0.00043 U	--	0.00039 U	0.0005 U	--	0.00038 U	0.00077 U	--	0.00038 U
1,2,3-Trichlorobenzene	--	0.0003 U	0.00011 U	--	0.00011 U	0.00011 U	--	0.0001 U	0.00013 U	--	0.0001 U	0.00021 U	--	0.0001 U
1,2,4-Trichlorobenzene	--	0.00087 U	0.00033 U	--	0.00032 U	0.00033 U	--	0.00031 U	0.00039 U	--	0.0003 U	0.0006 U	--	0.00029 U
1,2-Dibromo-3-Chloropropane	--	0.0013 U	0.00049 U	--	0.00048 U	0.00049 U	--	0.00045 U	0.00057 U	--	0.00044 U	0.00088 U	--	0.00043 U
1,2-Dibromoethane (Ethylene Dibromide)	--	0.00032 U	0.00012 U	--	0.00012 U	0.00012 U	--	0.00011 U	0.00015 U	--	0.00011 U	0.00022 U	--	0.00011 U
1,2-Dichlorobenzene	--	0.00038 U	0.00015 U	--	0.00014 U	0.00015 U	--	0.00013 U	0.00017 U	--	0.00013 U	0.00026 U	--	0.00013 U
1,2-Dichloroethane	--	0.0003 U	0.00011 U	--	0.00011 U	0.00011 U	--	0.0001 U	0.00013 U	--	0.0001 U	0.00021 U	--	0.0001 U
1,2-Dichloropropane	--	0.00046 U	0.00018 U	--	0.00017 U	0.00018 U	--	0.00016 U	0.00021 U	--	0.00016 U	0.00032 U	--	0.00016 U
1,3-Dichlorobenzene	--	0.00032 U	0.00012 U	--	0.00012 U	0.00012 U	--	0.00011 U	0.00015 U	--	0.00011 U	0.00022 U	--	0.00011 U
1,4-Dichlorobenzene	--	0.00035 U	0.00014 U	--	0.00013 U	0.00014 U	--	0.00012 U	0.00016 U	--	0.00012 U	0.00024 U	--	0.00012 U
2-Hexanone	--	0.0025 U	0.00098 U	--	0.00095 U	0.00098 U	--	0.0009 U	0.0011 U	--	0.00088 U	0.0018 U	--	0.00086 U
Acetone	--	0.046	0.011	--	0.046	0.0082	--	0.06	0.0053 J	--	0.029	0.03	--	0.007
Benzene	--	0.0011 J	0.00035 J	--	0.00024 J	0.00021 U	--	0.00082 J	0.00056 J	--	0.00038 J	0.00048 J	--	0.00018 U
Bromochloromethane	--	0.00046 U	0.00018 U	--	0.00017 U	0.00018 U	--	0.00016 U	0.00021 U	--	0.00016 U	0.00032 U	--	0.00016 U
Bromodichloromethane	--	0.001 U	0.00039 U	--	0.00038 U	0.0004 U	--	0.00036 U	0.00046 U	--	0.00035 U	0.00071 U	--	0.00035 U
Bromoform	--	0.00035 U	0.00014 U	--	0.00013 U	0.00014 U	--	0.00012 U	0.00016 U	--	0.00012 U	0.00024 U	--	0.00012 U
Bromomethane	--	0.00087 U	0.00033 U	--	0.00032 U	0.00033 U	--	0.00031 U	0.00039 U	--	0.0003 UJ	0.0006 UJ	--	0.00029 U
Carbon Disulfide	--	0.0015 J	0.00045 U	--	0.00068 J	0.00045 U	--	0.00041 U	0.00052 U	--	0.0014	0.0024	--	0.00039 U
Carbon Tetrachloride	--	0.0012 U	0.00045 U	--	0.00044 U	0.00045 U	--	0.00041 U	0.00052 U	--	0.0004 U	0.0008 U	--	0.00039 U
Chlorobenzene	--	0.00038 U	0.00015 U	--	0.00014 U	0.00015 U	--	0.00013 U	0.00017 U	--	0.00013 U	0.00026 U	--	0.00013 U
Chloroethane	--	0.00095 U	0.00036 U	--	0.00035 U	0.00036 U	--	0.00033 U	0.00043 U	--	0.00033 U	0.00066 U	--	0.00032 U
Chloroform	--	0.00057 U	0.00022 U	--	0.00021 U	0.00022 U	--	0.0002 U	0.00026 U	--	0.0002 U	0.00039 U	--	0.00019 U
Chloromethane	--	0.001 U	0.00039 U	--	0.00038 U	0.0004 U	--	0.00036 U	0.00046 U	--	0.00035 UJ	0.00071 UJ	--	0.00035 U
Cis-1,2-Dichloroethylene	--	0.0006 U	0.00023 U	--	0.00022 U	0.00023 U	--	0.00021 U	0.00027 U	--	0.00021 U	0.00041 U	--	0.0002 U
Cis-1,3-Dichloropropene	--	0.00041 U	0.00016 U	--	0.00015 U	0.00016 U	--	0.00014 U	0.00018 U	--	0.00014 U	0.00028 U	--	0.00014 U
Cyclohexane	--	0.0015 J	0.00089 J	--	0.00047 U	0.00072 J	--	0.00044 U	0.0018	--	0.00043 U	0.00086 U	--	0.00042 U
Dibromochloromethane	--	0.00041 U	0.00016 U	--	0.00015 U	0.00016 U	--	0.00014 U	0.00018 U	--	0.00014 U	0.00028 U	--	0.00014 U
Dichlorodifluoromethane	--	0.00087 U	0.00033 U	--	0.00032 U	0.00033 U	--	0.00031 U	0.00039 U	--	0.0003 U	0.0006 U	--	0.00029 U
Ethylbenzene	--	0.00094 J	0.00045 J	--	0.00018 U	0.00038 J	--	0.00017 U	0.00068 J	--	0.00017 U	0.00038 J	--	0.00016 U
Isopropylbenzene (Cumene)	--	0.00046 U	0.00018 U	--	0.00017 U	0.00018 U	--	0.00016 U	0.00021 U	--	0.00016 U	0.00032 U	--	0.00016 U
M,P-Xylene	--	0.0024 J	0.0013	--	0.00023 J	0.0011	--	0.0001 U	0.0021	--	0.00039 J	0.0011 J	--	0.0001 U

Table E-2
Summary of Data Used in Risk Assessment
Main Plant Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-040	CFSB-040	CFSB-040	CFSB-042	CFSB-042	CFSB-042	CFSB-044	CFSB-044	CFSB-044	CFSB-045	CFSB-045	CFSB-045	CFSB-046	CFSB-046
Sample Lab IDs	460-114275-10	460-114275-11	460-114275-12	460-114275-7	460-114275-8	460-114275-9	460-114141-46	460-114141-47	460-114141-48	460-114275-27	460-114275-28	460-114275-29	460-114141-44	460-114141-45
Sample Name	CFSB-040-SO-0-0.5	CFSB-040-SO-0.5-2	CFSB-040-SO-10-12	CFSB-042-SO-0-0.5	CFSB-042-SO-0.5-2	CFSB-042-SO-10-12	CFSB-044-SO-0-0.5	CFSB-044-SO-0.5-2.0	CFSB-044-SO-10-12	CFSB-045-SO-0-0.5	CFSB-045-SO-0.5-2	CFSB-045-SO-10-12	CFSB-046-SO-0-0.5	CFSB-046-SO-0.5-2.0
Sample Depth	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft
Chemical	5/20/2016	5/20/2016	5/20/2016	5/20/2016	5/20/2016	5/20/2016	5/20/2016	5/20/2016	5/20/2016	5/21/2016	5/21/2016	5/21/2016	5/20/2016	5/20/2016
Methyl Acetate	--	0.0024 U	0.00094 U	--	0.00091 U	0.00094 U	--	0.0022 J	0.0011 U	--	0.00084 U	0.0017 U	--	0.00082 U
Methyl Ethyl Ketone (2-Butanone)	--	0.0021 U	0.0008 U	--	0.0017 J	0.0008 U	--	0.00073 U	0.00094 U	--	0.0017 J	0.0034 J	--	0.0007 U
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	--	0.006 U	0.0023 U	--	0.0022 U	0.0023 U	--	0.0021 U	0.0027 U	--	0.0021 U	0.0042 U	--	0.002 U
Methylcyclohexane	--	0.0024 J	0.0018	--	0.00051 U	0.0013	--	0.00048 U	0.0034	--	0.00057 J	0.0013 J	--	0.00046 U
Methylene Chloride	--	0.00087 U	0.00033 U	--	0.00032 U	0.00033 U	--	0.00031 U	0.00039 U	--	0.0003 U	0.00082 J	--	0.00029 U
O-Xylene (1,2-Dimethylbenzene)	--	0.0011 J	0.00046 J	--	0.00016 U	0.00037 J	--	0.00015 U	0.00068 J	--	0.00016 J	0.00046 J	--	0.00015 U
Styrene	--	0.00041 U	0.00016 U	--	0.00015 U	0.00016 U	--	0.00014 U	0.00018 U	--	0.00014 U	0.00028 U	--	0.00014 U
Tert-Butyl Methyl Ether	--	0.00046 U	0.00018 U	--	0.00017 U	0.00018 U	--	0.00016 U	0.00021 U	--	0.00016 U	0.00032 U	--	0.00016 U
Tetrachloroethylene (PCE)	--	0.00076 U	0.00029 U	--	0.00028 U	0.00029 U	--	0.00027 U	0.00034 U	--	0.00026 U	0.00052 U	--	0.00026 U
Toluene	--	0.0037	0.0018	--	0.00066 J	0.0017	--	0.00068 J	0.0028	--	0.00068 J	0.0018 J	--	0.00017 U
Trans-1,2-Dichloroethene	--	0.0011 U	0.00041 U	--	0.0004 U	0.00041 U	--	0.00037 U	0.00047 U	--	0.00036 U	0.00073 U	--	0.00036 U
Trans-1,3-Dichloropropene	--	0.00027 U	0.0001 U	--	0.0001 U	0.0001 U	--	0.000095 U	0.00012 U	--	0.000093 U	0.00019 U	--	0.000091 U
Trichloroethylene (TCE)	--	0.0007 U	0.00027 U	--	0.00026 U	0.00027 U	--	0.00025 U	0.00032 U	--	0.00024 U	0.00049 U	--	0.00024 U
Trichlorofluoromethane	--	0.00092 U	0.00035 U	--	0.00034 U	0.00035 U	--	0.00032 U	0.00041 U	--	0.00032 U	0.00064 U	--	0.00031 U
Vinyl Chloride	--	0.0011 U	0.00041 U	--	0.0004 U	0.00041 U	--	0.00037 U	0.00047 U	--	0.00036 U	0.00073 U	--	0.00036 U

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-2
Summary of Data Used in Risk Assessment
Main Plant Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-046	CFSB-048	CFSB-048	CFSB-048	CFSB-049	CFSB-049	CFSB-050	CFSB-050	CFSB-050	CFSB-051	CFSB-051	CFSB-051	CFSB-052	CFSB-052
Sample Lab IDs	460-114275-15	460-114141-49	460-114141-50	460-114141-51	460-114793-34	460-114793-32	460-114275-24	460-114275-25	460-114275-26	460-114275-16	460-114275-17	460-114275-18	460-114275-13	460-114275-14
Sample Name	CFSB-046-SO-10-12	CFSB-048-SO-0-0.5	CFSB-048-SO-0.5-2.0	CFSB-048-SO-10-12	CFSB-049-SO-0.5-2	CFSB-049-SO-10-12	CFSB-050-SO-0-0.5	CFSB-050-SO-0.5-2	CFSB-050-SO-10-12	CFSB-051-SO-0-0.5	CFSB-051-SO-0.5-2	CFSB-051-SO-10-12	CFSB-052-SO-0.5-2	CFSB-052-SO-10-12
Sample Depth	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0.5-2 ft	10-12 ft
Chemical	5/20/2016	5/20/2016	5/20/2016	5/20/2016	5/28/2016	5/28/2016	5/21/2016	5/21/2016	5/21/2016	5/21/2016	5/21/2016	5/21/2016	5/20/2016	5/20/2016
GENERAL CHEMISTRY (mg/kg)														
Fluoride	10.7 J-	109 J-	57.7 J-	18.6 J-	23.3 J	4.48 J	126	165	23.4	77 J-	73 J-	81.1 J-	1.55 J-	4.16 J-
Cyanide	0.017 U	0.16	0.066 J	0.017 U	0.037 J-	0.016 UJ	0.048 J	0.11	0.017 U	0.026 J	0.052 J	0.025 J	0.091 J	0.029 J
METALS (mg/kg)														
"Chromium, Hexavalent - Estimated"	0.323844	0.240876	0.243552	0.227494	0.192701	0.208759	0.20073	0.53528	0.208759	0.746715	0.623601	0.289051	0.452311	0.254258
"Chromium, Trivalent - Calculated"	--	--	--	--	--	--	--	--	--	--	--	--	--	--
"Chromium, Trivalent - Estimated"	11.7762	8.75912	8.85645	8.27251	7.0073	7.59124	7.29927	19.4647	7.59124	27.1533	22.6764	10.5109	16.4477	9.24574
Aluminum	6720	12700	10700	6820	7140	6030	6780 J	15200 J	5900 J	7960	7450	7430	9000	6620
Antimony	0.37 UJ	0.46 UJ	0.45 UJ	0.42 UJ	0.4 U	0.4 U	0.44 UJ	0.45 UJ	0.37 UJ	0.44 UJ	0.44 UJ	0.43 UJ	0.4 UJ	0.39 UJ
Arsenic	3.5 J	4.3	3.9	3.3	4.3	3.4	2.7	3.4 J	3 J	4.5 J	4.4 J	6 J	4.1 J	4.9 J
Barium	44.4	78.5 J+	123 J+	39.1 J+	65.3	44.3	54.3	208	42.7	72.7	72.6	65.4	104	82.3
Beryllium	0.3 J	0.56	0.49	0.38 J	0.27 J	0.21 J	0.26 J	0.5	0.23 J	0.3 J	0.32 J	0.33 J	0.33 J	0.35 J
Cadmium	0.28 U	0.35 U	0.34 U	0.32 U	0.31 U	0.3 U	0.34 U	0.34 U	0.28 U	0.33 U	0.33 U	0.32 U	0.31 U	0.29 U
Calcium	36000 J	17300	19700	33900	32500	41400	12400 J	16300 J	28500 J	31000 J	13100 J	43200 J	81500 J	30900 J
Chromium, Total	12.1	9	9.1	8.5	7.2	7.8	7.5 J	20 J	7.8 J	27.9	23.3	10.8	16.9	9.5
Cobalt	4.3	4.8	5.3	4.5	3.9	3.9	3.7	6.1	4.3	5.1	4.8	5.4	9.6	5
Copper	11.9 J+	15.5	15.1	9.8	9.6	8.3	14.7 J	30.8 J	13.5 J	13.1 J+	15.2 J+	14.1 J+	18 J+	12.8 J+
Iron	12200	11400	13300	12300	11100	10600	9380 J	16000 J	11200 J	13500	12400	12600	12600	13800
Lead	6.6 J	16.2	10.2	4.9	5.9	5.8	22 J	27.1 J	3.9 J	39.4 J	26.7 J	10.8 J	8.7 J	5.9 J
Magnesium	11400 J	8960	7660	10600	8200	11300	6350 J	6110 J	9540 J	8550 J	7230 J	9730 J	8860 J	10900 J
Manganese	314	301	438	295	376	265	261	630	324	374	369	377	402	359
Mercury	0.014 J	0.021	0.018	0.012 U	0.022	0.012 J	0.019	0.018	0.012 J	0.015 J	0.043	0.021	0.012 U	0.014 J
Nickel	9.4 J+	31.4	18.4	9.3	7.7	8	11.8 J	18 J	9.2 J	13.4 J+	10.4 J+	10.9 J+	9.3 J+	9.5 J+
Potassium	543 J	783	658	637	477	442	552	808 J	559 J	700 J	702 J	696 J	1390 J	629 J
Selenium	0.35 U	0.43 U	0.46 J	0.39 U	0.38 U	0.37 U	0.42 U	0.42 U	0.34 U	0.41 U	0.41 U	0.4 U	0.38 U	0.36 U
Silver	0.68 U	0.96 J	0.82 U	0.76 U	0.74 U	0.73 U	0.81 U	0.82 U	0.67 U	0.8 U	0.8 U	0.78 U	0.74 U	0.71 U
Sodium	34.8 U	124	92.8 J	58.5 J	37.7 U	37.1 U	68.1 J	226	37.4 J	197	132	90.9 J	214	58.4 J
Thallium	0.14 U	0.17 U	0.17 U	0.16 U	0.15 U	0.15 U	0.17 U	0.17 U	0.14 U	0.16 U	0.16 U	0.16 U	0.15 U	0.15 U
Vanadium	7.8	15.8	13.5	9.3	6.7	5.4	9 J	13.6 J	7 J	12	9.6	7.1	8.9	8.4
Zinc	30.3 J	50.1	62.2	32.1	27.4	27.1	63.8 J	66 J	28.9 J	81.6 J	86.1 J	44.7 J	145	36.7
METALS|HEXAVALENT CHROMIUM (mg/kg)														
Chromium, Hexavalent	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PESTICIDES (mg/kg)														
Aldrin	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Alpha Bhc (Alpha Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Alpha Endosulfan	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Beta Bhc (Beta Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Beta Endosulfan	--	--	--	--	--	--	--	--	--	--	--	--	--	--
cis-Chlordane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Delta BHC (Delta Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dieldrin	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endosulfan Sulfate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin Aldehyde	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin Ketone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Gamma Bhc (Lindane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Heptachlor	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Heptachlor Epoxide	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methoxychlor	--	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDD	--	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDT	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Toxaphene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
trans-Chlordane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
POLYCHLORINATED BIPHENYLS (mg/kg)														
PCB-1016 (Aroclor 1016)	0.0094 U	0.01 U	0.0099 U	0.0096 U	0.0096 U	0.0092 U	0.0099 U	0.01 U	0.0093 U	0.0095 U	0.0095 U	0.0094 U	0.0093 U	0.0094 U
PCB-1221 (Aroclor 1221)	0.0094 U	0.01 U	0.0099 U	0.0096 U	0.0096 U	0.0092 U	0.0099 U	0.01 U	0.0093 U	0.0095 U	0.0095 U	0.0094 U	0.0093 U	0.0094 U

Table E-2
Summary of Data Used in Risk Assessment
Main Plant Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-046	CFSB-048	CFSB-048	CFSB-048	CFSB-049	CFSB-049	CFSB-050	CFSB-050	CFSB-050	CFSB-051	CFSB-051	CFSB-051	CFSB-052	CFSB-052
Sample Lab IDs	460-114275-15	460-114141-49	460-114141-50	460-114141-51	460-114793-34	460-114793-32	460-114275-24	460-114275-25	460-114275-26	460-114275-16	460-114275-17	460-114275-18	460-114275-13	460-114275-14
Sample Name	CFSB-046-SO-10-12	CFSB-048-SO-0-0.5	CFSB-048-SO-0.5-2.0	CFSB-048-SO-10-12	CFSB-049-SO-0.5-2	CFSB-049-SO-10-12	CFSB-050-SO-0-0.5	CFSB-050-SO-0.5-2	CFSB-050-SO-10-12	CFSB-051-SO-0-0.5	CFSB-051-SO-0.5-2	CFSB-051-SO-10-12	CFSB-052-SO-0.5-2	CFSB-052-SO-10-12
Sample Depth	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0.5-2 ft	10-12 ft
Chemical	5/20/2016	5/20/2016	5/20/2016	5/20/2016	5/28/2016	5/28/2016	5/21/2016	5/21/2016	5/21/2016	5/21/2016	5/21/2016	5/21/2016	5/20/2016	5/20/2016
PCB-1232 (Aroclor 1232)	0.0094 U	0.01 U	0.0099 U	0.0096 U	0.0096 U	0.0092 U	0.0099 U	0.01 U	0.0093 U	0.0095 U	0.0095 U	0.0094 U	0.0093 U	0.0094 U
PCB-1242 (Aroclor 1242)	0.0094 U	0.01 U	0.0099 U	0.0096 U	0.0096 U	0.0092 U	0.0099 U	0.01 U	0.0093 U	0.0095 U	0.0095 U	0.0094 U	0.0093 U	0.0094 U
PCB-1248 (Aroclor 1248)	0.0094 U	0.01 U	0.0099 U	0.0096 U	0.0096 U	0.0092 U	0.0099 U	0.01 U	0.0093 U	0.0095 U	0.0095 U	0.0094 U	0.0093 U	0.0094 U
PCB-1254 (Aroclor 1254)	0.0097 U	0.011 U	0.01 U	0.0099 U	0.0099 U	0.0095 U	0.01 U	0.01 U	0.0096 U	0.0098 U	0.0098 U	0.0097 U	0.0096 U	0.0097 U
PCB-1260 (Aroclor 1260)	0.0097 U	0.011 U	0.01 U	0.0099 U	0.0099 U	0.0095 U	0.01 U	0.01 U	0.0096 U	0.0098 U	0.0098 U	0.0097 U	0.0096 U	0.0097 U
PCB-1262 (Aroclor 1262)	0.0097 U	0.011 U	0.01 U	0.0099 U	0.0099 U	0.0095 U	0.01 U	0.01 U	0.0096 U	0.0098 U	0.0098 U	0.0097 U	0.0096 U	0.0097 U
PCB-1268 (Aroclor 1268)	0.0097 U	0.011 U	0.01 U	0.0099 U	0.0099 U	0.0095 U	0.01 U	0.01 U	0.0096 U	0.0098 U	0.0098 U	0.0097 U	0.0096 U	0.0097 U
Polychlorinated Biphenyl (PCBs)	0.0097 U	0.011 U	0.01 U	0.0099 U	0.0099 U	0.0095 U	0.01 U	0.01 U	0.0096 U	0.0098 U	0.0098 U	0.0097 U	0.0096 U	0.0097 U
SEMIVOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,2,4,5-Tetrachlorobenzene	0.026 U	0.28 U	0.027 U	0.026 U	0.026 UJ	0.025 UJ	0.027 U	0.028 U	0.026 U	0.026 U	0.026 U	0.026 U	0.026 U	0.026 U
1,4-Dioxane (P-Dioxane)	0.094 U	1 U	0.098 U	0.095 U	0.095 UJ	0.091 UJ	0.098 U	0.1 U	0.092 U	0.094 U	0.094 U	0.094 U	0.093 U	0.093 U
2,3,4,6-Tetrachlorophenol	0.033 U	0.36 U	0.035 U	0.033 U	0.033 UJ	0.032 UJ	0.035 U	0.035 U	0.033 U	0.033 U	0.033 U	0.033 U	0.033 UR	0.033 U
2,4,5-Trichlorophenol	0.035 U	0.38 U	0.037 U	0.035 U	0.035 UJ	0.034 UJ	0.037 U	0.037 U	0.034 U	0.035 U	0.035 U	0.035 U	0.034 UR	0.035 U
2,4,6-Trichlorophenol	0.01 U	0.11 U	0.01 U	0.01 U	0.01 UJ	0.0097 UJ	0.01 U	0.011 U	0.0098 U	0.01 U	0.01 U	0.01 U	0.0098 UR	0.0099 U
2,4-Dichlorophenol	0.0083 U	0.09 U	0.0087 U	0.0084 U	0.0084 UJ	0.008 UJ	0.0087 U	0.0088 U	0.0082 U	0.0083 U	0.0083 U	0.0083 U	0.0082 UR	0.0082 U
2,4-Dimethylphenol	0.077 U	0.84 U	0.081 U	0.078 U	0.078 UJ	0.075 UJ	0.081 U	0.082 U	0.076 U	0.078 U	0.078 U	0.077 U	0.076 UR	0.077 U
2,4-Dinitrophenol	0.26 U	2.9 U	0.28 U	0.27 U	0.27 UJ	0.26 UJ	0.28 U	0.28 U	0.26 U	0.27 U	0.27 U	0.26 U	0.26 UR	0.26 U
2,4-Dinitrotoluene	0.014 U	0.15 U	0.015 U	0.014 U	0.014 UJ	0.014 UJ	0.015 U	0.015 U	0.014 U	0.014 U	0.014 U	0.014 U	0.014 U	0.014 U
2,6-Dinitrotoluene	0.019 U	0.2 U	0.02 U	0.019 U	0.019 UJ	0.018 UJ	0.02 U	0.02 U	0.018 U	0.019 U	0.019 U	0.019 U	0.018 U	0.019 U
2-Chloronaphthalene	0.0079 U	0.087 U	0.0083 U	0.008 U	0.0081 UJ	0.0077 UJ	0.0083 U	0.0085 U	0.0078 U	0.008 U	0.008 U	0.0079 U	0.0079 U	0.0079 U
2-Chlorophenol	0.0089 U	0.097 U	0.0093 U	0.009 U	0.009 UJ	0.0087 UJ	0.0093 U	0.0095 U	0.0088 U	0.009 U	0.009 U	0.0089 U	0.0088 UR	0.0089 U
2-Methylnaphthalene	0.0077 U	0.26 J	0.39	0.19 J	0.0079 UJ	0.0075 UJ	0.1 J	0.0083 U	0.0076 U	0.027 J	0.028 J	0.0077 U	0.0076 U	0.0077 U
2-Methylphenol (O-Cresol)	0.015 U	0.17 U	0.016 U	0.015 U	0.016 UJ	0.015 UJ	0.016 U	0.016 U	0.015 U	0.015 U	0.015 U	0.015 U	0.015 UR	0.015 U
2-Nitroaniline	0.012 U	0.13 U	0.012 U	0.012 U	0.012 UJ	0.011 UJ	0.012 U	0.012 U	0.011 U	0.012 U	0.012 U	0.012 U	0.011 U	0.011 U
2-Nitrophenol	0.012 U	0.13 U	0.012 U	0.012 U	0.012 UJ	0.011 UJ	0.012 U	0.013 U	0.012 U	0.012 U	0.012 U	0.012 U	0.012 UR	0.012 U
3- And 4- Methylphenol (Total)	0.0093 U	0.1 U	0.0098 U	0.0094 U	0.0095 UJ	0.0091 UJ	0.0098 U	0.011 J	0.0092 U	0.0094 U	0.0094 U	0.0093 U	0.0092 UR	0.0093 U
3,3'-Dichlorobenzidine	0.039 U	0.43 U	0.041 U	0.04 U	0.04 UJ	0.038 UJ	0.041 U	0.042 U	0.039 U	0.039 U	0.039 U	0.039 U	0.039 U	0.039 U
3-Nitroaniline	0.01 U	0.11 U	0.011 U	0.011 U	0.011 UJ	0.01 UJ	0.011 U	0.011 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
4,6-Dinitro-2-Methylphenol	0.093 U	1 U	0.098 U	0.095 U	0.095 UJ	0.091 UJ	0.098 U	0.1 U	0.092 U	0.094 U	0.094 U	0.093 U	0.092 UR	0.093 U
4-Bromophenyl Phenyl Ether	0.011 U	0.12 U	0.012 U	0.011 U	0.011 UJ	0.011 UJ	0.012 U	0.012 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U
4-Chloro-3-Methylphenol	0.015 U	0.16 U	0.016 U	0.015 U	0.015 UJ	0.015 UJ	0.016 U	0.016 U	0.015 U	0.015 U	0.015 U	0.015 U	0.015 UR	0.015 U
4-Chloroaniline	0.009 U	0.098 U	0.0095 U	0.0091 U	0.0092 UJ	0.0088 UJ	0.0095 U	0.0096 U	0.0089 U	0.0091 U	0.0091 U	0.009 U	0.0089 U	0.009 U
4-Chlorophenyl Phenyl Ether	0.01 U	0.11 U	0.011 U	0.011 U	0.011 UJ	0.01 UJ	0.011 U	0.011 U	0.01 U	0.011 U	0.011 U	0.01 U	0.01 U	0.01 U
4-Nitroaniline	0.013 U	0.14 U	0.014 U	0.013 U	0.013 UJ	0.013 UJ	0.014 U	0.014 U	0.013 U	0.013 U	0.013 U	0.013 U	0.013 U	0.013 U
4-Nitrophenol	0.17 U	1.8 U	0.18 UJ	0.17 U	0.17 UJ	0.16 UJ	0.18 U	0.18 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 UR	0.17 U
Acenaphthene	0.0085 U	1.6 J	0.25 J	0.062 J	0.0086 UJ	0.0082 UJ	0.58	0.021 J	0.011 J	0.21 J	0.15 J	0.051 J	0.017 J	0.011 J
Acenaphthylene	0.009 U	0.098 U	0.0095 U	0.0091 U	0.0092 UJ	0.0088 UJ	0.0095 U	0.0096 U	0.0089 U	0.0091 U	0.0091 U	0.009 U	0.0089 U	0.009 U
Acetophenone	0.0076 U	0.083 U	0.008 U	0.0077 U	0.0078 UJ	0.0074 UJ	0.008 U	0.0082 U	0.0075 U	0.0077 U	0.0077 U	0.0077 J	0.0075 U	0.0076 U
Anthracene	0.033 U	4.2	0.36 J	0.034 U	0.034 UJ	0.032 UJ	0.9	0.044 J	0.033 U	0.47	0.34 J	0.14 J	0.033 U	0.033 U
Atrazine	0.016 U	0.17 U	0.016 U	0.016 U	0.016 UJ	0.015 UJ	0.016 U	0.017 U	0.015 U	0.016 U	0.016 U	0.016 U	0.015 U	0.015 U
Benzaldehyde	0.027 U	0.29 U	0.028 U	0.027 U	0.027 UJ	0.026 UJ	0.028 U	0.029 U	0.026 U	0.027 U	0.027 U	0.027 U	0.026 U	0.027 U
Benzo(A)Anthracene	0.14	29	2.6	0.031 J	0.03 UJ	0.028 UJ	3.3	0.25	0.1	3.4	2.2	1.1	0.34	0.14
Benzo(A)Pyrene	0.15	37	3.3	0.029 J	0.024 J-	0.01 UJ	4.6	0.3	0.13	3.6	2.3	1.1	0.33	0.14
Benzo(B)Fluoranthene	0.22	47	3.8	0.037	0.033 J-	0.013 UJ	5.3	0.43	0.18	5.4	3.6	1.8	0.42	0.17
Benzo(G,H,I)Perylene	0.15 J+	35 J+	3.2 J+	0.029 J	0.028 J-	0.02 UJ	4.5	0.25 J	0.086 J	3.5 J+	2.2 J+	1.1 J+	0.3 J+	0.12 J+
Benzo(K)Fluoranthene	0.092	17	1.7	0.018 J	0.016 UJ	0.015 UJ	2.2	0.21	0.08	2	1.2	0.59	0.18	0.074
Benzyl Butyl Phthalate	0.011 U	0.12 U	0.011 U	0.011 U	0.011 UJ	0.011 UJ	3.3	1.9	6.3	0.098 J	0.03 J	0.056 J	0.011 U	0.011 U
Biphenyl (Diphenyl)	0.03 U	0.33 U	0.077 J	0.033 J	0.03 UJ	0.029 UJ	0.034 J	0.032 U	0.029 U	0.03 U	0.03 U	0.03 U	0.03 U	0.03 U
Bis(2-Chloroethoxy) Methane	0.011 U	0.12 U	0.011 U	0.011 U	0.011 UJ	0.011 UJ	0.011 U	0.012 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.0083 U	0.09 U	0.0087 U	0.0084 U	0.0084 UJ	0.008 UJ	0.0087 U	0.0088 U	0.0082 U	0.0083 U	0.0083 U	0.0083 U	0.0082 U	0.0082 U
Bis(2-Chloroisopropyl) Ether	0.014 U	0.16 U	0.015 UJ	0.015 U	0.015 UJ	0.014 UJ	0.015 U	0.015 U	0.014 U	0.015 U	0.015 U	0.014 U	0.014 U	0.014 U
Bis(2-Ethylhexyl) Phthalate	0.014 U	0.15 U	0.014 U	0.014 U	0.014 UJ	0.013 UJ	0.014 U	0.015 U	0.062 J	0.096 J	0.087 J	0.051 J	0.014 U	0.014 U
Caprolactam	0.025 UJ	0.27 U	0.026 U	0.026 U	0.026 UJ	0.025 UJ	0.026 U	0.027 U	0.025 UJ	0.025 UJ	0.025 UJ	0.025 UJ	0.025 UJ	0.025 UJ
Carbazole	0.019 J	3.2 J	0.27 J	0.0088 U	0.0088 UJ	0.0085 UJ	0.65	0.036 J	0.015 J	0.4	0.3 J	0.11 J	0.064 J	0.028 J
Chrysene	0.18 J	34	3.1	0.027 J	0.045 J-	0.015 J-	3.8	0.33 J	0.13 J	4.4	3	1.4	0.42	0.17 J
Dibenz(A,H)Anthracene	0.044 J+	8.6 J+	0.85 J+	0.018 U	0.019 UJ	0.018 UJ	1.2	0.07	0.021 J	0.95 J+	0.57 J+	0.31 J+	0.071 J+	0.035 J+
Dibenzofuran	0.011 U	0.48 J	0.11 J	0.036 J	0.011 UJ	0.01 UJ	0.3 J	0.011 U	0.01 U	0.085 J	0.067 J	0.021 J	0.016 J	0.011 U

Table E-2
Summary of Data Used in Risk Assessment
Main Plant Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-046	CFSB-048	CFSB-048	CFSB-048	CFSB-049	CFSB-049	CFSB-050	CFSB-050	CFSB-050	CFSB-051	CFSB-051	CFSB-051	CFSB-052	CFSB-052
Sample Lab IDs	460-114275-15	460-114141-49	460-114141-50	460-114141-51	460-114793-34	460-114793-32	460-114275-24	460-114275-25	460-114275-26	460-114275-16	460-114275-17	460-114275-18	460-114275-13	460-114275-14
Sample Name	CFSB-046-SO-10-12	CFSB-048-SO-0-0.5	CFSB-048-SO-0.5-2.0	CFSB-048-SO-10-12	CFSB-049-SO-0.5-2	CFSB-049-SO-10-12	CFSB-050-SO-0-0.5	CFSB-050-SO-0.5-2	CFSB-050-SO-10-12	CFSB-051-SO-0-0.5	CFSB-051-SO-0.5-2	CFSB-051-SO-10-12	CFSB-052-SO-0.5-2	CFSB-052-SO-10-12
Sample Depth	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0.5-2 ft	10-12 ft
Chemical	5/20/2016	5/20/2016	5/20/2016	5/20/2016	5/28/2016	5/28/2016	5/21/2016	5/21/2016	5/21/2016	5/21/2016	5/21/2016	5/21/2016	5/20/2016	5/20/2016
Diethyl Phthalate	0.01 U	0.11 U	0.01 U	0.01 U	0.01 UJ	0.0097 UJ	0.01 U	0.011 U	0.0098 U	0.01 U	0.01 U	0.01 U	0.0098 U	0.0099 U
Dimethyl Phthalate	0.01 U	0.11 U	0.011 U	0.01 U	0.01 UJ	0.0099 UJ	0.011 U	0.011 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Di-N-Butyl Phthalate	0.01 U	0.11 U	0.011 U	0.011 U	0.011 UJ	0.01 UJ	0.08 J	0.19 J	0.66	0.014 J	0.011 U	0.01 U	0.01 U	0.01 U
Di-N-Octylphthalate	0.018 U	0.19 U	0.019 U	0.018 U	0.018 UJ	0.017 UJ	0.019 U	0.019 U	0.018 U	0.018 U	0.018 U	0.018 U	0.018 U	0.018 U
Fluoranthene	0.21 J	36	4	0.029 J	0.025 J-	0.01 UJ	5.5	0.43	0.18 J	5.4	4	1.7	1.2	0.4
Fluorene	0.0076 U	0.88 J	0.11 J	0.022 J	0.0078 UJ	0.0074 UJ	0.46	0.017 J	0.0089 J	0.14 J	0.12 J	0.036 J	0.009 J	0.0087 J
Hexachlorobenzene	0.014 U	0.15 U	0.015 U	0.014 U	0.014 UJ	0.014 UJ	0.015 U	0.015 U	0.014 U	0.014 U	0.014 U	0.014 U	0.014 U	0.014 U
Hexachlorobutadiene	0.0099 U	0.11 U	0.01 U	0.01 U	0.01 UJ	0.0096 UJ	0.01 U	0.011 U	0.0097 U	0.0099 U	0.0099 U	0.0098 U	0.0097 U	0.0098 U
Hexachlorocyclopentadiene	0.022 U	0.24 U	0.023 U	0.022 U	0.022 UJ	0.021 UJ	0.023 U	0.023 U	0.022 U	0.022 U	0.022 U	0.022 U	0.022 U	0.022 U
Hexachloroethane	0.013 U	0.14 U	0.013 U	0.013 U	0.013 UJ	0.012 UJ	0.013 U	0.014 U	0.013 U	0.013 U	0.013 U	0.013 U	0.013 U	0.013 U
Indeno(1,2,3-C,D)Pyrene	0.16 J+	35 J+	3.7 J+	0.026 J+	0.029 J	0.023 UJ	4.4	0.25	0.086	3.6 J+	2.2 J+	1.1 J+	0.3 J+	0.13 J+
Isophorone	0.0075 U	0.082 U	0.0079 U	0.0076 U	0.0076 UJ	0.0073 UJ	0.035 J	0.027 J	0.0074 U	0.0076 U	0.0076 U	0.0075 U	3.3	0.076 J
Naphthalene	0.0089 U	0.74 J	0.96	0.51	0.009 UJ	0.0087 UJ	0.68	0.013 J	0.0096 J	0.068 J	0.077 J	0.014 J	0.0088 U	0.0089 U
Nitrobenzene	0.011 U	0.12 U	0.012 U	0.011 U	0.011 UJ	0.011 UJ	0.012 U	0.012 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U
N-Nitrosodi-N-Propylamine	0.012 U	0.13 U	0.012 U	0.012 U	0.012 UJ	0.011 UJ	0.012 U	0.013 U	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U
N-Nitrosodiphenylamine	0.032 U	0.35 U	0.033 U	0.032 U	0.032 UJ	0.031 UJ	0.033 U	0.034 U	0.031 U	0.032 U	0.032 U	0.032 U	0.031 U	0.032 U
Pentachlorophenol	0.042 U	0.46 U	0.044 U	0.043 U	0.043 UJ	0.041 UJ	0.044 U	0.045 U	0.042 U	0.043 U	0.043 U	0.042 U	0.042 UR	0.042 U
Phenanthrene	0.11 J	18	1.5	0.03 J	0.014 J-	0.0091 UJ	4	0.2 J	0.11 J	2.2	1.5	0.66	1.1	0.32 J
Phenol	0.011 U	0.12 U	0.012 U	0.012 U	0.012 UJ	0.011 UJ	0.012 U	0.012 U	0.011 U	0.012 U	0.012 U	0.011 U	0.011 UR	0.011 U
Pyrene	0.21 J	45	3	0.037 J	0.04 J-	0.018 J-	5.1	0.45	0.18 J	5.2	3.9	1.6	1.1	0.36
VOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,1,1-Trichloroethane	0.00042 U	--	0.00036 U	0.00037 U	0.00032 U	0.00031 U	--	0.00077 U	0.00067 U	--	0.00042 U	0.00037 U	0.00041 U	0.00034 U
1,1,2,2-Tetrachloroethane	0.00019 U	--	0.00016 U	0.00016 U	0.00014 U	0.00014 U	--	0.00035 U	0.0003 U	--	0.00019 U	0.00017 U	0.00019 U	0.00015 U
1,1,2-Trichloro-1,2,2-Trifluoroethane	0.00049 U	--	0.00042 U	0.00042 U	0.00037 U	0.00035 U	--	0.00089 U	0.00078 U	--	0.00049 U	0.00043 U	0.00048 U	0.00039 U
1,1,2-Trichloroethane	0.00031 U	--	0.00027 U	0.00027 U	0.00024 U	0.00023 U	--	0.00057 U	0.00049 U	--	0.00031 U	0.00027 U	0.00031 U	0.00025 U
1,1-Dichloroethane	0.00038 U	--	0.00032 U	0.00033 U	0.00029 U	0.00027 U	--	0.00069 U	0.0006 U	--	0.00038 U	0.00033 U	0.00037 U	0.0003 U
1,1-Dichloroethene	0.00045 U	--	0.00039 U	0.0004 U	0.00034 U	0.00033 U	--	0.00083 U	0.00072 U	--	0.00045 U	0.0004 U	0.00045 U	0.00036 U
1,2,3-Trichlorobenzene	0.00012 U	--	0.0001 U	0.00011 U	0.000092 U	0.000089 U	--	0.00022 U	0.00019 U	--	0.00012 U	0.00011 U	0.00012 U	0.000098 U
1,2,4-Trichlorobenzene	0.00035 U	--	0.0003 U	0.00031 U	0.00027 U	0.00026 U	--	0.00065 U	0.00057 U	--	0.00035 U	0.00031 U	0.00035 U	0.00028 U
1,2-Dibromo-3-Chloropropane	0.00052 U	--	0.00045 U	0.00045 U	0.0004 U	0.00038 U	--	0.00095 U	0.00083 U	--	0.00052 U	0.00046 U	0.00051 U	0.00042 U
1,2-Dibromoethane (Ethylene Dibromide)	0.00013 U	--	0.00011 U	0.00012 U	0.0001 U	0.000097 U	--	0.00024 U	0.00021 U	--	0.00013 U	0.00012 U	0.00013 U	0.00011 U
1,2-Dichlorobenzene	0.00016 U	--	0.00013 U	0.00013 U	0.00012 U	0.00011 U	--	0.00028 U	0.00025 U	--	0.00015 U	0.00014 U	0.00015 U	0.00012 U
1,2-Dichloroethane	0.00012 U	--	0.0001 U	0.00011 U	0.000092 U	0.000089 U	--	0.00022 U	0.00019 U	--	0.00012 U	0.00011 U	0.00012 U	0.000098 U
1,2-Dichloropropane	0.00019 U	--	0.00016 U	0.00016 U	0.00014 U	0.00014 U	--	0.00035 U	0.0003 U	--	0.00019 U	0.00017 U	0.00019 U	0.00015 U
1,3-Dichlorobenzene	0.00013 U	--	0.00011 U	0.00012 U	0.0001 U	0.000097 U	--	0.00024 U	0.00021 U	--	0.00013 U	0.00012 U	0.00013 U	0.00011 U
1,4-Dichlorobenzene	0.00014 U	--	0.00012 U	0.00013 U	0.00011 U	0.0001 U	--	0.00026 U	0.00023 U	--	0.00014 U	0.00013 U	0.00014 U	0.00012 U
2-Hexanone	0.001 U	--	0.00089 U	0.00091 U	0.00079 U	0.00076 U	--	0.0019 U	0.0017 U	--	0.001 U	0.00092 U	0.001 U	0.00083 U
Acetone	0.0061	--	0.023	0.0067	0.019	0.024	--	0.078	0.017	--	0.025	0.016	0.032	0.0093
Benzene	0.00024 J	--	0.00055 J	0.00044 J	0.00081 J	0.00016 U	--	0.00066 J	0.00036 J	--	0.00028 J	0.00028 J	0.00022 U	0.00042 J
Bromochloromethane	0.00019 U	--	0.00016 U	0.00016 U	0.00014 U	0.00014 U	--	0.00035 U	0.0003 U	--	0.00019 U	0.00017 U	0.00019 U	0.00015 U
Bromodichloromethane	0.00042 U	--	0.00036 U	0.00037 U	0.00032 U	0.00031 U	--	0.00077 U	0.00067 U	--	0.00042 U	0.00037 U	0.00041 U	0.00034 U
Bromoform	0.00014 U	--	0.00012 U	0.00013 U	0.00011 U	0.0001 U	--	0.00026 U	0.00023 U	--	0.00014 U	0.00013 U	0.00014 U	0.00012 U
Bromomethane	0.00035 U	--	0.0003 U	0.00031 U	0.00027 U	0.00026 U	--	0.00065 U	0.00057 UJ	--	0.00035 U	0.00031 U	0.00035 UJ	0.00028 U
Carbon Disulfide	0.00056 J	--	0.001	0.00041 U	0.00054 J	0.00039 J	--	0.0014 J	0.00076 U	--	0.0028	0.003	0.0011	0.00042 J
Carbon Tetrachloride	0.00048 U	--	0.00041 U	0.00041 U	0.00036 U	0.00035 U	--	0.00087 U	0.00076 U	--	0.00048 U	0.00042 U	0.00047 U	0.00038 U
Chlorobenzene	0.00016 U	--	0.00013 U	0.00013 U	0.00012 U	0.00011 U	--	0.00028 U	0.00025 U	--	0.00015 U	0.00014 U	0.00015 U	0.00012 U
Chloroethane	0.00039 U	--	0.00033 U	0.00034 U	0.00029 U	0.00028 U	--	0.00071 U	0.00062 U	--	0.00039 U	0.00034 U	0.00038 U	0.00031 U
Chloroform	0.00023 U	--	0.0002 U	0.0002 U	0.00018 U	0.00017 U	--	0.00043 U	0.00037 U	--	0.00023 U	0.00021 U	0.00023 U	0.00019 U
Chloromethane	0.00042 U	--	0.00036 U	0.00037 U	0.00032 U	0.00031 U	--	0.00077 U	0.00067 UJ	--	0.00042 U	0.00037 U	0.00041 UJ	0.00034 U
Cis-1,2-Dichloroethylene	0.00024 U	--	0.00021 U	0.00021 U	0.00018 U	0.00018 U	--	0.00045 U	0.00039 U	--	0.00024 U	0.00022 U	0.00024 U	0.0002 U
Cis-1,3-Dichloropropene	0.00017 U	--	0.00014 U	0.00014 U	0.00013 U	0.00012 U	--	0.0003 U	0.00027 U	--	0.00017 U	0.00015 U	0.00016 U	0.00013 U
Cyclohexane	0.00051 U	--	0.00044 U	0.00087 J	0.00063 J+	0.00037 U	--	0.00093 U	0.0011 J	--	0.00051 U	0.00045 U	0.0005 U	0.00097
Dibromochloromethane	0.00017 U	--	0.00014 U	0.00014 U	0.00013 U	0.00012 U	--	0.0003 U	0.00027 U	--	0.00017 U	0.00015 U	0.00016 U	0.00013 U
Dichlorodifluoromethane	0.00035 U	--	0.0003 U	0.00031 U	0.00027 U	0.00026 U	--	0.00065 U	0.00057 U	--	0.00035 U	0.00031 U	0.00035 U	0.00028 U
Ethylbenzene	0.0002 U	--	0.00017 U	0.00048 J	0.0004 J	0.00015 U	--	0.00048 J	0.00051 J	--	0.0002 U	0.00018 U	0.0002 U	0.00037 J
Isopropylbenzene (Cumene)	0.00019 U	--	0.00016 U	0.00016 U	0.00014 U	0.00014 U	--	0.00035 U	0.0003 U	--	0.00019 U	0.00017 U	0.00019 U	0.00015 U
M,P-Xylene	0.00057 J	--	0.0001 U	0.0015	0.0012	0.00019 J	--	0.0012 J	0.0017 J	--	0.00034 J	0.0006 J	0.00026 J	0.0013

Table E-2
Summary of Data Used in Risk Assessment
Main Plant Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-046	CFSB-048	CFSB-048	CFSB-048	CFSB-049	CFSB-049	CFSB-050	CFSB-050	CFSB-050	CFSB-051	CFSB-051	CFSB-051	CFSB-052	CFSB-052
Sample Lab IDs	460-114275-15	460-114141-49	460-114141-50	460-114141-51	460-114793-34	460-114793-32	460-114275-24	460-114275-25	460-114275-26	460-114275-16	460-114275-17	460-114275-18	460-114275-13	460-114275-14
Sample Name	CFSB-046-SO-10-12	CFSB-048-SO-0-0.5	CFSB-048-SO-0.5-2.0	CFSB-048-SO-10-12	CFSB-049-SO-0.5-2	CFSB-049-SO-10-12	CFSB-050-SO-0-0.5	CFSB-050-SO-0.5-2	CFSB-050-SO-10-12	CFSB-051-SO-0-0.5	CFSB-051-SO-0.5-2	CFSB-051-SO-10-12	CFSB-052-SO-0.5-2	CFSB-052-SO-10-12
Sample Depth	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0.5-2 ft	10-12 ft
Chemical	5/20/2016	5/20/2016	5/20/2016	5/20/2016	5/28/2016	5/28/2016	5/21/2016	5/21/2016	5/21/2016	5/21/2016	5/21/2016	5/21/2016	5/20/2016	5/20/2016
Methyl Acetate	0.001 U	--	0.014	0.00087 U	0.00076 U	0.00073 U	--	0.32	0.0016 U	--	0.001 U	0.00088 U	0.0043 J	0.0008 U
Methyl Ethyl Ketone (2-Butanone)	0.00085 U	--	0.00073 U	0.00074 U	0.0032 J	0.0023 J	--	0.0016 U	0.0014 U	--	0.00085 U	0.00075 U	0.00084 U	0.00068 U
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	0.0025 U	--	0.0021 U	0.0021 U	0.0019 U	0.0018 U	--	0.0045 U	0.0039 U	--	0.0025 U	0.0022 U	0.0024 U	0.002 U
Methylcyclohexane	0.001 J	--	0.00047 U	0.0016	0.00064 J	0.0004 U	--	0.001 U	0.0017 J	--	0.00062 J	0.00066 J	0.00055 U	0.0018
Methylene Chloride	0.00035 U	--	0.0003 U	0.00031 U	0.00027 U	0.00026 U	--	0.0027	0.0024	--	0.00035 U	0.00031 U	0.00068 J	0.00028 U
O-Xylene (1,2-Dimethylbenzene)	0.00021 J	--	0.00015 U	0.00049 J	0.00058 J	0.00013 U	--	0.0005 J	0.00053 J	--	0.00018 U	0.00022 J	0.00017 U	0.0004 J
Styrene	0.00017 U	--	0.00014 U	0.00014 U	0.00013 U	0.00012 U	--	0.0003 U	0.00027 U	--	0.00017 U	0.00015 U	0.00016 U	0.00013 U
Tert-Butyl Methyl Ether	0.00019 U	--	0.00016 U	0.00016 U	0.00014 U	0.00014 U	--	0.00035 U	0.0003 U	--	0.00019 U	0.00017 U	0.00019 U	0.00015 U
Tetrachloroethylene (PCE)	0.00031 U	--	0.00027 U	0.00027 U	0.00024 U	0.00023 U	--	0.00057 U	0.00049 U	--	0.00031 U	0.00027 U	0.00031 U	0.00025 U
Toluene	0.00096 J	--	0.00053 J	0.0022	0.002	0.00024 J	--	0.0017 J	0.0022	--	0.00068 J	0.00073 J	0.00026 J	0.0021
Trans-1,2-Dichloroethene	0.00043 U	--	0.00037 U	0.00038 U	0.00033 U	0.00031 U	--	0.00079 U	0.00069 U	--	0.00043 U	0.00038 U	0.00043 U	0.00035 U
Trans-1,3-Dichloropropene	0.00011 U	--	0.000095 U	0.000096 U	0.000084 U	0.000081 U	--	0.0002 U	0.00018 U	--	0.00011 U	0.000098 U	0.00011 U	0.000089 U
Trichloroethylene (TCE)	0.00029 U	--	0.00025 U	0.00025 U	0.00022 U	0.00021 U	--	0.00053 U	0.00046 U	--	0.00029 U	0.00025 U	0.00028 U	0.00023 U
Trichlorofluoromethane	0.00038 U	--	0.00032 U	0.00033 U	0.00029 U	0.00027 U	--	0.00069 U	0.0006 U	--	0.00038 U	0.00033 U	0.00037 U	0.0003 U
Vinyl Chloride	0.00043 U	--	0.00037 U	0.00038 U	0.00033 U	0.00031 U	--	0.00079 U	0.00069 U	--	0.00043 U	0.00038 U	0.00043 U	0.00035 U

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-2
Summary of Data Used in Risk Assessment
Main Plant Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-053	CFSB-053	CFSB-054	CFSB-054	CFSB-054	CFSB-055	CFSB-055	CFSB-055	CFSB-057	CFSB-057	CFSB-057	CFSB-059	CFSB-059-DUP	CFSB-059
Sample Lab IDs	460-114793-56	460-114793-58	460-114793-20	460-114793-25	460-114793-24	460-114793-19	460-114793-21	460-114793-26	460-114793-27	460-114793-35	460-114793-31	460-114793-30	460-114793-29	460-114793-33
Sample Name	CFSB-053-SO-0.5-2	CFSB-053-SO-10-12	CFSB-054-SO-0-0.5	CFSB-054-SO-0.5-2	CFSB-054-SO-10-12	CFSB-055-SO-0-0.5	CFSB-055-SO-0.5-2	CFSB-055-SO-10-12	CFSB-057-SO-0-0.5	CFSB-057-SO-0.5-2	CFSB-057-SO-10-12	CFSB-059-SO-0-0.5	CFSB-DUP8-SO	CFSB-059-SO-0.5-2
Sample Depth	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0-0.5 ft	0.5-2 ft
Chemical	5/31/2016	5/31/2016	5/28/2016	5/28/2016	5/28/2016	5/28/2016	5/28/2016	5/28/2016	5/28/2016	5/28/2016	5/28/2016	5/28/2016	5/28/2016	5/28/2016
GENERAL CHEMISTRY (mg/kg)														
Fluoride	25.8 J	2 J+	44 J	58.1 J-	13.1 J	147 J	129 J	95.4 J	75.7 J-	76.2 J	13.5 J	51.2 J-	52.1 J-	42.5 J-
Cyanide	0.023 J	0.017 U	0.083 J-	0.07 J-	0.017 UJ	0.59 J-	0.26 J-	0.11 J-	0.085 J-	0.066 J-	0.037 J-	0.048 J-	0.058 J-	0.038 J-
METALS (mg/kg)														
"Chromium, Hexavalent - Estimated"	0.17129	0.289051	0.259611	0.254258	0.235523	0.537956	0.264964	0.227494	0.294404	0.216788	0.243552	0.259611	0.17129	0.2382
"Chromium, Trivalent - Calculated"	--	--	--	--	--	--	--	--	--	--	--	--	--	--
"Chromium, Trivalent - Estimated"	6.22871	10.5109	9.44039	9.24574	8.56448	19.562	9.63504	8.27251	10.7056	7.88321	8.85645	9.44039	6.22871	8.6618
Aluminum	7340	7650	13200	12100	8560	24500	16300	8090	22100	15300	8600	10900	8130	10100
Antimony	0.47 UJ	0.41 UJ	0.35 U	0.34 UJ	0.34 U	0.37 U	0.33 U	0.36 UJ	0.32 UJ	0.43 U	0.43 UJ	0.32 UJ	0.36 UJ	0.37 UJ
Arsenic	1.9	4.1	4.8 J	3.9	3.7 J	5.4 J	4.2 J	3.1	4.1	2.5	3.8	2.8	2.1	4.7
Barium	66.3	57.6	89.4 J	125	60.9 J	79.9 J	69 J	71.5	146 J	81.5	66.8	68.2	52.6	66
Beryllium	0.23 J	0.38 J	0.47	0.63	0.36	0.96	0.65	0.48	0.55	0.28 J	0.33 J	0.29 J	0.26 J	0.43
Cadmium	0.35 U	0.31 U	0.27 U	0.26 U	0.26 U	0.28 U	0.25 U	0.27 U	0.24 U	0.33 U	0.32 U	0.24 U	0.27 U	0.28 U
Calcium	10200	33200	20800 J	34000	25000 J	22900 J	28300 J	33100	45000 J	16000	38400	7500	7010	8950
Chromium, Total	6.4	10.8	9.7 J	9.5	8.8 J	20.1 J	9.9 J	8.5	11	8.1	9.1	9.7	6.4	8.9
Cobalt	3.5	4.6	5.6	4.9	4.8	5.8	4.6	4.9	4.8	3.5	5.1	4.5	4.2	4.9
Copper	7.1 J	15.6 J	11.5	11.5	12.8	16	15.4	12.6	12.9	10.3	17.7 J	9.9 J	5.7 J	13.6
Iron	9690	12500	13200	14300	13000	14800	12200	11000	11200	7960	13400	12300	7910	13900
Lead	13.6 J	7.2 J	11.1	10.1	8.5	23.7	14	8.3	11.4 J	8.4	7.2 J	6.8	4.3	11.7
Magnesium	5970	12800	11700 J	14800	12200 J	9220 J	10100 J	10600	20800 J	5670	12900	7510	5640	8960
Manganese	253	329	419 J	484	362 J	394 J	373 J	576	562 J	225	362	261	173	347
Mercury	0.018 J	0.017	0.021	0.016 J	0.016 J	0.017	0.028	0.021	0.013 U	0.012 U	0.016	0.017	0.012 J	0.031
Nickel	7.1 J	9.9 J	14.9 J	15.3	9.6 J	38.7 J	23.1 J	12.3	29.6	36	11.9 J	15.7	15.3	10.6
Potassium	476	661	861 J	781	776 J	1140 J	885 J	779	866	330	749	616	543	866
Selenium	0.44 U	0.38 U	0.33 U	0.32 U	0.32 U	0.35 U	0.31 U	0.34 U	0.3 UJ	0.4 U	0.4 U	0.3 U	0.34 U	0.34 U
Silver	0.86 U	0.75 U	0.65 U	0.62 U	0.63 U	0.68 U	0.6 U	0.66 U	0.59 U	0.79 U	0.78 U	0.59 U	0.66 U	0.67 U
Sodium	43.7 U	52.8 J	56.3 J	54.1 J	34.9 J	164	91.3	112	62.8 J	58.9 J	58.6 J	31.3 J	33.8 U	34.2 U
Thallium	0.18 U	0.15 U	0.13 U	0.13 U	0.13 U	0.14 U	0.12 U	0.14 U	0.12 U	0.16 U	0.16 U	0.12 U	0.14 U	0.14 U
Vanadium	6.2	9.1	11.1 J	10.6	8.5 J	18.6 J	11.6 J	8	14.7	13.1	8	8.8	6.3	9.3
Zinc	24.3	30.8	39.9	38.1	32.3	66.4	52.1	32.6	61.4	38.4	35.7	35.6	28	34.5
METALS|HEXAVALENT CHROMIUM (mg/kg)														
Chromium, Hexavalent	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PESTICIDES (mg/kg)														
Aldrin	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Alpha Bhc (Alpha Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Alpha Endosulfan	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Beta Bhc (Beta Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Beta Endosulfan	--	--	--	--	--	--	--	--	--	--	--	--	--	--
cis-Chlordane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Delta BHC (Delta Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dieldrin	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endosulfan Sulfate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin Aldehyde	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin Ketone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Gamma Bhc (Lindane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Heptachlor	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Heptachlor Epoxide	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methoxychlor	--	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDD	--	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDT	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Toxaphene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
trans-Chlordane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
POLYCHLORINATED BIPHENYLS (mg/kg)														
PCB-1016 (Aroclor 1016)	0.01 U	0.0094 U	0.0096 U	0.0096 U	0.0095 U	0.0097 U	0.0095 U	0.01 U	0.0096 U	0.0095 U	0.0095 U	0.0096 U	0.0096 U	0.0098 U
PCB-1221 (Aroclor 1221)	0.01 U	0.0094 U	0.0096 U	0.0096 U	0.0095 U	0.0097 U	0.0095 U	0.01 U	0.0096 U	0.0095 U	0.0095 U	0.0096 U	0.0096 U	0.0098 U

Table E-2
Summary of Data Used in Risk Assessment
Main Plant Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-053	CFSB-053	CFSB-054	CFSB-054	CFSB-054	CFSB-055	CFSB-055	CFSB-055	CFSB-057	CFSB-057	CFSB-057	CFSB-059	CFSB-059-DUP	CFSB-059
Sample Lab IDs	460-114793-56	460-114793-58	460-114793-20	460-114793-25	460-114793-24	460-114793-19	460-114793-21	460-114793-26	460-114793-27	460-114793-35	460-114793-31	460-114793-30	460-114793-29	460-114793-33
Sample Name	CFSB-053-SO-0.5-2	CFSB-053-SO-10-12	CFSB-054-SO-0-0.5	CFSB-054-SO-0.5-2	CFSB-054-SO-10-12	CFSB-055-SO-0-0.5	CFSB-055-SO-0.5-2	CFSB-055-SO-10-12	CFSB-057-SO-0-0.5	CFSB-057-SO-0.5-2	CFSB-057-SO-10-12	CFSB-059-SO-0-0.5	CFSB-DUP8-SO	CFSB-059-SO-0.5-2
Sample Depth	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0-0.5 ft	0.5-2 ft
Chemical	5/31/2016	5/31/2016	5/28/2016	5/28/2016	5/28/2016	5/28/2016	5/28/2016	5/28/2016	5/28/2016	5/28/2016	5/28/2016	5/28/2016	5/28/2016	5/28/2016
PCB-1232 (Aroclor 1232)	0.01 U	0.0094 U	0.0096 U	0.0096 U	0.0095 U	0.0097 U	0.0095 U	0.01 U	0.0096 U	0.0095 U	0.0095 U	0.0096 U	0.0096 U	0.0098 U
PCB-1242 (Aroclor 1242)	0.01 U	0.0094 U	0.0096 U	0.0096 U	0.0095 U	0.0097 U	0.0095 U	0.01 U	0.0096 U	0.0095 U	0.0095 U	0.0096 U	0.0096 U	0.0098 U
PCB-1248 (Aroclor 1248)	0.01 U	0.0094 U	0.0096 U	0.0096 U	0.0095 U	0.0097 U	0.0095 U	0.01 U	0.0096 U	0.0095 U	0.0095 U	0.0096 U	0.0096 U	0.0098 U
PCB-1254 (Aroclor 1254)	0.011 U	0.0097 U	0.0099 U	0.0099 U	0.0098 U	0.01 U	0.0098 U	0.01 U	0.01 U	0.0099 U	0.0099 U	0.0099 U	0.0099 U	0.01 U
PCB-1260 (Aroclor 1260)	0.011 U	0.0097 U	0.0099 U	0.0099 U	0.0098 U	0.01 U	0.0098 U	0.01 U	0.01 U	0.0099 U	0.0099 U	0.0099 U	0.0099 U	0.01 U
PCB-1262 (Aroclor 1262)	0.011 U	0.0097 U	0.0099 U	0.0099 U	0.0098 U	0.01 U	0.0098 U	0.01 U	0.01 U	0.0099 U	0.0099 U	0.0099 U	0.0099 U	0.01 U
PCB-1268 (Aroclor 1268)	0.011 U	0.0097 U	0.0099 U	0.0099 U	0.0098 U	0.01 U	0.0098 U	0.01 U	0.01 U	0.0099 U	0.0099 U	0.0099 U	0.0099 U	0.01 U
Polychlorinated Biphenyl (PCBs)	0.011 U	0.0097 U	0.0099 U	0.0099 U	0.0098 U	0.01 U	0.0098 U	0.01 U	0.01 U	0.0099 U	0.0099 U	0.0099 U	0.0099 U	0.01 U
SEMIVOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,2,4,5-Tetrachlorobenzene	0.028 U	0.026 UJ	0.026 U	0.027 U	0.026 U	0.13 U	0.026 U	0.028 U	0.027 U	0.026 UJ	0.026 UJ	0.027 U	0.027 U	0.027 U
1,4-Dioxane (P-Dioxane)	0.1 U	0.093 UJ	0.095 U	0.095 U	0.094 U	0.48 U	0.094 U	0.1 U	0.095 U	0.094 UJ	0.094 UJ	0.096 U	0.095 U	0.097 U
2,3,4,6-Tetrachlorophenol	0.036 U	0.033 UJ	0.033 U	0.034 U	0.033 U	0.17 U	0.033 U	0.035 U	0.034 UJ	0.033 UJ	0.033 UJ	0.034 U	0.034 U	0.034 U
2,4,5-Trichlorophenol	0.038 U	0.035 UJ	0.035 U	0.035 U	0.035 U	0.18 U	0.035 U	0.037 U	0.036 UJ	0.035 UJ	0.035 UJ	0.036 U	0.036 U	0.036 U
2,4,6-Trichlorophenol	0.011 U	0.0099 UJ	0.01 U	0.01 U	0.01 U	0.051 U	0.01 U	0.011 U	0.01 UJ	0.01 UJ	0.01 UJ	0.01 U	0.01 U	0.01 U
2,4-Dichlorophenol	0.0089 U	0.0082 UJ	0.0084 U	0.0084 U	0.0083 U	0.043 U	0.0083 U	0.0089 U	0.0084 U	0.0083 UJ	0.0083 UJ	0.0084 U	0.0084 U	0.0086 U
2,4-Dimethylphenol	0.083 U	0.076 UJ	0.078 U	0.078 U	0.077 U	0.4 U	0.077 U	0.083 U	0.078 U	0.078 UJ	0.078 UJ	0.079 U	0.079 U	0.08 U
2,4-Dinitrophenol	0.29 U	0.26 UJ	0.27 U	0.27 U	0.27 U	1.4 U	0.27 U	0.28 U	0.27 UJ	0.27 UJ	0.27 UJ	0.27 U	0.27 U	0.28 U
2,4-Dinitrotoluene	0.015 U	0.014 UJ	0.014 U	0.014 U	0.014 U	0.072 U	0.014 U	0.015 U	0.014 U	0.014 UJ	0.014 UJ	0.014 U	0.014 U	0.014 U
2,6-Dinitrotoluene	0.02 U	0.018 UJ	0.019 U	0.019 U	0.019 U	0.096 U	0.019 U	0.02 U	0.019 U	0.019 UJ	0.019 UJ	0.019 U	0.019 U	0.019 U
2-Chloronaphthalene	0.0086 U	0.0079 UJ	0.008 U	0.0081 U	0.008 U	0.041 U	0.008 U	0.0085 U	0.0081 U	0.008 UJ	0.008 UJ	0.0081 U	0.0081 U	0.0083 U
2-Chlorophenol	0.0096 U	0.0088 UJ	0.009 U	0.0091 U	0.0089 U	0.046 U	0.009 U	0.0095 U	0.0091 U	0.009 UJ	0.009 UJ	0.0091 U	0.0091 U	0.0092 U
2-Methylnaphthalene	0.0084 U	0.0077 UJ	0.011 J	0.01 J	0.0078 U	0.081 J	0.024 J	0.017 J	0.0079 U	0.013 J-	0.0078 UJ	0.023 J	0.015 J	0.008 U
2-Methylphenol (O-Cresol)	0.017 U	0.015 UJ	0.015 U	0.016 U	0.015 U	0.079 U	0.015 U	0.016 U	0.016 U	0.015 UJ	0.015 UJ	0.016 U	0.016 U	0.016 U
2-Nitroaniline	0.012 U	0.011 UJ	0.012 U	0.012 U	0.012 U	0.06 U	0.012 U	0.012 U	0.012 U	0.012 UJ	0.012 UJ	0.012 U	0.012 U	0.012 U
2-Nitrophenol	0.013 U	0.012 UJ	0.012 U	0.012 U	0.012 U	0.061 U	0.012 U	0.013 U	0.012 U	0.012 UJ	0.012 UJ	0.012 U	0.012 U	0.012 U
3- And 4- Methylphenol (Total)	0.01 U	0.0092 UJ	0.0094 U	0.0095 U	0.0094 U	0.048 U	0.0094 U	0.01 U	0.0095 U	0.0094 UJ	0.0094 UJ	0.0095 U	0.0095 U	0.0097 U
3,3'-Dichlorobenzidine	0.042 U	0.039 UJ	0.04 U	0.04 U	0.039 U	0.2 U	0.039 U	0.042 U	0.04 U	0.039 UJ	0.039 UJ	0.04 U	0.04 U	0.041 U
3-Nitroaniline	0.011 U	0.01 UJ	0.011 U	0.011 U	0.01 U	0.054 U	0.01 U	0.011 U	0.011 U	0.01 UJ	0.01 UJ	0.011 U	0.011 U	0.011 U
4,6-Dinitro-2-Methylphenol	0.1 U	0.093 UJ	0.095 U	0.095 U	0.094 U	0.48 U	0.094 U	0.1 U	0.095 UJ	0.094 UJ	0.094 UJ	0.095 U	0.095 U	0.097 U
4-Bromophenyl Phenyl Ether	0.012 U	0.011 UJ	0.011 U	0.011 U	0.011 U	0.057 U	0.011 U	0.012 U	0.011 U	0.011 UJ	0.011 UJ	0.011 U	0.011 U	0.011 U
4-Chloro-3-Methylphenol	0.016 U	0.015 UJ	0.015 U	0.015 U	0.015 U	0.078 U	0.015 U	0.016 U	0.015 U	0.015 UJ	0.015 UJ	0.015 U	0.015 U	0.016 U
4-Chloroaniline	0.0097 U	0.0089 UJ	0.0091 U	0.0092 U	0.0091 U	0.046 U	0.0091 U	0.0097 U	0.0092 U	0.0091 UJ	0.0091 UJ	0.0092 U	0.0092 U	0.0094 U
4-Chlorophenyl Phenyl Ether	0.011 U	0.01 UJ	0.011 U	0.011 U	0.011 U	0.054 U	0.011 U	0.011 U	0.011 U	0.011 UJ	0.011 UJ	0.011 U	0.011 U	0.011 U
4-Nitroaniline	0.014 U	0.013 UJ	0.013 U	0.013 U	0.013 U	0.068 U	0.013 U	0.014 U	0.013 U	0.013 UJ	0.013 UJ	0.014 U	0.013 U	0.014 U
4-Nitrophenol	0.18 U	0.17 UJ	0.17 U	0.17 U	0.17 U	0.87 U	0.17 U	0.18 U	0.17 U	0.17 UJ	0.17 UJ	0.17 U	0.17 U	0.18 U
Acenaphthene	0.012 J	0.0084 UJ	0.1 J	0.1 J	0.0085 U	0.69 J	0.22 J	0.16 J	0.047 J	0.093 J-	0.0085 UJ	0.22 J	0.12 J	0.012 J
Acenaphthylene	0.0097 U	0.0089 UJ	0.0091 U	0.0092 U	0.0091 U	0.046 U	0.0091 U	0.0097 U	0.014 J	0.01 J-	0.0091 UJ	0.0092 U	0.0092 U	0.0094 U
Acetophenone	0.0083 U	0.0076 UJ	0.0077 U	0.0078 U	0.0077 U	0.039 U	0.0077 U	0.0082 U	0.0078 U	0.0077 UJ	0.0077 UJ	0.0078 U	0.0078 U	0.0079 U
Anthracene	0.036 U	0.033 UJ	0.18 J	0.18 J	0.033 U	1.2 J	0.35	0.22 J	0.12 J	0.23 J-	0.034 UJ	0.48 J	0.28 J	0.035 U
Atrazine	0.017 U	0.015 UJ	0.016 U	0.016 U	0.016 U	0.08 U	0.016 U	0.017 U	0.016 U	0.016 UJ	0.016 UJ	0.016 U	0.016 U	0.016 U
Benzaldehyde	0.029 U	0.026 UJ	0.027 U	0.027 U	0.027 U	0.14 U	0.027 U	0.029 U	0.027 U	0.027 UJ	0.027 UJ	0.027 U	0.027 U	0.028 U
Benzo(A)Anthracene	0.053	0.029 UJ	1.2	1.4	0.029 U	7.3	1.9	0.65	0.66	1.7 J-	0.054 J-	2.5 J	1.5 J	0.19
Benzo(A)Pyrene	0.047	0.011 UJ	1.6	1.7	0.011 U	9.4	2.4	0.74	0.9	2.3 J-	0.063 J-	2.9	2 J	0.24
Benzo(B)Fluoranthene	0.057	0.014 UJ	2.1	2.2	0.014 U	11	3.2	1.1	1.2	3.1 J-	0.11 J-	3.7	2.4 J	0.32
Benzo(G,H,I)Perylene	0.058 J	0.02 UJ	1.8	1.9 J+	0.02 U	7.5	2.5 J+	0.81 J+	1.1 J+	3.4 J-	0.067 J-	2.9 J+	2.3 J	0.27 J+
Benzo(K)Fluoranthene	0.032 J	0.015 UJ	0.72	0.99	0.015 U	5.3	1.1	0.41	0.48	1.2 J-	0.029 J-	1.4	1.1 J	0.12
Benzyl Butyl Phthalate	0.012 U	0.011 UJ	0.011 U	0.011 U	0.011 U	0.056 U	0.011 U	0.012 U	0.017 J+	0.02 J-	0.011 UJ	0.011 UJ	0.019 J	0.011 U
Biphenyl (Diphenyl)	0.032 U	0.03 UJ	0.03 U	0.03 U	0.03 U	0.15 U	0.03 U	0.032 U	0.03 U	0.03 UJ	0.03 UJ	0.03 U	0.03 U	0.031 U
Bis(2-Chloroethoxy) Methane	0.012 U	0.011 UJ	0.011 U	0.011 U	0.011 U	0.056 U	0.011 U	0.012 U	0.011 U	0.011 UJ	0.011 UJ	0.011 U	0.011 U	0.011 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.0089 U	0.0082 UJ	0.0084 U	0.0084 U	0.0083 U	0.043 U	0.0083 U	0.0089 U	0.0084 U	0.0083 UJ	0.0083 UJ	0.0084 U	0.0084 U	0.0086 U
Bis(2-Chloroisopropyl) Ether	0.016 U	0.014 UJ	0.015 U	0.015 U	0.014 U	0.074 U	0.014 U	0.015 U	0.015 U	0.015 UJ	0.015 UJ	0.015 U	0.015 U	0.015 U
Bis(2-Ethylhexyl) Phthalate	0.015 U	0.014 UJ	0.049 J	0.052 J+	0.014 U	0.07 U	0.065 J+	0.1 J+	0.14 J+	0.014 UJ	0.072 J	0.064 J	0.17 J	0.014 U
Caprolactam	0.027 U	0.025 UJ	0.026 U	0.026 U	0.025 U	0.13 U	0.025 U	0.027 U	0.026 U	0.025 UJ	0.025 UJ	0.026 U	0.026 U	0.026 U
Carbazole	0.0094 U	0.0086 UJ	0.19 J	0.21 J	0.0087 U	1.2 J	0.35	0.17 J	0.18 J	0.28 J-	0.01 J-	0.4	0.26 J	0.027 J
Chrysene	0.046 J	0.0095 UJ	1.5	1.7	0.0096 U	9.7	2.5	0.91	1	2.3 J-	0.07 J-	3	2.1 J	0.26 J
Dibenz(A,H)Anthracene	0.02 U	0.018 UJ	0.46	0.45 J+	0.018 U	1.9	0.61 J+	0.2 J+	0.25 J+	0.67 J-	0.018 UJ	0.8 J+	0.59 J	0.061 J+
Dibenzofuran	0.011 U	0.011 UJ	0.032 J	0.029 J	0.011 U	0.2 J	0.081 J	0.064 J	0.016 J	0.032 J-	0.011 UJ	0.097 J	0.048 J	0.011 U

Table E-2
Summary of Data Used in Risk Assessment
Main Plant Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-053	CFSB-053	CFSB-054	CFSB-054	CFSB-054	CFSB-055	CFSB-055	CFSB-055	CFSB-057	CFSB-057	CFSB-057	CFSB-059	CFSB-059-DUP	CFSB-059
Sample Lab IDs	460-114793-56	460-114793-58	460-114793-20	460-114793-25	460-114793-24	460-114793-19	460-114793-21	460-114793-26	460-114793-27	460-114793-35	460-114793-31	460-114793-30	460-114793-29	460-114793-33
Sample Name	CFSB-053-SO-0.5-2	CFSB-053-SO-10-12	CFSB-054-SO-0-0.5	CFSB-054-SO-0.5-2	CFSB-054-SO-10-12	CFSB-055-SO-0-0.5	CFSB-055-SO-0.5-2	CFSB-055-SO-10-12	CFSB-057-SO-0-0.5	CFSB-057-SO-0.5-2	CFSB-057-SO-10-12	CFSB-059-SO-0-0.5	CFSB-DUP8-SO	CFSB-059-SO-0.5-2
Sample Depth	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0-0.5 ft	0.5-2 ft
Chemical	5/31/2016	5/31/2016	5/28/2016	5/28/2016	5/28/2016	5/28/2016	5/28/2016	5/28/2016	5/28/2016	5/28/2016	5/28/2016	5/28/2016	5/28/2016	5/28/2016
Diethyl Phthalate	0.011 U	0.0099 UJ	0.01 U	0.01 U	0.01 U	0.051 U	0.01 U	0.011 U	0.01 U	0.01 UJ	0.01 UJ	0.01 U	0.01 U	0.01 U
Dimethyl Phthalate	0.011 U	0.01 UJ	0.01 U	0.01 U	0.01 U	0.052 U	0.01 U	0.011 U	0.01 U	0.01 UJ	0.01 UJ	0.01 U	0.01 U	0.011 U
Di-N-Butyl Phthalate	0.011 U	0.01 UJ	0.011 U	0.011 U	0.011 U	0.054 U	0.011 U	0.011 U	0.011 U	0.019 J-	0.011 UJ	0.011 U	0.011 U	0.011 U
Di-N-Octylphthalate	0.019 U	0.018 UJ	0.018 U	0.018 U	0.018 U	0.092 U	0.018 U	0.019 U	0.018 U	0.018 UJ	0.018 UJ	0.018 U	0.018 U	0.018 U
Fluoranthene	0.094 J	0.01 UJ	1.9	2.1	0.01 U	13	3.2	1.4	1.3	2.6 J-	0.093 J-	3.7	2.5 J	0.32 J
Fluorene	0.009 J	0.0076 UJ	0.051 J	0.054 J	0.0077 U	0.41 J	0.14 J	0.11 J	0.03 J	0.054 J-	0.0077 UJ	0.15 J	0.084 J	0.0092 J
Hexachlorobenzene	0.015 U	0.014 UJ	0.014 U	0.014 U	0.014 U	0.073 UJ	0.014 U	0.015 U	0.014 U	0.014 UJ	0.014 UJ	0.014 U	0.014 U	0.015 U
Hexachlorobutadiene	0.011 U	0.0098 UJ	0.01 U	0.01 U	0.0099 U	0.051 U	0.0099 U	0.011 U	0.01 U	0.0099 UJ	0.0099 UJ	0.01 U	0.01 U	0.01 U
Hexachlorocyclopentadiene	0.024 UJ	0.022 UJ	0.022 U	0.022 UJ	0.022 UJ	0.11 UJ	0.022 UJ	0.023 UJ	0.022 UJ	0.022 UJ	0.022 UJ	0.022 UJ	0.022 UJ	0.023 UJ
Hexachloroethane	0.014 U	0.013 UJ	0.013 U	0.013 U	0.013 U	0.066 U	0.013 U	0.014 U	0.013 U	0.013 UJ	0.013 UJ	0.013 U	0.013 U	0.013 U
Indeno(1,2,3-C,D)Pyrene	0.053	0.023 UJ	1.7	1.7	0.023 U	7.2	2.3	0.76	0.93	3.2 J	0.068 J	2.9	2.3 J	0.26
Isophorone	0.0081 U	0.0075 UJ	0.0076 U	0.0077 U	0.0076 U	0.039 U	0.0076 U	0.0081 U	0.0077 U	0.0076 UJ	0.0076 UJ	0.0077 U	0.0077 U	0.0078 U
Naphthalene	0.0096 U	0.0088 UJ	0.023 J	0.02 J	0.0089 U	0.14 J	0.055 J	0.04 J	0.015 J	0.027 J-	0.009 UJ	0.095 J	0.064 J	0.0092 U
Nitrobenzene	0.012 U	0.011 UJ	0.011 U	0.011 U	0.011 U	0.057 U	0.011 U	0.012 U	0.011 U	0.011 UJ	0.011 UJ	0.011 U	0.011 U	0.011 U
N-Nitrosodi-N-Propylamine	0.013 U	0.012 UJ	0.012 U	0.012 U	0.012 U	0.061 U	0.012 U	0.013 U	0.012 U	0.012 UJ	0.012 UJ	0.012 U	0.012 U	0.012 U
N-Nitrosodiphenylamine	0.034 U	0.032 UJ	0.032 U	0.032 U	0.032 U	0.16 U	0.032 U	0.034 U	0.032 U	0.032 UJ	0.032 UJ	0.032 U	0.032 U	0.033 U
Pentachlorophenol	0.046 U	0.042 UJ	0.043 U	0.043 U	0.043 U	0.22 U	0.043 U	0.045 U	0.3 J	0.17 J-	0.043 UJ	0.53	0.46 J	0.044 U
Phenanthrene	0.076 J	0.0092 UJ	0.97	1	0.0094 U	6.3	1.8	1	0.52	1.2 J-	0.059 J-	2.1 J	1.2 J	0.15 J
Phenol	0.012 U	0.011 UJ	0.012 U	0.012 U	0.012 U	0.059 U	0.012 U	0.012 U	0.012 U	0.012 UJ	0.012 UJ	0.012 U	0.012 U	0.012 U
Pyrene	0.096 J	0.016 UJ	2.1 J+	2.5	0.016 U	15	3.6	1.4	1.3	3.2 J-	0.1 J-	3.8	2.4 J	0.3 J
VOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,1,1-Trichloroethane	0.00034 U	0.0003 U	--	0.00035 U	0.00038 U	--	0.00031 U	0.00041 U	--	0.00035 U	0.00034 U	--	--	0.00033 U
1,1,2,2-Tetrachloroethane	0.00015 U	0.00013 U	--	0.00016 U	0.00017 U	--	0.00014 U	0.00018 U	--	0.00015 U	0.00015 U	--	--	0.00015 U
1,1,2-Trichloro-1,2,2-Trifluoroethane	0.00039 U	0.00035 U	--	0.00041 U	0.00044 U	--	0.00036 U	0.00047 U	--	0.0004 U	0.00039 U	--	--	0.00038 U
1,1,2-Trichloroethane	0.00025 U	0.00022 U	--	0.00026 U	0.00028 U	--	0.00023 U	0.0003 U	--	0.00025 U	0.00025 U	--	--	0.00024 U
1,1-Dichloroethane	0.0003 U	0.00027 U	--	0.00031 U	0.00034 U	--	0.00028 U	0.00036 U	--	0.00031 U	0.0003 U	--	--	0.00029 U
1,1-Dichloroethene	0.00036 U	0.00032 U	--	0.00038 U	0.00041 U	--	0.00034 U	0.00044 U	--	0.00037 U	0.00036 U	--	--	0.00035 U
1,2,3-Trichlorobenzene	0.000098 U	0.000086 U	--	0.0001 U	0.00011 U	--	0.00009 U	0.00012 U	--	0.0001 U	0.000097 U	--	--	0.000094 U
1,2,4-Trichlorobenzene	0.00028 U	0.00025 U	--	0.0003 U	0.00032 U	--	0.00026 U	0.00034 U	--	0.00029 U	0.00028 U	--	--	0.00027 U
1,2-Dibromo-3-Chloropropane	0.00042 U	0.00037 U	--	0.00044 U	0.00047 U	--	0.00038 U	0.0005 U	--	0.00043 U	0.00042 U	--	--	0.0004 U
1,2-Dibromoethane (Ethylene Dibromide)	0.00011 U	0.000094 U	--	0.00011 U	0.00012 U	--	0.000098 U	0.00013 U	--	0.00011 U	0.00011 U	--	--	0.0001 U
1,2-Dichlorobenzene	0.00012 U	0.00011 U	--	0.00013 U	0.00014 U	--	0.00011 U	0.00015 U	--	0.00013 U	0.00012 U	--	--	0.00012 U
1,2-Dichloroethane	0.000098 U	0.000086 U	--	0.0001 U	0.00011 U	--	0.00009 U	0.00012 U	--	0.0001 U	0.000097 U	--	--	0.000094 U
1,2-Dichloropropane	0.00015 U	0.00013 U	--	0.00016 U	0.00017 U	--	0.00014 U	0.00018 U	--	0.00015 U	0.00015 U	--	--	0.00015 U
1,3-Dichlorobenzene	0.00011 U	0.000094 U	--	0.00011 U	0.00012 U	--	0.000098 U	0.00013 U	--	0.00011 U	0.00011 U	--	--	0.0001 U
1,4-Dichlorobenzene	0.00012 U	0.0001 U	--	0.00012 U	0.00013 U	--	0.00011 U	0.00014 U	--	0.00012 U	0.00011 U	--	--	0.00011 U
2-Hexanone	0.00084 U	0.00074 U	--	0.00087 U	0.00094 U	--	0.00077 U	0.001 U	--	0.00085 U	0.00083 U	--	--	0.00081 U
Acetone	0.012	0.0077	--	0.042	0.041	--	0.037	0.037	--	0.031	0.023	--	--	0.027
Benzene	0.00045 J	0.00022 J	--	0.00052 J	0.0006 J	--	0.00036 J	0.00037 J	--	0.00024 J	0.00041 J	--	--	0.00017 U
Bromochloromethane	0.00015 U	0.00013 U	--	0.00016 U	0.00017 U	--	0.00014 U	0.00018 U	--	0.00015 U	0.00015 U	--	--	0.00015 U
Bromodichloromethane	0.00034 U	0.0003 U	--	0.00035 U	0.00038 U	--	0.00031 U	0.00041 U	--	0.00035 U	0.00034 U	--	--	0.00033 U
Bromoform	0.00012 U	0.0001 U	--	0.00012 U	0.00013 U	--	0.00011 U	0.00014 U	--	0.00012 U	0.00011 U	--	--	0.00011 U
Bromomethane	0.00028 U	0.00025 U	--	0.0003 U	0.00032 U	--	0.0011	0.00063 J	--	0.00029 U	0.00028 U	--	--	0.00027 U
Carbon Disulfide	0.0024	0.0012	--	0.0024	0.0014	--	0.0011	0.0014	--	0.00047 J	0.00055 J	--	--	0.0025
Carbon Tetrachloride	0.00038 U	0.00034 U	--	0.0004 U	0.00043 U	--	0.00035 U	0.00046 U	--	0.00039 U	0.00038 U	--	--	0.00037 U
Chlorobenzene	0.00012 U	0.00011 U	--	0.00013 U	0.00014 U	--	0.00011 U	0.00015 U	--	0.00013 U	0.00012 U	--	--	0.00012 U
Chloroethane	0.00031 U	0.00027 U	--	0.00032 U	0.00035 U	--	0.00029 U	0.00038 U	--	0.00032 U	0.00031 U	--	--	0.0003 U
Chloroform	0.00019 U	0.00016 U	--	0.00019 U	0.00021 U	--	0.00017 U	0.00023 U	--	0.00019 U	0.00019 U	--	--	0.00018 U
Chloromethane	0.00034 U	0.0003 U	--	0.00035 U	0.00038 U	--	0.00031 U	0.00041 U	--	0.00035 U	0.00034 U	--	--	0.00033 U
Cis-1,2-Dichloroethylene	0.0002 U	0.00017 U	--	0.0002 U	0.00022 U	--	0.00018 U	0.00024 U	--	0.0002 U	0.00019 U	--	--	0.00019 U
Cis-1,3-Dichloropropene	0.00013 U	0.00012 U	--	0.00014 U	0.00015 U	--	0.00012 U	0.00016 U	--	0.00014 U	0.00013 U	--	--	0.00013 U
Cyclohexane	0.0013	0.00036 U	--	0.00065 J+	0.0014 J+	--	0.00061 J+	0.00049 J+	--	0.00042 U	0.00076 J+	--	--	0.00039 U
Dibromochloromethane	0.00013 U	0.00012 U	--	0.00014 U	0.00015 U	--	0.00012 U	0.00016 U	--	0.00014 U	0.00013 U	--	--	0.00013 U
Dichlorodifluoromethane	0.00028 U	0.00025 U	--	0.0003 U	0.00032 U	--	0.00026 U	0.00034 U	--	0.00029 U	0.00028 U	--	--	0.00027 U
Ethylbenzene	0.00034 J	0.00018 J	--	0.00025 J	0.00054 J	--	0.00025 J	0.00019 U	--	0.00016 U	0.0003 J	--	--	0.00015 U
Isopropylbenzene (Cumene)	0.00015 U	0.00013 U	--	0.00016 U	0.00017 U	--	0.00014 U	0.00018 U	--	0.00015 U	0.00015 U	--	--	0.00015 U
M,P-Xylene	0.00087 J	0.00049 J	--	0.00064 J	0.0018	--	0.0008 J	0.00055 J	--	0.0001 U	0.00099	--	--	0.000094 U

Table E-2
Summary of Data Used in Risk Assessment
Main Plant Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-053	CFSB-053	CFSB-054	CFSB-054	CFSB-054	CFSB-055	CFSB-055	CFSB-055	CFSB-057	CFSB-057	CFSB-057	CFSB-059	CFSB-059-DUP	CFSB-059
Sample Lab IDs	460-114793-56	460-114793-58	460-114793-20	460-114793-25	460-114793-24	460-114793-19	460-114793-21	460-114793-26	460-114793-27	460-114793-35	460-114793-31	460-114793-30	460-114793-29	460-114793-33
Sample Name	CFSB-053-SO-0.5-2	CFSB-053-SO-10-12	CFSB-054-SO-0-0.5	CFSB-054-SO-0.5-2	CFSB-054-SO-10-12	CFSB-055-SO-0-0.5	CFSB-055-SO-0.5-2	CFSB-055-SO-10-12	CFSB-057-SO-0-0.5	CFSB-057-SO-0.5-2	CFSB-057-SO-10-12	CFSB-059-SO-0-0.5	CFSB-DUP8-SO	CFSB-059-SO-0.5-2
Sample Depth	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0-0.5 ft	0.5-2 ft
Chemical	5/31/2016	5/31/2016	5/28/2016	5/28/2016	5/28/2016	5/28/2016	5/28/2016	5/28/2016	5/28/2016	5/28/2016	5/28/2016	5/28/2016	5/28/2016	5/28/2016
Methyl Acetate	0.0008 U	0.00071 U	--	0.00083 U	0.0009 U	--	0.00074 U	0.00096 U	--	0.00082 U	0.0008 U	--	--	0.00077 U
Methyl Ethyl Ketone (2-Butanone)	0.00069 U	0.0006 U	--	0.0043 J	0.0033 J	--	0.0034 J	0.0031 J	--	0.0007 U	0.0025 J	--	--	0.0015 J
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	0.002 U	0.0017 U	--	0.0021 U	0.0022 U	--	0.0018 U	0.0024 U	--	0.002 U	0.002 U	--	--	0.0019 U
Methylcyclohexane	0.0022	0.00076 J	--	0.00084 J	0.0023	--	0.0009	0.00061 J	--	0.00045 U	0.0012	--	--	0.00043 U
Methylene Chloride	0.00028 U	0.00025 U	--	0.0003 U	0.00032 U	--	0.00026 U	0.00034 U	--	0.00029 U	0.00028 U	--	--	0.00027 U
O-Xylene (1,2-Dimethylbenzene)	0.00032 J	0.00017 J	--	0.00022 J	0.00063 J	--	0.0003 J	0.0003 J	--	0.00015 U	0.00032 J	--	--	0.00014 U
Styrene	0.00013 U	0.00012 U	--	0.00014 U	0.00015 U	--	0.00012 U	0.00016 U	--	0.00014 U	0.00013 U	--	--	0.00013 U
Tert-Butyl Methyl Ether	0.00015 U	0.00013 U	--	0.00016 U	0.00017 U	--	0.00014 U	0.00018 U	--	0.00015 U	0.00015 U	--	--	0.00015 U
Tetrachloroethylene (PCE)	0.00025 U	0.00022 U	--	0.00026 U	0.00028 U	--	0.00023 U	0.0003 U	--	0.00025 U	0.00025 U	--	--	0.00024 U
Toluene	0.0017	0.00082	--	0.00092 J	0.0026	--	0.0011	0.00076 J	--	0.00027 J	0.0015	--	--	0.00016 J
Trans-1,2-Dichloroethene	0.00035 U	0.00031 U	--	0.00036 U	0.00039 U	--	0.00032 U	0.00042 U	--	0.00035 U	0.00034 U	--	--	0.00033 U
Trans-1,3-Dichloropropene	0.000089 U	0.000078 U	--	0.000093 U	0.0001 U	--	0.000082 U	0.00011 U	--	0.000091 U	0.000088 U	--	--	0.000086 U
Trichloroethylene (TCE)	0.00023 U	0.0002 U	--	0.00024 U	0.00026 U	--	0.00021 U	0.00028 U	--	0.00024 U	0.00023 U	--	--	0.00022 U
Trichlorofluoromethane	0.0003 U	0.00027 U	--	0.00031 U	0.00034 U	--	0.00028 U	0.00036 U	--	0.00031 U	0.0003 U	--	--	0.00029 U
Vinyl Chloride	0.00035 U	0.00031 U	--	0.00036 U	0.00039 U	--	0.00032 U	0.00042 U	--	0.00035 U	0.00034 U	--	--	0.00033 U

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-2
Summary of Data Used in Risk Assessment
Main Plant Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-059	CFSB-060	CFSB-060	CFSB-060	CFSB-062	CFSB-062	CFSB-062	CFSB-064	CFSB-064	CFSB-064	CFSB-065	CFSB-065	CFSB-065	CFSB-066
Sample Lab IDs	460-114793-28	460-114793-8	460-114793-2	460-114793-10	460-114828-40	460-114828-39	460-114828-41	460-115008-7	460-115008-8	460-115008-9	460-114828-34	460-114828-36	460-114828-32	460-114793-12
Sample Name	CFSB-059-SO-10-12	CFSB-060-SO-0-0.5	CFSB-060-SO-0.5-2	CFSB-060-SO-10-12	CFSB-062-SO-0-0.5	CFSB-062-SO-0.5-2	CFSB-062-SO-10-12	CFSB-064-SO-0-0.5	CFSB-064-SO-0.5-2	CFSB-064-SO-10-12	CFSB-065-SO-0-0.5	CFSB-065-SO-0.5-2	CFSB-065-SO-10-12	CFSB-066-SO-0-0.5
Sample Depth	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft
Chemical	5/28/2016	5/27/2016	5/27/2016	5/27/2016	6/2/2016	6/2/2016	6/2/2016	6/3/2016	6/3/2016	6/3/2016	6/2/2016	6/2/2016	6/2/2016	5/27/2016
GENERAL CHEMISTRY (mg/kg)														
Fluoride	21.6 J-	16.4 J	11.3 J	6.74 J	25.9 J	27.5 J	17.3 J	33.3 J	71.2 J	0.19 UJ	46.8 J	57.1 J	9.92 J	571 J
Cyanide	0.018 UJ	0.046 J	0.055 J	0.018 J	0.075 J	0.07 J	0.027 J	0.084 J	0.13	0.017 U	0.29	0.62	0.045 J	0.19
METALS (mg/kg)														
"Chromium, Hexavalent - Estimated"	0.26764	0.195377	0.179319	0.2382	0.294404	0.307786	0.232847	0.256934	0.259611	0.254258	0.331873	0.481752	0.224818	1.24453
"Chromium, Trivalent - Calculated"	--	--	--	--	--	--	--	--	--	--	--	--	--	--
"Chromium, Trivalent - Estimated"	9.73236	7.10462	6.52068	8.6618	10.7056	11.1922	8.46715	9.34307	9.44039	9.24574	12.0681	17.5182	8.17518	45.2555
Aluminum	7850	6800	6390	8510	14600 J	13000 J	6880 J	14500	17100	6540	16600 J	22800 J	6180 J	22700
Antimony	0.34 UJ	0.34 U	0.34 U	0.33 U	0.44 UJ	0.44 UJ	0.41 UJ	0.38 UJ	0.39 UJ	0.36 UJ	0.47 UJ	0.46 UJ	0.39 UJ	0.48 J
Arsenic	3.5	2.9 J	3 J	3.7 J	6.8 J	4.8 J	3.2 J	3.6	4.3	3.8	5.5 J	7.9 J	3.4 J	6.8 J
Barium	66.2	92.9 J	55.2 J	73.7 J	149 J	123 J	44.8 J	134	221	79.1	208 J	204 J	111 J	67.7 J
Beryllium	0.4	0.29 J	0.32 J	0.31 J	0.63	0.67	0.41	0.54	0.66	0.45	0.66	0.86	0.7	0.75
Cadmium	0.26 U	0.26 U	0.26 U	0.25 U	0.34 U	0.34 U	0.31 U	0.29 U	0.3 U	0.28 U	0.35 U	0.9 J	0.29 U	1.7
Calcium	41800	26200 J	36600 J	38200 J	4730	11200	35600	4270	6040	28100	1940	2400	37800	25400 J
Chromium, Total	10	7.3 J	6.7 J	8.9 J	11 J	11.5 J	8.7 J	9.6	9.7	9.5	12.4 J	18 J	8.4 J	46.5 J
Cobalt	5.3	4.1	4.5	4.9	6.4	6.6	4.5	5.2	6.3	5	7	8.7	4.9	7.8
Copper	14.6	19.3	8.7	12.6	24.4	23.2	14.6	12.5 J	13.7 J	18.5 J	22.6	52.6	36.7	26.5
Iron	13500	9790	10600	13200	16400 J	19600 J	13000 J	13100	15700	10500	17500 J	16800 J	11200 J	19600
Lead	5.9	4.9	4.2	6.3	14.6 J	9.6 J	4.8 J	10.5 J	10.6 J	6.4 J	14.5 J	26 J	5.4 J	18.4
Magnesium	12700	13900 J	9690 J	14500 J	8100	12500	11600	6980	7290	10200	7960	8140	15100	11300 J
Manganese	336	364 J	209 J	402 J	507 J	538 J	276 J	360	656	350	429 J	371 J	402 J	405 J
Mercury	0.012 J	0.013 J	0.014 J	0.015 J+	0.02	0.014 J	0.013 J	0.015 J	0.016 J	0.02	0.069	0.27	0.012 J	0.02 J+
Nickel	10.3	10.5 J	10.3 J	10.6 J	17.1	16.5	9.1	14.1	13	10	29.2	98.1	8.7	140 J
Potassium	763	585 J	566 J	741 J	781	582	532	1150 J+	1080 J+	827 J+	705	773	661	1320 J
Selenium	0.32 U	0.32 U	0.32 U	0.31 U	0.41 U	0.41 U	0.38 U	0.35 U	0.37 U	0.34 U	0.44 U	0.44 J	0.36 U	0.44 J
Silver	0.63 U	0.63 U	0.63 U	0.61 U	0.81 U	0.81 U	0.75 U	0.69 U	0.72 U	0.67 U	0.85 U	0.99 J	0.71 U	0.6 U
Sodium	32 U	32 U	459	36.1 J	57.1 J	51 J	38.8 J	51.2 J	61.5 J	46.7 J	89.4 J	112 J	50.2 J	1590
Thallium	0.13 U	0.13 U	0.13 U	0.12 U	0.17 U	0.17 U	0.15 U	0.14 U	0.15 U	0.14 U	0.18 U	0.17 U	0.15 U	0.12 U
Vanadium	9	6 J	5.2 J	7.6 J	15.8 J	13.2 J	8.6 J	14.1	16.1	6.4	19.7 J	31.8 J	9.3 J	17.7 J
Zinc	35.7	27.7	30.6	37.8	60.5 J	53 J	31.3 J	43.3	78.2	25.7	85.3 J	244 J	32.1 J	59.6
METALS|HEXAVALENT CHROMIUM (mg/kg)														
Chromium, Hexavalent	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PESTICIDES (mg/kg)														
Aldrin	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Alpha Bhc (Alpha Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Alpha Endosulfan	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Beta Bhc (Beta Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Beta Endosulfan	--	--	--	--	--	--	--	--	--	--	--	--	--	--
cis-Chlordane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Delta BHC (Delta Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dieldrin	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endosulfan Sulfate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin Aldehyde	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin Ketone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Gamma Bhc (Lindane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Heptachlor	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Heptachlor Epoxide	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methoxychlor	--	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDD	--	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDT	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Toxaphene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
trans-Chlordane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
POLYCHLORINATED BIPHENYLS (mg/kg)														
PCB-1016 (Aroclor 1016)	0.0095 U	0.0095 U	0.0093 U	0.0093 U	0.01 U	0.01 U	0.0095 U	0.01 U	0.011 U	0.0095 U	0.011 U	0.011 U	0.0095 U	0.0096 U
PCB-1221 (Aroclor 1221)	0.0095 U	0.0095 U	0.0093 U	0.0093 U	0.01 U	0.01 U	0.0095 U	0.01 U	0.011 U	0.0095 U	0.011 U	0.011 U	0.0095 U	0.0096 U

Table E-2
Summary of Data Used in Risk Assessment
Main Plant Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-059	CFSB-060	CFSB-060	CFSB-060	CFSB-062	CFSB-062	CFSB-062	CFSB-064	CFSB-064	CFSB-064	CFSB-065	CFSB-065	CFSB-065	CFSB-066
Sample Lab IDs	460-114793-28	460-114793-8	460-114793-2	460-114793-10	460-114828-40	460-114828-39	460-114828-41	460-115008-7	460-115008-8	460-115008-9	460-114828-34	460-114828-36	460-114828-32	460-114793-12
Sample Name	CFSB-059-SO-10-12	CFSB-060-SO-0-0.5	CFSB-060-SO-0.5-2	CFSB-060-SO-10-12	CFSB-062-SO-0-0.5	CFSB-062-SO-0.5-2	CFSB-062-SO-10-12	CFSB-064-SO-0-0.5	CFSB-064-SO-0.5-2	CFSB-064-SO-10-12	CFSB-065-SO-0-0.5	CFSB-065-SO-0.5-2	CFSB-065-SO-10-12	CFSB-066-SO-0-0.5
Sample Depth	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft
Chemical	5/28/2016	5/27/2016	5/27/2016	5/27/2016	6/2/2016	6/2/2016	6/2/2016	6/3/2016	6/3/2016	6/3/2016	6/2/2016	6/2/2016	6/2/2016	5/27/2016
PCB-1232 (Aroclor 1232)	0.0095 U	0.0095 U	0.0093 U	0.0093 U	0.01 U	0.01 U	0.0095 U	0.01 U	0.011 U	0.0095 U	0.011 U	0.011 U	0.0095 U	0.0096 U
PCB-1242 (Aroclor 1242)	0.0095 U	0.0095 U	0.0093 U	0.0093 U	0.01 U	0.01 U	0.0095 U	0.01 U	0.011 U	0.0095 U	0.011 U	0.011 U	0.0095 U	0.0096 U
PCB-1248 (Aroclor 1248)	0.0095 U	0.0095 U	0.0093 U	0.0093 U	0.01 U	0.01 U	0.0095 U	0.01 U	0.011 U	0.0095 U	0.011 U	0.011 U	0.0095 U	0.0096 U
PCB-1254 (Aroclor 1254)	0.0098 U	0.0098 U	0.0096 U	0.0096 U	0.011 U	0.01 U	0.0098 U	0.011 U	0.011 U	0.0099 U	0.011 U	0.012 U	0.0098 U	0.0099 U
PCB-1260 (Aroclor 1260)	0.0098 U	0.0098 U	0.0096 U	0.0096 U	0.011 U	0.01 U	0.0098 U	0.011 U	0.011 U	0.0099 U	0.011 U	0.012 U	0.0098 U	0.0099 U
PCB-1262 (Aroclor 1262)	0.0098 U	0.0098 U	0.0096 U	0.0096 U	0.011 U	0.01 U	0.0098 U	0.011 U	0.011 U	0.0099 U	0.011 U	0.012 U	0.0098 U	0.0099 U
PCB-1268 (Aroclor 1268)	0.0098 U	0.0098 U	0.0096 U	0.0096 U	0.011 U	0.01 U	0.0098 U	0.011 U	0.011 U	0.0099 U	0.011 U	0.012 U	0.0098 U	0.0099 U
Polychlorinated Biphenyl (PCBs)	0.0098 U	0.0098 U	0.0096 U	0.0096 U	0.011 U	0.01 U	0.0098 U	0.011 U	0.011 U	0.0099 U	0.011 U	0.012 U	0.0098 U	0.0099 U
SEMIVOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,2,4,5-Tetrachlorobenzene	0.026 U	0.026 U	0.026 U	0.026 U	0.029 U	0.028 U	0.026 U	0.028 U	0.03 U	0.026 U	0.029 U	0.15 U	0.026 U	0.13 U
1,4-Dioxane (P-Dioxane)	0.094 U	0.094 U	0.092 U	0.092 U	0.1 U	0.1 U	0.094 U	0.1 U	0.11 U	0.094 U	0.1 U	0.56 U	0.094 U	0.47 U
2,3,4,6-Tetrachlorophenol	0.033 U	0.033 U	0.032 U	0.032 U	0.036 U	0.035 U	0.033 U	0.036 U	0.038 U	0.033 U	0.037 U	0.2 U	0.033 U	0.17 U
2,4,5-Trichlorophenol	0.035 U	0.035 U	0.034 U	0.034 U	0.038 U	0.037 U	0.035 U	0.038 U	0.04 U	0.035 U	0.039 U	0.21 U	0.035 U	0.18 U
2,4,6-Trichlorophenol	0.01 U	0.01 U	0.0098 U	0.0098 U	0.011 U	0.011 U	0.01 U	0.011 U	0.012 U	0.01 U	0.011 U	0.059 U	0.01 U	0.05 U
2,4-Dichlorophenol	0.0083 U	0.0083 U	0.0081 U	0.0081 U	0.0091 U	0.0088 U	0.0083 U	0.0089 U	0.0096 U	0.0083 U	0.0092 U	0.049 U	0.0083 U	0.042 U
2,4-Dimethylphenol	0.077 U	0.077 U	0.075 U	0.076 U	0.085 U	0.082 U	0.078 U	0.083 U	0.089 U	0.077 U	0.086 U	0.46 U	0.077 U	0.39 U
2,4-Dinitrophenol	0.27 U	0.27 U	0.26 U	0.26 U	0.29 U	0.28 U	0.27 U	0.29 U	0.31 U	0.27 U	0.3 U	1.6 U	0.27 U	1.3 U
2,4-Dinitrotoluene	0.014 U	0.014 U	0.014 U	0.014 U	0.015 U	0.015 U	0.014 U	0.015 U	0.016 U	0.014 U	0.015 U	0.082 U	0.014 U	0.07 U
2,6-Dinitrotoluene	0.019 U	0.019 U	0.018 U	0.018 U	0.021 U	0.02 U	0.019 U	0.02 U	0.022 U	0.019 U	0.021 U	0.11 U	0.019 U	0.094 U
2-Chloronaphthalene	0.008 U	0.008 U	0.0078 U	0.0078 U	0.0088 U	0.0085 U	0.008 U	0.0086 U	0.0092 U	0.008 U	0.0089 U	0.047 U	0.008 U	0.04 U
2-Chlorophenol	0.009 U	0.009 U	0.0087 U	0.0088 U	0.0098 U	0.0095 U	0.009 U	0.0096 U	0.01 U	0.009 U	0.0099 U	0.053 U	0.0089 U	0.045 U
2-Methylnaphthalene	0.0078 U	0.0078 U	0.0076 U	0.0076 U	0.009 J	0.0086 J	0.0078 U	0.025 J	0.018 J	0.0078 U	0.0086 U	0.046 U	0.0078 U	0.078 J
2-Methylphenol (O-Cresol)	0.015 U	0.015 U	0.015 U	0.015 U	0.017 U	0.016 U	0.015 U	0.016 U	0.018 U	0.015 U	0.017 U	0.091 U	0.015 U	0.077 U
2-Nitroaniline	0.012 U	0.012 U	0.011 U	0.011 U	0.013 U	0.012 U	0.012 U	0.012 U	0.013 U	0.012 U	0.013 U	0.069 U	0.012 U	0.058 U
2-Nitrophenol	0.012 U	0.012 U	0.012 U	0.012 U	0.013 U	0.013 U	0.012 U	0.013 U	0.014 U	0.012 U	0.013 U	0.07 U	0.012 U	0.059 U
3- And 4- Methylphenol (Total)	0.0094 U	0.0094 U	0.0091 U	0.0092 U	0.01 U	0.0099 U	0.0094 U	0.01 U	0.011 U	0.0094 U	0.01 U	0.055 U	0.0094 U	0.047 U
3,3'-Dichlorobenzidine	0.039 U	0.039 U	0.038 U	0.038 U	0.043 U	0.042 U	0.039 U	0.042 U	0.045 U	0.039 U	0.044 U	0.23 U	0.039 U	0.2 U
3-Nitroaniline	0.01 U	0.01 U	0.01 U	0.01 U	0.011 U	0.011 U	0.01 U	0.011 U	0.012 U	0.01 U	0.012 U	0.062 U	0.01 U	0.052 U
4,6-Dinitro-2-Methylphenol	0.094 U	0.094 U	0.092 U	0.092 U	0.1 U	0.1 U	0.094 U	0.1 U	0.11 U	0.094 U	0.1 U	0.55 U	0.094 U	0.47 U
4-Bromophenyl Phenyl Ether	0.011 U	0.011 U	0.011 U	0.011 U	0.012 U	0.012 U	0.011 U	0.012 U	0.013 U	0.011 U	0.012 U	0.065 U	0.011 U	0.056 U
4-Chloro-3-Methylphenol	0.015 U	0.015 U	0.015 U	0.015 U	0.017 U	0.016 U	0.015 U	0.016 U	0.017 U	0.015 U	0.017 U	0.089 U	0.015 U	0.076 U
4-Chloroaniline	0.0091 U	0.0091 U	0.0088 U	0.0089 U	0.0099 U	0.0096 U	0.0091 U	0.0097 U	0.01 U	0.0091 U	0.01 U	0.053 U	0.009 U	0.046 U
4-Chlorophenyl Phenyl Ether	0.011 U	0.011 U	0.01 U	0.01 U	0.012 U	0.011 U	0.011 U	0.011 U	0.012 U	0.011 U	0.012 U	0.062 U	0.011 U	0.053 U
4-Nitroaniline	0.013 U	0.013 U	0.013 U	0.013 U	0.015 U	0.014 U	0.013 U	0.014 U	0.015 U	0.013 U	0.015 U	0.079 U	0.013 U	0.067 U
4-Nitrophenol	0.17 U	0.17 U	0.17 U	0.17 U	0.19 U	0.18 U	0.17 U	0.18 U	0.2 U	0.17 U	0.19 U	1 U	0.17 U	0.85 U
Acenaphthene	0.0085 U	0.15 J	0.011 J	0.0084 J	0.048 J	0.041 J	0.0085 U	0.049 J	0.061 J	0.0085 U	0.04 J	0.23 J	0.0085 U	0.41 J
Acenaphthylene	0.0091 U	0.0091 U	0.0088 U	0.0089 U	0.0099 U	0.0096 U	0.0091 U	0.0097 U	0.01 U	0.0091 U	0.01 U	0.053 U	0.009 U	0.046 U
Acetophenone	0.0077 U	0.0077 U	0.0075 U	0.0075 U	0.0084 U	0.0081 U	0.0077 U	0.0082 U	0.0088 U	0.0077 U	0.0085 U	0.045 U	0.0077 U	0.046 J
Anthracene	0.033 U	0.42	0.033 U	0.033 U	0.094 J	0.047 J	0.033 U	0.089 J	0.1 J	0.033 U	0.085 J	0.51 J	0.033 U	0.93 J
Atrazine	0.016 U	0.016 U	0.015 U	0.015 U	0.017 U	0.017 U	0.016 U	0.017 U	0.018 U	0.016 U	0.017 U	0.092 U	0.016 U	0.079 U
Benzaldehyde	0.027 U	0.027 U	0.026 U	0.026 U	0.029 U	0.028 U	0.027 U	0.031 J	0.031 U	0.027 U	0.03 U	0.16 U	0.027 U	0.13 U
Benzo(A)Anthracene	0.029 U	3.8	0.28	0.23	0.45	0.21	0.029 U	0.43	0.34	0.029 U	0.68	4.1	0.029 U	8
Benzo(A)Pyrene	0.021 J	4.5	0.34	0.28	0.58	0.22	0.011 U	0.54	0.36	0.011 U	0.91	5.4	0.011 U	9
Benzo(B)Fluoranthene	0.034 J	5.7	0.44	0.37	1.1	0.54	0.014 U	0.87	0.58	0.014 U	1.8	12	0.014 U	15
Benzo(G,H,I)Perylene	0.022 J+	3.6	0.25 J	0.21 J	0.53	0.25 J	0.02 U	0.55	0.26 J	0.02 U	1.4	9.7 J+	0.02 U	6.8
Benzo(K)Fluoranthene	0.015 U	2.1	0.16	0.11	0.45	0.18	0.015 U	0.3	0.24	0.015 U	0.65	3.8	0.015 U	5.2
Benzyl Butyl Phthalate	0.011 U	0.011 U	0.011 U	0.011 U	0.012 U	0.012 U	0.011 U	0.012 U	0.017 J	0.011 U	0.012 U	0.064 U	0.011 U	0.055 U
Biphenyl (Diphenyl)	0.03 U	0.03 U	0.029 U	0.029 U	0.033 U	0.032 U	0.03 U	0.032 U	0.035 U	0.03 U	0.033 U	0.18 U	0.03 U	0.15 U
Bis(2-Chloroethoxy) Methane	0.011 U	0.011 U	0.011 U	0.011 U	0.012 U	0.012 U	0.011 U	0.012 U	0.013 U	0.011 U	0.012 U	0.065 U	0.011 U	0.055 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.0083 U	0.0083 U	0.0081 U	0.0081 U	0.0091 U	0.0088 U	0.0083 U	0.0089 U	0.0096 U	0.0083 U	0.0092 U	0.049 U	0.0083 U	0.042 U
Bis(2-Chloroisopropyl) Ether	0.014 U	0.014 U	0.014 U	0.014 U	0.016 U	0.015 U	0.015 U	0.016 U	0.017 U	0.014 U	0.016 U	0.086 U	0.014 U	0.073 U
Bis(2-Ethylhexyl) Phthalate	0.014 U	0.014 U	0.013 U	0.013 U	0.031 J	0.015 U	0.014 U	0.015 U	0.31 J+	0.014 U	0.015 U	0.52 J	0.014 U	0.069 U
Caprolactam	0.025 U	0.025 U	0.025 U	0.025 U	0.028 U	0.027 U	0.025 U	0.027 U	0.029 U	0.025 U	0.028 U	0.15 U	0.025 U	0.13 U
Carbazole	0.0087 U	0.4	0.028 J	0.019 J	0.11 J	0.049 J	0.0087 U	0.088 J	0.035 J	0.0087 U	0.16 J	1.1 J	0.0087 U	1.7 J
Chrysene	0.025 J	4.2	0.32 J	0.25 J	0.84	0.39	0.0096 U	0.61	0.41	0.0096 U	1.3	10	0.0096 U	13
Dibenz(A,H)Anthracene	0.018 U	0.97	0.067	0.055	0.1	0.046	0.018 U	0.12	0.077	0.018 U	0.25	1.6 J+	0.018 U	1.9
Dibenzofuran	0.011 U	0.022 J	0.01 U	0.01 U	0.023 J	0.017 J	0.011 U	0.022 J	0.041 J	0.011 U	0.019 J	0.094 J	0.011 U	0.12 J

Table E-2
Summary of Data Used in Risk Assessment
Main Plant Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-059	CFSB-060	CFSB-060	CFSB-060	CFSB-062	CFSB-062	CFSB-062	CFSB-064	CFSB-064	CFSB-064	CFSB-065	CFSB-065	CFSB-065	CFSB-066
Sample Lab IDs	460-114793-28	460-114793-8	460-114793-2	460-114793-10	460-114828-40	460-114828-39	460-114828-41	460-115008-7	460-115008-8	460-115008-9	460-114828-34	460-114828-36	460-114828-32	460-114793-12
Sample Name	CFSB-059-SO-10-12	CFSB-060-SO-0-0.5	CFSB-060-SO-0.5-2	CFSB-060-SO-10-12	CFSB-062-SO-0-0.5	CFSB-062-SO-0.5-2	CFSB-062-SO-10-12	CFSB-064-SO-0-0.5	CFSB-064-SO-0.5-2	CFSB-064-SO-10-12	CFSB-065-SO-0-0.5	CFSB-065-SO-0.5-2	CFSB-065-SO-10-12	CFSB-066-SO-0-0.5
Sample Depth	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft
Chemical	5/28/2016	5/27/2016	5/27/2016	5/27/2016	6/2/2016	6/2/2016	6/2/2016	6/3/2016	6/3/2016	6/3/2016	6/2/2016	6/2/2016	6/2/2016	5/27/2016
Diethyl Phthalate	0.01 U	0.01 U	0.0098 U	0.0098 U	0.011 U	0.011 U	0.01 U	0.011 U	0.012 U	0.01 U	0.011 U	0.059 U	0.01 U	0.05 U
Dimethyl Phthalate	0.01 U	0.01 U	0.01 U	0.01 U	0.011 U	0.011 U	0.01 U	0.011 U	0.012 U	0.01 U	0.011 U	0.06 U	0.01 U	0.051 U
Di-N-Butyl Phthalate	0.011 U	0.011 U	0.01 U	0.01 U	0.012 U	0.011 U	0.011 U	0.011 U	0.012 U	0.011 U	0.012 U	0.062 U	0.011 U	0.053 U
Di-N-Octylphthalate	0.018 U	0.018 U	0.017 U	0.018 U	0.02 U	0.019 U	0.018 U	0.019 U	0.021 U	0.018 U	0.02 U	0.11 U	0.018 U	0.09 U
Fluoranthene	0.027 J	5.3	0.37	0.27 J	1	0.5	0.01 U	0.89	0.76	0.01 U	1.4	9.2	0.01 U	15
Fluorene	0.0077 U	0.053 J	0.0075 U	0.0075 U	0.044 J	0.034 J	0.0077 U	0.044 J	0.051 J	0.0077 U	0.029 J	0.17 J	0.0077 U	0.24 J
Hexachlorobenzene	0.014 U	0.014 UJ	0.014 U	0.014 U	0.016 U	0.015 U	0.014 U	0.015 U	0.016 U	0.014 U	0.016 U	0.084 U	0.014 U	0.072 UJ
Hexachlorobutadiene	0.0099 U	0.0099 U	0.0097 U	0.0097 U	0.011 U	0.011 U	0.0099 U	0.011 U	0.011 U	0.0099 U	0.011 U	0.058 U	0.0099 U	0.05 U
Hexachlorocyclopentadiene	0.022 UJ	0.022 UJ	0.021 U	0.021 U	0.024 U	0.023 U	0.022 U	0.024 U	0.025 U	0.022 U	0.024 U	0.13 U	0.022 U	0.11 UJ
Hexachloroethane	0.013 U	0.013 U	0.013 U	0.013 U	0.014 U	0.014 U	0.013 U	0.014 U	0.015 U	0.013 U	0.014 U	0.076 U	0.013 U	0.065 U
Indeno(1,2,3-C,D)Pyrene	0.023 J	3.7	0.26	0.22	0.57	0.22	0.023 U	0.6 J+	0.33	0.023 U	1.4	9.6 J+	0.023 U	6.8
Isophorone	0.0076 U	0.0076 U	0.0074 U	0.0074 U	0.0083 U	0.008 U	0.0076 U	0.0081 U	0.0087 U	0.0076 U	0.0084 U	0.045 U	0.0076 U	0.059 J
Naphthalene	0.009 U	0.025 J	0.0087 U	0.0088 U	0.017 J	0.022 J	0.009 U	0.024 J	0.02 J	0.009 U	0.014 J	0.09 J	0.0089 U	0.11 J
Nitrobenzene	0.011 U	0.011 U	0.011 U	0.011 U	0.012 U	0.012 U	0.011 U	0.012 U	0.013 U	0.011 U	0.012 U	0.065 U	0.011 U	0.056 U
N-Nitrosodi-N-Propylamine	0.012 U	0.012 U	0.012 U	0.012 U	0.013 U	0.013 U	0.012 U	0.013 U	0.014 U	0.012 U	0.013 U	0.07 U	0.012 U	0.059 U
N-Nitrosodiphenylamine	0.032 U	0.032 U	0.031 U	0.031 U	0.035 U	0.034 U	0.032 U	0.034 U	0.037 U	0.032 U	0.035 U	0.19 U	0.032 U	0.16 U
Pentachlorophenol	0.043 U	0.043 U	0.042 U	0.042 U	0.047 U	0.045 U	0.043 U	0.046 U	0.049 U	0.043 U	0.047 U	0.25 U	0.043 U	0.21 U
Phenanthrene	0.012 J	1.6	0.12 J	0.091 J	0.49	0.27 J	0.0094 U	0.51	0.36 J	0.0094 U	0.52	3.2	0.0094 U	5.8
Phenol	0.012 U	0.012 U	0.011 U	0.011 U	0.013 U	0.012 U	0.012 U	0.012 U	0.013 U	0.012 U	0.013 U	0.068 U	0.011 U	0.058 U
Pyrene	0.029 J	6.1	0.51 J+	0.36 J+	0.92	0.45	0.016 U	0.81	0.69	0.016 U	1.3	9.8	0.016 U	16
VOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,1,1-Trichloroethane	0.00028 U	--	0.00034 U	0.00035 U	--	0.00031 U	0.00032 U	--	0.00038 U	0.00037 U	--	0.00033 U	0.00029 U	--
1,1,2,2-Tetrachloroethane	0.00013 U	--	0.00015 U	0.00016 U	--	0.00014 U	0.00014 U	--	0.00017 U	0.00017 U	--	0.00015 U	0.00013 U	--
1,1,2-Trichloro-1,2,2-Trifluoroethane	0.00033 U	--	0.0004 U	0.00041 U	--	0.00036 U	0.00037 U	--	0.00044 U	0.00043 U	--	0.00039 U	0.00034 U	--
1,1,2-Trichloroethane	0.00021 U	--	0.00025 U	0.00026 U	--	0.00023 U	0.00024 U	--	0.00028 U	0.00027 U	--	0.00025 U	0.00021 U	--
1,1-Dichloroethane	0.00025 U	--	0.00031 U	0.00031 U	--	0.00028 U	0.00029 U	--	0.00034 U	0.00033 U	--	0.0003 U	0.00026 U	--
1,1-Dichloroethene	0.0003 U	--	0.00037 U	0.00038 U	--	0.00033 U	0.00035 U	--	0.00041 U	0.0004 U	--	0.00036 U	0.00031 U	--
1,2,3-Trichlorobenzene	0.000082 U	--	0.000099 U	0.0001 U	--	0.000089 U	0.000093 U	--	0.00011 U	0.00011 U	--	0.000096 U	0.000084 U	--
1,2,4-Trichlorobenzene	0.00024 U	--	0.00029 U	0.0003 U	--	0.00026 U	0.00027 U	--	0.00032 U	0.00031 U	--	0.00028 U	0.00024 U	--
1,2-Dibromo-3-Chloropropane	0.00035 U	--	0.00042 U	0.00043 U	--	0.00038 U	0.0004 U	--	0.00047 U	0.00046 U	--	0.00041 U	0.00036 U	--
1,2-Dibromoethane (Ethylene Dibromide)	0.000089 U	--	0.00011 U	0.00011 U	--	0.000097 U	0.0001 U	--	0.00012 U	0.00012 U	--	0.00011 U	0.000092 U	--
1,2-Dichlorobenzene	0.0001 U	--	0.00013 U	0.00013 U	--	0.00011 U	0.00012 U	--	0.00014 U	0.00014 U	--	0.00012 U	0.00011 U	--
1,2-Dichloroethane	0.000082 U	--	0.000099 U	0.0001 U	--	0.000089 U	0.000093 U	--	0.00011 U	0.00011 U	--	0.000096 U	0.000084 U	--
1,2-Dichloropropane	0.00013 U	--	0.00015 U	0.00016 U	--	0.00014 U	0.00014 U	--	0.00017 U	0.00017 U	--	0.00015 U	0.00013 U	--
1,3-Dichlorobenzene	0.000089 U	--	0.00011 U	0.00011 U	--	0.000097 U	0.0001 U	--	0.00012 U	0.00012 U	--	0.00011 U	0.000092 U	--
1,4-Dichlorobenzene	0.000096 U	--	0.00012 U	0.00012 U	--	0.00011 U	0.00011 U	--	0.00013 U	0.00013 U	--	0.00011 U	0.000099 U	--
2-Hexanone	0.0007 U	--	0.00085 U	0.00087 U	--	0.00076 U	0.0008 U	--	0.00094 U	0.00092 U	--	0.00082 U	0.00072 U	--
Acetone	0.012	--	0.01	0.0047	--	0.092	0.0061	--	0.012	0.0072	--	0.076	0.0049	--
Benzene	0.00042 J	--	0.00033 J	0.00018 U	--	0.00039 J	0.00053 J	--	0.0002 J	0.0002 U	--	0.00027 J	0.0027	--
Bromochloromethane	0.00013 U	--	0.00015 U	0.00016 U	--	0.00014 U	0.00014 U	--	0.00017 U	0.00017 U	--	0.00015 U	0.00013 U	--
Bromodichloromethane	0.00028 U	--	0.00034 U	0.00035 U	--	0.00031 U	0.00032 U	--	0.00038 U	0.00037 U	--	0.00033 U	0.00029 U	--
Bromoform	0.000096 U	--	0.00012 U	0.00012 U	--	0.00011 U	0.00011 U	--	0.00013 U	0.00013 U	--	0.00011 U	0.000099 U	--
Bromomethane	0.00024 U	--	0.00029 U	0.0003 U	--	0.00026 U	0.00027 U	--	0.00032 U	0.00031 U	--	0.00028 U	0.00024 U	--
Carbon Disulfide	0.00032 U	--	0.00058 J	0.0004 U	--	0.00035 U	0.00056 J	--	0.00043 U	0.00077 J	--	0.00063 J	0.00038 J	--
Carbon Tetrachloride	0.00032 U	--	0.00039 U	0.0004 U	--	0.00035 U	0.00036 U	--	0.00043 U	0.00042 U	--	0.00038 U	0.00033 U	--
Chlorobenzene	0.0001 U	--	0.00013 U	0.00013 U	--	0.00011 U	0.00012 U	--	0.00014 U	0.00014 U	--	0.00012 U	0.00011 U	--
Chloroethane	0.00026 U	--	0.00032 U	0.00032 U	--	0.00028 U	0.0003 U	--	0.00035 U	0.00034 U	--	0.00031 U	0.00027 U	--
Chloroform	0.00016 U	--	0.00019 U	0.00019 U	--	0.00017 U	0.00018 U	--	0.00021 U	0.00021 U	--	0.00018 U	0.00016 U	--
Chloromethane	0.00028 U	--	0.00034 U	0.00035 U	--	0.00031 U	0.00032 U	--	0.00038 U	0.00037 U	--	0.00033 U	0.00029 U	--
Cis-1,2-Dichloroethylene	0.00016 U	--	0.0002 U	0.0002 U	--	0.00018 U	0.00019 U	--	0.00022 U	0.00021 U	--	0.00019 U	0.00017 U	--
Cis-1,3-Dichloropropene	0.00011 U	--	0.00014 U	0.00014 U	--	0.00012 U	0.00013 U	--	0.00015 U	0.00015 U	--	0.00013 U	0.00011 U	--
Cyclohexane	0.0011 J+	--	0.00041 U	0.00043 U	--	0.00037 U	0.0016	--	0.00046 U	0.00045 U	--	0.0004 U	0.0062	--
Dibromochloromethane	0.00011 U	--	0.00014 U	0.00014 U	--	0.00012 U	0.00013 U	--	0.00015 U	0.00015 U	--	0.00013 U	0.00011 U	--
Dichlorodifluoromethane	0.00024 U	--	0.00029 U	0.0003 U	--	0.00026 U	0.00027 U	--	0.00032 U	0.00031 U	--	0.00028 U	0.00024 U	--
Ethylbenzene	0.00043 J	--	0.00016 U	0.00017 U	--	0.00015 U	0.00053 J	--	0.00018 U	0.00018 U	--	0.00016 U	0.0029	--
Isopropylbenzene (Cumene)	0.00013 U	--	0.00015 U	0.00016 U	--	0.00014 U	0.00014 U	--	0.00017 U	0.00017 U	--	0.00015 U	0.00037 J	--
M,P-Xylene	0.0014	--	0.00036 J	0.00016 J	--	0.00012 J	0.0018	--	0.00011 U	0.00032 J	--	0.000096 U	0.0081	--

Table E-2
Summary of Data Used in Risk Assessment
Main Plant Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-059	CFSB-060	CFSB-060	CFSB-060	CFSB-062	CFSB-062	CFSB-062	CFSB-064	CFSB-064	CFSB-064	CFSB-065	CFSB-065	CFSB-065	CFSB-066
Sample Lab IDs	460-114793-28	460-114793-8	460-114793-2	460-114793-10	460-114828-40	460-114828-39	460-114828-41	460-115008-7	460-115008-8	460-115008-9	460-114828-34	460-114828-36	460-114828-32	460-114793-12
Sample Name	CFSB-059-SO-10-12	CFSB-060-SO-0-0.5	CFSB-060-SO-0.5-2	CFSB-060-SO-10-12	CFSB-062-SO-0-0.5	CFSB-062-SO-0.5-2	CFSB-062-SO-10-12	CFSB-064-SO-0-0.5	CFSB-064-SO-0.5-2	CFSB-064-SO-10-12	CFSB-065-SO-0-0.5	CFSB-065-SO-0.5-2	CFSB-065-SO-10-12	CFSB-066-SO-0-0.5
Sample Depth	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft
Chemical	5/28/2016	5/27/2016	5/27/2016	5/27/2016	6/2/2016	6/2/2016	6/2/2016	6/3/2016	6/3/2016	6/3/2016	6/2/2016	6/2/2016	6/2/2016	5/27/2016
Methyl Acetate	0.00067 U	--	0.00081 U	0.00083 U	--	0.0035 J	0.00076 U	--	0.0009 U	0.00088 U	--	0.014	0.00069 U	--
Methyl Ethyl Ketone (2-Butanone)	0.0013 J	--	0.00069 U	0.00071 U	--	0.0057	0.00065 U	--	0.00077 U	0.00075 U	--	0.0033 J	0.00059 U	--
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	0.0016 U	--	0.002 U	0.0021 U	--	0.0018 U	0.0019 U	--	0.0022 U	0.0022 U	--	0.0019 U	0.0017 U	--
Methylcyclohexane	0.0019	--	0.00057 J	0.00046 U	--	0.00045 J	0.0027	--	0.0005 U	0.00049 U	--	0.00044 U	0.012	--
Methylene Chloride	0.00024 U	--	0.00029 U	0.0003 U	--	0.00026 U	0.00027 U	--	0.00032 U	0.00031 U	--	0.00028 U	0.00024 U	--
O-Xylene (1,2-Dimethylbenzene)	0.00047 J	--	0.00014 U	0.00015 U	--	0.00013 U	0.00059 J	--	0.00016 U	0.00016 U	--	0.00014 U	0.0028	--
Styrene	0.00011 U	--	0.00014 U	0.00014 U	--	0.00012 U	0.00013 U	--	0.00015 U	0.00015 U	--	0.00013 U	0.00011 U	--
Tert-Butyl Methyl Ether	0.00013 U	--	0.00015 U	0.00016 U	--	0.00014 U	0.00014 U	--	0.00017 U	0.00017 U	--	0.00015 U	0.00013 U	--
Tetrachloroethylene (PCE)	0.00021 U	--	0.00025 U	0.00026 U	--	0.00023 U	0.00024 U	--	0.00028 U	0.00027 U	--	0.00025 U	0.00021 U	--
Toluene	0.002	--	0.001	0.00031 J	--	0.00041 J	0.0026	--	0.00019 U	0.00041 J	--	0.00019 J	0.012	--
Trans-1,2-Dichloroethene	0.00029 U	--	0.00035 U	0.00036 U	--	0.00032 U	0.00033 U	--	0.00039 U	0.00038 U	--	0.00034 U	0.0003 U	--
Trans-1,3-Dichloropropene	0.000074 U	--	0.00009 U	0.000092 U	--	0.000081 U	0.000085 U	--	0.0001 U	0.000098 U	--	0.000088 U	0.000076 U	--
Trichloroethylene (TCE)	0.00019 U	--	0.00023 U	0.00024 U	--	0.00021 U	0.00022 U	--	0.00026 U	0.00025 U	--	0.00023 U	0.0002 U	--
Trichlorofluoromethane	0.00025 U	--	0.00031 U	0.00031 U	--	0.00028 U	0.00029 U	--	0.00034 U	0.00033 U	--	0.0003 U	0.00026 U	--
Vinyl Chloride	0.00029 U	--	0.00035 U	0.00036 U	--	0.00032 U	0.00033 U	--	0.00039 U	0.00038 U	--	0.00034 U	0.0003 U	--

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-2
Summary of Data Used in Risk Assessment
Main Plant Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-066	CFSB-066	CFSB-068	CFSB-068	CFSB-069	CFSB-069	CFSB-069	CFSB-071	CFSB-071	CFSB-071	CFSB-071-DUP	CFSB-073	CFSB-073	CFSB-073
Sample Lab IDs	460-114793-1	460-114793-16	460-114793-18	460-114793-11	460-114793-14	460-114793-15	460-114793-17	460-114793-4	460-114793-9	460-114793-13	460-114793-7	320-19320-22, 460-114828-7	320-19320-17, 460-114828-2	320-19320-18, 460-114828-3
Sample Name	CFSB-066-SO-0.5-2	CFSB-066-SO-10-12	CFSB-068-SO-0.5-2	CFSB-068-SO-10-12	CFSB-069-SO-0-0.5	CFSB-069-SO-0.5-2	CFSB-069-SO-10-12	CFSB-071-SO-0-0.5	CFSB-071-SO-0.5-2	CFSB-071-SO-10-12	CFSB-DUP7-SO	CFSB-073-SO-0-0.5	CFSB-073-SO-0.5-2	CFSB-073-SO-10-12
Sample Depth	0.5-2 ft	10-12 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft
Chemical	5/27/2016	5/27/2016	5/27/2016	5/27/2016	5/27/2016	5/27/2016	5/27/2016	5/27/2016	5/27/2016	5/27/2016	5/27/2016	6/1/2016	6/1/2016	6/1/2016
GENERAL CHEMISTRY (mg/kg)														
Fluoride	367 J	25.2 J	19 J	28.1 J+	36.3 J	39.8 J	6.42 J	47.3 J	54 J	3.16 J	4.28 J	28.2 J	24.3 J	10.3 J
Cyanide	0.14	0.018 U	0.02 J	0.023 J	0.034 J	0.018 U	0.018 U	0.072 J	0.029 J	0.02 J	0.016 U	0.019 J	0.017 U	0.017 U
METALS (mg/kg)														
"Chromium, Hexavalent - Estimated"	0.843066	0.184672	0.281022	0.26764	0.299757	0.262287	0.366667	0.17129	0.259611	0.2382	0.176642	0.29708	0.272993	0.246229
"Chromium, Trivalent - Calculated"	--	--	--	--	--	--	--	--	--	--	--	--	--	--
"Chromium, Trivalent - Estimated"	30.6569	6.71533	10.219	9.73236	10.9002	9.53771	13.3333	6.22871	9.44039	8.6618	6.42336	10.8029	9.92701	8.95377
Aluminum	14600	2840	10500	7870	13800	10100	6840	10100	12600	5130	4740	15200	10600	6920
Antimony	0.4 J	0.34 U	0.42 UJ	0.34 U	0.43 UJ	0.34 U	0.41 UJ	0.32 U	0.34 U	0.45 UJ	0.34 U	0.37 UJ	0.36 UJ	0.34 UJ
Arsenic	5.9 J	1.6 J	4.1	3.6 J	4.5	4.2 J	3.4	5.7 J	4.7 J	2.7	2.5 J	4.9	4.4	2.3
Barium	68.4 J	28.7 J	50.8	37.5 J	75.8	49.9 J	261	40.3 J	51.4 J	65.6	52.5 J	121	60.6	58.5
Beryllium	0.52	0.13 J	0.38 J	0.19 J	0.39 J	0.35	0.3 J	0.32	0.34	0.27 J	0.25 J	0.59	0.44	0.25 J
Cadmium	0.6 J	0.26 U	0.32 U	0.25 U	0.33 U	0.25 U	0.31 U	0.24 U	0.26 U	0.34 U	0.26 U	0.28 U	0.27 U	0.26 U
Calcium	45400 J	14000 J	26900	33800 J	17200	38200 J	63700	51700 J	42500 J	49700 J	27700 J	17300	11200	48200
Chromium, Total	31.5 J	6.9 J	10.5	10 J	11.2	9.8 J	13.7	6.4 J	9.7 J	8.9	6.6 J	11.1	10.2	9.2
Cobalt	6.6	1.9	6.1	3	5.2	6.1	6.6	3.5	4.6	4.6	4	6.1	5.5	4.5
Copper	20.5	4.3	13.7 J	9.4	15.8	12.8	13.3	9.4	12.5	9.4	10.7	12.6	17.9	9
Iron	16300	4860	17300	11600	15500	14400	13700	13300	14000	10600	9090	14400	16000	11400
Lead	22.5	2.2	8.6 J	4.6	12.4	9.9	6	9.3	12.1	4.1	2.5	9.7	8.1	4.8
Magnesium	13800 J	5150 J	11700	11200 J	9690	12600 J	12100	27500 J	17600 J	23000 J	7820 J	12800	10200	9930
Manganese	395 J	200 J	372	236 J	361	379 J	324	460 J	444 J	738 J	436 J	506	316	270
Mercury	0.017	0.028 J+	0.016 J+	0.027 J+	0.015 J+	0.018 J+	0.012 U	0.025	0.018	0.013 U	0.012 U	0.014 J	0.022	0.016 J
Nickel	76.9 J	4.5 J	16.6 J	8.4 J	15.3	12.2 J	13.1	11.2 J	13.6 J	7.6	6.4 J	28.2	11.7	8.7
Potassium	1130 J	359 J	683	617 J	664	653 J	645	766 J	848 J	530	398 J	916 J+	936 J+	659 J+
Selenium	0.33 J	0.32 U	0.39 U	0.31 U	0.4 U	0.31 U	0.38 U	0.3 U	0.32 U	0.42 U	0.31 U	0.34 U	0.33 U	0.32 U
Silver	0.64 U	0.63 U	0.76 U	0.61 U	0.79 U	0.61 U	0.75 U	0.59 U	0.63 U	0.82 U	0.61 U	0.67 U	0.65 U	0.62 U
Sodium	847	35.3 J	63.8 J	31.4 U	55.8 J	31.4 U	68.6 J	38.5 J	40.1 J	54.5 J	31.4 UJ	40.3 J	33.4 U	31.7 U
Thallium	0.13 U	0.13 U	0.16 U	0.13 U	0.16 U	0.13 U	0.15 U	0.12 U	0.13 U	0.17 U	0.13 U	0.14 U	0.13 U	0.13 U
Vanadium	12.5 J	3.2 J	9.3	6.8 J	10.7	8.1 J	12.9	6.6 J	7.9 J	6.9	4.7 J	14.8	11.8	9.7
Zinc	53.5	11.3	41.9	30.9	46.2	41	30.2	32.9	39.4	25.8	26.8	46.3	36.5	26.5
METALS|HEXAVALENT CHROMIUM (mg/kg)														
Chromium, Hexavalent	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PESTICIDES (mg/kg)														
Aldrin	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Alpha Bhc (Alpha Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Alpha Endosulfan	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Beta Bhc (Beta Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Beta Endosulfan	--	--	--	--	--	--	--	--	--	--	--	--	--	--
cis-Chlordane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Delta BHC (Delta Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dieldrin	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endosulfan Sulfate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin Aldehyde	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin Ketone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Gamma Bhc (Lindane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Heptachlor	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Heptachlor Epoxide	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methoxychlor	--	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDD	--	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDT	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Toxaphene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
trans-Chlordane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
POLYCHLORINATED BIPHENYLS (mg/kg)														
PCB-1016 (Aroclor 1016)	0.0093 U	0.0092 U	0.0094 U	0.0092 U	0.0096 U	0.0094 U	0.0096 U	0.0096 U	0.0095 U	0.01 U	0.0094 U	0.0094 U	0.0098 U	0.0092 U
PCB-1221 (Aroclor 1221)	0.0093 U	0.0092 U	0.0094 U	0.0092 U	0.0096 U	0.0094 U	0.0096 U	0.0096 U	0.0095 U	0.01 U	0.0094 U	0.0094 U	0.0098 U	0.0092 U

Table E-2
Summary of Data Used in Risk Assessment
Main Plant Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-066	CFSB-066	CFSB-068	CFSB-068	CFSB-069	CFSB-069	CFSB-069	CFSB-071	CFSB-071	CFSB-071	CFSB-071-DUP	CFSB-073	CFSB-073	CFSB-073
Sample Lab IDs	460-114793-1	460-114793-16	460-114793-18	460-114793-11	460-114793-14	460-114793-15	460-114793-17	460-114793-4	460-114793-9	460-114793-13	460-114793-7	320-19320-22, 460-114828-7	320-19320-17, 460-114828-2	320-19320-18, 460-114828-3
Sample Name	CFSB-066-SO-0.5-2	CFSB-066-SO-10-12	CFSB-068-SO-0.5-2	CFSB-068-SO-10-12	CFSB-069-SO-0-0.5	CFSB-069-SO-0.5-2	CFSB-069-SO-10-12	CFSB-071-SO-0-0.5	CFSB-071-SO-0.5-2	CFSB-071-SO-10-12	CFSB-DUP7-SO	CFSB-073-SO-0-0.5	CFSB-073-SO-0.5-2	CFSB-073-SO-10-12
Sample Depth	0.5-2 ft	10-12 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft
Chemical	5/27/2016	5/27/2016	5/27/2016	5/27/2016	5/27/2016	5/27/2016	5/27/2016	5/27/2016	5/27/2016	5/27/2016	5/27/2016	6/1/2016	6/1/2016	6/1/2016
PCB-1232 (Aroclor 1232)	0.0093 U	0.0092 U	0.0094 U	0.0092 U	0.0096 U	0.0094 U	0.0096 U	0.0096 U	0.0095 U	0.01 U	0.0094 U	0.0094 U	0.0098 U	0.0092 U
PCB-1242 (Aroclor 1242)	0.0093 U	0.0092 U	0.0094 U	0.0092 U	0.0096 U	0.0094 U	0.0096 U	0.0096 U	0.0095 U	0.01 U	0.0094 U	0.0094 U	0.0098 U	0.0092 U
PCB-1248 (Aroclor 1248)	0.0093 U	0.0092 U	0.0094 U	0.0092 U	0.0096 U	0.0094 U	0.0096 U	0.0096 U	0.0095 U	0.01 U	0.0094 U	0.0094 U	0.0098 U	0.0092 U
PCB-1254 (Aroclor 1254)	0.0096 U	0.0096 U	0.0097 U	0.0095 U	0.0099 U	0.0097 U	0.0099 U	0.01 U	0.0098 U	0.01 U	0.0097 U	0.0098 U	0.01 U	0.0096 U
PCB-1260 (Aroclor 1260)	0.0096 U	0.0096 U	0.0097 U	0.0095 U	0.0099 U	0.0097 U	0.0099 U	0.01 U	0.0098 U	0.01 U	0.0097 U	0.0098 U	0.01 U	0.0096 U
PCB-1262 (Aroclor 1262)	0.0096 U	0.0096 U	0.0097 U	0.0095 U	0.0099 U	0.0097 U	0.0099 U	0.01 U	0.0098 U	0.01 U	0.0097 U	0.0098 U	0.01 U	0.0096 U
PCB-1268 (Aroclor 1268)	0.0096 U	0.0096 U	0.0097 U	0.0095 U	0.0099 U	0.0097 U	0.0099 U	0.01 U	0.0098 U	0.01 U	0.0097 U	0.0098 U	0.01 U	0.0096 U
Polychlorinated Biphenyl (PCBs)	0.0096 U	0.0096 U	0.0097 U	0.0095 U	0.0099 U	0.0097 U	0.0099 U	0.01 U	0.0098 U	0.01 U	0.0097 U	0.0098 U	0.01 U	0.0096 U
SEMIVOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,2,4,5-Tetrachlorobenzene	0.026 U	0.026 U	0.026 U	0.025 U	0.027 U	0.026 U	0.026 U	0.027 U	0.026 U	0.028 U	0.026 U	0.026 U	0.027 U	0.026 U
1,4-Dioxane (P-Dioxane)	0.093 U	0.092 U	0.093 U	0.091 U	0.095 U	0.093 U	0.095 U	0.096 U	0.094 U	0.1 U	0.093 U	0.094 U	0.098 U	0.092 U
2,3,4,6-Tetrachlorophenol	0.033 U	0.032 U	0.033 U	0.032 U	0.034 U	0.033 U	0.033 U	0.034 U	0.033 U	0.035 U	0.033 U	0.033 U	0.034 U	0.032 U
2,4,5-Trichlorophenol	0.034 U	0.034 U	0.035 U	0.034 U	0.036 U	0.035 U	0.035 U	0.036 U	0.035 U	0.037 U	0.035 U	0.035 U	0.036 U	0.034 U
2,4,6-Trichlorophenol	0.0098 U	0.0098 U	0.0099 U	0.0097 U	0.01 U	0.0099 U	0.01 U	0.01 U	0.01 U	0.011 U	0.0099 U	0.01 U	0.01 U	0.0098 U
2,4-Dichlorophenol	0.0082 U	0.0081 U	0.0082 U	0.0081 U	0.0084 U	0.0082 U	0.0084 U	0.0084 U	0.0083 U	0.0088 U	0.0082 U	0.0083 U	0.0086 U	0.0081 U
2,4-Dimethylphenol	0.076 U	0.075 U	0.077 U	0.075 U	0.078 U	0.076 U	0.078 U	0.079 U	0.077 U	0.082 U	0.076 U	0.077 U	0.08 U	0.076 U
2,4-Dinitrophenol	0.26 U	0.26 U	0.26 U	0.26 U	0.27 U	0.26 U	0.27 U	0.27 U	0.26 U	0.28 U	0.26 U	0.26 U	0.28 U	0.26 U
2,4-Dinitrotoluene	0.014 U	0.014 U	0.014 U	0.014 U	0.014 U	0.014 U	0.014 U	0.014 U	0.014 U	0.015 U	0.014 U	0.014 U	0.014 U	0.014 U
2,6-Dinitrotoluene	0.018 U	0.018 U	0.019 U	0.018 U	0.019 U	0.018 U	0.019 U	0.019 U	0.019 U	0.02 U	0.019 U	0.019 U	0.019 U	0.018 U
2-Chloronaphthalene	0.0079 U	0.0078 U	0.0079 U	0.0078 U	0.0081 U	0.0079 U	0.008 U	0.0081 U	0.0079 U	0.0085 U	0.0079 U	0.0079 U	0.0083 U	0.0078 U
2-Chlorophenol	0.0088 U	0.0087 U	0.0089 U	0.0087 U	0.0091 U	0.0088 U	0.009 U	0.0091 U	0.0089 U	0.0095 U	0.0088 U	0.0089 U	0.0093 U	0.0087 U
2-Methylnaphthalene	0.022 J	0.0076 U	0.0077 U	0.0075 U	0.0085 J	0.0077 U	0.0078 U	0.011 J	0.0077 U	0.0083 U	0.0077 U	0.0077 U	0.0081 U	0.0076 U
2-Methylphenol (O-Cresol)	0.015 U	0.015 U	0.015 U	0.015 U	0.016 U	0.015 U	0.015 U	0.016 U	0.015 U	0.016 U	0.015 U	0.015 U	0.016 U	0.015 U
2-Nitroaniline	0.011 U	0.011 U	0.012 U	0.011 U	0.012 U	0.011 U	0.012 U	0.012 U	0.012 U	0.012 U	0.011 U	0.012 U	0.012 U	0.011 U
2-Nitrophenol	0.012 U	0.012 U	0.012 U	0.011 U	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U	0.013 U	0.012 U	0.012 U	0.012 U	0.012 U
3- And 4- Methylphenol (Total)	0.0092 U	0.0091 U	0.0093 U	0.0091 U	0.0095 U	0.0092 U	0.0094 U	0.0095 U	0.0093 U	0.01 U	0.0093 U	0.0093 U	0.0097 U	0.0091 U
3,3'-Dichlorobenzidine	0.039 U	0.038 U	0.039 U	0.038 U	0.04 U	0.039 U	0.04 U	0.04 U	0.039 U	0.042 U	0.039 U	0.039 U	0.041 U	0.038 U
3-Nitroaniline	0.01 U	0.01 U	0.01 U	0.01 U	0.011 U	0.01 U	0.011 U	0.011 U	0.01 U	0.011 U	0.01 U	0.01 U	0.011 U	0.01 U
4,6-Dinitro-2-Methylphenol	0.092 U	0.091 U	0.093 U	0.091 U	0.095 U	0.093 U	0.095 U	0.095 U	0.093 U	0.1 U	0.093 U	0.093 U	0.097 U	0.092 U
4-Bromophenyl Phenyl Ether	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.012 U	0.011 U	0.011 U	0.011 U	0.011 U
4-Chloro-3-Methylphenol	0.015 U	0.015 U	0.015 U	0.015 U	0.015 U	0.015 U	0.015 U	0.015 U	0.015 U	0.016 U	0.015 U	0.015 U	0.016 U	0.015 U
4-Chloroaniline	0.0089 U	0.0088 U	0.009 U	0.0088 U	0.0092 U	0.0089 U	0.0091 U	0.0092 U	0.009 U	0.0096 U	0.0089 U	0.009 U	0.0094 U	0.0088 U
4-Chlorophenyl Phenyl Ether	0.01 U	0.01 U	0.01 U	0.01 U	0.011 U	0.01 U	0.011 U	0.011 U	0.01 U	0.011 U	0.01 U	0.01 U	0.011 U	0.01 U
4-Nitroaniline	0.013 U	0.013 U	0.013 U	0.013 U	0.013 U	0.013 U	0.013 U	0.014 U	0.013 U	0.014 U	0.013 U	0.013 U	0.014 U	0.013 U
4-Nitrophenol	0.17 U	0.16 U	0.17 U	0.16 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.18 U	0.17 U	0.17 U	0.18 U	0.17 U
Acenaphthene	0.11 J	0.0083 U	0.03 J	0.029 J	0.061 J	0.02 J	0.0086 U	0.037 J	0.019 J	0.0091 U	0.0084 U	0.015 J	0.0088 U	0.0083 U
Acenaphthylene	0.0089 U	0.0088 U	0.009 U	0.0088 U	0.01 J	0.0089 U	0.0091 U	0.0092 U	0.009 U	0.0096 U	0.0089 U	0.009 U	0.0094 U	0.0088 U
Acetophenone	0.017 J	0.0075 U	0.0076 U	0.0074 U	0.0078 U	0.0076 U	0.0077 U	0.0078 U	0.0076 U	0.0082 U	0.0076 U	0.0076 U	0.0079 U	0.0075 U
Anthracene	0.28 J	0.033 U	0.063 J	0.07 J	0.12 J	0.051 J	0.034 U	0.077 J	0.033 J	0.036 U	0.033 U	0.04 J	0.035 U	0.033 U
Atrazine	0.015 U	0.015 U	0.016 U	0.015 U	0.016 U	0.015 U	0.016 U	0.016 U	0.016 U	0.017 U	0.015 U	0.016 U	0.016 U	0.015 U
Benzaldehyde	0.026 U	0.026 U	0.027 U	0.026 U	0.027 U	0.026 U	0.027 U	0.027 U	0.027 U	0.029 U	0.027 U	0.027 U	0.028 U	0.026 U
Benzo(A)Anthracene	2.2	0.2	0.48	0.26	0.64	0.27	0.03 U	0.51	0.26	0.031 U	0.029 U	0.37	0.03 U	0.068
Benzo(A)Pyrene	2.2	0.17	0.61	0.28	0.81	0.33	0.011 U	0.59	0.34	0.011 U	0.011 U	0.52	0.011 U	0.08
Benzo(B)Fluoranthene	3.4	0.29	0.82	0.35	1.1	0.48	0.014 U	0.84	0.46	0.015 U	0.014 U	1	0.014 U	0.15
Benzo(G,H,I)Perylene	1.9	0.17 J	0.43	0.26 J	0.71	0.4	0.02 U	0.67	0.34 J	0.022 U	0.02 U	0.77	0.021 U	0.097 J
Benzo(K)Fluoranthene	1.4	0.12	0.3	0.15	0.39	0.14	0.015 U	0.37	0.19	0.016 U	0.015 U	0.33	0.016 U	0.06
Benzyl Butyl Phthalate	0.011 U	0.011 U	0.011 U	0.022 J+	0.011 U	0.013 J+	0.011 U	0.3 J+	0.068 J+	0.012 U	0.011 U	0.011 U	0.011 U	0.011 U
Biphenyl (Diphenyl)	0.03 U	0.029 U	0.03 U	0.029 U	0.03 U	0.03 U	0.03 U	0.03 U	0.03 U	0.032 U	0.03 U	0.03 U	0.031 U	0.029 U
Bis(2-Chloroethoxy) Methane	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.012 U	0.011 U	0.011 U	0.011 U	0.011 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.0082 U	0.0081 U	0.0082 U	0.0081 U	0.0084 U	0.0082 U	0.0084 U	0.0084 U	0.0083 U	0.0088 U	0.0082 U	0.0083 U	0.0086 U	0.0081 U
Bis(2-Chloroisopropyl) Ether	0.014 U	0.014 U	0.014 U	0.014 U	0.015 U	0.014 U	0.015 U	0.015 U	0.014 U	0.015 U	0.014 U	0.014 U	0.015 U	0.014 U
Bis(2-Ethylhexyl) Phthalate	0.044 J	0.013 U	0.054 J	0.013 U	0.028 J	0.014 U	0.014 U	0.038 J	0.024 J	0.015 U	0.014 U	0.014 U	0.014 U	0.013 U
Caprolactam	0.025 U	0.025 U	0.025 U	0.025 U	0.026 U	0.025 U	0.026 U	0.026 U	0.025 U	0.027 U	0.025 U	0.025 U	0.026 U	0.025 U
Carbazole	0.45	0.035 J	0.081 J	0.089 J	0.13 J	0.05 J	0.0088 U	0.088 J	0.044 J	0.0093 U	0.0086 U	0.088 J	0.009 U	0.013 J
Chrysene	3.6	0.33 J	0.66	0.37	0.83	0.35	0.0097 U	0.68	0.38	0.01 U	0.0095 U	0.61	0.0099 U	0.11 J
Dibenz(A,H)Anthracene	0.53	0.049	0.12	0.062	0.16	0.094	0.018 U	0.16	0.078	0.019 U	0.018 U	0.14	0.019 U	0.018 U
Dibenzofuran	0.031 J	0.01 U	0.011 U	0.015 J	0.023 J	0.011 U	0.011 U	0.013 J	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.01 U

Table E-2
Summary of Data Used in Risk Assessment
Main Plant Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-066	CFSB-066	CFSB-068	CFSB-068	CFSB-069	CFSB-069	CFSB-069	CFSB-071	CFSB-071	CFSB-071	CFSB-071-DUP	CFSB-073	CFSB-073	CFSB-073
Sample Lab IDs	460-114793-1	460-114793-16	460-114793-18	460-114793-11	460-114793-14	460-114793-15	460-114793-17	460-114793-4	460-114793-9	460-114793-13	460-114793-7	320-19320-22, 460-114828-7	320-19320-17, 460-114828-2	320-19320-18, 460-114828-3
Sample Name	CFSB-066-SO-0.5-2	CFSB-066-SO-10-12	CFSB-068-SO-0.5-2	CFSB-068-SO-10-12	CFSB-069-SO-0-0.5	CFSB-069-SO-0.5-2	CFSB-069-SO-10-12	CFSB-071-SO-0-0.5	CFSB-071-SO-0.5-2	CFSB-071-SO-10-12	CFSB-DUP7-SO	CFSB-073-SO-0-0.5	CFSB-073-SO-0.5-2	CFSB-073-SO-10-12
Sample Depth	0.5-2 ft	10-12 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft
Chemical	5/27/2016	5/27/2016	5/27/2016	5/27/2016	5/27/2016	5/27/2016	5/27/2016	5/27/2016	5/27/2016	5/27/2016	5/27/2016	6/1/2016	6/1/2016	6/1/2016
Diethyl Phthalate	0.0098 U	0.0098 U	0.0099 U	0.0097 U	0.01 U	0.0099 U	0.01 U	0.01 U	0.01 U	0.011 U	0.0099 U	0.01 U	0.01 U	0.0098 U
Dimethyl Phthalate	0.01 U	0.01 U	0.01 U	0.0099 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.011 U	0.01 U	0.01 U	0.011 U	0.01 U
Di-N-Butyl Phthalate	0.01 U	0.01 U	0.01 U	0.01 U	0.011 U	0.01 U	0.011 U	0.011 U	0.01 U	0.011 U	0.01 U	0.01 U	0.011 U	0.01 U
Di-N-Octylphthalate	0.018 U	0.017 U	0.018 U	0.017 U	0.018 U	0.018 U	0.018 U	0.018 U	0.018 U	0.019 U	0.018 U	0.018 U	0.019 U	0.017 U
Fluoranthene	3.7	0.34	0.82	0.71	1.1	0.41	0.012 J	0.74	0.37	0.011 U	0.01 U	0.63	0.011 U	0.1 J
Fluorene	0.06 J	0.0075 U	0.019 J	0.023 J	0.038 J	0.015 J	0.0077 U	0.023 J	0.01 J	0.0082 U	0.0076 U	0.0076 U	0.0079 U	0.0075 U
Hexachlorobenzene	0.014 U	0.014 U	0.014 U	0.014 U	0.014 U	0.014 U	0.014 U	0.014 U	0.014 U	0.015 U	0.014 U	0.014 U	0.015 U	0.014 U
Hexachlorobutadiene	0.0097 U	0.0096 U	0.0098 U	0.0096 U	0.01 U	0.0098 U	0.01 U	0.01 U	0.0098 U	0.011 U	0.0098 U	0.0098 U	0.01 U	0.0097 U
Hexachlorocyclopentadiene	0.022 U	0.021 U	0.022 U	0.021 U	0.022 U	0.022 U	0.022 U	0.022 U	0.022 U	0.023 U	0.022 U	0.022 U	0.023 U	0.021 U
Hexachloroethane	0.013 U	0.013 U	0.013 U	0.013 U	0.013 U	0.013 U	0.013 U	0.013 U	0.013 U	0.014 U	0.013 U	0.013 U	0.013 U	0.013 U
Indeno(1,2,3-C,D)Pyrene	1.9	0.17	0.47	0.25	0.69	0.35	0.024 U	0.59	0.32	0.025 U	0.023 U	0.53	0.024 U	0.072
Isophorone	0.0099 J	0.0074 U	0.0075 U	0.0073 U	0.0077 U	0.0075 U	0.0076 U	0.0077 U	0.0075 U	0.008 U	0.0075 U	0.0075 U	0.0078 U	0.0074 U
Naphthalene	0.033 J	0.0087 U	0.0089 U	0.011 J	0.022 J	0.0088 U	0.009 U	0.017 J	0.0098 J	0.0095 U	0.0088 U	0.0089 U	0.0093 U	0.0087 U
Nitrobenzene	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.012 U	0.011 U	0.011 U	0.011 U	0.011 U
N-Nitrosodi-N-Propylamine	0.012 U	0.012 U	0.012 U	0.011 U	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U	0.013 U	0.012 U	0.012 U	0.012 U	0.012 U
N-Nitrosodiphenylamine	0.031 U	0.031 U	0.032 U	0.031 U	0.032 U	0.032 U	0.032 U	0.032 U	0.032 U	0.034 U	0.032 U	0.032 U	0.033 U	0.031 U
Pentachlorophenol	0.042 U	0.041 U	0.042 U	0.041 U	0.043 U	0.28	0.043 U	0.043 U	0.042 U	0.045 U	0.042 U	0.042 U	0.044 U	0.042 U
Phenanthrene	1.7	0.12 J	0.39	0.36	0.58	0.26 J	0.01 J	0.41	0.18 J	0.01 U	0.0093 U	0.24 J	0.0097 U	0.042 J
Phenol	0.011 U	0.011 U	0.011 U	0.011 U	0.012 U	0.011 U	0.012 U	0.012 U	0.011 U	0.012 U	0.011 U	0.011 U	0.012 U	0.011 U
Pyrene	4.9 J+	0.35 J+	0.76	0.59 J+	0.91	0.44 J+	0.016 U	1 J+	0.48 J+	0.017 U	0.016 U	0.66	0.017 U	0.11 J
VOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,1,1-Trichloroethane	0.00035 U	0.00031 U	0.00038 U	0.00032 U	--	0.00037 U	0.00032 U	--	0.00035 U	0.00039 U	0.00033 U	--	0.0004 U	0.00039 U
1,1,2,2-Tetrachloroethane	0.00016 U	0.00014 U	0.00017 U	0.00014 U	--	0.00017 U	0.00014 U	--	0.00016 U	0.00017 U	0.00015 U	--	0.00018 U	0.00017 U
1,1,2-Trichloro-1,2,2-Trifluoroethane	0.0004 U	0.00036 U	0.00044 U	0.00037 U	--	0.00043 U	0.00037 U	--	0.00041 U	0.00045 U	0.00038 U	--	0.00046 U	0.00045 U
1,1,2-Trichloroethane	0.00026 U	0.00023 U	0.00028 U	0.00023 U	--	0.00027 U	0.00024 U	--	0.00026 U	0.00028 U	0.00024 U	--	0.0003 U	0.00029 U
1,1-Dichloroethane	0.00031 U	0.00028 U	0.00034 U	0.00028 U	--	0.00033 U	0.00029 U	--	0.00032 U	0.00035 U	0.00029 U	--	0.00036 U	0.00035 U
1,1-Dichloroethene	0.00038 U	0.00034 U	0.00041 U	0.00034 U	--	0.0004 U	0.00035 U	--	0.00038 U	0.00042 U	0.00035 U	--	0.00043 U	0.00042 U
1,2,3-Trichlorobenzene	0.0001 U	0.00009 U	0.00011 U	0.000091 U	--	0.00011 U	0.000094 U	--	0.0001 U	0.00011 U	0.000094 U	--	0.00012 U	0.00011 U
1,2,4-Trichlorobenzene	0.00029 U	0.00026 U	0.00032 U	0.00027 U	--	0.00031 U	0.00027 U	--	0.0003 U	0.00033 U	0.00027 U	--	0.00034 U	0.00033 U
1,2-Dibromo-3-Chloropropane	0.00043 U	0.00039 U	0.00048 U	0.00039 U	--	0.00046 U	0.0004 U	--	0.00044 U	0.00048 U	0.0004 U	--	0.0005 U	0.00048 U
1,2-Dibromoethane (Ethylene Dibromide)	0.00011 U	0.000098 U	0.00012 U	0.0001 U	--	0.00012 U	0.0001 U	--	0.00011 U	0.00012 U	0.0001 U	--	0.00013 U	0.00012 U
1,2-Dichlorobenzene	0.00013 U	0.00011 U	0.00014 U	0.00012 U	--	0.00014 U	0.00012 U	--	0.00013 U	0.00014 U	0.00012 U	--	0.00015 U	0.00014 U
1,2-Dichloroethane	0.0001 U	0.00009 U	0.00011 U	0.000091 U	--	0.00011 U	0.000094 U	--	0.0001 U	0.00011 U	0.000094 U	--	0.00012 U	0.00011 U
1,2-Dichloropropane	0.00016 U	0.00014 U	0.00017 U	0.00014 U	--	0.00017 U	0.00014 U	--	0.00016 U	0.00017 U	0.00015 U	--	0.00018 U	0.00017 U
1,3-Dichlorobenzene	0.00011 U	0.000098 U	0.00012 U	0.0001 U	--	0.00012 U	0.0001 U	--	0.00011 U	0.00012 U	0.0001 U	--	0.00013 U	0.00012 U
1,4-Dichlorobenzene	0.00012 U	0.00011 U	0.00013 U	0.00011 U	--	0.00013 U	0.00011 U	--	0.00012 U	0.00013 U	0.00011 U	--	0.00014 U	0.00013 U
2-Hexanone	0.0012 J	0.00077 U	0.00095 U	0.00078 U	--	0.00092 U	0.0008 U	--	0.00087 U	0.00096 U	0.00081 U	--	0.00099 U	0.00096 U
Acetone	0.065	0.012	0.011	0.0089	--	0.0097	0.0095	--	0.0063	0.0056 J	0.017 J	--	0.024	0.0058
Benzene	0.0011	0.00027 J	0.00038 J	0.00021 J	--	0.0002 U	0.00023 J	--	0.00019 U	0.00047 J	0.00035 J	--	0.00021 U	0.00022 J
Bromochloromethane	0.00016 U	0.00014 U	0.00017 U	0.00014 U	--	0.00017 U	0.00014 U	--	0.00016 U	0.00017 U	0.00015 U	--	0.00018 U	0.00017 U
Bromodichloromethane	0.00035 U	0.00031 U	0.00038 U	0.00032 U	--	0.00037 U	0.00032 U	--	0.00035 U	0.00039 U	0.00033 U	--	0.0004 U	0.00039 U
Bromoform	0.00012 U	0.00011 U	0.00013 U	0.00011 U	--	0.00013 U	0.00011 U	--	0.00012 U	0.00013 U	0.00011 U	--	0.00014 U	0.00013 U
Bromomethane	0.00029 U	0.00026 U	0.00032 U	0.00027 U	--	0.00031 U	0.00027 U	--	0.0003 U	0.00033 U	0.00027 U	--	0.00034 U	0.00033 U
Carbon Disulfide	0.0021	0.00061 J	0.0017	0.00044 J	--	0.00042 U	0.00066 J	--	0.0004 U	0.00044 U	0.00037 U	--	0.00045 U	0.00063 J
Carbon Tetrachloride	0.0004 U	0.00035 U	0.00043 U	0.00036 U	--	0.00042 U	0.00037 U	--	0.0004 U	0.00044 U	0.00037 U	--	0.00045 U	0.00044 U
Chlorobenzene	0.00013 U	0.00011 U	0.00014 U	0.00012 U	--	0.00014 U	0.00012 U	--	0.00013 U	0.00014 U	0.00012 U	--	0.00015 U	0.00014 U
Chloroethane	0.00032 U	0.00029 U	0.00035 U	0.00029 U	--	0.00034 U	0.0003 U	--	0.00032 U	0.00036 U	0.0003 U	--	0.00037 UJ	0.00036 UJ
Chloroform	0.00019 U	0.00017 U	0.00021 U	0.00017 U	--	0.00021 U	0.00018 U	--	0.00019 U	0.00021 U	0.00018 U	--	0.00022 U	0.00022 U
Chloromethane	0.00035 U	0.00031 U	0.00038 U	0.00032 U	--	0.00037 U	0.00032 U	--	0.00035 U	0.00039 U	0.00033 U	--	0.0004 U	0.00039 U
Cis-1,2-Dichloroethylene	0.0002 U	0.00018 U	0.00022 U	0.00018 U	--	0.00022 U	0.00019 U	--	0.0002 U	0.00022 U	0.00019 U	--	0.00023 U	0.00023 U
Cis-1,3-Dichloropropene	0.00014 U	0.00012 U	0.00015 U	0.00012 U	--	0.00015 U	0.00013 U	--	0.00014 U	0.00015 U	0.00013 U	--	0.00016 U	0.00015 U
Cyclohexane	0.00042 U	0.00075 J+	0.00093 J+	0.00048 J+	--	0.00045 U	0.00058 J+	--	0.00043 U	0.0011 J+	0.0011 J+	--	0.00049 U	0.00047 U
Dibromochloromethane	0.00014 U	0.00012 U	0.00015 U	0.00012 U	--	0.00015 U	0.00013 U	--	0.00014 U	0.00015 U	0.00013 U	--	0.00016 U	0.00015 U
Dichlorodifluoromethane	0.00029 U	0.00026 U	0.00032 U	0.00027 U	--	0.00031 U	0.00027 U	--	0.0003 U	0.00033 U	0.00027 U	--	0.00034 U	0.00033 U
Ethylbenzene	0.0011	0.00021 J	0.00037 J	0.00015 U	--	0.00018 U	0.00015 U	--	0.00017 U	0.00045 J	0.00027 J	--	0.00019 U	0.00018 U
Isopropylbenzene (Cumene)	0.0003 J	0.00014 U	0.00017 U	0.00014 U	--	0.00017 U	0.00014 U	--	0.00016 U	0.00017 U	0.00015 U	--	0.00018 U	0.00017 U
M,P-Xylene	0.0042	0.00076 J	0.0013	0.00041 J	--	0.00029 J	0.00058 J	--	0.00032 J	0.0017	0.0011	--	0.00012 U	0.00039 J

Table E-2
Summary of Data Used in Risk Assessment
Main Plant Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-066	CFSB-066	CFSB-068	CFSB-068	CFSB-069	CFSB-069	CFSB-069	CFSB-071	CFSB-071	CFSB-071	CFSB-071-DUP	CFSB-073	CFSB-073	CFSB-073
Sample Lab IDs	460-114793-1	460-114793-16	460-114793-18	460-114793-11	460-114793-14	460-114793-15	460-114793-17	460-114793-4	460-114793-9	460-114793-13	460-114793-7	320-19320-22, 460-114828-7	320-19320-17, 460-114828-2	320-19320-18, 460-114828-3
Sample Name	CFSB-066-SO-0.5-2	CFSB-066-SO-10-12	CFSB-068-SO-0.5-2	CFSB-068-SO-10-12	CFSB-069-SO-0-0.5	CFSB-069-SO-0.5-2	CFSB-069-SO-10-12	CFSB-071-SO-0-0.5	CFSB-071-SO-0.5-2	CFSB-071-SO-10-12	CFSB-DUP7-SO	CFSB-073-SO-0-0.5	CFSB-073-SO-0.5-2	CFSB-073-SO-10-12
Sample Depth	0.5-2 ft	10-12 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft
Chemical	5/27/2016	5/27/2016	5/27/2016	5/27/2016	5/27/2016	5/27/2016	5/27/2016	5/27/2016	5/27/2016	5/27/2016	5/27/2016	6/1/2016	6/1/2016	6/1/2016
Methyl Acetate	0.00083 U	0.00074 U	0.00091 U	0.00075 U	--	0.00088 U	0.00077 U	--	0.00083 U	0.00091 U	0.00077 U	--	0.00095 U	0.00092 U
Methyl Ethyl Ketone (2-Butanone)	0.008	0.0015 J	0.00078 U	0.0014 J	--	0.00075 U	0.0015 J	--	0.00071 U	0.00078 UJ	0.0015 J	--	0.00081 U	0.00079 U
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	0.0043 J	0.0018 U	0.0022 U	0.0018 U	--	0.0022 U	0.0019 U	--	0.0021 U	0.0023 U	0.0019 U	--	0.0023 U	0.0023 U
Methylcyclohexane	0.00046 U	0.001	0.0015	0.00056 J	--	0.00049 U	0.0008 J	--	0.00046 U	0.0018	0.0022	--	0.00053 U	0.00051 U
Methylene Chloride	0.00029 U	0.00026 U	0.00032 U	0.00027 U	--	0.00031 U	0.00027 U	--	0.0003 U	0.00033 U	0.00027 U	--	0.00034 U	0.00033 U
O-Xylene (1,2-Dimethylbenzene)	0.0051	0.00024 J	0.00037 J	0.00017 J	--	0.00016 U	0.00016 J	--	0.00015 U	0.00058 J	0.0003 J	--	0.00017 U	0.00016 U
Styrene	0.0003 J	0.00012 U	0.00015 U	0.00012 U	--	0.00015 U	0.00013 U	--	0.00014 U	0.00015 U	0.00013 U	--	0.00016 U	0.00015 U
Tert-Butyl Methyl Ether	0.00016 U	0.00014 U	0.00017 U	0.00014 U	--	0.00017 U	0.00014 U	--	0.00016 U	0.00017 U	0.00015 U	--	0.00018 U	0.00017 U
Tetrachloroethylene (PCE)	0.00026 U	0.00023 U	0.00028 U	0.00023 U	--	0.00027 U	0.00024 U	--	0.00026 U	0.00028 U	0.00024 U	--	0.0003 U	0.00029 U
Toluene	0.012	0.0011	0.0015	0.00059 J	--	0.00045 J	0.00077 J	--	0.00046 J	0.0022 J	0.0013 J	--	0.0002 U	0.00066 J
Trans-1,2-Dichloroethene	0.00036 U	0.00032 U	0.00039 U	0.00032 U	--	0.00038 U	0.00033 U	--	0.00036 U	0.0004 U	0.00033 U	--	0.00041 U	0.0004 U
Trans-1,3-Dichloropropene	0.000092 U	0.000082 U	0.0001 U	0.000083 U	--	0.000098 U	0.000085 U	--	0.000093 U	0.0001 U	0.000086 U	--	0.00011 U	0.0001 U
Trichloroethylene (TCE)	0.00024 U	0.00021 U	0.00026 U	0.00022 U	--	0.00025 U	0.00022 U	--	0.00024 U	0.00026 U	0.00022 U	--	0.00027 U	0.00027 U
Trichlorofluoromethane	0.00031 U	0.00028 U	0.00034 U	0.00028 U	--	0.00033 U	0.00029 U	--	0.00032 U	0.00035 U	0.00029 U	--	0.00036 U	0.00035 U
Vinyl Chloride	0.00036 U	0.00032 U	0.00039 U	0.00032 U	--	0.00038 U	0.00033 U	--	0.00036 U	0.0004 U	0.00033 U	--	0.00041 U	0.0004 U

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-2
Summary of Data Used in Risk Assessment
Main Plant Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-074	CFSB-074	CFSB-074	CFSB-075	CFSB-075	CFSB-075	CFSB-079	CFSB-079	CFSB-079	CFSB-080	CFSB-080	CFSB-080	CFSB-082	CFSB-082
Sample Lab IDs	320-19320-31, 460-114828-17	320-19320-16, 460-114828-1	320-19320-30, 460-114828-16	320-19320-23, 460-114828-8	320-19320-19, 460-114828-4	320-19320-21, 460-114828-6	320-19320-25, 460-114828-10	320-19320-24, 460-114828-9	320-19320-20, 460-114828-5	320-19320-27, 460-114828-13	320-19320-28, 460-114828-14	320-19320-33, 460-114828-12	320-19320-26, 460-114828-11	320-19320-32, 460-114828-18
Sample Name	CFSB-074-SO-0-0.5	CFSB-074-SO-0.5-2	CFSB-074-SO-10-12	CFSB-075-SO-0-0.5	CFSB-075-SO-0.5-2	CFSB-075-SO-10-12	CFSB-079-SO-0-0.5	CFSB-079-SO-0.5-2	CFSB-079-SO-10-12	CFSB-080-SO-0-0.5	CFSB-080-SO-0.5-2	CFSB-080-SO-10-12	CFSB-082-SO-0-0.5	CFSB-082-SO-0.5-2
Sample Depth	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft
Chemical	6/1/2016	6/1/2016	6/1/2016	6/1/2016	6/1/2016	6/1/2016	6/1/2016	6/1/2016	6/1/2016	6/1/2016	6/1/2016	6/1/2016	6/1/2016	6/1/2016
GENERAL CHEMISTRY (mg/kg)														
Fluoride	143 J	8.98 J	28.3 J	43 J	33.7 J	26.8 J	55.4 J	20.3 J	21.5 J	35.7 J	8.79 J	10.2 J	30.4 J	18.2 J
Cyanide	0.018 U	0.018 U	0.015 U	0.031 J	0.02 J	0.015 U	0.03 J	0.021 J	0.018 U	0.05 J	0.023 J	0.018 J	0.018 J	0.019 U
METALS (mg/kg)														
"Chromium, Hexavalent - Estimated"	0.251582	0.211436	0.264964	0.240876	0.254258	0.272993	0.2382	0.270316	0.179319	0.235523	0.259611	0.272993	0.310462	0.227494
"Chromium, Trivalent - Calculated"	--	--	--	--	--	--	--	--	--	--	--	--	--	--
"Chromium, Trivalent - Estimated"	9.14842	7.68856	9.63504	8.75912	9.24574	9.92701	8.6618	9.82968	6.52068	8.56448	9.44039	9.92701	11.2895	8.27251
Aluminum	14200	7420	8610	11500	12200	12500	13700	7990	3950	11000	9690	7730	10100	9810
Antimony	0.41 UJ	0.34 UJ	0.42 UJ	0.42 UJ	0.35 UJ	0.34 UJ	0.44 UJ	0.44 UJ	0.31 UJ	0.42 UJ	0.42 UJ	0.37 UJ	0.43 UJ	0.46 UJ
Arsenic	3.7	2.5	3.5	3.6	3.9	3.5	4.6	4.4	2.9	4.5	3.8	3.9	3.2	4.7
Barium	70.5	52.9	109	125	105	103	118	108	76.9	95.1	74.3	47.9	118	64.6
Beryllium	0.41	0.29 J	0.3 J	0.42	0.5	0.44	0.55	0.29 J	0.31	0.4 J	0.37 J	0.34 J	0.45	0.35 J
Cadmium	0.31 U	0.26 U	0.32 U	0.32 U	0.3 J	0.26 U	0.34 U	0.33 U	0.24 U	0.32 U	0.32 U	0.28 U	0.32 U	0.35 U
Calcium	26400	40100	36100	17800	37000	22600	21800	22800	17800	32000	1700	30200	19300	42100
Chromium, Total	9.4	7.9	9.9	9	9.5	10.2	8.9	10.1	6.7	8.8	9.7	10.2	11.6	8.5
Cobalt	4.8	4.6	4	5	5.1	5.5	4.7	5	7	4.3	5.5	4.1	3.9	5.2
Copper	12.6	10.2	11.3	13	10.6	11.8	7.6	13.4	5.5	14	16.2	18.2	9	12.8
Iron	10700	11700	11500	13300	12500	15500	10300	12000	8610	12400	14500	11200	9140	14200
Lead	7.8	4.6	6.1	9	11.7	8.3	8.5	5.7	3	8.4	7.6	5.4	8.3	8.3
Magnesium	11000	12200	13300	8820	15700	10800	13900	8100	9680	10200	8060	9040	9400	10400
Manganese	360	393	340	513	504	353	453	333	316	325	454	256	316	359
Mercury	0.016	0.012 U	0.012 J	0.017 J	0.014 J	0.018	0.013 U	0.026	0.016 J	0.021	0.032	0.016 J	0.028	0.018
Nickel	30	9.2	11.7	14.1	19.6	14	20.6	10.7	12.7	10.9	10.4	12	15.4	9.8
Potassium	639	675 J+	786	616	1050 J+	860 J+	586	452	467 J+	614	582	572	616	615
Selenium	0.38 U	0.32 U	0.39 U	0.4 U	0.33 U	0.32 U	0.42 U	0.41 U	0.29 U	0.4 U	0.4 U	0.35 U	0.4 U	0.43 U
Silver	0.74 U	0.62 U	0.76 U	0.77 U	0.64 U	0.62 U	0.81 U	0.81 U	0.57 U	0.78 U	0.78 U	0.68 U	0.78 U	0.84 U
Sodium	38.2 J	31.6 U	39.1 U	62.3 J	65.2 J	46.8 J	41.4 U	41.2 U	29 U	39.6 U	39.6 U	34.6 U	40 U	42.8 U
Thallium	0.15 U	0.13 U	0.16 U	0.16 U	0.13 U	0.13 U	0.17 U	0.17 U	0.12 U	0.16 U	0.16 U	0.14 U	0.16 U	0.17 U
Vanadium	13.8	6.9	7.7	11.8	14.4	11.8	13.6	7.1	4.6	9.1	8.9	7.5	9.7	9.5
Zinc	36.2	32.6	31.2	46.6	58.2	45.1	34.6	29.3	19.7	38.1	32.2	30.1	33	39.6
METALS|HEXAVALENT CHROMIUM (mg/kg)														
Chromium, Hexavalent	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PESTICIDES (mg/kg)														
Aldrin	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Alpha Bhc (Alpha Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Alpha Endosulfan	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Beta Bhc (Beta Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Beta Endosulfan	--	--	--	--	--	--	--	--	--	--	--	--	--	--
cis-Chlordane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Delta BHC (Delta Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dieldrin	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endosulfan Sulfate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin Aldehyde	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin Ketone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Gamma Bhc (Lindane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Heptachlor	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Heptachlor Epoxide	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methoxychlor	--	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDD	--	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDT	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Toxaphene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
trans-Chlordane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
POLYCHLORINATED BIPHENYLS (mg/kg)														
PCB-1016 (Aroclor 1016)	0.0094 U	0.0092 U	0.0092 U	0.0098 U	0.0097 U	0.0096 U	0.0099 U	0.0095 U	0.0094 U	0.0096 U	0.01 U	0.0094 U	0.0095 U	0.0099 U
PCB-1221 (Aroclor 1221)	0.0094 U	0.0092 U	0.0092 U	0.0098 U	0.0097 U	0.0096 U	0.0099 U	0.0095 U	0.0094 U	0.0096 U	0.01 U	0.0094 U	0.0095 U	0.0099 U

Table E-2
Summary of Data Used in Risk Assessment
Main Plant Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-074	CFSB-074	CFSB-074	CFSB-075	CFSB-075	CFSB-075	CFSB-079	CFSB-079	CFSB-079	CFSB-080	CFSB-080	CFSB-080	CFSB-082	CFSB-082
Sample Lab IDs	320-19320-31, 460-114828-17	320-19320-16, 460-114828-1	320-19320-30, 460-114828-16	320-19320-23, 460-114828-8	320-19320-19, 460-114828-4	320-19320-21, 460-114828-6	320-19320-25, 460-114828-10	320-19320-24, 460-114828-9	320-19320-20, 460-114828-5	320-19320-27, 460-114828-13	320-19320-28, 460-114828-14	320-19320-33, 460-114828-12	320-19320-26, 460-114828-11	320-19320-32, 460-114828-18
Sample Name	CFSB-074-SO-0-0.5	CFSB-074-SO-0.5-2	CFSB-074-SO-10-12	CFSB-075-SO-0-0.5	CFSB-075-SO-0.5-2	CFSB-075-SO-10-12	CFSB-079-SO-0-0.5	CFSB-079-SO-0.5-2	CFSB-079-SO-10-12	CFSB-080-SO-0-0.5	CFSB-080-SO-0.5-2	CFSB-080-SO-10-12	CFSB-082-SO-0-0.5	CFSB-082-SO-0.5-2
Sample Depth	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft
Chemical	6/1/2016	6/1/2016	6/1/2016	6/1/2016	6/1/2016	6/1/2016	6/1/2016	6/1/2016	6/1/2016	6/1/2016	6/1/2016	6/1/2016	6/1/2016	6/1/2016
PCB-1232 (Aroclor 1232)	0.0094 U	0.0092 U	0.0092 U	0.0098 U	0.0097 U	0.0096 U	0.0099 U	0.0095 U	0.0094 U	0.0096 U	0.01 U	0.0094 U	0.0095 U	0.0099 U
PCB-1242 (Aroclor 1242)	0.0094 U	0.0092 U	0.0092 U	0.0098 U	0.0097 U	0.0096 U	0.0099 U	0.0095 U	0.0094 U	0.0096 U	0.01 U	0.0094 U	0.0095 U	0.0099 U
PCB-1248 (Aroclor 1248)	0.0094 U	0.0092 U	0.0092 U	0.0098 U	0.0097 U	0.0096 U	0.0099 U	0.0095 U	0.0094 U	0.0096 U	0.01 U	0.0094 U	0.0095 U	0.0099 U
PCB-1254 (Aroclor 1254)	0.0097 U	0.0095 U	0.0095 U	0.01 U	0.01 U	0.01 U	0.01 U	0.0099 U	0.0097 U	0.01 U	0.01 U	0.0097 U	0.0098 U	0.01 U
PCB-1260 (Aroclor 1260)	0.0097 U	0.0095 U	0.0095 U	0.01 U	0.01 U	0.01 U	0.01 U	0.0099 U	0.0097 U	0.01 U	0.01 U	0.0097 U	0.0098 U	0.01 U
PCB-1262 (Aroclor 1262)	0.0097 U	0.0095 U	0.0095 U	0.01 U	0.01 U	0.01 U	0.01 U	0.0099 U	0.0097 U	0.01 U	0.01 U	0.0097 U	0.0098 U	0.01 U
PCB-1268 (Aroclor 1268)	0.0097 U	0.0095 U	0.0095 U	0.01 U	0.01 U	0.01 U	0.01 U	0.0099 U	0.0097 U	0.01 U	0.01 U	0.0097 U	0.0098 U	0.01 U
Polychlorinated Biphenyl (PCBs)	0.0097 U	0.0095 U	0.0095 U	0.01 U	0.01 U	0.01 U	0.01 U	0.0099 U	0.0097 U	0.01 U	0.01 U	0.0097 U	0.0098 U	0.01 U
SEMIVOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,2,4,5-Tetrachlorobenzene	0.026 U	0.025 U	0.025 U	0.027 U	0.027 U	0.027 U	0.027 U	0.026 U	0.026 U	0.027 U	0.028 U	0.026 U	0.026 U	0.027 U
1,4-Dioxane (P-Dioxane)	0.093 U	0.092 U	0.092 U	0.097 U	0.096 U	0.096 U	0.098 U	0.095 U	0.093 U	0.096 U	0.099 U	0.093 U	0.094 U	0.098 U
2,3,4,6-Tetrachlorophenol	0.033 U	0.032 U	0.032 U	0.034 U	0.034 U	0.034 U	0.034 U	0.033 U	0.033 U	0.034 U	0.035 U	0.033 U	0.033 U	0.035 U
2,4,5-Trichlorophenol	0.035 U	0.034 U	0.034 U	0.036 U	0.036 U	0.036 U	0.036 U	0.035 U	0.035 U	0.036 U	0.037 U	0.035 U	0.035 U	0.037 U
2,4,6-Trichlorophenol	0.0099 U	0.0097 U	0.0097 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.0099 U	0.01 U	0.011 U	0.0099 U	0.01 U	0.01 U
2,4-Dichlorophenol	0.0082 U	0.0081 U	0.0081 U	0.0086 U	0.0085 U	0.0084 U	0.0087 U	0.0084 U	0.0082 U	0.0084 U	0.0088 U	0.0082 U	0.0083 U	0.0087 U
2,4-Dimethylphenol	0.077 U	0.075 U	0.075 U	0.08 U	0.079 U	0.079 U	0.081 U	0.078 U	0.077 U	0.079 U	0.082 U	0.076 U	0.077 U	0.081 U
2,4-Dinitrophenol	0.26 U	0.26 U	0.26 U	0.27 U	0.27 U	0.27 U	0.28 U	0.27 U	0.26 U	0.27 U	0.28 U	0.26 U	0.27 U	0.28 U
2,4-Dinitrotoluene	0.014 U	0.014 U	0.014 U	0.014 U	0.014 U	0.014 U	0.015 U	0.014 U	0.014 U	0.014 U	0.015 U	0.014 U	0.014 U	0.015 U
2,6-Dinitrotoluene	0.019 U	0.018 U	0.018 U	0.019 U	0.019 U	0.019 U	0.02 U	0.019 U	0.019 U	0.019 U	0.02 U	0.019 U	0.019 U	0.02 U
2-Chloronaphthalene	0.0079 U	0.0078 U	0.0078 U	0.0082 U	0.0081 U	0.0081 U	0.0083 U	0.008 U	0.0079 U	0.0081 U	0.0084 U	0.0079 U	0.008 U	0.0084 U
2-Chlorophenol	0.0089 U	0.0087 U	0.0087 U	0.0092 U	0.0091 U	0.0091 U	0.0093 U	0.009 U	0.0089 U	0.0091 U	0.0094 U	0.0088 U	0.0089 U	0.0094 U
2-Methylnaphthalene	0.0099 J	0.0076 U	0.0076 U	0.008 U	0.0079 U	0.0079 U	0.0081 U	0.0078 U	0.0077 U	0.0079 U	0.0082 U	0.1 J	0.0077 U	0.0081 U
2-Methylphenol (O-Cresol)	0.015 U	0.015 U	0.015 U	0.016 U	0.016 U	0.016 U	0.016 U	0.015 U	0.015 U	0.016 U	0.016 U	0.015 U	0.015 U	0.016 U
2-Nitroaniline	0.012 U	0.011 U	0.011 U	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U	0.011 U	0.012 U	0.012 U
2-Nitrophenol	0.012 U	0.011 U	0.011 U	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U
3- And 4- Methylphenol (Total)	0.0093 U	0.0091 U	0.0091 U	0.0097 U	0.0095 U	0.0095 U	0.0098 U	0.0094 U	0.0093 U	0.0095 U	0.0099 U	0.0093 U	0.0093 U	0.0098 U
3,3'-Dichlorobenzidine	0.039 U	0.038 U	0.038 U	0.041 U	0.04 U	0.04 U	0.041 U	0.04 U	0.039 U	0.04 U	0.041 U	0.039 U	0.039 U	0.041 U
3-Nitroaniline	0.01 U	0.01 U	0.01 U	0.011 U	0.011 U	0.011 U	0.011 U	0.01 U	0.01 U	0.011 U	0.011 U	0.01 U	0.01 U	0.011 U
4,6-Dinitro-2-Methylphenol	0.093 U	0.091 U	0.091 U	0.097 U	0.096 U	0.096 U	0.098 U	0.094 U	0.093 U	0.095 U	0.099 U	0.093 U	0.094 U	0.098 U
4-Bromophenyl Phenyl Ether	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.012 U	0.011 U	0.011 U	0.011 U	0.012 U	0.011 U	0.011 U	0.012 U
4-Chloro-3-Methylphenol	0.015 U	0.015 U	0.015 U	0.016 U	0.015 U	0.015 U	0.016 U	0.015 U	0.015 U	0.015 U	0.016 U	0.015 U	0.015 U	0.016 U
4-Chloroaniline	0.009 U	0.0088 U	0.0088 U	0.0093 U	0.0092 U	0.0092 U	0.0094 U	0.0091 U	0.009 U	0.0092 U	0.0095 U	0.0089 U	0.009 U	0.0095 U
4-Chlorophenyl Phenyl Ether	0.01 U	0.01 U	0.01 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.01 U	0.011 U	0.011 U	0.01 U	0.011 U	0.011 U
4-Nitroaniline	0.013 U	0.013 U	0.013 U	0.014 U	0.014 U	0.014 U	0.014 U	0.013 U	0.013 U	0.014 U	0.014 U	0.013 U	0.013 U	0.014 U
4-Nitrophenol	0.17 U	0.16 U	0.16 U	0.17 U	0.17 U	0.17 U	0.18 U	0.17 U	0.17 U	0.17 U	0.18 U	0.17 U	0.17 U	0.18 U
Acenaphthene	0.072 J	0.0083 U	0.0091 J	0.035 J	0.019 J	0.0087 U	0.015 J	0.0086 U	0.0084 U	0.0087 U	0.009 U	0.016 J	0.014 J	0.0089 U
Acenaphthylene	0.009 U	0.0088 U	0.0088 U	0.0093 U	0.0092 U	0.0092 U	0.0094 U	0.0091 U	0.009 U	0.0092 U	0.0095 U	0.0089 U	0.009 U	0.0095 U
Acetophenone	0.0076 U	0.0075 U	0.0075 U	0.0079 U	0.0078 U	0.0078 U	0.008 U	0.0077 U	0.0076 U	0.0078 U	0.0081 U	0.0076 U	0.0076 U	0.008 U
Anthracene	0.19 J	0.033 U	0.033 U	0.1 J	0.044 J	0.034 U	0.038 J	0.034 U	0.033 U	0.034 U	0.035 U	0.033 U	0.045 J	0.035 U
Atrazine	0.016 U	0.015 U	0.015 U	0.016 U	0.016 U	0.016 U	0.016 U	0.016 U	0.016 U	0.016 U	0.016 U	0.015 U	0.016 U	0.016 U
Benzaldehyde	0.027 U	0.026 U	0.026 U	0.028 U	0.027 U	0.027 U	0.028 U	0.027 U	0.027 U	0.027 U	0.028 U	0.026 U	0.027 U	0.028 U
Benzo(A)Anthracene	1.6	0.03 J	0.22	0.43	0.37	0.12	0.26	0.03 U	0.029 U	0.13	0.031 U	0.059	0.3	0.031 U
Benzo(A)Pyrene	2.1	0.021 J	0.31	0.51	0.48	0.18	0.37	0.011 U	0.035	0.17	0.011 U	0.074	0.38	0.011 U
Benzo(B)Fluoranthene	3.4	0.038	0.49	0.87	0.81	0.3	0.73	0.014 U	0.067	0.39	0.014 U	0.13	0.9	0.017 J
Benzo(G,H,I)Perylene	2.5	0.02 U	0.34	0.54	0.48	0.19 J	2.5	0.02 U	0.18 J	0.47	0.021 U	0.15 J	0.83	0.021 U
Benzo(K)Fluoranthene	1.2	0.015 U	0.19	0.33	0.33	0.11	0.3	0.015 U	0.038	0.14	0.016 U	0.058	0.33	0.016 U
Benzyl Butyl Phthalate	0.011 U	0.011 U	0.011 U	0.052 J	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.031 J	0.011 U
Biphenyl (Diphenyl)	0.03 U	0.029 U	0.029 U	0.031 U	0.031 U	0.031 U	0.031 U	0.03 U	0.03 U	0.031 U	0.032 U	0.03 U	0.03 U	0.031 U
Bis(2-Chloroethoxy) Methane	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.012 U	0.011 U	0.011 U	0.011 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.0082 U	0.0081 U	0.0081 U	0.0086 U	0.0085 U	0.0084 U	0.0087 U	0.0084 U	0.0082 U	0.0084 U	0.0088 U	0.0082 U	0.0083 U	0.0087 U
Bis(2-Chloroisopropyl) Ether	0.014 U	0.014 U	0.014 U	0.015 U	0.015 U	0.015 U	0.015 U	0.015 U	0.014 U	0.015 U	0.015 U	0.014 U	0.014 U	0.015 U
Bis(2-Ethylhexyl) Phthalate	0.014 U	0.013 U	0.013 U	0.014 U	0.014 U	0.014 U	0.014 U	0.014 U	0.014 U	0.014 U	0.014 U	0.014 U	0.014 U	0.014 U
Caprolactam	0.025 U	0.025 U	0.025 U	0.026 U	0.026 U	0.026 U	0.026 U	0.025 U	0.025 U	0.026 U	0.027 U	0.025 U	0.025 U	0.027 U
Carbazole	0.28 J	0.0085 U	0.043 J	0.096 J	0.071 J	0.027 J	0.096 J	0.0088 U	0.012 J	0.05 J	0.0092 U	0.015 J	0.085 J	0.0091 U
Chrysene	2.3	0.025 J	0.32 J	0.62	0.56	0.21 J	0.42	0.0096 U	0.045 J	0.22 J	0.01 U	0.08 J	0.5	0.014 J
Dibenz(A,H)Anthracene	0.5	0.018 U	0.063	0.13	0.074	0.019 U	0.28	0.018 U	0.018 U	0.065	0.019 U	0.02 J	0.1	0.019 U
Dibenzofuran	0.025 J	0.01 U	0.01 U	0.023 J	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.021 J	0.011 U	0.011 U

Table E-2
Summary of Data Used in Risk Assessment
Main Plant Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-074	CFSB-074	CFSB-074	CFSB-075	CFSB-075	CFSB-075	CFSB-079	CFSB-079	CFSB-079	CFSB-080	CFSB-080	CFSB-080	CFSB-082	CFSB-082
Sample Lab IDs	320-19320-31, 460-114828-17	320-19320-16, 460-114828-1	320-19320-30, 460-114828-16	320-19320-23, 460-114828-8	320-19320-19, 460-114828-4	320-19320-21, 460-114828-6	320-19320-25, 460-114828-10	320-19320-24, 460-114828-9	320-19320-20, 460-114828-5	320-19320-27, 460-114828-13	320-19320-28, 460-114828-14	320-19320-33, 460-114828-12	320-19320-26, 460-114828-11	320-19320-32, 460-114828-18
Sample Name	CFSB-074-SO-0-0.5	CFSB-074-SO-0.5-2	CFSB-074-SO-10-12	CFSB-075-SO-0-0.5	CFSB-075-SO-0.5-2	CFSB-075-SO-10-12	CFSB-079-SO-0-0.5	CFSB-079-SO-0.5-2	CFSB-079-SO-10-12	CFSB-080-SO-0-0.5	CFSB-080-SO-0.5-2	CFSB-080-SO-10-12	CFSB-082-SO-0-0.5	CFSB-082-SO-0.5-2
Sample Depth	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft
Chemical	6/1/2016	6/1/2016	6/1/2016	6/1/2016	6/1/2016	6/1/2016	6/1/2016	6/1/2016	6/1/2016	6/1/2016	6/1/2016	6/1/2016	6/1/2016	6/1/2016
Diethyl Phthalate	0.0099 U	0.0097 U	0.0097 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.0099 U	0.01 U	0.011 U	0.0099 U	0.01 U	0.01 U
Dimethyl Phthalate	0.01 U	0.0099 U	0.0099 U	0.011 U	0.01 U	0.01 U	0.011 U	0.01 U	0.01 U	0.01 U	0.011 U	0.01 U	0.01 U	0.011 U
Di-N-Butyl Phthalate	0.01 U	0.01 U	0.01 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.01 U	0.011 U	0.011 U	0.081 J	0.011 U	0.011 U
Di-N-Octylphthalate	0.018 U	0.017 U	0.017 U	0.018 U	0.018 U	0.018 U	0.019 U	0.018 U	0.018 U	0.018 U	0.019 U	0.018 U	0.018 U	0.019 U
Fluoranthene	2.7	0.038 J	0.38	0.9	0.62	0.21 J	0.46	0.01 U	0.044 J	0.22 J	0.011 U	0.087 J	0.49	0.016 J
Fluorene	0.046 J	0.0075 U	0.0075 U	0.035 J	0.0078 U	0.0078 U	0.0085 J	0.0077 U	0.0076 U	0.0078 U	0.0081 U	0.013 J	0.011 J	0.008 U
Hexachlorobenzene	0.014 U	0.014 U	0.014 U	0.015 U	0.015 U	0.015 U	0.015 U	0.014 U	0.014 U	0.015 U	0.015 U	0.014 U	0.014 U	0.091
Hexachlorobutadiene	0.0098 U	0.0096 U	0.0096 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.0098 U	0.01 U	0.01 U	0.0098 U	0.0099 U	0.01 U
Hexachlorocyclopentadiene	0.022 U	0.021 U	0.021 U	0.023 U	0.022 U	0.022 U	0.023 U	0.022 U	0.022 U	0.022 U	0.023 U	0.022 U	0.022 U	0.023 U
Hexachloroethane	0.013 U	0.013 U	0.013 U	0.013 U	0.013 U	0.013 U	0.013 U	0.013 U	0.013 U	0.013 U	0.014 U	0.013 U	0.013 U	0.013 U
Indeno(1,2,3-C,D)Pyrene	1.9	0.023 U	0.25	0.45	0.4	0.15	1.3	0.024 U	0.093	0.23	0.025 U	0.081	0.48	0.025 U
Isophorone	0.0075 U	0.0073 U	0.0074 U	0.0078 U	0.0077 U	0.0077 U	0.0079 U	0.0076 U	0.0075 U	0.0077 U	0.008 U	0.0075 U	0.0075 U	0.0079 U
Naphthalene	0.022 J	0.0087 U	0.0087 U	0.0092 U	0.0091 U	0.0091 U	0.0093 U	0.009 U	0.0089 U	0.0091 U	0.0094 U	0.67	0.0089 U	0.0094 U
Nitrobenzene	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.012 U	0.011 U	0.011 U	0.011 U	0.012 U	0.011 U	0.011 U	0.012 U
N-Nitrosodi-N-Propylamine	0.012 U	0.011 U	0.011 U	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U
N-Nitrosodiphenylamine	0.032 U	0.031 U	0.031 U	0.033 U	0.033 U	0.032 U	0.033 U	0.032 U	0.032 U	0.032 U	0.034 U	0.032 U	0.032 U	0.033 U
Pentachlorophenol	0.042 U	0.041 U	0.041 U	0.044 U	0.043 U	0.043 U	0.044 U	0.043 U	0.042 U	0.043 U	0.045 U	0.042 U	0.042 U	0.045 U
Phenanthrene	1	0.025 J	0.15 J	0.46	0.26 J	0.088 J	0.16 J	0.0094 U	0.018 J	0.082 J	0.0099 U	0.045 J	0.19 J	0.012 J
Phenol	0.011 U	0.011 U	0.011 U	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U	0.011 U	0.012 U	0.012 U	0.011 U	0.011 U	0.012 U
Pyrene	2.8	0.036 J	0.39	0.85	0.64	0.21 J	0.45	0.016 U	0.047 J	0.23 J	0.017 U	0.093 J	0.56	0.018 J
VOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,1,1-Trichloroethane	--	0.00038 U	0.00043 U	--	0.00037 U	0.0004 J	--	0.00034 U	0.00036 U	--	0.0004 U	0.00034 U	--	0.00035 U
1,1,2,2-Tetrachloroethane	--	0.00017 U	0.00019 U	--	0.00017 U	0.00016 U	--	0.00015 U	0.00016 U	--	0.00018 U	0.00015 U	--	0.00016 U
1,1,2-Trichloro-1,2,2-Trifluoroethane	--	0.00044 U	0.0005 U	--	0.00043 U	0.00042 U	--	0.0004 U	0.00042 U	--	0.00046 U	0.00039 U	--	0.00041 U
1,1,2-Trichloroethane	--	0.00028 U	0.00032 U	--	0.00027 U	0.00027 U	--	0.00025 U	0.00026 U	--	0.00029 U	0.00025 U	--	0.00026 U
1,1-Dichloroethane	--	0.00034 U	0.00039 U	--	0.00033 U	0.00033 U	--	0.00031 U	0.00032 U	--	0.00036 U	0.0003 U	--	0.00031 U
1,1-Dichloroethene	--	0.00041 U	0.00047 U	--	0.0004 U	0.00039 U	--	0.00037 U	0.00039 U	--	0.00043 U	0.00036 U	--	0.00038 U
1,2,3-Trichlorobenzene	--	0.00011 U	0.00013 U	--	0.00011 U	0.00011 U	--	0.000099 U	0.0001 U	--	0.00012 U	0.000098 U	--	0.0001 U
1,2,4-Trichlorobenzene	--	0.00032 U	0.00036 U	--	0.00031 U	0.00031 U	--	0.00029 U	0.0003 U	--	0.00034 U	0.00028 U	--	0.0003 U
1,2-Dibromo-3-Chloropropane	--	0.00047 U	0.00053 U	--	0.00046 U	0.00045 U	--	0.00042 U	0.00044 U	--	0.00049 U	0.00042 U	--	0.00043 U
1,2-Dibromoethane (Ethylene Dibromide)	--	0.00012 U	0.00014 U	--	0.00012 U	0.00012 U	--	0.00011 U	0.00011 U	--	0.00013 U	0.00011 U	--	0.00011 U
1,2-Dichlorobenzene	--	0.00014 U	0.00016 U	--	0.00014 U	0.00013 U	--	0.00013 U	0.00013 U	--	0.00015 U	0.00012 U	--	0.00013 U
1,2-Dichloroethane	--	0.00011 U	0.00013 U	--	0.00011 U	0.00011 U	--	0.000099 U	0.0001 U	--	0.00012 U	0.000098 U	--	0.0001 U
1,2-Dichloropropane	--	0.00017 U	0.00019 U	--	0.00017 U	0.00016 U	--	0.00015 U	0.00016 U	--	0.00018 U	0.00015 U	--	0.00016 U
1,3-Dichlorobenzene	--	0.00012 U	0.00014 U	--	0.00012 U	0.00012 U	--	0.00011 U	0.00011 U	--	0.00013 U	0.00011 U	--	0.00011 U
1,4-Dichlorobenzene	--	0.00013 U	0.00015 U	--	0.00013 U	0.00012 U	--	0.00012 U	0.00012 U	--	0.00014 U	0.00012 U	--	0.00012 U
2-Hexanone	--	0.00094 U	0.0011 U	--	0.00092 U	0.0009 U	--	0.00085 U	0.00089 U	--	0.00099 U	0.00083 U	--	0.00087 U
Acetone	--	0.0011 U	0.0081	--	0.017	0.028	--	0.04	0.014	--	0.033	0.0098	--	0.015
Benzene	--	0.0002 U	0.00026 J	--	0.00056 J	0.00071 J	--	0.00018 U	0.00036 J	--	0.00021 U	0.00066 J	--	0.00043 J
Bromochloromethane	--	0.00017 U	0.00019 U	--	0.00017 U	0.00016 U	--	0.00015 U	0.00016 U	--	0.00018 U	0.00015 U	--	0.00016 U
Bromodichloromethane	--	0.00038 U	0.00043 U	--	0.00037 U	0.00037 U	--	0.00034 U	0.00036 U	--	0.0004 U	0.00034 U	--	0.00035 U
Bromoform	--	0.00013 U	0.00015 U	--	0.00013 U	0.00012 U	--	0.00012 U	0.00012 U	--	0.00014 U	0.00012 U	--	0.00012 U
Bromomethane	--	0.00032 U	0.00036 U	--	0.00031 U	0.00031 U	--	0.00029 U	0.0003 U	--	0.00034 U	0.00028 U	--	0.0003 U
Carbon Disulfide	--	0.00043 U	0.00079 J	--	0.00087 J	0.0009 J	--	0.00039 U	0.0016	--	0.0005 J	0.00078 J	--	0.0014
Carbon Tetrachloride	--	0.00043 U	0.00049 U	--	0.00042 U	0.00041 U	--	0.00039 U	0.00041 U	--	0.00045 U	0.00038 U	--	0.0004 U
Chlorobenzene	--	0.00014 U	0.00016 U	--	0.00014 U	0.00013 U	--	0.00013 U	0.00013 U	--	0.00015 U	0.00012 U	--	0.00013 U
Chloroethane	--	0.00035 U	0.0004 UJ	--	0.00034 UJ	0.00034 UJ	--	0.00032 UJ	0.00033 UJ	--	0.00037 UJ	0.00031 UJ	--	0.00032 UJ
Chloroform	--	0.00021 U	0.00024 U	--	0.00021 U	0.0002 U	--	0.00019 U	0.0002 U	--	0.00022 U	0.00019 U	--	0.00019 U
Chloromethane	--	0.00038 U	0.00043 U	--	0.00037 U	0.00037 U	--	0.00034 U	0.00036 U	--	0.0004 U	0.00034 U	--	0.00035 U
Cis-1,2-Dichloroethylene	--	0.00022 U	0.00025 U	--	0.00021 U	0.00021 U	--	0.0002 U	0.00021 U	--	0.00023 U	0.0002 U	--	0.0002 U
Cis-1,3-Dichloropropene	--	0.00015 U	0.00017 U	--	0.00015 U	0.00014 U	--	0.00014 U	0.00014 U	--	0.00016 U	0.00013 U	--	0.00014 U
Cyclohexane	--	0.00046 U	0.00052 U	--	0.00084 J	0.0011	--	0.00042 U	0.00043 U	--	0.00048 U	0.0016	--	0.00061 J
Dibromochloromethane	--	0.00015 U	0.00017 U	--	0.00015 U	0.00014 U	--	0.00014 U	0.00014 U	--	0.00016 U	0.00013 U	--	0.00014 U
Dichlorodifluoromethane	--	0.00032 U	0.00036 U	--	0.00031 U	0.00031 U	--	0.00029 U	0.0003 U	--	0.00034 U	0.00028 U	--	0.0003 U
Ethylbenzene	--	0.00018 U	0.0002 U	--	0.0002 J	0.00017 U	--	0.00016 U	0.00017 U	--	0.00019 U	0.00042 J	--	0.00017 U
Isopropylbenzene (Cumene)	--	0.00017 U	0.00019 U	--	0.00017 U	0.00016 U	--	0.00015 U	0.00016 U	--	0.00018 U	0.00015 U	--	0.00016 U
M,P-Xylene	--	0.00056 J	0.00051 J	--	0.00056 J	0.00043 J	--	0.000099 U	0.00034 J	--	0.00012 U	0.0012	--	0.00048 J

Table E-2
Summary of Data Used in Risk Assessment
Main Plant Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-074	CFSB-074	CFSB-074	CFSB-075	CFSB-075	CFSB-075	CFSB-079	CFSB-079	CFSB-079	CFSB-080	CFSB-080	CFSB-080	CFSB-082	CFSB-082
Sample Lab IDs	320-19320-31, 460-114828-17	320-19320-16, 460-114828-1	320-19320-30, 460-114828-16	320-19320-23, 460-114828-8	320-19320-19, 460-114828-4	320-19320-21, 460-114828-6	320-19320-25, 460-114828-10	320-19320-24, 460-114828-9	320-19320-20, 460-114828-5	320-19320-27, 460-114828-13	320-19320-28, 460-114828-14	320-19320-33, 460-114828-12	320-19320-26, 460-114828-11	320-19320-32, 460-114828-18
Sample Name	CFSB-074-SO-0-0.5	CFSB-074-SO-0.5-2	CFSB-074-SO-10-12	CFSB-075-SO-0-0.5	CFSB-075-SO-0.5-2	CFSB-075-SO-10-12	CFSB-079-SO-0-0.5	CFSB-079-SO-0.5-2	CFSB-079-SO-10-12	CFSB-080-SO-0-0.5	CFSB-080-SO-0.5-2	CFSB-080-SO-10-12	CFSB-082-SO-0-0.5	CFSB-082-SO-0.5-2
Sample Depth	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft
Chemical	6/1/2016	6/1/2016	6/1/2016	6/1/2016	6/1/2016	6/1/2016	6/1/2016	6/1/2016	6/1/2016	6/1/2016	6/1/2016	6/1/2016	6/1/2016	6/1/2016
Methyl Acetate	--	0.0009 U	0.001 U	--	0.00088 U	0.00087 U	--	0.00081 U	0.00085 U	--	0.00095 U	0.0008 U	--	0.00083 U
Methyl Ethyl Ketone (2-Butanone)	--	0.00077 U	0.00088 U	--	0.00075 U	0.00074 U	--	0.0049	0.00073 U	--	0.00081 U	0.00068 U	--	0.00071 U
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	--	0.0022 U	0.0025 U	--	0.0022 U	0.0021 U	--	0.002 U	0.0021 U	--	0.0023 U	0.002 U	--	0.002 U
Methylcyclohexane	--	0.00073 J	0.00089 J	--	0.0016	0.002	--	0.00045 U	0.00047 U	--	0.00053 U	0.0024	--	0.0012
Methylene Chloride	--	0.00032 U	0.00036 U	--	0.00031 U	0.00031 U	--	0.00029 U	0.0003 U	--	0.00034 U	0.00028 U	--	0.0003 U
O-Xylene (1,2-Dimethylbenzene)	--	0.00021 J	0.00021 J	--	0.00018 J	0.00015 U	--	0.00014 U	0.00015 U	--	0.00017 U	0.00044 J	--	0.00015 U
Styrene	--	0.00015 U	0.00017 U	--	0.00015 U	0.00014 U	--	0.00014 U	0.00014 U	--	0.00016 U	0.00013 U	--	0.00014 U
Tert-Butyl Methyl Ether	--	0.00017 U	0.00019 U	--	0.00017 U	0.00016 U	--	0.00015 U	0.00016 U	--	0.00018 U	0.00015 U	--	0.00016 U
Tetrachloroethylene (PCE)	--	0.00028 U	0.00032 U	--	0.00027 U	0.00027 U	--	0.00025 U	0.00026 U	--	0.00029 U	0.00025 U	--	0.00033 J
Toluene	--	0.00079 J	0.00088 J	--	0.0013	0.0011	--	0.00017 U	0.00062 J	--	0.0002 U	0.0018	--	0.00086 J
Trans-1,2-Dichloroethene	--	0.00039 U	0.00044 U	--	0.00038 U	0.00037 U	--	0.00035 U	0.00037 U	--	0.00041 U	0.00035 U	--	0.00036 U
Trans-1,3-Dichloropropene	--	0.0001 U	0.00011 U	--	0.000098 U	0.000096 U	--	0.00009 U	0.000094 U	--	0.00011 U	0.000089 U	--	0.000092 U
Trichloroethylene (TCE)	--	0.00026 U	0.0003 U	--	0.00025 U	0.00025 U	--	0.00023 U	0.00025 U	--	0.00027 U	0.00023 U	--	0.00024 U
Trichlorofluoromethane	--	0.00034 U	0.00039 U	--	0.00033 U	0.00033 U	--	0.00031 U	0.00032 U	--	0.00036 U	0.0003 U	--	0.00031 U
Vinyl Chloride	--	0.00039 U	0.00044 U	--	0.00038 U	0.00037 U	--	0.00035 U	0.00037 U	--	0.00041 U	0.00035 U	--	0.00036 U

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-2
Summary of Data Used in Risk Assessment
Main Plant Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-082	CFSB-084	CFSB-084	CFSB-084	CFSB-086	CFSB-086	CFSB-086	CFSB-087	CFSB-087	CFSB-087	CFSB-088	CFSB-088	CFSB-088	CFSB-092
Sample Lab IDs	320-19320-29, 460-114828-15	320-19320-13, 460-114793-3	320-19320-14, 460-114793-6	320-19320-15, 460-114793-5	320-19320-10, 460-114529-28	320-19320-11, 460-114529-29	320-19320-12, 460-114529-30	320-19320-7, 460-114529-25	320-19320-8, 460-114529-26	320-19320-9, 460-114529-27	320-19320-4, 460-114529-22	320-19320-5, 460-114529-23	320-19320-6, 460-114529-24	320-19320-1, 460-114529-19
Sample Name	CFSB-082-SO-10-12	CFSB-084-SO-0-0.5	CFSB-084-SO-0.5-2	CFSB-084-SO-10-12	CFSB-086-SO-0-0.5	CFSB-086-SO-0.5-2	CFSB-086-SO-10-12	CFSB-087-SO-0-0.5	CFSB-087-SO-0.5-2	CFSB-087-SO-10-12	CFSB-088-SO-0-0.5	CFSB-088-SO-0.5-2	CFSB-088-SO-10-12	CFSB-092-SO-0-0.5
Sample Depth	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft
Chemical	6/1/2016	5/27/2016	5/27/2016	5/27/2016	5/26/2016	5/26/2016	5/26/2016	5/26/2016	5/26/2016	5/26/2016	5/26/2016	5/26/2016	5/26/2016	5/26/2016
GENERAL CHEMISTRY (mg/kg)														
Fluoride	5.35 J	59.6 J	24.1 J	7.15 J	21.1 J+	12.9 J+	18.6 J+	34.9 J+	29.3 J+	17.2 J+	23.5 J+	25.8 J+	5.88 J+	14.1 J
Cyanide	0.016 U	0.026 J	0.02 U	0.023 J	0.024 J	0.019 U	0.024 J	0.041 J	0.045 J	0.032 J	0.022 J	0.017 U	0.017 U	0.02 J
METALS (mg/kg)														
"Chromium, Hexavalent - Estimated"	0.256934	0.224818	0.412165	0.190024	0.264964	0.29708	0.235523	0.291727	0.286375	0.406813	0.227494	0.264964	0.326521	0.299757
"Chromium, Trivalent - Calculated"	--	--	--	--	--	--	--	--	--	--	--	--	--	--
"Chromium, Trivalent - Estimated"	9.34307	8.17518	14.9878	6.90998	9.63504	10.8029	8.56448	10.6083	10.4136	14.7932	8.27251	9.63504	11.8735	10.9002
Aluminum	8890	7170	5540	6750	10400	10600	7330	15200	11900	9240	8680	9860	7270	11500
Antimony	0.44 UJ	0.34 U	0.38 U	0.36 U	0.35 UJ	0.34 UJ	0.43 UJ	0.36 UJ	0.34 UJ	0.34 UJ	0.34 UJ	0.33 UJ	0.34 UJ	0.36 UJ
Arsenic	5.3	3.2 J	3.3 J	2.3 J	2.8 J	4.2 J	3.6	4 J	4.1 J	3.8 J	3.3 J	3.9 J	3.6 J	4.6 J
Barium	60.9	65.4 J	45.3 J	103 J	89.4	91.3	76	99.5	109	93.7	57.5	85.6	96.2	100
Beryllium	0.41 J	0.32 J	0.25 J	0.28 J	0.48	0.45	0.31 J	0.57	0.45	0.45	0.45	0.46	0.36	0.48
Cadmium	0.34 U	0.26 U	0.29 U	0.27 U	0.3 J	0.26 U	0.33 U	0.29 J	0.26 U	0.26 U	0.26 U	0.25 U	0.26 U	0.28 U
Calcium	15000	36700 J	32000 J	31500 J	20400	26600	43200	18500	37200	22100	14300	21900	42000	15700
Chromium, Total	9.6	8.4 J	15.4 J	7.1 J	9.9	11.1	8.8 J+	10.9	10.7	15.2	8.5	9.9	12.2	11.2
Cobalt	5.4	4.2	3.3	4.2	5 J-	5.6 J-	4.2	5.2 J-	4.8 J-	4.8 J-	4.6 J-	4.3 J-	5 J-	5.3 J-
Copper	16.8	9.2	9.5	11.3	16.6 J+	16 J+	12.4	19.5 J+	12.6 J+	13.4 J+	7.4 J+	9.9 J+	12.5 J+	14.7 J+
Iron	14600	8880	9320	10100	10900	14200	10000	12600	12600	11700	9860	11000	12500	14700
Lead	8.7	6.2	5.5	4.3	8.1 J	10.2 J	7.4 J-	12.9 J	8.6 J	7 J	8 J	8 J	4.9 J	12.2 J
Magnesium	9070	10700 J	13500 J	9100 J	10700	11700	12700	9920	11700	9830	10000	10900	14300	10400
Manganese	351	357 J	396 J	366 J	359	385	331	333	443	302	361	373	296	454
Mercury	0.022	0.018	0.013 U	0.019	0.013 J+	0.017 J+	0.013 J+	0.021 J+	0.016 J+	0.017 J+	0.018 J+	0.022 J+	0.012 U	0.022 J+
Nickel	10.8	12.2 J	11.3 J	8 J	16.9	14.2	10.5	22.1	13.7	15.4	13.5	14.5	10.3	12.8
Potassium	649	633 J	694 J	539 J	856 J+	965 J+	663	1100 J+	1070 J+	949 J+	685 J+	752 J+	790 J+	1230 J+
Selenium	0.42 U	0.31 U	0.36 U	0.33 U	0.33 U	0.31 U	0.4 U	0.34 U	0.32 U	0.32 U	0.32 U	0.31 U	0.32 U	0.34 U
Silver	0.81 U	0.62 U	0.7 U	0.65 U	0.64 U	0.61 U	0.79 U	0.66 U	0.63 U	0.63 U	0.63 U	0.6 U	0.62 U	0.67 U
Sodium	41.6 U	50.1 J	35.5 U	33.3 U	45.7 J	45.8 J	40.3 U	62.6 J	63.3 J	43.1 J	32.2 U	30.8 U	53.7 J	35.1 J
Thallium	0.17 U	0.13 U	0.14 U	0.13 U	0.13 U	0.13 U	0.16 U	0.14 U	0.13 U	0.13 U	0.13 U	0.12 U	0.13 U	0.14 U
Vanadium	12.5	7.9 J	5.4 J	5.9 J	10.1	11.6	6.9	14.8	13	9.4	8.4	8.3	9.1	12.6
Zinc	34.6	35.2	32.6	28.9	57.8	43.1	32.7	88.8	56.2	52.3	28.5	33.7	30.9	42.4
METALS|HEXAVALENT CHROMIUM (mg/kg)														
Chromium, Hexavalent	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PESTICIDES (mg/kg)														
Aldrin	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Alpha Bhc (Alpha Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Alpha Endosulfan	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Beta Bhc (Beta Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Beta Endosulfan	--	--	--	--	--	--	--	--	--	--	--	--	--	--
cis-Chlordane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Delta BHC (Delta Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dieldrin	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endosulfan Sulfate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin Aldehyde	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin Ketone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Gamma Bhc (Lindane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Heptachlor	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Heptachlor Epoxide	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methoxychlor	--	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDD	--	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDT	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Toxaphene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
trans-Chlordane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
POLYCHLORINATED BIPHENYLS (mg/kg)														
PCB-1016 (Aroclor 1016)	0.0099 U	0.0095 U	0.01 U	0.0094 U	0.0094 U	0.0097 U	0.0093 U	0.0098 U	0.0097 U	0.0094 U	0.0097 U	0.0096 U	0.0093 U	0.0096 U
PCB-1221 (Aroclor 1221)	0.0099 U	0.0095 U	0.01 U	0.0094 U	0.0094 U	0.0097 U	0.0093 U	0.0098 U	0.0097 U	0.0094 U	0.0097 U	0.0096 U	0.0093 U	0.0096 U

Table E-2
Summary of Data Used in Risk Assessment
Main Plant Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-082	CFSB-084	CFSB-084	CFSB-084	CFSB-086	CFSB-086	CFSB-086	CFSB-087	CFSB-087	CFSB-087	CFSB-088	CFSB-088	CFSB-088	CFSB-092
Sample Lab IDs	320-19320-29, 460-114828-15	320-19320-13, 460-114793-3	320-19320-14, 460-114793-6	320-19320-15, 460-114793-5	320-19320-10, 460-114529-28	320-19320-11, 460-114529-29	320-19320-12, 460-114529-30	320-19320-7, 460-114529-25	320-19320-8, 460-114529-26	320-19320-9, 460-114529-27	320-19320-4, 460-114529-22	320-19320-5, 460-114529-23	320-19320-6, 460-114529-24	320-19320-1, 460-114529-19
Sample Name	CFSB-082-SO-10-12	CFSB-084-SO-0-0.5	CFSB-084-SO-0.5-2	CFSB-084-SO-10-12	CFSB-086-SO-0-0.5	CFSB-086-SO-0.5-2	CFSB-086-SO-10-12	CFSB-087-SO-0-0.5	CFSB-087-SO-0.5-2	CFSB-087-SO-10-12	CFSB-088-SO-0-0.5	CFSB-088-SO-0.5-2	CFSB-088-SO-10-12	CFSB-092-SO-0-0.5
Sample Depth	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft
Chemical	6/1/2016	5/27/2016	5/27/2016	5/27/2016	5/26/2016	5/26/2016	5/26/2016	5/26/2016	5/26/2016	5/26/2016	5/26/2016	5/26/2016	5/26/2016	5/26/2016
PCB-1232 (Aroclor 1232)	0.0099 U	0.0095 U	0.01 U	0.0094 U	0.0094 U	0.0097 U	0.0093 U	0.0098 U	0.0097 U	0.0094 U	0.0097 U	0.0096 U	0.0093 U	0.0096 U
PCB-1242 (Aroclor 1242)	0.0099 U	0.0095 U	0.01 U	0.0094 U	0.0094 U	0.0097 U	0.0093 U	0.0098 U	0.0097 U	0.0094 U	0.0097 U	0.0096 U	0.0093 U	0.0096 U
PCB-1248 (Aroclor 1248)	0.0099 U	0.0095 U	0.01 U	0.0094 U	0.0094 U	0.0097 U	0.0093 U	0.0098 U	0.0097 U	0.0094 U	0.0097 U	0.0096 U	0.0093 U	0.0096 U
PCB-1254 (Aroclor 1254)	0.01 U	0.0099 U	0.011 U	0.0097 U	0.0098 U	0.01 U	0.0097 U	0.01 U	0.01 U	0.0097 U	0.01 U	0.0099 U	0.0096 U	0.0099 U
PCB-1260 (Aroclor 1260)	0.01 U	0.0099 U	0.011 U	0.0097 U	0.0098 U	0.01 U	0.0097 U	0.01 U	0.01 U	0.0097 U	0.01 U	0.0099 U	0.0096 U	0.0099 U
PCB-1262 (Aroclor 1262)	0.01 U	0.0099 U	0.011 U	0.0097 U	0.0098 U	0.01 U	0.0097 U	0.01 U	0.01 U	0.0097 U	0.01 U	0.0099 U	0.0096 U	0.0099 U
PCB-1268 (Aroclor 1268)	0.01 U	0.0099 U	0.011 U	0.0097 U	0.0098 U	0.01 U	0.0097 U	0.01 U	0.01 U	0.0097 U	0.01 U	0.0099 U	0.0096 U	0.0099 U
Polychlorinated Biphenyl (PCBs)	0.01 U	0.0099 U	0.011 U	0.0097 U	0.0098 U	0.01 U	0.0097 U	0.01 U	0.01 U	0.0097 U	0.01 U	0.0099 U	0.0096 U	0.0099 U
SEMIVOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,2,4,5-Tetrachlorobenzene	0.027 U	0.026 U	0.028 U	0.026 U	0.026 U	0.027 U	0.026 U	0.027 U	0.027 U	0.026 U	0.027 U	0.026 U	0.026 U	0.027 U
1,4-Dioxane (P-Dioxane)	0.098 U	0.095 U	0.1 U	0.094 U	0.094 U	0.096 U	0.093 U	0.097 U	0.096 U	0.093 U	0.096 U	0.095 U	0.092 U	0.095 U
2,3,4,6-Tetrachlorophenol	0.035 U	0.033 UJ	0.036 U	0.033 U	0.033 U	0.034 U	0.033 U	0.034 U	0.034 U	0.033 U	0.034 U	0.033 U	0.032 U	0.034 U
2,4,5-Trichlorophenol	0.037 U	0.035 U	0.038 U	0.035 U	0.035 U	0.036 U	0.035 U	0.036 U	0.036 U	0.035 U	0.036 U	0.035 U	0.034 U	0.036 U
2,4,6-Trichlorophenol	0.01 U	0.01 U	0.011 U	0.0099 U	0.01 U	0.01 U	0.0099 U	0.01 U	0.01 U	0.0099 U	0.01 U	0.01 U	0.0098 U	0.01 U
2,4-Dichlorophenol	0.0087 U	0.0083 U	0.009 U	0.0083 U	0.0083 U	0.0085 U	0.0082 U	0.0086 U	0.0085 U	0.0082 U	0.0085 U	0.0084 U	0.0081 U	0.0084 U
2,4-Dimethylphenol	0.081 U	0.078 U	0.084 U	0.077 U	0.077 U	0.079 U	0.076 U	0.08 U	0.079 U	0.077 U	0.079 U	0.078 U	0.076 U	0.079 U
2,4-Dinitrophenol	0.28 U	0.27 UJ	0.29 U	0.26 U	0.26 U	0.27 U	0.26 U	0.28 U	0.27 U	0.26 U	0.27 U	0.27 U	0.26 U	0.27 U
2,4-Dinitrotoluene	0.015 U	0.014 U	0.015 U	0.014 U	0.014 U	0.014 U	0.014 U	0.014 U	0.014 U	0.014 U	0.014 U	0.014 U	0.014 U	0.014 U
2,6-Dinitrotoluene	0.02 U	0.019 U	0.02 U	0.019 U	0.019 U	0.019 U	0.018 U	0.019 U	0.019 U	0.019 U	0.019 U	0.019 U	0.018 U	0.019 U
2-Chloronaphthalene	0.0084 U	0.008 U	0.0086 U	0.0079 U	0.0079 U	0.0081 U	0.0079 U	0.0083 U	0.0082 U	0.0079 U	0.0082 U	0.008 U	0.0078 U	0.0081 U
2-Chlorophenol	0.0094 U	0.009 U	0.0097 U	0.0089 U	0.0089 U	0.0091 U	0.0088 U	0.0093 U	0.0091 U	0.0089 U	0.0091 U	0.009 U	0.0087 U	0.0091 U
2-Methylnaphthalene	0.0081 U	0.0078 U	0.0084 U	0.0077 U	0.0077 U	0.0079 U	0.0077 U	0.008 U	0.0079 U	0.0077 U	0.0079 U	0.0078 U	0.0076 U	0.0079 U
2-Methylphenol (O-Cresol)	0.016 U	0.015 U	0.017 U	0.015 U	0.015 U	0.016 U	0.015 U	0.016 U	0.016 U	0.015 U	0.016 U	0.015 U	0.015 U	0.016 U
2-Nitroaniline	0.012 U	0.012 U	0.013 U	0.012 U	0.012 U	0.012 U	0.011 U	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U	0.011 U	0.012 U
2-Nitrophenol	0.012 U	0.012 U	0.013 U	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U
3- And 4- Methylphenol (Total)	0.0098 U	0.0094 U	0.01 U	0.0093 U	0.0093 U	0.0096 U	0.0092 U	0.0097 U	0.0096 U	0.0093 U	0.0096 U	0.0094 U	0.0091 U	0.0095 U
3,3'-Dichlorobenzidine	0.041 U	0.039 U	0.042 U	0.039 U	0.039 U	0.04 U	0.039 U	0.041 U	0.04 U	0.039 U	0.04 U	0.04 U	0.038 U	0.04 U
3-Nitroaniline	0.011 U	0.01 U	0.011 U	0.01 U	0.01 U	0.011 U	0.01 U	0.011 U	0.011 U	0.01 U	0.011 U	0.011 U	0.01 U	0.011 U
4,6-Dinitro-2-Methylphenol	0.098 U	0.094 UJ	0.1 U	0.093 U	0.093 U	0.096 U	0.093 U	0.097 U	0.096 U	0.093 U	0.096 U	0.095 U	0.092 U	0.095 U
4-Bromophenyl Phenyl Ether	0.012 U	0.011 U	0.012 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U
4-Chloro-3-Methylphenol	0.016 U	0.015 U	0.016 U	0.015 U	0.015 U	0.015 U	0.015 U	0.016 U	0.015 U	0.015 U	0.015 U	0.015 U	0.015 U	0.015 U
4-Chloroaniline	0.0095 U	0.0091 U	0.0098 U	0.009 U	0.009 U	0.0092 U	0.0089 U	0.0094 U	0.0093 U	0.009 U	0.0092 U	0.0091 U	0.0088 U	0.0092 U
4-Chlorophenyl Phenyl Ether	0.011 U	0.011 U	0.011 U	0.01 U	0.01 U	0.011 U	0.01 U	0.011 U	0.011 U	0.01 U	0.011 U	0.011 U	0.01 U	0.011 U
4-Nitroaniline	0.014 U	0.013 U	0.014 U	0.013 U	0.013 U	0.014 U	0.013 U	0.014 U	0.014 U	0.013 U	0.014 U	0.013 U	0.013 U	0.014 U
4-Nitrophenol	0.18 U	0.17 U	0.18 U	0.17 U	0.17 U	0.17 U	0.17 U	0.18 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U
Acenaphthene	0.0089 U	0.03 J	0.0092 U	0.0085 U	0.04 J	0.0087 U	0.0084 U	0.028 J	0.024 J	0.015 J	0.021 J	0.032 J	0.0083 U	0.036 J
Acenaphthylene	0.0095 U	0.0091 U	0.0098 U	0.009 U	0.009 U	0.0092 U	0.0089 U	0.0094 U	0.0093 U	0.009 U	0.0092 U	0.0091 U	0.0088 U	0.0092 U
Acetophenone	0.008 U	0.0077 U	0.0083 U	0.0076 U	0.0076 U	0.0078 U	0.0076 U	0.0079 U	0.0078 U	0.0076 U	0.0078 U	0.0077 U	0.0075 U	0.0078 U
Anthracene	0.035 U	0.06 J	0.036 U	0.033 U	0.078 J	0.034 U	0.033 U	0.068 J	0.046 J	0.039 J	0.043 J	0.06 J	0.033 U	0.059 J
Atrazine	0.016 U	0.016 U	0.017 U	0.016 U	0.016 U	0.016 U	0.015 U	0.016 U	0.016 U	0.016 U	0.016 U	0.016 U	0.015 U	0.016 U
Benzaldehyde	0.028 U	0.027 U	0.029 U	0.027 U	0.027 U	0.027 U	0.026 U	0.028 U	0.027 U	0.027 U	0.027 U	0.027 U	0.026 U	0.027 U
Benzo(A)Anthracene	0.031 U	0.48	0.063	0.072	0.4	0.094	0.13	0.44	0.23	0.22	0.3	0.45	0.029 J	0.23
Benzo(A)Pyrene	0.011 U	0.68	0.072	0.088	0.49	0.12	0.16	0.61	0.35	0.31	0.42	0.59	0.026 J	0.28
Benzo(B)Fluoranthene	0.014 U	1.3	0.15	0.16	0.89	0.2	0.27	1.4	0.7	0.71	0.97	1.4	0.072	0.47
Benzo(G,H,I)Perylene	0.021 U	0.95	0.13 J	0.11 J	0.69	0.14 J	0.21 J	1.2	0.7	0.61	0.61	0.79	0.031 J	0.31 J
Benzo(K)Fluoranthene	0.016 U	0.52	0.063	0.058	0.34	0.085	0.11	0.43	0.29	0.21	0.016 U	0.015 U	0.015 U	0.2
Benzyl Butyl Phthalate	0.011 U	0.036 J	0.012 U	0.011 U	1.4	0.46	0.043 J	0.016 J	0.015 J	0.011 U	0.011 U	0.015 J	0.011 U	0.011 U
Biphenyl (Diphenyl)	0.031 U	0.03 U	0.032 U	0.03 U	0.03 U	0.031 U	0.03 U	0.031 U	0.031 U	0.03 U	0.031 U	0.03 U	0.029 U	0.03 U
Bis(2-Chloroethoxy) Methane	0.011 U	0.011 U	0.012 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.0087 U	0.0083 U	0.009 U	0.0083 U	0.0083 U	0.0085 U	0.0082 U	0.0086 U	0.0085 U	0.0082 U	0.0085 U	0.0084 U	0.0081 U	0.0084 U
Bis(2-Chloroisopropyl) Ether	0.015 U	0.015 U	0.016 U	0.014 U	0.014 U	0.015 U	0.014 U	0.015 U	0.015 U	0.014 U	0.015 U	0.015 U	0.014 U	0.015 U
Bis(2-Ethylhexyl) Phthalate	0.014 U	0.014 U	0.015 U	0.014 U	0.022 J	0.014 U	0.019 J	0.023 J	0.019 J	0.036 J	0.014 U	0.014 U	0.013 U	0.014 U
Caprolactam	0.026 U	0.025 U	0.027 U	0.025 U	0.025 U	0.026 U	0.025 U	0.026 U	0.026 U	0.025 U	0.026 U	0.026 U	0.025 U	0.026 U
Carbazole	0.0091 U	0.099 J	0.014 J	0.014 J	0.13 J	0.028 J	0.038 J	0.2 J	0.099 J	0.09 J	0.089 J	0.12 J	0.0085 U	0.052 J
Chrysene	0.01 U	0.81	0.096 J	0.099 J	0.64	0.15 J	0.2 J	0.85	0.48	0.44	0.55	0.84	0.042 J	0.3 J
Dibenz(A,H)Anthracene	0.019 U	0.16	0.02 U	0.027 J	0.15	0.039	0.048	0.24	0.16	0.12	0.12	0.14	0.018 U	0.069
Dibenzofuran	0.011 U	0.012 J	0.012 U	0.011 U	0.013 J	0.011 U	0.01 U	0.011 U	0.011 U	0.011 U	0.011 U	0.012 J	0.01 U	0.017 J

Table E-2
Summary of Data Used in Risk Assessment
Main Plant Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-082	CFSB-084	CFSB-084	CFSB-084	CFSB-086	CFSB-086	CFSB-086	CFSB-087	CFSB-087	CFSB-087	CFSB-088	CFSB-088	CFSB-088	CFSB-092
Sample Lab IDs	320-19320-29, 460-114828-15	320-19320-13, 460-114793-3	320-19320-14, 460-114793-6	320-19320-15, 460-114793-5	320-19320-10, 460-114529-28	320-19320-11, 460-114529-29	320-19320-12, 460-114529-30	320-19320-7, 460-114529-25	320-19320-8, 460-114529-26	320-19320-9, 460-114529-27	320-19320-4, 460-114529-22	320-19320-5, 460-114529-23	320-19320-6, 460-114529-24	320-19320-1, 460-114529-19
Sample Name	CFSB-082-SO-10-12	CFSB-084-SO-0-0.5	CFSB-084-SO-0.5-2	CFSB-084-SO-10-12	CFSB-086-SO-0-0.5	CFSB-086-SO-0.5-2	CFSB-086-SO-10-12	CFSB-087-SO-0-0.5	CFSB-087-SO-0.5-2	CFSB-087-SO-10-12	CFSB-088-SO-0-0.5	CFSB-088-SO-0.5-2	CFSB-088-SO-10-12	CFSB-092-SO-0-0.5
Sample Depth	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft
Chemical	6/1/2016	5/27/2016	5/27/2016	5/27/2016	5/26/2016	5/26/2016	5/26/2016	5/26/2016	5/26/2016	5/26/2016	5/26/2016	5/26/2016	5/26/2016	5/26/2016
Diethyl Phthalate	0.01 U	0.01 U	0.011 U	0.0099 U	0.01 U	0.01 U	0.0099 U	0.01 U	0.01 U	0.0099 U	0.01 U	0.01 U	0.0098 U	0.01 U
Dimethyl Phthalate	0.011 U	0.01 U	0.011 U	0.01 U	0.01 U	0.01 U	0.01 U	0.011 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Di-N-Butyl Phthalate	0.011 U	0.011 U	0.011 U	0.01 U	0.01 U	0.011 U	0.01 U	0.011 U	0.011 U	0.01 U	0.011 U	0.011 U	0.01 U	0.011 U
Di-N-Octylphthalate	0.019 U	0.018 U	0.019 U	0.018 U	0.018 U	0.018 U	0.018 U	0.019 U	0.018 U	0.018 U	0.018 U	0.018 U	0.017 U	0.018 U
Fluoranthene	0.014 J	0.92	0.083 J	0.097 J	0.76	0.19 J	0.23 J	0.76	0.43	0.37	0.52	0.78	0.044 J	0.4
Fluorene	0.008 U	0.02 J	0.0083 U	0.0076 U	0.029 J	0.0078 U	0.0076 U	0.02 J	0.019 J	0.011 J	0.017 J	0.021 J	0.0075 U	0.028 J
Hexachlorobenzene	0.015 U	0.014 U	0.015 U	0.014 U	0.014 U	0.015 U	0.014 U	0.015 U	0.015 U	0.014 U	0.015 U	0.014 U	0.014 U	0.014 U
Hexachlorobutadiene	0.01 U	0.0099 U	0.011 U	0.0098 U	0.0099 U	0.01 U	0.0098 U	0.01 U	0.01 U	0.0098 U	0.01 U	0.01 U	0.0097 U	0.01 U
Hexachlorocyclopentadiene	0.023 U	0.022 UJ	0.024 U	0.022 U	0.022 U	0.022 U	0.022 U	0.023 U	0.022 U	0.022 U	0.022 U	0.022 U	0.021 U	0.022 U
Hexachloroethane	0.013 U	0.013 U	0.014 U	0.013 U	0.013 U	0.013 U	0.013 U	0.013 U	0.013 U	0.013 U	0.013 U	0.013 U	0.013 U	0.013 U
Indeno(1,2,3-C,D)Pyrene	0.024 U	0.84	0.094	0.097	0.6	0.12	0.19	1.1	0.63	0.54	0.48	0.64	0.025 J	0.26
Isophorone	0.0079 U	0.0076 U	0.0082 U	0.0075 U	0.0075 U	0.0077 U	0.0074 U	0.0078 U	0.0077 U	0.0075 U	0.0077 U	0.0076 U	0.0074 U	0.0077 U
Naphthalene	0.0094 U	0.011 J	0.0097 U	0.0089 U	0.009 J	0.0091 U	0.0088 U	0.01 J	0.011 J	0.0089 U	0.0091 U	0.011 J	0.0087 U	0.022 J
Nitrobenzene	0.012 U	0.011 U	0.012 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U
N-Nitrosodi-N-Propylamine	0.012 U	0.012 U	0.013 U	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U
N-Nitrosodiphenylamine	0.033 U	0.032 U	0.035 U	0.032 U	0.032 U	0.033 U	0.031 U	0.033 U	0.033 U	0.032 U	0.033 U	0.032 U	0.031 U	0.032 U
Pentachlorophenol	0.045 U	0.043 UJ	0.046 U	0.042 U	0.042 U	0.043 U	0.042 U	0.044 U	0.044 U	0.042 U	0.044 U	0.043 U	0.042 U	0.043 U
Phenanthrene	0.0098 U	0.34 J	0.038 J	0.047 J	0.35	0.075 J	0.079 J	0.29 J	0.21 J	0.17 J	0.25 J	0.34 J	0.025 J	0.26 J
Phenol	0.012 U	0.012 U	0.012 U	0.011 U	0.011 U	0.012 U	0.011 U	0.012 U	0.012 U	0.011 U	0.012 U	0.012 U	0.011 U	0.012 U
Pyrene	0.017 U	0.92	0.11 J+	0.13 J+	0.6	0.15 J	0.17 J	0.61	0.4	0.36	0.67	1	0.048 J	0.42
VOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,1,1-Trichloroethane	0.00037 U	--	0.00038 U	0.00031 U	--	0.00031 U	0.00038 U	--	0.00031 U	0.0003 U	--	0.00031 U	0.00036 U	--
1,1,2,2-Tetrachloroethane	0.00016 U	--	0.00017 U	0.00014 U	--	0.00014 U	0.00017 U	--	0.00014 U	0.00013 U	--	0.00014 U	0.00016 U	--
1,1,2-Trichloro-1,2,2-Trifluoroethane	0.00043 U	--	0.00043 U	0.00036 U	--	0.00036 UJ	0.00044 UJ	--	0.00036 UJ	0.00034 UJ	--	0.00036 U	0.00041 UJ	--
1,1,2-Trichloroethane	0.00027 U	--	0.00028 U	0.00023 U	--	0.00023 U	0.00028 U	--	0.00023 U	0.00022 U	--	0.00023 U	0.00026 U	--
1,1-Dichloroethane	0.00033 U	--	0.00034 U	0.00028 U	--	0.00028 U	0.00034 U	--	0.00028 U	0.00027 U	--	0.00028 U	0.00032 U	--
1,1-Dichloroethene	0.0004 U	--	0.00041 U	0.00034 U	--	0.00034 U	0.00041 U	--	0.00034 U	0.00032 U	--	0.00034 U	0.00038 U	--
1,2,3-Trichlorobenzene	0.00011 U	--	0.00011 U	0.000091 U	--	0.000091 U	0.00011 U	--	0.00009 U	0.000086 U	--	0.000091 U	0.0001 U	--
1,2,4-Trichlorobenzene	0.00031 U	--	0.00032 U	0.00026 U	--	0.00027 U	0.00032 U	--	0.00026 U	0.00025 U	--	0.00026 U	0.0003 U	--
1,2-Dibromo-3-Chloropropane	0.00046 U	--	0.00046 U	0.00039 U	--	0.00039 U	0.00047 U	--	0.00038 U	0.00037 U	--	0.00039 U	0.00044 U	--
1,2-Dibromoethane (Ethylene Dibromide)	0.00012 U	--	0.00012 U	0.000099 U	--	0.000099 U	0.00012 U	--	0.000098 U	0.000094 U	--	0.000099 U	0.00011 U	--
1,2-Dichlorobenzene	0.00014 U	--	0.00014 U	0.00012 U	--	0.00012 U	0.00014 U	--	0.00011 U	0.00011 U	--	0.00012 U	0.00013 U	--
1,2-Dichloroethane	0.00011 U	--	0.00011 U	0.000091 U	--	0.000091 U	0.00011 U	--	0.00009 U	0.000086 U	--	0.000091 U	0.0001 U	--
1,2-Dichloropropane	0.00016 U	--	0.00017 U	0.00014 U	--	0.00014 U	0.00017 U	--	0.00014 U	0.00013 U	--	0.00014 U	0.00016 U	--
1,3-Dichlorobenzene	0.00012 U	--	0.00012 U	0.000099 U	--	0.000099 U	0.00012 U	--	0.000098 U	0.000094 U	--	0.000099 U	0.00011 U	--
1,4-Dichlorobenzene	0.00013 U	--	0.00013 U	0.00011 U	--	0.00011 U	0.00013 U	--	0.00011 U	0.0001 U	--	0.00011 U	0.00012 U	--
2-Hexanone	0.00091 U	--	0.00093 U	0.00078 U	--	0.00078 U	0.00094 U	--	0.00077 U	0.00073 U	--	0.00078 U	0.00088 U	--
Acetone	0.049	--	0.019	0.0057	--	0.012	0.0062	--	0.012	0.0075	--	0.0099	0.0042 J	--
Benzene	0.00019 U	--	0.00042 J	0.00028 J	--	0.00017 U	0.00023 J	--	0.00052 J	0.00027 J	--	0.00016 U	0.00019 U	--
Bromochloromethane	0.00016 U	--	0.00017 U	0.00014 U	--	0.00014 U	0.00017 U	--	0.00014 U	0.00013 U	--	0.00014 U	0.00016 U	--
Bromodichloromethane	0.00037 U	--	0.00038 U	0.00031 U	--	0.00031 U	0.00038 U	--	0.00031 U	0.0003 U	--	0.00031 U	0.00036 U	--
Bromoform	0.00013 U	--	0.00013 U	0.00011 U	--	0.00011 U	0.00013 U	--	0.00011 U	0.0001 U	--	0.00011 U	0.00012 U	--
Bromomethane	0.00031 U	--	0.00032 U	0.00026 U	--	0.00027 UJ	0.00032 UJ	--	0.00026 UJ	0.00025 UJ	--	0.00026 UJ	0.0003 UJ	--
Carbon Disulfide	0.0017	--	0.0012	0.00036 U	--	0.00076 J	0.00081 J	--	0.00094	0.00078	--	0.00038 J	0.0004 U	--
Carbon Tetrachloride	0.00042 U	--	0.00043 U	0.00036 U	--	0.00036 U	0.00043 U	--	0.00035 U	0.00034 U	--	0.00035 U	0.0004 U	--
Chlorobenzene	0.00014 U	--	0.00014 U	0.00012 U	--	0.00012 U	0.00014 U	--	0.00011 U	0.00011 U	--	0.00012 U	0.00013 U	--
Chloroethane	0.00034 UJ	--	0.00035 U	0.00029 U	--	0.00029 UJ	0.00035 UJ	--	0.00029 UJ	0.00027 UJ	--	0.00029 UJ	0.00033 UJ	--
Chloroform	0.0002 U	--	0.00021 U	0.00017 U	--	0.00017 U	0.00021 U	--	0.00017 U	0.00016 U	--	0.00017 U	0.0002 U	--
Chloromethane	0.00037 U	--	0.00038 U	0.00031 U	--	0.00031 U	0.00038 U	--	0.00031 U	0.0003 U	--	0.00031 U	0.00036 U	--
Cis-1,2-Dichloroethylene	0.00021 U	--	0.00022 U	0.00018 U	--	0.00018 U	0.00022 U	--	0.00018 U	0.00017 U	--	0.00018 U	0.00021 U	--
Cis-1,3-Dichloropropene	0.00015 U	--	0.00015 U	0.00012 U	--	0.00012 U	0.00015 U	--	0.00012 U	0.00012 U	--	0.00012 U	0.00014 U	--
Cyclohexane	0.00045 U	--	0.0011 J+	0.0005 J+	--	0.00038 UJ	0.00046 UJ	--	0.0012 J-	0.00036 UJ	--	0.00038 U	0.00043 UJ	--
Dibromochloromethane	0.00015 U	--	0.00015 U	0.00012 U	--	0.00012 U	0.00015 U	--	0.00012 U	0.00012 U	--	0.00012 U	0.00014 U	--
Dichlorodifluoromethane	0.00031 U	--	0.00032 U	0.00026 U	--	0.00027 UJ	0.00032 UJ	--	0.00026 UJ	0.00025 UJ	--	0.00026 U	0.0003 UJ	--
Ethylbenzene	0.00017 U	--	0.00026 J	0.00021 J	--	0.00015 U	0.00018 U	--	0.0003 J	0.00014 U	--	0.00015 U	0.00017 J	--
Isopropylbenzene (Cumene)	0.00016 U	--	0.00017 U	0.00014 U	--	0.00014 U	0.00017 U	--	0.00014 U	0.00013 U	--	0.00014 U	0.00016 U	--
M,P-Xylene	0.00014 J	--	0.00091 J	0.00053 J	--	0.00022 J	0.0004 J	--	0.00077 J	0.000086 U	--	0.00015 J	0.00056 J	--

Table E-2
Summary of Data Used in Risk Assessment
Main Plant Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-082	CFSB-084	CFSB-084	CFSB-084	CFSB-086	CFSB-086	CFSB-086	CFSB-087	CFSB-087	CFSB-087	CFSB-088	CFSB-088	CFSB-088	CFSB-092
Sample Lab IDs	320-19320-29, 460-114828-15	320-19320-13, 460-114793-3	320-19320-14, 460-114793-6	320-19320-15, 460-114793-5	320-19320-10, 460-114529-28	320-19320-11, 460-114529-29	320-19320-12, 460-114529-30	320-19320-7, 460-114529-25	320-19320-8, 460-114529-26	320-19320-9, 460-114529-27	320-19320-4, 460-114529-22	320-19320-5, 460-114529-23	320-19320-6, 460-114529-24	320-19320-1, 460-114529-19
Sample Name	CFSB-082-SO-10-12	CFSB-084-SO-0-0.5	CFSB-084-SO-0.5-2	CFSB-084-SO-10-12	CFSB-086-SO-0-0.5	CFSB-086-SO-0.5-2	CFSB-086-SO-10-12	CFSB-087-SO-0-0.5	CFSB-087-SO-0.5-2	CFSB-087-SO-10-12	CFSB-088-SO-0-0.5	CFSB-088-SO-0.5-2	CFSB-088-SO-10-12	CFSB-092-SO-0-0.5
Sample Depth	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft
Chemical	6/1/2016	5/27/2016	5/27/2016	5/27/2016	5/26/2016	5/26/2016	5/26/2016	5/26/2016	5/26/2016	5/26/2016	5/26/2016	5/26/2016	5/26/2016	5/26/2016
Methyl Acetate	0.014	--	0.00089 U	0.00074 U	--	0.00075 U	0.0009 U	--	0.00074 U	0.0007 U	--	0.00074 U	0.00084 U	--
Methyl Ethyl Ketone (2-Butanone)	0.0017 J	--	0.0021 J	0.00064 U	--	0.00064 U	0.00077 U	--	0.00063 U	0.0006 U	--	0.00063 U	0.00072 U	--
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	0.0022 U	--	0.0022 U	0.0018 U	--	0.0018 U	0.0022 U	--	0.0018 U	0.0017 U	--	0.0018 U	0.0021 U	--
Methylcyclohexane	0.00048 U	--	0.0015	0.0008 J	--	0.00041 UJ	0.0005 J-	--	0.0021 J-	0.00039 J-	--	0.00041 U	0.00078 J-	--
Methylene Chloride	0.00031 U	--	0.00032 U	0.00026 U	--	0.00027 U	0.00032 U	--	0.00026 U	0.00025 U	--	0.00026 U	0.0003 U	--
O-Xylene (1,2-Dimethylbenzene)	0.00015 U	--	0.00032 J	0.00019 J	--	0.00013 U	0.00016 U	--	0.0002 J	0.00012 U	--	0.00013 U	0.00018 J	--
Styrene	0.00015 U	--	0.00015 U	0.00012 U	--	0.00012 U	0.00015 U	--	0.00012 U	0.00012 U	--	0.00012 U	0.00014 U	--
Tert-Butyl Methyl Ether	0.00016 U	--	0.00017 U	0.00014 U	--	0.00014 U	0.00017 U	--	0.00014 U	0.00013 U	--	0.00014 U	0.00016 U	--
Tetrachloroethylene (PCE)	0.00027 U	--	0.00028 U	0.00023 U	--	0.00023 U	0.00028 U	--	0.00023 U	0.00022 U	--	0.00023 U	0.00026 U	--
Toluene	0.00033 J	--	0.0015	0.0009	--	0.00036 J	0.0006 J	--	0.0015	0.00028 J	--	0.0003 J	0.0009 J	--
Trans-1,2-Dichloroethene	0.00038 U	--	0.00039 U	0.00032 U	--	0.00032 U	0.00039 U	--	0.00032 U	0.0003 U	--	0.00032 U	0.00037 U	--
Trans-1,3-Dichloropropene	0.000097 U	--	0.000099 U	0.000083 U	--	0.000083 U	0.0001 U	--	0.000082 U	0.000078 U	--	0.000082 U	0.000094 U	--
Trichloroethylene (TCE)	0.00025 U	--	0.00026 U	0.00022 U	--	0.00022 U	0.00026 U	--	0.00021 U	0.0002 U	--	0.00021 U	0.00024 U	--
Trichlorofluoromethane	0.00033 U	--	0.00034 U	0.00028 U	--	0.00028 UJ	0.00034 UJ	--	0.00028 UJ	0.00027 UJ	--	0.00028 U	0.00032 UJ	--
Vinyl Chloride	0.00038 U	--	0.00039 U	0.00032 U	--	0.00032 U	0.00039 U	--	0.00032 U	0.0003 U	--	0.00032 U	0.00037 U	--

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-2
Summary of Data Used in Risk Assessment
Main Plant Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-092	CFSB-092	CFSB-094	CFSB-094	CFSB-094	CFSB-095	CFSB-095	CFSB-095	CFSB-097	CFSB-097	CFSB-097	CFSB-098	CFSB-098	CFSB-098
Sample Lab IDs	320-19320-2, 460-114529-20	320-19320-3, 460-114529-21	460-114456-42	460-114456-43	460-114456-41	460-114456-37	460-114456-38	460-114456-36	460-114456-25	460-114456-34	460-114456-31	460-114456-27	460-114456-32	460-114456-35
Sample Name	CFSB-092-SO-0.5-2	CFSB-092-SO-10-12	CFSB-094-SO-0-0.5	CFSB-094-SO-0.5-2.0	CFSB-094-SO-10-12	CFSB-095-SO-0-0.5	CFSB-095-SO-0.5-2.0	CFSB-095-SO-10-12	CFSB-097-SO-0-0.5	CFSB-097-SO-0.5-2	CFSB-097-SO-10-12	CFSB-098-SO-0-0.5	CFSB-098-SO-0.5-2	CFSB-098-SO-10-12
Sample Depth	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft
Chemical	5/26/2016	5/26/2016	5/24/2016	5/24/2016	5/24/2016	5/24/2016	5/24/2016	5/24/2016	5/24/2016	5/24/2016	5/24/2016	5/24/2016	5/24/2016	5/24/2016
GENERAL CHEMISTRY (mg/kg)														
Fluoride	29.9 J	2.35 J+	86.9 J-	63.2 J-	1.49 J-	19.5 J-	16.9 J-	10.4 J-	80.1 J-	47.6 J-	1.29 J-	93.3 J-	79.9 J-	141 J-
Cyanide	0.017 J	0.014 U	0.04 J	0.042 J	0.024 J	0.053 J	0.047 J	0.018 U	0.089 J	0.054 J	0.017 J	0.077 J	0.037 J	0.018 J
METALS (mg/kg)														
"Chromium, Hexavalent - Estimated"	0.281022	0.136496	0.281022	0.211436	0.313139	0.235523	0.192701	0.251582	0.206083	0.232847	0.243552	0.173966	0.254258	0.409489
"Chromium, Trivalent - Calculated"	--	--	--	--	--	--	--	--	--	--	--	--	--	--
"Chromium, Trivalent - Estimated"	10.219	4.9635	10.219	7.68856	11.3869	8.56448	7.0073	9.14842	7.49392	8.46715	8.85645	6.32603	9.24574	14.8905
Aluminum	11400	3860	8670	9660	9420	12100	8470	6250	15900	13800	5720	6560	9840	5360
Antimony	0.33 UJ	0.32 UJ	0.35 J-	0.34 UJ	0.33 UJ	0.34 UJ	0.32 UJ	0.34 UJ	0.39 UJ	0.34 UJ	0.31 UJ	0.37 UJ	0.33 UJ	0.33 UJ
Arsenic	4.5 J	3.4 J	3	3.2	6.4	4.4	3.7	3.7	3.7	4.6	5.3	2.4	3.5	2.8
Barium	78	61.1	88.4	67.6	69.6	123	129	95.8	199	161	112	52.3	71	90
Beryllium	0.53	0.21 J	0.44	0.4	0.44	0.42	0.31	0.34	0.57	0.5	0.29 J	0.21 J	0.42	0.21 J
Cadmium	0.25 U	0.25 U	0.52 J	0.29 J	0.25 U	0.25 U	0.24 U	0.29 J	0.3 U	0.26 U	0.24 U	0.28 U	0.25 U	0.25 U
Calcium	11900	51700	65300	10600	29800	12900	16800	130000	4750	7450	52300	31500	24100	33900
Chromium, Total	10.5	5.1	10.5	7.9	11.7	8.8	7.2	9.4	7.7	8.7	9.1	6.5	9.5	15.3
Cobalt	6 J-	2.2 J-	4.9	4.1	5.5	5.4	4.4	3.7	5.5	5.4	3.7	3.5	4.1	4.1
Copper	13.5 J+	5.5 J+	21 J	13.2 J	13.9 J	15.2 J+	10.8 J+	10.1 J+	11.5 J+	12.5 J+	8.6 J+	8.9 J+	13 J+	10.8 J+
Iron	14600	6550	12600	11300	13300	12700	9980	8980	13600	13100	8630	11200	11100	8260
Lead	13.7 J	7.4 J	48.2 J	18.6 J	9.6 J	11	8.4	6.3	9.2	11.4	5	4.1	9	4.3
Magnesium	10900	7380	8700	8720	13600	8530	7120	10900	7980	6660	13200	10600	11600	11100
Manganese	394	192	285	265	481	411	438	345	597	460	379	328	330	218
Mercury	0.012 U	0.012 J+	0.027	0.022	0.064	0.015 J	0.018	0.013 J	0.013 U	0.016 J	0.015 J	0.015 J	0.02	0.013 J
Nickel	13.5	4.6	22.3	10.2	10.4	10.6	8.9	7.9	10.3	9.9	7.8	6.3	10.1	7.4
Potassium	1070 J+	461 J+	727	671	710	953 J+	641 J+	699 J+	916 J+	857 J+	641 J+	492 J+	872 J+	465 J+
Selenium	0.31 U	0.3 U	0.33 U	0.32 U	0.31 U	0.31 U	0.3 U	0.32 U	0.37 U	0.32 U	0.29 U	0.35 U	0.31 U	0.31 U
Silver	0.6 U	0.59 U	0.64 U	0.62 U	0.61 U	0.61 U	0.58 U	0.63 U	0.72 U	0.63 U	0.57 U	0.68 U	0.61 U	0.6 U
Sodium	37.3 J	35.8 J	172	115	59.3 J	31.3 U	29.8 U	38.9 J	58.1 J	44 J	29.3 U	102	112	30.8 U
Thallium	0.12 U	0.12 U	0.13 U	0.13 U	0.13 U	0.13 U	0.12 U	0.13 U	0.15 U	0.13 U	0.12 U	0.14 U	0.13 U	0.12 U
Vanadium	12.9	4.1	8.4	7.6	7.5	11.7	8.4	10.5	12.2	13.3	5.3	7.4	9.7	5.4
Zinc	44.3	15.6	41.6	41.7	38.5	41.8	32	33.5	45.9	45.6	24.1	22.2	34.4	20.1
METALS|HEXAVALENT CHROMIUM (mg/kg)														
Chromium, Hexavalent	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PESTICIDES (mg/kg)														
Aldrin	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Alpha Bhc (Alpha Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Alpha Endosulfan	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Beta Bhc (Beta Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Beta Endosulfan	--	--	--	--	--	--	--	--	--	--	--	--	--	--
cis-Chlordane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Delta BHC (Delta Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dieldrin	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endosulfan Sulfate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin Aldehyde	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin Ketone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Gamma Bhc (Lindane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Heptachlor	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Heptachlor Epoxide	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methoxychlor	--	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDD	--	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDT	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Toxaphene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
trans-Chlordane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
POLYCHLORINATED BIPHENYLS (mg/kg)														
PCB-1016 (Aroclor 1016)	0.0097 U	0.0093 U	0.0096 U	0.0093 U	0.0092 U	0.01 U	0.0094 U	0.0099 U	0.01 U	0.01 U	0.0091 U	0.01 U	0.0094 U	0.0093 U
PCB-1221 (Aroclor 1221)	0.0097 U	0.0093 U	0.0096 U	0.0093 U	0.0092 U	0.01 U	0.0094 U	0.0099 U	0.01 U	0.01 U	0.0091 U	0.01 U	0.0094 U	0.0093 U

Table E-2
Summary of Data Used in Risk Assessment
Main Plant Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-092	CFSB-092	CFSB-094	CFSB-094	CFSB-094	CFSB-095	CFSB-095	CFSB-095	CFSB-097	CFSB-097	CFSB-097	CFSB-098	CFSB-098	CFSB-098
Sample Lab IDs	320-19320-2, 460-114529-20	320-19320-3, 460-114529-21	460-114456-42	460-114456-43	460-114456-41	460-114456-37	460-114456-38	460-114456-36	460-114456-25	460-114456-34	460-114456-31	460-114456-27	460-114456-32	460-114456-35
Sample Name	CFSB-092-SO-0.5-2	CFSB-092-SO-10-12	CFSB-094-SO-0-0.5	CFSB-094-SO-0.5-2.0	CFSB-094-SO-10-12	CFSB-095-SO-0-0.5	CFSB-095-SO-0.5-2.0	CFSB-095-SO-10-12	CFSB-097-SO-0-0.5	CFSB-097-SO-0.5-2	CFSB-097-SO-10-12	CFSB-098-SO-0-0.5	CFSB-098-SO-0.5-2	CFSB-098-SO-10-12
Sample Depth	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft
Chemical	5/26/2016	5/26/2016	5/24/2016	5/24/2016	5/24/2016	5/24/2016	5/24/2016	5/24/2016	5/24/2016	5/24/2016	5/24/2016	5/24/2016	5/24/2016	5/24/2016
PCB-1232 (Aroclor 1232)	0.0097 U	0.0093 U	0.0096 U	0.0093 U	0.0092 U	0.01 U	0.0094 U	0.0099 U	0.01 U	0.01 U	0.0091 U	0.01 U	0.0094 U	0.0093 U
PCB-1242 (Aroclor 1242)	0.0097 U	0.0093 U	0.0096 U	0.0093 U	0.0092 U	0.01 U	0.0094 U	0.0099 U	0.01 U	0.01 U	0.0091 U	0.01 U	0.0094 U	0.0093 U
PCB-1248 (Aroclor 1248)	0.0097 U	0.0093 U	0.0096 U	0.0093 U	0.0092 U	0.01 U	0.0094 U	0.0099 U	0.01 U	0.01 U	0.0091 U	0.01 U	0.0094 U	0.0093 U
PCB-1254 (Aroclor 1254)	0.01 U	0.0096 U	0.0099 U	0.0096 U	0.0095 U	0.01 U	0.0098 U	0.01 U	0.011 U	0.01 U	0.0094 U	0.01 U	0.0097 U	0.0096 U
PCB-1260 (Aroclor 1260)	0.01 U	0.0096 U	0.0099 U	0.0096 U	0.0095 U	0.01 U	0.0098 U	0.01 U	0.011 U	0.01 U	0.0094 U	0.01 U	0.0097 U	0.0096 U
PCB-1262 (Aroclor 1262)	0.01 U	0.0096 U	0.0099 U	0.0096 U	0.0095 U	0.01 U	0.0098 U	0.01 U	0.011 U	0.01 U	0.0094 U	0.01 U	0.0097 U	0.0096 U
PCB-1268 (Aroclor 1268)	0.01 U	0.0096 U	0.0099 U	0.0096 U	0.0095 U	0.01 U	0.0098 U	0.01 U	0.011 U	0.01 U	0.0094 U	0.01 U	0.0097 U	0.0096 U
Polychlorinated Biphenyl (PCBs)	0.01 U	0.0096 U	0.0099 U	0.0096 U	0.0095 U	0.01 U	0.0098 U	0.01 U	0.011 U	0.01 U	0.0094 U	0.01 U	0.0097 U	0.0096 U
SEMIVOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,2,4,5-Tetrachlorobenzene	0.027 U	0.026 U	0.027 U	0.026 U	0.026 U	0.028 U	0.026 U	0.027 U	0.029 U	0.028 U	0.025 U	0.028 U	0.026 U	0.026 U
1,4-Dioxane (P-Dioxane)	0.097 U	0.092 U	0.095 U	0.092 U	0.092 U	0.099 U	0.094 U	0.099 U	0.1 U	0.1 U	0.09 U	0.1 U	0.094 U	0.092 U
2,3,4,6-Tetrachlorophenol	0.034 U	0.032 U	0.034 U	0.032 U	0.032 U	0.035 U	0.033 U	0.035 U	0.036 U	0.035 U	0.032 U	0.035 U	0.033 U	0.032 U
2,4,5-Trichlorophenol	0.036 U	0.034 U	0.036 U	0.034 U	0.034 U	0.037 U	0.035 U	0.037 U	0.038 U	0.037 U	0.034 U	0.037 U	0.035 U	0.034 U
2,4,6-Trichlorophenol	0.01 U	0.0098 U	0.01 U	0.0098 U	0.0097 U	0.011 U	0.01 U	0.01 U	0.011 U	0.011 U	0.0096 U	0.011 U	0.0099 U	0.0098 U
2,4-Dichlorophenol	0.0085 U	0.0081 U	0.0084 U	0.0081 U	0.0081 U	0.0088 U	0.0083 U	0.0087 U	0.0091 U	0.0088 U	0.008 U	0.0088 U	0.0083 U	0.0081 U
2,4-Dimethylphenol	0.079 U	0.076 U	0.078 U	0.076 U	0.075 U	0.082 U	0.077 U	0.081 U	0.084 U	0.082 U	0.074 U	0.082 U	0.077 U	0.076 U
2,4-Dinitrophenol	0.27 U	0.26 U	0.27 U	0.26 U	0.26 U	0.28 U	0.27 U	0.28 U	0.29 U	0.28 U	0.25 U	0.28 U	0.26 U	0.26 U
2,4-Dinitrotoluene	0.014 U	0.014 U	0.014 U	0.014 U	0.014 U	0.015 U	0.014 U	0.015 U	0.015 U	0.015 U	0.013 U	0.015 U	0.014 U	0.014 U
2,6-Dinitrotoluene	0.019 U	0.018 U	0.019 U	0.018 U	0.018 U	0.02 U	0.019 U	0.02 U	0.02 U	0.02 U	0.018 U	0.02 U	0.019 U	0.018 U
2-Chloronaphthalene	0.0082 U	0.0078 U	0.0081 U	0.0078 U	0.0078 U	0.0084 U	0.008 U	0.0084 U	0.0087 U	0.0085 U	0.0076 U	0.0085 U	0.0079 U	0.0078 U
2-Chlorophenol	0.0092 U	0.0087 U	0.0091 U	0.0088 U	0.0087 U	0.0094 U	0.0089 U	0.0094 U	0.0098 U	0.0095 U	0.0086 U	0.0095 U	0.0089 U	0.0088 U
2-Methylnaphthalene	0.008 U	0.0076 U	0.0079 U	0.0076 U	0.0088 J	0.0082 U	0.0077 U	0.0081 U	0.0085 U	0.0083 U	0.0074 U	0.013 J	0.0077 U	0.0076 U
2-Methylphenol (O-Cresol)	0.016 U	0.015 U	0.016 U	0.015 U	0.015 U	0.016 U	0.015 U	0.016 U	0.017 U	0.016 U	0.015 U	0.016 U	0.015 U	0.015 U
2-Nitroaniline	0.012 U	0.011 U	0.012 U	0.011 U	0.011 U	0.012 U	0.012 U	0.012 U	0.013 U	0.012 U	0.011 U	0.012 U	0.012 U	0.011 U
2-Nitrophenol	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U	0.013 U	0.013 U	0.011 U	0.013 U	0.012 U	0.012 U
3- And 4- Methylphenol (Total)	0.0096 U	0.0092 U	0.0095 U	0.0092 U	0.0091 U	0.0099 U	0.0093 U	0.0098 U	0.01 U	0.013 J	0.009 U	0.01 U	0.0093 U	0.0092 U
3,3'-Dichlorobenzidine	0.04 U	0.038 U	0.04 U	0.039 U	0.038 U	0.042 U	0.039 U	0.041 U	0.043 U	0.042 U	0.038 U	0.042 U	0.039 U	0.038 U
3-Nitroaniline	0.011 U	0.01 U	0.011 U	0.01 U	0.01 U	0.011 U	0.01 U	0.011 U	0.011 U	0.011 U	0.01 U	0.011 U	0.01 U	0.01 U
4,6-Dinitro-2-Methylphenol	0.096 U	0.092 U	0.095 U	0.092 U	0.091 U	0.099 U	0.094 U	0.098 U	0.1 U	0.1 U	0.09 U	0.1 U	0.093 U	0.092 U
4-Bromophenyl Phenyl Ether	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.012 U	0.011 U	0.012 U	0.012 U	0.012 U	0.011 U	0.012 U	0.011 U	0.011 U
4-Chloro-3-Methylphenol	0.016 U	0.015 U	0.015 U	0.015 U	0.015 U	0.016 U	0.015 U	0.016 U	0.016 U	0.016 U	0.014 U	0.016 U	0.015 U	0.015 U
4-Chloroaniline	0.0093 U	0.0088 U	0.0092 U	0.0089 U	0.0088 U	0.0096 U	0.009 U	0.0095 U	0.0099 U	0.0096 U	0.0087 U	0.0096 U	0.009 U	0.0089 U
4-Chlorophenyl Phenyl Ether	0.011 U	0.01 U	0.011 U	0.01 U	0.01 U	0.011 U	0.01 U	0.011 U	0.011 U	0.011 U	0.01 U	0.011 U	0.01 U	0.01 U
4-Nitroaniline	0.014 U	0.013 U	0.013 U	0.013 U	0.013 U	0.014 U	0.013 U	0.014 U	0.015 U	0.014 U	0.013 U	0.014 U	0.013 U	0.013 U
4-Nitrophenol	0.17 U	0.17 U	0.17 U	0.17 U	0.16 U	0.18 U	0.17 U	0.18 U	0.18 U	0.18 U	0.16 U	0.18 U	0.17 U	0.17 U
Acenaphthene	0.0099 J	0.0083 U	0.027 J	0.032 J	0.038 J	0.029 J	0.0085 U	0.0089 U	0.0095 J	0.013 J	0.0082 U	0.067 J	0.0085 U	0.0083 U
Acenaphthylene	0.0093 U	0.0088 U	0.013 J	0.0089 U	0.0088 U	0.0096 U	0.009 U	0.0095 U	0.0099 U	0.0096 U	0.0087 U	0.0096 U	0.009 U	0.0089 U
Acetophenone	0.0079 U	0.0075 U	0.0079 J	0.0075 U	0.0075 U	0.0081 U	0.0076 U	0.008 U	0.0084 U	0.0082 U	0.0073 U	0.0082 U	0.0076 U	0.0075 U
Anthracene	0.034 U	0.033 U	0.065 J	0.046 J	0.047 J	0.052 J	0.033 U	0.035 U	0.036 U	0.036 U	0.032 U	0.17 J	0.033 U	0.033 U
Atrazine	0.016 U	0.015 U	0.016 U	0.015 U	0.015 U	0.017 U	0.016 U	0.016 U	0.017 U	0.017 U	0.015 U	0.017 U	0.016 U	0.015 U
Benzaldehyde	0.028 U	0.026 U	0.027 U	0.026 U	0.026 U	0.028 U	0.027 U	0.028 U	0.029 U	0.029 U	0.026 U	0.029 U	0.027 U	0.026 U
Benzo(A)Anthracene	0.15	0.029 U	0.21	0.17	0.075	0.3	0.038	0.031 U	0.032 U	0.13	0.028 U	1.5	0.14	0.029 U
Benzo(A)Pyrene	0.2	0.01 U	0.28	0.18	0.06	0.4	0.046	0.012 J	0.012 U	0.15	0.01 U	2	0.16	0.01 U
Benzo(B)Fluoranthene	0.4	0.013 U	0.41	0.27	0.1	0.78	0.076	0.02 J	0.028 J	0.22	0.013 U	2.9	0.27	0.013 U
Benzo(G,H,I)Perylene	0.28 J	0.02 U	0.92	0.27 J	0.11 J	0.59	0.043 J	0.021 U	0.032 J	0.28 J	0.019 U	2.8	0.28 J	0.02 U
Benzo(K)Fluoranthene	0.13	0.015 U	0.18	0.11	0.042	0.32	0.03 J	0.016 U	0.017 U	0.077	0.015 U	0.96	0.099	0.015 U
Benzyl Butyl Phthalate	0.011 U	0.011 U	0.05 J	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.012 U	0.012 U	0.01 U	0.012 U	0.011 U	0.011 U
Biphenyl (Diphenyl)	0.031 U	0.029 U	0.03 U	0.029 U	0.029 U	0.032 U	0.03 U	0.031 U	0.033 U	0.032 U	0.029 U	0.032 U	0.03 U	0.029 U
Bis(2-Chloroethoxy) Methane	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.012 U	0.011 U	0.011 U	0.012 U	0.012 U	0.011 U	0.012 U	0.011 U	0.011 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.0085 U	0.0081 U	0.0084 U	0.0081 U	0.0081 U	0.0088 U	0.0083 U	0.0087 U	0.0091 U	0.0088 U	0.008 U	0.0088 U	0.0083 U	0.0081 U
Bis(2-Chloroisopropyl) Ether	0.015 U	0.014 U	0.015 U	0.014 U	0.014 U	0.015 U	0.014 U	0.015 U	0.016 UJ	0.015 UJ	0.014 UJ	0.015 UJ	0.014 UJ	0.014 UJ
Bis(2-Ethylhexyl) Phthalate	0.014 U	0.013 U	0.12 J	0.064 J	0.061 J	0.046 J	0.014 U	0.014 U	0.015 U	0.015 U	0.013 U	0.065 J	0.014 U	0.016 J
Caprolactam	0.026 U	0.025 U	0.026 U	0.025 U	0.025 U	0.027 U	0.025 U	0.027 U	0.028 U	0.027 U	0.024 U	0.027 U	0.025 U	0.025 U
Carbazole	0.04 J	0.0085 U	0.057 J	0.038 J	0.025 J	0.069 J	0.0087 U	0.0092 U	0.0095 U	0.03 J	0.0084 U	0.2 J	0.028 J	0.0085 U
Chrysene	0.23 J	0.0094 U	0.33 J	0.24 J	0.097 J	0.55	0.057 J	0.022 J	0.022 J	0.18 J	0.0092 U	2.2	0.19 J	0.0094 U
Dibenz(A,H)Anthracene	0.057	0.018 U	0.12 J+	0.054 J+	0.023 J+	0.12 J+	0.018 U	0.019 U	0.02 U	0.032 J	0.018 U	0.53	0.049	0.018 U
Dibenzofuran	0.011 U	0.01 U	0.011 U	0.011 J	0.015 J	0.013 J	0.011 U	0.011 U	0.012 U	0.011 U	0.01 U	0.036 J	0.011 U	0.01 U

Table E-2
Summary of Data Used in Risk Assessment
Main Plant Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-092	CFSB-092	CFSB-094	CFSB-094	CFSB-094	CFSB-095	CFSB-095	CFSB-095	CFSB-097	CFSB-097	CFSB-097	CFSB-098	CFSB-098	CFSB-098
Sample Lab IDs	320-19320-2, 460-114529-20	320-19320-3, 460-114529-21	460-114456-42	460-114456-43	460-114456-41	460-114456-37	460-114456-38	460-114456-36	460-114456-25	460-114456-34	460-114456-31	460-114456-27	460-114456-32	460-114456-35
Sample Name	CFSB-092-SO-0.5-2	CFSB-092-SO-10-12	CFSB-094-SO-0-0.5	CFSB-094-SO-0.5-2.0	CFSB-094-SO-10-12	CFSB-095-SO-0-0.5	CFSB-095-SO-0.5-2.0	CFSB-095-SO-10-12	CFSB-097-SO-0-0.5	CFSB-097-SO-0.5-2	CFSB-097-SO-10-12	CFSB-098-SO-0-0.5	CFSB-098-SO-0.5-2	CFSB-098-SO-10-12
Sample Depth	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft
Chemical	5/26/2016	5/26/2016	5/24/2016	5/24/2016	5/24/2016	5/24/2016	5/24/2016	5/24/2016	5/24/2016	5/24/2016	5/24/2016	5/24/2016	5/24/2016	5/24/2016
Diethyl Phthalate	0.01 U	0.0098 U	0.01 U	0.0098 U	0.0097 U	0.011 U	0.01 U	0.01 U	0.011 U	0.011 U	0.0096 U	0.011 U	0.0099 U	0.0098 U
Dimethyl Phthalate	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.011 U	0.01 U	0.011 U	0.011 U	0.011 U	0.0098 U	0.011 U	0.01 U	0.01 U
Di-N-Butyl Phthalate	0.011 U	0.01 U	0.085 J	0.02 J	0.01 U	0.011 U	0.01 U	0.011 U	0.011 U	0.011 U	0.01 U	0.011 U	0.01 U	0.01 U
Di-N-Octylphthalate	0.018 U	0.017 U	0.018 U	0.018 U	0.017 U	0.019 U	0.018 U	0.019 U	0.02 U	0.019 U	0.017 U	0.019 U	0.018 U	0.018 U
Fluoranthene	0.25 J	0.01 U	0.42	0.35	0.18 J	0.57	0.071 J	0.021 J	0.051 J	0.26 J	0.01 U	2.5	0.23 J	0.01 U
Fluorene	0.0079 U	0.0075 U	0.02 J	0.021 J	0.03 J	0.022 J	0.0076 U	0.008 U	0.0085 J	0.011 J	0.0073 U	0.049 J	0.009 J	0.0075 U
Hexachlorobenzene	0.015 U	0.014 U	0.014 U	0.014 U	0.014 U	0.015 U	0.014 U	0.015 U	0.016 U	0.015 U	0.014 U	0.015 U	0.014 U	0.014 U
Hexachlorobutadiene	0.01 U	0.0097 U	0.01 U	0.0097 U	0.0096 U	0.01 U	0.0099 U	0.01 U	0.011 U	0.011 U	0.0095 U	0.011 U	0.0098 U	0.0097 U
Hexachlorocyclopentadiene	0.023 U	0.021 U	0.022 UJ	0.022 UJ	0.021 UJ	0.023 UJ	0.022 UJ	0.023 UJ	0.024 U	0.023 U	0.021 U	0.023 U	0.022 U	0.021 U
Hexachloroethane	0.013 U	0.013 U	0.013 U	0.013 U	0.013 U	0.014 U	0.013 U	0.014 U	0.014 U	0.014 U	0.012 U	0.014 U	0.013 U	0.013 U
Indeno(1,2,3-C,D)Pyrene	0.22	0.023 U	0.56 J+	0.22 J+	0.083 J+	0.55 J+	0.042 J+	0.025 U	0.029 J	0.23	0.022 U	2.9	0.3	0.023 U
Isophorone	0.0078 U	0.0074 U	0.0077 U	0.0074 U	0.0074 U	0.008 U	0.0075 U	0.56	0.0082 U	0.0081 U	0.0072 U	0.008 U	0.0075 U	0.0074 U
Naphthalene	0.0092 U	0.0087 U	0.0091 U	0.0088 U	0.025 J	0.01 J	0.0089 U	0.0094 U	0.0098 U	0.0095 U	0.0086 U	0.032 J	0.0089 U	0.0088 U
Nitrobenzene	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.012 U	0.011 U	0.012 U	0.012 U	0.012 U	0.011 U	0.012 U	0.011 U	0.011 U
N-Nitrosodi-N-Propylamine	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U	0.013 U	0.013 U	0.011 U	0.013 U	0.012 U	0.012 U
N-Nitrosodiphenylamine	0.033 U	0.031 U	0.032 U	0.031 U	0.031 U	0.034 U	0.032 U	0.033 U	0.035 U	0.034 U	0.031 U	0.034 U	0.032 U	0.031 U
Pentachlorophenol	0.044 U	0.042 U	0.043 U	0.042 U	0.041 U	0.045 U	0.042 U	0.045 U	0.046 U	0.045 U	0.041 U	0.045 U	0.042 U	0.042 U
Phenanthrene	0.11 J	0.0092 U	0.24 J	0.25 J	0.2 J	0.31 J	0.051 J	0.015 J	0.047 J	0.16 J	0.009 U	1.2	0.13 J	0.0092 U
Phenol	0.012 U	0.011 U	0.012 U	0.011 U	0.011 U	0.012 U	0.011 U	0.012 U	0.013 U	0.012 U	0.011 U	0.012 U	0.011 U	0.011 U
Pyrene	0.25 J	0.016 U	0.4	0.35	0.19 J	0.62	0.07 J	0.022 J	0.043 J	0.23 J	0.015 U	2.4	0.25 J	0.016 U
VOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,1,1-Trichloroethane	0.00031 U	0.00033 U	--	0.00036 U	0.00036 U	--	0.00035 U	0.00041 U	--	0.00036 U	0.00035 U	--	0.00033 U	0.00037 U
1,1,2,2-Tetrachloroethane	0.00014 U	0.00015 U	--	0.00016 U	0.00016 U	--	0.00016 U	0.00018 U	--	0.00016 U	0.00016 U	--	0.00015 U	0.00017 U
1,1,2-Trichloro-1,2,2-Trifluoroethane	0.00035 U	0.00038 U	--	0.00041 U	0.00042 U	--	0.00041 U	0.00048 U	--	0.00042 U	0.00041 U	--	0.00038 U	0.00043 U
1,1,2-Trichloroethane	0.00023 U	0.00024 U	--	0.00026 U	0.00027 U	--	0.00026 U	0.0003 U	--	0.00026 U	0.00026 U	--	0.00024 U	0.00027 U
1,1-Dichloroethane	0.00027 U	0.00029 U	--	0.00032 U	0.00033 U	--	0.00032 U	0.00037 U	--	0.00032 U	0.00032 U	--	0.00029 U	0.00033 U
1,1-Dichloroethene	0.00033 U	0.00036 U	--	0.00038 U	0.00039 U	--	0.00038 U	0.00045 U	--	0.00039 U	0.00038 U	--	0.00035 U	0.0004 U
1,2,3-Trichlorobenzene	0.000089 U	0.000095 U	--	0.0001 U	0.00011 U	--	0.0001 U	0.00012 U	--	0.0001 U	0.0001 U	--	0.000094 U	0.00011 U
1,2,4-Trichlorobenzene	0.00026 U	0.00028 U	--	0.0003 U	0.00031 U	--	0.0003 U	0.00035 U	--	0.0003 U	0.0003 U	--	0.00027 U	0.00031 U
1,2-Dibromo-3-Chloropropane	0.00038 U	0.00041 U	--	0.00044 U	0.00045 U	--	0.00044 U	0.00051 U	--	0.00044 U	0.00044 U	--	0.0004 U	0.00046 U
1,2-Dibromoethane (Ethylene Dibromide)	0.000097 U	0.0001 U	--	0.00011 U	0.00012 U	--	0.00011 U	0.00013 U	--	0.00011 U	0.00011 U	--	0.0001 U	0.00012 U
1,2-Dichlorobenzene	0.00011 U	0.00012 U	--	0.00013 U	0.00013 U	--	0.00013 U	0.00015 U	--	0.00013 U	0.00013 U	--	0.00012 U	0.00014 U
1,2-Dichloroethane	0.000089 U	0.000095 U	--	0.0001 U	0.00011 U	--	0.0001 U	0.00012 U	--	0.0001 U	0.0001 U	--	0.000094 U	0.00011 U
1,2-Dichloropropane	0.00014 U	0.00015 U	--	0.00016 U	0.00016 U	--	0.00016 U	0.00018 U	--	0.00016 U	0.00016 U	--	0.00015 U	0.00017 U
1,3-Dichlorobenzene	0.000097 U	0.0001 U	--	0.00011 U	0.00012 U	--	0.00011 U	0.00013 U	--	0.00011 U	0.00011 U	--	0.0001 U	0.00012 U
1,4-Dichlorobenzene	0.0001 U	0.00011 U	--	0.00012 U	0.00012 U	--	0.00012 U	0.00014 U	--	0.00012 U	0.00012 U	--	0.00011 U	0.00013 U
2-Hexanone	0.00076 U	0.00081 U	--	0.00088 U	0.0009 U	--	0.00087 U	0.001 U	--	0.00089 U	0.00088 U	--	0.00081 U	0.00092 U
Acetone	0.017	0.0033 J	--	0.022	0.012	--	0.017	0.016	--	0.11	0.0051	--	0.0055	0.0074
Benzene	0.00016 U	0.00017 U	--	0.00032 J	0.00019 U	--	0.00025 J	0.00028 J	--	0.00031 J	0.00025 J	--	0.00033 J	0.00057 J
Bromochloromethane	0.00014 U	0.00015 U	--	0.00016 U	0.00016 U	--	0.00016 U	0.00018 U	--	0.00016 U	0.00016 U	--	0.00015 U	0.00017 U
Bromodichloromethane	0.00031 U	0.00033 U	--	0.00036 U	0.00036 U	--	0.00035 U	0.00041 U	--	0.00036 U	0.00035 U	--	0.00033 U	0.00037 U
Bromoform	0.0001 U	0.00011 U	--	0.00012 U	0.00012 U	--	0.00012 U	0.00014 U	--	0.00012 U	0.00012 U	--	0.00011 U	0.00013 U
Bromomethane	0.00026 UJ	0.00028 UJ	--	0.0003 U	0.00031 U	--	0.0003 U	0.00035 U	--	0.0003 U	0.0003 U	--	0.00027 U	0.00031 U
Carbon Disulfide	0.00035 U	0.00037 U	--	0.00083 J	0.00041 U	--	0.00068 J	0.00047 U	--	0.00041 U	0.0004 U	--	0.00037 U	0.00078 J
Carbon Tetrachloride	0.00035 U	0.00037 U	--	0.0004 U	0.00041 U	--	0.0004 U	0.00047 U	--	0.00041 U	0.0004 U	--	0.00037 U	0.00042 U
Chlorobenzene	0.00011 U	0.00012 U	--	0.00013 U	0.00013 U	--	0.00013 U	0.00015 U	--	0.00013 U	0.00013 U	--	0.00012 U	0.00014 U
Chloroethane	0.00028 UJ	0.0003 UJ	--	0.00033 U	0.00034 U	--	0.00033 U	0.00038 U	--	0.00033 U	0.00033 U	--	0.0003 U	0.00034 U
Chloroform	0.00017 U	0.00018 U	--	0.0002 U	0.0002 U	--	0.0002 U	0.00023 U	--	0.0002 U	0.0002 U	--	0.00018 U	0.00021 U
Chloromethane	0.00031 U	0.00033 U	--	0.00036 U	0.00036 U	--	0.00035 U	0.00041 U	--	0.00036 U	0.00035 U	--	0.00033 U	0.00037 U
Cis-1,2-Dichloroethylene	0.00018 U	0.00019 U	--	0.00021 U	0.00021 U	--	0.0002 U	0.00024 U	--	0.00021 U	0.00021 U	--	0.00019 U	0.00022 U
Cis-1,3-Dichloropropene	0.00012 U	0.00013 U	--	0.00014 U	0.00014 U	--	0.00014 U	0.00016 U	--	0.00014 U	0.00014 U	--	0.00013 U	0.00015 U
Cyclohexane	0.00037 U	0.0004 U	--	0.00043 U	0.00044 U	--	0.00043 U	0.0005 U	--	0.00043 U	0.00058 J	--	0.00073 J	0.0013
Dibromochloromethane	0.00012 U	0.00013 U	--	0.00014 U	0.00014 U	--	0.00014 U	0.00016 U	--	0.00014 U	0.00014 U	--	0.00013 U	0.00015 U
Dichlorodifluoromethane	0.00026 U	0.00028 U	--	0.0003 U	0.00031 U	--	0.0003 U	0.00035 U	--	0.0003 U	0.0003 U	--	0.00027 U	0.00031 U
Ethylbenzene	0.00015 U	0.00016 U	--	0.00017 U	0.00017 U	--	0.00017 U	0.0002 U	--	0.00017 U	0.0002 J	--	0.00037 J	0.0007 J
Isopropylbenzene (Cumene)	0.00014 U	0.00015 U	--	0.00016 U	0.00016 U	--	0.00016 U	0.00018 U	--	0.00016 U	0.00016 U	--	0.00015 U	0.00017 U
M,P-Xylene	9.70E-05 J	0.00059 J	--	0.00028 J	0.00011 U	--	0.0002 J	0.00042 J	--	0.0001 U	0.00064 J	--	0.0013	0.0019

Table E-2
Summary of Data Used in Risk Assessment
Main Plant Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-092	CFSB-092	CFSB-094	CFSB-094	CFSB-094	CFSB-095	CFSB-095	CFSB-095	CFSB-097	CFSB-097	CFSB-097	CFSB-098	CFSB-098	CFSB-098
Sample Lab IDs	320-19320-2, 460-114529-20	320-19320-3, 460-114529-21	460-114456-42	460-114456-43	460-114456-41	460-114456-37	460-114456-38	460-114456-36	460-114456-25	460-114456-34	460-114456-31	460-114456-27	460-114456-32	460-114456-35
Sample Name	CFSB-092-SO-0.5-2	CFSB-092-SO-10-12	CFSB-094-SO-0-0.5	CFSB-094-SO-0.5-2.0	CFSB-094-SO-10-12	CFSB-095-SO-0-0.5	CFSB-095-SO-0.5-2.0	CFSB-095-SO-10-12	CFSB-097-SO-0-0.5	CFSB-097-SO-0.5-2	CFSB-097-SO-10-12	CFSB-098-SO-0-0.5	CFSB-098-SO-0.5-2	CFSB-098-SO-10-12
Sample Depth	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft
Chemical	5/26/2016	5/26/2016	5/24/2016	5/24/2016	5/24/2016	5/24/2016	5/24/2016	5/24/2016	5/24/2016	5/24/2016	5/24/2016	5/24/2016	5/24/2016	5/24/2016
Methyl Acetate	0.00073 U	0.00078 U	--	0.00084 U	0.00086 U	--	0.00084 U	0.00098 U	--	0.02	0.00084 U	--	0.00077 U	0.00088 U
Methyl Ethyl Ketone (2-Butanone)	0.00062 U	0.00067 U	--	0.00072 U	0.00074 U	--	0.00072 U	0.00084 U	--	0.014	0.00072 U	--	0.00066 U	0.00075 U
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	0.0018 U	0.0019 U	--	0.0021 U	0.0021 U	--	0.0021 U	0.0024 U	--	0.0021 U	0.0021 U	--	0.0019 U	0.0022 U
Methylcyclohexane	0.0004 U	0.00071 J	--	0.00078 J	0.00048 U	--	0.00078 J	0.00066 J	--	0.00047 U	0.001	--	0.0015	0.0023
Methylene Chloride	0.00026 U	0.00028 U	--	0.0003 U	0.00031 U	--	0.0003 U	0.00035 U	--	0.0021	0.0003 U	--	0.00027 U	0.00031 U
O-Xylene (1,2-Dimethylbenzene)	0.00013 U	0.00018 J	--	0.00015 U	0.00015 U	--	0.00015 U	0.00017 U	--	0.00015 U	0.00022 J	--	0.00038 J	0.00064 J
Styrene	0.00012 U	0.00013 U	--	0.00014 U	0.00014 U	--	0.00014 U	0.00016 U	--	0.00014 U	0.00014 U	--	0.00013 U	0.00015 U
Tert-Butyl Methyl Ether	0.00014 U	0.00015 U	--	0.00016 U	0.00016 U	--	0.00016 U	0.00018 U	--	0.00016 U	0.00016 U	--	0.00015 U	0.00017 U
Tetrachloroethylene (PCE)	0.00023 U	0.00024 U	--	0.00026 U	0.00027 U	--	0.00026 U	0.0003 U	--	0.00026 U	0.00026 U	--	0.00024 U	0.00027 U
Toluene	0.00022 J	0.00077 J	--	0.00064 J	0.00025 J	--	0.00054 J	0.0009 J	--	0.0002 J	0.0011	--	0.0017	0.0028
Trans-1,2-Dichloroethene	0.00031 U	0.00034 U	--	0.00036 U	0.00037 U	--	0.00036 U	0.00042 U	--	0.00037 U	0.00036 U	--	0.00033 U	0.00038 U
Trans-1,3-Dichloropropene	0.000081 U	0.000087 U	--	0.000094 U	0.000096 U	--	0.000093 U	0.00011 U	--	0.000094 U	0.000093 U	--	0.000086 U	0.000098 U
Trichloroethylene (TCE)	0.00021 U	0.00023 U	--	0.00024 U	0.00025 U	--	0.00024 U	0.00028 U	--	0.00025 U	0.00024 U	--	0.00022 U	0.00025 U
Trichlorofluoromethane	0.00027 U	0.00029 U	--	0.00032 U	0.00033 U	--	0.00032 U	0.00037 U	--	0.00032 U	0.00032 U	--	0.00029 U	0.00033 U
Vinyl Chloride	0.00031 U	0.00034 U	--	0.00036 U	0.00037 U	--	0.00036 U	0.00042 U	--	0.00037 U	0.00036 U	--	0.00033 U	0.00038 U

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-2
Summary of Data Used in Risk Assessment
Main Plant Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-099	CFSB-099	CFSB-099	CFSB-100	CFSB-100	CFSB-100	CFSB-121	CFSB-121-DUP	CFSB-121	CFSB-121	CFSB-128	CFSB-128	CFSB-128	CFSB-129
Sample Lab IDs	460-114456-23	460-114456-28	460-114456-30	460-114456-26	460-114456-33	460-114456-29	460-114141-20	460-114141-23	460-114141-21	460-114141-22	460-114456-39	460-114456-40	460-114456-47	460-114456-44
Sample Name	CFSB-099-SO-0-0.5	CFSB-099-SO-0.5-2	CFSB-099-SO-10-12	CFSB-100-SO-0-0.5	CFSB-100-SO-0.5-2	CFSB-100-SO-10-12	CFSB-121-SO-0-0.5	CFSB-DUP1-SO	CFSB-121-SO-0.5-2.0	CFSB-121-SO-10-12	CFSB-128-SO-0-0.5	CFSB-128-SO-0.5-2.0	CFSB-128-SO-10-12	CFSB-129-SO-0-0.5
Sample Depth	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft
Chemical	5/24/2016	5/24/2016	5/24/2016	5/24/2016	5/24/2016	5/24/2016	5/18/2016	5/18/2016	5/18/2016	5/18/2016	5/24/2016	5/24/2016	5/24/2016	5/24/2016
GENERAL CHEMISTRY (mg/kg)														
Fluoride	41.7 J+	3.18 J+	2.87 J+	39.2 J+	90.9 J-	16.6 J+	13.5 J-	9.05 J-	10.1 J-	1.38 J-	46.7 J-	63.4 J-	10.6 J-	214 J-
Cyanide	0.29	0.055 J	0.016 U	0.023 J	0.018 U	0.021 J	0.1 J	0.091 J	0.074 J	0.022 J	0.04 J	0.052 J	0.015 U	0.065 J
METALS (mg/kg)														
"Chromium, Hexavalent - Estimated"	0.388078	0.198054	0.139173	0.141849	0.147202	0.240876	0.26764	0.248905	0.270316	0.248905	0.235523	0.147202	0.240876	0.2382
"Chromium, Trivalent - Calculated"	--	--	--	--	--	--	--	--	--	--	--	--	--	--
"Chromium, Trivalent - Estimated"	14.1119	7.20195	5.06083	5.15815	5.3528	8.75912	9.73236	9.05109	9.82968	9.05109	8.56448	5.3528	8.75912	8.6618
Aluminum	15100	5990	3660	6420	6060	3720	18100	15500 J	16700	6570 J	14500	7530	5970	11700
Antimony	0.4 UJ	0.31 UJ	0.31 UJ	0.34 UJ	0.33 UJ	0.35 UJ	0.37 UJ	0.37 UJ	0.36 UJ	0.32 UJ	0.34 UJ	0.34 UJ	0.31 UJ	0.37 UJ
Arsenic	7.6	3.4	2.1	2.3	1.6	2.9	5	4.8 J	4.4	4.6 J	4.3	2.8	2.5	5
Barium	200	63.2	30.8	59.7	32.6	119	195	187	156	69.3	93.3	113	185	77.3
Beryllium	0.68	0.27 J	0.097 J	0.26 J	0.16 J	0.25 J	0.66	0.59	0.57	0.37	0.42	0.34	0.31	0.47
Cadmium	0.3 U	0.24 U	0.24 U	0.26 U	0.25 U	0.26 U	0.28 U	0.28 U	0.28 U	0.24 U	0.26 U	0.26 U	0.23 U	0.28 U
Calcium	36200 J	41400	21000	28200	24400	33800	2570	2700	1830	32300	19000	34100	36300	27400
Chromium, Total	14.5	7.4	5.2	5.3	5.5	9	10	9.3	10.1	9.3	8.8	5.5	9	8.9
Cobalt	6.6	3.8	2.2	2.8	3.3	3.7	6.4	5.9	6.3	4.5	4.6	4	3.7	4.8
Copper	19.9 J+	16.5 J+	4.1 J+	8.6 J+	5.6 J+	6.2 J+	12.6	11.6 J	10.7	14.8 J	14.1 J+	9.7 J	10 J	13.2 J
Iron	15600	8780	6490	6170	9310	8580	16500	15900	16400	12800	12000	8110	8610	12800
Lead	16.9	12.6	3.3	6.2	2.9	3.3	11.5	10.7	9.3	6.1	14.8	8.7 J	5.3 J	12.5 J
Magnesium	16900	14300	8170	7260	12200	15400	7030	6400	7240	9470	10300	6570	11200	9530
Manganese	506	296	176	191	248	328	529	492 J	454	396 J	341	438	338	370
Mercury	0.042	0.023	0.014 J	0.015 J	0.02	0.013 J	0.013 J	0.014 J	0.013 U	0.013 J	0.016 J	0.025	0.012 U	0.016 J
Nickel	11	7.4	4.7	10	6.5	6.5	13	13.2	12	8.4	16	8.4	7.5	13.2
Potassium	1090 J+	571 J+	389 J+	433 J+	324 J+	527 J+	1080	1180	938	670	910 J+	536	869	866
Selenium	0.66 J	0.29 U	0.3 U	0.32 U	0.31 U	0.33 U	0.34 U	0.34 U	0.34 U	0.3 U	0.32 U	0.32 U	0.29 U	0.35 U
Silver	0.73 U	0.57 U	0.58 U	0.63 U	0.61 U	0.64 U	0.67 U	0.67 U	0.66 U	0.59 U	0.63 U	0.62 U	0.56 U	0.68 U
Sodium	52.4 J	29.2 U	29.4 U	57.4 J	51.6 J	32.8 J	39.6 J	38 J	54.9 J	43.5 J	77.5 J	40.7 J	54.9 J	123
Thallium	0.15 U	0.12 U	0.12 U	0.13 U	0.13 U	0.13 U	0.14 U	0.14 U	0.14 U	0.12 U	0.13 U	0.13 U	0.12 U	0.14 U
Vanadium	10.8	5.3	3.2	6	5.6	4.8	15.9	15.6	15.1	10.5	12.4	7.7	7.2	9.6
Zinc	47.8	27.5	16.1	22.6	29.7	22.6	57.9	54	47.2	28.3	43.3	28.5	24.4	46.1
METALS|HEXAVALENT CHROMIUM (mg/kg)														
Chromium, Hexavalent	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PESTICIDES (mg/kg)														
Aldrin	--	--	--	--	--	--	0.00092 U	0.00093 U	--	--	--	--	--	--
Alpha Bhc (Alpha Hexachlorocyclohexane)	--	--	--	--	--	--	0.00069 U	0.0007 U	--	--	--	--	--	--
Alpha Endosulfan	--	--	--	--	--	--	0.0011 U	0.0011 U	--	--	--	--	--	--
Beta Bhc (Beta Hexachlorocyclohexane)	--	--	--	--	--	--	0.00074 U	0.00075 U	--	--	--	--	--	--
Beta Endosulfan	--	--	--	--	--	--	0.0012 U	0.0012 U	--	--	--	--	--	--
cis-Chlordane	--	--	--	--	--	--	0.0012 U	0.0013 U	--	--	--	--	--	--
Delta BHC (Delta Hexachlorocyclohexane)	--	--	--	--	--	--	0.00083 U	0.00084 U	--	--	--	--	--	--
Dieldrin	--	--	--	--	--	--	0.00099 U	0.001 U	--	--	--	--	--	--
Endosulfan Sulfate	--	--	--	--	--	--	0.00089 U	0.0009 U	--	--	--	--	--	--
Endrin	--	--	--	--	--	--	0.00097 U	0.00098 U	--	--	--	--	--	--
Endrin Aldehyde	--	--	--	--	--	--	0.00095 U	0.00095 U	--	--	--	--	--	--
Endrin Ketone	--	--	--	--	--	--	0.0011 U	0.0011 U	--	--	--	--	--	--
Gamma Bhc (Lindane)	--	--	--	--	--	--	0.00068 U	0.00069 U	--	--	--	--	--	--
Heptachlor	--	--	--	--	--	--	0.00098 U	0.00099 U	--	--	--	--	--	--
Heptachlor Epoxide	--	--	--	--	--	--	0.0015 U	0.0015 U	--	--	--	--	--	--
Methoxychlor	--	--	--	--	--	--	0.0016 U	0.0016 U	--	--	--	--	--	--
P,P'-DDD	--	--	--	--	--	--	0.001 U	0.001 U	--	--	--	--	--	--
P,P'-DDE	--	--	--	--	--	--	0.0011 U	0.0011 U	--	--	--	--	--	--
P,P'-DDT	--	--	--	--	--	--	0.00079 U	0.00079 U	--	--	--	--	--	--
Toxaphene	--	--	--	--	--	--	0.022 U	0.022 U	--	--	--	--	--	--
trans-Chlordane	--	--	--	--	--	--	0.0017 U	0.0017 U	--	--	--	--	--	--
POLYCHLORINATED BIPHENYLS (mg/kg)														
PCB-1016 (Aroclor 1016)	0.012 U	0.0093 U	0.0093 U	0.0093 U	0.0094 U	0.0097 U	0.01 U	0.01 U	0.0097 U	0.0093 U	0.0098 U	0.0098 U	0.0092 U	0.0096 U
PCB-1221 (Aroclor 1221)	0.012 U	0.0093 U	0.0093 U	0.0093 U	0.0094 U	0.0097 U	0.01 U	0.01 U	0.0097 U	0.0093 U	0.0098 U	0.0098 U	0.0092 U	0.0096 U

Table E-2
Summary of Data Used in Risk Assessment
Main Plant Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-099	CFSB-099	CFSB-099	CFSB-100	CFSB-100	CFSB-100	CFSB-121	CFSB-121-DUP	CFSB-121	CFSB-121	CFSB-128	CFSB-128	CFSB-128	CFSB-129
Sample Lab IDs	460-114456-23	460-114456-28	460-114456-30	460-114456-26	460-114456-33	460-114456-29	460-114141-20	460-114141-23	460-114141-21	460-114141-22	460-114456-39	460-114456-40	460-114456-47	460-114456-44
Sample Name	CFSB-099-SO-0-0.5	CFSB-099-SO-0.5-2	CFSB-099-SO-10-12	CFSB-100-SO-0-0.5	CFSB-100-SO-0.5-2	CFSB-100-SO-10-12	CFSB-121-SO-0-0.5	CFSB-DUP1-SO	CFSB-121-SO-0.5-2.0	CFSB-121-SO-10-12	CFSB-128-SO-0-0.5	CFSB-128-SO-0.5-2.0	CFSB-128-SO-10-12	CFSB-129-SO-0-0.5
Sample Depth	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft
Chemical	5/24/2016	5/24/2016	5/24/2016	5/24/2016	5/24/2016	5/24/2016	5/18/2016	5/18/2016	5/18/2016	5/18/2016	5/24/2016	5/24/2016	5/24/2016	5/24/2016
PCB-1232 (Aroclor 1232)	0.012 U	0.0093 U	0.0093 U	0.0093 U	0.0094 U	0.0097 U	0.01 U	0.01 U	0.0097 U	0.0093 U	0.0098 U	0.0098 U	0.0092 U	0.0096 U
PCB-1242 (Aroclor 1242)	0.012 U	0.0093 U	0.0093 U	0.0093 U	0.0094 U	0.0097 U	0.01 U	0.01 U	0.0097 U	0.0093 U	0.0098 U	0.0098 U	0.0092 U	0.0096 U
PCB-1248 (Aroclor 1248)	0.012 U	0.0093 U	0.0093 U	0.0093 U	0.0094 U	0.0097 U	0.01 U	0.01 U	0.0097 U	0.0093 U	0.0098 U	0.0098 U	0.0092 U	0.0096 U
PCB-1254 (Aroclor 1254)	0.012 U	0.0096 U	0.0097 U	0.0096 U	0.0097 U	0.01 U	0.01 U	0.011 U	0.01 U	0.0096 U	0.01 U	0.01 U	0.0095 U	0.0099 U
PCB-1260 (Aroclor 1260)	0.012 U	0.0096 U	0.0097 U	0.0096 U	0.0097 U	0.01 U	0.01 U	0.011 U	0.01 U	0.0096 U	0.01 U	0.01 U	0.0095 U	0.0099 U
PCB-1262 (Aroclor 1262)	0.012 U	0.0096 U	0.0097 U	0.0096 U	0.0097 U	0.01 U	0.01 U	0.011 U	0.01 U	0.0096 U	0.01 U	0.01 U	0.0095 U	0.0099 U
PCB-1268 (Aroclor 1268)	0.012 U	0.0096 U	0.0097 U	0.0096 U	0.0097 U	0.01 U	0.01 U	0.011 U	0.01 U	0.0096 U	0.01 U	0.01 U	0.0095 U	0.0099 U
Polychlorinated Biphenyl (PCBs)	0.012 U	0.0096 U	0.0097 U	0.0096 U	0.0097 U	0.01 U	0.01 U	0.011 U	0.01 U	0.0096 U	0.01 U	0.01 U	0.0095 U	0.0099 U
SEMIVOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,2,4,5-Tetrachlorobenzene	0.033 U	0.026 U	0.026 U	0.026 U	0.026 U	0.027 U	0.028 U	0.028 U	0.027 U	0.026 U	0.027 U	0.027 U	0.025 U	0.026 U
1,4-Dioxane (P-Dioxane)	0.12 U	0.093 U	0.093 U	0.093 U	0.093 U	0.096 U	0.1 U	0.1 U	0.097 U	0.092 U	0.098 U	0.098 U	0.091 U	0.095 U
2,3,4,6-Tetrachlorophenol	0.041 U	0.033 U	0.033 U	0.033 U	0.033 U	0.034 U	0.035 U	0.036 U	0.034 U	0.032 U	0.034 U	0.034 U	0.032 U	0.033 U
2,4,5-Trichlorophenol	0.044 U	0.034 U	0.034 U	0.034 U	0.035 U	0.036 U	0.037 U	0.038 U	0.036 UJ	0.034 U	0.036 U	0.036 U	0.034 U	0.035 U
2,4,6-Trichlorophenol	0.012 U	0.0098 U	0.0099 U	0.0098 U	0.0099 U	0.01 U	0.011 U	0.011 U	0.01 U	0.0098 U	0.01 U	0.01 U	0.0097 U	0.01 U
2,4-Dichlorophenol	0.01 U	0.0082 U	0.0082 U	0.0082 U	0.0082 U	0.0085 U	0.0089 U	0.0089 U	0.0085 U	0.0081 U	0.0086 U	0.0086 U	0.0081 U	0.0084 U
2,4-Dimethylphenol	0.096 U	0.076 U	0.076 U	0.076 U	0.076 U	0.079 U	0.083 U	0.083 U	0.079 UJ	0.076 U	0.08 U	0.08 U	0.075 U	0.078 U
2,4-Dinitrophenol	0.33 U	0.26 U	0.26 U	0.26 U	0.26 U	0.27 U	0.28 U	0.29 U	0.27 UJ	0.26 U	0.28 U	0.28 U	0.26 U	0.27 U
2,4-Dinitrotoluene	0.017 U	0.014 U	0.014 U	0.014 U	0.014 U	0.014 U	0.015 U	0.015 U	0.014 U	0.014 U	0.014 U	0.014 U	0.014 U	0.014 U
2,6-Dinitrotoluene	0.023 U	0.018 U	0.018 U	0.018 U	0.019 U	0.019 U	0.02 U	0.02 U	0.019 U	0.018 U	0.019 U	0.019 U	0.018 U	0.019 U
2-Chloronaphthalene	0.0099 U	0.0079 U	0.0079 U	0.0079 U	0.0079 U	0.0082 U	0.0085 U	0.0086 U	0.0082 UJ	0.0078 U	0.0083 U	0.0083 U	0.0078 U	0.0081 U
2-Chlorophenol	0.011 U	0.0088 U	0.0088 U	0.0088 U	0.0088 U	0.0092 U	0.0096 U	0.0096 U	0.0092 U	0.0088 U	0.0093 U	0.0093 U	0.0087 U	0.009 U
2-Methylnaphthalene	0.0097 U	0.0076 U	0.0077 U	0.0076 U	0.0077 U	0.008 U	0.0083 U	0.0084 U	0.008 U	0.0076 U	0.06 J	0.0086 J	0.0075 U	0.0087 J
2-Methylphenol (O-Cresol)	0.019 U	0.015 U	0.015 U	0.015 U	0.015 U	0.016 U	0.016 U	0.017 U	0.016 U	0.015 U	0.016 U	0.016 U	0.015 U	0.016 U
2-Nitroaniline	0.014 U	0.011 U	0.011 U	0.011 U	0.011 U	0.012 U	0.012 U	0.012 U	0.012 U	0.011 U	0.012 U	0.012 U	0.011 U	0.012 U
2-Nitrophenol	0.015 U	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U	0.013 U	0.013 U	0.012 U	0.012 U	0.012 U	0.012 U	0.011 U	0.012 U
3- And 4- Methylphenol (Total)	0.012 U	0.0092 U	0.0092 U	0.0092 U	0.0093 U	0.0096 U	0.01 U	0.01 U	0.0096 U	0.0092 U	0.0097 U	0.0097 U	0.0091 U	0.0095 U
3,3'-Dichlorobenzidine	0.049 U	0.039 U	0.039 U	0.039 U	0.039 U	0.04 U	0.042 U	0.042 U	0.04 U	0.038 U	0.041 U	0.041 U	0.038 U	0.04 U
3-Nitroaniline	0.013 U	0.01 U	0.01 U	0.01 U	0.01 U	0.011 U	0.011 U	0.011 U	0.011 U	0.01 U	0.011 U	0.011 U	0.01 U	0.011 U
4,6-Dinitro-2-Methylphenol	0.12 U	0.092 U	0.092 U	0.092 U	0.093 U	0.096 U	0.1 U	0.1 U	0.096 UJ	0.092 U	0.097 U	0.097 U	0.091 U	0.095 U
4-Bromophenyl Phenyl Ether	0.014 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.012 U	0.012 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U
4-Chloro-3-Methylphenol	0.019 U	0.015 U	0.015 U	0.015 U	0.015 U	0.015 U	0.016 U	0.016 U	0.016 U	0.015 U	0.016 U	0.016 U	0.015 U	0.015 U
4-Chloroaniline	0.011 U	0.0089 U	0.0089 U	0.0089 U	0.0089 U	0.0093 U	0.0097 U	0.0097 U	0.0093 U	0.0089 U	0.0094 U	0.0094 U	0.0088 U	0.0092 U
4-Chlorophenyl Phenyl Ether	0.013 U	0.01 U	0.01 U	0.01 U	0.01 U	0.011 U	0.011 U	0.011 U	0.011 U	0.01 U	0.011 U	0.011 U	0.01 U	0.011 U
4-Nitroaniline	0.017 U	0.013 U	0.013 U	0.013 U	0.013 U	0.014 U	0.014 U	0.014 U	0.014 U	0.013 U	0.014 U	0.014 U	0.013 U	0.013 U
4-Nitrophenol	0.21 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.18 U	0.18 U	0.17 UJ	0.17 UJ	0.18 U	0.18 U	0.16 U	0.17 U
Acenaphthene	0.011 U	0.0084 U	0.0084 U	0.0084 U	0.0084 U	0.0087 U	0.0091 U	0.0092 U	0.0087 U	0.0083 U	0.27 J	0.073 J	0.0083 U	0.083 J
Acenaphthylene	0.011 U	0.0089 U	0.0089 U	0.0089 U	0.0089 U	0.0093 U	0.0097 U	0.0097 U	0.0093 U	0.0089 U	0.012 J	0.0094 U	0.0088 U	0.0092 U
Acetophenone	0.0095 U	0.0075 U	0.0075 U	0.0075 U	0.0076 U	0.0079 U	0.0082 U	0.0083 U	0.0079 U	0.0075 U	0.0079 U	0.008 U	0.0074 U	0.0078 U
Anthracene	0.042 U	0.033 U	0.033 U	0.033 U	0.033 U	0.034 U	0.036 U	0.036 U	0.034 U	0.033 U	0.57	0.15 J	0.032 U	0.16 J
Atrazine	0.019 U	0.015 U	0.015 U	0.015 U	0.015 U	0.016 U	0.017 U	0.017 U	0.016 U	0.015 U	0.016 U	0.016 U	0.015 U	0.016 U
Benzaldehyde	0.033 U	0.026 U	0.026 U	0.026 U	0.026 U	0.027 U	0.029 U	0.029 U	0.028 UJ	0.026 U	0.028 U	0.028 U	0.026 U	0.027 U
Benzo(A)Anthracene	0.045 J	0.029 J	0.029 U	0.14	0.094	0.03 U	0.091 J	0.043 J	0.03 U	0.029 U	2.6	0.76	0.061	1
Benzo(A)Pyrene	0.055 J	0.024 J	0.01 U	0.15	0.091	0.011 U	0.11 J	0.048 J	0.019 J	0.01 U	3	0.91	0.062	1.3
Benzo(B)Fluoranthene	0.12 J	0.039	0.014 U	0.28	0.19	0.014 U	0.24 J	0.1 J	0.032 J	0.013 U	4	1.2	0.083	1.6
Benzo(G,H,I)Perylene	0.058 J	0.033 J	0.02 U	0.27 J	0.14 J	0.021 U	0.11 J	0.043 J	0.021 U	0.02 U	3	1.1	0.052 J	1.4
Benzo(K)Fluoranthene	0.019 UJ	0.015 U	0.015 U	0.077	0.063	0.016 U	0.072 J	0.026 J	0.016 U	0.015 U	1.3	0.42	0.034	0.73
Benzyl Butyl Phthalate	0.014 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.012 U	0.012 U	0.011 U	0.011 U	0.26 J	0.094 J	0.011 U	0.011 U
Biphenyl (Diphenyl)	0.037 U	0.03 U	0.03 U	0.03 U	0.03 U	0.031 U	0.032 U	0.032 U	0.031 UJ	0.029 U	0.031 U	0.031 U	0.029 U	0.03 U
Bis(2-Chloroethoxy) Methane	0.014 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.012 U	0.012 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.01 U	0.0082 U	0.0082 U	0.0082 U	0.0082 U	0.0085 U	0.0089 U	0.0089 U	0.0085 U	0.0081 U	0.0086 U	0.0086 U	0.0081 U	0.0084 U
Bis(2-Chloroisopropyl) Ether	0.018 U	0.014 UJ	0.014 UJ	0.014 UJ	0.014 UJ	0.015 UJ	0.015 UJ	0.016 U	0.015 UJ	0.014 UJ	0.015 U	0.015 U	0.014 U	0.015 U
Bis(2-Ethylhexyl) Phthalate	0.038 J	0.14 J	0.015 J	0.016 J	0.019 J	0.014 U	0.015 U	0.015 U	0.014 U	0.013 U	0.014 U	0.046 J	0.013 U	0.014 U
Caprolactam	0.032 U	0.025 U	0.025 U	0.025 U	0.025 U	0.026 U	0.027 U	0.027 U	0.026 UJ	0.025 U	0.026 U	0.026 U	0.025 U	0.026 U
Carbazole	0.011 J	0.0086 U	0.0086 U	0.02 J	0.01 J	0.0089 U	0.014 J	0.0094 U	0.009 U	0.0085 U	0.63	0.16 J	0.0088 J	0.17 J
Chrysene	0.089 J	0.03 J	0.0094 U	0.18 J	0.14 J	0.0098 U	0.15 J	0.07 J	0.023 J	0.0094 U	3.6	1.1	0.069 J	1.5
Dibenz(A,H)Anthracene	0.023 UJ	0.018 U	0.018 U	0.053	0.024 J	0.019 U	0.02 U	0.02 U	0.019 U	0.018 U	0.75 J+	0.27 J+	0.018 U	0.34 J+
Dibenzofuran	0.013 U	0.01 U	0.01 U	0.01 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.01 U	0.12 J	0.024 J	0.01 U	0.024 J

Table E-2
Summary of Data Used in Risk Assessment
Main Plant Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-099	CFSB-099	CFSB-099	CFSB-100	CFSB-100	CFSB-100	CFSB-121	CFSB-121-DUP	CFSB-121	CFSB-121	CFSB-128	CFSB-128	CFSB-128	CFSB-129
Sample Lab IDs	460-114456-23	460-114456-28	460-114456-30	460-114456-26	460-114456-33	460-114456-29	460-114141-20	460-114141-23	460-114141-21	460-114141-22	460-114456-39	460-114456-40	460-114456-47	460-114456-44
Sample Name	CFSB-099-SO-0-0.5	CFSB-099-SO-0.5-2	CFSB-099-SO-10-12	CFSB-100-SO-0-0.5	CFSB-100-SO-0.5-2	CFSB-100-SO-10-12	CFSB-121-SO-0-0.5	CFSB-DUP1-SO	CFSB-121-SO-0.5-2.0	CFSB-121-SO-10-12	CFSB-128-SO-0-0.5	CFSB-128-SO-0.5-2.0	CFSB-128-SO-10-12	CFSB-129-SO-0-0.5
Sample Depth	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft
Chemical	5/24/2016	5/24/2016	5/24/2016	5/24/2016	5/24/2016	5/24/2016	5/18/2016	5/18/2016	5/18/2016	5/18/2016	5/24/2016	5/24/2016	5/24/2016	5/24/2016
Diethyl Phthalate	0.012 U	0.0098 U	0.0099 U	0.0098 U	0.0099 U	0.01 U	0.011 U	0.011 U	0.01 U	0.0098 U	0.01 U	0.01 U	0.0097 U	0.01 U
Dimethyl Phthalate	0.013 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.011 U	0.011 U	0.01 U	0.01 U	0.011 U	0.011 U	0.0099 U	0.01 U
Di-N-Butyl Phthalate	0.013 U	0.01 U	0.01 U	0.01 U	0.01 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 J	0.011 U	0.011 U	0.01 U	0.011 U
Di-N-Octylphthalate	0.022 U	0.018 U	0.018 U	0.018 U	0.018 U	0.018 U	0.019 U	0.019 U	0.018 U	0.018 U	0.019 U	0.019 U	0.017 U	0.018 U
Fluoranthene	0.079 J	0.042 J	0.01 U	0.21 J	0.13 J	0.011 U	0.17 J	0.07 J	0.029 J	0.01 U	5.5	1.4	0.092 J	1.8
Fluorene	0.0095 U	0.0075 U	0.0075 U	0.0075 U	0.0076 U	0.0079 U	0.0082 U	0.0083 U	0.0079 U	0.0075 U	0.21 J	0.046 J	0.0086 J	0.048 J
Hexachlorobenzene	0.018 U	0.014 U	0.014 U	0.014 U	0.014 U	0.015 U	0.015 U	0.015 U	0.015 U	0.014 U	0.015 U	0.015 U	0.014 U	0.014 U
Hexachlorobutadiene	0.012 U	0.0097 U	0.0097 U	0.0097 U	0.0098 U	0.01 U	0.011 U	0.011 U	0.01 U	0.0097 U	0.01 U	0.01 U	0.0096 U	0.01 U
Hexachlorocyclopentadiene	0.027 UJ	0.022 U	0.022 U	0.022 U	0.022 U	0.022 U	0.023 U	0.024 U	0.023 U	0.021 U	0.023 UJ	0.023 UJ	0.021 UJ	0.022 UJ
Hexachloroethane	0.016 U	0.013 U	0.013 U	0.013 U	0.013 U	0.013 U	0.014 U	0.014 U	0.013 UJ	0.013 U	0.013 U	0.013 U	0.013 U	0.013 U
Indeno(1,2,3-C,D)Pyrene	0.06 J	0.036	0.023 U	0.27	0.15	0.024 U	0.11 J	0.043 J	0.024 U	0.023 U	2.8 J+	1.1 J+	0.052 J+	1.3 J+
Isophorone	0.0094 U	0.0074 U	0.0074 U	0.0074 U	0.0075 U	0.0077 U	0.0081 U	0.0081 U	0.0078 U	0.0074 U	0.0078 U	0.0078 U	0.0073 U	0.0076 U
Naphthalene	0.011 U	0.0088 U	0.0088 U	0.0088 U	0.0088 U	0.0092 U	0.0096 U	0.0096 U	0.0092 UJ	0.0088 U	0.19 J	0.019 J	0.0087 U	0.014 J
Nitrobenzene	0.014 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.012 U	0.012 U	0.011 UJ	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U
N-Nitrosodi-N-Propylamine	0.015 U	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U	0.013 U	0.013 U	0.012 U	0.012 U	0.012 U	0.012 U	0.011 U	0.012 U
N-Nitrosodiphenylamine	0.04 U	0.031 U	0.031 U	0.031 U	0.032 U	0.033 U	0.034 U	0.034 U	0.033 UJ	0.031 U	0.033 U	0.033 U	0.031 U	0.032 U
Pentachlorophenol	0.053 U	0.042 U	0.042 U	0.042 U	0.042 U	0.044 U	0.045 U	0.046 U	0.044 U	0.042 U	0.044 U	0.044 U	0.041 U	0.043 U
Phenanthrene	0.056 J	0.032 J	0.0092 U	0.093 J	0.076 J	0.0096 U	0.083 J	0.037 J	0.016 J	0.0092 U	3.2	0.86	0.069 J	1
Phenol	0.014 U	0.011 U	0.011 U	0.011 U	0.011 U	0.012 U	0.012 U	0.012 U	0.012 U	0.011 U	0.012 U	0.012 U	0.011 U	0.012 U
Pyrene	0.078 J	0.035 J	0.016 U	0.21 J	0.14 J	0.016 U	0.17 J	0.069 J	0.029 J	0.016 U	3.9	1.3	0.099 J	1.9
VOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,1,1-Trichloroethane	--	0.00036 U	0.00037 U	--	0.00036 U	0.0003 U	--	--	0.00039 UJ	0.00036 U	--	0.00031 U	0.00035 U	--
1,1,2,2-Tetrachloroethane	--	0.00016 U	0.00016 U	--	0.00016 U	0.00013 U	--	--	0.00017 UJ	0.00016 U	--	0.00014 U	0.00016 U	--
1,1,2-Trichloro-1,2,2-Trifluoroethane	--	0.00042 U	0.00043 U	--	0.00041 U	0.00034 U	--	--	0.00045 UJ	0.00042 U	--	0.00036 U	0.00041 U	--
1,1,2-Trichloroethane	--	0.00026 U	0.00027 U	--	0.00026 U	0.00022 U	--	--	0.00028 UJ	0.00027 U	--	0.00023 U	0.00026 U	--
1,1-Dichloroethane	--	0.00032 U	0.00033 U	--	0.00032 U	0.00026 U	--	--	0.00035 UJ	0.00033 U	--	0.00028 U	0.00031 U	--
1,1-Dichloroethene	--	0.00039 U	0.0004 U	--	0.00038 U	0.00032 U	--	--	0.00042 UJ	0.00039 U	--	0.00033 U	0.00038 U	--
1,2,3-Trichlorobenzene	--	0.0001 U	0.00011 U	--	0.0001 U	0.000085 U	--	--	0.00011 UJ	0.00011 U	--	0.00009 U	0.0001 U	--
1,2,4-Trichlorobenzene	--	0.0003 U	0.00031 U	--	0.0003 U	0.00025 U	--	--	0.00033 UJ	0.00031 U	--	0.00026 U	0.0003 U	--
1,2-Dibromo-3-Chloropropane	--	0.00044 U	0.00046 U	--	0.00044 U	0.00037 U	--	--	0.00048 UJ	0.00045 U	--	0.00038 U	0.00043 U	--
1,2-Dibromoethane (Ethylene Dibromide)	--	0.00011 U	0.00012 U	--	0.00011 U	0.000093 U	--	--	0.00012 UJ	0.00011 U	--	0.000098 U	0.00011 U	--
1,2-Dichlorobenzene	--	0.00013 U	0.00014 U	--	0.00013 U	0.00011 U	--	--	0.00014 UJ	0.00013 U	--	0.00011 U	0.00013 U	--
1,2-Dichloroethane	--	0.0001 U	0.00011 U	--	0.0001 U	0.000085 U	--	--	0.00011 UJ	0.00011 U	--	0.00009 U	0.0001 U	--
1,2-Dichloropropane	--	0.00016 U	0.00016 U	--	0.00016 U	0.00013 U	--	--	0.00017 UJ	0.00016 U	--	0.00014 U	0.00016 U	--
1,3-Dichlorobenzene	--	0.00011 U	0.00012 U	--	0.00011 U	0.000093 U	--	--	0.00012 UJ	0.00011 U	--	0.000098 U	0.00011 U	--
1,4-Dichlorobenzene	--	0.00012 U	0.00013 U	--	0.00012 U	0.0001 U	--	--	0.00013 UJ	0.00012 U	--	0.00011 U	0.00012 U	--
2-Hexanone	--	0.00089 U	0.00091 U	--	0.00088 U	0.00073 U	--	--	0.00095 UJ	0.0009 U	--	0.00077 U	0.00087 U	--
Acetone	--	0.012	0.012	--	0.014	0.0082	--	--	0.041	0.0066	--	0.043	0.0092	--
Benzene	--	0.00019 J	0.00028 J	--	0.00019 U	0.0008	--	--	0.0002 UJ	0.00091 J	--	0.00041 J	0.00072 J	--
Bromochloromethane	--	0.00016 U	0.00016 U	--	0.00016 U	0.00013 U	--	--	0.00017 UJ	0.00016 U	--	0.00014 U	0.00016 U	--
Bromodichloromethane	--	0.00036 U	0.00037 U	--	0.00036 U	0.0003 U	--	--	0.00039 UJ	0.00036 U	--	0.00031 U	0.00035 U	--
Bromoform	--	0.00012 U	0.00013 U	--	0.00012 U	0.0001 U	--	--	0.00013 U	0.00012 U	--	0.00011 U	0.00012 U	--
Bromomethane	--	0.0003 U	0.00031 U	--	0.0003 U	0.00025 U	--	--	0.00033 U	0.00031 U	--	0.00026 U	0.0003 U	--
Carbon Disulfide	--	0.00041 U	0.00042 U	--	0.0004 U	0.00033 U	--	--	0.00044 UJ	0.00041 U	--	0.00075 J	0.00072 J	--
Carbon Tetrachloride	--	0.00041 U	0.00042 U	--	0.0004 U	0.00033 U	--	--	0.00044 UJ	0.00041 U	--	0.00035 U	0.0004 U	--
Chlorobenzene	--	0.00013 U	0.00014 U	--	0.00013 U	0.00011 U	--	--	0.00014 UJ	0.00013 U	--	0.00011 U	0.00013 U	--
Chloroethane	--	0.00033 U	0.00034 U	--	0.00033 U	0.00027 U	--	--	0.00036 U	0.00034 U	--	0.00029 U	0.00032 U	--
Chloroform	--	0.0002 U	0.0002 U	--	0.0002 U	0.00016 U	--	--	0.00021 UJ	0.0002 U	--	0.00017 U	0.00019 U	--
Chloromethane	--	0.00036 U	0.00037 U	--	0.00036 U	0.0003 U	--	--	0.00039 U	0.00036 U	--	0.00031 U	0.00035 U	--
Cis-1,2-Dichloroethylene	--	0.00021 U	0.00021 U	--	0.00021 U	0.00017 U	--	--	0.00022 UJ	0.00021 U	--	0.00018 U	0.0002 U	--
Cis-1,3-Dichloropropene	--	0.00014 U	0.00015 U	--	0.00014 U	0.00012 U	--	--	0.00015 UJ	0.00014 U	--	0.00012 U	0.00014 U	--
Cyclohexane	--	0.00043 U	0.00076 J	--	0.00043 U	0.0019	--	--	0.00047 UJ	0.00044 U	--	0.00038 U	0.0021	--
Dibromochloromethane	--	0.00014 U	0.00015 U	--	0.00014 U	0.00012 U	--	--	0.00015 UJ	0.00014 U	--	0.00012 U	0.00014 U	--
Dichlorodifluoromethane	--	0.0003 U	0.00031 U	--	0.0003 U	0.00025 U	--	--	0.00033 UJ	0.00031 U	--	0.00026 U	0.0003 U	--
Ethylbenzene	--	0.00017 U	0.00034 J	--	0.00017 U	0.00099	--	--	0.00018 UJ	0.00098	--	0.00015 U	0.00087 J	--
Isopropylbenzene (Cumene)	--	0.00016 U	0.00016 U	--	0.00016 U	0.00015 J	--	--	0.00017 UJ	0.00016 U	--	0.00014 U	0.00016 U	--
M,P-Xylene	--	0.00038 J	0.0011	--	0.00038 J	0.0031	--	--	0.00011 UJ	0.0032	--	9.10E-05 J	0.0034	--

Table E-2
Summary of Data Used in Risk Assessment
Main Plant Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-099	CFSB-099	CFSB-099	CFSB-100	CFSB-100	CFSB-100	CFSB-121	CFSB-121-DUP	CFSB-121	CFSB-121	CFSB-128	CFSB-128	CFSB-128	CFSB-129
Sample Lab IDs	460-114456-23	460-114456-28	460-114456-30	460-114456-26	460-114456-33	460-114456-29	460-114141-20	460-114141-23	460-114141-21	460-114141-22	460-114456-39	460-114456-40	460-114456-47	460-114456-44
Sample Name	CFSB-099-SO-0-0.5	CFSB-099-SO-0.5-2	CFSB-099-SO-10-12	CFSB-100-SO-0-0.5	CFSB-100-SO-0.5-2	CFSB-100-SO-10-12	CFSB-121-SO-0-0.5	CFSB-DUP1-SO	CFSB-121-SO-0.5-2.0	CFSB-121-SO-10-12	CFSB-128-SO-0-0.5	CFSB-128-SO-0.5-2.0	CFSB-128-SO-10-12	CFSB-129-SO-0-0.5
Sample Depth	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft
Chemical	5/24/2016	5/24/2016	5/24/2016	5/24/2016	5/24/2016	5/24/2016	5/18/2016	5/18/2016	5/18/2016	5/18/2016	5/24/2016	5/24/2016	5/24/2016	5/24/2016
Methyl Acetate	--	0.00085 U	0.00087 U	--	0.00084 U	0.0007 U	--	--	0.0024 J	0.00086 U	--	0.00073 U	0.00083 U	--
Methyl Ethyl Ketone (2-Butanone)	--	0.00073 U	0.00075 U	--	0.00072 U	0.0006 U	--	--	0.00078 U	0.00074 U	--	0.0025 J	0.00071 U	--
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	--	0.0021 U	0.0021 U	--	0.0021 U	0.0017 U	--	--	0.0023 UJ	0.0021 U	--	0.0018 U	0.0021 U	--
Methylcyclohexane	--	0.00047 J	0.0015	--	0.00052 J	0.0037	--	--	0.00051 UJ	0.0055	--	0.00041 U	0.0035	--
Methylene Chloride	--	0.0003 U	0.00031 U	--	0.0003 U	0.00025 U	--	--	0.00033 UJ	0.00031 U	--	0.00026 U	0.0003 U	--
O-Xylene (1,2-Dimethylbenzene)	--	0.00015 U	0.00035 J	--	0.00015 U	0.001	--	--	0.00016 UJ	0.00093 J	--	0.00013 U	0.0012	--
Styrene	--	0.00014 U	0.00015 U	--	0.00014 U	0.00012 U	--	--	0.00015 UJ	0.00014 U	--	0.00012 U	0.00014 U	--
Tert-Butyl Methyl Ether	--	0.00016 U	0.00016 U	--	0.00016 U	0.00013 U	--	--	0.00017 UJ	0.00016 U	--	0.00014 U	0.00016 U	--
Tetrachloroethylene (PCE)	--	0.00026 U	0.00027 U	--	0.00026 U	0.00022 U	--	--	0.00028 UJ	0.00027 U	--	0.00023 U	0.00026 U	--
Toluene	--	0.0006 J	0.0014	--	0.00069 J	0.0044	--	--	0.00019 UJ	0.0051	--	0.0004 J	0.0045	--
Trans-1,2-Dichloroethene	--	0.00037 U	0.00038 U	--	0.00037 U	0.0003 U	--	--	0.0004 UJ	0.00037 U	--	0.00032 U	0.00036 U	--
Trans-1,3-Dichloropropene	--	0.000094 U	0.000097 U	--	0.000094 U	0.000078 U	--	--	0.0001 UJ	0.000096 U	--	0.000082 U	0.000092 U	--
Trichloroethylene (TCE)	--	0.00025 U	0.00025 U	--	0.00024 U	0.0002 U	--	--	0.00026 UJ	0.00025 U	--	0.00021 U	0.00024 U	--
Trichlorofluoromethane	--	0.00032 U	0.00033 U	--	0.00032 U	0.00026 U	--	--	0.00035 U	0.00033 U	--	0.00028 U	0.00031 U	--
Vinyl Chloride	--	0.00037 U	0.00038 U	--	0.00037 U	0.0003 U	--	--	0.0004 U	0.00037 U	--	0.00032 U	0.00036 U	--

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-2
Summary of Data Used in Risk Assessment
Main Plant Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-129	CFSB-129	CFSB-130	CFSB-130	CFSB-131	CFSB-131	CFSB-154	CFSB-154	CFSB-154	CFSB-155	CFSB-155	CFSB-155	CFSB-156	CFSB-156
Sample Lab IDs	460-114456-46	460-114456-45	460-115731-5	460-115731-6	460-115731-1	460-115731-2	180-77782-56, 460-156361-23	180-77782-57, 460-156361-24	180-77782-58, 460-156361-25	180-77782-53, 460-156361-20	180-77782-54, 460-156361-21	180-77782-55, 460-156361-22	180-77782-50, 460-156361-17	180-77782-51, 460-156361-18
Sample Name	CFSB-129-SO-0.5-2.0	CFSB-129-SO-10-12	CFSB-130-SO-0.5-2	CFSB-130-SO-10-12	CFSB-131-SO-0.5-2	CFSB-131-SO-10-12	CFSB-154-SO-0.5-2.5	CFSB-154-SO-5.5-7.5	CFSB-154-SO-10.5-12.5	CFSB-155-SO-0.5-2.5	CFSB-155-SO-5.5-7.5	CFSB-155-SO-10.5-12.5	CFSB-156-SO-0.5-2.5	CFSB-156-SO-5.5-7.5
Sample Depth	0.5-2 ft	10-12 ft	0.5-2 ft	10-12 ft	0.5-2 ft	10-12 ft	0.5-2.5 ft	5.5-7.5 ft	10.5-12.5 ft	0.5-2.5 ft	5.5-7.5 ft	10.5-12.5 ft	0.5-2.5 ft	5.5-7.5 ft
Chemical	5/24/2016	5/24/2016	6/17/2016	6/17/2016	6/17/2016	6/17/2016	5/15/2018	5/15/2018	5/15/2018	5/15/2018	5/15/2018	5/15/2018	5/15/2018	5/15/2018
GENERAL CHEMISTRY (mg/kg)														
Fluoride	203 J-	123 J-	2.46	232 J-	3.82	86.7 J-	2.94	0.16 U	0.17 U	6.85 J+	0.59 J+	0.65 J	19.3 J+	0.63 J+
Cyanide	0.042 J	0.016 U	0.74	1.5	2.4	3.8	0.059 U	0.064 U	0.059 U	0.054 UJ	0.058 U	0.058 U	0.054 UJ	0.085 J-
METALS (mg/kg)														
"Chromium, Hexavalent - Estimated"	0.270316	0.211436	0.16326	0.390754	0.254258	0.224818	0.206083	0.165937	0.211436	0.181995	0.144526	0.168613	0.206083	0.198054
"Chromium, Trivalent - Calculated"	--	--	--	--	--	--	--	--	--	--	--	--	--	--
"Chromium, Trivalent - Estimated"	9.82968	7.68856	5.93674	14.2092	9.24574	8.17518	7.49392	6.03406	7.68856	6.618	5.25547	6.13139	7.49392	7.20195
Aluminum	11900	7600	5880	21900	10100	8000	6980	5850	7750	6270	2960	5080	7290	6210
Antimony	0.34 UJ	0.33 UJ	0.43 UJ	0.48 J-	0.38 U	0.4 U	0.31 UJ	0.28 UJ	0.31 UJ	0.3 UJ	0.3 UJ	0.3 UJ	0.29 UJ	0.28 UJ
Arsenic	3.5	2.5	5	3.7	5.5	3.1	3.2	2.7	3.8	2.9	3.2	4.2	4	3.6
Barium	66.4	78.8	47	122	98.1	53.9	63.3	35.7	66.3	78.6	56.1	73.1	69.5	83.6
Beryllium	0.5	0.39	0.34 J	1.1	0.38	0.36 J	0.3 J	0.29 J	0.4 J	0.33 J	0.29 J	0.3 J	0.39 J	0.34 J
Cadmium	0.26 U	0.25 U	0.32 U	0.34 U	0.29 U	0.32 J	0.35 U	0.32 U	0.36 U	0.35 U	0.34 U	0.34 U	0.34 U	0.32 U
Calcium	17300	20200	40200 J	34200 J	68700	14400	23400	14900	20000	34000	18200	42000	39900	28500
Chromium, Total	10.1	7.9	6.1	14.6	9.5	8.4	7.7	6.2	7.9	6.8	5.4	6.3	7.7	7.4
Cobalt	4.9	6.3	2.8 J+	4.1 J+	4.2	4.4	5	3.6	4.9	4	3.2	5.8	4.9	4.7
Copper	12.2 J	9.2 J	23.2 J	8.8 J	8.7	11.1	9.6	8.5	12.5	15.2 J+	15.3 J+	8.6	12.7 J+	10.8 J+
Iron	9670	10700	9640	13400	13400	12600	11400	8810	12400	9980	10200	9690	12700	11500
Lead	13.5 J	4.9 J	27.7	6.9	6.6	6.6	4.8	4.2	5.1	5.5 J	3 J	5.5	5.9 J	5.2 J
Magnesium	7370	9690	6510	11600	12000	8320	10200	8410	10400	10800	4690	8220	11000	10400
Manganese	281	249	210	351	516	267	272	219	301	265	184	719	342	319
Mercury	0.014 J	0.013 J	0.013 U	0.012 U	0.012 U	0.012 U	0.017 J+	0.014 J+	0.011 J+	0.011 J+	0.015 J+	0.012 J+	0.017 J+	0.013 J+
Nickel	15.4	9.6	6.6 J-	8.9 J-	9.4	9.4	9.2	7.6	9.6	7.8	8.6	7.6	10.1	8.6
Potassium	892	783	627	2140	990	693	613	440	796	790	479	688	626	480
Selenium	0.32 U	0.31 U	0.4 U	0.42 U	0.36 U	0.37 U	0.3 U	0.28 U	0.31 U	0.3 U	0.3 U	0.29 U	0.29 U	0.27 U
Silver	0.62 U	0.61 U	0.78 U	0.82 U	0.7 U	0.73 U	0.65 U	0.59 U	0.66 U	0.64 U	0.63 U	0.62 U	0.62 U	0.58 U
Sodium	162	31.3 U	363	2110	978	882	34.3 J	75.1 J	33.6 U	93.6 J-	32.1 UR	31.6 U	52.5 J-	29.5 UR
Thallium	0.13 U	0.13 U	0.16 U	0.17 U	0.14 U	0.15 U	0.13 U	0.12 U	0.13 U	0.13 U	0.13 U	0.15 J	0.13 U	0.12 U
Vanadium	9.4	7.8	4.4	12.3	6.8	8.2	6.7	4.5	8.1	6.4	6.7	5.8	7.5	6.7
Zinc	35.8	36	25.3	33.2	38.9	34.7	28.8	24.9	31	24.8	32.4	31.1	34	27.7
METALS|HEXAVALENT CHROMIUM (mg/kg)														
Chromium, Hexavalent	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PESTICIDES (mg/kg)														
Aldrin	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Alpha Bhc (Alpha Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Alpha Endosulfan	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Beta Bhc (Beta Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Beta Endosulfan	--	--	--	--	--	--	--	--	--	--	--	--	--	--
cis-Chlordane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Delta BHC (Delta Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dieldrin	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endosulfan Sulfate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin Aldehyde	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin Ketone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Gamma Bhc (Lindane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Heptachlor	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Heptachlor Epoxide	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methoxychlor	--	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDD	--	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDT	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Toxaphene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
trans-Chlordane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
POLYCHLORINATED BIPHENYLS (mg/kg)														
PCB-1016 (Aroclor 1016)	0.0092 U	0.0092 U	0.0093 U	0.0098 U	0.0094 U	0.0096 U	--	--	--	--	--	--	--	--
PCB-1221 (Aroclor 1221)	0.0092 U	0.0092 U	0.0093 U	0.0098 U	0.0094 U	0.0096 U	--	--	--	--	--	--	--	--

Table E-2
Summary of Data Used in Risk Assessment
Main Plant Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-129	CFSB-129	CFSB-130	CFSB-130	CFSB-131	CFSB-131	CFSB-154	CFSB-154	CFSB-154	CFSB-155	CFSB-155	CFSB-155	CFSB-156	CFSB-156
Sample Lab IDs	460-114456-46	460-114456-45	460-115731-5	460-115731-6	460-115731-1	460-115731-2	180-77782-56, 460-156361-23	180-77782-57, 460-156361-24	180-77782-58, 460-156361-25	180-77782-53, 460-156361-20	180-77782-54, 460-156361-21	180-77782-55, 460-156361-22	180-77782-50, 460-156361-17	180-77782-51, 460-156361-18
Sample Name	CFSB-129-SO-0.5-2.0	CFSB-129-SO-10-12	CFSB-130-SO-0.5-2	CFSB-130-SO-10-12	CFSB-131-SO-0.5-2	CFSB-131-SO-10-12	CFSB-154-SO-0.5-2.5	CFSB-154-SO-5.5-7.5	CFSB-154-SO-10.5-12.5	CFSB-155-SO-0.5-2.5	CFSB-155-SO-5.5-7.5	CFSB-155-SO-10.5-12.5	CFSB-156-SO-0.5-2.5	CFSB-156-SO-5.5-7.5
Sample Depth	0.5-2 ft	10-12 ft	0.5-2 ft	10-12 ft	0.5-2 ft	10-12 ft	0.5-2.5 ft	5.5-7.5 ft	10.5-12.5 ft	0.5-2.5 ft	5.5-7.5 ft	10.5-12.5 ft	0.5-2.5 ft	5.5-7.5 ft
Chemical	5/24/2016	5/24/2016	6/17/2016	6/17/2016	6/17/2016	6/17/2016	5/15/2018	5/15/2018	5/15/2018	5/15/2018	5/15/2018	5/15/2018	5/15/2018	5/15/2018
PCB-1232 (Aroclor 1232)	0.0092 U	0.0092 U	0.0093 U	0.0098 U	0.0094 U	0.0096 U	--	--	--	--	--	--	--	--
PCB-1242 (Aroclor 1242)	0.0092 U	0.0092 U	0.0093 U	0.0098 U	0.0094 U	0.0096 U	--	--	--	--	--	--	--	--
PCB-1248 (Aroclor 1248)	0.0092 U	0.0092 U	0.0093 U	0.0098 U	0.0094 U	0.0096 U	--	--	--	--	--	--	--	--
PCB-1254 (Aroclor 1254)	0.0096 U	0.0095 U	0.0097 U	0.01 U	0.0097 U	0.01 U	--	--	--	--	--	--	--	--
PCB-1260 (Aroclor 1260)	0.0096 U	0.0095 U	0.0097 U	0.01 U	0.0097 U	0.01 U	--	--	--	--	--	--	--	--
PCB-1262 (Aroclor 1262)	0.0096 U	0.0095 U	0.0097 U	0.01 U	0.0097 U	0.01 U	--	--	--	--	--	--	--	--
PCB-1268 (Aroclor 1268)	0.0096 U	0.0095 U	0.0097 U	0.01 U	0.0097 U	0.01 U	--	--	--	--	--	--	--	--
Polychlorinated Biphenyl (PCBs)	0.0096 U	0.0095 U	0.0097 U	0.01 U	0.0097 U	0.01 U	--	--	--	--	--	--	--	--
SEMIVOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,2,4,5-Tetrachlorobenzene	0.026 U	0.025 U	0.026 U	0.13 U	0.026 U	0.027 U	0.0015 UJ	0.0014 UJ	0.0016 UJ	0.0015 UJ	0.0015 UJ	0.0015 UJ	0.0015 UJ	0.0015 UJ
1,4-Dioxane (P-Dioxane)	0.092 U	0.091 U	0.093 U	0.48 U	0.093 U	0.096 U	0.011 U	0.01 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U
2,3,4,6-Tetrachlorophenol	0.032 U	0.032 U	0.033 UR	0.17 U	0.033 U	0.034 U	0.014 U	0.014 U	0.015 U	0.015 U	0.015 U	0.015 U	0.015 U	0.014 U
2,4,5-Trichlorophenol	0.034 U	0.034 U	0.035 UR	0.18 U	0.035 U	0.036 U	0.0025 U	0.0024 U	0.0026 U	0.0025 U	0.0026 U	0.0025 U	0.0025 U	0.0025 U
2,4,6-Trichlorophenol	0.0098 U	0.0097 U	0.0099 UR	0.052 U	0.0099 U	0.01 U	0.0019 U	0.0018 U	0.002 U	0.0019 U	0.002 U	0.002 U	0.0019 U	0.0019 U
2,4-Dichlorophenol	0.0081 U	0.0081 U	0.0082 UR	0.043 U	0.0082 U	0.0084 U	0.0027 U	0.0025 U	0.0028 U	0.0027 U	0.0028 U	0.0027 U	0.0027 U	0.0027 U
2,4-Dimethylphenol	0.076 U	0.075 U	0.076 UR	0.4 U	0.077 U	0.079 U	0.0021 U	0.002 U	0.0023 U	0.0022 U	0.0022 U	0.0022 U	0.0022 U	0.0021 U
2,4-Dinitrophenol	0.26 U	0.26 U	0.26 UR	1.4 U	0.26 U	0.27 U	0.093 UJ	0.089 UJ	0.098 UJ	0.094 UJ	0.096 UJ	0.096 UJ	0.095 UJ	0.093 UJ
2,4-Dinitrotoluene	0.014 U	0.014 U	0.014 U	0.072 U	0.014 U	0.014 U	0.0017 U	0.0016 U	0.0018 U	0.0017 U	0.0018 U	0.0018 U	0.0018 U	0.0017 U
2,6-Dinitrotoluene	0.018 U	0.018 U	0.018 U	0.096 U	0.019 U	0.019 U	0.0021 U	0.002 U	0.0023 U	0.0022 U	0.0022 U	0.0022 U	0.0022 U	0.0021 U
2-Chloronaphthalene	0.0078 U	0.0077 U	0.0079 U	0.041 U	0.0079 U	0.0081 U	0.0016 U	0.0015 U	0.0017 U	0.0016 U	0.0016 U	0.0016 U	0.0016 U	0.0016 U
2-Chlorophenol	0.0087 U	0.0087 U	0.0088 UR	0.046 U	0.0089 U	0.0091 U	0.0016 U	0.0015 U	0.0017 U	0.0016 U	0.0017 U	0.0017 U	0.0016 U	0.0016 U
2-Methylnaphthalene	0.021 J	0.0075 U	0.0077 U	0.88 J	0.017 J	0.0096 J	0.0017 U	0.0016 U	0.0018 U	0.0017 U	0.0017 U	0.0017 U	0.0017 U	0.0017 U
2-Methylphenol (O-Cresol)	0.015 U	0.015 U	0.015 UR	0.079 U	0.015 U	0.016 U	0.0099 U	0.0094 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.0099 U
2-Nitroaniline	0.011 U	0.011 U	0.011 U	0.06 U	0.012 U	0.012 U	0.016 U	0.015 U	0.017 U	0.016 U	0.016 U	0.016 U	0.016 U	0.016 U
2-Nitrophenol	0.012 U	0.011 U	0.012 UR	0.061 U	0.012 U	0.012 U	0.002 U	0.0019 U	0.0021 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U
3- And 4- Methylphenol (Total)	0.0091 U	0.0091 U	0.0092 UR	0.048 U	0.0093 U	0.0095 U	--	--	--	--	--	--	--	--
3,3'-Dichlorobenzidine	0.038 U	0.038 U	0.039 U	0.2 U	0.039 U	0.04 U	0.032 U	0.031 U	0.034 U	0.033 U	0.033 U	0.033 U	0.033 U	0.032 U
3-Nitroaniline	0.01 U	0.01 U	0.01 U	0.054 U	0.01 U	0.011 U	0.0088 U	0.0084 U	0.0093 U	0.0089 U	0.0091 U	0.0091 U	0.009 U	0.0088 U
4,6-Dinitro-2-Methylphenol	0.092 U	0.091 U	0.093 UR	0.48 U	0.093 U	0.095 U	0.059 U	0.057 U	0.063 U	0.06 U	0.062 U	0.061 U	0.061 U	0.06 U
4-Bromophenyl Phenyl Ether	0.011 U	0.011 U	0.011 U	0.057 U	0.011 U	0.011 U	0.0024 U	0.0023 U	0.0026 U	0.0024 U	0.0025 U	0.0025 U	0.0025 U	0.0024 U
4-Chloro-3-Methylphenol	0.015 U	0.015 U	0.015 UR	0.078 U	0.015 U	0.015 U	0.0016 U	0.0016 U	0.0017 U	0.0016 U	0.0017 U	0.0017 U	0.0017 U	0.0016 U
4-Chloroaniline	0.0088 U	0.0088 U	0.0089 U	0.047 U	0.009 U	0.0092 U	0.0011 U	0.0011 U	0.0012 U	0.0012 U	0.0012 U	0.0012 U	0.0012 U	0.0011 U
4-Chlorophenyl Phenyl Ether	0.01 U	0.01 U	0.01 U	0.054 U	0.01 U	0.011 U	0.0021 U	0.002 U	0.0022 U	0.0021 U	0.0022 U	0.0022 U	0.0021 U	0.0021 U
4-Nitroaniline	0.013 U	0.013 U	0.013 U	0.069 U	0.013 U	0.014 U	0.0017 U	0.0016 U	0.0018 U	0.0017 U	0.0017 U	0.0017 U	0.0017 U	0.0017 U
4-Nitrophenol	0.17 U	0.16 U	0.17 UR	0.87 U	0.17 U	0.17 U	0.024 U	0.023 U	0.026 U	0.025 U	0.025 U	0.025 U	0.025 U	0.024 U
Acenaphthene	0.22 J	0.019 J	0.0084 U	4.2	0.0084 U	0.0086 U	0.002 U	0.0019 U	0.0021 U	0.002 U	0.0021 U	0.0021 U	0.002 U	0.002 U
Acenaphthylene	0.0088 U	0.0088 U	0.0089 U	0.059 J	0.009 U	0.0092 U	0.0015 U	0.0014 U	0.0016 U	0.0015 U	0.0016 U	0.0016 U	0.0015 U	0.0015 U
Acetophenone	0.0075 U	0.0074 U	0.0076 U	0.039 U	0.0076 U	0.0078 U	0.0019 U	0.0018 U	0.002 U	0.0019 U	0.0019 U	0.0019 U	0.0019 U	0.0019 U
Anthracene	0.43	0.037 J	0.033 U	5.5	0.033 U	0.034 U	0.0018 U	0.0017 U	0.0019 U	0.0018 U	0.0019 U	0.0018 U	0.0018 U	0.0018 U
Atrazine	0.015 U	0.015 U	0.015 U	0.081 U	0.016 U	0.016 U	0.015 UJ	0.014 UJ	0.016 UJ	0.015 UJ	0.016 UJ	0.016 UJ	0.015 UJ	0.015 UJ
Benzaldehyde	0.026 U	0.026 U	0.026 U	0.14 U	0.027 U	0.027 U	0.0043 UR	0.0041 UR	0.0045 UR	0.0043 UR	0.0044 UR	0.0044 UR	0.0044 UR	0.0043 UR
Benzo(A)Anthracene	2.7	0.26	0.029 U	8	0.039	0.03 U	0.0013 U	0.0012 U	0.0014 U	0.0013 J	0.0014 U	0.0013 U	0.0013 U	0.0013 U
Benzo(A)Pyrene	3.4	0.34	0.012 J	8	0.032 J	0.012 J	0.0015 U	0.0014 U	0.0016 U	0.0015 U	0.0016 U	0.0015 U	0.0015 U	0.0015 U
Benzo(B)Fluoranthene	3.8	0.41	0.032 J	9.4	0.049	0.03 J	0.0017 U	0.0016 U	0.0018 U	0.0017 J	0.0018 U	0.0018 U	0.0017 U	0.0017 U
Benzo(G,H,I)Perylene	3.7	0.33 J	0.02 U	3.9	0.022 J	0.021 U	0.0015 U	0.0014 U	0.0016 U	0.0015 U	0.0015 U	0.0015 U	0.0015 U	0.0015 U
Benzo(K)Fluoranthene	1.7	0.17	0.015 U	3.8	0.018 J	0.016 U	0.0021 U	0.002 U	0.0022 U	0.0021 U	0.0021 U	0.0021 U	0.0021 U	0.0021 U
Benzyl Butyl Phthalate	0.011 U	0.011 U	0.011 U	0.056 U	0.011 U	0.011 U	0.024 U	0.023 U	0.025 U	0.024 U	0.025 U	0.024 U	0.024 U	0.024 U
Biphenyl (Diphenyl)	0.029 U	0.029 U	0.03 U	0.27 J	0.03 U	0.03 U	0.0014 U	0.0014 U	0.0015 U	0.0015 U	0.0015 U	0.0015 U	0.0015 U	0.0014 U
Bis(2-Chloroethoxy) Methane	0.011 U	0.011 U	0.011 U	0.056 U	0.011 U	0.011 U	0.0016 U	0.0016 U	0.0017 U	0.0017 U	0.0017 U	0.0017 U	0.0017 U	0.0016 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.0081 U	0.0081 U	0.0082 U	0.043 U	0.0082 U	0.0084 U	0.0013 U	0.0012 U	0.0013 U	0.0013 U	0.0013 U	0.0013 U	0.0013 U	0.0013 U
Bis(2-Chloroisopropyl) Ether	0.014 U	0.014 U	0.014 U	0.075 U	0.014 U	0.015 U	0.0026 U	0.0024 U	0.0027 U	0.0026 U	0.0027 U	0.0026 U	0.0026 U	0.0026 U
Bis(2-Ethylhexyl) Phthalate	0.091 J	0.013 U	0.014 U	0.071 U	0.014 U	0.014 U	0.037 U	0.035 U	0.039 U	0.037 U	0.038 U	0.038 U	0.038 U	0.037 U
Caprolactam	0.025 U	0.025 U	0.025 UJ	0.13 UJ	0.025 UJ	0.026 UJ	0.022 U	0.021 U	0.024 U	0.023 U	0.023 U	0.023 U	0.023 U	0.022 U
Carbazole	0.47	0.038 J	0.0086 U	2	0.0087 U	0.0089 U	0.0016 U	0.0015 U	0.0017 U	0.0016 U	0.0017 U	0.0017 U	0.0017 U	0.0016 U
Chrysene	3.6	0.36	0.021 J	7.4	0.056 J	0.025 J	0.0014 U	0.0013 U	0.0014 U	0.0035 J	0.0014 U	0.0014 U	0.0014 U	0.0014 U
Dibenz(A,H)Anthracene	0.88 J+	0.07 J+	0.018 U	1.1	0.018 U	0.019 U	0.0015 U	0.0015 U	0.0016 U	0.0016 U	0.0016 U	0.0016 U	0.0016 U	0.0015 U
Dibenzofuran	0.058 J	0.01 U	0.01 U	1.9	0.011 U	0.011 U	0.0015 U	0.0014 U	0.0016 U	0.0015 U	0.0016 U	0.0016 U	0.0015 U	0.0015 U

Table E-2
Summary of Data Used in Risk Assessment
Main Plant Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-129	CFSB-129	CFSB-130	CFSB-130	CFSB-131	CFSB-131	CFSB-154	CFSB-154	CFSB-154	CFSB-155	CFSB-155	CFSB-155	CFSB-156	CFSB-156
Sample Lab IDs	460-114456-46	460-114456-45	460-115731-5	460-115731-6	460-115731-1	460-115731-2	180-77782-56, 460-156361-23	180-77782-57, 460-156361-24	180-77782-58, 460 156361-25	180-77782-53, 460-156361-20	180-77782-54, 460-156361-21	180-77782-55, 460 156361-22	180-77782-50, 460-156361-17	180-77782-51, 460-156361-18
Sample Name	CFSB-129-SO-0.5-2.0	CFSB-129-SO-10-12	CFSB-130-SO-0.5-2	CFSB-130-SO-10-12	CFSB-131-SO-0.5-2	CFSB-131-SO-10-12	CFSB-154-SO-0.5-2.5	CFSB-154-SO-5.5-7.5	CFSB-154-SO-10.5-12.5	CFSB-155-SO-0.5-2.5	CFSB-155-SO-5.5-7.5	CFSB-155-SO-10.5-12.5	CFSB-156-SO-0.5-2.5	CFSB-156-SO-5.5-7.5
Sample Depth	0.5-2 ft	10-12 ft	0.5-2 ft	10-12 ft	0.5-2 ft	10-12 ft	0.5-2.5 ft	5.5-7.5 ft	10.5-12.5 ft	0.5-2.5 ft	5.5-7.5 ft	10.5-12.5 ft	0.5-2.5 ft	5.5-7.5 ft
Chemical	5/24/2016	5/24/2016	6/17/2016	6/17/2016	6/17/2016	6/17/2016	5/15/2018	5/15/2018	5/15/2018	5/15/2018	5/15/2018	5/15/2018	5/15/2018	5/15/2018
Diethyl Phthalate	0.0098 U	0.0097 U	0.0099 U	0.052 U	0.0099 U	0.01 U	0.01 U	0.0099 U	0.011 U	0.01 U	0.011 U	0.011 U	0.011 U	0.01 U
Dimethyl Phthalate	0.01 U	0.0099 U	0.01 U	0.053 U	0.01 U	0.01 U	0.0013 U	0.0012 U	0.0013 U	0.0013 U	0.0013 U	0.0013 U	0.0013 U	0.0013 U
Di-N-Butyl Phthalate	0.01 U	0.01 U	0.037 J	0.054 U	0.024 J	0.011 U	0.015 U	0.014 U	0.016 U	0.015 U	0.016 U	0.016 U	0.015 U	0.015 U
Di-N-Octylphthalate	0.017 U	0.017 U	0.018 U	0.092 U	0.018 U	0.018 U	0.02 U	0.019 U	0.021 U	0.02 U	0.021 U	0.021 U	0.021 U	0.02 U
Fluoranthene	4.8	0.44	0.029 J	25	0.073 J	0.026 J	0.0018 U	0.0017 U	0.0019 U	0.0057 J	0.0019 U	0.0019 U	0.0024 J	0.0018 U
Fluorene	0.13 J	0.011 J	0.0076 U	3.7	0.0076 U	0.0078 U	0.0014 U	0.0013 U	0.0014 U	0.0014 U	0.0014 U	0.0014 U	0.0014 U	0.0014 U
Hexachlorobenzene	0.014 U	0.014 U	0.014 U	0.073 U	0.014 U	0.014 U	0.0025 U	0.0024 U	0.0026 U	0.0025 U	0.0026 U	0.0026 U	0.0025 U	0.0025 U
Hexachlorobutadiene	0.0097 U	0.0096 U	0.0098 U	0.051 U	0.0098 U	0.01 U	0.002 UJ	0.0019 UJ	0.0021 UJ	0.002 UJ	0.0021 UJ	0.0021 UJ	0.0021 UJ	0.002 UJ
Hexachlorocyclopentadiene	0.021 UJ	0.021 UJ	0.022 U	0.11 U	0.022 U	0.022 U	0.0018 UJ	0.0017 UJ	0.0019 UJ	0.0018 UJ	0.0018 UJ	0.0018 UJ	0.0018 UJ	0.0018 UJ
Hexachloroethane	0.013 U	0.013 U	0.013 U	0.066 U	0.013 U	0.013 U	0.0018 U	0.0017 U	0.0019 U	0.0018 U	0.0018 U	0.0018 U	0.0018 U	0.0018 U
Indeno(1,2,3-C,D)Pyrene	3.5 J+	0.31 J+	0.023 U	5	0.023 U	0.024 U	0.0014 U	0.0013 U	0.0015 U	0.0014 U	0.0014 U	0.0014 U	0.0014 U	0.0014 U
Isophorone	0.0074 U	0.0073 U	3	2.1	0.81	1.7	0.0018 U	0.0017 U	0.0019 U	0.0018 U	0.0018 U	0.0018 U	0.0018 U	0.0018 U
Naphthalene	0.031 J	0.0087 U	0.0088 U	1.9	0.0089 U	0.0091 U	0.0013 U	0.0013 U	0.0014 U	0.0014 U	0.0014 U	0.0014 U	0.0014 U	0.0013 U
Nitrobenzene	0.011 U	0.011 U	0.011 U	0.057 U	0.011 U	0.011 U	0.013 U	0.012 U	0.013 U	0.013 U	0.013 U	0.013 U	0.013 U	0.013 U
N-Nitrosodi-N-Propylamine	0.012 U	0.011 U	0.012 U	0.061 U	0.012 U	0.012 U	0.0023 U	0.0022 U	0.0025 U	0.0024 U	0.0024 U	0.0024 U	0.0024 U	0.0023 U
N-Nitrosodiphenylamine	0.031 U	0.031 U	0.031 U	0.16 U	0.032 U	0.032 U	0.011 U	0.011 U	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U	0.011 U
Pentachlorophenol	0.042 U	0.041 U	--	0.22 U	0.042 U	0.043 U	0.055 U	0.053 U	0.059 U	0.056 U	0.058 U	0.057 U	0.057 U	0.055 U
Phenanthrene	2.8	0.24 J	0.016 J	19	0.07 J	0.015 J	0.0019 U	0.0018 U	0.002 U	0.0032 J	0.0019 U	0.0019 U	0.0022 J	0.0019 U
Phenol	0.011 U	0.011 U	0.011 UR	0.059 U	0.011 U	0.012 U	0.01 U	0.01 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.01 U
Pyrene	4.6	0.52	0.027 J	14	0.083 J	0.028 J	0.0016 U	0.0016 U	0.0017 U	0.0044 J	0.0017 U	0.0017 U	0.0017 J	0.0016 U
VOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,1,1-Trichloroethane	0.00033 U	0.00038 U	0.00034 U	0.00028 U	0.00037 U	0.0003 U	0.00025 U	0.00022 U	0.00022 U	0.00021 U	0.00021 U	0.00021 U	0.00025 U	0.00023 U
1,1,2,2-Tetrachloroethane	0.00015 U	0.00017 U	0.00015 U	0.00013 U	0.00017 U	0.00013 U	0.00023 U	0.0002 U	0.0002 U	0.00019 U	0.00019 U	0.00019 U	0.00023 U	0.00021 U
1,1,2-Trichloro-1,2,2-Trifluoroethane	0.00038 U	0.00044 U	0.00039 U	0.00033 U	0.00043 U	0.00035 U	0.00033 UJ	0.00029 UJ	0.00028 UJ	0.00027 UJ	0.00027 UJ	0.00027 UJ	0.00032 U	0.00029 U
1,1,2-Trichloroethane	0.00024 U	0.00028 U	0.00025 U	0.00021 U	0.00028 U	0.00022 U	0.00019 U	0.00017 U	0.00016 U	0.00016 U	0.00016 U	0.00016 U	0.00019 U	0.00017 U
1,1-Dichloroethane	0.00029 U	0.00034 U	0.0003 U	0.00025 U	0.00034 U	0.00027 U	0.00022 U	0.0002 U	0.00019 U	0.00018 U	0.00019 U	0.00018 U	0.00022 U	0.0002 U
1,1-Dichloroethene	0.00035 U	0.00041 U	0.00037 U	0.00031 U	0.0004 U	0.00032 U	0.00024 UJ	0.00021 UJ	0.00021 UJ	0.0002 UJ	0.0002 UJ	0.0002 UJ	0.00024 U	0.00022 U
1,2,3-Trichlorobenzene	0.000094 U	0.00011 U	0.000099 U	0.000082 U	0.00011 U	0.000087 U	0.0002 U	0.00017 U	0.00017 UJ	0.00016 U	0.00016 U	0.00016 U	0.00019 U	0.00018 U
1,2,4-Trichlorobenzene	0.00027 U	0.00032 U	0.00029 U	0.00024 U	0.00032 U	0.00025 U	0.0001 U	0.000088 U	0.000085 UJ	0.000082 U	0.000083 U	0.000082 U	0.000097 U	0.000089 U
1,2-Dibromo-3-Chloropropane	0.0004 U	0.00046 U	0.00042 U	0.00035 U	0.00046 U	0.00037 U	0.0005 U	0.00044 U	0.00043 U	0.00041 U	0.00042 U	0.00041 U	0.00048 U	0.00045 U
1,2-Dibromoethane (Ethylene Dibromide)	0.0001 U	0.00012 U	0.00011 U	0.000089 U	0.00012 U	0.000094 U	0.0002 U	0.00017 U	0.00017 U	0.00016 U	0.00016 U	0.00016 U	0.00019 U	0.00017 U
1,2-Dichlorobenzene	0.00012 U	0.00014 U	0.00013 U	0.0001 U	0.00014 U	0.00011 U	0.00016 U	0.00014 U	0.00013 UJ	0.00013 U	0.00013 U	0.00013 U	0.00015 U	0.00014 U
1,2-Dichloroethane	0.000094 U	0.00011 U	0.000099 U	0.000082 U	0.00011 U	0.000087 U	0.00032 U	0.00028 U	0.00027 U	0.00026 U	0.00027 U	0.00026 U	0.00031 U	0.00029 U
1,2-Dichloropropane	0.00015 U	0.00017 U	0.00015 U	0.00013 U	0.00017 U	0.00013 U	0.00046 U	0.0004 U	0.00039 U	0.00038 U	0.00038 U	0.00038 U	0.00044 U	0.00041 U
1,3-Dichlorobenzene	0.0001 U	0.00012 U	0.00011 U	0.000089 U	0.00012 U	0.000094 U	0.00017 U	0.00015 U	0.00015 UJ	0.00014 U	0.00014 U	0.00014 U	0.00017 U	0.00015 U
1,4-Dichlorobenzene	0.00011 U	0.00013 U	0.00012 U	0.000097 U	0.00013 U	0.0001 U	0.00011 U	0.000095 U	0.000092 UJ	0.000089 U	0.00009 U	0.000089 U	0.00011 U	0.000097 U
2-Hexanone	0.0008 U	0.00093 U	0.00084 U	0.0007 U	0.00093 U	0.00074 U	0.00085 UJ	0.00074 UJ	0.00072 UJ	0.0007 UJ	0.0007 UJ	0.0007 UJ	0.00082 U	0.00076 U
Acetone	0.021	0.0058	0.023 J+	0.065 J+	0.023 J+	0.016 J+	0.022 J-	0.015 J-	0.0035 UJ	0.011 J-	0.013 J-	0.0034 UJ	0.025	0.019
Benzene	0.00031 J	0.00021 J	0.00078 J	0.00061 J	0.00035 J	0.00038 J	0.00037 J	0.00044 J	0.00058 J	0.0018	0.00055 J	0.0011	0.0006 J	0.00081 J
Bromochloromethane	0.00015 U	0.00017 U	0.00015 U	0.00013 U	0.00017 U	0.00013 U	0.0003 UJ	0.00027 UJ	0.00026 UJ	0.00025 UJ	0.00025 UJ	0.00025 UJ	0.0003 U	0.00027 U
Bromodichloromethane	0.00033 U	0.00038 U	0.00034 U	0.00028 U	0.00037 U	0.0003 U	0.00028 U	0.00025 U	0.00024 U	0.00023 U	0.00023 U	0.00023 U	0.00027 U	0.00025 U
Bromoform	0.00011 U	0.00013 U	0.00012 U	0.000097 U	0.00013 U	0.0001 U	0.00046 U	0.00041 U	0.00039 U	0.00038 U	0.00038 U	0.00038 U	0.00045 U	0.00041 U
Bromomethane	0.00027 U	0.00032 U	0.00029 U	0.00064 J	0.00032 U	0.00025 U	0.00051 UJ	0.00045 UJ	0.00044 UJ	0.00042 UJ	0.00043 UJ	0.00042 UJ	0.0005 U	0.00046 U
Carbon Disulfide	0.0006 J	0.00043 U	0.0017	0.0047	0.0017	0.00077 J	0.00032 J-	0.00025 UJ	0.00025 UJ	0.00024 UJ	0.00024 UJ	0.00024 UJ	0.00077 J	0.00054 J
Carbon Tetrachloride	0.00037 U	0.00043 U	0.00039 U	0.00032 U	0.00042 U	0.00034 U	0.0002 U	0.00017 U	0.00017 U	0.00016 U	0.00016 U	0.00016 U	0.00019 U	0.00018 U
Chlorobenzene	0.00012 U	0.00014 U	0.00013 U	0.0001 U	0.00014 U	0.00011 U	0.00019 U	0.00017 U	0.00016 U	0.00016 U	0.00016 U	0.00016 U	0.00019 U	0.00017 U
Chloroethane	0.0003 U	0.00035 U	0.00031 U	0.00026 U	0.00034 U	0.00028 U	0.00057 U	0.0005 U	0.00048 U	0.00047 U	0.00047 U	0.00047 U	0.00055 U	0.00051 U
Chloroform	0.00018 U	0.00021 U	0.00019 U	0.00016 U	0.00021 U	0.00017 U	0.00035 U	0.0003 U	0.00029 U	0.00028 U	0.00029 U	0.00028 U	0.00034 U	0.00031 U
Chloromethane	0.00033 U	0.00038 U	0.00034 UJ	0.0025	0.00037 UJ	0.0003 UJ	0.00047 U	0.00042 U	0.0004 U	0.00039 U	0.00039 U	0.00039 U	0.00046 U	0.00042 U
Cis-1,2-Dichloroethylene	0.00019 U	0.00022 U	0.0002 U	0.00016 U	0.00022 U	0.00017 U	0.00016 UJ	0.00015 UJ	0.00014 UJ	0.00014 UJ	0.00014 UJ	0.00014 UJ	0.00016 U	0.00015 U
Cis-1,3-Dichloropropene	0.00013 U	0.00015 U	0.00013 U	0.00011 U	0.00015 U	0.00012 U	0.0003 U	0.00026 U	0.00025 U	0.00024 U	0.00025 U	0.00024 U	0.00029 U	0.00026 U
Cyclohexane	0.00067 J	0.00045 U	0.00041 U	0.00097	0.00045 U	0.00083	0.00071 J-	0.00084 J-	0.00098 J-	0.0018 J-	0.00066 J-	0.0016 J-	0.0011	0.0017
Dibromochloromethane	0.00013 U	0.00015 U	0.00013 U	0.00011 U	0.00015 U	0.00012 U	0.00021 U	0.00019 U	0.00018 U	0.00017 U	0.00018 U	0.00017 U	0.0002 U	0.00019 U
Dichlorodifluoromethane	0.00027 U	0.00032 U	0.00029 U	0.00024 U	0.00032 U	0.00025 U	0.00037 UJ	0.00032 UJ	0.00031 UJ	0.0003 UJ	0.00031 UJ	0.0003 UJ	0.00036 UJ	0.00033 UJ
Ethylbenzene	0.00017 J	0.00018 U	0.00036 J	0.00033 J	0.00018 U	0.00044 J	0.00022 U	0.00027 J	0.00056 J	0.0021	0.00027 J	0.0014	0.00053 J	0.00088 J
Isopropylbenzene (Cumene)	0.00015 U	0.00017 U	0.00015 U	0.00013 U	0.00017 U	0.00013 U	0.00014 U	0.00012 U	0.00012 UJ	0.00024 J	0.00011 U	0.00016 J	0.00013 U	0.00012 U
M,P-Xylene	0.0005 J	0.00061 J	0.00033 J	0.00097	0.00011 U	0.0015	0.00059 J	0.00085 J	0.002	0.0044	0.001	0.0025	0.0017	0.0029

Table E-2
Summary of Data Used in Risk Assessment
Main Plant Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-129	CFSB-129	CFSB-130	CFSB-130	CFSB-131	CFSB-131	CFSB-154	CFSB-154	CFSB-154	CFSB-155	CFSB-155	CFSB-155	CFSB-156	CFSB-156
Sample Lab IDs	460-114456-46	460-114456-45	460-115731-5	460-115731-6	460-115731-1	460-115731-2	180-77782-56, 460-156361-23	180-77782-57, 460-156361-24	180-77782-58, 460-156361-25	180-77782-53, 460-156361-20	180-77782-54, 460-156361-21	180-77782-55, 460-156361-22	180-77782-50, 460-156361-17	180-77782-51, 460-156361-18
Sample Name	CFSB-129-SO-0.5-2.0	CFSB-129-SO-10-12	CFSB-130-SO-0.5-2	CFSB-130-SO-10-12	CFSB-131-SO-0.5-2	CFSB-131-SO-10-12	CFSB-154-SO-0.5-2.5	CFSB-154-SO-5.5-7.5	CFSB-154-SO-10.5-12.5	CFSB-155-SO-0.5-2.5	CFSB-155-SO-5.5-7.5	CFSB-155-SO-10.5-12.5	CFSB-156-SO-0.5-2.5	CFSB-156-SO-5.5-7.5
Sample Depth	0.5-2 ft	10-12 ft	0.5-2 ft	10-12 ft	0.5-2 ft	10-12 ft	0.5-2.5 ft	5.5-7.5 ft	10.5-12.5 ft	0.5-2.5 ft	5.5-7.5 ft	10.5-12.5 ft	0.5-2.5 ft	5.5-7.5 ft
Chemical	5/24/2016	5/24/2016	6/17/2016	6/17/2016	6/17/2016	6/17/2016	5/15/2018	5/15/2018	5/15/2018	5/15/2018	5/15/2018	5/15/2018	5/15/2018	5/15/2018
Methyl Acetate	0.00077 U	0.00089 U	0.00081 U	0.00067 U	0.00089 U	0.00071 U	0.0047 U	0.0041 U	0.004 U	0.0038 U	0.0039 U	0.0038 U	0.0045 U	0.0042 U
Methyl Ethyl Ketone (2-Butanone)	0.00066 U	0.00076 U	0.0037 J	0.0054	0.0025 J	0.0016 J	0.0012 UJ	0.0011 UJ	0.001 UJ	0.00099 UJ	0.001 UJ	0.00099 UJ	0.0028 J	0.0017 J
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	0.0019 U	0.0022 U	0.002 U	0.0017 U	0.0022 U	0.0017 U	0.00072 UJ	0.00063 UJ	0.00061 UJ	0.00059 UJ	0.0006 UJ	0.00059 UJ	0.0007 U	0.00064 U
Methylcyclohexane	0.0013	0.00073 J	0.00045 U	0.001	0.00049 U	0.0013	0.00096 J-	0.0013 J-	0.002 J-	0.0035 J-	0.0012 J-	0.003 J-	0.0025	0.0039
Methylene Chloride	0.00027 U	0.00059 J	0.00029 U	0.00024 U	0.00032 U	0.00025 U	0.0012 J-	0.00018 J-	0.00015 UJ	0.00015 UJ	0.00015 UJ	0.00015 UJ	0.00017 U	0.00016 U
O-Xylene (1,2-Dimethylbenzene)	0.00015 J	0.00023 J	0.00018 J	0.00037 J	0.00016 U	0.00072 J	0.0002 J	0.0003 J	0.00065 J	0.0017	0.00028 J	0.00098	0.00053 J	0.001
Styrene	0.00013 U	0.00015 U	0.00013 U	0.00011 U	0.00015 U	0.00012 U	0.00013 U	0.00012 U	0.00011 U	0.00011 U	0.00011 U	0.00011 U	0.00013 U	0.00012 U
Tert-Butyl Methyl Ether	0.00015 U	0.00017 U	0.00015 U	0.00013 U	0.00017 U	0.00013 U	0.00014 UJ	0.00012 UJ	0.00012 UJ	0.00011 UJ	0.00011 UJ	0.00011 UJ	0.00013 U	0.00012 U
Tetrachloroethylene (PCE)	0.00024 U	0.00028 U	0.00025 U	0.00021 U	0.00028 U	0.00022 U	0.00016 U	0.00014 U	0.00013 U	0.00013 U	0.00013 U	0.00013 U	0.00015 U	0.00014 U
Toluene	0.0011	0.00096 J	0.00094	0.0015	0.00043 J	0.0015	0.0012	0.0017	0.0027	0.0072	0.0015	0.0053	0.0025	0.0042
Trans-1,2-Dichloroethene	0.00033 U	0.00039 U	0.00035 U	0.00029 U	0.00038 U	0.00031 U	0.00027 UJ	0.00023 UJ	0.00023 UJ	0.00022 UJ	0.00022 UJ	0.00022 UJ	0.00026 U	0.00024 U
Trans-1,3-Dichloropropene	0.000086 U	0.000099 U	0.00009 U	0.000074 U	0.000099 U	0.000079 U	0.00029 U	0.00025 U	0.00025 U	0.00024 U	0.00024 U	0.00024 U	0.00028 U	0.00026 U
Trichloroethylene (TCE)	0.00022 U	0.00026 U	0.00023 U	0.00019 U	0.00026 U	0.0002 U	0.00016 UJ	0.00014 UJ	0.00013 UJ	0.00013 UJ	0.00013 UJ	0.00013 UJ	0.00015 U	0.00014 U
Trichlorofluoromethane	0.00029 U	0.00034 U	0.0003 U	0.00025 U	0.00034 U	0.00027 U	0.00044 UJ	0.00039 UJ	0.00038 UJ	0.00036 UJ	0.00037 UJ	0.00036 UJ	0.00043 U	0.00039 U
Vinyl Chloride	0.00033 U	0.00039 U	0.00035 U	0.00029 U	0.00038 U	0.00031 U	0.00059 U	0.00052 U	0.0005 U	0.00049 U	0.00049 U	0.00049 U	0.00057 U	0.00053 U

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-2
Summary of Data Used in Risk Assessment
Main Plant Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-156	CFSB-157	CFSB-157-DUP	CFSB-157	CFSB-157	CFSB-158	CFSB-158	CFSB-158	CFSB-161	CFSB-161	CFSB-161	CFSB-162	CFSB-162	CFSB-167
Sample Lab IDs	180-77782-52, 460-156361-19	180-77782-28, 460-156162-45	180-77782-29, 460-156162-46	180-77782-30, 460-156162-47	180-77782-31, 460-156162-48	180-77782-19, 460-156162-36	180-77782-20, 460-156162-37	180-77782-21, 460-156162-38	180-77782-22, 460-156162-39	180-77782-23, 460-156162-40	180-77782-24, 460-156162-41	180-77782-25, 460-156162-42	180-77782-26, 460-156162-43	180-77782-47, 460-156361-14
Sample Name	CFSB-156-SO-10.5-12.5	CFSB-157-SO-0.5-2.5	CFSB-DUP36-SO	CFSB-157-SO-5.5-7.5	CFSB-157-SO-10.5-12.5	CFSB-158-SO-0.5-2.5	CFSB-158-SO-5.5-7.5	CFSB-158-SO-10.5-12.5	CFSB-161-SO-0.5-2.5	CFSB-161-SO-5.5-7.5	CFSB-161-SO-10.5-12.5	CFSB-162-SO-0.5-2.5	CFSB-162-SO-5.5-7.5	CFSB-167-SO-1-3
Sample Depth	10.5-12.5 ft	0.5-2.5 ft	0.5-2.5 ft	5.5-7.5 ft	10.5-12.5 ft	1.5-2.5 ft	5.5-7.5 ft	10.5-12.5 ft	0.5-2.5 ft	5.5-7.5 ft	10.5-12.5 ft	0.5-2.5 ft	5.5-7.5 ft	1-3 ft
Chemical	5/15/2018	5/12/2018	5/12/2018	5/12/2018	5/12/2018	5/12/2018	5/12/2018	5/12/2018	5/12/2018	5/12/2018	5/12/2018	5/12/2018	5/12/2018	5/15/2018
GENERAL CHEMISTRY (mg/kg)														
Fluoride	0.73 J+	0.71 J	3.11 J	1.23	0.71 J	24.3 J+	0.16 U	4.64 J+	9.37 J+	0.95 J+	1.32 J+	0.72 J	0.87	0.63 J+
Cyanide	0.096 J-	0.063 U	0.061 U	0.064 UJ	0.064 J-	0.064 U	0.057 U	0.056 U	0.056 U	0.062 U	0.055 U	0.065 UJ	0.058 UJ	0.22 J-
METALS (mg/kg)														
"Chromium, Hexavalent - Estimated"	0.240876	0.23017	0.235523	0.23017	0.2382	0.294404	0.208759	9.71533	0.179319	0.543309	0.246229	0.179319	0.165937	0.206083
"Chromium, Trivalent - Calculated"	--	--	--	--	--	--	--	--	--	--	--	--	--	--
"Chromium, Trivalent - Estimated"	8.75912	8.36983	8.56448	8.36983	8.6618	10.7056	7.59124	353.285	6.52068	19.7567	8.95377	6.52068	6.03406	7.49392
Aluminum	6060	10400	10500	7420	7850	7700	6690	7100	5870	7490	9460	6120	5640	6620
Antimony	0.28 UJ	0.31 UJ	0.31 UJ	0.28 UJ	0.29 UJ	0.3 UJ	0.26 UJ	0.29 UJ	0.3 UJ	0.29 UJ	0.3 UJ	0.29 UJ	0.3 UJ	0.29 UJ
Arsenic	2.8	5.8 J+	6.3 J+	3.9 J+	4.4 J	4.7 J	3.6 J	6.3 J	3 J	4 J	4.6 J+	3.6 J+	2.4 J+	4.2
Barium	71.1	83.7 J	84.9 J	46.4 J	80.7	60.2	48.4	67.5	65.2	97.3	76.4 J	61.1 J	63 J	55.5
Beryllium	0.29 J	0.42	0.37 J	0.29 J	0.32 J	0.4	0.3 J	0.34 J	0.29 J	0.39	0.3 J	0.32 J	0.27 J	0.31 J
Cadmium	0.32 U	0.36 U	0.35 U	0.33 U	0.33 U	0.34 U	0.29 U	0.33 U	0.34 U	0.33 U	0.35 U	0.34 U	0.34 U	0.33 U
Calcium	30400	47200	40400	26700	29300	40300	33100	68500	35600	42100	32600	33600	26800	40500
Chromium, Total	9	8.6	8.8	8.6	8.9	11	7.8	363	6.7	20.3	9.2	6.7	6.2	7.7
Cobalt	4.5	4.8 J+	5.2 J+	6.1 J+	5	5.8	4.5	8.7	4	5.2	5.8 J+	4.3 J+	3.9 J+	5
Copper	9.6 J+	13.4 J	15.7 J	11.8 J	11.3	22.4	10.2	66	12.9	17.3	14 J	13.2 J	9.6 J	11.7 J+
Iron	11900	13000	13700	13100	13500	14800	11500	43800	10600	14900	13900	9840	9390	11900
Lead	3.9 J	8.6	9.9	4.9	9 J+	6.9 J+	4.4 J+	5 J+	4.6 J+	5.9 J+	7.5	7	3.7	5.4 J
Magnesium	9670	10700	10600	9490	12400	11800	9640	11600	10700	12000	13800	10100	9800	10400
Manganese	280	386	361	284	451	339	261	599	491	365	368	286	214	303
Mercury	0.012 J+	0.02	0.024	0.01 J	0.01 U	0.015 J	0.0093 U	0.0094 J	0.012 J	0.0099 U	0.011 J	0.013 J	0.01 J	0.018 J+
Nickel	8.5	10.3	10.9	9.4	10	12.2	8.7	64.6	8.3	11	11.8	8.3	7.6	8.8
Potassium	638	862	960	604	706	711	493	836	484	890	702	577	574	569
Selenium	0.27 U	0.31 U	0.3 U	0.28 U	0.29 U	0.29 U	0.25 U	0.29 U	0.29 U	0.28 U	0.3 U	0.29 U	0.3 U	0.29 U
Silver	0.59 U	0.66 U	0.65 U	0.6 U	0.62 U	0.62 U	0.54 U	0.61 U	0.63 U	0.61 U	0.64 U	0.62 U	0.63 U	0.61 U
Sodium	29.7 UR	49.1 J	56.5 J	30.4 U	31.2 U	149	57.6 J	80 J	92.7 J	74.3 J	32.5 U	41.5 J	47.8 J	32.4 J-
Thallium	0.12 U	0.13 U	0.13 U	0.12 U	0.12 U	0.13 U	0.11 U	0.12 U	0.13 U	0.12 U	0.13 U	0.13 U	0.13 U	0.12 U
Vanadium	6.9	7.5	7.1	9.1	7.3	7.1	7.5	8.8	6.6	9.9	6.9	6.5	6.6	7.6
Zinc	25.7	38	41.6	31.2	34.3	37	29.1	27.4	26.1	37.1	39.2	28.5	23.9	29.9
METALS|HEXAVALENT CHROMIUM (mg/kg)														
Chromium, Hexavalent	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PESTICIDES (mg/kg)														
Aldrin	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Alpha Bhc (Alpha Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Alpha Endosulfan	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Beta Bhc (Beta Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Beta Endosulfan	--	--	--	--	--	--	--	--	--	--	--	--	--	--
cis-Chlordane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Delta BHC (Delta Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dieldrin	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endosulfan Sulfate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin Aldehyde	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin Ketone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Gamma Bhc (Lindane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Heptachlor	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Heptachlor Epoxide	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methoxychlor	--	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDD	--	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDT	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Toxaphene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
trans-Chlordane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
POLYCHLORINATED BIPHENYLS (mg/kg)														
PCB-1016 (Aroclor 1016)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1221 (Aroclor 1221)	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Table E-2
Summary of Data Used in Risk Assessment
Main Plant Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-156	CFSB-157	CFSB-157-DUP	CFSB-157	CFSB-157	CFSB-158	CFSB-158	CFSB-158	CFSB-161	CFSB-161	CFSB-161	CFSB-162	CFSB-162	CFSB-167
Sample Lab IDs	180-77782-52, 460-156361-19	180-77782-28, 460-156162-45	180-77782-29, 460-156162-46	180-77782-30, 460-156162-47	180-77782-31, 460-156162-48	180-77782-19, 460-156162-36	180-77782-20, 460-156162-37	180-77782-21, 460-156162-38	180-77782-22, 460-156162-39	180-77782-23, 460-156162-40	180-77782-24, 460-156162-41	180-77782-25, 460-156162-42	180-77782-26, 460-156162-43	180-77782-47, 460-156361-14
Sample Name	CFSB-156-SO-10.5-12.5	CFSB-157-SO-0.5-2.5	CFSB-DUP36-SO	CFSB-157-SO-5.5-7.5	CFSB-157-SO-10.5-12.5	CFSB-158-SO-0.5-2.5	CFSB-158-SO-5.5-7.5	CFSB-158-SO-10.5-12.5	CFSB-161-SO-0.5-2.5	CFSB-161-SO-5.5-7.5	CFSB-161-SO-10.5-12.5	CFSB-162-SO-0.5-2.5	CFSB-162-SO-5.5-7.5	CFSB-167-SO-1-3
Sample Depth	10.5-12.5 ft	0.5-2.5 ft	0.5-2.5 ft	5.5-7.5 ft	10.5-12.5 ft	1.5-2.5 ft	5.5-7.5 ft	10.5-12.5 ft	0.5-2.5 ft	5.5-7.5 ft	10.5-12.5 ft	0.5-2.5 ft	5.5-7.5 ft	1-3 ft
Chemical	5/15/2018	5/12/2018	5/12/2018	5/12/2018	5/12/2018	5/12/2018	5/12/2018	5/12/2018	5/12/2018	5/12/2018	5/12/2018	5/12/2018	5/12/2018	5/15/2018
PCB-1232 (Aroclor 1232)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1242 (Aroclor 1242)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1248 (Aroclor 1248)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1254 (Aroclor 1254)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1260 (Aroclor 1260)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1262 (Aroclor 1262)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1268 (Aroclor 1268)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Polychlorinated Biphenyl (PCBs)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SEMIVOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,2,4,5-Tetrachlorobenzene	0.0015 UJ	0.0016 U	0.0016 U	0.0015 U	0.0015 U	0.0015 U	0.0015 U	0.0015 U	0.0015 U	0.0015 U	0.0015 U	0.0015 U	0.0015 U	0.0015 U
1,4-Dioxane (P-Dioxane)	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.01 U	0.011 U	0.011 U	0.011 U	0.011 U
2,3,4,6-Tetrachlorophenol	0.015 U	0.015 U	0.015 U	0.014 U	0.015 U	0.015 U	0.014 U	0.015 U	0.014 U	0.014 U	0.014 U	0.015 U	0.014 U	0.014 U
2,4,5-Trichlorophenol	0.0026 U	0.0026 U	0.0026 U	0.0024 U	0.0025 U	0.0025 U	0.0025 U	0.0025 U	0.0024 U	0.0024 U	0.0024 U	0.0025 U	0.0025 U	0.0025 U
2,4,6-Trichlorophenol	0.002 U	0.002 U	0.002 U	0.0019 U	0.0019 U	0.0019 U	0.0019 U	0.0019 U	0.0019 U	0.0018 U	0.0019 U	0.0019 U	0.0019 U	0.0019 U
2,4-Dichlorophenol	0.0028 U	0.0028 U	0.0028 U	0.0026 U	0.0027 U	0.0027 U	0.0027 U	0.0027 U	0.0026 U	0.0026 U	0.0026 U	0.0027 U	0.0027 U	0.0027 U
2,4-Dimethylphenol	0.0022 U	0.0023 U	0.0023 U	0.0021 U	0.0022 U	0.0022 U	0.0021 U	0.0022 U	0.0021 U	0.0021 U	0.0021 U	0.0022 U	0.0022 U	0.0021 U
2,4-Dinitrophenol	0.096 UJ	0.098 UJ	0.098 UJ	0.091 UJ	0.094 UJ	0.095 UJ	0.093 UJ	0.095 UJ	0.091 UJ	0.091 UJ	0.091 UJ	0.094 UJ	0.093 UJ	0.093 UJ
2,4-Dinitrotoluene	0.0018 U	0.0018 U	0.0018 U	0.0017 U	0.0017 U	0.0018 U	0.0017 U	0.0018 U	0.0017 U	0.0017 U	0.0017 U	0.0017 U	0.0017 U	0.0017 U
2,6-Dinitrotoluene	0.0022 U	0.0023 U	0.0023 U	0.0021 U	0.0022 U	0.0022 U	0.0021 U	0.0022 U	0.0021 U	0.0021 U	0.0021 U	0.0021 U	0.0021 U	0.0021 U
2-Chloronaphthalene	0.0016 U	0.0017 U	0.0017 U	0.0016 U	0.0016 U	0.0016 U	0.0016 U	0.0016 U	0.0016 U	0.0015 U	0.0016 U	0.0016 U	0.0016 U	0.0016 U
2-Chlorophenol	0.0017 U	0.0017 U	0.0017 U	0.0016 U	0.0016 U	0.0016 U	0.0016 U	0.0016 U	0.0016 U	0.0016 U	0.0016 U	0.0016 U	0.0016 U	0.0016 U
2-Methylnaphthalene	0.0017 U	0.0018 U	0.0017 U	0.0016 U	0.0017 U	0.0017 U	0.0017 U	0.0017 U	0.0016 U	0.0016 U	0.0016 U	0.0017 U	0.0017 U	0.0017 U
2-Methylphenol (O-Cresol)	0.01 U	0.01 U	0.01 U	0.0097 U	0.01 U	0.01 U	0.0099 U	0.01 U	0.0097 U	0.0097 U	0.0097 U	0.01 U	0.01 U	0.0099 U
2-Nitroaniline	0.016 U	0.017 U	0.017 U	0.015 U	0.016 U	0.016 U	0.016 U	0.016 U	0.015 U	0.015 U	0.016 U	0.016 U	0.016 U	0.016 U
2-Nitrophenol	0.002 U	0.0021 U	0.0021 U	0.0019 U	0.002 U	0.002 U	0.002 U	0.002 U	0.0019 U	0.0019 U	0.0019 U	0.002 U	0.002 U	0.002 U
3- And 4- Methylphenol (Total)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3,3'-Dichlorobenzidine	0.033 U	0.034 U	0.034 U	0.032 U	0.033 U	0.033 U	0.032 U	0.033 U	0.032 U	0.031 U	0.032 U	0.032 U	0.032 U	0.032 U
3-Nitroaniline	0.0091 U	0.0093 U	0.0093 U	0.0086 U	0.0089 U	0.009 U	0.0088 U	0.009 U	0.0086 U	0.0086 U	0.0086 U	0.0088 U	0.0088 U	0.0088 U
4,6-Dinitro-2-Methylphenol	0.062 U	0.063 U	0.063 U	0.058 U	0.06 U	0.061 U	0.059 U	0.061 U	0.058 U	0.058 U	0.059 U	0.06 U	0.06 U	0.06 U
4-Bromophenyl Phenyl Ether	0.0025 U	0.0025 U	0.0025 U	0.0024 U	0.0024 U	0.0025 U	0.0024 U	0.0025 U	0.0024 U	0.0024 U	0.0024 U	0.0024 U	0.0024 U	0.0024 U
4-Chloro-3-Methylphenol	0.0017 U	0.0017 U	0.0017 U	0.0016 U	0.0017 U	0.0017 U	0.0016 U	0.0017 U	0.0016 U	0.0016 U	0.0016 U	0.0016 U	0.0016 U	0.0016 U
4-Chloroaniline	0.0012 U	0.0012 U	0.0012 U	0.0011 U	0.0012 U	0.0012 U	0.0011 U	0.0012 U	0.0011 U	0.0011 U	0.0011 U	0.0012 U	0.0012 U	0.0012 U
4-Chlorophenyl Phenyl Ether	0.0022 U	0.0022 U	0.0022 U	0.002 U	0.0021 U	0.0021 U	0.0021 U	0.0021 U	0.0021 U	0.002 U	0.0021 U	0.0021 U	0.0021 U	0.0021 U
4-Nitroaniline	0.0017 U	0.0018 U	0.0018 U	0.0016 U	0.0017 U	0.0017 U	0.0017 U	0.0017 U	0.0016 U	0.0016 U	0.0017 U	0.0017 U	0.0017 U	0.0017 U
4-Nitrophenol	0.025 U	0.026 U	0.026 U	0.024 U	0.025 U	0.025 U	0.024 U	0.025 U	0.024 U	0.024 U	0.024 U	0.024 U	0.024 U	0.024 U
Acenaphthene	0.0021 U	0.0021 U	0.0021 U	0.0019 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.0019 U	0.002 U	0.002 U	0.002 U	0.002 U
Acenaphthylene	0.0016 U	0.0016 U	0.0016 U	0.0015 U	0.0015 U	0.0015 U	0.0015 U	0.0015 U	0.0015 U	0.0015 U	0.0015 U	0.0015 U	0.0015 U	0.0015 U
Acetophenone	0.0019 U	0.002 U	0.002 U	0.0018 U	0.0019 U	0.0019 U	0.0019 U	0.0019 U	0.0018 U	0.0018 U	0.0018 U	0.0019 U	0.0019 U	0.0019 U
Anthracene	0.0019 U	0.0019 U	0.0019 U	0.0018 U	0.0018 U	0.0029 J	0.0018 U	0.0018 U	0.0018 U	0.0017 U	0.0018 U	0.0018 U	0.0018 U	0.0018 U
Atrazine	0.016 UJ	0.016 U	0.016 U	0.015 U	0.015 U	0.015 U	0.015 U	0.015 U	0.015 U	0.015 U	0.015 U	0.015 U	0.015 U	0.015 U
Benzaldehyde	0.0044 UR	0.0045 UR	0.0045 UR	0.0042 UR	0.0044 UR	0.0044 UR	0.0043 UR	0.0044 UR	0.0042 UR	0.0042 UR	0.0042 UR	0.0043 UR	0.0043 UR	0.0043 UR
Benzo(A)Anthracene	0.0014 U	0.036	0.023	0.0013 U	0.0013 U	0.017	0.0013 U	0.02	0.0013 U	0.0013 U	0.0013 U	0.0051 J	0.0013 U	0.0013 U
Benzo(A)Pyrene	0.0016 U	0.0091	0.0067 J	0.0015 U	0.0015 U	0.014	0.0015 U	0.008	0.0015 U	0.0015 U	0.0015 U	0.0026 J	0.0015 U	0.0015 U
Benzo(B)Fluoranthene	0.0018 U	0.045	0.031	0.0017 U	0.0017 U	0.028	0.0017 U	0.028	0.0017 U	0.0017 J	0.0017 U	0.0067 J	0.0017 U	0.0017 U
Benzo(G,H,I)Perylene	0.0015 U	0.013	0.009	0.0015 U	0.0015 U	0.02	0.0015 U	0.0097	0.0025 J	0.0015 U	0.0015 U	0.0039 J	0.0015 U	0.0015 U
Benzo(K)Fluoranthene	0.0021 U	0.016 J	0.0093 J	0.002 U	0.0021 U	0.012	0.0021 U	0.011	0.002 U	0.002 U	0.002 U	0.0036 J	0.0021 U	0.0021 U
Benzyl Butyl Phthalate	0.025 U	0.025 U	0.025 U	0.023 U	0.024 U	0.024 U	0.024 U	0.024 U	0.023 U	0.023 U	0.023 U	0.024 U	0.024 U	0.024 U
Biphenyl (Diphenyl)	0.0015 U	0.0015 U	0.0015 U	0.0014 U	0.0015 U	0.0015 U	0.0014 U	0.0015 U	0.0014 U	0.0014 U	0.0014 U	0.0015 U	0.0015 U	0.0015 U
Bis(2-Chloroethoxy) Methane	0.0017 U	0.0017 U	0.0017 U	0.0016 U	0.0017 U	0.0017 U	0.0016 U	0.0017 U	0.0016 U	0.0016 U	0.0016 U	0.0017 U	0.0017 U	0.0016 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.0013 U	0.0013 U	0.0013 U	0.0012 U	0.0013 U	0.0013 U	0.0012 U	0.0013 U	0.0012 U	0.0012 U	0.0012 U	0.0013 U	0.0013 U	0.0013 U
Bis(2-Chloroisopropyl) Ether	0.0027 U	0.0027 U	0.0027 U	0.0025 UJ	0.0026 U	0.0026 U	0.0026 UJ	0.0026 UJ	0.0025 UJ	0.0025 UJ	0.0025 U	0.0026 U	0.0026 U	0.0026 UJ
Bis(2-Ethylhexyl) Phthalate	0.038 U	0.039 U	0.039 U	0.036 U	0.037 U	2.2	0.037 U	0.038 U	0.036 U	0.036 U	0.036 U	0.037 U	0.037 U	0.037 U
Caprolactam	0.023 U	0.024 U	0.024 U	0.022 U	0.023 U	0.023 U	0.022 U	0.023 U	0.022 U	0.022 U	0.022 U	0.023 U	0.023 U	0.022 U
Carbazole	0.0017 U	0.011	0.0071 J	0.0016 U	0.0016 U	0.0044 J	0.0016 U	0.0054 J	0.0016 U	0.0016 U	0.0016 U	0.0016 U	0.0016 U	0.0016 U
Chrysene	0.0014 U	0.086	0.054	0.0014 J	0.0014 U	0.031	0.0014 U	0.039	0.0014 J	0.0022 J	0.0013 U	0.011	0.0018 J	0.0014 U
Dibenz(A,H)Anthracene	0.0016 U	0.0045 J	0.003 J	0.0015 U	0.0016 U	0.0048 J	0.0015 U	0.0028 J	0.0015 U	0.0015 U	0.0015 U	0.0016 U	0.0016 U	0.0015 U
Dibenzofuran	0.0016 U	0.0016 U	0.0016 U	0.0015 U	0.0015 U	0.0015 U	0.0015 U	0.0015 U	0.0015 U	0.0015 U	0.0015 U	0.0015 U	0.0015 U	0.0015 U

Table E-2
Summary of Data Used in Risk Assessment
Main Plant Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-156	CFSB-157	CFSB-157-DUP	CFSB-157	CFSB-157	CFSB-158	CFSB-158	CFSB-158	CFSB-161	CFSB-161	CFSB-161	CFSB-162	CFSB-162	CFSB-167
Sample Lab IDs	180-77782-52, 460-156361-19	180-77782-28, 460-156162-45	180-77782-29, 460-156162-46	180-77782-30, 460-156162-47	180-77782-31, 460-156162-48	180-77782-19, 460-156162-36	180-77782-20, 460-156162-37	180-77782-21, 460-156162-38	180-77782-22, 460-156162-39	180-77782-23, 460-156162-40	180-77782-24, 460 156162-41	180-77782-25, 460-156162-42	180-77782-26, 460-156162-43	180-77782-47, 460-156361-14
Sample Name	CFSB-156-SO-10.5-12.5	CFSB-157-SO-0.5-2.5	CFSB-DUP36-SO	CFSB-157-SO-5.5-7.5	CFSB-157-SO-10.5-12.5	CFSB-158-SO-0.5-2.5	CFSB-158-SO-5.5-7.5	CFSB-158-SO-10.5-12.5	CFSB-161-SO-0.5-2.5	CFSB-161-SO-5.5-7.5	CFSB-161-SO-10.5-12.5	CFSB-162-SO-0.5-2.5	CFSB-162-SO-5.5-7.5	CFSB-167-SO-1-3
Sample Depth	10.5-12.5 ft	0.5-2.5 ft	0.5-2.5 ft	5.5-7.5 ft	10.5-12.5 ft	1.5-2.5 ft	5.5-7.5 ft	10.5-12.5 ft	0.5-2.5 ft	5.5-7.5 ft	10.5-12.5 ft	0.5-2.5 ft	5.5-7.5 ft	1-3 ft
Chemical	5/15/2018	5/12/2018	5/12/2018	5/12/2018	5/12/2018	5/12/2018	5/12/2018	5/12/2018	5/12/2018	5/12/2018	5/12/2018	5/12/2018	5/12/2018	5/15/2018
Diethyl Phthalate	0.011 U	0.011 U	0.011 U	0.01 U	0.011 U	0.011 U	0.01 U	0.011 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Dimethyl Phthalate	0.0013 U	0.0013 U	0.0013 U	0.0012 U	0.0013 U	0.0013 U	0.0012 U	0.0013 U	0.0012 U	0.0012 U	0.0012 U	0.0013 U	0.0013 U	0.0013 U
Di-N-Butyl Phthalate	0.016 U	0.016 U	0.016 U	0.015 U	0.015 U	0.015 U	0.015 U	0.015 U	0.015 U	0.015 U	0.015 U	0.015 U	0.015 U	0.015 U
Di-N-Octylphthalate	0.021 U	0.021 U	0.021 U	0.02 U	0.02 U	0.021 U	0.02 U	0.021 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
Fluoranthene	0.0019 U	0.12	0.073	0.0023 J	0.0018 U	0.049	0.0018 U	0.081	0.0029 J	0.0071	0.0018 U	0.015	0.0019 J	0.0018 U
Fluorene	0.0014 U	0.0014 U	0.0014 U	0.0013 U	0.0014 U	0.0014 U	0.0014 U	0.0014 U	0.0013 U	0.0013 U	0.0013 U	0.0014 U	0.0014 U	0.0014 U
Hexachlorobenzene	0.0026 U	0.0026 U	0.0026 U	0.0024 U	0.0025 U	0.0025 U	0.0025 U	0.0025 U	0.0024 U	0.0024 U	0.0024 U	0.0025 U	0.0025 U	0.0025 U
Hexachlorobutadiene	0.0021 UJ	0.0021 U	0.0021 U	0.002 U	0.002 U	0.0021 U	0.002 U	0.0021 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U
Hexachlorocyclopentadiene	0.0018 UJ	0.0019 U	0.0019 U	0.0017 U	0.0018 U	0.0018 U	0.0018 U	0.0018 U	0.0017 U	0.0017 U	0.0017 U	0.0018 U	0.0018 U	0.0018 U
Hexachloroethane	0.0018 U	0.0019 U	0.0019 U	0.0017 U	0.0018 U	0.0018 U	0.0018 U	0.0018 U	0.0017 U	0.0017 U	0.0018 U	0.0018 U	0.0018 U	0.0018 U
Indeno(1,2,3-C,D)Pyrene	0.0014 U	0.013	0.0082	0.0014 U	0.0014 U	0.019	0.0014 U	0.0078	0.0014 U	0.0014 U	0.0014 U	0.0031 J	0.0014 U	0.0014 U
Isophorone	0.0018 U	0.0019 U	0.0019 U	0.0017 U	0.0018 U	0.0018 U	0.0018 U	0.0018 U	0.0017 U	0.0017 U	0.0017 U	0.0018 U	0.0018 U	0.0018 U
Naphthalene	0.0014 U	0.0014 U	0.0014 U	0.0013 U	0.0014 U	0.0014 U	0.0013 U	0.0014 U	0.0013 U	0.0013 U	0.0013 U	0.0014 U	0.0014 U	0.0013 U
Nitrobenzene	0.013 U	0.013 U	0.013 U	0.012 U	0.013 U	0.013 U	0.013 U	0.013 U	0.012 U	0.012 U	0.012 U	0.013 U	0.013 U	0.013 U
N-Nitrosodi-N-Propylamine	0.0024 U	0.0025 U	0.0025 U	0.0023 U	0.0024 U	0.0024 U	0.0023 U	0.0024 U	0.0023 U	0.0023 U	0.0023 U	0.0024 U	0.0024 U	0.0023 U
N-Nitrosodiphenylamine	0.012 U	0.012 U	0.012 U	0.011 U	0.012 U	0.012 U	0.011 U	0.012 U	0.011 U	0.011 U	0.011 U	0.012 U	0.012 U	0.012 U
Pentachlorophenol	0.058 U	0.059 U	0.059 U	0.054 UJ	0.056 U	0.057 U	0.055 UJ	0.057 UJ	0.054 UJ	0.054 UJ	0.055 U	0.056 U	0.056 U	0.056 UJ
Phenanthrene	0.0019 U	0.023	0.014	0.0018 U	0.0019 U	0.021	0.0018 U	0.017	0.0021 J	0.0045 J	0.0018 U	0.0035 J	0.0019 U	0.0019 U
Phenol	0.011 U	0.011 U	0.011 U	0.01 U	0.011 U	0.011 U	0.01 U	0.011 U	0.01 U	0.01 U	0.01 U	0.011 U	0.011 U	0.01 U
Pyrene	0.0017 U	0.12	0.077	0.0016 U	0.0017 U	0.049	0.0016 U	0.072	0.002 J	0.0037 J	0.0016 U	0.017	0.002 J	0.0016 U
VOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,1,1-Trichloroethane	0.00025 U	0.00022 U	0.00021 U	0.00023 U	0.00018 UJ	0.0002 U	0.0002 U	0.00018 U	0.00022 U	0.00021 U	0.00013 U	0.00012 U	0.00026 U	0.00023 U
1,1,2,2-Tetrachloroethane	0.00023 U	0.0002 U	0.00019 U	0.00021 U	0.00016 U	0.00018 U	0.00018 U	0.00017 U	0.0002 U	0.00019 U	0.00012 U	0.00011 U	0.00023 U	0.00021 U
1,1,2-Trichloro-1,2,2-Trifluoroethane	0.00032 U	0.00028 UJ	0.00027 UJ	0.00029 UJ	0.00023 UJ	0.00025 UJ	0.00025 UJ	0.00024 UJ	0.00028 UJ	0.00027 UJ	0.00017 UJ	0.00015 UJ	0.00033 UJ	0.00029 U
1,1,2-Trichloroethane	0.00019 U	0.00016 U	0.00016 U	0.00017 U	0.00014 U	0.00015 U	0.00015 U	0.00014 U	0.00017 U	0.00016 U	0.0001 U	0.00009 U	0.0002 U	0.00017 U
1,1-Dichloroethane	0.00022 U	0.00019 U	0.00018 U	0.0002 U	0.00016 UJ	0.00017 U	0.00017 U	0.00016 U	0.00019 U	0.00019 U	0.00012 U	0.0001 U	0.00023 U	0.0002 U
1,1-Dichloroethene	0.00024 U	0.00021 UJ	0.0002 UJ	0.00022 UJ	0.00017 UJ	0.00019 UJ	0.00019 UJ	0.00018 UJ	0.00021 UJ	0.0002 UJ	0.00013 UJ	0.00011 UJ	0.00025 UJ	0.00022 U
1,2,3-Trichlorobenzene	0.00019 U	0.00017 U	0.00016 U	0.00018 U	0.00014 U	0.00015 U	0.00015 U	0.00014 U	0.00017 U	0.00016 U	0.0001 U	0.000091 U	0.0002 U	0.00018 U
1,2,4-Trichlorobenzene	0.000097 U	0.000085 U	0.000082 U	0.00009 U	0.00007 UJ	0.000078 U	0.000078 U	0.000073 U	0.000086 U	0.000083 U	0.000052 U	0.000046 U	0.0001 U	0.00009 U
1,2-Dibromo-3-Chloropropane	0.00048 U	0.00043 U	0.00041 U	0.00045 U	0.00035 U	0.00039 U	0.00039 U	0.00037 U	0.00043 U	0.00041 U	0.00026 U	0.00023 U	0.0005 U	0.00045 U
1,2-Dibromoethane (Ethylene Dibromide)	0.00019 U	0.00017 U	0.00016 U	0.00018 U	0.00014 U	0.00015 U	0.00015 U	0.00014 U	0.00017 U	0.00016 U	0.0001 U	0.000091 U	0.0002 U	0.00018 U
1,2-Dichlorobenzene	0.00015 U	0.00013 U	0.00013 U	0.00014 U	0.00011 UJ	0.00012 U	0.00012 U	0.00011 U	0.00013 U	0.00013 U	0.000081 U	0.000073 U	0.00016 U	0.00014 U
1,2-Dichloroethane	0.00031 U	0.00027 U	0.00027 U	0.00029 U	0.00022 U	0.00025 U	0.00025 U	0.00024 U	0.00028 U	0.00027 U	0.00017 U	0.00015 U	0.00032 U	0.00029 U
1,2-Dichloropropane	0.00045 U	0.00039 U	0.00038 U	0.00041 U	0.00032 UJ	0.00036 U	0.00036 U	0.00034 U	0.00039 U	0.00038 U	0.00024 U	0.00021 U	0.00046 U	0.00041 U
1,3-Dichlorobenzene	0.00017 U	0.00015 U	0.00014 U	0.00016 U	0.00012 UJ	0.00013 U	0.00013 U	0.00013 U	0.00015 U	0.00014 U	0.00009 U	0.00008 U	0.00017 U	0.00016 U
1,4-Dichlorobenzene	0.00011 U	0.000093 U	0.00009 U	0.000098 U	0.000076 UJ	0.000085 U	0.000084 U	0.000079 U	0.000093 U	0.00009 U	0.000056 U	0.000051 U	0.00011 U	0.000098 U
2-Hexanone	0.00082 U	0.00072 U	0.0007 U	0.00076 U	0.00059 UJ	0.00066 U	0.00066 U	0.00062 U	0.00073 U	0.0007 U	0.00044 U	0.00039 U	0.00085 UJ	0.00076 U
Acetone	0.02	0.015 J-	0.019 J-	0.011 J-	0.0079 J-	0.01 J-	0.0032 UJ	0.003 UJ	0.0035 UJ	0.0092 J-	0.0021 UJ	0.006 J-	0.015 J-	0.016
Benzene	0.00078 J	0.00024 U	0.00023 U	0.00056 J	0.0002 U	0.00022 J	0.00046 J	0.0012	0.00044 J	0.00063 J	0.00015 U	0.00018 J	0.0009 J	0.00069 J
Bromochloromethane	0.0003 U	0.00026 UJ	0.00025 UJ	0.00027 UJ	0.00021 UJ	0.00024 UJ	0.00024 UJ	0.00022 UJ	0.00026 UJ	0.00025 UJ	0.00016 UJ	0.00014 UJ	0.00031 UJ	0.00027 U
Bromodichloromethane	0.00027 U	0.00024 U	0.00023 U	0.00025 U	0.0002 U	0.00022 U	0.00022 U	0.0002 U	0.00024 U	0.00023 U	0.00014 U	0.00013 U	0.00028 U	0.00025 U
Bromoform	0.00045 U	0.00039 U	0.00038 U	0.00041 U	0.00032 U	0.00036 U	0.00036 U	0.00034 U	0.0004 U	0.00038 U	0.00024 U	0.00021 U	0.00047 U	0.00041 U
Bromomethane	0.0005 U	0.00044 UJ	0.00042 UJ	0.00046 UJ	0.00036 UJ	0.0004 UJ	0.0004 UJ	0.00038 UJ	0.00044 UJ	0.00043 UJ	0.00027 UJ	0.00024 UJ	0.00052 UJ	0.00046 U
Carbon Disulfide	0.00092 J	0.00026 J	0.00027 J	0.00026 U	0.0002 UJ	0.00024 J	0.00022 U	0.00074 J	0.00025 U	0.00061 J	0.00015 U	0.00013 U	0.00029 UJ	0.00026 U
Carbon Tetrachloride	0.00019 U	0.00017 U	0.00016 U	0.00018 U	0.00014 UJ	0.00015 U	0.00015 U	0.00014 U	0.00017 U	0.00016 U	0.0001 U	0.000091 U	0.0002 U	0.00018 U
Chlorobenzene	0.00019 U	0.00016 U	0.00016 U	0.00017 U	0.00013 UJ	0.00015 U	0.00015 U	0.00014 U	0.00016 U	0.00016 U	0.0001 U	0.000089 U	0.00019 U	0.00017 U
Chloroethane	0.00055 U	0.00048 U	0.00047 U	0.00051 U	0.0004 U	0.00044 U	0.00044 U	0.00041 U	0.00049 U	0.00047 U	0.00029 U	0.00026 U	0.00057 U	0.00051 U
Chloroform	0.00034 U	0.0003 U	0.00029 U	0.00031 U	0.00024 UJ	0.00027 U	0.00027 U	0.00025 U	0.0003 U	0.00029 U	0.00018 U	0.00016 U	0.00035 U	0.00031 U
Chloromethane	0.00046 U	0.0004 U	0.00039 U	0.00042 U	0.00033 U	0.00037 U	0.00037 U	0.00035 U	0.0004 U	0.00039 U	0.00025 U	0.00022 U	0.00048 U	0.00042 U
Cis-1,2-Dichloroethylene	0.00016 U	0.00014 U	0.00014 U	0.00015 U	0.00012 UJ	0.00013 U	0.00013 U	0.00012 U	0.00014 U	0.00014 U	0.000086 U	0.000077 U	0.00017 UJ	0.00015 U
Cis-1,3-Dichloropropene	0.00029 U	0.00025 U	0.00024 U	0.00027 U	0.00021 U	0.00023 U	0.00023 U	0.00022 U	0.00025 U	0.00025 U	0.00015 U	0.00014 U	0.0003 U	0.00027 U
Cyclohexane	0.0014	0.0002 U	0.0002 U	0.001	0.00046 J-	0.00059 J	0.00092	0.00018 U	0.00093	0.001	0.00035 J	0.00035 J	0.0011 J-	0.0012
Dibromochloromethane	0.0002 U	0.00018 U	0.00017 U	0.00019 U	0.00015 UJ	0.00016 U	0.00016 U	0.00015 U	0.00018 U	0.00017 U	0.00011 U	0.000098 U	0.00021 U	0.00019 U
Dichlorodifluoromethane	0.00036 UJ	0.00031 UJ	0.0003 UJ	0.00033 UJ	0.00026 UJ	0.00029 UJ	0.00029 UJ	0.00027 UJ	0.00031 UJ	0.0003 UJ	0.00019 UJ	0.00017 UJ	0.00037 UJ	0.00033 UJ
Ethylbenzene	0.00065 J	0.00018 U	0.00018 U	0.00048 J	0.00015 UJ	0.00017 U	0.00045 J	0.00046 J	0.00044 J	0.00053 J	0.00011 U	0.00011 J	0.0004 J	0.0008 J
Isopropylbenzene (Cumene)	0.00013 U	0.00012 U	0.00011 U	0.00012 U	0.000096 UJ	0.00011 U	0.00011 U	0.0001 U	0.00012 U	0.00011 U	0.000071 U	0.000064 U	0.00014 U	0.00012 U
M,P-Xylene	0.0022	0.00016 U	0.00018 J	0.0016	0.0003 J-	0.00049 J	0.0015	0.0012	0.0014	0.0016	0.00029 J	0.00041 J	0.0016	0.0026

Table E-2
Summary of Data Used in Risk Assessment
Main Plant Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-156	CFSB-157	CFSB-157-DUP	CFSB-157	CFSB-157	CFSB-158	CFSB-158	CFSB-158	CFSB-161	CFSB-161	CFSB-161	CFSB-162	CFSB-162	CFSB-167
Sample Lab IDs	180-77782-52, 460-156361-19	180-77782-28, 460-156162-45	180-77782-29, 460-156162-46	180-77782-30, 460-156162-47	180-77782-31, 460-156162-48	180-77782-19, 460-156162-36	180-77782-20, 460-156162-37	180-77782-21, 460-156162-38	180-77782-22, 460-156162-39	180-77782-23, 460-156162-40	180-77782-24, 460 156162-41	180-77782-25, 460-156162-42	180-77782-26, 460-156162-43	180-77782-47, 460-156361-14
Sample Name	CFSB-156-SO-10.5-12.5	CFSB-157-SO-0.5-2.5	CFSB-DUP36-SO	CFSB-157-SO-5.5-7.5	CFSB-157-SO-10.5-12.5	CFSB-158-SO-0.5-2.5	CFSB-158-SO-5.5-7.5	CFSB-158-SO-10.5-12.5	CFSB-161-SO-0.5-2.5	CFSB-161-SO-5.5-7.5	CFSB-161-SO-10.5-12.5	CFSB-162-SO-0.5-2.5	CFSB-162-SO-5.5-7.5	CFSB-167-SO-1-3
Sample Depth	10.5-12.5 ft	0.5-2.5 ft	0.5-2.5 ft	5.5-7.5 ft	10.5-12.5 ft	1.5-2.5 ft	5.5-7.5 ft	10.5-12.5 ft	0.5-2.5 ft	5.5-7.5 ft	10.5-12.5 ft	0.5-2.5 ft	5.5-7.5 ft	1-3 ft
Chemical	5/15/2018	5/12/2018	5/12/2018	5/12/2018	5/12/2018	5/12/2018	5/12/2018	5/12/2018	5/12/2018	5/12/2018	5/12/2018	5/12/2018	5/12/2018	5/15/2018
Methyl Acetate	0.0045 U	0.004 U	0.0039 U	0.0042 U	0.0033 U	0.0036 U	0.0036 U	0.0034 U	0.004 U	0.0039 U	0.0024 U	0.0022 U	0.0047 U	0.0042 U
Methyl Ethyl Ketone (2-Butanone)	0.0021 J	0.001 UJ	0.00099 UJ	0.0011 UJ	0.00084 UJ	0.00097 J-	0.00094 UJ	0.0014 J-	0.001 UJ	0.0011 J-	0.00063 UJ	0.00056 UJ	0.0012 UJ	0.0015 J
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	0.0007 U	0.00061 U	0.00059 U	0.00065 U	0.0005 UJ	0.00056 U	0.00056 U	0.00053 U	0.00062 U	0.0006 U	0.00037 U	0.00034 U	0.00073 UJ	0.00065 U
Methylcyclohexane	0.0032	0.00057 J	0.00059 J	0.0018	0.0006 J-	0.00087	0.0018	0.0012	0.0017	0.0018	0.00048 J	0.00051	0.0018 J-	0.003
Methylene Chloride	0.00017 U	0.00015 U	0.00015 U	0.00016 U	0.00012 UJ	0.00014 U	0.00014 U	0.00013 U	0.00015 U	0.00015 U	0.000092 U	0.000082 U	0.00018 UJ	0.00016 U
O-Xylene (1,2-Dimethylbenzene)	0.00069 J	0.000088 U	0.000085 U	0.00052 J	0.0001 J-	0.00018 J	0.00053 J	0.00045 J	0.00051 J	0.00055 J	0.000085 J	0.00014 J	0.00054 J	0.00078 J
Styrene	0.00013 U	0.00011 U	0.00011 U	0.00012 U	0.000093 UJ	0.0001 U	0.0001 U	0.000098 U	0.00011 U	0.00011 U	0.000069 U	0.000062 U	0.00013 U	0.00012 U
Tert-Butyl Methyl Ether	0.00013 U	0.00012 U	0.00011 U	0.00012 U	0.000095 UJ	0.00011 U	0.00011 U	0.000099 U	0.00012 U	0.00011 U	0.00007 U	0.000063 U	0.00014 UJ	0.00012 U
Tetrachloroethylene (PCE)	0.00015 U	0.00013 U	0.00013 U	0.00014 U	0.00011 UJ	0.00012 U	0.00012 U	0.00011 U	0.00013 U	0.00013 U	0.000081 U	0.000072 U	0.00016 U	0.00014 U
Toluene	0.0034	0.00058 U	0.00056 U	0.0022	0.0005 J	0.00084 J	0.0022	0.0019	0.0021	0.0022	0.00037 J	0.00058	0.0026	0.0036
Trans-1,2-Dichloroethene	0.00026 U	0.00023 U	0.00022 U	0.00024 U	0.00019 UJ	0.00021 U	0.00021 U	0.0002 U	0.00023 U	0.00022 U	0.00014 U	0.00012 U	0.00027 UJ	0.00024 U
Trans-1,3-Dichloropropene	0.00028 U	0.00025 U	0.00024 U	0.00026 U	0.0002 U	0.00022 U	0.00022 U	0.00021 U	0.00025 U	0.00024 U	0.00015 U	0.00013 U	0.00029 U	0.00026 U
Trichloroethylene (TCE)	0.00015 U	0.00013 U	0.00013 U	0.00014 U	0.00011 UJ	0.00012 U	0.00012 U	0.00011 U	0.00013 U	0.00013 U	0.000081 U	0.000073 U	0.00016 UJ	0.00014 U
Trichlorofluoromethane	0.00043 U	0.00038 UJ	0.00036 UJ	0.0004 UJ	0.00031 UJ	0.00034 UJ	0.00034 UJ	0.00032 UJ	0.00038 UJ	0.00037 UJ	0.00023 UJ	0.00021 UJ	0.00044 UJ	0.0004 U
Vinyl Chloride	0.00057 U	0.00051 U	0.00049 U	0.00053 U	0.00041 UJ	0.00046 U	0.00046 U	0.00043 U	0.00051 U	0.00049 U	0.00031 U	0.00028 U	0.0006 U	0.00053 U

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-2
Summary of Data Used in Risk Assessment
Main Plant Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-167	CFSB-189	CFSB-189	CFSB-189	CFSB-189	CFSB-190	CFSB-190	CFSB-190	CFSB-190	CFSB-205	CFSB-205-DUP	CFSB-205	CFSB-205	CFSB-205
Sample Lab IDs	180-77782-48, 460-156361-15	180-79434-1, 460-159377-1	180-79434-2, 460-159377-2	320-43709-10	320-43709-11	180-79434-29, 460-159377-29	180-79434-30, 460-159377-30	320-43709-14	320-43709-15	180-79434-3, 460-159377-3	180-79434-5, 460-159377-5	180-79434-4, 460-159377-4	320-43646-3	320-43646-4
Sample Name	CFSB-167-SO-6-8	CFSB-189-SO-0-0.5	CFSB-189-SO-0.5-2	CFSB-189-SO-0-0.5	CFSB-189-SO-0.5-2	CFSB-190-SO-0-0.5	CFSB-190-SO-0.5-2	CFSB-190-SO-0-0.5	CFSB-190-SO-0.5-2	CFSB-205-SO-0-0.5	CFSB-DUP45-SO	CFSB-205-SO-0.5-2	CFSB-205-SO-0-0.5	CFSB-205-SO-0.5-2
Sample Depth	6-8 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft
Chemical	5/15/2018	6/27/2018	6/27/2018	9/27/2018	9/27/2018	6/27/2018	6/27/2018	9/27/2018	9/27/2018	6/27/2018	6/27/2018	6/27/2018	9/26/2018	9/26/2018
GENERAL CHEMISTRY (mg/kg)														
Fluoride	0.59 J+	1.97 J-	4.88 J-	--	--	7.21	17.6	--	--	11.1 J-	12.4 J-	22.9 J-	--	--
Cyanide	2.6 J-	0.066 U	0.055 U	--	--	0.47 J+	0.28 J+	--	--	0.064 U	0.1 J+	0.11 J+	--	--
METALS (mg/kg)														
"Chromium, Hexavalent - Estimated"	0.20073	--	--	--	--	0.2382	0.291727	--	--	--	--	--	--	--
"Chromium, Trivalent - Calculated"	--	5.09	5.82	--	--	--	--	--	--	7.815	5.515	9.615	--	--
"Chromium, Trivalent - Estimated"	7.29927	--	--	--	--	8.6618	10.6083	--	--	--	--	--	--	--
Aluminum	6720	6530	7560	--	--	18200	15800	--	--	13100	8950	16000	--	--
Antimony	0.3 UJ	0.24 UJ	0.24 UJ	--	--	0.3 U	0.31 U	--	--	0.26 UJ	0.26 UJ	0.27 UJ	--	--
Arsenic	4.1	3.9	4.7	--	--	4.5	5.8	--	--	4.2	3.2	4.2	--	--
Barium	69.1	57.2	70.5	--	--	178	149	--	--	147	94.5	208	--	--
Beryllium	0.33 J	0.29 J	0.28 J	--	--	0.63	0.63	--	--	0.56	0.34 J	0.64	--	--
Cadmium	0.34 U	0.27 U	0.28 U	--	--	0.34 U	0.36 U	--	--	0.29 U	0.3 U	0.31 U	--	--
Calcium	33700	21400	24900	--	--	4350	15100	--	--	3890	2730	4700	--	--
Chromium, Total	7.5	5.3	5.9	--	--	8.9	10.9	--	--	7.9	5.6	9.7	--	--
Cobalt	5.4	4.3	4.5	--	--	5.3	6.2	--	--	5.1	3.5	6.3	--	--
Copper	11.9 J+	11.2	16	--	--	16.8	18.7	--	--	12.2	9.4	12.8	--	--
Iron	12900	8930	10400	--	--	13500	16400	--	--	12800	8760	16600	--	--
Lead	4.5 J	9.1	10.6	--	--	16.2	14.5	--	--	10.1	10.9	10	--	--
Magnesium	11800	7120	8910	--	--	6080	9000	--	--	6330	4590	7050	--	--
Manganese	371	291	338	--	--	507	497	--	--	392	266	599	--	--
Mercury	0.018 J+	0.01 J-	0.0099 UJ	--	--	0.016 J	0.015 J-	--	--	0.017 J-	0.012 J-	0.056 J-	--	--
Nickel	9.3	8.3	8.5	--	--	37.9	19.2	--	--	11.4	7.2	11.4	--	--
Potassium	549	551	632	--	--	1260	1180	--	--	861	591	853	--	--
Selenium	0.29 U	0.23 U	0.24 U	--	--	0.3 U	0.31 U	--	--	0.25 U	0.26 U	0.27 U	--	--
Silver	0.63 U	0.5 U	0.52 U	--	--	0.63 U	0.66 U	--	--	0.54 U	0.55 U	0.57 U	--	--
Sodium	32 J-	28.4 J	26.5 J	--	--	71.1 J	53.6 J	--	--	58.2 J	44.4 J	66.7 J	--	--
Thallium	0.13 U	0.1 U	0.1 U	--	--	0.13 U	0.13 U	--	--	0.11 U	0.11 U	0.12 U	--	--
Vanadium	8.4	4.1	4.4	--	--	18.2	13.5	--	--	12.2	7.7	16.5	--	--
Zinc	29.4	32.2	36.1	--	--	65.1	67.3	--	--	40.5	25.9	52.1	--	--
METALS|HEXAVALENT CHROMIUM (mg/kg)														
Chromium, Hexavalent	--	0.21 J-	0.16 UJ	--	--	--	--	--	--	0.17 UJ	0.17 UJ	0.17 UJ	--	--
PESTICIDES (mg/kg)														
Aldrin	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Alpha Bhc (Alpha Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Alpha Endosulfan	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Beta Bhc (Beta Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Beta Endosulfan	--	--	--	--	--	--	--	--	--	--	--	--	--	--
cis-Chlordane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Delta BHC (Delta Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dieldrin	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endosulfan Sulfate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin Aldehyde	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin Ketone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Gamma Bhc (Lindane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Heptachlor	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Heptachlor Epoxide	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methoxychlor	--	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDD	--	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDT	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Toxaphene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
trans-Chlordane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
POLYCHLORINATED BIPHENYLS (mg/kg)														
PCB-1016 (Aroclor 1016)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1221 (Aroclor 1221)	--	--	--	--	--	--	--	--	--	--	--	--	--	--

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Summary of Data Used in Risk Assessment
Main Plant Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-167	CFSB-189	CFSB-189	CFSB-189	CFSB-189	CFSB-190	CFSB-190	CFSB-190	CFSB-190	CFSB-205	CFSB-205-DUP	CFSB-205	CFSB-205	CFSB-205
Sample Lab IDs	180-77782-48, 460-156361-15	180-79434-1, 460-159377-1	180-79434-2, 460-159377-2	320-43709-10	320-43709-11	180-79434-29, 460-159377-29	180-79434-30, 460-159377-30	320-43709-14	320-43709-15	180-79434-3, 460-159377-3	180-79434-5, 460-159377-5	180-79434-4, 460-159377-4	320-43646-3	320-43646-4
Sample Name	CFSB-167-SO-6-8	CFSB-189-SO-0-0.5	CFSB-189-SO-0.5-2	CFSB-189-SO-0-0.5	CFSB-189-SO-0.5-2	CFSB-190-SO-0-0.5	CFSB-190-SO-0.5-2	CFSB-190-SO-0-0.5	CFSB-190-SO-0.5-2	CFSB-205-SO-0-0.5	CFSB-DUP45-SO	CFSB-205-SO-0.5-2	CFSB-205-SO-0-0.5	CFSB-205-SO-0.5-2
Sample Depth	6-8 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft
Chemical	5/15/2018	6/27/2018	6/27/2018	9/27/2018	9/27/2018	6/27/2018	6/27/2018	9/27/2018	9/27/2018	6/27/2018	6/27/2018	6/27/2018	9/26/2018	9/26/2018
PCB-1232 (Aroclor 1232)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1242 (Aroclor 1242)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1248 (Aroclor 1248)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1254 (Aroclor 1254)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1260 (Aroclor 1260)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1262 (Aroclor 1262)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1268 (Aroclor 1268)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Polychlorinated Biphenyl (PCBs)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SEMIVOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,2,4,5-Tetrachlorobenzene	0.0015 U	0.0015 U	0.0015 U	--	--	0.0063 U	0.0032 U	--	--	0.0033 U	0.0032 U	0.0016 U	--	--
1,4-Dioxane (P-Dioxane)	0.011 U	0.011 U	0.011 U	--	--	0.046 U	0.023 U	--	--	0.024 U	0.023 U	0.011 U	--	--
2,3,4,6-Tetrachlorophenol	0.014 U	0.014 U	0.014 U	--	--	0.061 U	0.031 U	--	--	0.032 U	0.03 U	0.015 U	--	--
2,4,5-Trichlorophenol	0.0025 U	0.0024 U	0.0025 U	--	--	0.01 U	0.0052 U	--	--	0.0054 U	0.0052 U	0.0026 U	--	--
2,4,6-Trichlorophenol	0.0019 U	0.0019 U	0.0019 U	--	--	0.008 U	0.004 U	--	--	0.0042 U	0.004 U	0.002 U	--	--
2,4-Dichlorophenol	0.0027 U	0.0026 U	0.0026 U	--	--	0.011 U	0.0057 U	--	--	0.0059 U	0.0056 U	0.0028 U	--	--
2,4-Dimethylphenol	0.0021 U	0.0021 U	0.0021 U	--	--	0.0091 U	0.0046 U	--	--	0.0047 U	0.0045 U	0.0023 U	--	--
2,4-Dinitrophenol	0.093 UJ	0.092 U	0.092 U	--	--	0.39 U	0.2 U	--	--	0.2 U	0.2 U	0.099 U	--	--
2,4-Dinitrotoluene	0.0017 U	0.0017 U	0.0017 U	--	--	0.0073 U	0.0036 U	--	--	0.0038 U	0.0036 U	0.0018 U	--	--
2,6-Dinitrotoluene	0.0021 U	0.0021 U	0.0021 U	--	--	0.0091 U	0.0045 U	--	--	0.0047 U	0.0045 U	0.0023 U	--	--
2-Chloronaphthalene	0.0016 U	0.0016 U	0.0016 U	--	--	0.0067 U	0.0034 U	--	--	0.0035 U	0.0034 U	0.0017 U	--	--
2-Chlorophenol	0.0016 U	0.0016 U	0.0016 U	--	--	0.0068 U	0.0034 U	--	--	0.0035 U	0.0034 U	0.0017 U	--	--
2-Methylnaphthalene	0.0017 U	0.0016 U	0.0016 U	--	--	0.007 U	0.0035 U	--	--	0.0044 J	0.0043 J	0.0018 U	--	--
2-Methylphenol (O-Cresol)	0.0099 U	0.0098 U	0.0099 U	--	--	0.042 U	0.021 U	--	--	0.022 U	0.021 U	0.011 U	--	--
2-Nitroaniline	0.016 U	0.016 U	0.016 U	--	--	0.067 U	0.033 U	--	--	0.035 U	0.033 U	0.017 U	--	--
2-Nitrophenol	0.002 U	0.002 U	0.002 U	--	--	0.0084 U	0.0042 U	--	--	0.0044 U	0.0042 U	0.0021 U	--	--
3- And 4- Methylphenol (Total)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3,3'-Dichlorobenzidine	0.032 U	0.032 U	0.032 U	--	--	0.14 U	0.068 U	--	--	0.071 U	0.068 U	0.034 U	--	--
3-Nitroaniline	0.0088 U	0.0087 U	0.0087 U	--	--	0.037 U	0.019 U	--	--	0.019 U	0.019 U	0.0094 U	--	--
4,6-Dinitro-2-Methylphenol	0.059 U	0.059 U	0.059 U	--	--	0.25 U	0.13 U	--	--	0.13 U	0.13 U	0.063 U	--	--
4-Bromophenyl Phenyl Ether	0.0024 U	0.0024 U	0.0024 U	--	--	0.01 U	0.0051 U	--	--	0.0053 U	0.0051 U	0.0026 U	--	--
4-Chloro-3-Methylphenol	0.0016 U	0.0016 U	0.0016 U	--	--	0.0069 U	0.0035 U	--	--	0.0036 U	0.0034 U	0.0017 U	--	--
4-Chloroaniline	0.0011 U	0.0011 U	0.0011 U	--	--	0.0049 U	0.0024 U	--	--	0.0025 U	0.0024 U	0.0012 U	--	--
4-Chlorophenyl Phenyl Ether	0.0021 U	0.0021 U	0.0021 U	--	--	0.0089 U	0.0044 U	--	--	0.0046 U	0.0044 U	0.0022 U	--	--
4-Nitroaniline	0.0017 U	0.0017 U	0.0017 U	--	--	0.0071 U	0.0036 U	--	--	0.0037 U	0.0036 U	0.0018 U	--	--
4-Nitrophenol	0.024 U	0.024 U	0.024 U	--	--	0.1 U	0.051 U	--	--	0.053 U	0.051 U	0.026 U	--	--
Acenaphthene	0.002 U	0.002 U	0.0029 J	--	--	0.028 J	0.012 J	--	--	0.029	0.035	0.003 J	--	--
Acenaphthylene	0.0015 U	0.0015 U	0.0015 U	--	--	0.0064 U	0.0063 J	--	--	0.0033 U	0.0032 U	0.0016 U	--	--
Acetophenone	0.0019 U	0.0026 J	0.0024 J	--	--	0.008 U	0.004 U	--	--	0.0041 U	0.004 U	0.002 U	--	--
Anthracene	0.0018 U	0.002 J	0.0059 J	--	--	0.055	0.028	--	--	0.047	0.059	0.0035 J	--	--
Atrazine	0.015 U	0.015 U	0.015 U	--	--	0.064 UJ	0.032 UJ	--	--	0.033 U	0.032 U	0.016 U	--	--
Benzaldehyde	0.0043 UR	0.0049 J	0.01 J	--	--	0.018 U	0.0091 U	--	--	0.0094 U	0.0091 U	0.0052 J	--	--
Benzo(A)Anthracene	0.0013 U	0.019	0.051	--	--	0.44	0.17	--	--	0.22	0.29	0.015	--	--
Benzo(A)Pyrene	0.0015 U	0.027	0.091	--	--	0.56	0.26	--	--	0.27	0.37	0.019	--	--
Benzo(B)Fluoranthene	0.0017 U	0.057	0.24	--	--	1	0.55	--	--	0.49	0.62	0.031	--	--
Benzo(G,H,I)Perylene	0.0015 U	0.035	0.12	--	--	0.86	0.59	--	--	0.3	0.43	0.022	--	--
Benzo(K)Fluoranthene	0.0021 U	0.016	0.054	--	--	0.34	0.21	--	--	0.19 J	0.32 J	0.013	--	--
Benzyl Butyl Phthalate	0.024 U	0.024 U	0.024 U	--	--	0.1 U	0.05 U	--	--	0.052 U	0.05 U	0.025 U	--	--
Biphenyl (Diphenyl)	0.0014 U	0.0014 U	0.0014 U	--	--	0.0062 U	0.0031 U	--	--	0.0032 U	0.0031 U	0.0015 U	--	--
Bis(2-Chloroethoxy) Methane	0.0016 U	0.0016 U	0.0016 U	--	--	0.007 U	0.0035 U	--	--	0.0036 U	0.0035 U	0.0018 U	--	--
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.0013 U	0.0012 U	0.0012 U	--	--	0.0053 U	0.0027 U	--	--	0.0028 U	0.0027 U	0.0013 U	--	--
Bis(2-Chloroisopropyl) Ether	0.0026 UJ	0.0025 U	0.0025 U	--	--	0.011 U	0.0054 U	--	--	0.0056 U	0.0054 U	0.0027 U	--	--
Bis(2-Ethylhexyl) Phthalate	0.037 U	0.037 U	0.037 U	--	--	0.16 U	0.078 U	--	--	0.081 UJ	0.59 J	0.039 U	--	--
Caprolactam	0.022 U	0.022 U	0.022 U	--	--	0.095 U	0.048 U	--	--	0.049 U	0.048 U	0.024 U	--	--
Carbazole	0.0016 U	0.0046 J	0.012	--	--	0.091	0.061	--	--	0.061	0.081	0.0046 J	--	--
Chrysene	0.0014 U	0.049	0.14	--	--	0.72	0.37	--	--	0.34	0.48	0.026	--	--
Dibenz(A,H)Anthracene	0.0015 U	0.0073	0.0015 U	--	--	0.19	0.0033 U	--	--	0.074	0.11	0.0016 U	--	--
Dibenzofuran	0.0015 U	0.0017 J	0.0024 J	--	--	0.0074 J	0.0041 J	--	--	0.014 J	0.014 J	0.0031 J	--	--

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Sample Location ID	CFSB-167	CFSB-189	CFSB-189	CFSB-189	CFSB-189	CFSB-190	CFSB-190	CFSB-190	CFSB-190	CFSB-205	CFSB-205-DUP	CFSB-205	CFSB-205	CFSB-205
Sample Lab IDs	180-77782-48, 460-156361-15	180-79434-1, 460-159377-1	180-79434-2, 460-159377-2	320-43709-10	320-43709-11	180-79434-29, 460-159377-29	180-79434-30, 460-159377-30	320-43709-14	320-43709-15	180-79434-3, 460-159377-3	180-79434-5, 460-159377-5	180-79434-4, 460-159377-4	320-43646-3	320-43646-4
Sample Name	CFSB-167-SO-6-8	CFSB-189-SO-0-0.5	CFSB-189-SO-0.5-2	CFSB-189-SO-0-0.5	CFSB-189-SO-0.5-2	CFSB-190-SO-0-0.5	CFSB-190-SO-0.5-2	CFSB-190-SO-0-0.5	CFSB-190-SO-0.5-2	CFSB-205-SO-0-0.5	CFSB-DUP45-SO	CFSB-205-SO-0.5-2	CFSB-205-SO-0-0.5	CFSB-205-SO-0.5-2
Sample Depth	6-8 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft
Chemical	5/15/2018	6/27/2018	6/27/2018	9/27/2018	9/27/2018	6/27/2018	6/27/2018	9/27/2018	9/27/2018	6/27/2018	6/27/2018	6/27/2018	9/26/2018	9/26/2018
Diethyl Phthalate	0.01 U	0.01 U	0.01 U	--	--	0.044 U	0.022 U	--	--	0.023 U	0.022 U	0.011 U	--	--
Dimethyl Phthalate	0.0013 U	0.0012 U	0.0012 U	--	--	0.0053 U	0.0027 U	--	--	0.0028 U	0.0027 U	0.0013 U	--	--
Di-N-Butyl Phthalate	0.015 U	0.015 U	0.015 U	--	--	0.064 U	0.032 U	--	--	0.033 U	0.032 U	0.016 U	--	--
Di-N-Octylphthalate	0.02 U	0.02 U	0.02 U	--	--	0.085 U	0.043 U	--	--	0.044 U	0.043 U	0.021 U	--	--
Fluoranthene	0.0018 U	0.047	0.088	--	--	0.72	0.28	--	--	0.56	0.61	0.027	--	--
Fluorene	0.0014 U	0.002 J	0.0025 J	--	--	0.015 J	0.0083 J	--	--	0.025	0.027	0.0031 J	--	--
Hexachlorobenzene	0.0025 U	0.0025 U	0.0025 U	--	--	0.011 U	0.0053 U	--	--	0.0055 U	0.0052 U	0.0026 U	--	--
Hexachlorobutadiene	0.002 U	0.002 U	0.002 U	--	--	0.0086 U	0.0043 U	--	--	0.0044 U	0.0043 U	0.0022 U	--	--
Hexachlorocyclopentadiene	0.0018 U	0.0017 U	0.0018 U	--	--	0.0075 U	0.0037 U	--	--	0.0039 U	0.0037 U	0.0019 U	--	--
Hexachloroethane	0.0018 U	0.0018 U	0.0018 U	--	--	0.0076 U	0.0038 U	--	--	0.0039 U	0.0038 U	0.0019 U	--	--
Indeno(1,2,3-C,D)Pyrene	0.0014 U	0.03	0.12	--	--	0.65	0.42	--	--	0.26	0.37	0.019	--	--
Isophorone	0.0018 U	0.0017 U	0.0018 U	--	--	0.0075 U	0.0037 U	--	--	0.0039 U	0.0037 U	0.0019 U	--	--
Naphthalene	0.0013 U	0.0013 U	0.0013 U	--	--	0.0057 U	0.0029 U	--	--	0.0084 J	0.0096 J	0.0014 U	--	--
Nitrobenzene	0.013 U	0.013 U	0.013 U	--	--	0.054 U	0.027 U	--	--	0.028 U	0.027 U	0.013 U	--	--
N-Nitrosodi-N-Propylamine	0.0023 U	0.0023 U	0.0023 U	--	--	0.0099 U	0.005 U	--	--	0.0052 U	0.005 U	0.0025 U	--	--
N-Nitrosodiphenylamine	0.011 U	0.011 U	0.011 U	--	--	0.049 U	0.024 U	--	--	0.025 U	0.024 U	0.012 U	--	--
Pentachlorophenol	0.055 UJ	0.055 U	0.055 U	--	--	0.24 U	0.12 U	--	--	0.12 U	0.12 U	0.059 U	--	--
Phenanthrene	0.0018 U	0.017	0.033	--	--	0.32	0.13	--	--	0.23	0.29	0.022	--	--
Phenol	0.01 U	0.01 U	0.01 U	--	--	0.044 U	0.022 U	--	--	0.023 U	0.022 U	0.011 U	--	--
Pyrene	0.0016 U	0.039	0.093	--	--	0.83	0.33	--	--	0.42	0.51	0.03	--	--
VOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,1,1-Trichloroethane	0.00021 U	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,2,2-Tetrachloroethane	0.0002 U	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,2-Trichloro-1,2,2-Trifluoroethane	0.00027 U	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,2-Trichloroethane	0.00016 U	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1-Dichloroethane	0.00019 U	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1-Dichloroethene	0.00021 U	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,3-Trichlorobenzene	0.00017 U	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,4-Trichlorobenzene	0.000084 U	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dibromo-3-Chloropropane	0.00042 U	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dibromoethane (Ethylene Dibromide)	0.00016 U	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichlorobenzene	0.00013 U	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichloroethane	0.00027 U	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichloropropane	0.00039 U	--	--	--	--	--	--	--	--	--	--	--	--	--
1,3-Dichlorobenzene	0.00015 U	--	--	--	--	--	--	--	--	--	--	--	--	--
1,4-Dichlorobenzene	0.000091 U	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Hexanone	0.00071 U	--	--	--	--	--	--	--	--	--	--	--	--	--
Acetone	0.02	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzene	0.00081 J	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromochloromethane	0.00026 U	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromodichloromethane	0.00023 U	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromoform	0.00039 U	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromomethane	0.00043 U	--	--	--	--	--	--	--	--	--	--	--	--	--
Carbon Disulfide	0.00066 J	--	--	--	--	--	--	--	--	--	--	--	--	--
Carbon Tetrachloride	0.00017 U	--	--	--	--	--	--	--	--	--	--	--	--	--
Chlorobenzene	0.00016 U	--	--	--	--	--	--	--	--	--	--	--	--	--
Chloroethane	0.00048 U	--	--	--	--	--	--	--	--	--	--	--	--	--
Chloroform	0.00029 U	--	--	--	--	--	--	--	--	--	--	--	--	--
Chloromethane	0.0004 U	--	--	--	--	--	--	--	--	--	--	--	--	--
Cis-1,2-Dichloroethylene	0.00014 U	--	--	--	--	--	--	--	--	--	--	--	--	--
Cis-1,3-Dichloropropene	0.00025 U	--	--	--	--	--	--	--	--	--	--	--	--	--
Cyclohexane	0.0016	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibromochloromethane	0.00018 U	--	--	--	--	--	--	--	--	--	--	--	--	--
Dichlorodifluoromethane	0.00031 UJ	--	--	--	--	--	--	--	--	--	--	--	--	--
Ethylbenzene	0.00085 J	--	--	--	--	--	--	--	--	--	--	--	--	--
Isopropylbenzene (Cumene)	0.00011 U	--	--	--	--	--	--	--	--	--	--	--	--	--
M,P-Xylene	0.0027	--	--	--	--	--	--	--	--	--	--	--	--	--

Table E-2
Summary of Data Used in Risk Assessment
Main Plant Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-167	CFSB-189	CFSB-189	CFSB-189	CFSB-189	CFSB-190	CFSB-190	CFSB-190	CFSB-190	CFSB-205	CFSB-205-DUP	CFSB-205	CFSB-205	CFSB-205
Sample Lab IDs	180-77782-48, 460-156361-15	180-79434-1, 460-159377-1	180-79434-2, 460-159377-2	320-43709-10	320-43709-11	180-79434-29, 460-159377-29	180-79434-30, 460-159377-30	320-43709-14	320-43709-15	180-79434-3, 460-159377-3	180-79434-5, 460-159377-5	180-79434-4, 460-159377-4	320-43646-3	320-43646-4
Sample Name	CFSB-167-SO-6-8	CFSB-189-SO-0-0.5	CFSB-189-SO-0.5-2	CFSB-189-SO-0-0.5	CFSB-189-SO-0.5-2	CFSB-190-SO-0-0.5	CFSB-190-SO-0.5-2	CFSB-190-SO-0-0.5	CFSB-190-SO-0.5-2	CFSB-205-SO-0-0.5	CFSB-DUP45-SO	CFSB-205-SO-0.5-2	CFSB-205-SO-0-0.5	CFSB-205-SO-0.5-2
Sample Depth	6-8 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft
Chemical	5/15/2018	6/27/2018	6/27/2018	9/27/2018	9/27/2018	6/27/2018	6/27/2018	9/27/2018	9/27/2018	6/27/2018	6/27/2018	6/27/2018	9/26/2018	9/26/2018
Methyl Acetate	0.0039 U	--	--	--	--	--	--	--	--	--	--	--	--	--
Methyl Ethyl Ketone (2-Butanone)	0.0016 J	--	--	--	--	--	--	--	--	--	--	--	--	--
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	0.00061 U	--	--	--	--	--	--	--	--	--	--	--	--	--
Methylcyclohexane	0.004	--	--	--	--	--	--	--	--	--	--	--	--	--
Methylene Chloride	0.00015 U	--	--	--	--	--	--	--	--	--	--	--	--	--
O-Xylene (1,2-Dimethylbenzene)	0.00095	--	--	--	--	--	--	--	--	--	--	--	--	--
Styrene	0.00011 U	--	--	--	--	--	--	--	--	--	--	--	--	--
Tert-Butyl Methyl Ether	0.00011 U	--	--	--	--	--	--	--	--	--	--	--	--	--
Tetrachloroethylene (PCE)	0.00013 U	--	--	--	--	--	--	--	--	--	--	--	--	--
Toluene	0.0041	--	--	--	--	--	--	--	--	--	--	--	--	--
Trans-1,2-Dichloroethene	0.00022 U	--	--	--	--	--	--	--	--	--	--	--	--	--
Trans-1,3-Dichloropropene	0.00024 U	--	--	--	--	--	--	--	--	--	--	--	--	--
Trichloroethylene (TCE)	0.00013 U	--	--	--	--	--	--	--	--	--	--	--	--	--
Trichlorofluoromethane	0.00037 U	--	--	--	--	--	--	--	--	--	--	--	--	--
Vinyl Chloride	0.0005 U	--	--	--	--	--	--	--	--	--	--	--	--	--

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-2
Summary of Data Used in Risk Assessment
Main Plant Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-206	CFSB-206	CFSB-207	CFSB-207	CFSB-208	CFSB-208-DUP	CFSB-208	CFSB-213	CFSB-213	CFSB-231	CFSB-231	CFSB-232	CFSB-232	CFSB-233
Sample Lab IDs	180-79204-1, 320-40608-1, 460-159044-1	180-79204-2, 320-40608-2, 460-159044-2	180-77302-1, 320-38708-1, 460-155040-1	180-77302-2, 320-38708-2, 460-155040-2	180-77302-3, 320-38708-3, 460-155040-3	180-77302-6, 320-38708-17, 460-155040-19	180-77302-4, 320-38708-4, 460-155040-4	180-79204-3, 320-40608-4, 460-159044-3	180-79204-4, 320-40608-3, 460-159044-4	320-38708-5, 460-155040-5	320-38708-6, 460-155040-6	320-38708-7, 460-155040-7	320-38708-8, 460-155040-8	320-38708-9, 460-155040-9
Sample Name	CFSB-206-SO-0-0.5	CFSB-206-SO-0.5-2	CFSB-207-SO-0-0.5	CFSB-207-SO-0.5-2	CFSB-208-SO-0-0.5	CFSB-DUP25-SO	CFSB-208-SO-0.5-2	CFSB-213-SO-0-0.5	CFSB-213-SO-0.5-2	CFSB-231-SO-0-0.5	CFSB-231-SO-0.5-2	CFSB-232-SO-0-0.5	CFSB-232-SO-0.5-2	CFSB-233-SO-0-0.5
Sample Depth	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft
Chemical	6/22/2018	6/22/2018	4/28/2018	4/28/2018	4/28/2018	4/28/2018	4/28/2018	6/22/2018	6/22/2018	4/28/2018	4/28/2018	4/28/2018	4/28/2018	4/28/2018
GENERAL CHEMISTRY (mg/kg)														
Fluoride	13.3 J-	4.17 J-	13.4 J+	30.1 J+	9.11 J+	10.7 J+	11 J+	6.09 J-	25.8 J-	--	--	--	--	--
Cyanide	0.06 U	0.06 U	0.069 U	0.072 U	0.067 U	0.063 U	0.067 U	0.058 U	0.069 U	--	--	--	--	--
METALS (mg/kg)														
"Chromium, Hexavalent - Estimated"	0.222141	0.232847	0.286375	0.243552	0.208759	0.224818	0.219465	0.259611	0.195377	--	--	--	--	--
"Chromium, Trivalent - Calculated"	--	--	--	--	--	--	--	--	--	--	--	--	--	--
"Chromium, Trivalent - Estimated"	8.07786	8.46715	10.4136	8.85645	7.59124	8.17518	7.98054	9.44039	7.10462	--	--	--	--	--
Aluminum	10700	8790	11300	15200	9990	11600	10500	9710	9930	--	--	--	--	--
Antimony	0.25 U	0.24 U	0.32 UJ	0.32 UJ	0.29 UJ	0.3 UJ	0.31 UJ	0.23 U	0.27 U	--	--	--	--	--
Arsenic	4.3	3	5.2	6.8	4.2	4.3	4.1	4.6	4.5	--	--	--	--	--
Barium	89.9	62.4	109	189	99.7	115	103	56.9	256	--	--	--	--	--
Beryllium	0.4	0.32 J	0.52	0.63	0.4	0.42	0.51	0.41	0.43	--	--	--	--	--
Cadmium	0.28 U	0.28 U	0.37 U	0.37 U	0.33 U	0.35 U	0.36 U	0.39 J	0.31 U	--	--	--	--	--
Calcium	21000	1430	7450	5410	15500	12800	7820	19500	20400	--	--	--	--	--
Chromium, Total	8.3	8.7	10.7 J-	9.1 J-	7.8 J-	8.4 J-	8.2 J-	9.7	7.3	--	--	--	--	--
Cobalt	4.7	5.5	5	5.9	5.3	5.7	5	4.5	4.8	--	--	--	--	--
Copper	11.7	10.2	17.1 J-	16.8 J-	17.7 J-	14.9 J-	14.5 J-	15.1	14	--	--	--	--	--
Iron	11600	12900	13500	14400	11900	12900	12700	11800	11700	--	--	--	--	--
Lead	11.2	6.9	25.4	18.7	10.3	10.9	8.9	16.9	9.7	--	--	--	--	--
Magnesium	8870	7370	7450	6740	8210	7900	8090	9720	7980	--	--	--	--	--
Manganese	347	297	402	568	357	347	369	318	721	--	--	--	--	--
Mercury	0.02	0.0098 U	0.012 J	0.02	0.022	0.022	0.019	0.023	0.022	--	--	--	--	--
Nickel	13.7	10.5	13.6 J-	11.7 J-	16.9 J-	20.1 J-	11.4 J-	18.1	9.9	--	--	--	--	--
Potassium	593	441	695 J-	685 J-	624 J-	728 J-	597 J-	631	604	--	--	--	--	--
Selenium	0.24 U	0.24 U	0.32 U	0.32 U	0.29 U	0.3 U	0.31 U	0.23 U	0.26 U	--	--	--	--	--
Silver	0.52 U	0.51 U	0.68 U	0.67 U	0.62 U	0.64 U	0.65 U	0.48 U	0.56 U	--	--	--	--	--
Sodium	52.6 J	25.6 U	49.5 J	46.9 J	53.1 J	60 J	45.4 J	45.8 J	51.7 J	--	--	--	--	--
Thallium	0.1 U	0.1 U	0.14 U	0.14 U	0.12 U	0.13 U	0.13 U	0.098 U	0.11 U	--	--	--	--	--
Vanadium	9.8	9.5	11.7 J-	13.5 J-	11.1 J-	12.4 J-	9.5 J-	10.1	8.2	--	--	--	--	--
Zinc	41.2	33	47.6	45	40.7	44.2	35.6	49.1	50.9	--	--	--	--	--
METALS|HEXAVALENT CHROMIUM (mg/kg)														
Chromium, Hexavalent	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PESTICIDES (mg/kg)														
Aldrin	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Alpha Bhc (Alpha Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Alpha Endosulfan	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Beta Bhc (Beta Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Beta Endosulfan	--	--	--	--	--	--	--	--	--	--	--	--	--	--
cis-Chlordane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Delta BHC (Delta Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dieldrin	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endosulfan Sulfate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin Aldehyde	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin Ketone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Gamma Bhc (Lindane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Heptachlor	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Heptachlor Epoxide	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methoxychlor	--	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDD	--	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDT	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Toxaphene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
trans-Chlordane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
POLYCHLORINATED BIPHENYLS (mg/kg)														
PCB-1016 (Aroclor 1016)	--	--	0.0097 U	0.0098 U	0.0095 U	0.0093 U	0.0094 U	--	--	0.01 U	0.0098 U	0.0096 U	0.0094 U	0.01 U
PCB-1221 (Aroclor 1221)	--	--	0.0097 U	0.0098 U	0.0095 U	0.0093 U	0.0094 U	--	--	0.01 U	0.0098 U	0.0096 U	0.0094 U	0.01 U

Table E-2
Summary of Data Used in Risk Assessment
Main Plant Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-206	CFSB-206	CFSB-207	CFSB-207	CFSB-208	CFSB-208-DUP	CFSB-208	CFSB-213	CFSB-213	CFSB-231	CFSB-231	CFSB-232	CFSB-232	CFSB-233
Sample Lab IDs	180-79204-1, 320-40608-1, 460-159044-1	180-79204-2, 320-40608-2, 460-159044-2	180-77302-1, 320-38708-1, 460-155040-1	180-77302-2, 320-38708-2, 460-155040-2	180-77302-3, 320-38708-3, 460-155040-3	180-77302-6, 320-38708-17, 460-155040-19	180-77302-4, 320-38708-4, 460-155040-4	180-79204-3, 320-40608-4, 460-159044-3	180-79204-4, 320-40608-3, 460-159044-4	320-38708-5, 460-155040-5	320-38708-6, 460-155040-6	320-38708-7, 460-155040-7	320-38708-8, 460-155040-8	320-38708-9, 460-155040-9
Sample Name	CFSB-206-SO-0-0.5	CFSB-206-SO-0.5-2	CFSB-207-SO-0-0.5	CFSB-207-SO-0.5-2	CFSB-208-SO-0-0.5	CFSB-DUP25-SO	CFSB-208-SO-0.5-2	CFSB-213-SO-0-0.5	CFSB-213-SO-0.5-2	CFSB-231-SO-0-0.5	CFSB-231-SO-0.5-2	CFSB-232-SO-0-0.5	CFSB-232-SO-0.5-2	CFSB-233-SO-0-0.5
Sample Depth	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft
Chemical	6/22/2018	6/22/2018	4/28/2018	4/28/2018	4/28/2018	4/28/2018	4/28/2018	6/22/2018	6/22/2018	4/28/2018	4/28/2018	4/28/2018	4/28/2018	4/28/2018
PCB-1232 (Aroclor 1232)	--	--	0.0097 U	0.0098 U	0.0095 U	0.0093 U	0.0094 U	--	--	0.01 U	0.0098 U	0.0096 U	0.0094 U	0.01 U
PCB-1242 (Aroclor 1242)	--	--	0.0097 U	0.0098 U	0.0095 U	0.0093 U	0.0094 U	--	--	0.01 U	0.0098 U	0.0096 U	0.0094 U	0.01 U
PCB-1248 (Aroclor 1248)	--	--	0.0097 U	0.0098 U	0.0095 U	0.0093 U	0.0094 U	--	--	0.01 U	0.0098 U	0.0096 U	0.0094 U	0.01 U
PCB-1254 (Aroclor 1254)	--	--	0.01 U	0.01 U	0.0098 U	0.0096 U	0.0097 U	--	--	0.11	0.064 J	0.064 J	0.0098 U	0.056 J
PCB-1260 (Aroclor 1260)	--	--	0.01 U	0.01 U	0.0098 U	0.0096 U	0.0097 U	--	--	0.011 U	0.01 U	0.01 U	0.0098 U	0.011 U
PCB-1262 (Aroclor 1262)	--	--	0.01 U	0.01 U	0.0098 U	0.0096 U	0.0097 U	--	--	0.011 U	0.01 U	0.01 U	0.0098 U	0.011 U
PCB-1268 (Aroclor 1268)	--	--	0.01 U	0.01 U	0.0098 U	0.0096 U	0.0097 U	--	--	0.011 U	0.01 U	0.01 U	0.0098 U	0.011 U
Polychlorinated Biphenyl (PCBs)	--	--	0.01 U	0.01 U	0.0098 U	0.0096 U	0.0097 U	--	--	0.11	0.064 J	0.064 J	0.0098 U	0.056 J
SEMIVOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,2,4,5-Tetrachlorobenzene	0.006 U	0.0015 U	0.002 UT	0.0016 U	0.0015 U	0.0015 U	0.0016 U	0.015 U	0.0032 U	--	--	--	--	--
1,4-Dioxane (P-Dioxane)	0.044 U	0.011 U	0.014 U	0.012 U	0.011 U	0.011 U	0.011 U	0.11 U	0.023 U	--	--	--	--	--
2,3,4,6-Tetrachlorophenol	0.058 UJ	0.015 UJ	0.019 U	0.016 U	0.014 U	0.015 U	0.015 U	0.14 UJ	0.031 UJ	--	--	--	--	--
2,4,5-Trichlorophenol	0.01 U	0.0025 U	0.0033 U	0.0027 U	0.0024 U	0.0025 U	0.0026 U	0.025 U	0.0053 U	--	--	--	--	--
2,4,6-Trichlorophenol	0.0077 U	0.0019 U	0.0025 U	0.0021 U	0.0019 U	0.0019 U	0.002 U	0.019 U	0.0041 U	--	--	--	--	--
2,4-Dichlorophenol	0.011 U	0.0027 U	0.0036 U	0.0029 U	0.0026 U	0.0027 U	0.0028 U	0.027 U	0.0058 U	--	--	--	--	--
2,4-Dimethylphenol	0.0087 U	0.0022 U	0.0029 U	0.0023 U	0.0021 U	0.0022 U	0.0023 U	0.021 U	0.0047 U	--	--	--	--	--
2,4-Dinitrophenol	0.38 UJ	0.094 UJ	0.12 UJ	0.1 UJ	0.092 UJ	0.095 UJ	0.098 UJ	0.93 UJ	0.2 UJ	--	--	--	--	--
2,4-Dinitrotoluene	0.007 U	0.0017 U	0.0023 U	0.0019 U	0.0017 U	0.0018 U	0.0018 U	0.017 U	0.0037 U	--	--	--	--	--
2,6-Dinitrotoluene	0.0086 U	0.0022 U	0.0029 U	0.0023 U	0.0021 U	0.0022 U	0.0023 U	0.021 U	0.0046 U	--	--	--	--	--
2-Chloronaphthalene	0.0064 U	0.0016 U	0.0021 U	0.0017 U	0.0016 U	0.0016 U	0.0017 U	0.016 U	0.0034 U	--	--	--	--	--
2-Chlorophenol	0.0065 U	0.0016 U	0.0022 UT	0.0017 U	0.0016 U	0.0016 U	0.0017 U	0.016 U	0.0035 U	--	--	--	--	--
2-Methylnaphthalene	0.0079 J	0.0017 U	0.0046 J	0.0018 U	0.0017 J	0.002 J	0.0018 J	0.017 U	0.009 J	--	--	--	--	--
2-Methylphenol (O-Cresol)	0.04 U	0.01 U	0.013 U	0.011 U	0.0098 U	0.01 U	0.01 U	0.099 U	0.021 U	--	--	--	--	--
2-Nitroaniline	0.064 U	0.016 U	0.021 U	0.017 U	0.016 U	0.016 U	0.017 U	0.16 U	0.034 U	--	--	--	--	--
2-Nitrophenol	0.008 U	0.002 U	0.0027 U	0.0022 U	0.002 U	0.002 U	0.0021 U	0.02 U	0.0043 U	--	--	--	--	--
3- And 4- Methylphenol (Total)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3,3'-Dichlorobenzidine	0.13 U	0.033 U	0.043 UJ	0.035 U	0.032 U	0.033 U	0.034 U	0.32 U	0.07 U	--	--	--	--	--
3-Nitroaniline	0.036 U	0.0089 U	0.012 U	0.0096 U	0.0087 U	0.0089 U	0.0093 U	0.087 U	0.019 U	--	--	--	--	--
4,6-Dinitro-2-Methylphenol	0.24 U	0.06 U	0.08 U	0.065 U	0.059 U	0.061 U	0.063 U	0.59 U	0.13 U	--	--	--	--	--
4-Bromophenyl Phenyl Ether	0.0098 U	0.0024 U	0.0032 U	0.0026 U	0.0024 U	0.0025 U	0.0025 U	0.024 U	0.0052 U	--	--	--	--	--
4-Chloro-3-Methylphenol	0.0066 U	0.0017 U	0.0022 U	0.0018 U	0.0016 U	0.0017 U	0.0017 U	0.016 U	0.0035 U	--	--	--	--	--
4-Chloroaniline	0.0047 U	0.0012 U	0.0015 U	0.0013 U	0.0011 U	0.0012 U	0.0012 U	0.011 U	0.0025 U	--	--	--	--	--
4-Chlorophenyl Phenyl Ether	0.0085 U	0.0021 U	0.0028 U	0.0023 U	0.0021 U	0.0021 U	0.0022 U	0.021 U	0.0045 U	--	--	--	--	--
4-Nitroaniline	0.0068 U	0.0017 U	0.0022 U	0.0018 U	0.0017 U	0.0017 U	0.0018 U	0.017 U	0.0036 U	--	--	--	--	--
4-Nitrophenol	0.098 UJ	0.025 UJ	0.032 U	0.026 U	0.024 U	0.025 U	0.026 U	0.24 UJ	0.053 UJ	--	--	--	--	--
Acenaphthene	0.049	0.002 U	0.031	0.0062 J	0.015	0.017	0.013	0.024 J	0.045	--	--	--	--	--
Acenaphthylene	0.0061 U	0.0015 U	0.0029 J	0.0016 U	0.0023 J	0.0027 J	0.0022 J	0.015 U	0.0033 U	--	--	--	--	--
Acetophenone	0.0076 U	0.0019 U	0.0025 U	0.002 U	0.0019 U	0.0019 U	0.002 U	0.019 U	0.0041 U	--	--	--	--	--
Anthracene	0.091	0.0018 U	0.066	0.011	0.033	0.036	0.021	0.055 J	0.065	--	--	--	--	--
Atrazine	0.061 UJ	0.015 UJ	0.02 U	0.016 U	0.015 U	0.015 U	0.016 U	0.15 UJ	0.033 UJ	--	--	--	--	--
Benzaldehyde	0.017 UR	0.0044 UR	0.0057 UR	0.0047 UR	0.0043 UR	0.0044 UR	0.0045 UR	0.043 UR	0.0093 UR	--	--	--	--	--
Benzo(A)Anthracene	0.53	0.0031 J	0.41	0.056	0.35	0.34	0.12	0.29	0.24	--	--	--	--	--
Benzo(A)Pyrene	0.77	0.0038 J	0.47 J+	0.065	0.46	0.46	0.16	0.39	0.32	--	--	--	--	--
Benzo(B)Fluoranthene	1.1	0.0059 J	0.74	0.1	0.71	0.73	0.22	0.56	0.37	--	--	--	--	--
Benzo(G,H,I)Perylene	0.68	0.0039 J	0.48 J+	0.063	0.5	0.48	0.15	0.37	0.24	--	--	--	--	--
Benzo(K)Fluoranthene	0.35	0.0023 J	0.33 J+	0.039	0.31	0.26	0.087	0.18	0.17	--	--	--	--	--
Benzyl Butyl Phthalate	0.096 U	0.024 U	0.032 U	0.026 U	0.024 U	0.024 U	0.025 U	0.24 U	0.051 U	--	--	--	--	--
Biphenyl (Diphenyl)	0.0059 U	0.0018 J	0.0019 UT	0.0016 U	0.0014 U	0.0015 U	0.0015 U	0.014 U	0.0048 J	--	--	--	--	--
Bis(2-Chloroethoxy) Methane	0.0067 U	0.0017 U	0.0022 U	0.0018 U	0.0016 U	0.0017 U	0.0017 U	0.016 U	0.0036 U	--	--	--	--	--
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.0051 U	0.0013 U	0.0017 U	0.0014 U	0.0012 U	0.0013 U	0.0013 U	0.012 U	0.0027 U	--	--	--	--	--
Bis(2-Chloroisopropyl) Ether	0.01 U	0.0026 U	0.0034 U	0.0028 U	0.0025 U	0.0026 U	0.0027 U	0.025 U	0.0055 U	--	--	--	--	--
Bis(2-Ethylhexyl) Phthalate	0.46 J	0.11 J	0.049 U	0.04 U	0.036 U	0.037 U	0.039 U	0.37 U	0.08 U	--	--	--	--	--
Caprolactam	0.091 U	0.023 U	0.03 UT	0.024 U	0.022 U	0.023 U	0.024 U	0.22 U	0.049 U	--	--	--	--	--
Carbazole	0.11	0.0016 U	0.1	0.014	0.058	0.06	0.023	0.067 J	0.055	--	--	--	--	--
Chrysene	0.82	0.0042 J	0.69	0.092	0.59	0.58	0.17	0.53	0.31	--	--	--	--	--
Dibenz(A,H)Anthracene	0.16	0.0016 U	0.095 J+	0.014	0.11	0.11	0.035	0.062 J	0.065	--	--	--	--	--
Dibenzofuran	0.019 J	0.0015 U	0.012 J	0.0024 J	0.0043 J	0.0051 J	0.0047 J	0.015 U	0.022 J	--	--	--	--	--

Table E-2
Summary of Data Used in Risk Assessment
Main Plant Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-206	CFSB-206	CFSB-207	CFSB-207	CFSB-208	CFSB-208-DUP	CFSB-208	CFSB-213	CFSB-213	CFSB-231	CFSB-231	CFSB-232	CFSB-232	CFSB-233
Sample Lab IDs	180-79204-1, 320-40608-1, 460-159044-1	180-79204-2, 320-40608-2, 460-159044-2	180-77302-1, 320-38708-1, 460-155040-1	180-77302-2, 320-38708-2, 460-155040-2	180-77302-3, 320-38708-3, 460-155040-3	180-77302-6, 320-38708-17, 460-155040-19	180-77302-4, 320-38708-4, 460-155040-4	180-79204-3, 320-40608-4, 460-159044-3	180-79204-4, 320-40608-3, 460-159044-4	320-38708-5, 460-155040-5	320-38708-6, 460-155040-6	320-38708-7, 460-155040-7	320-38708-8, 460-155040-8	320-38708-9, 460-155040-9
Sample Name	CFSB-206-SO-0-0.5	CFSB-206-SO-0.5-2	CFSB-207-SO-0-0.5	CFSB-207-SO-0.5-2	CFSB-208-SO-0-0.5	CFSB-DUP25-SO	CFSB-208-SO-0.5-2	CFSB-213-SO-0-0.5	CFSB-213-SO-0.5-2	CFSB-231-SO-0-0.5	CFSB-231-SO-0.5-2	CFSB-232-SO-0-0.5	CFSB-232-SO-0.5-2	CFSB-233-SO-0-0.5
Sample Depth	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft
Chemical	6/22/2018	6/22/2018	4/28/2018	4/28/2018	4/28/2018	4/28/2018	4/28/2018	6/22/2018	6/22/2018	4/28/2018	4/28/2018	4/28/2018	4/28/2018	4/28/2018
Diethyl Phthalate	0.042 U	0.011 U	0.014 U	0.011 U	0.01 U	0.011 U	0.011 U	0.1 U	0.022 U	--	--	--	--	--
Dimethyl Phthalate	0.0051 U	0.0013 U	0.0017 U	0.0014 U	0.0012 U	0.0013 U	0.0013 U	0.012 U	0.0027 U	--	--	--	--	--
Di-N-Butyl Phthalate	0.061 U	0.015 U	0.02 U	0.016 U	0.015 U	0.015 U	0.016 U	0.15 U	0.033 U	--	--	--	--	--
Di-N-Octylphthalate	0.081 U	0.02 U	0.027 U	0.022 U	0.02 U	0.02 U	0.021 U	0.2 U	0.044 U	--	--	--	--	--
Fluoranthene	1.1	0.0065 J	0.93	0.12	0.66	0.66	0.22	0.62	0.49	--	--	--	--	--
Fluorene	0.035	0.0018 J	0.023	0.0044 J	0.0097	0.011	0.0096	0.018 J	0.037	--	--	--	--	--
Hexachlorobenzene	0.01 U	0.0025 U	0.0033 U	0.0027 U	0.0025 U	0.0025 U	0.0026 U	0.025 U	0.0054 U	--	--	--	--	--
Hexachlorobutadiene	0.0082 U	0.0021 U	0.0027 U	0.0022 U	0.002 U	0.0021 U	0.0021 U	0.02 U	0.0044 U	--	--	--	--	--
Hexachlorocyclopentadiene	0.0071 UJ	0.0018 UJ	0.0024 U	0.0019 U	0.0017 U	0.0018 U	0.0019 U	0.018 UJ	0.0038 UJ	--	--	--	--	--
Hexachloroethane	0.0072 U	0.0018 U	0.0024 U	0.0019 U	0.0018 U	0.0018 U	0.0019 U	0.018 U	0.0039 U	--	--	--	--	--
Indeno(1,2,3-C,D)Pyrene	0.57	0.0033 J	0.38 J+	0.053	0.39	0.39	0.13	0.3	0.2	--	--	--	--	--
Isophorone	0.0071 U	0.0018 U	0.0024 U	0.0019 U	0.0017 U	0.0018 U	0.0019 U	0.018 U	0.0038 U	--	--	--	--	--
Naphthalene	0.016 J	0.0014 U	0.014	0.0015 U	0.0032 J	0.004 J	0.0034 J	0.013 U	0.015	--	--	--	--	--
Nitrobenzene	0.051 U	0.013 U	0.017 U	0.014 U	0.013 U	0.013 U	0.013 U	0.13 U	0.027 U	--	--	--	--	--
N-Nitrosodi-N-Propylamine	0.0095 U	0.0024 U	0.0031 U	0.0025 U	0.0023 U	0.0024 U	0.0025 U	0.023 U	0.0051 U	--	--	--	--	--
N-Nitrosodiphenylamine	0.047 U	0.012 U	0.015 U	0.013 U	0.011 U	0.012 U	0.012 U	0.11 U	0.025 U	--	--	--	--	--
Pentachlorophenol	0.22 UJ	0.056 UJ	0.074 UJ	0.06 UJ	0.055 UJ	0.057 UJ	0.059 UJ	0.55 UJ	0.12 UJ	--	--	--	--	--
Phenanthrene	0.53	0.007	0.33	0.054	0.2	0.22	0.1	0.35	0.34	--	--	--	--	--
Phenol	0.042 U	0.011 U	0.014 UT	0.011 U	0.01 U	0.011 U	0.011 U	0.1 U	0.023 U	--	--	--	--	--
Pyrene	1	0.0061 J	0.88	0.11	0.65	0.66	0.23	0.57	0.43	--	--	--	--	--
VOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,1,1-Trichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,2,2-Tetrachloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,2-Trichloro-1,2,2-Trifluoroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,2-Trichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1-Dichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1-Dichloroethene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,3-Trichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,4-Trichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dibromo-3-Chloropropane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dibromoethane (Ethylene Dibromide)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichloropropane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,3-Dichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,4-Dichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Hexanone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acetone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromochloromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromodichloromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromoform	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromomethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Carbon Disulfide	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Carbon Tetrachloride	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chloroform	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chloromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cis-1,2-Dichloroethylene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cis-1,3-Dichloropropene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cyclohexane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibromochloromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dichlorodifluoromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Ethylbenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Isopropylbenzene (Cumene)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
M,P-Xylene	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Table E-2
Summary of Data Used in Risk Assessment
Main Plant Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-206	CFSB-206	CFSB-207	CFSB-207	CFSB-208	CFSB-208-DUP	CFSB-208	CFSB-213	CFSB-213	CFSB-231	CFSB-231	CFSB-232	CFSB-232	CFSB-233
Sample Lab IDs	180-79204-1, 320-40608-1, 460-159044-1	180-79204-2, 320-40608-2, 460-159044-2	180-77302-1, 320-38708-1, 460-155040-1	180-77302-2, 320-38708-2, 460-155040-2	180-77302-3, 320-38708-3, 460-155040-3	180-77302-6, 320-38708-17, 460-155040-19	180-77302-4, 320-38708-4, 460-155040-4	180-79204-3, 320-40608-4, 460-159044-3	180-79204-4, 320-40608-3, 460-159044-4	320-38708-5, 460-155040-5	320-38708-6, 460-155040-6	320-38708-7, 460-155040-7	320-38708-8, 460-155040-8	320-38708-9, 460-155040-9
Sample Name	CFSB-206-SO-0-0.5	CFSB-206-SO-0.5-2	CFSB-207-SO-0-0.5	CFSB-207-SO-0.5-2	CFSB-208-SO-0-0.5	CFSB-DUP25-SO	CFSB-208-SO-0.5-2	CFSB-213-SO-0-0.5	CFSB-213-SO-0.5-2	CFSB-231-SO-0-0.5	CFSB-231-SO-0.5-2	CFSB-232-SO-0-0.5	CFSB-232-SO-0.5-2	CFSB-233-SO-0-0.5
Sample Depth	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft
Chemical	6/22/2018	6/22/2018	4/28/2018	4/28/2018	4/28/2018	4/28/2018	4/28/2018	6/22/2018	6/22/2018	4/28/2018	4/28/2018	4/28/2018	4/28/2018	4/28/2018
Methyl Acetate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methyl Ethyl Ketone (2-Butanone)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methylcyclohexane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methylene Chloride	--	--	--	--	--	--	--	--	--	--	--	--	--	--
O-Xylene (1,2-Dimethylbenzene)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Styrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Tert-Butyl Methyl Ether	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Tetrachloroethylene (PCE)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Toluene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Trans-1,2-Dichloroethene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Trans-1,3-Dichloropropene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Trichloroethylene (TCE)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Trichlorofluoromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Vinyl Chloride	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-2
Summary of Data Used in Risk Assessment
Main Plant Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-233	CFSB-234	CFSB-234	CFSB-235	CFSB-235	CFSB-236	CFSB-236	CFSB-240	CFSB-240	CFSB-240	CFSB-242	CFSB-242	CFSB-242	CFSB-243
Sample Lab IDs	320-38708-10, 460-155040-10	320-38708-11, 460-155040-11	320-38708-12, 460-155040-12	320-38708-13, 460-155040-13	320-38708-14, 460-155040-14	320-38708-15, 460-155040-15	320-38708-16, 460-155040-16	180-77673-45, 460-155989-67	180-77673-46, 460-155989-68	180-77673-47, 460-155989-69	180-77673-39, 460-155989-61	180-77673-40, 460-155989-62	180-77673-41, 460-155989-63	180-77673-42, 460-155989-64
Sample Name	CFSB-233-SO-0.5-2	CFSB-234-SO-0-0.5	CFSB-234-SO-0.5-2	CFSB-235-SO-0-0.5	CFSB-235-SO-0.5-2	CFSB-236-SO-0-0.5	CFSB-236-SO-0.5-2	CFSB-240-SO-0-0.5	CFSB-240-SO-0.5-2	CFSB-240-SO-10-12	CFSB-242-SO-0-0.5	CFSB-242-SO-0.5-2	CFSB-242-SO-10-12	CFSB-243-SO-0-0.5
Sample Depth	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft
Chemical	4/28/2018	4/28/2018	4/28/2018	4/28/2018	4/28/2018	4/28/2018	4/28/2018	5/10/2018	5/10/2018	5/10/2018	5/10/2018	5/10/2018	5/10/2018	5/10/2018
GENERAL CHEMISTRY (mg/kg)														
Fluoride	--	--	--	--	--	--	--	9.46 J-	11.5 J-	10.9 J-	13.1 J	26.5 J	4.23 J-	3.74 J-
Cyanide	--	--	--	--	--	--	--	0.13 J	0.23 J	0.12 J	0.14 J	0.14 J	0.12 J	0.11 J
METALS (mg/kg)														
"Chromium, Hexavalent - Estimated"	--	--	--	--	--	--	--	0.256934	0.270316	0.56472	0.195377	0.254258	0.190024	0.206083
"Chromium, Trivalent - Calculated"	--	--	--	--	--	--	--	--	--	--	--	--	--	--
"Chromium, Trivalent - Estimated"	--	--	--	--	--	--	--	9.34307	9.82968	20.5353	7.10462	9.24574	6.90998	7.49392
Aluminum	--	--	--	--	--	--	--	13100	11900	8690	9070	9220	5870	7490
Antimony	--	--	--	--	--	--	--	0.32 U	0.31 U	0.31 U	0.26 UJ	0.24 UJ	0.23 UJ	0.26 UJ
Arsenic	--	--	--	--	--	--	--	5.2	4	5.1	3.1	3.4	2.5	2.8
Barium	--	--	--	--	--	--	--	119	101	75	88.4	108	44.4	44.2
Beryllium	--	--	--	--	--	--	--	0.42 J	0.42	0.42	0.42	0.45	0.22 J	0.25 J
Cadmium	--	--	--	--	--	--	--	0.37 U	0.36 U	0.35 U	0.3 U	0.28 U	0.26 U	0.3 U
Calcium	--	--	--	--	--	--	--	18100	27800	30800	3610 J	2660 J	32100 J	14500 J
Chromium, Total	--	--	--	--	--	--	--	9.6	10.1	21.1	7.3	9.5	7.1	7.7
Cobalt	--	--	--	--	--	--	--	5.1	5.1	5.5	4.5	4.4	3.3	4.1
Copper	--	--	--	--	--	--	--	11.8	10.8	13.4	7.7 J	6.3 J	10 J	9.7 J
Iron	--	--	--	--	--	--	--	14900	16400	14300	9950	12500	9570	11300
Lead	--	--	--	--	--	--	--	9.9	7.1	8.6	9.7 J	6.7 J	4.1 J	6.6 J
Magnesium	--	--	--	--	--	--	--	9920	17500	11900	6620 J	6700 J	9490 J	8480 J
Manganese	--	--	--	--	--	--	--	441	468	357	379	540	286	248
Mercury	--	--	--	--	--	--	--	0.022	0.024	0.016 J	0.016 J	0.012 J	0.025	0.033
Nickel	--	--	--	--	--	--	--	17.2	11.7	11.1	11.7	9.1	7.4	9.6
Potassium	--	--	--	--	--	--	--	966	1040	896	639 J+	571 J+	407 J+	492 J+
Selenium	--	--	--	--	--	--	--	0.32 U	0.31 U	0.3 U	0.26 U	0.24 U	0.23 U	0.26 U
Silver	--	--	--	--	--	--	--	0.68 U	0.65 U	0.64 U	0.55 U	0.52 U	0.48 U	0.55 U
Sodium	--	--	--	--	--	--	--	48.2 J	34.3 J	32.6 U	28.1 U	26.2 U	24.4 U	27.9 U
Thallium	--	--	--	--	--	--	--	0.14 U	0.13 U	0.13 U	0.11 U	0.1 U	0.098 U	0.11 U
Vanadium	--	--	--	--	--	--	--	12.4	9.7	8.1	7.6	7.5	4.5	7
Zinc	--	--	--	--	--	--	--	49.6	44.1	38.6	36.8	37	25.3	29.1
METALS|HEXAVALENT CHROMIUM (mg/kg)														
Chromium, Hexavalent	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PESTICIDES (mg/kg)														
Aldrin	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Alpha Bhc (Alpha Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Alpha Endosulfan	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Beta Bhc (Beta Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Beta Endosulfan	--	--	--	--	--	--	--	--	--	--	--	--	--	--
cis-Chlordane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Delta BHC (Delta Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dieldrin	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endosulfan Sulfate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin Aldehyde	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin Ketone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Gamma Bhc (Lindane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Heptachlor	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Heptachlor Epoxide	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methoxychlor	--	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDD	--	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDT	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Toxaphene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
trans-Chlordane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
POLYCHLORINATED BIPHENYLS (mg/kg)														
PCB-1016 (Aroclor 1016)	0.011 U	0.01 U	0.01 U	0.0098 U	0.0096 U	0.0094 U	0.0094 U	--	--	--	--	--	--	--
PCB-1221 (Aroclor 1221)	0.011 U	0.01 U	0.01 U	0.0098 U	0.0096 U	0.0094 U	0.0094 U	--	--	--	--	--	--	--

Table E-2
Summary of Data Used in Risk Assessment
Main Plant Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-233	CFSB-234	CFSB-234	CFSB-235	CFSB-235	CFSB-236	CFSB-236	CFSB-240	CFSB-240	CFSB-240	CFSB-242	CFSB-242	CFSB-242	CFSB-243
Sample Lab IDs	320-38708-10, 460-155040-10	320-38708-11, 460-155040-11	320-38708-12, 460-155040-12	320-38708-13, 460-155040-13	320-38708-14, 460-155040-14	320-38708-15, 460-155040-15	320-38708-16, 460-155040-16	180-77673-45, 460-155989-67	180-77673-46, 460-155989-68	180-77673-47, 460-155989-69	180-77673-39, 460-155989-61	180-77673-40, 460-155989-62	180-77673-41, 460-155989-63	180-77673-42, 460-155989-64
Sample Name	CFSB-233-SO-0.5-2	CFSB-234-SO-0-0.5	CFSB-234-SO-0.5-2	CFSB-235-SO-0-0.5	CFSB-235-SO-0.5-2	CFSB-236-SO-0-0.5	CFSB-236-SO-0.5-2	CFSB-240-SO-0-0.5	CFSB-240-SO-0.5-2	CFSB-240-SO-10-12	CFSB-242-SO-0-0.5	CFSB-242-SO-0.5-2	CFSB-242-SO-10-12	CFSB-243-SO-0-0.5
Sample Depth	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft
Chemical	4/28/2018	4/28/2018	4/28/2018	4/28/2018	4/28/2018	4/28/2018	4/28/2018	5/10/2018	5/10/2018	5/10/2018	5/10/2018	5/10/2018	5/10/2018	5/10/2018
PCB-1232 (Aroclor 1232)	0.011 U	0.01 U	0.01 U	0.0098 U	0.0096 U	0.0094 U	0.0094 U	--	--	--	--	--	--	--
PCB-1242 (Aroclor 1242)	0.011 U	0.01 U	0.01 U	0.0098 U	0.0096 U	0.0094 U	0.0094 U	--	--	--	--	--	--	--
PCB-1248 (Aroclor 1248)	0.011 U	0.01 U	0.01 U	0.0098 U	0.0096 U	0.0094 U	0.0094 U	--	--	--	--	--	--	--
PCB-1254 (Aroclor 1254)	0.012 U	0.01 U	0.011 U	0.01 U	0.01 U	0.0097 U	0.0097 U	--	--	--	--	--	--	--
PCB-1260 (Aroclor 1260)	0.012 U	0.01 U	0.011 U	0.01 U	0.01 U	0.0097 U	0.0097 U	--	--	--	--	--	--	--
PCB-1262 (Aroclor 1262)	0.012 U	0.01 U	0.011 U	0.01 U	0.01 U	0.0097 U	0.0097 U	--	--	--	--	--	--	--
PCB-1268 (Aroclor 1268)	0.012 U	0.01 U	0.011 U	0.01 U	0.01 U	0.0097 U	0.0097 U	--	--	--	--	--	--	--
Polychlorinated Biphenyl (PCBs)	0.012 U	0.01 U	0.011 U	0.01 U	0.01 U	0.0097 U	0.0097 U	--	--	--	--	--	--	--
SEMIVOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,2,4,5-Tetrachlorobenzene	--	--	--	--	--	--	--	0.0016 U	0.0016 U	0.0016 U	0.0016 U	0.0016 U	0.0015 U	0.0016 U
1,4-Dioxane (P-Dioxane)	--	--	--	--	--	--	--	0.012 U	0.011 U	0.012 U	0.012 U	0.012 U	0.011 U	0.011 U
2,3,4,6-Tetrachlorophenol	--	--	--	--	--	--	--	0.016 U	0.015 U	0.015 U	0.016 U	0.016 U	0.015 U	0.015 U
2,4,5-Trichlorophenol	--	--	--	--	--	--	--	0.0027 U	0.0026 U	0.0026 U	0.0027 U	0.0027 U	0.0026 U	0.0026 U
2,4,6-Trichlorophenol	--	--	--	--	--	--	--	0.0021 U	0.002 U	0.002 U	0.0021 U	0.0021 U	0.002 U	0.002 U
2,4-Dichlorophenol	--	--	--	--	--	--	--	0.0029 U	0.0028 U	0.0028 U	0.0029 U	0.0029 U	0.0028 U	0.0028 U
2,4-Dimethylphenol	--	--	--	--	--	--	--	0.0023 U	0.0023 U	0.0023 U	0.0024 U	0.0023 U	0.0022 U	0.0023 U
2,4-Dinitrophenol	--	--	--	--	--	--	--	0.1 UJ	0.098 UJ	0.099 UJ	0.1 UJ	0.1 UJ	0.096 UJ	0.098 UJ
2,4-Dinitrotoluene	--	--	--	--	--	--	--	0.0019 U	0.0018 U	0.0018 U	0.0019 U	0.0019 U	0.0018 U	0.0018 U
2,6-Dinitrotoluene	--	--	--	--	--	--	--	0.0023 U	0.0022 U	0.0023 U	0.0024 U	0.0023 U	0.0022 U	0.0023 U
2-Chloronaphthalene	--	--	--	--	--	--	--	0.0017 U	0.0017 U	0.0017 U	0.0018 U	0.0017 U	0.0016 U	0.0017 U
2-Chlorophenol	--	--	--	--	--	--	--	0.0017 U	0.0017 U	0.0017 U	0.0018 U	0.0017 U	0.0017 U	0.0017 U
2-Methylnaphthalene	--	--	--	--	--	--	--	0.0064 J	0.0017 U	0.0018 U	0.0018 U	0.0018 U	0.0017 U	0.004 J
2-Methylphenol (O-Cresol)	--	--	--	--	--	--	--	0.011 U	0.01 U	0.011 U	0.011 U	0.011 U	0.01 U	0.01 U
2-Nitroaniline	--	--	--	--	--	--	--	0.017 U	0.017 U	0.017 U	0.017 U	0.017 U	0.016 U	0.017 U
2-Nitrophenol	--	--	--	--	--	--	--	0.0021 U	0.0021 U	0.0021 U	0.0022 U	0.0021 U	0.002 U	0.0021 U
3- And 4- Methylphenol (Total)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3,3'-Dichlorobenzidine	--	--	--	--	--	--	--	0.035 U	0.034 U	0.034 U	0.036 U	0.035 U	0.033 U	0.034 U
3-Nitroaniline	--	--	--	--	--	--	--	0.0095 U	0.0092 U	0.0094 U	0.0097 U	0.0095 U	0.0091 U	0.0093 U
4,6-Dinitro-2-Methylphenol	--	--	--	--	--	--	--	0.065 U	0.063 U	0.064 U	0.066 U	0.065 U	0.062 U	0.063 U
4-Bromophenyl Phenyl Ether	--	--	--	--	--	--	--	0.0026 U	0.0025 U	0.0026 U	0.0027 U	0.0026 U	0.0025 U	0.0026 U
4-Chloro-3-Methylphenol	--	--	--	--	--	--	--	0.0018 U	0.0017 U	0.0017 U	0.0018 U	0.0018 U	0.0017 U	0.0017 U
4-Chloroaniline	--	--	--	--	--	--	--	0.0012 U	0.0012 U	0.0012 U	0.0013 U	0.0012 U	0.0012 U	0.0012 U
4-Chlorophenyl Phenyl Ether	--	--	--	--	--	--	--	0.0023 U	0.0022 U	0.0022 U	0.0023 U	0.0023 U	0.0022 U	0.0022 U
4-Nitroaniline	--	--	--	--	--	--	--	0.0018 U	0.0018 U	0.0018 U	0.0019 U	0.0018 U	0.0017 U	0.0018 U
4-Nitrophenol	--	--	--	--	--	--	--	0.026 U	0.025 U	0.026 U	0.027 U	0.026 U	0.025 U	0.026 U
Acenaphthene	--	--	--	--	--	--	--	0.016	0.0038 J	0.0021 U	0.0061 J	0.0022 U	0.0021 U	0.023
Acenaphthylene	--	--	--	--	--	--	--	0.052	0.0025 J	0.0016 U	0.0017 U	0.0016 U	0.0016 U	0.0016 U
Acetophenone	--	--	--	--	--	--	--	0.002 U	0.002 U	0.002 U	0.0021 U	0.002 U	0.0019 U	0.002 U
Anthracene	--	--	--	--	--	--	--	0.067	0.0062 J	0.0019 U	0.01	0.0019 U	0.0019 U	0.026
Atrazine	--	--	--	--	--	--	--	0.016 U	0.016 U	0.016 U	0.017 U	0.016 U	0.016 U	0.016 U
Benzaldehyde	--	--	--	--	--	--	--	0.0047 UR	0.0045 UR	0.0046 UR	0.0047 UR	0.0047 UR	0.0044 UR	0.0045 UR
Benzo(A)Anthracene	--	--	--	--	--	--	--	0.3	0.024	0.0026 J	0.081	0.0047 J	0.0075	0.094
Benzo(A)Pyrene	--	--	--	--	--	--	--	0.46	0.031	0.0039 J	0.12	0.0063 J	0.0097	0.13
Benzo(B)Fluoranthene	--	--	--	--	--	--	--	0.7	0.042	0.0063 J	0.2	0.0093	0.013	0.17
Benzo(G,H,I)Perylene	--	--	--	--	--	--	--	0.44	0.028	0.004 J	0.14	0.0076	0.0086	0.13
Benzo(K)Fluoranthene	--	--	--	--	--	--	--	0.29	0.016	0.0022 U	0.053	0.0043 J	0.0056 J	0.085
Benzyl Butyl Phthalate	--	--	--	--	--	--	--	0.026 U	0.025 U	0.025 U	0.026 U	0.026 U	0.025 U	0.025 U
Biphenyl (Diphenyl)	--	--	--	--	--	--	--	0.0016 U	0.0015 U	0.0016 U	0.0016 U	0.0016 U	0.0015 U	0.0015 U
Bis(2-Chloroethoxy) Methane	--	--	--	--	--	--	--	0.0018 U	0.0017 U	0.0018 U	0.0018 U	0.0018 U	0.0017 U	0.0017 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	--	--	--	--	--	--	--	0.0014 U	0.0013 U	0.0013 U	0.0014 U	0.0014 U	0.0013 U	0.0013 U
Bis(2-Chloroisopropyl) Ether	--	--	--	--	--	--	--	0.0028 UJ	0.0027 UJ	0.0027 UJ	0.0028 UJ	0.0028 UJ	0.0026 UJ	0.0027 UJ
Bis(2-Ethylhexyl) Phthalate	--	--	--	--	--	--	--	0.04 U	0.039 U	0.039 U	0.041 U	0.04 U	0.038 U	0.039 U
Caprolactam	--	--	--	--	--	--	--	0.024 U	0.024 U	0.024 U	0.025 U	0.024 U	0.023 U	0.024 U
Carbazole	--	--	--	--	--	--	--	0.038	0.0048 J	0.0017 U	0.014	0.0018 U	0.0017 U	0.022
Chrysene	--	--	--	--	--	--	--	0.51	0.034	0.0044 J	0.13	0.007 J	0.01	0.14
Dibenz(A,H)Anthracene	--	--	--	--	--	--	--	0.094	0.0062 J	0.0017 U	0.023	0.0017 J	0.0016 J	0.025
Dibenzofuran	--	--	--	--	--	--	--	0.0054 J	0.0023 J	0.0016 U	0.0021 J	0.0016 U	0.0016 U	0.0093 J

Table E-2
Summary of Data Used in Risk Assessment
Main Plant Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-233	CFSB-234	CFSB-234	CFSB-235	CFSB-235	CFSB-236	CFSB-236	CFSB-240	CFSB-240	CFSB-240	CFSB-242	CFSB-242	CFSB-242	CFSB-243
Sample Lab IDs	320-38708-10, 460-155040-10	320-38708-11, 460-155040-11	320-38708-12, 460-155040-12	320-38708-13, 460-155040-13	320-38708-14, 460-155040-14	320-38708-15, 460-155040-15	320-38708-16, 460-155040-16	180-77673-45, 460-155989-67	180-77673-46, 460-155989-68	180-77673-47, 460-155989-69	180-77673-39, 460-155989-61	180-77673-40, 460-155989-62	180-77673-41, 460-155989-63	180-77673-42, 460-155989-64
Sample Name	CFSB-233-SO-0.5-2	CFSB-234-SO-0-0.5	CFSB-234-SO-0.5-2	CFSB-235-SO-0-0.5	CFSB-235-SO-0.5-2	CFSB-236-SO-0-0.5	CFSB-236-SO-0.5-2	CFSB-240-SO-0-0.5	CFSB-240-SO-0.5-2	CFSB-240-SO-10-12	CFSB-242-SO-0-0.5	CFSB-242-SO-0.5-2	CFSB-242-SO-10-12	CFSB-243-SO-0-0.5
Sample Depth	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft
Chemical	4/28/2018	4/28/2018	4/28/2018	4/28/2018	4/28/2018	4/28/2018	4/28/2018	5/10/2018	5/10/2018	5/10/2018	5/10/2018	5/10/2018	5/10/2018	5/10/2018
Diethyl Phthalate	--	--	--	--	--	--	--	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U
Dimethyl Phthalate	--	--	--	--	--	--	--	0.0014 U	0.0013 U	0.0013 U	0.0014 U	0.0014 U	0.0013 U	0.0013 U
Di-N-Butyl Phthalate	--	--	--	--	--	--	--	0.016 U	0.016 U	0.016 U	0.017 U	0.016 U	0.016 U	0.016 U
Di-N-Octylphthalate	--	--	--	--	--	--	--	0.022 U	0.021 U	0.021 U	0.022 U	0.022 U	0.021 U	0.021 U
Fluoranthene	--	--	--	--	--	--	--	0.49	0.047	0.0053 J	0.16	0.01	0.015	0.24
Fluorene	--	--	--	--	--	--	--	0.018	0.0033 J	0.0015 U	0.0035 J	0.0015 U	0.0014 U	0.016
Hexachlorobenzene	--	--	--	--	--	--	--	0.0027 U	0.0026 U	0.0026 U	0.0027 U	0.0027 U	0.0026 U	0.0026 U
Hexachlorobutadiene	--	--	--	--	--	--	--	0.0022 U	0.0021 U	0.0022 U	0.0022 U	0.0022 U	0.0021 U	0.0021 U
Hexachlorocyclopentadiene	--	--	--	--	--	--	--	0.0019 U	0.0019 U	0.0019 U	0.0019 U	0.0019 U	0.0018 U	0.0019 U
Hexachloroethane	--	--	--	--	--	--	--	0.0019 U	0.0019 U	0.0019 U	0.002 U	0.0019 U	0.0018 U	0.0019 U
Indeno(1,2,3-C,D)Pyrene	--	--	--	--	--	--	--	0.36	0.024	0.0031 J	0.1	0.0059 J	0.0061 J	0.11
Isophorone	--	--	--	--	--	--	--	0.0019 U	0.0019 U	0.0019 U	0.0019 U	0.0019 U	0.0018 U	0.0019 U
Naphthalene	--	--	--	--	--	--	--	0.0054 J	0.0029 J	0.0014 U	0.0017 J	0.0015 U	0.0014 U	0.012
Nitrobenzene	--	--	--	--	--	--	--	0.014 U	0.013 U	0.014 U	0.014 U	0.014 U	0.013 U	0.013 U
N-Nitrosodi-N-Propylamine	--	--	--	--	--	--	--	0.0025 U	0.0025 U	0.0025 U	0.0026 U	0.0025 U	0.0024 U	0.0025 U
N-Nitrosodiphenylamine	--	--	--	--	--	--	--	0.012 U	0.012 U	0.012 U	0.013 U	0.012 U	0.012 U	0.012 U
Pentachlorophenol	--	--	--	--	--	--	--	0.06 UJ	0.058 UJ	0.059 UJ	0.061 UJ	0.06 UJ	0.057 UJ	0.059 UJ
Phenanthrene	--	--	--	--	--	--	--	0.2	0.027	0.0031 J	0.06	0.0064 J	0.0073	0.14
Phenol	--	--	--	--	--	--	--	0.011 U	0.011 U	0.011 U	0.012 U	0.011 U	0.011 U	0.011 U
Pyrene	--	--	--	--	--	--	--	0.49	0.039	0.0046 J	0.13	0.0076	0.014	0.2
VOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,1,1-Trichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,2,2-Tetrachloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,2-Trichloro-1,2,2-Trifluoroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,2-Trichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1-Dichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1-Dichloroethene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,3-Trichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,4-Trichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dibromo-3-Chloropropane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dibromoethane (Ethylene Dibromide)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichloropropane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,3-Dichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,4-Dichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Hexanone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acetone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromochloromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromodichloromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromoform	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromomethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Carbon Disulfide	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Carbon Tetrachloride	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chloroform	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chloromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cis-1,2-Dichloroethylene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cis-1,3-Dichloropropene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cyclohexane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibromochloromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dichlorodifluoromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Ethylbenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Isopropylbenzene (Cumene)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
M,P-Xylene	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Table E-2
Summary of Data Used in Risk Assessment
Main Plant Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-233	CFSB-234	CFSB-234	CFSB-235	CFSB-235	CFSB-236	CFSB-236	CFSB-240	CFSB-240	CFSB-240	CFSB-242	CFSB-242	CFSB-242	CFSB-243
Sample Lab IDs	320-38708-10, 460-155040-10	320-38708-11, 460-155040-11	320-38708-12, 460-155040-12	320-38708-13, 460-155040-13	320-38708-14, 460-155040-14	320-38708-15, 460-155040-15	320-38708-16, 460-155040-16	180-77673-45, 460-155989-67	180-77673-46, 460-155989-68	180-77673-47, 460-155989-69	180-77673-39, 460-155989-61	180-77673-40, 460-155989-62	180-77673-41, 460-155989-63	180-77673-42, 460-155989-64
Sample Name	CFSB-233-SO-0.5-2	CFSB-234-SO-0-0.5	CFSB-234-SO-0.5-2	CFSB-235-SO-0-0.5	CFSB-235-SO-0.5-2	CFSB-236-SO-0-0.5	CFSB-236-SO-0.5-2	CFSB-240-SO-0-0.5	CFSB-240-SO-0.5-2	CFSB-240-SO-10-12	CFSB-242-SO-0-0.5	CFSB-242-SO-0.5-2	CFSB-242-SO-10-12	CFSB-243-SO-0-0.5
Sample Depth	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft
Chemical	4/28/2018	4/28/2018	4/28/2018	4/28/2018	4/28/2018	4/28/2018	4/28/2018	5/10/2018	5/10/2018	5/10/2018	5/10/2018	5/10/2018	5/10/2018	5/10/2018
Methyl Acetate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methyl Ethyl Ketone (2-Butanone)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methylcyclohexane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methylene Chloride	--	--	--	--	--	--	--	--	--	--	--	--	--	--
O-Xylene (1,2-Dimethylbenzene)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Styrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Tert-Butyl Methyl Ether	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Tetrachloroethylene (PCE)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Toluene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Trans-1,2-Dichloroethene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Trans-1,3-Dichloropropene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Trichloroethylene (TCE)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Trichlorofluoromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Vinyl Chloride	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-2
Summary of Data Used in Risk Assessment
Main Plant Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-243	CFSB-243	CFSB-246	CFSB-246	CFSB-246	CFSB-247	CFSB-247	CFSB-247	CFSB-266	CFSB-266	CFSB-266	CFSB-274	CFSB-274	CFSB-274
Sample Lab IDs	180-77673-43, 460-155989-65	180-77673-44, 460-155989-66	180-77673-20, 460-155989-42	180-77673-21, 460-155989-43	180-77673-22, 460-155989-44	180-77673-23, 460-155989-45	180-77673-24, 460-155989-46	180-77673-25, 460-155989-47	180-77673-48, 460-155989-70	180-77673-49, 460-155989-71	180-77673-50, 460-155989-72	180-77782-67, 460-156162-17	180-77782-68, 460-156162-18	180-77782-69, 460-156162-19
Sample Name	CFSB-243-SO-0.5-2	CFSB-243-SO-10-12	CFSB-246-SO-0-0.5	CFSB-246-SO-0.5-2	CFSB-246-SO-10-12	CFSB-247-SO-0-0.5	CFSB-247-SO-0.5-2	CFSB-247-SO-10-12	CFSB-266-SO-0-0.5	CFSB-266-SO-0.5-2	CFSB-266-SO-10-12	CFSB-274-SO-0-0.5	CFSB-274-SO-0.5-2	CFSB-274-SO-6-8
Sample Depth	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	6-8 ft
Chemical	5/10/2018	5/10/2018	5/9/2018	5/9/2018	5/9/2018	5/9/2018	5/9/2018	5/9/2018	5/10/2018	5/10/2018	5/10/2018	5/11/2018	5/11/2018	5/11/2018
GENERAL CHEMISTRY (mg/kg)														
Fluoride	2.39 J-	2.48 J-	10 J	8.05 J	1.47 J	19.6 J	4 J	12.6 J	18.8 J-	14.9 J-	10.3 J-	32.5	10.9	6.12
Cyanide	0.066 U	0.066 U	0.15 J	0.059 U	0.13 J	0.14 J	0.055 U	0.13 J	0.11 J	0.073 J	0.093 J	--	--	0.055 U
METALS (mg/kg)														
"Chromium, Hexavalent - Estimated"	0.291727	0.347932	0.307786	0.240876	0.305109	0.259611	0.157908	0.281022	0.321168	0.289051	0.441606	0.20073	0.29708	0.318491
"Chromium, Trivalent - Calculated"	--	--	--	--	--	--	--	--	--	--	--	--	--	--
"Chromium, Trivalent - Estimated"	10.6083	12.6521	11.1922	8.75912	11.0949	9.44039	5.74209	10.219	11.6788	10.5109	16.0584	7.29927	10.8029	11.5815
Aluminum	8090	9620	21900	8370	8460	9650	5230	6400	15300	11900	11900	6020	10500	12900
Antimony	0.25 UJ	0.29 U	0.3 U	0.27 U	0.25 U	0.25 U	0.24 UJ	0.24 UJ	0.33 U	0.31 U	0.32 U	0.29 UJ	0.35 J-	0.3 UJ
Arsenic	4.2	3.7	4.9	7	3.9	5.8	2.6	3.1	7	5	5.8	3	5.1	4.7
Barium	67.7	113	254	80.1	172	154	80	140	132	73.8	74.9	92.9	98.6	168
Beryllium	0.37	0.4	0.77	0.4	0.41	0.33 J	0.27 J	0.36	0.65	0.44	0.47	0.38 J	0.51	0.47
Cadmium	0.28 U	0.33 U	0.34 U	0.31 U	0.28 U	0.29 U	0.28 U	0.28 U	0.38 U	0.36 U	0.37 U	0.35 J	0.33 U	0.34 U
Calcium	41900 J	36900	2830	1410	17200	31900	18200 J	26500 J	14300	2650	7770	14300 J	23400 J	25100 J
Chromium, Total	10.9	13	11.5	9	11.4	9.7	5.9	10.5	12	10.8	16.5	7.5	11.1	11.9
Cobalt	5	5.3	5.5	7.2	5.5	4.6	3.3	3.7	6.2	6.1	6.7	4.2	6	8.7
Copper	11.1 J	11.1	16.3	33.2	12.1	12.9	10.1 J	10.6 J	19.1	17	18	9.4	15.1	17.5
Iron	13400	15600	15000	11000	14000	13900	8160	9670	17400	17800	18300	9510	15600	22500
Lead	7.4 J	6.4	10	10.2	7	10.2	5.4 J	8.3 J	10.8	10.3	9.1	14.4 J+	8 J+	12.4 J+
Magnesium	11400 J	15700	5500	5850	9580	18300	6660 J	6510 J	8630	8800	9310	8150	12500	16000
Manganese	402	485	598	380	462	812	292	324	439	473	388	330	394	421
Mercury	0.02 J+	0.02	0.023	0.017	0.011 J	0.029	0.03	0.023	0.015 J	0.02	0.029	0.013 J+	0.015 J+	0.14 J+
Nickel	10	11.5	11.9	9.3	10.4	11.3	6.7	8.1	15.2	12.7	14.8	11.3	12.5	12.4
Potassium	552 J+	888	989	604	704	604	424 J+	559 J+	1220	1020	1060	654	850	824
Selenium	0.25 U	0.28 U	0.29 U	0.27 U	0.25 U	0.25 U	0.24 U	0.24 U	0.33 U	0.31 U	0.32 U	0.29 U	0.29 U	0.3 U
Silver	0.52 U	0.6 U	0.63 U	0.57 U	0.52 U	0.53 U	0.51 U	0.51 U	0.7 U	0.66 U	0.67 U	0.62 U	0.61 U	0.63 U
Sodium	26.5 U	100	73.7 J	28.8 U	26.5 U	26.8 U	81.8 J	25.9 U	47.8 J	33.4 U	34.2 U	50.3 J	49.9 J	54.8 J
Thallium	0.11 U	0.12 U	0.13 U	0.11 U	0.11 U	0.11 U	0.1 U	0.1 U	0.14 U	0.13 U	0.14 U	0.12 U	0.12 U	0.13 U
Vanadium	8.6	8.7	15.7	7.8	8.3	9.3	4.3	6	14.7	10.2	14.9	6.8	10.3	20.2
Zinc	37.5	40.7	60.9	35.2	37.4	40.4	22.8	25.4	70.9	40.3	44.1	136	46	60.8
METALS|HEXAVALENT CHROMIUM (mg/kg)														
Chromium, Hexavalent	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PESTICIDES (mg/kg)														
Aldrin	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Alpha Bhc (Alpha Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Alpha Endosulfan	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Beta Bhc (Beta Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Beta Endosulfan	--	--	--	--	--	--	--	--	--	--	--	--	--	--
cis-Chlordane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Delta BHC (Delta Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dieldrin	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endosulfan Sulfate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin Aldehyde	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin Ketone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Gamma Bhc (Lindane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Heptachlor	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Heptachlor Epoxide	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methoxychlor	--	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDD	--	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDT	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Toxaphene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
trans-Chlordane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
POLYCHLORINATED BIPHENYLS (mg/kg)														
PCB-1016 (Aroclor 1016)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1221 (Aroclor 1221)	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Table E-2
Summary of Data Used in Risk Assessment
Main Plant Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-243	CFSB-243	CFSB-246	CFSB-246	CFSB-246	CFSB-247	CFSB-247	CFSB-247	CFSB-266	CFSB-266	CFSB-266	CFSB-274	CFSB-274	CFSB-274
Sample Lab IDs	180-77673-43, 460-155989-65	180-77673-44, 460-155989-66	180-77673-20, 460-155989-42	180-77673-21, 460-155989-43	180-77673-22, 460-155989-44	180-77673-23, 460-155989-45	180-77673-24, 460-155989-46	180-77673-25, 460-155989-47	180-77673-48, 460-155989-70	180-77673-49, 460-155989-71	180-77673-50, 460-155989-72	180-77782-67, 460-156162-17	180-77782-68, 460-156162-18	180-77782-69, 460-156162-19
Sample Name	CFSB-243-SO-0.5-2	CFSB-243-SO-10-12	CFSB-246-SO-0-0.5	CFSB-246-SO-0.5-2	CFSB-246-SO-10-12	CFSB-247-SO-0-0.5	CFSB-247-SO-0.5-2	CFSB-247-SO-10-12	CFSB-266-SO-0-0.5	CFSB-266-SO-0.5-2	CFSB-266-SO-10-12	CFSB-274-SO-0-0.5	CFSB-274-SO-0.5-2	CFSB-274-SO-6-8
Sample Depth	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	6-8 ft
Chemical	5/10/2018	5/10/2018	5/9/2018	5/9/2018	5/9/2018	5/9/2018	5/9/2018	5/9/2018	5/10/2018	5/10/2018	5/10/2018	5/11/2018	5/11/2018	5/11/2018
PCB-1232 (Aroclor 1232)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1242 (Aroclor 1242)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1248 (Aroclor 1248)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1254 (Aroclor 1254)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1260 (Aroclor 1260)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1262 (Aroclor 1262)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1268 (Aroclor 1268)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Polychlorinated Biphenyl (PCBs)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SEMIVOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,2,4,5-Tetrachlorobenzene	0.0015 U	0.0015 U	0.0018 U	0.0016 U	0.0015 U	0.0016 U	0.0015 U	0.0015 U	0.0016 U	0.0016 U	0.0016 U	0.075 U	0.0061 U	0.0044 U
1,4-Dioxane (P-Dioxane)	0.011 U	0.011 U	0.013 U	0.011 U	0.011 U	0.012 U	0.011 U	0.011 U	0.012 U	0.012 U	0.012 U	0.54 U	0.044 U	0.032 U
2,3,4,6-Tetrachlorophenol	0.015 U	0.014 U	0.017 U	0.015 U	0.015 U	0.016 U	0.015 U	0.015 U	0.016 U	0.015 U	0.015 U	0.72 U	0.059 U	0.042 U
2,4,5-Trichlorophenol	0.0025 U	0.0025 U	0.0029 U	0.0026 U	0.0025 U	0.0027 U	0.0025 U	0.0025 U	0.0027 U	0.0027 U	0.0026 U	0.12 U	0.01 U	0.0073 U
2,4,6-Trichlorophenol	0.0019 U	0.0019 U	0.0022 U	0.002 U	0.0019 U	0.0021 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.095 U	0.0078 U	0.0056 U
2,4-Dichlorophenol	0.0027 U	0.0027 U	0.0031 U	0.0028 U	0.0027 U	0.0029 U	0.0027 U	0.0027 U	0.0029 U	0.0029 U	0.0029 U	0.13 U	0.011 U	0.0078 U
2,4-Dimethylphenol	0.0022 U	0.0021 U	0.0025 U	0.0023 U	0.0022 U	0.0023 U	0.0022 U	0.0022 U	0.0023 U	0.0023 U	0.0023 U	0.11 U	0.0088 U	0.0063 U
2,4-Dinitrophenol	0.095 UJ	0.093 UJ	0.11 U	0.099 U	0.095 U	0.1 U	0.096 U	0.096 U	0.1 U	0.1 U	0.1 U	4.7 UJ	0.38 UJ	0.27 UJ
2,4-Dinitrotoluene	0.0018 U	0.0017 U	0.002 U	0.0018 U	0.0018 U	0.0019 U	0.0018 U	0.0018 U	0.0019 U	0.0018 U	0.0018 U	0.086 U	0.007 U	0.0051 U
2,6-Dinitrotoluene	0.0022 U	0.0021 U	0.0025 U	0.0023 U	0.0022 U	0.0023 U	0.0022 U	0.0022 U	0.0023 U	0.0023 U	0.0023 U	0.11 U	0.0087 U	0.0063 U
2-Chloronaphthalene	0.0016 U	0.0016 U	0.0019 U	0.0017 U	0.0016 U	0.0017 U	0.0016 U	0.0016 U	0.0017 U	0.0017 U	0.0017 U	0.08 U	0.0065 U	0.0047 U
2-Chlorophenol	0.0016 U	0.0016 U	0.0019 U	0.0017 U	0.0017 U	0.0018 U	0.0017 U	0.0017 U	0.0017 U	0.0017 U	0.0017 U	0.081 U	0.0066 U	0.0047 U
2-Methylnaphthalene	0.0017 U	0.0017 U	0.002 U	0.0018 U	0.0017 U	0.0018 U	0.0017 U	0.0017 U	0.0018 U	0.0018 U	0.0018 U	0.43	0.076	0.021
2-Methylphenol (O-Cresol)	0.01 U	0.0099 U	0.012 U	0.011 U	0.01 U	0.011 U	0.01 U	0.01 U	0.011 U	0.011 U	0.011 U	0.5 U	0.041 U	0.029 U
2-Nitroaniline	0.016 U	0.016 U	0.019 U	0.017 U	0.016 U	0.017 U	0.016 U	0.016 U	0.017 U	0.017 U	0.017 U	0.79 U	0.065 U	0.046 U
2-Nitrophenol	0.002 U	0.002 U	0.0023 U	0.0021 U	0.002 U	0.0022 U	0.002 U	0.002 U	0.0021 U	0.0021 U	0.0021 U	0.099 U	0.0081 U	0.0058 U
3- And 4- Methylphenol (Total)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3,3'-Dichlorobenzidine	0.033 U	0.032 U	0.038 U	0.034 U	0.033 U	0.035 U	0.033 U	0.033 U	0.035 U	0.035 U	0.035 U	1.6 U	0.13 U	0.095 U
3-Nitroaniline	0.009 U	0.0088 U	0.01 U	0.0093 U	0.009 U	0.0096 U	0.0091 U	0.009 U	0.0095 U	0.0094 U	0.0094 U	0.44 U	0.036 U	0.026 U
4,6-Dinitro-2-Methylphenol	0.061 U	0.059 U	0.07 U	0.063 U	0.061 U	0.065 U	0.061 U	0.061 U	0.064 U	0.064 U	0.064 U	3 U	0.24 U	0.18 U
4-Bromophenyl Phenyl Ether	0.0025 U	0.0024 U	0.0028 U	0.0026 U	0.0025 U	0.0026 U	0.0025 U	0.0025 U	0.0026 U	0.0026 U	0.0026 U	0.12 U	0.0099 U	0.0071 U
4-Chloro-3-Methylphenol	0.0017 U	0.0016 U	0.0019 U	0.0017 U	0.0017 U	0.0018 U	0.0017 U	0.0017 U	0.0018 U	0.0017 U	0.0017 U	0.082 U	0.0067 U	0.0048 U
4-Chloroaniline	0.0012 U	0.0011 U	0.0014 U	0.0012 U	0.0012 U	0.0013 U	0.0012 U	0.0012 U	0.0012 U	0.0012 U	0.0012 U	0.058 U	0.0047 U	0.0034 U
4-Chlorophenyl Phenyl Ether	0.0021 U	0.0021 U	0.0025 U	0.0022 U	0.0022 U	0.0023 U	0.0022 U	0.0022 U	0.0023 U	0.0022 U	0.0022 U	0.11 U	0.0086 U	0.0062 U
4-Nitroaniline	0.0017 U	0.0017 U	0.002 U	0.0018 U	0.0017 U	0.0018 U	0.0017 U	0.0017 U	0.0018 U	0.0018 U	0.0018 U	0.084 U	0.0069 U	0.0049 U
4-Nitrophenol	0.025 U	0.024 U	0.029 U	0.026 U	0.025 U	0.026 U	0.025 U	0.025 U	0.026 U	0.026 U	0.026 U	1.2 UJ	0.099 UJ	0.071 UJ
Acenaphthene	0.002 U	0.002 U	0.0023 U	0.0021 U	0.002 U	0.0087	0.002 U	0.002 U	0.0026 J	0.0021 U	0.0021 U	2.8	0.51	0.14
Acenaphthylene	0.0015 U	0.0015 U	0.0018 U	0.0016 U	0.0016 U	0.0017 U	0.0016 U	0.0016 U	0.0016 U	0.0016 U	0.0016 U	0.076 U	0.015 J	0.0045 U
Acetophenone	0.0019 U	0.0019 U	0.0022 U	0.002 U	0.0019 U	0.002 U	0.0019 U	0.0019 U	0.002 U	0.002 U	0.002 U	0.094 U	0.0077 U	0.0055 U
Anthracene	0.0018 U	0.0018 U	0.0064 J	0.0019 U	0.0018 U	0.018	0.0018 U	0.0019 J	0.0056 J	0.0019 U	0.0019 U	6.2	0.68	0.27
Atrazine	0.015 U	0.015 U	0.018 U	0.016 UJ	0.016 U	0.017 UJ	0.016 U	0.016 U	0.016 U	0.016 U	0.016 U	0.76 UJ	0.062 UJ	0.045 UJ
Benzaldehyde	0.0044 UR	0.0043 UR	0.0051 U	0.0046 U	0.0044 U	0.0047 U	0.0044 U	0.0044 U	0.0046 UR	0.0046 UR	0.0046 UR	0.22 UR	0.018 UR	0.013 UR
Benzo(A)Anthracene	0.0013 J	0.0024 J	0.043	0.0065 J	0.0019 J	0.14	0.0013 U	0.018	0.053	0.0025 J	0.015	28	1	1.1
Benzo(A)Pyrene	0.0015 J	0.0038 J	0.051	0.0076	0.0017 J	0.16	0.0015 U	0.02	0.087	0.0032 J	0.021	31	1	1.2
Benzo(B)Fluoranthene	0.002 J	0.0052 J	0.12	0.013	0.0028 J	0.27	0.0018 U	0.036	0.16	0.005 J	0.037	34	1.1	1.4
Benzo(G,H,I)Perylene	0.0015 J	0.0043 J	0.058	0.0085	0.0017 J	0.22	0.0015 U	0.018	0.13	0.0037 J	0.028	24	0.95	0.97
Benzo(K)Fluoranthene	0.0021 U	0.0024 J	0.045	0.0046 J	0.0021 U	0.092	0.0021 U	0.013	0.07	0.0025 J	0.014	13	0.47	0.53
Benzyl Butyl Phthalate	0.024 U	0.024 U	0.028 U	0.025 U	0.024 U	0.026 U	0.024 U	0.024 U	0.026 U	0.025 U	0.025 U	1.2 U	0.097 U	0.07 U
Biphenyl (Diphenyl)	0.0015 U	0.0014 U	0.0017 U	0.0015 U	0.0015 U	0.0016 U	0.0015 U	0.0015 U	0.0016 U	0.0016 U	0.0016 U	0.1 J	0.026 J	0.0074 J
Bis(2-Chloroethoxy) Methane	0.0017 U	0.0016 U	0.0019 U	0.0017 U	0.0017 U	0.0018 U	0.0017 U	0.0017 U	0.0018 U	0.0018 U	0.0018 U	0.083 U	0.0068 U	0.0049 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.0013 U	0.0012 U	0.0015 U	0.0013 U	0.0013 U	0.0014 U	0.0013 U	0.0013 U	0.0014 U	0.0013 U	0.0013 U	0.063 U	0.0051 U	0.0037 U
Bis(2-Chloroisopropyl) Ether	0.0026 UJ	0.0026 UJ	0.003 U	0.0027 U	0.0026 U	0.0028 U	0.0026 U	0.0026 U	0.0028 U	0.0028 U	0.0028 U	0.13 U	0.01 U	0.0075 U
Bis(2-Ethylhexyl) Phthalate	0.038 U	0.037 U	0.043 U	0.039 U	0.038 U	0.04 U	0.038 U	0.038 U	0.04 U	0.04 U	0.04 U	1.8 U	0.15 U	0.11 U
Caprolactam	0.023 U	0.022 U	0.027 U	0.024 U	0.023 U	0.025 U	0.023 U	0.023 U	0.024 U	0.024 U	0.024 U	1.1 U	0.092 U	0.066 U
Carbazole	0.0016 U	0.0016 U	0.0047 J	0.0017 U	0.0017 U	0.024	0.0017 U	0.0024 J	0.014	0.0017 U	0.0036 J	5.5	0.33	0.21
Chrysene	0.0015 J	0.0038 J	0.059	0.0089	0.0023 J	0.22	0.0014 U	0.035	0.12	0.0045 J	0.03	35	1.1	1.3
Dibenz(A,H)Anthracene	0.0016 U	0.0015 U	0.015	0.0016 U	0.0016 U	0.042	0.0016 U	0.0016 U	0.023	0.0017 U	0.0049 J	6.4	0.22	0.2
Dibenzofuran	0.0015 U	0.0015 U	0.0018 U	0.0016 U	0.0016 U	0.0027 J	0.0016 U	0.0016 U	0.0016 U	0.0016 U	0.0016 U	1.2 J	0.2	0.08 J

Table E-2
Summary of Data Used in Risk Assessment
Main Plant Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-243	CFSB-243	CFSB-246	CFSB-246	CFSB-246	CFSB-247	CFSB-247	CFSB-247	CFSB-266	CFSB-266	CFSB-266	CFSB-274	CFSB-274	CFSB-274
Sample Lab IDs	180-77673-43, 460-155989-65	180-77673-44, 460-155989-66	180-77673-20, 460-155989-42	180-77673-21, 460-155989-43	180-77673-22, 460-155989-44	180-77673-23, 460-155989-45	180-77673-24, 460-155989-46	180-77673-25, 460-155989-47	180-77673-48, 460-155989-70	180-77673-49, 460-155989-71	180-77673-50, 460-155989-72	180-77782-67, 460-156162-17	180-77782-68, 460-156162-18	180-77782-69, 460-156162-19
Sample Name	CFSB-243-SO-0.5-2	CFSB-243-SO-10-12	CFSB-246-SO-0-0.5	CFSB-246-SO-0.5-2	CFSB-246-SO-10-12	CFSB-247-SO-0-0.5	CFSB-247-SO-0.5-2	CFSB-247-SO-10-12	CFSB-266-SO-0-0.5	CFSB-266-SO-0.5-2	CFSB-266-SO-10-12	CFSB-274-SO-0-0.5	CFSB-274-SO-0.5-2	CFSB-274-SO-6-8
Sample Depth	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	6-8 ft
Chemical	5/10/2018	5/10/2018	5/9/2018	5/9/2018	5/9/2018	5/9/2018	5/9/2018	5/9/2018	5/10/2018	5/10/2018	5/10/2018	5/11/2018	5/11/2018	5/11/2018
Diethyl Phthalate	0.011 U	0.01 U	0.012 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.52 U	0.042 U	0.031 U
Dimethyl Phthalate	0.0013 U	0.0012 U	0.0015 U	0.0013 U	0.0013 U	0.0014 U	0.0013 U	0.0013 U	0.0014 U	0.0013 U	0.0013 U	0.063 U	0.0051 U	0.0037 U
Di-N-Butyl Phthalate	0.015 U	0.015 U	0.018 U	0.016 U	0.016 U	0.017 U	0.016 U	0.016 U	0.016 U	0.016 U	0.016 U	0.76 U	0.062 U	0.045 U
Di-N-Octylphthalate	0.021 U	0.02 U	0.024 U	0.021 U	0.021 U	0.022 U	0.021 U	0.021 U	0.022 U	0.022 U	0.022 U	1 U	0.082 U	0.059 U
Fluoranthene	0.0021 J	0.0056 J	0.071	0.011	0.0033 J	0.24	0.0019 U	0.029	0.11	0.0053 J	0.032	46	2.5	1.8
Fluorene	0.0014 U	0.0014 U	0.0016 U	0.0014 U	0.0014 U	0.0055 J	0.0014 U	0.0014 U	0.0015 U	0.0015 U	0.0015 U	2.2	0.43	0.12
Hexachlorobenzene	0.0025 U	0.0025 U	0.0029 U	0.0026 U	0.0025 U	0.0027 U	0.0026 U	0.0025 U	0.0027 U	0.0027 U	0.0027 U	0.12 U	0.01 U	0.0073 U
Hexachlorobutadiene	0.0021 U	0.002 U	0.0024 U	0.0021 U	0.0021 U	0.0022 U	0.0021 U	0.0021 U	0.0022 U	0.0022 U	0.0022 U	0.1 U	0.0083 U	0.006 U
Hexachlorocyclopentadiene	0.0018 U	0.0018 U	0.0021 U	0.0019 U	0.0018 U	0.0019 U	0.0018 U	0.0018 U	0.0019 U	0.0019 U	0.0019 U	0.088 UJ	0.0072 UJ	0.0052 UJ
Hexachloroethane	0.0018 U	0.0018 U	0.0021 U	0.0019 U	0.0018 U	0.0019 U	0.0018 U	0.0018 U	0.0019 U	0.0019 U	0.0019 U	0.089 U	0.0073 U	0.0053 U
Indeno(1,2,3-C,D)Pyrene	0.0014 U	0.0032 J	0.05	0.0071 J	0.0015 J	0.17	0.0014 U	0.016	0.091	0.0029 J	0.021	19	0.78	0.77
Isophorone	0.0018 U	0.0018 U	0.0021 U	0.0019 U	0.0018 U	0.0019 U	0.0018 U	0.0018 U	0.0019 U	0.0019 U	0.0019 U	0.088 U	0.0072 U	0.0052 U
Naphthalene	0.0014 U	0.0013 U	0.0016 U	0.0014 U	0.0014 U	0.0022 J	0.0014 U	0.0014 U	0.0015 U	0.0014 U	0.0014 U	0.96	0.18	0.093
Nitrobenzene	0.013 U	0.013 U	0.015 U	0.013 U	0.013 U	0.014 U	0.013 U	0.013 U	0.014 U	0.014 U	0.014 U	0.63 U	0.052 U	0.037 U
N-Nitrosodi-N-Propylamine	0.0024 U	0.0023 U	0.0028 U	0.0025 U	0.0024 U	0.0026 U	0.0024 U	0.0024 U	0.0025 U	0.0025 U	0.0025 U	0.12 U	0.0096 U	0.0069 U
N-Nitrosodiphenylamine	0.012 U	0.011 U	0.014 U	0.012 U	0.012 U	0.013 U	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U	0.58 U	0.047 U	0.034 U
Pentachlorophenol	0.057 UJ	0.055 UJ	0.066 U	0.059 U	0.057 U	0.061 U	0.057 U	0.057 U	0.06 U	0.06 U	0.06 U	2.8 U	0.23 U	0.16 U
Phenanthrene	0.0019 U	0.0025 J	0.024	0.0055 J	0.0019 U	0.1	0.0019 U	0.011	0.034	0.0027 J	0.0099	30	2.6	1.2
Phenol	0.011 U	0.01 U	0.012 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.53 U	0.043 U	0.031 U
Pyrene	0.0017 J	0.0043 J	0.064	0.015	0.0026 J	0.32	0.0017 U	0.025	0.11	0.0047 J	0.032	52	2.4	1.8
VOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,1,1-Trichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,2,2-Tetrachloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,2-Trichloro-1,2,2-Trifluoroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,2-Trichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1-Dichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1-Dichloroethene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,3-Trichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,4-Trichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dibromo-3-Chloropropane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dibromoethane (Ethylene Dibromide)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichloropropane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,3-Dichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,4-Dichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Hexanone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acetone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromochloromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromodichloromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromoform	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromomethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Carbon Disulfide	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Carbon Tetrachloride	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chloroform	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chloromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cis-1,2-Dichloroethylene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cis-1,3-Dichloropropene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cyclohexane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibromochloromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dichlorodifluoromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Ethylbenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Isopropylbenzene (Cumene)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
M,P-Xylene	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Table E-2
Summary of Data Used in Risk Assessment
Main Plant Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-243	CFSB-243	CFSB-246	CFSB-246	CFSB-246	CFSB-247	CFSB-247	CFSB-247	CFSB-266	CFSB-266	CFSB-266	CFSB-274	CFSB-274	CFSB-274
Sample Lab IDs	180-77673-43, 460-155989-65	180-77673-44, 460-155989-66	180-77673-20, 460-155989-42	180-77673-21, 460-155989-43	180-77673-22, 460-155989-44	180-77673-23, 460-155989-45	180-77673-24, 460-155989-46	180-77673-25, 460-155989-47	180-77673-48, 460-155989-70	180-77673-49, 460-155989-71	180-77673-50, 460-155989-72	180-77782-67, 460-156162-17	180-77782-68, 460-156162-18	180-77782-69, 460-156162-19
Sample Name	CFSB-243-SO-0.5-2	CFSB-243-SO-10-12	CFSB-246-SO-0-0.5	CFSB-246-SO-0.5-2	CFSB-246-SO-10-12	CFSB-247-SO-0-0.5	CFSB-247-SO-0.5-2	CFSB-247-SO-10-12	CFSB-266-SO-0-0.5	CFSB-266-SO-0.5-2	CFSB-266-SO-10-12	CFSB-274-SO-0-0.5	CFSB-274-SO-0.5-2	CFSB-274-SO-6-8
Sample Depth	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	6-8 ft
Chemical	5/10/2018	5/10/2018	5/9/2018	5/9/2018	5/9/2018	5/9/2018	5/9/2018	5/9/2018	5/10/2018	5/10/2018	5/10/2018	5/11/2018	5/11/2018	5/11/2018
Methyl Acetate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methyl Ethyl Ketone (2-Butanone)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methylcyclohexane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methylene Chloride	--	--	--	--	--	--	--	--	--	--	--	--	--	--
O-Xylene (1,2-Dimethylbenzene)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Styrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Tert-Butyl Methyl Ether	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Tetrachloroethylene (PCE)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Toluene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Trans-1,2-Dichloroethene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Trans-1,3-Dichloropropene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Trichloroethylene (TCE)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Trichlorofluoromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Vinyl Chloride	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-2
Summary of Data Used in Risk Assessment
Main Plant Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-274	CFSB-274	CFSB-274	CFSB-275	CFSB-275	CFSB-275	CFSB-275	CFSB-275	CFSB-275-DUP	CFSB-275	CFSB-276	CFSB-276	CFSB-276	CFSB-276
Sample Lab IDs	180-77782-70, 460-156162-20	460-165781-2	460-165781-3	180-77782-2, 460-156162-29	180-77782-3, 460-156162-30	180-77782-4, 460-156162-31	180-77782-5, 460-156162-32	460-165781-4	460-165781-1	460-165781-5	180-77782-73, 460-156162-23	180-77782-74, 460-156162-24	180-77782-75, 460-156162-25	180-77782-76, 460-156162-26
Sample Name	CFSB-274-SO-10-12	CFSB-274-SO-0-0.5	CFSB-274-SO-0.5-2	CFSB-275-SO-0-0.5	CFSB-275-SO-0.5-2	CFSB-275-SO-6-8	CFSB-275-SO-10-12	CFSB-275-SO-0-0.5	CFSB-DUP51-SO	CFSB-275-SO-0.5-2	CFSB-276-SO-0-0.5	CFSB-276-SO-0.5-2	CFSB-276-SO-6-8	CFSB-276-SO-10-12
Sample Depth	10-12 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	6-8 ft	10-12 ft	0-0.5 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	6-8 ft	10-12 ft
Chemical	5/11/2018	9/28/2018	9/28/2018	5/11/2018	5/11/2018	5/11/2018	5/11/2018	9/28/2018	9/28/2018	9/28/2018	5/11/2018	5/11/2018	5/11/2018	5/11/2018
GENERAL CHEMISTRY (mg/kg)														
Fluoride	6.19	--	--	28.2 J+	16.5 J+	4.59 J+	5.77 J+	--	--	--	208 J+	17 J+	17 J+	9.52 J+
Cyanide	0.065 U	0.13 J	0.099 J+	--	--	0.055 U	0.066 U	0.14 J+	0.13 J	0.068 U	--	--	0.093 J	0.067 U
METALS (mg/kg)														
"Chromium, Hexavalent - Estimated"	0.278345	--	--	0.302433	0.281022	0.272993	0.23017	--	--	--	0.40146	0.278345	0.291727	0.281022
"Chromium, Trivalent - Calculated"	--	--	--	--	--	--	--	--	--	--	--	--	--	--
"Chromium, Trivalent - Estimated"	10.1217	--	--	10.9976	10.219	9.92701	8.36983	--	--	--	14.5985	10.1217	10.6083	10.219
Aluminum	9290	--	--	11300	11300	8480	5910	--	--	--	8800	11100	10900	9480
Antimony	0.31 UJ	--	--	0.3 UJ	0.29 UJ	0.29 UJ	0.3 UJ	--	--	--	0.31 UJ	0.31 UJ	0.31 UJ	0.31 UJ
Arsenic	4.7	--	--	5.2 J	4.2 J	4.2 J	2.5 J	--	--	--	4 J	5.8 J	4.1 J	3.6 J
Barium	134	--	--	92.6	86	67	39.6	--	--	--	119	94.1	65	62.2
Beryllium	0.32 J	--	--	0.48	0.44	0.39 J	0.29 J	--	--	--	0.38 J	0.4 J	0.44	0.38 J
Cadmium	0.35 U	--	--	0.34 U	0.36 J	0.33 U	0.35 U	--	--	--	0.36 U	0.36 U	0.35 U	0.36 U
Calcium	59200 J	--	--	26900	36800	18800	29200	--	--	--	32400	15200	5940	27500
Chromium, Total	10.4	--	--	11.3	10.5	10.2	8.6	--	--	--	15	10.4	10.9	10.5
Cobalt	6.2	--	--	5.7	5.1	5.3	3.4	--	--	--	5.9	5.1	5.7	6.5
Copper	14.8	--	--	15.7	14.7	12.1	7.1	--	--	--	12.4	19.1	14.8	19
Iron	15000	--	--	16100	14100	14000	9900	--	--	--	14800	13500	16100	14400
Lead	8.2 J+	--	--	45.2 J+	35.8 J+	9.2 J+	3.8 J+	--	--	--	9.9 J+	11.5 J+	6.8 J+	7.4 J+
Magnesium	12100	--	--	11000	10600	10100	12600	--	--	--	12100	8600	10600	11000
Manganese	366	--	--	353	339	331	250	--	--	--	379	422	330	347
Mercury	0.016 J+	--	--	0.029	0.016 J	0.011 J	0.018	--	--	--	0.017 J	0.023	0.039	0.015 J
Nickel	11.3	--	--	14.9	15.3	10.2	7.1	--	--	--	10.3	12.4	11.9	11.1
Potassium	712	--	--	887	860	726	707	--	--	--	758	955	597	738
Selenium	0.3 U	--	--	0.29 U	0.28 U	0.29 U	0.3 U	--	--	--	0.31 U	0.31 U	0.3 U	0.31 U
Silver	0.64 U	--	--	0.63 U	0.61 U	0.62 U	0.64 U	--	--	--	0.66 U	0.66 U	0.65 U	0.65 U
Sodium	63.1 J	--	--	205	186	82.8 J	57.3 J	--	--	--	40.7 J	679	32.7 U	63.9 J
Thallium	0.13 U	--	--	0.13 U	0.12 U	0.12 U	0.13 U	--	--	--	0.13 U	0.13 U	0.13 U	0.13 U
Vanadium	10.2	--	--	14.1	13.2	9.5	6.4	--	--	--	10.2	10.9	10.6	8.5
Zinc	44.7	--	--	120	114	36.6	23.9	--	--	--	48	51.4	37.8	35.3
METALS|HEXAVALENT CHROMIUM (mg/kg)														
Chromium, Hexavalent	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PESTICIDES (mg/kg)														
Aldrin	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Alpha Bhc (Alpha Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Alpha Endosulfan	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Beta Bhc (Beta Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Beta Endosulfan	--	--	--	--	--	--	--	--	--	--	--	--	--	--
cis-Chlordane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Delta BHC (Delta Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dieldrin	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endosulfan Sulfate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin Aldehyde	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin Ketone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Gamma Bhc (Lindane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Heptachlor	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Heptachlor Epoxide	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methoxychlor	--	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDD	--	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDT	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Toxaphene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
trans-Chlordane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
POLYCHLORINATED BIPHENYLS (mg/kg)														
PCB-1016 (Aroclor 1016)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1221 (Aroclor 1221)	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Table E-2
Summary of Data Used in Risk Assessment
Main Plant Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-274	CFSB-274	CFSB-274	CFSB-275	CFSB-275	CFSB-275	CFSB-275	CFSB-275	CFSB-275-DUP	CFSB-275	CFSB-276	CFSB-276	CFSB-276	CFSB-276
Sample Lab IDs	180-77782-70, 460-156162-20	460-165781-2	460-165781-3	180-77782-2, 460-156162-29	180-77782-3, 460-156162-30	180-77782-4, 460-156162-31	180-77782-5, 460-156162-32	460-165781-4	460-165781-1	460-165781-5	180-77782-73, 460-156162-23	180-77782-74, 460-156162-24	180-77782-75, 460-156162-25	180-77782-76, 460-156162-26
Sample Name	CFSB-274-SO-10-12	CFSB-274-SO-0-0.5	CFSB-274-SO-0.5-2	CFSB-275-SO-0-0.5	CFSB-275-SO-0.5-2	CFSB-275-SO-6-8	CFSB-275-SO-10-12	CFSB-275-SO-0-0.5	CFSB-DUP51-SO	CFSB-275-SO-0.5-2	CFSB-276-SO-0-0.5	CFSB-276-SO-0.5-2	CFSB-276-SO-6-8	CFSB-276-SO-10-12
Sample Depth	10-12 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	6-8 ft	10-12 ft	0-0.5 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	6-8 ft	10-12 ft
Chemical	5/11/2018	9/28/2018	9/28/2018	5/11/2018	5/11/2018	5/11/2018	5/11/2018	9/28/2018	9/28/2018	9/28/2018	5/11/2018	5/11/2018	5/11/2018	5/11/2018
PCB-1232 (Aroclor 1232)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1242 (Aroclor 1242)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1248 (Aroclor 1248)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1254 (Aroclor 1254)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1260 (Aroclor 1260)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1262 (Aroclor 1262)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1268 (Aroclor 1268)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Polychlorinated Biphenyl (PCBs)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SEMIVOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,2,4,5-Tetrachlorobenzene	0.0062 U	--	--	0.042 U	0.0015 U	0.0015 U	0.0015 U	--	--	--	0.062 U	0.0015 U	0.0072 U	0.0015 U
1,4-Dioxane (P-Dioxane)	0.045 U	--	--	0.3 U	0.011 U	0.011 U	0.011 U	--	--	--	0.45 U	0.011 U	0.052 U	0.011 U
2,3,4,6-Tetrachlorophenol	0.06 U	--	--	0.4 U	0.015 U	0.015 U	0.015 U	--	--	--	0.6 U	0.015 U	0.07 U	0.014 U
2,4,5-Trichlorophenol	0.01 U	--	--	0.069 U	0.0025 U	0.0025 U	0.0025 U	--	--	--	0.1 U	0.0025 U	0.012 U	0.0024 U
2,4,6-Trichlorophenol	0.0078 U	--	--	0.053 U	0.0019 U	0.0019 U	0.0019 U	--	--	--	0.079 U	0.0019 U	0.0092 U	0.0019 U
2,4-Dichlorophenol	0.011 U	--	--	0.074 U	0.0027 U	0.0027 U	0.0027 U	--	--	--	0.11 U	0.0027 U	0.013 U	0.0026 U
2,4-Dimethylphenol	0.0089 U	--	--	0.06 U	0.0022 U	0.0022 U	0.0022 U	--	--	--	0.089 U	0.0022 U	0.01 U	0.0021 U
2,4-Dinitrophenol	0.38 UJ	--	--	2.6 UJ	0.094 UJ	0.094 UJ	0.095 UJ	--	--	--	3.9 UJ	0.094 UJ	0.45 UJ	0.092 UJ
2,4-Dinitrotoluene	0.0071 U	--	--	0.048 U	0.0017 U	0.0017 U	0.0018 U	--	--	--	0.072 U	0.0017 U	0.0083 U	0.0017 U
2,6-Dinitrotoluene	0.0088 U	--	--	0.06 U	0.0022 U	0.0022 U	0.0022 U	--	--	--	0.089 U	0.0022 U	0.01 U	0.0021 U
2-Chloronaphthalene	0.0066 U	--	--	0.044 U	0.0016 U	0.0016 U	0.0016 U	--	--	--	0.066 U	0.0016 U	0.0077 U	0.0016 U
2-Chlorophenol	0.0066 U	--	--	0.045 U	0.0016 U	0.0016 U	0.0016 U	--	--	--	0.067 U	0.0016 U	0.0078 U	0.0016 U
2-Methylnaphthalene	0.033	--	--	0.4	0.0041 J	0.002 J	0.0089	--	--	--	0.12 J	0.0017 U	0.023 J	0.0034 J
2-Methylphenol (O-Cresol)	0.041 U	--	--	0.28 U	0.01 U	0.01 U	0.01 U	--	--	--	0.41 U	0.01 U	0.048 U	0.0098 U
2-Nitroaniline	0.065 U	--	--	0.44 U	0.016 U	0.016 U	0.016 U	--	--	--	0.66 U	0.016 U	0.076 U	0.016 U
2-Nitrophenol	0.0082 U	--	--	0.055 U	0.002 U	0.002 U	0.002 U	--	--	--	0.082 U	0.002 U	0.0096 U	0.002 U
3- And 4- Methylphenol (Total)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3,3'-Dichlorobenzidine	0.13 U	--	--	0.9 U	0.033 U	0.032 U	0.033 U	--	--	--	1.3 U	0.033 U	0.16 U	0.032 U
3-Nitroaniline	0.036 U	--	--	0.25 U	0.0089 U	0.0089 U	0.009 U	--	--	--	0.37 U	0.0089 U	0.043 U	0.0087 U
4,6-Dinitro-2-Methylphenol	0.25 U	--	--	1.7 U	0.06 U	0.06 U	0.061 U	--	--	--	2.5 U	0.06 U	0.29 U	0.059 U
4-Bromophenyl Phenyl Ether	0.01 U	--	--	0.067 U	0.0025 U	0.0024 U	0.0025 U	--	--	--	0.1 U	0.0024 U	0.012 U	0.0024 U
4-Chloro-3-Methylphenol	0.0067 U	--	--	0.045 U	0.0017 U	0.0016 U	0.0017 U	--	--	--	0.068 U	0.0016 U	0.0079 U	0.0016 U
4-Chloroaniline	0.0048 U	--	--	0.032 U	0.0012 U	0.0012 U	0.0012 U	--	--	--	0.048 U	0.0012 U	0.0056 U	0.0011 U
4-Chlorophenyl Phenyl Ether	0.0087 U	--	--	0.059 U	0.0021 U	0.0021 U	0.0021 U	--	--	--	0.087 U	0.0021 U	0.01 U	0.0021 U
4-Nitroaniline	0.0069 U	--	--	0.047 U	0.0017 U	0.0017 U	0.0017 U	--	--	--	0.07 U	0.0017 U	0.0081 U	0.0017 U
4-Nitrophenol	0.1 UJ	--	--	0.68 U	0.025 U	0.024 U	0.025 U	--	--	--	1 UJ	0.024 UJ	0.12 UJ	0.024 UJ
Acenaphthene	0.21	--	--	2	0.022	0.013	0.044	--	--	--	1	0.0035 J	0.21	0.037
Acenaphthylene	0.0063 U	--	--	0.055 J	0.0018 J	0.0015 U	0.0016 J	--	--	--	0.063 U	0.0015 U	0.0073 U	0.0015 U
Acetophenone	0.0078 U	--	--	0.052 U	0.0019 U	0.0019 U	0.0019 U	--	--	--	0.078 U	0.0019 U	0.0091 U	0.0019 U
Anthracene	0.43	--	--	2.9	0.046	0.02	0.068	--	--	--	2.2	0.0076	0.47	0.12
Atrazine	0.063 UJ	--	--	0.42 U	0.015 U	0.015 U	0.016 U	--	--	--	0.63 UJ	0.015 UJ	0.073 UJ	0.015 UJ
Benzaldehyde	0.018 UR	--	--	0.12 UR	0.0044 UR	0.0043 UR	0.0044 UR	--	--	--	0.18 UR	0.0043 UR	0.021 UR	0.0042 UR
Benzo(A)Anthracene	1.9	--	--	9.9	0.26	0.082	0.3	--	--	--	11	0.041	2.3	0.39
Benzo(A)Pyrene	2	--	--	12	0.26	0.095	0.34	--	--	--	13	0.048	2.5	0.42
Benzo(B)Fluoranthene	2.4	--	--	14	0.33	0.11	0.39	--	--	--	12	0.055	3.2	0.5
Benzo(G,H,I)Perylene	1.7	--	--	8.8	0.21	0.072	0.25	--	--	--	11	0.04	2.2	0.39
Benzo(K)Fluoranthene	0.93	--	--	5.4	0.13	0.046	0.17	--	--	--	7.4	0.019	0.73	0.17
Benzyl Butyl Phthalate	0.098 U	--	--	0.66 U	0.024 U	0.024 U	0.024 U	--	--	--	0.99 U	0.024 U	0.12 U	0.023 U
Biphenyl (Diphenyl)	0.011 J	--	--	0.14 J	0.0017 J	0.0015 U	0.0032 J	--	--	--	0.06 U	0.0015 U	0.007 U	0.0014 U
Bis(2-Chloroethoxy) Methane	0.0068 U	--	--	0.046 U	0.0017 U	0.0017 U	0.0017 U	--	--	--	0.069 U	0.0017 U	0.008 U	0.0016 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.0052 U	--	--	0.035 U	0.0013 U	0.0013 U	0.0013 U	--	--	--	0.052 U	0.0013 U	0.0061 U	0.0012 U
Bis(2-Chloroisopropyl) Ether	0.011 U	--	--	0.072 U	0.0026 U	0.0026 U	0.0026 U	--	--	--	0.11 U	0.0026 U	0.012 U	0.0025 U
Bis(2-Ethylhexyl) Phthalate	0.15 U	--	--	1 U	0.037 U	0.037 U	0.038 U	--	--	--	1.5 U	0.037 U	0.18 U	0.036 U
Caprolactam	0.093 U	--	--	0.63 U	0.023 U	0.023 U	0.023 U	--	--	--	0.94 U	0.023 U	0.11 U	0.022 U
Carbazole	0.34	--	--	1.8	0.039	0.013	0.041	--	--	--	2.2	0.0083	0.43	0.1
Chrysene	2.2	--	--	12	0.33	0.096	0.34	--	--	--	14	0.055	2.9	0.51
Dibenz(A,H)Anthracene	0.38	--	--	2.1	0.046	0.016	0.065	--	--	--	2.3	0.01	0.53	0.094
Dibenzofuran	0.11 J	--	--	1	0.011 J	0.0063 J	0.023 J	--	--	--	0.32 J	0.0015 U	0.073 J	0.011 J

Table E-2
Summary of Data Used in Risk Assessment
Main Plant Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-274	CFSB-274	CFSB-274	CFSB-275	CFSB-275	CFSB-275	CFSB-275	CFSB-275	CFSB-275-DUP	CFSB-275	CFSB-276	CFSB-276	CFSB-276	CFSB-276
Sample Lab IDs	180-77782-70, 460-156162-20	460-165781-2	460-165781-3	180-77782-2, 460-156162-29	180-77782-3, 460-156162-30	180-77782-4, 460-156162-31	180-77782-5, 460-156162-32	460-165781-4	460-165781-1	460-165781-5	180-77782-73, 460-156162-23	180-77782-74, 460-156162-24	180-77782-75, 460-156162-25	180-77782-76, 460-156162-26
Sample Name	CFSB-274-SO-10-12	CFSB-274-SO-0-0.5	CFSB-274-SO-0.5-2	CFSB-275-SO-0-0.5	CFSB-275-SO-0.5-2	CFSB-275-SO-6-8	CFSB-275-SO-10-12	CFSB-275-SO-0-0.5	CFSB-DUP51-SO	CFSB-275-SO-0.5-2	CFSB-276-SO-0-0.5	CFSB-276-SO-0.5-2	CFSB-276-SO-6-8	CFSB-276-SO-10-12
Sample Depth	10-12 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	6-8 ft	10-12 ft	0-0.5 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	6-8 ft	10-12 ft
Chemical	5/11/2018	9/28/2018	9/28/2018	5/11/2018	5/11/2018	5/11/2018	5/11/2018	9/28/2018	9/28/2018	9/28/2018	5/11/2018	5/11/2018	5/11/2018	5/11/2018
Diethyl Phthalate	0.043 U	--	--	0.29 U	0.011 U	0.01 U	0.011 U	--	--	--	0.43 U	0.01 U	0.05 U	0.01 U
Dimethyl Phthalate	0.0052 U	--	--	0.035 U	0.0013 U	0.0013 U	0.0013 U	--	--	--	0.052 U	0.0013 U	0.0061 U	0.0012 U
Di-N-Butyl Phthalate	0.063 U	--	--	0.42 U	0.015 U	0.015 U	0.016 U	--	--	--	0.63 U	0.015 U	0.073 U	0.015 U
Di-N-Octylphthalate	0.083 U	--	--	0.56 U	0.02 U	0.02 U	0.021 U	--	--	--	0.84 U	0.02 U	0.098 U	0.02 U
Fluoranthene	3.1	--	--	20	0.65	0.15	0.52	--	--	--	21	0.077	4.1	0.68
Fluorene	0.17	--	--	1.6	0.018	0.0098	0.036	--	--	--	0.66	0.0023 J	0.15	0.024
Hexachlorobenzene	0.01 U	--	--	0.069 U	0.0025 U	0.0025 U	0.0025 U	--	--	--	0.1 U	0.0025 U	0.012 U	0.0024 U
Hexachlorobutadiene	0.0084 U	--	--	0.056 U	0.0021 U	0.002 U	0.0021 U	--	--	--	0.084 U	0.002 U	0.0098 U	0.002 U
Hexachlorocyclopentadiene	0.0073 UJ	--	--	0.049 U	0.0018 U	0.0018 U	0.0018 U	--	--	--	0.073 UJ	0.0018 UJ	0.0085 UJ	0.0017 UJ
Hexachloroethane	0.0074 U	--	--	0.05 U	0.0018 U	0.0018 U	0.0018 U	--	--	--	0.074 U	0.0018 U	0.0086 U	0.0018 U
Indeno(1,2,3-C,D)Pyrene	1.4	--	--	7.3	0.17	0.063	0.23	--	--	--	8.3	0.033	1.8	0.31
Isophorone	0.0073 U	--	--	0.049 U	0.0018 U	0.0018 U	0.0018 U	--	--	--	0.073 U	0.0018 U	0.0085 U	0.0017 U
Naphthalene	0.09	--	--	1.3	0.011	0.0056 J	0.028	--	--	--	0.28 J	0.0014 U	0.05	0.0072
Nitrobenzene	0.052 U	--	--	0.35 U	0.013 U	0.013 U	0.013 U	--	--	--	0.53 U	0.013 U	0.061 U	0.012 U
N-Nitrosodi-N-Propylamine	0.0097 U	--	--	0.065 U	0.0024 U	0.0024 U	0.0024 U	--	--	--	0.097 U	0.0024 U	0.011 U	0.0023 U
N-Nitrosodiphenylamine	0.048 U	--	--	0.32 U	0.012 U	0.012 U	0.012 U	--	--	--	0.48 U	0.012 U	0.056 U	0.011 U
Pentachlorophenol	0.23 U	--	--	1.6 UJ	0.056 UJ	0.056 UJ	0.057 UJ	--	--	--	2.3 U	0.056 U	0.27 U	0.055 U
Phenanthrene	1.9	--	--	13	0.24	0.091	0.29	--	--	--	12	0.046	2.5	0.42
Phenol	0.043 U	--	--	0.29 U	0.011 U	0.011 U	0.011 U	--	--	--	0.44 U	0.011 U	0.051 U	0.01 U
Pyrene	3	--	--	18	0.55	0.14	0.51	--	--	--	21	0.078	4.4	0.72
VOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,1,1-Trichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,2,2-Tetrachloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,2-Trichloro-1,2,2-Trifluoroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,2-Trichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1-Dichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1-Dichloroethene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,3-Trichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,4-Trichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dibromo-3-Chloropropane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dibromoethane (Ethylene Dibromide)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichloropropane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,3-Dichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,4-Dichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Hexanone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acetone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromochloromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromodichloromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromoform	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromomethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Carbon Disulfide	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Carbon Tetrachloride	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chloroform	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chloromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cis-1,2-Dichloroethylene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cis-1,3-Dichloropropene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cyclohexane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibromochloromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dichlorodifluoromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Ethylbenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Isopropylbenzene (Cumene)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
M,P-Xylene	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Table E-2
Summary of Data Used in Risk Assessment
Main Plant Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-274	CFSB-274	CFSB-274	CFSB-275	CFSB-275	CFSB-275	CFSB-275	CFSB-275	CFSB-275-DUP	CFSB-275	CFSB-276	CFSB-276	CFSB-276	CFSB-276
Sample Lab IDs	180-77782-70, 460-156162-20	460-165781-2	460-165781-3	180-77782-2, 460-156162-29	180-77782-3, 460-156162-30	180-77782-4, 460-156162-31	180-77782-5, 460-156162-32	460-165781-4	460-165781-1	460-165781-5	180-77782-73, 460-156162-23	180-77782-74, 460-156162-24	180-77782-75, 460-156162-25	180-77782-76, 460-156162-26
Sample Name	CFSB-274-SO-10-12	CFSB-274-SO-0-0.5	CFSB-274-SO-0.5-2	CFSB-275-SO-0-0.5	CFSB-275-SO-0.5-2	CFSB-275-SO-6-8	CFSB-275-SO-10-12	CFSB-275-SO-0-0.5	CFSB-DUP51-SO	CFSB-275-SO-0.5-2	CFSB-276-SO-0-0.5	CFSB-276-SO-0.5-2	CFSB-276-SO-6-8	CFSB-276-SO-10-12
Sample Depth	10-12 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	6-8 ft	10-12 ft	0-0.5 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	6-8 ft	10-12 ft
Chemical	5/11/2018	9/28/2018	9/28/2018	5/11/2018	5/11/2018	5/11/2018	5/11/2018	9/28/2018	9/28/2018	9/28/2018	5/11/2018	5/11/2018	5/11/2018	5/11/2018
Methyl Acetate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methyl Ethyl Ketone (2-Butanone)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methylcyclohexane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methylene Chloride	--	--	--	--	--	--	--	--	--	--	--	--	--	--
O-Xylene (1,2-Dimethylbenzene)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Styrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Tert-Butyl Methyl Ether	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Tetrachloroethylene (PCE)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Toluene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Trans-1,2-Dichloroethene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Trans-1,3-Dichloropropene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Trichloroethylene (TCE)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Trichlorofluoromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Vinyl Chloride	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-2
Summary of Data Used in Risk Assessment
Main Plant Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-276	CFSB-276	CFSB-278	CFSB-278	CFSB-278	CFSB-278	CFSB-278	CFSB-278	CFSB-287	CFSB-288	CFSB-288	CFSB-288	CFSB-288	CFSB-293
Sample Lab IDs	460-165781-6	460-165781-7	180-77782-61, 460-156162-11	180-77782-62, 460-156162-12	180-77782-63, 460-156162-13	180-77782-64, 460-156162-14	460-165781-8	460-165781-9	180-77944-6, 460-156665-8	460-159538-14	460-159538-15	320-43709-20	320-43709-21	320-43709-16
Sample Name	CFSB-276-SO-0-0.5	CFSB-276-SO-0.5-2	CFSB-278-SO-0-0.5	CFSB-278-SO-0.5-2	CFSB-278-SO-6-8	CFSB-278-SO-10-12	CFSB-278-SO-0-0.5	CFSB-278-SO-0.5-2	CFSB-287-SO-8-10	CFSB-288-SO-0-0.5	CFSB-288-SO-0.5-2	CFSB-288-SO-0-0.5	CFSB-288-SO-0.5-2	CFSB-293-SO-0-0.5
Sample Depth	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	6-8 ft	10-12 ft	0-0.5 ft	0.5-2 ft	8-10 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft
Chemical	9/28/2018	9/28/2018	5/11/2018	5/11/2018	5/11/2018	5/11/2018	9/28/2018	9/28/2018	5/18/2018	6/28/2018	6/28/2018	9/27/2018	9/27/2018	9/27/2018
GENERAL CHEMISTRY (mg/kg)														
Fluoride	--	--	64	99.6	59.2	8.41	--	--	1.3 J	--	--	--	--	--
Cyanide	0.99 J+	0.5 J+	--	--	0.091 J	0.067 U	0.18 J+	0.82 J+	0.065 UJ	--	--	--	--	--
METALS (mg/kg)														
"Chromium, Hexavalent - Estimated"	--	--	0.377372	0.800243	0.339903	0.256934	--	--	0.224818	--	--	--	--	--
"Chromium, Trivalent - Calculated"	--	--	--	--	--	--	--	--	--	34.66	11.915	--	--	--
"Chromium, Trivalent - Estimated"	--	--	13.7226	29.0998	12.3601	9.34307	--	--	8.17518	--	--	--	--	--
Aluminum	--	--	32800	23600	10100	8780	--	--	8460	--	--	--	--	--
Antimony	--	--	0.3 UJ	0.31 J-	0.3 UJ	0.3 UJ	--	--	0.96 J	--	--	--	--	--
Arsenic	--	--	6	8.8	4.2	4.5	--	--	4.1	--	--	--	--	--
Barium	--	--	104	100	86.6	59.6	--	--	88.4	--	--	--	--	--
Beryllium	--	--	0.73	0.71	0.39 J	0.45	--	--	0.36 J	--	--	--	--	--
Cadmium	--	--	0.35 U	0.36 U	0.34 U	0.34 U	--	--	0.36 U	--	--	--	--	--
Calcium	--	--	30500 J	37900 J	49900 J	49600 J	--	--	20000	--	--	--	--	--
Chromium, Total	--	--	14.1	29.9	12.7	9.6	--	--	8.4	34.9	12	--	--	--
Cobalt	--	--	5.5	6	4.9	6.1	--	--	4.8	--	--	--	--	--
Copper	--	--	24.1	22.8	14.4	13.7	--	--	13	--	--	--	--	--
Iron	--	--	16600	17700	14200	16200	--	--	11400	--	--	--	--	--
Lead	--	--	16.2 J+	16.2 J+	6.6 J+	6.5 J+	--	--	7.3	--	--	--	--	--
Magnesium	--	--	11000	11700	13100	13400	--	--	9590	--	--	--	--	--
Manganese	--	--	324	569	342	354	--	--	271	--	--	--	--	--
Mercury	--	--	0.01 U	0.018 J+	0.015 J+	0.011 U	--	--	0.01 J	--	--	--	--	--
Nickel	--	--	41.1	34.3	14	12	--	--	9.5	--	--	--	--	--
Potassium	--	--	1250	1370	821	678	--	--	911	--	--	--	--	--
Selenium	--	--	0.3 U	0.32 J	0.3 U	0.3 U	--	--	0.31 U	--	--	--	--	--
Silver	--	--	0.64 U	0.66 U	0.92 J	0.63 U	--	--	0.67 U	--	--	--	--	--
Sodium	--	--	393	798	244	232	--	--	33.8 U	--	--	--	--	--
Thallium	--	--	0.13 U	0.13 J	0.13 U	0.13 U	--	--	0.14 U	--	--	--	--	--
Vanadium	--	--	17.6	16.5	11.2	15.2	--	--	11.5	--	--	--	--	--
Zinc	--	--	56.2	53.8	35.3	38.2	--	--	33.9	--	--	--	--	--
METALS|HEXAVALENT CHROMIUM (mg/kg)														
Chromium, Hexavalent	--	--	--	--	--	--	--	--	--	0.24 J-	0.17 UJ	--	--	--
PESTICIDES (mg/kg)														
Aldrin	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Alpha Bhc (Alpha Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Alpha Endosulfan	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Beta Bhc (Beta Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Beta Endosulfan	--	--	--	--	--	--	--	--	--	--	--	--	--	--
cis-Chlordane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Delta BHC (Delta Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dieldrin	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endosulfan Sulfate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin Aldehyde	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin Ketone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Gamma Bhc (Lindane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Heptachlor	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Heptachlor Epoxide	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methoxychlor	--	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDD	--	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDT	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Toxaphene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
trans-Chlordane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
POLYCHLORINATED BIPHENYLS (mg/kg)														
PCB-1016 (Aroclor 1016)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1221 (Aroclor 1221)	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Table E-2
Summary of Data Used in Risk Assessment
Main Plant Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-276	CFSB-276	CFSB-278	CFSB-278	CFSB-278	CFSB-278	CFSB-278	CFSB-278	CFSB-287	CFSB-288	CFSB-288	CFSB-288	CFSB-288	CFSB-293
Sample Lab IDs	460-165781-6	460-165781-7	180-77782-61, 460-156162-11	180-77782-62, 460-156162-12	180-77782-63, 460-156162-13	180-77782-64, 460-156162-14	460-165781-8	460-165781-9	180-77944-6, 460-156665-8	460-159538-14	460-159538-15	320-43709-20	320-43709-21	320-43709-16
Sample Name	CFSB-276-SO-0-0.5	CFSB-276-SO-0.5-2	CFSB-278-SO-0-0.5	CFSB-278-SO-0.5-2	CFSB-278-SO-6-8	CFSB-278-SO-10-12	CFSB-278-SO-0-0.5	CFSB-278-SO-0.5-2	CFSB-287-SO-8-10	CFSB-288-SO-0-0.5	CFSB-288-SO-0.5-2	CFSB-288-SO-0-0.5	CFSB-288-SO-0.5-2	CFSB-293-SO-0-0.5
Sample Depth	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	6-8 ft	10-12 ft	0-0.5 ft	0.5-2 ft	8-10 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft
Chemical	9/28/2018	9/28/2018	5/11/2018	5/11/2018	5/11/2018	5/11/2018	9/28/2018	9/28/2018	5/18/2018	6/28/2018	6/28/2018	9/27/2018	9/27/2018	9/27/2018
PCB-1232 (Aroclor 1232)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1242 (Aroclor 1242)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1248 (Aroclor 1248)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1254 (Aroclor 1254)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1260 (Aroclor 1260)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1262 (Aroclor 1262)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1268 (Aroclor 1268)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Polychlorinated Biphenyl (PCBs)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SEMIVOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,2,4,5-Tetrachlorobenzene	--	--	0.046 UJ	0.039 UJ	0.0061 UJ	0.0015 UJ	--	--	0.32 U	--	--	--	--	--
1,4-Dioxane (P-Dioxane)	--	--	0.33 U	0.28 U	0.044 U	0.011 U	--	--	2.3 U	--	--	--	--	--
2,3,4,6-Tetrachlorophenol	--	--	0.44 U	0.37 U	0.058 U	0.014 U	--	--	3.1 U	--	--	--	--	--
2,4,5-Trichlorophenol	--	--	0.076 U	0.064 U	0.01 U	0.0024 U	--	--	0.52 U	--	--	--	--	--
2,4,6-Trichlorophenol	--	--	0.058 U	0.049 U	0.0077 U	0.0019 U	--	--	0.4 U	--	--	--	--	--
2,4-Dichlorophenol	--	--	0.082 U	0.069 U	0.011 U	0.0026 U	--	--	0.57 U	--	--	--	--	--
2,4-Dimethylphenol	--	--	0.066 U	0.055 U	0.0087 U	0.0021 U	--	--	0.46 U	--	--	--	--	--
2,4-Dinitrophenol	--	--	2.8 UJ	2.4 UJ	0.38 UJ	0.092 UJ	--	--	20 UJ	--	--	--	--	--
2,4-Dinitrotoluene	--	--	0.053 U	0.044 U	0.007 U	0.0017 U	--	--	0.37 U	--	--	--	--	--
2,6-Dinitrotoluene	--	--	0.065 U	0.055 U	0.0087 U	0.0021 U	--	--	0.45 U	--	--	--	--	--
2-Chloronaphthalene	--	--	0.049 U	0.041 U	0.0064 U	0.0016 U	--	--	0.34 U	--	--	--	--	--
2-Chlorophenol	--	--	0.049 U	0.042 U	0.0065 U	0.0016 U	--	--	0.34 U	--	--	--	--	--
2-Methylnaphthalene	--	--	0.12 J	0.079 J	0.015 J	0.0016 U	--	--	0.35 U	--	--	--	--	--
2-Methylphenol (O-Cresol)	--	--	0.3 U	0.26 U	0.04 U	0.0098 U	--	--	2.1 U	--	--	--	--	--
2-Nitroaniline	--	--	0.48 U	0.41 U	0.064 U	0.016 U	--	--	3.4 U	--	--	--	--	--
2-Nitrophenol	--	--	0.061 U	0.051 U	0.008 U	0.002 U	--	--	0.42 U	--	--	--	--	--
3- And 4- Methylphenol (Total)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3,3'-Dichlorobenzidine	--	--	0.99 U	0.83 U	0.13 U	0.032 U	--	--	6.9 U	--	--	--	--	--
3-Nitroaniline	--	--	0.27 U	0.23 U	0.036 U	0.0087 U	--	--	1.9 U	--	--	--	--	--
4,6-Dinitro-2-Methylphenol	--	--	1.8 U	1.5 U	0.24 U	0.059 U	--	--	13 U	--	--	--	--	--
4-Bromophenyl Phenyl Ether	--	--	0.074 U	0.062 U	0.0098 U	0.0024 U	--	--	0.51 U	--	--	--	--	--
4-Chloro-3-Methylphenol	--	--	0.05 U	0.042 U	0.0066 U	0.0016 U	--	--	0.35 U	--	--	--	--	--
4-Chloroaniline	--	--	0.035 U	0.03 U	0.0047 U	0.0011 U	--	--	0.24 U	--	--	--	--	--
4-Chlorophenyl Phenyl Ether	--	--	0.064 U	0.054 U	0.0085 U	0.0021 U	--	--	0.45 U	--	--	--	--	--
4-Nitroaniline	--	--	0.051 U	0.043 U	0.0068 U	0.0017 U	--	--	0.36 U	--	--	--	--	--
4-Nitrophenol	--	--	0.74 U	0.63 U	0.098 U	0.024 U	--	--	5.2 UJ	--	--	--	--	--
Acenaphthene	--	--	0.84	0.64	0.11	0.002 U	--	--	0.7 J	--	--	--	--	--
Acenaphthylene	--	--	0.046 U	0.039 U	0.0061 U	0.0015 U	--	--	0.32 U	--	--	--	--	--
Acetophenone	--	--	0.057 U	0.049 U	0.0076 U	0.0019 U	--	--	0.4 U	--	--	--	--	--
Anthracene	--	--	1.4	1.3	0.18	0.0018 U	--	--	1.1 J	--	--	--	--	--
Atrazine	--	--	0.46 UJ	0.39 UJ	0.061 UJ	0.015 UJ	--	--	3.2 UJ	--	--	--	--	--
Benzaldehyde	--	--	0.13 UR	0.11 UR	0.017 UR	0.0043 UR	--	--	0.91 UR	--	--	--	--	--
Benzo(A)Anthracene	--	--	8.5	7.8	1.1	0.0013 J	--	--	2.6	--	--	--	--	--
Benzo(A)Pyrene	--	--	10	8.9	1.3	0.0015 U	--	--	3.1	--	--	--	--	--
Benzo(B)Fluoranthene	--	--	12	9.6	1.4	0.0017 U	--	--	1.9	--	--	--	--	--
Benzo(G,H,I)Perylene	--	--	10	9	1.2	0.0018 J	--	--	2.3	--	--	--	--	--
Benzo(K)Fluoranthene	--	--	5.1	4.9	0.74	0.0021 U	--	--	1 J	--	--	--	--	--
Benzyl Butyl Phthalate	--	--	0.73 U	0.61 U	0.096 U	0.024 U	--	--	5 U	--	--	--	--	--
Biphenyl (Diphenyl)	--	--	0.044 U	0.038 U	0.0059 U	0.0014 U	--	--	0.31 U	--	--	--	--	--
Bis(2-Chloroethoxy) Methane	--	--	0.05 U	0.043 U	0.0067 U	0.0016 U	--	--	0.35 U	--	--	--	--	--
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	--	--	0.038 U	0.032 U	0.0051 U	0.0012 U	--	--	0.27 U	--	--	--	--	--
Bis(2-Chloroisopropyl) Ether	--	--	0.078 U	0.066 U	0.01 U	0.0025 U	--	--	0.54 U	--	--	--	--	--
Bis(2-Ethylhexyl) Phthalate	--	--	1.1 U	0.95 U	0.15 U	0.036 U	--	--	7.8 U	--	--	--	--	--
Caprolactam	--	--	0.69 U	0.58 U	0.091 U	0.022 U	--	--	4.8 U	--	--	--	--	--
Carbazole	--	--	1.5	1.4	0.21	0.0016 U	--	--	0.4 J	--	--	--	--	--
Chrysene	--	--	12	9.8	1.5	0.0013 U	--	--	4.3	--	--	--	--	--
Dibenz(A,H)Anthracene	--	--	2.2	2	0.28	0.0015 U	--	--	0.5 J	--	--	--	--	--
Dibenzofuran	--	--	0.35 J	0.23 J	0.041 J	0.0015 U	--	--	0.32 U	--	--	--	--	--

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Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-276	CFSB-276	CFSB-278	CFSB-278	CFSB-278	CFSB-278	CFSB-278	CFSB-278	CFSB-287	CFSB-288	CFSB-288	CFSB-288	CFSB-288	CFSB-293
Sample Lab IDs	460-165781-6	460-165781-7	180-77782-61, 460-156162-11	180-77782-62, 460-156162-12	180-77782-63, 460-156162-13	180-77782-64, 460-156162-14	460-165781-8	460-165781-9	180-77944-6, 460-156665-8	460-159538-14	460-159538-15	320-43709-20	320-43709-21	320-43709-16
Sample Name	CFSB-276-SO-0-0.5	CFSB-276-SO-0.5-2	CFSB-278-SO-0-0.5	CFSB-278-SO-0.5-2	CFSB-278-SO-6-8	CFSB-278-SO-10-12	CFSB-278-SO-0-0.5	CFSB-278-SO-0.5-2	CFSB-287-SO-8-10	CFSB-288-SO-0-0.5	CFSB-288-SO-0.5-2	CFSB-288-SO-0-0.5	CFSB-288-SO-0.5-2	CFSB-293-SO-0-0.5
Sample Depth	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	6-8 ft	10-12 ft	0-0.5 ft	0.5-2 ft	8-10 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft
Chemical	9/28/2018	9/28/2018	5/11/2018	5/11/2018	5/11/2018	5/11/2018	9/28/2018	9/28/2018	5/18/2018	6/28/2018	6/28/2018	9/27/2018	9/27/2018	9/27/2018
Diethyl Phthalate	--	--	0.32 U	0.27 U	0.042 U	0.01 U	--	--	2.2 U	--	--	--	--	--
Dimethyl Phthalate	--	--	0.038 U	0.032 U	0.0051 U	0.0012 U	--	--	0.27 U	--	--	--	--	--
Di-N-Butyl Phthalate	--	--	0.46 U	0.39 U	0.061 U	0.015 U	--	--	3.2 U	--	--	--	--	--
Di-N-Octylphthalate	--	--	0.62 U	0.52 U	0.082 U	0.02 U	--	--	4.3 U	--	--	--	--	--
Fluoranthene	--	--	14	13	1.9	0.0018 U	--	--	3.7	--	--	--	--	--
Fluorene	--	--	0.52	0.47	0.069	0.0013 U	--	--	0.65 J	--	--	--	--	--
Hexachlorobenzene	--	--	0.076 U	0.064 U	0.01 U	0.0025 U	--	--	0.53 U	--	--	--	--	--
Hexachlorobutadiene	--	--	0.062 UJ	0.052 UJ	0.0082 UJ	0.002 UJ	--	--	0.43 U	--	--	--	--	--
Hexachlorocyclopentadiene	--	--	0.054 UJ	0.046 UJ	0.0071 UJ	0.0017 UJ	--	--	0.37 UJ	--	--	--	--	--
Hexachloroethane	--	--	0.055 U	0.046 U	0.0072 U	0.0018 U	--	--	0.38 U	--	--	--	--	--
Indeno(1,2,3-C,D)Pyrene	--	--	7.8	6.6	0.94	0.0014 U	--	--	1.4 J	--	--	--	--	--
Isophorone	--	--	0.054 U	0.046 U	0.0071 U	0.0017 U	--	--	0.37 U	--	--	--	--	--
Naphthalene	--	--	0.17 J	0.2	0.021 J	0.0013 U	--	--	0.32 J	--	--	--	--	--
Nitrobenzene	--	--	0.39 U	0.33 U	0.051 U	0.013 U	--	--	2.7 U	--	--	--	--	--
N-Nitrosodi-N-Propylamine	--	--	0.072 U	0.061 U	0.0095 U	0.0023 U	--	--	0.5 U	--	--	--	--	--
N-Nitrosodiphenylamine	--	--	0.35 U	0.3 U	0.047 U	0.011 U	--	--	2.4 U	--	--	--	--	--
Pentachlorophenol	--	--	1.7 U	1.4 U	0.23 U	0.055 U	--	--	12 UJ	--	--	--	--	--
Phenanthrene	--	--	7.9	7	1	0.0018 U	--	--	3.3	--	--	--	--	--
Phenol	--	--	0.32 U	0.27 U	0.042 U	0.01 U	--	--	2.2 U	--	--	--	--	--
Pyrene	--	--	16	13	2	0.0016 U	--	--	8.9	--	--	--	--	--
VOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,1,1-Trichloroethane	--	--	--	--	--	--	--	--	0.00017 U	--	--	--	--	--
1,1,2,2-Tetrachloroethane	--	--	--	--	--	--	--	--	0.00015 UJ	--	--	--	--	--
1,1,2-Trichloro-1,2,2-Trifluoroethane	--	--	--	--	--	--	--	--	0.00021 U	--	--	--	--	--
1,1,2-Trichloroethane	--	--	--	--	--	--	--	--	0.00013 U	--	--	--	--	--
1,1-Dichloroethane	--	--	--	--	--	--	--	--	0.00015 U	--	--	--	--	--
1,1-Dichloroethene	--	--	--	--	--	--	--	--	0.00016 U	--	--	--	--	--
1,2,3-Trichlorobenzene	--	--	--	--	--	--	--	--	0.00013 UJ	--	--	--	--	--
1,2,4-Trichlorobenzene	--	--	--	--	--	--	--	--	0.000065 UJ	--	--	--	--	--
1,2-Dibromo-3-Chloropropane	--	--	--	--	--	--	--	--	0.00033 UJ	--	--	--	--	--
1,2-Dibromoethane (Ethylene Dibromide)	--	--	--	--	--	--	--	--	0.00013 U	--	--	--	--	--
1,2-Dichlorobenzene	--	--	--	--	--	--	--	--	0.0001 UJ	--	--	--	--	--
1,2-Dichloroethane	--	--	--	--	--	--	--	--	0.00021 U	--	--	--	--	--
1,2-Dichloropropane	--	--	--	--	--	--	--	--	0.0003 U	--	--	--	--	--
1,3-Dichlorobenzene	--	--	--	--	--	--	--	--	0.00011 UJ	--	--	--	--	--
1,4-Dichlorobenzene	--	--	--	--	--	--	--	--	0.000071 UJ	--	--	--	--	--
2-Hexanone	--	--	--	--	--	--	--	--	0.00055 U	--	--	--	--	--
Acetone	--	--	--	--	--	--	--	--	0.04	--	--	--	--	--
Benzene	--	--	--	--	--	--	--	--	0.0013	--	--	--	--	--
Bromochloromethane	--	--	--	--	--	--	--	--	0.0002 U	--	--	--	--	--
Bromodichloromethane	--	--	--	--	--	--	--	--	0.00018 U	--	--	--	--	--
Bromoform	--	--	--	--	--	--	--	--	0.0003 U	--	--	--	--	--
Bromomethane	--	--	--	--	--	--	--	--	0.00034 U	--	--	--	--	--
Carbon Disulfide	--	--	--	--	--	--	--	--	0.00096	--	--	--	--	--
Carbon Tetrachloride	--	--	--	--	--	--	--	--	0.00013 U	--	--	--	--	--
Chlorobenzene	--	--	--	--	--	--	--	--	0.00013 U	--	--	--	--	--
Chloroethane	--	--	--	--	--	--	--	--	0.00037 U	--	--	--	--	--
Chloroform	--	--	--	--	--	--	--	--	0.00023 U	--	--	--	--	--
Chloromethane	--	--	--	--	--	--	--	--	0.00031 U	--	--	--	--	--
Cis-1,2-Dichloroethylene	--	--	--	--	--	--	--	--	0.00011 U	--	--	--	--	--
Cis-1,3-Dichloropropene	--	--	--	--	--	--	--	--	0.00019 U	--	--	--	--	--
Cyclohexane	--	--	--	--	--	--	--	--	0.0017	--	--	--	--	--
Dibromochloromethane	--	--	--	--	--	--	--	--	0.00014 U	--	--	--	--	--
Dichlorodifluoromethane	--	--	--	--	--	--	--	--	0.00024 UJ	--	--	--	--	--
Ethylbenzene	--	--	--	--	--	--	--	--	0.0012	--	--	--	--	--
Isopropylbenzene (Cumene)	--	--	--	--	--	--	--	--	0.00028 J	--	--	--	--	--
M,P-Xylene	--	--	--	--	--	--	--	--	0.0031	--	--	--	--	--

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Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-276	CFSB-276	CFSB-278	CFSB-278	CFSB-278	CFSB-278	CFSB-278	CFSB-278	CFSB-287	CFSB-288	CFSB-288	CFSB-288	CFSB-288	CFSB-293
Sample Lab IDs	460-165781-6	460-165781-7	180-77782-61, 460-156162-11	180-77782-62, 460-156162-12	180-77782-63, 460-156162-13	180-77782-64, 460-156162-14	460-165781-8	460-165781-9	180-77944-6, 460-156665-8	460-159538-14	460-159538-15	320-43709-20	320-43709-21	320-43709-16
Sample Name	CFSB-276-SO-0-0.5	CFSB-276-SO-0.5-2	CFSB-278-SO-0-0.5	CFSB-278-SO-0.5-2	CFSB-278-SO-6-8	CFSB-278-SO-10-12	CFSB-278-SO-0-0.5	CFSB-278-SO-0.5-2	CFSB-287-SO-8-10	CFSB-288-SO-0-0.5	CFSB-288-SO-0.5-2	CFSB-288-SO-0-0.5	CFSB-288-SO-0.5-2	CFSB-293-SO-0-0.5
Sample Depth	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	6-8 ft	10-12 ft	0-0.5 ft	0.5-2 ft	8-10 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft
Chemical	9/28/2018	9/28/2018	5/11/2018	5/11/2018	5/11/2018	5/11/2018	9/28/2018	9/28/2018	5/18/2018	6/28/2018	6/28/2018	9/27/2018	9/27/2018	9/27/2018
Methyl Acetate	--	--	--	--	--	--	--	--	0.003 U	--	--	--	--	--
Methyl Ethyl Ketone (2-Butanone)	--	--	--	--	--	--	--	--	0.0081	--	--	--	--	--
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	--	--	--	--	--	--	--	--	0.00047 U	--	--	--	--	--
Methylcyclohexane	--	--	--	--	--	--	--	--	0.0076	--	--	--	--	--
Methylene Chloride	--	--	--	--	--	--	--	--	0.00012 U	--	--	--	--	--
O-Xylene (1,2-Dimethylbenzene)	--	--	--	--	--	--	--	--	0.0017	--	--	--	--	--
Styrene	--	--	--	--	--	--	--	--	0.000087 U	--	--	--	--	--
Tert-Butyl Methyl Ether	--	--	--	--	--	--	--	--	0.000089 U	--	--	--	--	--
Tetrachloroethylene (PCE)	--	--	--	--	--	--	--	--	0.00029 J	--	--	--	--	--
Toluene	--	--	--	--	--	--	--	--	0.0047	--	--	--	--	--
Trans-1,2-Dichloroethene	--	--	--	--	--	--	--	--	0.00017 U	--	--	--	--	--
Trans-1,3-Dichloropropene	--	--	--	--	--	--	--	--	0.00019 U	--	--	--	--	--
Trichloroethylene (TCE)	--	--	--	--	--	--	--	--	0.0001 U	--	--	--	--	--
Trichlorofluoromethane	--	--	--	--	--	--	--	--	0.00029 U	--	--	--	--	--
Vinyl Chloride	--	--	--	--	--	--	--	--	0.00039 U	--	--	--	--	--

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-2
Summary of Data Used in Risk Assessment
Main Plant Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-293	CFSB-294	CFSB-294
Sample Lab IDs	320-43709-17	320-43709-12	320-43709-13
Sample Name	CFSB-293-SO-0.5-2	CFSB-294-SO-0-0.5	CFSB-294-SO-0.5-2
Sample Depth	0.5-2 ft	0-0.5 ft	0.5-2 ft
Chemical	9/27/2018	9/27/2018	9/27/2018
GENERAL CHEMISTRY (mg/kg)			
Fluoride	--	--	--
Cyanide	--	--	--
METALS (mg/kg)			
"Chromium, Hexavalent - Estimated"	--	--	--
"Chromium, Trivalent - Calculated"	--	--	--
"Chromium, Trivalent - Estimated"	--	--	--
Aluminum	--	--	--
Antimony	--	--	--
Arsenic	--	--	--
Barium	--	--	--
Beryllium	--	--	--
Cadmium	--	--	--
Calcium	--	--	--
Chromium, Total	--	--	--
Cobalt	--	--	--
Copper	--	--	--
Iron	--	--	--
Lead	--	--	--
Magnesium	--	--	--
Manganese	--	--	--
Mercury	--	--	--
Nickel	--	--	--
Potassium	--	--	--
Selenium	--	--	--
Silver	--	--	--
Sodium	--	--	--
Thallium	--	--	--
Vanadium	--	--	--
Zinc	--	--	--
METALS|HEXAVALENT CHROMIUM (mg/kg)			
Chromium, Hexavalent	--	--	--
PESTICIDES (mg/kg)			
Aldrin	--	--	--
Alpha Bhc (Alpha Hexachlorocyclohexane)	--	--	--
Alpha Endosulfan	--	--	--
Beta Bhc (Beta Hexachlorocyclohexane)	--	--	--
Beta Endosulfan	--	--	--
cis-Chlordane	--	--	--
Delta BHC (Delta Hexachlorocyclohexane)	--	--	--
Dieldrin	--	--	--
Endosulfan Sulfate	--	--	--
Endrin	--	--	--
Endrin Aldehyde	--	--	--
Endrin Ketone	--	--	--
Gamma Bhc (Lindane)	--	--	--
Heptachlor	--	--	--
Heptachlor Epoxide	--	--	--
Methoxychlor	--	--	--
P,P'-DDD	--	--	--
P,P'-DDE	--	--	--
P,P'-DDT	--	--	--
Toxaphene	--	--	--
trans-Chlordane	--	--	--
POLYCHLORINATED BIPHENYLS (mg/kg)			
PCB-1016 (Aroclor 1016)	--	--	--
PCB-1221 (Aroclor 1221)	--	--	--

Table E-2
Summary of Data Used in Risk Assessment
Main Plant Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-293	CFSB-294	CFSB-294
Sample Lab IDs	320-43709-17	320-43709-12	320-43709-13
Sample Name	CFSB-293-SO-0.5-2	CFSB-294-SO-0-0.5	CFSB-294-SO-0.5-2
Sample Depth	0.5-2 ft	0-0.5 ft	0.5-2 ft
Chemical	9/27/2018	9/27/2018	9/27/2018
PCB-1232 (Aroclor 1232)	--	--	--
PCB-1242 (Aroclor 1242)	--	--	--
PCB-1248 (Aroclor 1248)	--	--	--
PCB-1254 (Aroclor 1254)	--	--	--
PCB-1260 (Aroclor 1260)	--	--	--
PCB-1262 (Aroclor 1262)	--	--	--
PCB-1268 (Aroclor 1268)	--	--	--
Polychlorinated Biphenyl (PCBs)	--	--	--
SEMIVOLATILE ORGANIC COMPOUNDS (mg/kg)			
1,2,4,5-Tetrachlorobenzene	--	--	--
1,4-Dioxane (P-Dioxane)	--	--	--
2,3,4,6-Tetrachlorophenol	--	--	--
2,4,5-Trichlorophenol	--	--	--
2,4,6-Trichlorophenol	--	--	--
2,4-Dichlorophenol	--	--	--
2,4-Dimethylphenol	--	--	--
2,4-Dinitrophenol	--	--	--
2,4-Dinitrotoluene	--	--	--
2,6-Dinitrotoluene	--	--	--
2-Chloronaphthalene	--	--	--
2-Chlorophenol	--	--	--
2-Methylnaphthalene	--	--	--
2-Methylphenol (O-Cresol)	--	--	--
2-Nitroaniline	--	--	--
2-Nitrophenol	--	--	--
3- And 4- Methylphenol (Total)	--	--	--
3,3'-Dichlorobenzidine	--	--	--
3-Nitroaniline	--	--	--
4,6-Dinitro-2-Methylphenol	--	--	--
4-Bromophenyl Phenyl Ether	--	--	--
4-Chloro-3-Methylphenol	--	--	--
4-Chloroaniline	--	--	--
4-Chlorophenyl Phenyl Ether	--	--	--
4-Nitroaniline	--	--	--
4-Nitrophenol	--	--	--
Acenaphthene	--	--	--
Acenaphthylene	--	--	--
Acetophenone	--	--	--
Anthracene	--	--	--
Atrazine	--	--	--
Benzaldehyde	--	--	--
Benzo(A)Anthracene	--	--	--
Benzo(A)Pyrene	--	--	--
Benzo(B)Fluoranthene	--	--	--
Benzo(G,H,I)Perylene	--	--	--
Benzo(K)Fluoranthene	--	--	--
Benzyl Butyl Phthalate	--	--	--
Biphenyl (Diphenyl)	--	--	--
Bis(2-Chloroethoxy) Methane	--	--	--
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	--	--	--
Bis(2-Chloroisopropyl) Ether	--	--	--
Bis(2-Ethylhexyl) Phthalate	--	--	--
Caprolactam	--	--	--
Carbazole	--	--	--
Chrysene	--	--	--
Dibenz(A,H)Anthracene	--	--	--
Dibenzofuran	--	--	--

Table E-2
Summary of Data Used in Risk Assessment
Main Plant Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-293	CFSB-294	CFSB-294
Sample Lab IDs	320-43709-17	320-43709-12	320-43709-13
Sample Name	CFSB-293-SO-0.5-2	CFSB-294-SO-0-0.5	CFSB-294-SO-0.5-2
Sample Depth	0.5-2 ft	0-0.5 ft	0.5-2 ft
Chemical	9/27/2018	9/27/2018	9/27/2018
Diethyl Phthalate	--	--	--
Dimethyl Phthalate	--	--	--
Di-N-Butyl Phthalate	--	--	--
Di-N-Octylphthalate	--	--	--
Fluoranthene	--	--	--
Fluorene	--	--	--
Hexachlorobenzene	--	--	--
Hexachlorobutadiene	--	--	--
Hexachlorocyclopentadiene	--	--	--
Hexachloroethane	--	--	--
Indeno(1,2,3-C,D)Pyrene	--	--	--
Isophorone	--	--	--
Naphthalene	--	--	--
Nitrobenzene	--	--	--
N-Nitrosodi-N-Propylamine	--	--	--
N-Nitrosodiphenylamine	--	--	--
Pentachlorophenol	--	--	--
Phenanthrene	--	--	--
Phenol	--	--	--
Pyrene	--	--	--
VOLATILE ORGANIC COMPOUNDS (mg/kg)			
1,1,1-Trichloroethane	--	--	--
1,1,2,2-Tetrachloroethane	--	--	--
1,1,2-Trichloro-1,2,2-Trifluoroethane	--	--	--
1,1,2-Trichloroethane	--	--	--
1,1-Dichloroethane	--	--	--
1,1-Dichloroethene	--	--	--
1,2,3-Trichlorobenzene	--	--	--
1,2,4-Trichlorobenzene	--	--	--
1,2-Dibromo-3-Chloropropane	--	--	--
1,2-Dibromoethane (Ethylene Dibromide)	--	--	--
1,2-Dichlorobenzene	--	--	--
1,2-Dichloroethane	--	--	--
1,2-Dichloropropane	--	--	--
1,3-Dichlorobenzene	--	--	--
1,4-Dichlorobenzene	--	--	--
2-Hexanone	--	--	--
Acetone	--	--	--
Benzene	--	--	--
Bromochloromethane	--	--	--
Bromodichloromethane	--	--	--
Bromoform	--	--	--
Bromomethane	--	--	--
Carbon Disulfide	--	--	--
Carbon Tetrachloride	--	--	--
Chlorobenzene	--	--	--
Chloroethane	--	--	--
Chloroform	--	--	--
Chloromethane	--	--	--
Cis-1,2-Dichloroethylene	--	--	--
Cis-1,3-Dichloropropene	--	--	--
Cyclohexane	--	--	--
Dibromochloromethane	--	--	--
Dichlorodifluoromethane	--	--	--
Ethylbenzene	--	--	--
Isopropylbenzene (Cumene)	--	--	--
M,P-Xylene	--	--	--

Table E-2
Summary of Data Used in Risk Assessment
Main Plant Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-293	CFSB-294	CFSB-294
Sample Lab IDs	320-43709-17	320-43709-12	320-43709-13
Sample Name	CFSB-293-SO-0.5-2	CFSB-294-SO-0-0.5	CFSB-294-SO-0.5-2
Sample Depth	0.5-2 ft	0-0.5 ft	0.5-2 ft
Chemical	9/27/2018	9/27/2018	9/27/2018
Methyl Acetate	--	--	--
Methyl Ethyl Ketone (2-Butanone)	--	--	--
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	--	--	--
Methylcyclohexane	--	--	--
Methylene Chloride	--	--	--
O-Xylene (1,2-Dimethylbenzene)	--	--	--
Styrene	--	--	--
Tert-Butyl Methyl Ether	--	--	--
Tetrachloroethylene (PCE)	--	--	--
Toluene	--	--	--
Trans-1,2-Dichloroethene	--	--	--
Trans-1,3-Dichloropropene	--	--	--
Trichloroethylene (TCE)	--	--	--
Trichlorofluoromethane	--	--	--
Vinyl Chloride	--	--	--

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-3
Summary of Data Used in Risk Assessment
North Percolation Pond Area Soil (0-0.5 ft-bgs) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-027	CFSB-014	CFSB-016	CFSB-019	CFSB-025	CFSB-026	CFSB-027	CFSB-028	CFSB-030	CFSB-199	CFSB-201	CFSB-201	CFSB-202	CFSB-202
Sample Lab IDs	460-116402-11	460-114828-33	460-114828-25	460-115008-10	460-115528-18	460-115528-16	460-115528-22	460-117381-1	460-115528-20	180-79434-34, 200-44138-3, 460-159538-4	180-79204-15, 200-44015-5, 460-159044-21	180-79433-1	180-79204-17, 200-44015-7, 460-159044-23	180-79433-2
Sample Name	CFMW-027-SO-0-0.5	CFSB-014-SO-0-0.5	CFSB-016-SO-0-0.5	CFSB-019-SO-0-0.5	CFSB-025-SO-0-0.5	CFSB-026-SO-0-0.5	CFSB-027-SO-0-0.5	CFSB-028-SO-0-0.5	CFSB-030-SO-0-0.5	CFSB-199-SO-0-0.5	CFSB-201-SO-0-0.5	CFSB-201-SO-0-0.5	CFSB-202-SO-0-0.5	CFSB-202-SO-0-0.5
Sample Depth	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft
Chemical	6/30/2016	6/2/2016	6/2/2016	6/4/2016	6/13/2016	6/13/2016	6/13/2016	7/18/2016	6/13/2016	6/28/2018	6/22/2018	6/29/2018	6/22/2018	6/29/2018
GENERAL CHEMISTRY (mg/kg)														
Fluoride	149 J+	33.6 J	241 J	50 J	138 J-	167 J-	52.8 J-	94.8 J+	221 J+	44.2	9.49 J-	--	2.42 J-	--
Cyanide	1.2	6.8	8.3	1.3	8.2 J	137 J	0.19	1.5	4.7 J	2.7 J	5.2	--	3.6	--
METALS (mg/kg)														
"Chromium, Hexavalent - Estimated"	0.444282	0.489781	0.559367	0.527251	0.837713	1.27129	0.305109	0.313139	0.355961	0.987591	0.414842	--	0.808273	--
"Chromium, Trivalent - Calculated"	--	--	--	--	--	--	--	--	--	--	--	--	--	--
"Chromium, Trivalent - Estimated"	16.1557	17.8102	20.3406	19.1727	30.4623	46.2287	11.0949	11.3869	12.944	35.9124	15.0852	--	29.3917	--
Aluminum	17000	14600 J	36200	27400	71300	106000	10300	18600	47300	24200	31600	--	21800	--
Antimony	0.47 UJ	0.48 UJ	0.7 UJ	0.39 UJ	2.6 J-	1.1 J-	0.36 UJ	0.43 UJ	0.42 UJ	0.32 UJ	0.32 U	--	0.32 U	--
Arsenic	3.7	8.5 J	14.1	9	13.2	22.7	5.7	5.9	8.5	7.9	12.8	--	8.7	--
Barium	48.9 J	256 J	228	138	166	461	82.9	115	268	79.6	242	--	237	--
Beryllium	0.59	0.75	3.4	1.2	3.4	17.2	0.36	1.2	1.3	1.3	2.9	--	1.2	--
Cadmium	1.1	0.68 J	2.5	1.8	3.6	8.3	0.27 U	0.93 J	1.4	1.6	2.7	--	1.7	--
Calcium	1370	19200	9990	2630	12600 J	68600 J	20400 J	49100	6670 J	2050	4940	--	6200	--
Chromium, Total	16.6	18.3 J	20.9	19.7	31.3	47.5	11.4	11.7 J+	13.3	36.9	15.5	--	30.2	--
Cobalt	2.6	6	7.8	7.4	27.4	8.7	4.7	4.6	6.9	4.6	5.7	--	4.9	--
Copper	16.9 J	35	59.4	36.2 J	55.2	6.7 J	10.9	12.5 J+	27.2	27.4	29.2	--	71.6	--
Iron	2920	13500 J	15400	12100	8050	6400	12100	11600	13100	3750	10900	--	5170	--
Lead	30.3	14.6 J	43.1	28.4 J	221 J+	238 J+	8.3 J+	15.9 J	26.8 J+	34.2	30.3	--	24.2	--
Magnesium	1090	10200	9260	6660	1560	6270	10000	11800	6960	1680	7380	--	2350	--
Manganese	46	408 J	113	232	15.8 J	96.1 J	323 J	375	479 J	20.1	96.3	--	86.5	--
Mercury	0.031 J+	0.015 U	0.04	0.025	0.021 U	0.028 U	0.016 J	0.018	0.021	0.015 J	0.014 J	--	0.025	--
Nickel	84.5	73.4	171	153	1250 J+	377 J+	17.9 J+	56.4	81.3 J+	181	131	--	163	--
Potassium	266 J+	559	790	920 J+	727	844	892	1380 J+	1900	444 J+	623	--	301	--
Selenium	1 J	0.45 U	0.75 J	1 J	3.3 J	1.6 J	0.34 U	0.4 U	0.71 J	0.81 J	0.32 U	--	0.34 J	--
Silver	0.85 U	0.88 U	1.3 U	0.72 U	1.1 U	1.4 U	0.66 U	0.78 U	0.76 U	0.68 U	0.67 U	--	0.67 U	--
Sodium	116	67.6 J	144 J	139	2140	831	33.8 U	101 J	247	148	75.6 J	--	93.2 J	--
Thallium	0.31 J	0.18 U	0.38 J	0.27 J	4.2	4.6	0.29 J	0.25 J	0.64	0.7	0.19 J	--	0.14 J	--
Vanadium	34.5	26.1 J	54.2	60.3	348 J-	140 J-	13.3 J-	21.3 J	41.3 J-	76.8	25.9	--	51.2	--
Zinc	130	148 J	265	248	257 J-	225 J-	42.2 J-	141	148 J-	173	265	--	335	--
METALS|HEXAVALENT CHROMIUM (mg/kg)														
Chromium, Hexavalent	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PESTICIDES (mg/kg)														
Aldrin	0.0012 U	0.00099 U	0.0015 U	--	0.0015 U	0.0021 U	--	0.00092 U	0.001 U	--	--	--	--	--
Alpha Bhc (Alpha Hexachlorocyclohexane)	0.00089 U	0.00075 U	0.0011 U	--	0.0011 U	0.0016 U	--	0.00069 U	0.00079 U	--	--	--	--	--
Alpha Endosulfan	0.0014 U	0.0011 U	0.0017 U	--	0.0017 U	0.0024 U	--	0.0011 U	0.0012 U	--	--	--	--	--
Beta Bhc (Beta Hexachlorocyclohexane)	0.00095 U	0.00079 U	0.0012 U	--	0.0012 U	0.0017 U	--	0.00074 U	0.00084 U	--	--	--	--	--
Beta Endosulfan	0.0015 U	0.0013 U	0.0019 U	--	0.002 U	0.0027 U	--	0.0012 U	0.0014 U	--	--	--	--	--
cis-Chlordane	0.0016 U	0.0013 U	0.002 U	--	0.002 U	0.0028 U	--	0.0012 U	0.0014 U	--	--	--	--	--
Delta BHC (Delta Hexachlorocyclohexane)	0.0011 U	0.00089 U	0.0013 U	--	0.0014 U	0.0019 U	--	0.00083 U	0.00094 U	--	--	--	--	--
Dieldrin	0.0013 U	0.0011 U	0.0016 U	--	0.0016 U	0.0022 U	--	0.00099 U	0.0011 U	--	--	--	--	--
Endosulfan Sulfate	0.0011 U	0.00095 U	0.0014 U	--	0.0015 U	0.002 U	--	0.00088 U	0.001 U	--	--	--	--	--
Endrin	0.0012 U	0.001 U	0.0015 U	--	0.0016 U	0.0022 U	--	0.00096 U	0.0011 U	--	--	--	--	--
Endrin Aldehyde	0.0012 U	0.001 U	0.0015 U	--	0.0016 U	0.0021 U	--	0.00094 U	0.0011 U	--	--	--	--	--
Endrin Ketone	0.0014 U	0.0011 U	0.0017 U	--	0.0017 U	0.0024 U	--	0.0011 U	0.0012 U	--	--	--	--	--
Gamma Bhc (Lindane)	0.00088 U	0.00073 U	0.0011 U	--	0.0011 U	0.0015 U	--	0.00068 U	0.00078 U	--	--	--	--	--
Heptachlor	0.0013 U	0.0011 U	0.0016 U	--	0.0016 U	0.0022 U	--	0.00098 U	0.0011 U	--	--	--	--	--
Heptachlor Epoxide	0.0019 U	0.0016 U	0.0024 U	--	0.0025 U	0.0034 U	--	0.0015 U	0.0017 U	--	--	--	--	--
Methoxychlor	0.0021 U	0.0017 U	0.0026 U	--	0.0027 U	0.0036 U	--	0.0016 U	0.0018 U	--	--	--	--	--
P,P'-DDD	0.0013 U	0.0011 U	0.0016 U	--	0.0017 U	0.0023 U	--	0.001 U	0.0011 U	--	--	--	--	--
P,P'-DDE	0.0014 U	0.0012 U	0.0018 U	--	0.0018 U	0.0025 U	--	0.0011 U	0.0013 U	--	--	--	--	--
P,P'-DDT	0.001 U	0.00084 U	0.0013 U	--	0.0013 U	0.0018 U	--	0.00078 U	0.00089 U	--	--	--	--	--
Toxaphene	0.029 U	0.024 U	0.035 U	--	0.037 U	0.05 U	--	0.022 U	0.025 U	--	--	--	--	--
trans-Chlordane	0.0021 U	0.0018 U	0.0026 U	--	0.0027 U	0.0037 U	--	0.0016 U	0.0019 U	--	--	--	--	--

Table E-3
Summary of Data Used in Risk Assessment
North Percolation Pond Area Soil (0-0.5 ft-bgs) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-027	CFSB-014	CFSB-016	CFSB-019	CFSB-025	CFSB-026	CFSB-027	CFSB-028	CFSB-030	CFSB-199	CFSB-201	CFSB-201	CFSB-202	CFSB-202
Sample Lab IDs	460-116402-11	460-114828-33	460-114828-25	460-115008-10	460-115528-18	460-115528-16	460-115528-22	460-117381-1	460-115528-20	180-79434-34, 200-44138-3, 460-159538-4	180-79204-15, 200-44015-5, 460-159044-21	180-79433-1	180-79204-17, 200-44015-7, 460-159044-23	180-79433-2
Sample Name	CFMW-027-SO-0-0.5	CFSB-014-SO-0-0.5	CFSB-016-SO-0-0.5	CFSB-019-SO-0-0.5	CFSB-025-SO-0-0.5	CFSB-026-SO-0-0.5	CFSB-027-SO-0-0.5	CFSB-028-SO-0-0.5	CFSB-030-SO-0-0.5	CFSB-199-SO-0-0.5	CFSB-201-SO-0-0.5	CFSB-201-SO-0-0.5	CFSB-202-SO-0-0.5	CFSB-202-SO-0-0.5
Sample Depth	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft
Chemical	6/30/2016	6/2/2016	6/2/2016	6/4/2016	6/13/2016	6/13/2016	6/13/2016	7/18/2016	6/13/2016	6/28/2018	6/22/2018	6/29/2018	6/22/2018	6/29/2018
POLYCHLORINATED BIPHENYLS (mg/kg)														
PCB-1016 (Aroclor 1016)	0.013 U	0.011 U	0.016 U	0.01 U	0.017 U	0.023 U	0.0095 U	0.01 U	0.012 U	--	--	--	--	--
PCB-1221 (Aroclor 1221)	0.013 U	0.011 U	0.016 U	0.01 U	0.017 U	0.023 U	0.0095 U	0.01 U	0.012 U	--	--	--	--	--
PCB-1232 (Aroclor 1232)	0.013 U	0.011 U	0.016 U	0.01 U	0.017 U	0.023 U	0.0095 U	0.01 U	0.012 U	--	--	--	--	--
PCB-1242 (Aroclor 1242)	0.013 U	0.011 U	0.016 U	0.01 U	0.017 U	0.023 U	0.0095 U	0.01 U	0.012 U	--	--	--	--	--
PCB-1248 (Aroclor 1248)	0.013 U	0.011 U	0.016 U	0.01 U	0.017 U	0.023 U	0.0095 U	0.01 U	0.012 U	--	--	--	--	--
PCB-1254 (Aroclor 1254)	0.013 U	0.011 U	0.017 U	0.011 U	0.017 U	0.024 U	0.0099 U	0.01 U	0.012 U	--	--	--	--	--
PCB-1260 (Aroclor 1260)	0.013 U	0.011 U	0.017 U	0.011 U	0.017 U	0.024 U	0.0099 U	0.01 U	0.012 U	--	--	--	--	--
PCB-1262 (Aroclor 1262)	0.013 U	0.011 U	0.017 U	0.011 U	0.017 U	0.024 U	0.0099 U	0.01 U	0.012 U	--	--	--	--	--
PCB-1268 (Aroclor 1268)	0.013 U	0.011 U	0.017 U	0.011 U	0.017 U	0.024 U	0.0099 U	0.01 U	0.012 U	--	--	--	--	--
Polychlorinated Biphenyl (PCBs)	0.013 U	0.011 U	0.017 U	0.011 U	0.017 U	0.024 U	0.0099 U	0.01 U	0.012 U	--	--	--	--	--
SEMIVOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,2,4,5-Tetrachlorobenzene	3.6 U	0.03 U	0.22 U	0.029 U	2.3 U	1.3 U	0.13 U	0.056 U	0.064 U	0.46 U	--	0.016 U	--	0.0031 U
1,4-Dioxane (P-Dioxane)	13 U	0.11 U	0.8 U	0.1 U	8.3 U	4.5 U	0.47 U	0.2 U	0.23 U	3.3 U	--	0.12 U	--	0.022 U
2,3,4,6-Tetrachlorophenol	4.5 U	0.038 U	0.28 U	0.037 U	2.9 U	1.6 U	0.17 U	0.07 U	0.08 U	4.5 U	--	0.16 U	--	0.03 U
2,4,5-Trichlorophenol	4.8 U	0.04 U	0.3 U	0.039 U	3.1 U	1.7 U	0.18 U	0.075 U	0.085 U	0.77 U	--	0.027 U	--	0.0051 U
2,4,6-Trichlorophenol	1.4 U	0.011 U	0.085 U	0.011 U	0.88 U	0.48 U	0.05 U	0.021 U	0.024 U	0.59 U	--	0.021 U	--	0.0039 U
2,4-Dichlorophenol	1.1 U	0.0095 U	0.071 U	0.0092 U	0.73 U	0.4 U	0.042 U	0.018 U	0.02 U	0.83 U	--	0.029 U	--	0.0055 U
2,4-Dimethylphenol	11 U	0.089 U	0.66 U	0.085 U	6.8 U	3.7 U	0.39 U	0.16 U	0.19 U	0.67 U	--	0.023 U	--	0.0044 U
2,4-Dinitrophenol	37 U	0.31 U	2.3 U	0.29 U	23 U	13 U	1.3 U	0.57 U	0.65 U	29 U	--	1 U	--	0.19 U
2,4-Dinitrotoluene	1.9 U	0.016 U	0.12 U	0.015 U	1.2 U	0.67 U	0.07 U	0.03 U	0.034 U	0.53 U	--	0.019 U	--	0.0036 U
2,6-Dinitrotoluene	2.6 U	0.021 U	0.16 U	0.021 U	1.7 U	0.9 U	0.094 U	0.04 U	0.045 U	0.66 U	--	0.023 U	--	0.0044 U
2-Chloronaphthalene	1.1 U	0.0092 U	0.068 U	0.0088 U	0.7 U	0.38 U	0.04 U	0.017 U	0.019 U	0.49 U	--	0.017 U	--	0.0033 U
2-Chlorophenol	1.2 U	0.01 U	0.076 U	0.0099 U	0.79 U	0.43 U	0.045 U	0.019 U	0.022 U	0.5 U	--	0.018 U	--	0.0033 U
2-Methylnaphthalene	3.6 J	0.017 J	0.37 J	1	1.6 J	3.2 J	0.095 J	0.037 J	0.063 J	0.8 J	--	0.058 J	--	0.018
2-Methylphenol (O-Cresol)	2.1 U	0.018 U	0.13 U	0.017 U	1.4 U	0.74 U	0.077 U	0.033 U	0.037 U	3.1 U	--	0.11 U	--	0.021 U
2-Nitroaniline	1.6 U	0.013 U	0.099 U	0.013 U	1 UJ	0.56 U	0.058 U	0.025 U	0.028 U	4.9 U	--	0.17 U	--	0.033 U
2-Nitrophenol	1.6 U	0.014 U	0.1 U	0.013 U	1 U	0.57 U	0.059 U	0.025 U	0.029 U	0.61 U	--	0.022 U	--	0.0041 U
3- And 4- Methylphenol (Total)	1.3 U	0.011 U	0.08 U	0.01 U	0.83 U	0.45 U	0.047 U	0.02 U	0.023 U	--	--	--	--	--
3,3'-Dichlorobenzidine	5.4 U	0.045 U	0.33 U	0.043 U	3.5 U	1.9 U	0.2 U	0.084 U	0.095 U	10 U	--	0.35 U	--	0.067 U
3-Nitroaniline	1.4 U	0.012 U	0.089 U	0.012 U	0.92 U	0.5 U	0.052 U	0.022 U	0.025 U	2.7 U	--	0.096 U	--	0.018 U
4,6-Dinitro-2-Methylphenol	13 U	0.11 U	0.8 U	0.1 U	8.3 U	4.5 U	0.47 U	0.2 U	0.23 U	18 U	--	0.65 U	--	0.12 U
4-Bromophenyl Phenyl Ether	1.5 U	0.013 U	0.094 U	0.012 U	0.98 U	0.53 U	0.056 U	0.024 U	0.027 U	0.75 U	--	0.026 U	--	0.005 U
4-Chloro-3-Methylphenol	2.1 U	0.017 U	0.13 U	0.017 U	1.3 U	0.73 U	0.076 U	0.032 U	0.037 U	0.5 U	--	0.018 U	--	0.0034 U
4-Chloroaniline	1.2 U	0.01 U	0.077 U	0.01 U	0.8 U	0.44 U	0.046 U	0.019 U	0.022 U	0.36 U	--	0.013 U	--	0.0024 U
4-Chlorophenyl Phenyl Ether	1.4 U	0.012 U	0.09 U	0.012 U	0.93 U	0.51 U	0.053 U	0.022 U	0.026 U	0.65 U	--	0.023 U	--	0.0043 U
4-Nitroaniline	1.8 U	0.015 U	0.11 U	0.015 U	1.2 U	0.64 U	0.067 U	0.028 U	0.032 U	0.52 U	--	0.018 U	--	0.0035 U
4-Nitrophenol	23 U	0.19 U	1.4 U	0.19 U	15 U	8.1 U	0.85 U	0.36 U	0.41 U	7.5 U	--	0.27 U	--	0.05 U
Acenaphthene	40 J	0.031 J	0.72 J	0.069 J	5.3 J	8.4 J-	0.91 J	0.31 J	0.36 J	4.3	--	0.075 J	--	0.044
Acenaphthylene	1.2 J	0.01 U	0.077 U	0.033 J	0.8 U	0.44 U	0.046 U	0.019 U	0.022 U	0.47 U	--	0.017 J	--	0.0096 J
Acetophenone	1.1 U	0.0088 U	0.065 U	0.011 J	0.68 U	0.37 U	0.039 U	0.016 U	0.019 U	0.58 U	--	0.021 U	--	0.0039 U
Anthracene	41 J	0.13 J	1.9 J	0.049 J	38	21	2	0.89	0.85	20	--	0.26	--	0.32
Atrazine	2.2 U	0.018 U	0.13 U	0.017 U	1.4 U	0.75 U	0.079 U	0.033 U	0.038 U	4.7 UJ	--	0.17 U	--	0.031 U
Benzaldehyde	3.7 U	0.031 U	0.23 U	0.03 U	2.4 U	1.3 U	0.13 U	0.057 U	0.065 U	1.3 U	--	0.047 U	--	0.0089 U
Benzo(A)Anthracene	280	1.7	11	0.032 U	190	89	13	4.9	6	110	--	1.5	--	1.4
Benzo(A)Pyrene	320	2	14	0.012 U	140	76	15	5.3	6.9	72	--	2.3	--	1.5
Benzo(B)Fluoranthene	460	6.8	30	0.015 U	210	190	18	8.8	13	160	--	4.1	--	5.1
Benzo(G,H,I)Perylene	250	2.2	15 J+	0.022 U	50	56	13	5	8.2	95	--	5.4	--	1.4
Benzo(K)Fluoranthene	150	2.4	12	0.017 U	78	57	6.1	3.3	4.3	51	--	1.7	--	1.7
Benzyl Butyl Phthalate	1.5 U	0.012 U	0.092 U	0.012 U	0.96 U	0.52 U	0.055 U	0.55 J	0.026 U	7.4 U	--	0.26 U	--	0.049 U
Biphenyl (Diphenyl)	4.1 U	0.034 U	0.26 U	0.072 J	2.6 U	1.4 U	0.15 U	0.064 U	0.073 U	0.45 U	--	0.016 U	--	0.0047 J
Bis(2-Chloroethoxy) Methane	1.5 U	0.013 U	0.093 U	0.012 U	0.97 U	0.53 U	0.055 U	0.023 U	0.027 U	0.51 U	--	0.018 U	--	0.0034 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	1.1 U	0.0095 U	0.071 U	0.0092 U	0.73 U	0.4 U	0.042 U	0.018 U	0.02 U	0.39 U	--	0.014 U	--	0.0026 U
Bis(2-Chloroisopropyl) Ether	2 U	0.017 U	0.12 U	0.016 U	1.3 U	0.7 U	0.073 U	0.031 U	0.035 U	0.79 U	--	0.028 U	--	0.0053 U
Bis(2-Ethylhexyl) Phthalate	1.9 U	0.016 U	0.12 U	0.015 U	1.2 U	0.66 U	0.069 U	0.17 J	0.033 U	11 U	--	0.4 U	--	0.076 U
Caprolactam	3.5 U	0.029 U	0.22 U	0.028 U	2.2 U	1.2 U	0.13 U	0.054 U	0.062 U	7 U	--	0.25 U	--	0.047 U
Carbazole	33 J	0.11 J	1.5 J	0.0096 U	8.2 J	4.5 J	1.5 J	0.76	1.2	7.3	--	0.18	--	0.12
Chrysene	350	2.3	16	0.011 U	270	220	15	8.8	11	150	--	2.4	--	1.8

Table E-3
Summary of Data Used in Risk Assessment
North Percolation Pond Area Soil (0-0.5 ft-bgs) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-027	CFSB-014	CFSB-016	CFSB-019	CFSB-025	CFSB-026	CFSB-027	CFSB-028	CFSB-030	CFSB-199	CFSB-201	CFSB-201	CFSB-202	CFSB-202
Sample Lab IDs	460-116402-11	460-114828-33	460-114828-25	460-115008-10	460-115528-18	460-115528-16	460-115528-22	460-117381-1	460-115528-20	180-79434-34, 200-44138-3, 460-159538-4	180-79204-15, 200-44015-5, 460-159044-21	180-79433-1	180-79204-17, 200-44015-7, 460-159044-23	180-79433-2
Sample Name	CFMW-027-SO-0-0.5	CFSB-014-SO-0-0.5	CFSB-016-SO-0-0.5	CFSB-019-SO-0-0.5	CFSB-025-SO-0-0.5	CFSB-026-SO-0-0.5	CFSB-027-SO-0-0.5	CFSB-028-SO-0-0.5	CFSB-030-SO-0-0.5	CFSB-199-SO-0-0.5	CFSB-201-SO-0-0.5	CFSB-201-SO-0-0.5	CFSB-202-SO-0-0.5	CFSB-202-SO-0-0.5
Sample Depth	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft
Chemical	6/30/2016	6/2/2016	6/2/2016	6/4/2016	6/13/2016	6/13/2016	6/13/2016	7/18/2016	6/13/2016	6/28/2018	6/22/2018	6/29/2018	6/22/2018	6/29/2018
Dibenz(A,H)Anthracene	70	0.61	3.3 J+	0.02 U	20	17	3.7	1.4	2.2	24	--	0.93	--	0.4
Dibenzofuran	7.3 J	0.041 J	0.68 J	0.078 J	3.7 J	4.1 J	0.3 J	0.097 J	0.17 J	2.1 J	--	0.074 J	--	0.036 J
Diethyl Phthalate	1.4 U	0.011 U	0.085 U	0.011 U	0.88 U	0.48 U	0.05 U	0.021 U	0.024 U	3.2 U	--	0.11 U	--	0.022 J
Dimethyl Phthalate	1.4 U	0.012 U	0.087 U	0.011 U	0.9 U	0.49 U	0.051 U	0.022 U	0.025 U	0.39 U	--	0.014 U	--	0.0026 U
Di-N-Butyl Phthalate	1.4 U	0.012 U	0.09 U	0.012 U	0.93 U	0.51 U	0.053 U	0.022 U	0.026 U	4.7 U	--	0.17 U	--	0.031 U
Di-N-Octylphthalate	2.5 U	0.021 U	0.15 U	0.02 U	1.6 U	0.86 U	0.09 U	0.038 U	0.043 U	6.2 U	--	0.22 U	--	0.042 U
Fluoranthene	430	2.3	19	0.029 J	320	250	22	7.5	11	270	--	2.3	--	1.8
Fluorene	16 J	0.012 J	0.37 J	0.19 J	4.2 J	8.1 J	0.82 J	0.21 J	0.3 J	2.9	--	0.047 J	--	0.019
Hexachlorobenzene	2 U	0.016 U	0.12 U	0.016 U	1.3 U	0.69 U	0.072 U	0.03 U	0.035 U	0.77 U	--	0.027 U	--	0.0051 U
Hexachlorobutadiene	1.4 U	0.011 U	0.084 U	0.011 U	0.87 U	0.48 U	0.05 U	0.021 U	0.024 U	0.63 U	--	0.022 U	--	0.0042 U
Hexachlorocyclopentadiene	3 U	0.025 U	0.19 U	0.024 U	1.9 U	1.1 U	0.11 U	0.047 U	0.053 U	0.55 U	--	0.019 U	--	0.0037 U
Hexachloroethane	1.8 U	0.015 U	0.11 U	0.014 U	1.1 U	0.62 U	0.065 U	0.027 U	0.031 U	0.55 U	--	0.02 U	--	0.0037 U
Indeno(1,2,3-C,D)Pyrene	260	2.7	17 J+	0.026 U	63	59	14	5.2	8.8	79	--	3.7	--	1.3
Isophorone	1 U	0.0087 U	0.064 U	0.0083 U	0.67 U	0.36 U	0.038 U	0.016 U	0.018 U	0.55 U	--	0.019 U	--	0.0037 U
Naphthalene	6.5 J	0.042 J	0.72 J	0.083 J	3.8 J	2.1 J	0.2 J	0.077 J	0.14 J	1.6 J	--	0.1	--	0.038
Nitrobenzene	1.5 U	0.013 U	0.094 U	0.012 U	0.98 U	0.53 U	0.056 U	0.024 U	0.027 U	3.9 U	--	0.14 U	--	0.026 U
N-Nitrosodi-N-Propylamine	1.6 U	0.014 U	0.1 U	0.013 U	1 U	0.57 U	0.059 U	0.025 U	0.029 U	0.73 U	--	0.026 U	--	0.0049 U
N-Nitrosodiphenylamine	4.4 U	0.037 U	0.27 U	0.035 U	2.8 U	1.5 U	0.16 U	0.068 U	0.078 U	3.6 U	--	0.13 U	--	0.024 U
Pentachlorophenol	5.9 U	0.049 U	0.36 U	0.047 U	3.8 U	2 U	0.21 U	0.091 U	0.1 U	17 U	--	0.61 U	--	0.12 U
Phenanthrene	200	0.65	9	0.51	56	86	12	3.7	4.4	44	--	0.86	--	0.59
Phenol	1.6 U	0.013 U	0.098 U	0.013 U	1 U	0.55 U	0.058 U	0.024 U	0.028 U	3.2 U	--	0.11 U	--	0.022 U
Pyrene	440	2.3	21	0.058 J	240	300	22	7.7	9.6	290	--	2.9	--	1.8
SEMIVOLATILE ORGANIC COMPOUNDS-SIM (mg/kg)														
Acenaphthene	--	--	--	--	--	--	--	--	--	2.9 J	0.06 J	--	0.18 J	--
Acenaphthylene	--	--	--	--	--	--	--	--	--	1.2 U	0.037 U	--	0.21 U	--
Anthracene	--	--	--	--	--	--	--	--	--	13	0.31	--	2.1	--
Benzo(A)Anthracene	--	--	--	--	--	--	--	--	--	79	2.2	--	9.1	--
Benzo(A)Pyrene	--	--	--	--	--	--	--	--	--	68	3.3	--	9.9	--
Benzo(B)Fluoranthene	--	--	--	--	--	--	--	--	--	110	5	--	24	--
Benzo(G,H,I)Perylene	--	--	--	--	--	--	--	--	--	63	4.8	--	12	--
Benzo(K)Fluoranthene	--	--	--	--	--	--	--	--	--	79	4.1	--	17	--
Benzo[E]Pyrene	--	--	--	--	--	--	--	--	--	76	3.9	--	15	--
C1-Chrysenes	--	--	--	--	--	--	--	--	--	34 J	1 J	--	5.1 J	--
C1-Fluoranthenes/Pyrenes	--	--	--	--	--	--	--	--	--	63 J	1.6 J	--	6.8 J	--
C1-Fluorenes	--	--	--	--	--	--	--	--	--	4.8 U	0.14 U	--	0.81 U	--
C1-Naphthalenes	--	--	--	--	--	--	--	--	--	4.8 U	0.14 U	--	0.81 U	--
C1-Phenanthrenes/Anthracenes	--	--	--	--	--	--	--	--	--	16 J	0.37 J	--	2.2 J	--
C2-Chrysenes	--	--	--	--	--	--	--	--	--	8.9 J	0.43 J	--	2.1 J	--
C2-Fluorenes	--	--	--	--	--	--	--	--	--	4.8 U	0.14 U	--	0.81 U	--
C2-Naphthalenes	--	--	--	--	--	--	--	--	--	4.8 U	0.14 U	--	0.81 U	--
C2-Phenanthrenes/Anthracenes	--	--	--	--	--	--	--	--	--	10 J	0.23 J	--	1.6 J	--
C3-Chrysenes	--	--	--	--	--	--	--	--	--	4.9 J	0.14 U	--	0.81 U	--
C3-Fluorenes	--	--	--	--	--	--	--	--	--	4.8 U	0.14 U	--	0.81 U	--
C3-Naphthalenes	--	--	--	--	--	--	--	--	--	4.8 U	0.14 U	--	0.81 U	--
C3-Phenanthrenes/Anthracenes	--	--	--	--	--	--	--	--	--	5.2 J	0.15 J	--	0.82 J	--
C4 Chrysenes	--	--	--	--	--	--	--	--	--	4.8 U	0.14 U	--	0.81 U	--
C4-Naphthalenes	--	--	--	--	--	--	--	--	--	4.8 U	0.14 U	--	0.81 U	--
C4-Phenanthrenes/Anthracenes	--	--	--	--	--	--	--	--	--	4.8 U	0.14 U	--	0.81 U	--
Chrysene	--	--	--	--	--	--	--	--	--	110	3.2	--	11	--
Dibenz(A,H)Anthracene	--	--	--	--	--	--	--	--	--	20	1.2	--	4.2	--
Fluoranthene	--	--	--	--	--	--	--	--	--	220	3.1	--	11	--
Fluorene	--	--	--	--	--	--	--	--	--	2.1 J	0.054 U	--	0.3 U	--
Indeno(1,2,3-C,D)Pyrene	--	--	--	--	--	--	--	--	--	57	4.2	--	12	--
Naphthalene	--	--	--	--	--	--	--	--	--	1.9 U	0.056 U	--	0.32 U	--

Table E-3
Summary of Data Used in Risk Assessment
North Percolation Pond Area Soil (0-0.5 ft-bgs) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-027	CFSB-014	CFSB-016	CFSB-019	CFSB-025	CFSB-026	CFSB-027	CFSB-028	CFSB-030	CFSB-199	CFSB-201	CFSB-201	CFSB-202	CFSB-202
Sample Lab IDs	460-116402-11	460-114828-33	460-114828-25	460-115008-10	460-115528-18	460-115528-16	460-115528-22	460-117381-1	460-115528-20	180-79434-34, 200-44138-3, 460-159538-4	180-79204-15, 200-44015-5, 460-159044-21	180-79433-1	180-79204-17, 200-44015-7, 460-159044-23	180-79433-2
Sample Name	CFMW-027-SO-0-0.5	CFSB-014-SO-0-0.5	CFSB-016-SO-0-0.5	CFSB-019-SO-0-0.5	CFSB-025-SO-0-0.5	CFSB-026-SO-0-0.5	CFSB-027-SO-0-0.5	CFSB-028-SO-0-0.5	CFSB-030-SO-0-0.5	CFSB-199-SO-0-0.5	CFSB-201-SO-0-0.5	CFSB-201-SO-0-0.5	CFSB-202-SO-0-0.5	CFSB-202-SO-0-0.5
Sample Depth	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft
Chemical	6/30/2016	6/2/2016	6/2/2016	6/4/2016	6/13/2016	6/13/2016	6/13/2016	7/18/2016	6/13/2016	6/28/2018	6/22/2018	6/29/2018	6/22/2018	6/29/2018
Perylene	--	--	--	--	--	--	--	--	--	19	0.87	--	2.5	--
Phenanthrene	--	--	--	--	--	--	--	--	--	31	0.75	--	2.7	--
Pyrene	--	--	--	--	--	--	--	--	--	190	3.7	--	13	--

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-3
Summary of Data Used in Risk Assessment
North Percolation Pond Area Soil (0-0.5 ft-bgs) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-203	CFSB-204	CFSB-214	CFSB-272	CFSB-272	CFSB-273	CFSB-273	CFSB-279	CFSB-279	CFSB-280	CFSB-280	CFSB-281	CFSB-281
Sample Lab IDs	180-79434-41, 200-44138-6, 460-159538-12	180-79204-13, 460-159044-19	180-79204-5, 200-44015-10, 460-159044-5	180-77440-14, 460-155481-14	200-44138-1	180-77440-1, 460-155481-1	460-159044-9	180-77673-11, 460-155989-31	200-44015-1	180-77673-16, 460-155989-38	200-44015-3	180-77440-8, 460-155481-8	460-159044-7
Sample Name	CFSB-203-SO-0-0.5	CFSB-204-SO-0-0.5	CFSB-214-SO-0-0.5	CFSB-272-SO-0-0.5	CFSB-272-SO-0-0.5	CFSB-273-SO-0-0.5	CFSB-273-SO-0-0.5	CFSB-279-SO-0-0.5	CFSB-279-SO-0-0.5	CFSB-280-SO-0-0.5	CFSB-280-SO-0-0.5	CFSB-281-SO-0-0.5	CFSB-281-SO-0-0.5
Sample Depth	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft
Chemical	6/28/2018	6/22/2018	6/22/2018	5/4/2018	6/28/2018	5/4/2018	6/22/2018	5/8/2018	6/22/2018	5/8/2018	6/22/2018	5/4/2018	6/22/2018
GENERAL CHEMISTRY (mg/kg)													
Fluoride	21.5	13.7 J-	51.3 J-	118 J	--	174 J	--	17.7 J	--	21.7 J	--	217 J	--
Cyanide	1.2 J+	6.4	0.52	2 J+	--	64.4 J+	--	0.54	--	2.3	--	9.6 J+	--
METALS (mg/kg)													
"Chromium, Hexavalent - Estimated"	0.206083	0.987591	--	0.594161	--	0.60219	--	0.444282	--	0.634307	--	0.864477	--
"Chromium, Trivalent - Calculated"	--	--	6.805	--	--	--	8.71	--	--	--	--	--	34.12
"Chromium, Trivalent - Estimated"	7.49392	35.9124	--	21.6058	--	21.8978	--	16.1557	--	23.0657	--	31.4355	--
Aluminum	10900 J	33500	25500	24800	--	63300	--	7520	--	30600	--	67400	--
Antimony	0.27 U	0.4 U	0.53 J	0.43 J	--	0.92 J	--	0.25 UJ	--	0.29 U	--	2	--
Arsenic	2.5	10.6	5.4	8.5	--	14.3	--	2.6	--	13.1	--	21.1	--
Barium	19.6 J+	217	128	101	--	258	--	47.9	--	171	--	222	--
Beryllium	0.34 J	2.1	0.53	0.97	--	4.9	--	0.47	--	3.1	--	4.4	--
Cadmium	0.54 J	2.6	0.95 J	1.4	--	2.8	--	0.29 J	--	2.8	--	5.4	--
Calcium	427	4550	20700	3240	--	23100	--	6400	--	23000	--	19400	--
Chromium, Total	7.7	36.9	7.2	22.2	--	22.5	8.8	16.6	--	23.7	--	32.3	34.8
Cobalt	1.2 J	4.5	4.2	5	--	7.2	--	2.9	--	5.5	--	12.9	--
Copper	6.4	65.4	23.8	27.7	--	32.5	--	19.6	--	37	--	57.1	--
Iron	1330 J+	3500	6770	7360	--	7090	--	4780	--	7920	--	8750	--
Lead	19.9 J	33.8	18.3	30.5	--	83.9	--	11.2	--	36.3	--	77.7	--
Magnesium	442 J	1280	4060	3490	--	3250	--	3680	--	4930	--	3620	--
Manganese	12.8 J	29.9	256	88	--	42.6	--	80.5 J	--	91	--	75.7	--
Mercury	0.0099 U	0.058	0.04	0.029 J+	--	0.12 J+	--	0.018	--	0.029	--	0.088 J+	--
Nickel	47	213	103	136	--	276	--	49.5	--	170	--	566	--
Potassium	101	251	941	550	--	890	--	347	--	521	--	668	--
Selenium	0.65 J	0.4 U	0.47 J	0.98 J	--	1 J	--	0.25 U	--	0.46 J	--	2.3 J	--
Silver	0.58 U	0.85 U	0.77 U	0.71 U	--	0.96 U	--	0.53 U	--	0.62 U	--	1 J	--
Sodium	69.9 J	122 J	134	316	--	1410	--	28.4 J	--	112	--	774	--
Thallium	0.14 J	0.21 J	0.16 U	0.46	--	0.99	--	0.11 U	--	0.22 J	--	0.78	--
Vanadium	18.2	57.4	28.4	61	--	101	--	19.7	--	40	--	167	--
Zinc	107	351	136	185	--	312	--	76.8	--	269	--	694	--
METALS|HEXAVALENT CHROMIUM (mg/kg)													
Chromium, Hexavalent	--	--	0.79 UJ	--	--	--	0.18 UJ	--	--	--	--	--	0.68 J-
PESTICIDES (mg/kg)													
Aldrin	--	--	--	--	--	--	--	--	--	--	--	--	--
Alpha Bhc (Alpha Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--	--
Alpha Endosulfan	--	--	--	--	--	--	--	--	--	--	--	--	--
Beta Bhc (Beta Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--	--
Beta Endosulfan	--	--	--	--	--	--	--	--	--	--	--	--	--
cis-Chlordane	--	--	--	--	--	--	--	--	--	--	--	--	--
Delta BHC (Delta Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--	--
Dieldrin	--	--	--	--	--	--	--	--	--	--	--	--	--
Endosulfan Sulfate	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin Aldehyde	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin Ketone	--	--	--	--	--	--	--	--	--	--	--	--	--
Gamma Bhc (Lindane)	--	--	--	--	--	--	--	--	--	--	--	--	--
Heptachlor	--	--	--	--	--	--	--	--	--	--	--	--	--
Heptachlor Epoxide	--	--	--	--	--	--	--	--	--	--	--	--	--
Methoxychlor	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDD	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDE	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDT	--	--	--	--	--	--	--	--	--	--	--	--	--
Toxaphene	--	--	--	--	--	--	--	--	--	--	--	--	--
trans-Chlordane	--	--	--	--	--	--	--	--	--	--	--	--	--

Table E-3
Summary of Data Used in Risk Assessment
North Percolation Pond Area Soil (0-0.5 ft-bgs) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-203	CFSB-204	CFSB-214	CFSB-272	CFSB-272	CFSB-273	CFSB-273	CFSB-279	CFSB-279	CFSB-280	CFSB-280	CFSB-281	CFSB-281
Sample Lab IDs	180-79434-41, 200-44138-6, 460-159538-12	180-79204-13, 460-159044-19	180-79204-5, 200-44015-10, 460-159044-5	180-77440-14, 460-155481-14	200-44138-1	180-77440-1, 460-155481-1	460-159044-9	180-77673-11, 460-155989-31	200-44015-1	180-77673-16, 460-155989-38	200-44015-3	180-77440-8, 460-155481-8	460-159044-7
Sample Name	CFSB-203-SO-0-0.5	CFSB-204-SO-0-0.5	CFSB-214-SO-0-0.5	CFSB-272-SO-0-0.5	CFSB-272-SO-0-0.5	CFSB-273-SO-0-0.5	CFSB-273-SO-0-0.5	CFSB-279-SO-0-0.5	CFSB-279-SO-0-0.5	CFSB-280-SO-0-0.5	CFSB-280-SO-0-0.5	CFSB-281-SO-0-0.5	CFSB-281-SO-0-0.5
Sample Depth	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft
Chemical	6/28/2018	6/22/2018	6/22/2018	5/4/2018	6/28/2018	5/4/2018	6/22/2018	5/8/2018	6/22/2018	5/8/2018	6/22/2018	5/4/2018	6/22/2018
POLYCHLORINATED BIPHENYLS (mg/kg)													
PCB-1016 (Aroclor 1016)	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1221 (Aroclor 1221)	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1232 (Aroclor 1232)	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1242 (Aroclor 1242)	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1248 (Aroclor 1248)	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1254 (Aroclor 1254)	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1260 (Aroclor 1260)	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1262 (Aroclor 1262)	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1268 (Aroclor 1268)	--	--	--	--	--	--	--	--	--	--	--	--	--
Polychlorinated Biphenyl (PCBs)	--	--	--	--	--	--	--	--	--	--	--	--	--
SEMIVOLATILE ORGANIC COMPOUNDS (mg/kg)													
1,2,4,5-Tetrachlorobenzene	3.7 U	0.23 U	0.052 U	8.6 U	--	0.12 U	--	0.48 U	--	0.059 U	--	0.15 U	--
1,4-Dioxane (P-Dioxane)	27 U	1.7 U	0.37 U	62 U	--	0.84 U	--	3.5 U	--	0.43 U	--	1.1 U	--
2,3,4,6-Tetrachlorophenol	36 U	2.2 U	0.5 UJ	83 U	--	1.1 U	--	4.6 U	--	0.57 U	--	1.4 U	--
2,4,5-Trichlorophenol	6.1 U	0.38 U	0.086 U	14 U	--	0.19 U	--	0.79 U	--	0.098 U	--	0.24 U	--
2,4,6-Trichlorophenol	4.7 U	0.29 U	0.066 U	11 U	--	0.15 U	--	0.61 U	--	0.075 U	--	0.19 U	--
2,4-Dichlorophenol	6.6 U	0.41 U	0.092 U	15 U	--	0.21 U	--	0.86 U	--	0.11 U	--	0.26 U	--
2,4-Dimethylphenol	5.3 U	0.33 U	0.074 U	12 U	--	0.17 U	--	0.69 U	--	0.085 U	--	0.21 U	--
2,4-Dinitrophenol	230 U	14 U	3.2 UJ	540 U	--	7.2 U	--	30 U	--	3.7 U	--	9.2 U	--
2,4-Dinitrotoluene	4.3 U	0.27 U	0.06 U	9.9 U	--	0.13 U	--	0.55 U	--	0.068 U	--	0.17 U	--
2,6-Dinitrotoluene	5.3 U	0.33 U	0.074 U	12 U	--	0.17 U	--	0.69 U	--	0.085 U	--	0.21 U	--
2-Chloronaphthalene	3.9 U	0.24 U	0.055 U	9.2 U	--	0.12 U	--	0.51 U	--	0.063 U	--	0.16 U	--
2-Chlorophenol	4 U	0.25 U	0.056 U	9.3 U	--	0.13 U	--	0.52 U	--	0.064 U	--	0.16 U	--
2-Methylnaphthalene	6.9 J	0.32 J	0.058 U	9.6 U	--	1.2	--	0.53 U	--	0.066 U	--	0.44 J	--
2-Methylphenol (O-Cresol)	25 U	1.5 U	0.34 U	57 U	--	0.77 U	--	3.2 U	--	0.39 U	--	0.98 U	--
2-Nitroaniline	39 U	2.4 U	0.55 U	91 U	--	1.2 U	--	5.1 U	--	0.63 U	--	1.6 U	--
2-Nitrophenol	4.9 U	0.3 U	0.069 U	11 U	--	0.15 U	--	0.64 U	--	0.079 U	--	0.2 U	--
3- And 4- Methylphenol (Total)	--	--	--	--	--	--	--	--	--	--	--	--	--
3,3'-Dichlorobenzidine	80 U	5 U	1.1 U	190 U	--	2.5 U	--	10 U	--	1.3 U	--	3.2 U	--
3-Nitroaniline	22 U	1.4 U	0.31 U	51 U	--	0.68 U	--	2.8 U	--	0.35 U	--	0.87 U	--
4,6-Dinitro-2-Methylphenol	150 U	9.2 U	2.1 U	340 U	--	4.6 U	--	19 U	--	2.4 U	--	5.9 U	--
4-Bromophenyl Phenyl Ether	6 U	0.37 U	0.084 U	14 U	--	0.19 U	--	0.78 U	--	0.096 U	--	0.24 U	--
4-Chloro-3-Methylphenol	4 U	0.25 U	0.056 U	9.4 U	--	0.13 U	--	0.52 U	--	0.065 U	--	0.16 U	--
4-Chloroaniline	2.9 U	0.18 U	0.04 U	6.7 U	--	0.09 U	--	0.37 U	--	0.046 U	--	0.11 U	--
4-Chlorophenyl Phenyl Ether	5.2 U	0.32 U	0.073 U	12 U	--	0.16 U	--	0.67 U	--	0.083 U	--	0.21 U	--
4-Nitroaniline	4.2 U	0.26 U	0.058 U	9.7 U	--	0.13 U	--	0.54 U	--	0.067 U	--	0.17 U	--
4-Nitrophenol	60 U	3.7 U	0.84 UJ	140 U	--	1.9 U	--	7.8 U	--	0.96 U	--	2.4 U	--
Acenaphthene	150	1.5	0.29	46	--	19	--	3	--	0.2 J	--	3	--
Acenaphthylene	3.8 U	0.23 J	0.053 U	8.7 U	--	0.85	--	0.49 U	--	0.06 U	--	0.15 U	--
Acetophenone	4.6 U	0.29 U	0.065 U	11 U	--	0.15 U	--	0.6 U	--	0.075 U	--	0.19 U	--
Anthracene	200	5	0.58	66	--	54	--	9.9	--	0.76	--	17	--
Atrazine	38 UJ	2.3 UJ	0.53 UJ	87 U	--	1.2 U	--	4.9 UJ	--	0.6 UJ	--	1.5 U	--
Benzaldehyde	11 U	0.66 UR	0.15 UR	25 U	--	0.33 U	--	1.4 U	--	0.17 U	--	0.42 U	--
Benzo(A)Anthracene	1700	24	3.1	560	--	130	--	54	--	3.9	--	80	--
Benzo(A)Pyrene	2000	36	4.2	590	--	100	--	55	--	5.3	--	55	--
Benzo(B)Fluoranthene	2800	64	5.3	880	--	190	--	92	--	11	--	100	--
Benzo(G,H,I)Perylene	2100	43	3.6	540	--	86	--	51	--	11	--	43	--
Benzo(K)Fluoranthene	870	24	1.9	290	--	62	--	31	--	3.4	--	29	--
Benzyl Butyl Phthalate	59 U	3.7 U	0.82 U	140 U	--	1.8 U	--	7.6 U	--	0.94 U	--	2.3 U	--
Biphenyl (Diphenyl)	3.6 U	0.22 U	0.05 U	8.4 U	--	0.55 J	--	0.47 U	--	0.058 U	--	0.14 U	--
Bis(2-Chloroethoxy) Methane	4.1 U	0.25 U	0.057 U	9.5 U	--	0.13 U	--	0.53 U	--	0.065 U	--	0.16 U	--
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	3.1 U	0.19 U	0.044 U	7.3 U	--	0.098 U	--	0.4 U	--	0.05 U	--	0.12 U	--
Bis(2-Chloroisopropyl) Ether	6.3 U	0.39 U	0.089 U	15 U	--	0.2 U	--	0.82 U	--	0.1 U	--	0.25 U	--
Bis(2-Ethylhexyl) Phthalate	91 U	5.7 U	1.3 U	210 U	--	2.9 U	--	12 U	--	1.5 U	--	3.6 U	--
Caprolactam	56 U	3.5 U	0.78 U	130 U	--	1.8 U	--	7.2 U	--	0.89 U	--	2.2 U	--
Carbazole	190	3.5	0.67	56	--	11	--	6.1	--	0.46	--	4.3	--
Chrysene	1900	33	4.4	590	--	190	--	69	--	5.5	--	110	--

Table E-3
Summary of Data Used in Risk Assessment
North Percolation Pond Area Soil (0-0.5 ft-bgs) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-203	CFSB-204	CFSB-214	CFSB-272	CFSB-272	CFSB-273	CFSB-273	CFSB-279	CFSB-279	CFSB-280	CFSB-280	CFSB-281	CFSB-281
Sample Lab IDs	180-79434-41, 200-44138-6, 460-159538-12	180-79204-13, 460-159044-19	180-79204-5, 200-44015-10, 460-159044-5	180-77440-14, 460-155481-14	200-44138-1	180-77440-1, 460-155481-1	460-159044-9	180-77673-11, 460-155989-31	200-44015-1	180-77673-16, 460-155989-38	200-44015-3	180-77440-8, 460-155481-8	460-159044-7
Sample Name	CFSB-203-SO-0-0.5	CFSB-204-SO-0-0.5	CFSB-214-SO-0-0.5	CFSB-272-SO-0-0.5	CFSB-272-SO-0-0.5	CFSB-273-SO-0-0.5	CFSB-273-SO-0-0.5	CFSB-279-SO-0-0.5	CFSB-279-SO-0-0.5	CFSB-280-SO-0-0.5	CFSB-280-SO-0-0.5	CFSB-281-SO-0-0.5	CFSB-281-SO-0-0.5
Sample Depth	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft
Chemical	6/28/2018	6/22/2018	6/22/2018	5/4/2018	6/28/2018	5/4/2018	6/22/2018	5/8/2018	6/22/2018	5/8/2018	6/22/2018	5/4/2018	6/22/2018
Dibenz(A,H)Anthracene	490	11	0.97	140	--	29	--	12	--	2.2	--	12	--
Dibenzofuran	28 J	0.6 J	0.11 J	8.7 U	--	4.2	--	1.2 J	--	0.12 J	--	1 J	--
Diethyl Phthalate	26 U	1.6 U	0.36 U	60 U	--	0.81 U	--	3.3 U	--	0.41 U	--	1 U	--
Dimethyl Phthalate	3.1 U	0.19 U	0.044 U	7.3 U	--	0.098 U	--	0.4 U	--	0.05 U	--	0.12 U	--
Di-N-Butyl Phthalate	38 U	2.3 U	0.53 U	87 U	--	1.2 U	--	4.9 U	--	0.6 U	--	1.5 U	--
Di-N-Octylphthalate	50 U	3.1 U	0.7 U	120 U	--	1.6 U	--	6.5 U	--	0.8 U	--	2 U	--
Fluoranthene	2800	42	5.5	880	--	480	--	100	--	6.4	--	270	--
Fluorene	61	0.71 J	0.18 J	20 J	--	10	--	2.3	--	0.087 J	--	2.5	--
Hexachlorobenzene	6.1 U	0.38 U	0.086 U	14 U	--	0.19 U	--	0.8 U	--	0.098 U	--	0.24 U	--
Hexachlorobutadiene	5 U	0.31 UJ	0.07 U	12 U	--	0.16 U	--	0.65 U	--	0.08 U	--	0.2 U	--
Hexachlorocyclopentadiene	4.4 U	0.27 UJ	0.061 UJ	10 U	--	0.14 U	--	0.57 U	--	0.07 U	--	0.17 U	--
Hexachloroethane	4.4 U	0.27 U	0.062 U	10 U	--	0.14 U	--	0.57 U	--	0.071 U	--	0.18 U	--
Indeno(1,2,3-C,D)Pyrene	1600	37	3.1	440	--	91	--	43	--	8.5	--	36	--
Isophorone	4.4 U	0.27 U	0.061 U	10 U	--	0.14 U	--	0.57 U	--	0.07 U	--	0.17 U	--
Naphthalene	17	0.56 J	0.076 J	7.8 U	--	1.5	--	1.1 J	--	0.16 J	--	0.7	--
Nitrobenzene	31 U	1.9 U	0.44 U	73 U	--	0.98 U	--	4.1 U	--	0.5 U	--	1.2 U	--
N-Nitrosodi-N-Propylamine	5.8 U	0.36 U	0.081 U	14 U	--	0.18 U	--	0.75 U	--	0.093 U	--	0.23 U	--
N-Nitrosodiphenylamine	29 U	1.8 U	0.4 U	67 U	--	0.9 U	--	3.7 U	--	0.46 U	--	1.1 U	--
Pentachlorophenol	140 U	8.6 U	1.9 UJ	320 U	--	4.3 U	--	18 U	--	2.2 U	--	5.5 U	--
Phenanthrene	960	16	2.9	290	--	110	--	35	--	2	--	37	--
Phenol	26 U	1.6 U	0.36 U	61 U	--	0.81 U	--	3.4 U	--	0.42 U	--	1 U	--
Pyrene	2400	39	5.6	750	--	420	--	84	--	5.9	--	230	--
SEMIVOLATILE ORGANIC COMPOUNDS-SIM (mg/kg)													
Acenaphthene	190	--	0.39	--	130	--	--	--	0.12 J	--	0.15 J	--	--
Acenaphthylene	26 U	--	0.041 U	--	0.89 J	--	--	--	0.056 U	--	0.099 U	--	--
Anthracene	250	--	0.9	--	180	--	--	--	0.94	--	0.7	--	--
Benzo(A)Anthracene	2700	--	4.1	--	1700	--	--	--	5.7	--	3.8	--	--
Benzo(A)Pyrene	3100	--	4.7	--	1900	--	--	--	5.8	--	5.2	--	--
Benzo(B)Fluoranthene	3000	--	5	--	2100	--	--	--	16	--	8.6	--	--
Benzo(G,H,I)Perylene	2200	--	3.7	--	1400	--	--	--	4.5	--	8.4	--	--
Benzo(K)Fluoranthene	2400	--	4.1	--	1300	--	--	--	9.6	--	6.8	--	--
Benzo[E]Pyrene	2100	--	3.5	--	1300	--	--	--	8.2	--	6.3	--	--
C1-Chrysenes	880 J	--	1.6 J	--	490 J	--	--	--	2.8 J	--	1.6 J	--	--
C1-Fluoranthenes/Pyrenes	1400 J	--	3 J	--	770 J	--	--	--	4.9 J	--	2.8 J	--	--
C1-Fluorenes	100 U	--	0.16 U	--	13 J	--	--	--	0.22 U	--	0.39 U	--	--
C1-Naphthalenes	100 U	--	0.16 U	--	8.3 J	--	--	--	0.22 U	--	0.39 U	--	--
C1-Phenanthrenes/Anthracenes	360 J	--	1 J	--	220 J	--	--	--	0.77 J	--	0.72 J	--	--
C2-Chrysenes	230 J	--	0.58 J	--	150 J	--	--	--	1.3 J	--	0.71 J	--	--
C2-Fluorenes	100 U	--	0.16 U	--	9.5 J	--	--	--	0.22 U	--	0.39 U	--	--
C2-Naphthalenes	100 U	--	0.16 U	--	13 J	--	--	--	0.22 U	--	0.39 U	--	--
C2-Phenanthrenes/Anthracenes	160 J	--	0.45 J	--	98 J	--	--	--	0.52 J	--	0.47 J	--	--
C3-Chrysenes	100 U	--	0.27 J	--	46 J	--	--	--	0.34 J	--	0.39 U	--	--
C3-Fluorenes	100 U	--	0.16 U	--	20 J	--	--	--	0.22 U	--	0.39 U	--	--
C3-Naphthalenes	100 U	--	0.16 U	--	8.6 J	--	--	--	0.22 U	--	0.39 U	--	--
C3-Phenanthrenes/Anthracenes	100 U	--	0.25 J	--	47 J	--	--	--	0.31 J	--	0.39 U	--	--
C4 Chrysenes	100 U	--	0.16 U	--	16 J	--	--	--	0.22 U	--	0.39 U	--	--
C4-Naphthalenes	100 U	--	0.16 U	--	3.8 J	--	--	--	0.22 U	--	0.39 U	--	--
C4-Phenanthrenes/Anthracenes	100 U	--	0.16 U	--	12 J	--	--	--	0.22 U	--	0.39 U	--	--
Chrysene	2800	--	5	--	1700	--	--	--	7.8	--	5.2	--	--
Dibenz(A,H)Anthracene	740	--	1.3	--	490	--	--	--	1.9	--	1.9	--	--
Fluoranthene	3700	--	6.9	--	2200	--	--	--	6.7	--	5.2	--	--
Fluorene	82 J	--	0.27	--	50	--	--	--	0.099 J	--	0.14 U	--	--
Indeno(1,2,3-C,D)Pyrene	2000	--	3.5	--	1300	--	--	--	5	--	7.1	--	--
Naphthalene	39 U	--	0.11 J	--	12	--	--	--	0.085 U	--	0.15 U	--	--

Table E-3
Summary of Data Used in Risk Assessment
North Percolation Pond Area Soil (0-0.5 ft-bgs) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-203	CFSB-204	CFSB-214	CFSB-272	CFSB-272	CFSB-273	CFSB-273	CFSB-279	CFSB-279	CFSB-280	CFSB-280	CFSB-281	CFSB-281
Sample Lab IDs	180-79434-41, 200-44138-6, 460-159538-12	180-79204-13, 460-159044-19	180-79204-5, 200-44015-10, 460-159044-5	180-77440-14, 460-155481-14	200-44138-1	180-77440-1, 460-155481-1	460-159044-9	180-77673-11, 460-155989-31	200-44015-1	180-77673-16, 460-155989-38	200-44015-3	180-77440-8, 460-155481-8	460-159044-7
Sample Name	CFSB-203-SO-0-0.5	CFSB-204-SO-0-0.5	CFSB-214-SO-0-0.5	CFSB-272-SO-0-0.5	CFSB-272-SO-0-0.5	CFSB-273-SO-0-0.5	CFSB-273-SO-0-0.5	CFSB-279-SO-0-0.5	CFSB-279-SO-0-0.5	CFSB-280-SO-0-0.5	CFSB-280-SO-0-0.5	CFSB-281-SO-0-0.5	CFSB-281-SO-0-0.5
Sample Depth	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft
Chemical	6/28/2018	6/22/2018	6/22/2018	5/4/2018	6/28/2018	5/4/2018	6/22/2018	5/8/2018	6/22/2018	5/8/2018	6/22/2018	5/4/2018	6/22/2018
Perylene	850	--	1.2	--	510	--	--	--	1.5	--	1.5	--	--
Phenanthrene	1300	--	3.7	--	760	--	--	--	1.6	--	1.6	--	--
Pyrene	3200	--	7.2	--	2000	--	--	--	6.9	--	6	--	--

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-4
Summary of Data Used in Risk Assessment
North Percolation Pond Area Soil (0-2 ft-bgs) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-027	CFMW-027	CFSB-014	CFSB-014	CFSB-016	CFSB-016	CFSB-019	CFSB-019	CFSB-019-DUP	CFSB-025	CFSB-025	CFSB-026	CFSB-026	CFSB-027
Sample Lab IDs	460-116402-11	460-116402-12	460-114828-33	460-114828-37	460-114828-25	460-114828-35	460-115008-10	460-115008-11	460-115008-12	460-115528-18	460-115528-15	460-115528-16	460-115528-11	460-115528-22
Sample Name	CFMW-027-SO-0-0.5	CFMW-027-SO-0.5-2	CFSB-014-SO-0-0.5	CFSB-014-SO-0.5-2	CFSB-016-SO-0-0.5	CFSB-016-SO-0.5-2	CFSB-019-SO-0-0.5	CFSB-019-SO-0.5-2	CFSB-DUP13-SO	CFSB-025-SO-0-0.5	CFSB-025-SO-0.5-2	CFSB-026-SO-0-0.5	CFSB-026-SO-0.5-2	CFSB-027-SO-0-0.5
Sample Depth	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft
Chemical	6/30/2016	6/30/2016	6/2/2016	6/2/2016	6/2/2016	6/2/2016	6/4/2016	6/4/2016	6/4/2016	6/13/2016	6/13/2016	6/13/2016	6/13/2016	6/13/2016
GENERAL CHEMISTRY (mg/kg)														
Fluoride	149 J+	58.8 J+	33.6 J	7.98 J	241 J	54.3 J	50 J	48.2 J	50.2 J	138 J-	154 J-	167 J-	258 J+	52.8 J-
Cyanide	1.2	1.6	6.8	0.078 J	8.3	0.76	1.3	1.2 J	0.1 J	8.2 J	37.5 J	137 J	125 J	0.19
METALS (mg/kg)														
"Chromium, Hexavalent - Estimated"	0.444282	0.679805	0.489781	0.604866	0.559367	0.495134	0.527251	0.412165	0.289051	0.837713	0.92871	1.27129	0.460341	0.305109
"Chromium, Trivalent - Calculated"	--	--	--	--	--	--	--	--	--	--	--	--	--	--
"Chromium, Trivalent - Estimated"	16.1557	24.7202	17.8102	21.9951	20.3406	18.0049	19.1727	14.9878	10.5109	30.4623	33.7713	46.2287	16.7397	11.0949
Aluminum	17000	23000	14600 J	12500 J	36200	19000 J	27400	19300 J	7930 J	71300	121000	106000	90700	10300
Antimony	0.47 UJ	0.45 UJ	0.48 UJ	0.46 UJ	0.7 UJ	0.56 UJ	0.39 UJ	0.37 UJ	0.38 UJ	2.6 J-	0.68 J-	1.1 J-	0.8 UJ	0.36 UJ
Arsenic	3.7	9.3	8.5 J	6.8 J	14.1	13.3 J	9	7.4 J	3.8 J	13.2	14.8	22.7	22.5	5.7
Barium	48.9 J	111 J	256 J	140 J	228	166 J	138	93.8	85.6	166	302	461	461	82.9
Beryllium	0.59	0.85	0.75	1.1	3.4	1.2	1.2	0.98 J	0.39 J	3.4	7.9	17.2	10.6	0.36
Cadmium	1.1	1.1	0.68 J	0.69 J	2.5	1.1 J	1.8	1.1 J	0.29 UJ	3.6	5.9	8.3	4	0.27 U
Calcium	1370	2500	19200	9380	9990	13200	2630	16900 J	39300 J	12600 J	23900 J	68600 J	75600 J	20400 J
Chromium, Total	16.6	25.4	18.3 J	22.6 J	20.9	18.5 J	19.7	15.4	10.8	31.3	34.7	47.5	17.2	11.4
Cobalt	2.6	6.2	6	5.5	7.8	5.9	7.4	7.1	5.7	27.4	8.3	8.7	5.4	4.7
Copper	16.9 J	30.1 J	35	40.7	59.4	25.6	36.2 J	36.1 J	202 J	55.2	11.6	6.7 J	7 J	10.9
Iron	2920	11400	13500 J	12000 J	15400	23600 J	12100	12600	11900	8050	7650	6400	4870	12100
Lead	30.3	36	14.6 J	12.2 J	43.1	14.7 J	28.4 J	19 J	13.4 J	221 J+	130 J+	238 J+	118 J+	8.3 J+
Magnesium	1090	5180	10200	8090	9260	21800	6660	9410	10300	1560	4740	6270	5280	10000
Manganese	46	36.5	408 J	429 J	113	425 J	232	204 J	361 J	15.8 J	51 J	96.1 J	69.2 J	323 J
Mercury	0.031 J+	0.029 J+	0.015 U	0.014 U	0.04	0.034	0.025	0.022	0.014 U	0.021 U	0.025 U	0.028 U	0.039 J	0.016 J
Nickel	84.5	151	73.4	67.9	171	63.1	153	99.9 J	12.5 J	1250 J+	358 J+	377 J+	213 J+	17.9 J+
Potassium	266 J+	848 J+	559	599	790	1040	920 J+	976 J+	833 J+	727	839	844	1570	892
Selenium	1 J	0.94 J	0.45 U	0.43 U	0.75 J	0.52 U	1 J	0.66 J	0.35 U	3.3 J	1.9 J	1.6 J	1.2 J	0.34 U
Silver	0.85 U	0.82 U	0.88 U	0.83 U	1.3 U	1 U	0.72 U	0.68 U	0.69 U	1.1 U	1.2 U	1.4 U	1.5 U	0.66 U
Sodium	116	83.1 J	67.6 J	73.2 J	144 J	64.2 J	139	111 J	53 J	2140	603	831	588	33.8 U
Thallium	0.31 J	0.65	0.18 U	0.17 J	0.38 J	0.28 J	0.27 J	0.14 J	0.14 U	4.2	2.8	4.6	3	0.29 J
Vanadium	34.5	85.9	26.1 J	25.4 J	54.2	29.6 J	60.3	40.7 J	11 J	348 J-	109 J-	140 J-	71.7 J-	13.3 J-
Zinc	130	196	148 J	128 J	265	104 J	248	159 J	34.3 J	257 J-	177 J-	225 J-	281 J-	42.2 J-
METALS|HEXAVALENT CHROMIUM (mg/kg)														
Chromium, Hexavalent	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PESTICIDES (mg/kg)														
Aldrin	0.0012 U	--	0.00099 U	--	0.0015 U	--	--	--	--	0.0015 U	--	0.0021 U	--	--
Alpha Bhc (Alpha Hexachlorocyclohexane)	0.00089 U	--	0.00075 U	--	0.0011 U	--	--	--	--	0.0011 U	--	0.0016 U	--	--
Alpha Endosulfan	0.0014 U	--	0.0011 U	--	0.0017 U	--	--	--	--	0.0017 U	--	0.0024 U	--	--
Beta Bhc (Beta Hexachlorocyclohexane)	0.00095 U	--	0.00079 U	--	0.0012 U	--	--	--	--	0.0012 U	--	0.0017 U	--	--
Beta Endosulfan	0.0015 U	--	0.0013 U	--	0.0019 U	--	--	--	--	0.002 U	--	0.0027 U	--	--
cis-Chlordane	0.0016 U	--	0.0013 U	--	0.002 U	--	--	--	--	0.002 U	--	0.0028 U	--	--
Delta BHC (Delta Hexachlorocyclohexane)	0.0011 U	--	0.00089 U	--	0.0013 U	--	--	--	--	0.0014 U	--	0.0019 U	--	--
Dieldrin	0.0013 U	--	0.0011 U	--	0.0016 U	--	--	--	--	0.0016 U	--	0.0022 U	--	--
Endosulfan Sulfate	0.0011 U	--	0.00095 U	--	0.0014 U	--	--	--	--	0.0015 U	--	0.002 U	--	--
Endrin	0.0012 U	--	0.001 U	--	0.0015 U	--	--	--	--	0.0016 U	--	0.0022 U	--	--
Endrin Aldehyde	0.0012 U	--	0.001 U	--	0.0015 U	--	--	--	--	0.0016 U	--	0.0021 U	--	--
Endrin Ketone	0.0014 U	--	0.0011 U	--	0.0017 U	--	--	--	--	0.0017 U	--	0.0024 U	--	--
Gamma Bhc (Lindane)	0.00088 U	--	0.00073 U	--	0.0011 U	--	--	--	--	0.0011 U	--	0.0015 U	--	--
Heptachlor	0.0013 U	--	0.0011 U	--	0.0016 U	--	--	--	--	0.0016 U	--	0.0022 U	--	--
Heptachlor Epoxide	0.0019 U	--	0.0016 U	--	0.0024 U	--	--	--	--	0.0025 U	--	0.0034 U	--	--
Methoxychlor	0.0021 U	--	0.0017 U	--	0.0026 U	--	--	--	--	0.0027 U	--	0.0036 U	--	--
P,P'-DDD	0.0013 U	--	0.0011 U	--	0.0016 U	--	--	--	--	0.0017 U	--	0.0023 U	--	--
P,P'-DDE	0.0014 U	--	0.0012 U	--	0.0018 U	--	--	--	--	0.0018 U	--	0.0025 U	--	--
P,P'-DDT	0.001 U	--	0.00084 U	--	0.0013 U	--	--	--	--	0.0013 U	--	0.0018 U	--	--
Toxaphene	0.029 U	--	0.024 U	--	0.035 U	--	--	--	--	0.037 U	--	0.05 U	--	--
trans-Chlordane	0.0021 U	--	0.0018 U	--	0.0026 U	--	--	--	--	0.0027 U	--	0.0037 U	--	--
POLYCHLORINATED BIPHENYLS (mg/kg)														
PCB-1016 (Aroclor 1016)	0.013 U	0.013 U	0.011 U	0.011 U	0.016 U	0.012 U	0.01 U	0.01 U	0.01 U	0.017 U	0.019 U	0.023 U	0.021 U	0.0095 U
PCB-1221 (Aroclor 1221)	0.013 U	0.013 U	0.011 U	0.011 U	0.016 U	0.012 U	0.01 U	0.01 U	0.01 U	0.017 U	0.019 U	0.023 U	0.021 U	0.0095 U
PCB-1232 (Aroclor 1232)	0.013 U	0.013 U	0.011 U	0.011 U	0.016 U	0.012 U	0.01 U	0.01 U	0.01 U	0.017 U	0.019 U	0.023 U	0.021 U	0.0095 U

Table E-4
Summary of Data Used in Risk Assessment
North Percolation Pond Area Soil (0-2 ft-bgs) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-027	CFMW-027	CFSB-014	CFSB-014	CFSB-016	CFSB-016	CFSB-019	CFSB-019	CFSB-019-DUP	CFSB-025	CFSB-025	CFSB-026	CFSB-026	CFSB-027
Sample Lab IDs	460-116402-11	460-116402-12	460-114828-33	460-114828-37	460-114828-25	460-114828-35	460-115008-10	460-115008-11	460-115008-12	460-115528-18	460-115528-15	460-115528-16	460-115528-11	460-115528-22
Sample Name	CFMW-027-SO-0-0.5	CFMW-027-SO-0.5-2	CFSB-014-SO-0-0.5	CFSB-014-SO-0.5-2	CFSB-016-SO-0-0.5	CFSB-016-SO-0.5-2	CFSB-019-SO-0-0.5	CFSB-019-SO-0.5-2	CFSB-DUP13-SO	CFSB-025-SO-0-0.5	CFSB-025-SO-0.5-2	CFSB-026-SO-0-0.5	CFSB-026-SO-0.5-2	CFSB-027-SO-0-0.5
Sample Depth	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft
Chemical	6/30/2016	6/30/2016	6/2/2016	6/2/2016	6/2/2016	6/2/2016	6/4/2016	6/4/2016	6/4/2016	6/13/2016	6/13/2016	6/13/2016	6/13/2016	6/13/2016
PCB-1242 (Aroclor 1242)	0.013 U	0.013 U	0.011 U	0.011 U	0.016 U	0.012 U	0.01 U	0.01 U	0.01 U	0.017 U	0.019 U	0.023 U	0.021 U	0.0095 U
PCB-1248 (Aroclor 1248)	0.013 U	0.013 U	0.011 U	0.011 U	0.016 U	0.012 U	0.01 U	0.01 U	0.01 U	0.017 U	0.019 U	0.023 U	0.021 U	0.0095 U
PCB-1254 (Aroclor 1254)	0.013 U	0.013 U	0.011 U	0.011 U	0.017 U	0.013 U	0.011 U	0.011 U	0.01 U	0.017 U	0.02 U	0.024 U	0.022 U	0.0099 U
PCB-1260 (Aroclor 1260)	0.013 U	0.013 U	0.011 U	0.011 U	0.017 U	0.013 U	0.011 U	0.011 U	0.01 U	0.017 U	0.02 U	0.024 U	0.022 U	0.0099 U
PCB-1262 (Aroclor 1262)	0.013 U	0.013 U	0.011 U	0.011 U	0.017 U	0.013 U	0.011 U	0.011 U	0.01 U	0.017 U	0.02 U	0.024 U	0.022 U	0.0099 U
PCB-1268 (Aroclor 1268)	0.013 U	0.013 U	0.011 U	0.011 U	0.017 U	0.013 U	0.011 U	0.011 U	0.01 U	0.017 U	0.02 U	0.024 U	0.022 U	0.0099 U
Polychlorinated Biphenyl (PCBs)	0.013 U	0.013 U	0.011 U	0.011 U	0.017 U	0.013 U	0.011 U	0.011 U	0.01 U	0.017 U	0.02 U	0.024 U	0.022 U	0.0099 U
SEMIVOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,2,4,5-Tetrachlorobenzene	3.6 U	0.35 U	0.03 U	0.03 U	0.22 U	0.17 U	0.029 U	0.58 U	0.55 U	2.3 U	5.3 U	1.3 U	1.5 U	0.13 U
1,4-Dioxane (P-Dioxane)	13 U	1.3 U	0.11 U	0.11 U	0.8 U	0.61 U	0.1 U	2.1 U	2 U	8.3 U	19 U	4.5 U	5.2 U	0.47 U
2,3,4,6-Tetrachlorophenol	4.5 U	0.45 U	0.038 U	0.038 U	0.28 U	0.21 U	0.037 U	0.73 U	0.7 U	2.9 U	6.7 U	1.6 U	1.8 U	0.17 U
2,4,5-Trichlorophenol	4.8 U	0.47 U	0.04 U	0.04 U	0.3 U	0.23 U	0.039 U	0.77 U	0.74 U	3.1 U	7.1 U	1.7 U	1.9 U	0.18 U
2,4,6-Trichlorophenol	1.4 U	0.13 U	0.011 U	0.011 U	0.085 U	0.065 U	0.011 U	0.22 U	0.21 U	0.88 U	2 U	0.48 U	0.56 U	0.05 U
2,4-Dichlorophenol	1.1 U	0.11 U	0.0095 U	0.0094 U	0.071 U	0.054 U	0.0092 U	0.18 U	0.18 U	0.73 U	1.7 U	0.4 U	0.46 U	0.042 U
2,4-Dimethylphenol	11 U	1 U	0.089 U	0.088 U	0.66 U	0.5 U	0.085 U	1.7 U	1.6 U	6.8 U	16 U	3.7 U	4.3 U	0.39 U
2,4-Dinitrophenol	37 U	3.6 U	0.31 U	0.3 U	2.3 U	1.7 U	0.29 U	5.9 U	5.6 U	23 U	54 U	13 U	15 U	1.3 U
2,4-Dinitrotoluene	1.9 U	0.19 U	0.016 U	0.016 U	0.12 U	0.09 U	0.015 U	0.31 U	0.3 U	1.2 U	2.8 U	0.67 U	0.77 U	0.07 U
2,6-Dinitrotoluene	2.6 U	0.25 U	0.021 U	0.021 U	0.16 U	0.12 U	0.021 U	0.41 U	0.4 U	1.7 U	3.8 U	0.9 U	1 U	0.094 U
2-Chloronaphthalene	1.1 U	0.11 U	0.0092 U	0.0091 U	0.068 U	0.052 U	0.0088 U	0.18 U	0.17 U	0.7 U	1.6 U	0.38 U	0.44 U	0.04 U
2-Chlorophenol	1.2 U	0.12 U	0.01 U	0.01 U	0.076 U	0.058 U	0.0099 U	0.2 U	0.19 U	0.79 U	1.8 U	0.43 U	0.5 U	0.045 U
2-Methylnaphthalene	3.6 J	0.42 J	0.017 J	0.02 J	0.37 J	0.094 J	1	0.2 J	0.28 J	1.6 J	1.6 U	3.2 J	4.2 J	0.095 J
2-Methylphenol (O-Cresol)	2.1 U	0.21 U	0.018 U	0.017 U	0.13 U	0.099 U	0.017 U	0.34 U	0.32 U	1.4 U	3.1 U	0.74 U	0.85 U	0.077 U
2-Nitroaniline	1.6 U	0.16 U	0.013 U	0.013 U	0.099 U	0.075 U	0.013 U	0.26 U	0.25 U	1 UJ	2.3 U	0.56 U	0.64 U	0.058 U
2-Nitrophenol	1.6 U	0.16 U	0.014 U	0.013 U	0.1 U	0.077 U	0.013 U	0.26 U	0.25 U	1 U	2.4 U	0.57 U	0.66 U	0.059 U
3- And 4- Methylphenol (Total)	1.3 U	0.13 U	0.011 U	0.011 U	0.08 U	0.061 U	0.01 U	0.21 U	0.2 U	0.83 U	1.9 U	0.45 U	0.52 U	0.047 U
3,3'-Dichlorobenzidine	5.4 U	0.53 U	0.045 U	0.045 U	0.33 U	0.25 U	0.043 U	0.87 U	0.83 U	3.5 U	7.9 U	1.9 U	2.2 U	0.2 U
3-Nitroaniline	1.4 U	0.14 U	0.012 U	0.012 U	0.089 U	0.068 U	0.012 U	0.23 U	0.22 U	0.92 U	2.1 U	0.5 U	0.58 U	0.052 U
4,6-Dinitro-2-Methylphenol	13 U	1.3 U	0.11 U	0.11 U	0.8 U	0.61 U	0.1 U	2.1 U	2 U	8.3 U	19 U	4.5 U	5.2 U	0.47 U
4-Bromophenyl Phenyl Ether	1.5 U	0.15 U	0.013 U	0.013 U	0.094 U	0.072 U	0.012 U	0.24 U	0.23 U	0.98 U	2.2 U	0.53 U	0.61 U	0.056 U
4-Chloro-3-Methylphenol	2.1 U	0.2 U	0.017 U	0.017 U	0.13 U	0.098 U	0.017 U	0.33 U	0.32 U	1.3 U	3 U	0.73 U	0.84 U	0.076 U
4-Chloroaniline	1.2 U	0.12 U	0.01 U	0.01 U	0.077 U	0.059 U	0.01 U	0.2 U	0.19 U	0.8 U	1.8 U	0.44 U	0.5 U	0.046 U
4-Chlorophenyl Phenyl Ether	1.4 U	0.14 U	0.012 U	0.012 U	0.09 U	0.068 U	0.012 U	0.23 U	0.22 U	0.93 U	2.1 U	0.51 U	0.58 U	0.053 U
4-Nitroaniline	1.8 U	0.18 U	0.015 U	0.015 U	0.11 U	0.086 U	0.015 U	0.29 U	0.28 U	1.2 U	2.7 U	0.64 U	0.74 U	0.067 U
4-Nitrophenol	23 U	2.3 U	0.19 U	0.19 U	1.4 U	1.1 U	0.19 U	3.7 U	3.6 U	15 U	34 U	8.1 U	9.4 U	0.85 U
Acenaphthene	40 J	2.5 J	0.031 J	0.039 J	0.72 J	0.42 J	0.069 J	3.4 J	5.2 J	5.3 J	8.4 J	8.4 J-	16 J	0.91 J
Acenaphthylene	1.2 J	0.12 U	0.01 U	0.01 U	0.077 U	0.059 U	0.033 J	0.2 U	0.19 U	0.8 U	1.8 U	0.44 U	0.5 U	0.046 U
Acetophenone	1.1 U	0.1 U	0.0088 U	0.0087 U	0.065 U	0.05 U	0.011 J	0.17 U	0.16 U	0.68 U	1.5 U	0.37 U	0.43 U	0.039 U
Anthracene	41 J	8	0.13 J	0.18 J	1.9 J	1.2 J	0.049 J	5.4 J	8	38	110	21	23	2
Atrazine	2.2 U	0.21 U	0.018 U	0.018 U	0.13 U	0.1 U	0.017 U	0.35 U	0.33 U	1.4 U	3.2 U	0.75 U	0.87 U	0.079 U
Benzaldehyde	3.7 U	0.36 U	0.031 U	0.03 U	0.23 U	0.17 U	0.03 U	0.59 U	0.57 U	2.4 U	5.4 U	1.3 U	1.5 U	0.13 U
Benzo(A)Anthracene	280	39	1.7	2.4	11	8.2	0.032 U	46	70	190	260	89	96	13
Benzo(A)Pyrene	320	39	2	2.4	14	9.7	0.012 U	66	98	140	170	76	120	15
Benzo(B)Fluoranthene	460	67	6.8	8.3	30	26	0.015 U	87	140	210	330	190	230	18
Benzo(G,H,I)Perylene	250	36	2.2	2.8 J+	15 J+	8.1	0.022 U	59	85	50	140	56	94	13
Benzo(K)Fluoranthene	150	23	2.4	3.2	12	9	0.017 U	37	41	78	110	57	67	6.1
Benzyl Butyl Phthalate	1.5 U	0.15 U	0.012 U	0.012 U	0.092 U	0.07 U	0.012 U	0.24 U	0.23 U	0.96 U	2.2 U	0.52 U	0.6 U	0.055 U
Biphenyl (Diphenyl)	4.1 U	0.4 U	0.034 U	0.034 U	0.26 U	0.19 U	0.072 J	0.66 U	0.64 U	2.6 U	6.1 U	1.4 U	1.7 U	0.15 U
Bis(2-Chloroethoxy) Methane	1.5 U	0.15 U	0.013 U	0.012 U	0.093 U	0.071 U	0.012 U	0.24 U	0.23 U	0.97 U	2.2 U	0.53 U	0.61 U	0.055 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	1.1 U	0.11 U	0.0095 U	0.0094 U	0.071 U	0.054 U	0.0092 U	0.18 U	0.18 U	0.73 U	1.7 U	0.4 U	0.46 U	0.042 U
Bis(2-Chloroisopropyl) Ether	2 U	0.19 U	0.017 U	0.016 U	0.12 U	0.094 U	0.016 U	0.32 U	0.31 U	1.3 U	2.9 U	0.7 U	0.8 U	0.073 U
Bis(2-Ethylhexyl) Phthalate	1.9 U	0.18 U	0.016 U	0.016 U	0.12 U	0.25 J	0.015 U	0.3 U	0.29 U	1.2 U	5.9 J	0.66 U	0.76 U	0.069 U
Caprolactam	3.5 U	0.34 U	0.029 U	0.029 U	0.22 U	0.16 U	0.028 U	0.56 U	0.54 U	2.2 U	5.1 U	1.2 U	1.4 U	0.13 U
Carbazole	33 J	3.6 J	0.11 J	0.15 J	1.5 J	0.88 J	0.0096 U	5.1 J	7.3 J	8.2 J	6.4 J	4.5 J	12 J	1.5 J
Chrysene	350	56	2.3	4.1	16	11	0.011 U	57	82	270	500	220	200	15
Dibenz(A,H)Anthracene	70	9.3	0.61	0.99 J+	3.3 J+	2.7	0.02 U	12	20	20	42	17	25	3.7
Dibenzofuran	7.3 J	1.3 J	0.041 J	0.049 J	0.68 J	0.32 J	0.078 J	0.7 J	1 J	3.7 J	5.8 J	4.1 J	8.8 J	0.3 J
Diethyl Phthalate	1.4 U	0.13 U	0.011 U	0.011 U	0.085 U	0.065 U	0.011 U	2.3 J	2.3 J	0.88 U	2 U	0.48 U	0.56 U	0.05 U
Dimethyl Phthalate	1.4 U	0.14 U	0.012 U	0.012 U	0.087 U	0.066 U	0.011 U	0.23 U	0.22 U	0.9 U	2.1 U	0.49 U	0.57 U	0.051 U

Table E-4
Summary of Data Used in Risk Assessment
North Percolation Pond Area Soil (0-2 ft-bgs) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-027	CFMW-027	CFSB-014	CFSB-014	CFSB-016	CFSB-016	CFSB-019	CFSB-019	CFSB-019-DUP	CFSB-025	CFSB-025	CFSB-026	CFSB-026	CFSB-027
Sample Lab IDs	460-116402-11	460-116402-12	460-114828-33	460-114828-37	460-114828-25	460-114828-35	460-115008-10	460-115008-11	460-115008-12	460-115528-18	460-115528-15	460-115528-16	460-115528-11	460-115528-22
Sample Name	CFMW-027-SO-0-0.5	CFMW-027-SO-0.5-2	CFSB-014-SO-0-0.5	CFSB-014-SO-0.5-2	CFSB-016-SO-0-0.5	CFSB-016-SO-0.5-2	CFSB-019-SO-0-0.5	CFSB-019-SO-0.5-2	CFSB-DUP13-SO	CFSB-025-SO-0-0.5	CFSB-025-SO-0.5-2	CFSB-026-SO-0-0.5	CFSB-026-SO-0.5-2	CFSB-027-SO-0-0.5
Sample Depth	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft
Chemical	6/30/2016	6/30/2016	6/2/2016	6/2/2016	6/2/2016	6/2/2016	6/4/2016	6/4/2016	6/4/2016	6/13/2016	6/13/2016	6/13/2016	6/13/2016	6/13/2016
Di-N-Butyl Phthalate	1.4 U	0.14 U	0.012 U	0.012 U	0.09 U	0.068 U	0.012 U	0.23 U	0.22 U	0.93 U	2.1 U	0.51 U	0.58 U	0.053 U
Di-N-Octylphthalate	2.5 U	0.24 U	0.021 U	0.02 U	0.15 U	0.12 U	0.02 U	0.39 U	0.38 U	1.6 U	3.6 U	0.86 U	0.99 U	0.09 U
Fluoranthene	430	75	2.3	2.7	19	15	0.029 J	73	110	320	1400	250	300	22
Fluorene	16 J	1.8 J	0.012 J	0.016 J	0.37 J	0.28 J	0.19 J	1.5 J	2.3 J	4.2 J	22 J	8.1 J	12 J	0.82 J
Hexachlorobenzene	2 U	0.19 U	0.016 U	0.016 U	0.12 U	0.093 U	0.016 U	0.31 U	0.3 U	1.3 U	2.9 U	0.69 U	0.79 U	0.072 U
Hexachlorobutadiene	1.4 U	0.13 U	0.011 U	0.011 U	0.084 U	0.064 U	0.011 U	0.22 U	0.21 U	0.87 U	2 U	0.48 U	0.55 U	0.05 U
Hexachlorocyclopentadiene	3 U	0.3 U	0.025 U	0.025 U	0.19 U	0.14 U	0.024 U	0.48 U	0.46 U	1.9 U	4.4 U	1.1 U	1.2 U	0.11 U
Hexachloroethane	1.8 U	0.17 U	0.015 U	0.015 U	0.11 U	0.084 U	0.014 U	0.28 U	0.27 U	1.1 U	2.6 U	0.62 U	0.71 U	0.065 U
Indeno(1,2,3-C,D)Pyrene	260	37	2.7	3.6 J+	17 J+	10	0.026 U	61	88	63	140	59	95	14
Isophorone	1 U	0.1 U	0.0087 U	0.0086 U	0.064 U	0.049 U	0.0083 U	0.17 U	0.16 U	0.67 U	1.5 U	0.36 U	0.42 U	0.038 U
Naphthalene	6.5 J	1.2 J	0.042 J	0.047 J	0.72 J	0.27 J	0.083 J	0.32 J	0.6 J	3.8 J	2.5 J	2.1 J	3.3 J	0.2 J
Nitrobenzene	1.5 U	0.15 U	0.013 U	0.013 U	0.094 U	0.072 U	0.012 U	0.24 U	0.23 U	0.98 U	2.2 U	0.53 U	0.61 U	0.056 U
N-Nitrosodi-N-Propylamine	1.6 U	0.16 U	0.014 U	0.013 U	0.1 U	0.077 U	0.013 U	0.26 U	0.25 U	1 U	2.4 U	0.57 U	0.66 U	0.059 U
N-Nitrosodiphenylamine	4.4 U	0.43 U	0.037 U	0.036 U	0.27 U	0.21 U	0.035 U	0.7 U	0.68 U	2.8 U	6.4 U	1.5 U	1.8 U	0.16 U
Pentachlorophenol	5.9 U	0.57 U	0.049 U	0.048 U	0.36 U	0.28 U	0.047 U	0.94 U	0.9 U	3.8 U	8.6 U	2 U	2.4 U	0.21 U
Phenanthrene	200	27	0.65	0.78	9	6.2	0.51	25	38	56	440	86	68	12
Phenol	1.6 U	0.15 U	0.013 U	0.013 U	0.098 U	0.075 U	0.013 U	0.25 U	0.24 U	1 U	2.3 U	0.55 U	0.64 U	0.058 U
Pyrene	440	77	2.3	2.6	21	15	0.058 J	74	98	240	1200	300	170	22
SEMIVOLATILE ORGANIC COMPOUNDS-SIM (mg/kg)														
Acenaphthene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acenaphthylene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Anthracene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(A)Anthracene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(A)Pyrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(B)Fluoranthene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(G,H,I)Perylene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(K)Fluoranthene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo[E]Pyrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
C1-Chrysenes	--	--	--	--	--	--	--	--	--	--	--	--	--	--
C1-Fluoranthenes/Pyrenes	--	--	--	--	--	--	--	--	--	--	--	--	--	--
C1-Fluorenes	--	--	--	--	--	--	--	--	--	--	--	--	--	--
C1-Naphthalenes	--	--	--	--	--	--	--	--	--	--	--	--	--	--
C1-Phenanthrenes/Anthracenes	--	--	--	--	--	--	--	--	--	--	--	--	--	--
C2-Chrysenes	--	--	--	--	--	--	--	--	--	--	--	--	--	--
C2-Fluorenes	--	--	--	--	--	--	--	--	--	--	--	--	--	--
C2-Naphthalenes	--	--	--	--	--	--	--	--	--	--	--	--	--	--
C2-Phenanthrenes/Anthracenes	--	--	--	--	--	--	--	--	--	--	--	--	--	--
C3-Chrysenes	--	--	--	--	--	--	--	--	--	--	--	--	--	--
C3-Fluorenes	--	--	--	--	--	--	--	--	--	--	--	--	--	--
C3-Naphthalenes	--	--	--	--	--	--	--	--	--	--	--	--	--	--
C3-Phenanthrenes/Anthracenes	--	--	--	--	--	--	--	--	--	--	--	--	--	--
C4 Chrysenes	--	--	--	--	--	--	--	--	--	--	--	--	--	--
C4-Naphthalenes	--	--	--	--	--	--	--	--	--	--	--	--	--	--
C4-Phenanthrenes/Anthracenes	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chrysene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibenz(A,H)Anthracene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Fluoranthene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Fluorene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Indeno(1,2,3-C,D)Pyrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Naphthalene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Perylene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Phenanthrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Pyrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
VOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,1,1-Trichloroethane	--	0.00047 U	--	0.00045 U	--	0.00064 U	--	0.00052 U	0.00067 U	--	0.001 U	--	0.00096 U	--
1,1,2,2-Tetrachloroethane	--	0.00021 U	--	0.0002 U	--	0.00028 U	--	0.00023 U	0.0003 U	--	0.00045 U	--	0.00043 U	--
1,1,2-Trichloro-1,2,2-Trifluoroethane	--	0.00054 U	--	0.00053 U	--	0.00074 U	--	0.00061 U	0.00078 U	--	0.0012 U	--	0.0011 U	--
1,1,2-Trichloroethane	--	0.00035 U	--	0.00034 U	--	0.00047 U	--	0.00039 U	0.0005 U	--	0.00075 U	--	0.0007 U	--

Table E-4
Summary of Data Used in Risk Assessment
North Percolation Pond Area Soil (0-2 ft-bgs) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-027	CFMW-027	CFSB-014	CFSB-014	CFSB-016	CFSB-016	CFSB-019	CFSB-019	CFSB-019-DUP	CFSB-025	CFSB-025	CFSB-026	CFSB-026	CFSB-027
Sample Lab IDs	460-116402-11	460-116402-12	460-114828-33	460-114828-37	460-114828-25	460-114828-35	460-115008-10	460-115008-11	460-115008-12	460-115528-18	460-115528-15	460-115528-16	460-115528-11	460-115528-22
Sample Name	CFMW-027-SO-0-0.5	CFMW-027-SO-0.5-2	CFSB-014-SO-0-0.5	CFSB-014-SO-0.5-2	CFSB-016-SO-0-0.5	CFSB-016-SO-0.5-2	CFSB-019-SO-0-0.5	CFSB-019-SO-0.5-2	CFSB-DUP13-SO	CFSB-025-SO-0-0.5	CFSB-025-SO-0.5-2	CFSB-026-SO-0-0.5	CFSB-026-SO-0.5-2	CFSB-027-SO-0-0.5
Sample Depth	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft
Chemical	6/30/2016	6/30/2016	6/2/2016	6/2/2016	6/2/2016	6/2/2016	6/4/2016	6/4/2016	6/4/2016	6/13/2016	6/13/2016	6/13/2016	6/13/2016	6/13/2016
1,1-Dichloroethane	--	0.00042 U	--	0.00041 U	--	0.00057 U	--	0.00047 U	0.0006 U	--	0.00091 U	--	0.00085 U	--
1,1-Dichloroethene	--	0.00051 U	--	0.00049 U	--	0.00069 U	--	0.00057 U	0.00073 U	--	0.0011 U	--	0.001 U	--
1,2,3-Trichlorobenzene	--	0.00014 U	--	0.00013 U	--	0.00018 U	--	0.00015 U	0.00019 U	--	0.00029 U	--	0.00028 U	--
1,2,4-Trichlorobenzene	--	0.0004 U	--	0.00038 U	--	0.00053 U	--	0.00044 U	0.00057 U	--	0.00086 U	--	0.0008 U	--
1,2-Dibromo-3-Chloropropane	--	0.00058 U	--	0.00056 U	--	0.00079 U	--	0.00065 U	0.00083 U	--	0.0013 U	--	0.0012 U	--
1,2-Dibromoethane (Ethylene Dibromide)	--	0.00015 U	--	0.00014 U	--	0.0002 U	--	0.00017 U	0.00021 U	--	0.00032 U	--	0.0003 U	--
1,2-Dichlorobenzene	--	0.00017 U	--	0.00017 U	--	0.00023 U	--	0.00019 U	0.00025 U	--	0.00037 U	--	0.00035 U	--
1,2-Dichloroethane	--	0.00014 U	--	0.00013 U	--	0.00018 U	--	0.00015 U	0.00019 U	--	0.00029 U	--	0.00028 U	--
1,2-Dichloropropane	--	0.00021 U	--	0.0002 U	--	0.00028 U	--	0.00023 U	0.0003 U	--	0.00045 U	--	0.00043 U	--
1,3-Dichlorobenzene	--	0.00015 U	--	0.00014 U	--	0.0002 U	--	0.00017 U	0.00021 U	--	0.00032 U	--	0.0003 U	--
1,4-Dichlorobenzene	--	0.00016 U	--	0.00016 U	--	0.00022 U	--	0.00018 U	0.00023 U	--	0.00035 U	--	0.00033 U	--
2-Hexanone	--	0.0036 J	--	0.0011 U	--	0.0024 J	--	0.0013 U	0.0017 U	--	0.0025 U	--	0.0024 U	--
Acetone	--	0.15	--	0.09	--	0.19	--	0.0096	0.0088 J	--	0.25 J+	--	0.31 J+	--
Benzene	--	0.00025 U	--	0.00024 U	--	0.00033 U	--	0.0012 J	0.00095 J	--	0.00054 U	--	0.0005 U	--
Bromochloromethane	--	0.00021 U	--	0.0002 U	--	0.00028 U	--	0.00023 U	0.0003 U	--	0.00045 U	--	0.00043 U	--
Bromodichloromethane	--	0.00047 U	--	0.00045 U	--	0.00064 U	--	0.00052 U	0.00067 U	--	0.001 U	--	0.00096 U	--
Bromoform	--	0.00016 U	--	0.00016 U	--	0.00022 U	--	0.00018 U	0.00023 U	--	0.00035 U	--	0.00033 U	--
Bromomethane	--	0.0004 U	--	0.00038 U	--	0.00053 U	--	0.00044 U	0.00057 U	--	0.00086 U	--	0.0008 U	--
Carbon Disulfide	--	0.00092 J	--	0.00051 U	--	0.0045	--	0.00059 U	0.00076 U	--	0.0033	--	0.0038	--
Carbon Tetrachloride	--	0.00053 U	--	0.00051 U	--	0.00072 U	--	0.00059 U	0.00076 U	--	0.0012 U	--	0.0011 U	--
Chlorobenzene	--	0.00017 U	--	0.00017 U	--	0.00023 U	--	0.00019 U	0.00025 U	--	0.00037 U	--	0.00035 U	--
Chloroethane	--	0.00043 U	--	0.00042 U	--	0.00059 U	--	0.00048 U	0.00062 U	--	0.00094 U	--	0.00088 U	--
Chloroform	--	0.00026 U	--	0.00025 U	--	0.00035 U	--	0.00029 U	0.00037 U	--	0.00056 U	--	0.00053 U	--
Chloromethane	--	0.00047 U	--	0.00045 U	--	0.00064 U	--	0.00052 U	0.00067 U	--	0.001 U	--	0.00096 U	--
Cis-1,2-Dichloroethylene	--	0.00027 U	--	0.00026 U	--	0.00037 U	--	0.0003 U	0.00039 U	--	0.00059 U	--	0.00055 U	--
Cis-1,3-Dichloropropene	--	0.00019 U	--	0.00018 U	--	0.00025 U	--	0.00021 U	0.00027 U	--	0.0004 U	--	0.00038 U	--
Cyclohexane	--	0.00057 U	--	0.00055 U	--	0.00077 U	--	0.0027	0.0026	--	0.0012 U	--	0.0012 U	--
Dibromochloromethane	--	0.00019 U	--	0.00018 U	--	0.00025 U	--	0.00021 U	0.00027 U	--	0.0004 U	--	0.00038 U	--
Dichlorodifluoromethane	--	0.0004 U	--	0.00038 U	--	0.00053 U	--	0.00044 U	0.00057 U	--	0.00086 U	--	0.0008 U	--
Ethylbenzene	--	0.00022 U	--	0.00022 U	--	0.0003 U	--	0.0015	0.0013 J	--	0.00048 U	--	0.00045 U	--
Isopropylbenzene (Cumene)	--	0.00021 U	--	0.0002 U	--	0.00028 U	--	0.00023 U	0.0003 U	--	0.00045 U	--	0.00043 U	--
M,P-Xylene	--	0.00016 J	--	0.00013 U	--	0.00018 U	--	0.0056	0.0051	--	0.00031 J	--	0.00028 U	--
Methyl Acetate	--	0.0065	--	0.0022 J	--	0.0054 J	--	0.0012 U	0.0016 U	--	0.0036 J+	--	0.0043 J+	--
Methyl Ethyl Ketone (2-Butanone)	--	0.034	--	0.0091	--	0.028	--	0.0011 U	0.0014 U	--	0.021	--	0.041	--
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	--	0.0027 U	--	0.0027 U	--	0.0037 U	--	0.0031 U	0.0039 U	--	0.0059 U	--	0.0056 U	--
Methylcyclohexane	--	0.00062 U	--	0.0006 U	--	0.00084 U	--	0.0055	0.0055	--	0.0013 U	--	0.0013 U	--
Methylene Chloride	--	0.0004 U	--	0.00038 U	--	0.00053 U	--	0.002 J	0.004 J	--	0.00086 U	--	0.0008 U	--
O-Xylene (1,2-Dimethylbenzene)	--	0.0002 U	--	0.00019 U	--	0.00027 U	--	0.0017	0.0016 J	--	0.00043 U	--	0.0004 U	--
Styrene	--	0.00019 U	--	0.00018 U	--	0.00025 U	--	0.00021 U	0.00027 U	--	0.0004 U	--	0.00038 U	--
Tert-Butyl Methyl Ether	--	0.00021 U	--	0.0002 U	--	0.00028 U	--	0.00023 U	0.0003 U	--	0.00045 U	--	0.00043 U	--
Tetrachloroethylene (PCE)	--	0.00035 U	--	0.00034 U	--	0.00047 U	--	0.00039 U	0.0005 U	--	0.00075 U	--	0.0007 U	--
Toluene	--	0.00041 J	--	0.00023 U	--	0.00091 J	--	0.0063	0.0056	--	0.00081 J	--	0.00061 J	--
Trans-1,2-Dichloroethene	--	0.00048 U	--	0.00047 U	--	0.00065 U	--	0.00054 U	0.00069 U	--	0.001 U	--	0.00098 U	--
Trans-1,3-Dichloropropene	--	0.00012 U	--	0.00012 U	--	0.00017 U	--	0.00014 U	0.00018 U	--	0.00027 U	--	0.00025 U	--
Trichloroethylene (TCE)	--	0.00032 U	--	0.00031 U	--	0.00043 U	--	0.00036 U	0.00046 U	--	0.0007 U	--	0.00065 U	--
Trichlorofluoromethane	--	0.00042 U	--	0.00041 U	--	0.00057 U	--	0.00047 U	0.0006 U	--	0.00091 U	--	0.00085 U	--
Vinyl Chloride	--	0.00048 U	--	0.00047 U	--	0.00065 U	--	0.00054 U	0.00069 U	--	0.001 U	--	0.00098 U	--

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-4
Summary of Data Used in Risk Assessment
North Percolation Pond Area Soil (0-2 ft-bgs) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-027	CFSB-028	CFSB-028	CFSB-030	CFSB-030	CFSB-199	CFSB-199	CFSB-199-DUP	CFSB-201	CFSB-201	CFSB-201	CFSB-202	CFSB-202	CFSB-202
Sample Lab IDs	460-115528-19	460-117381-1	460-117381-2	460-115528-20	460-115528-23	180-79434-34, 200-44138-3, 460-159538-4	180-79434-35, 200-44138-4, 460-159538-5	180-79434-36, 200-44138-5, 460-159538-6	180-79204-15, 200-44015-5, 460-159044-21	200-44015-6, 460-159044-22	180-79433-1	180-79204-17, 200-44015-7, 460-159044-23	200-44015-8, 460-159044-24	180-79433-2
Sample Name	CFSB-027-SO-0.5-2	CFSB-028-SO-0-0.5	CFSB-028-SO-0.5-2	CFSB-030-SO-0-0.5	CFSB-030-SO-0.5-2	CFSB-199-SO-0-0.5	CFSB-199-SO-0.5-2	CFSB-DUP46-SO	CFSB-201-SO-0-0.5	CFSB-201-SO-0.5-2	CFSB-201-SO-0-0.5	CFSB-202-SO-0-0.5	CFSB-202-SO-0.5-2	CFSB-202-SO-0-0.5
Sample Depth	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft
Chemical	6/13/2016	7/18/2016	7/18/2016	6/13/2016	6/13/2016	6/28/2018	6/28/2018	6/28/2018	6/22/2018	6/22/2018	6/29/2018	6/22/2018	6/22/2018	6/29/2018
GENERAL CHEMISTRY (mg/kg)														
Fluoride	81.5 J-	94.8 J+	23.8 J+	221 J+	84 J-	44.2	106	72.6	9.49 J-	7.57 J-	--	2.42 J-	4.49 J-	--
Cyanide	0.49 J	1.5	0.094 J	4.7 J	2	2.7 J	3.8 J	3.6 J	5.2	2.7	--	3.6	0.61	--
METALS (mg/kg)														
"Chromium, Hexavalent - Estimated"	0.254258	0.313139	0.264964	0.355961	0.262287	0.987591	0.457664	0.36399	0.414842	0.33455	--	0.808273	0.36399	--
"Chromium, Trivalent - Calculated"	--	--	--	--	--	--	--	--	--	--	--	--	--	--
"Chromium, Trivalent - Estimated"	9.24574	11.3869	9.63504	12.944	9.53771	35.9124	16.6423	13.236	15.0852	12.1655	--	29.3917	13.236	--
Aluminum	12200	18600	8860	47300	25600	24200	23500	15000	31600	21900	--	21800	13400	--
Antimony	0.38 UJ	0.43 UJ	0.41 UJ	0.42 UJ	0.37 UJ	0.32 UJ	0.33 UJ	0.28 UJ	0.32 U	0.31 U	--	0.32 U	0.3 U	--
Arsenic	4.8	5.9	5.3	8.5	7.2	7.9	13.8	12	12.8	10.1	--	8.7	5.9	--
Barium	78.3	115	90.8	268	112	79.6	186	131	242	161	--	237	122	--
Beryllium	0.41	1.2	0.85	1.3	1.2	1.3	1.7	1.1	2.9	1.9	--	1.2	0.56	--
Cadmium	0.29 J	0.93 J	0.31 U	1.4	0.72 J	1.6	1.1 J	0.65 J	2.7	1.6	--	1.7	0.56 J	--
Calcium	23900 J	49100	55600	6670 J	2390	2050	13400 J	7960 J	4940	4900	--	6200	2480	--
Chromium, Total	9.5	11.7 J+	9.9 J+	13.3	9.8	36.9	17.1	13.6	15.5	12.5	--	30.2	13.6	--
Cobalt	4.6	4.6	5.2	6.9	4.5	4.6	4.5	4.3	5.7	6.3	--	4.9	5.8	--
Copper	13.7	12.5 J+	15.8 J+	27.2	22.4 J+	27.4	11.9	8.5	29.2	21.1	--	71.6	20.5	--
Iron	9850	11600	15900	13100	14700	3750	9860	11100	10900	12300	--	5170	12700	--
Lead	9.9 J+	15.9 J	7.5 J	26.8 J+	26.8 J+	34.2	50.5	36	30.3	20.4	--	24.2	13.1	--
Magnesium	9990	11800	14500	6960	9050	1680	6520	6930	7380	8920	--	2350	8140	--
Manganese	183 J	375	762	479 J	233 J	20.1	58.2	69.6	96.3	117	--	86.5	185	--
Mercury	0.012 U	0.018	0.012 U	0.021	0.019	0.015 J	0.012 U	0.01 U	0.014 J	0.012 J	--	0.025	0.029	--
Nickel	30.9 J+	56.4	16	81.3 J+	79.4	181	88 J	51.1 J	131	86.9	--	163	59.8	--
Potassium	1270	1380 J+	894 J+	1900	699	444 J+	3200 J+	2300 J+	623	624	--	301	560	--
Selenium	0.36 U	0.4 U	0.39 U	0.71 J	0.64 J	0.81 J	0.56 J	0.37 J	0.32 U	0.31 U	--	0.34 J	0.3 U	--
Silver	0.69 U	0.78 U	0.76 U	0.76 U	0.7 J	0.68 U	0.69 U	0.6 U	0.67 U	0.65 U	--	0.67 U	0.64 U	--
Sodium	38.1 J	101 J	40.6 J	247	98.5	148	1260 J	188 J	75.6 J	51.6 J	--	93.2 J	32.4 U	--
Thallium	0.38	0.25 J	0.24 J	0.64	0.27 J	0.7	1.2 J	0.69 J	0.19 J	0.15 J	--	0.14 J	0.13 U	--
Vanadium	16.6 J-	21.3 J	12.5 J	41.3 J-	27.8	76.8	52.9	39.3	25.9	19.3	--	51.2	17.1	--
Zinc	82.4 J-	141	40.9	148 J-	77.9	173	96.8	70.3	265	167	--	335	106	--
METALS|HEXAVALENT CHROMIUM (mg/kg)														
Chromium, Hexavalent	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PESTICIDES (mg/kg)														
Aldrin	--	0.00092 U	--	0.001 U	--	--	--	--	--	--	--	--	--	--
Alpha Bhc (Alpha Hexachlorocyclohexane)	--	0.00069 U	--	0.00079 U	--	--	--	--	--	--	--	--	--	--
Alpha Endosulfan	--	0.0011 U	--	0.0012 U	--	--	--	--	--	--	--	--	--	--
Beta Bhc (Beta Hexachlorocyclohexane)	--	0.00074 U	--	0.00084 U	--	--	--	--	--	--	--	--	--	--
Beta Endosulfan	--	0.0012 U	--	0.0014 U	--	--	--	--	--	--	--	--	--	--
cis-Chlordane	--	0.0012 U	--	0.0014 U	--	--	--	--	--	--	--	--	--	--
Delta BHC (Delta Hexachlorocyclohexane)	--	0.00083 U	--	0.00094 U	--	--	--	--	--	--	--	--	--	--
Dieldrin	--	0.00099 U	--	0.0011 U	--	--	--	--	--	--	--	--	--	--
Endosulfan Sulfate	--	0.00088 U	--	0.001 U	--	--	--	--	--	--	--	--	--	--
Endrin	--	0.00096 U	--	0.0011 U	--	--	--	--	--	--	--	--	--	--
Endrin Aldehyde	--	0.00094 U	--	0.0011 U	--	--	--	--	--	--	--	--	--	--
Endrin Ketone	--	0.0011 U	--	0.0012 U	--	--	--	--	--	--	--	--	--	--
Gamma Bhc (Lindane)	--	0.00068 U	--	0.00078 U	--	--	--	--	--	--	--	--	--	--
Heptachlor	--	0.00098 U	--	0.0011 U	--	--	--	--	--	--	--	--	--	--
Heptachlor Epoxide	--	0.0015 U	--	0.0017 U	--	--	--	--	--	--	--	--	--	--
Methoxychlor	--	0.0016 U	--	0.0018 U	--	--	--	--	--	--	--	--	--	--
P,P'-DDD	--	0.001 U	--	0.0011 U	--	--	--	--	--	--	--	--	--	--
P,P'-DDE	--	0.0011 U	--	0.0013 U	--	--	--	--	--	--	--	--	--	--
P,P'-DDT	--	0.00078 U	--	0.00089 U	--	--	--	--	--	--	--	--	--	--
Toxaphene	--	0.022 U	--	0.025 U	--	--	--	--	--	--	--	--	--	--
trans-Chlordane	--	0.0016 U	--	0.0019 U	--	--	--	--	--	--	--	--	--	--
POLYCHLORINATED BIPHENYLS (mg/kg)														
PCB-1016 (Aroclor 1016)	0.01 U	0.01 U	0.0097 U	0.012 U	0.01 U	--	--	--	--	--	--	--	--	--
PCB-1221 (Aroclor 1221)	0.01 U	0.01 U	0.0097 U	0.012 U	0.01 U	--	--	--	--	--	--	--	--	--
PCB-1232 (Aroclor 1232)	0.01 U	0.01 U	0.0097 U	0.012 U	0.01 U	--	--	--	--	--	--	--	--	--

Table E-4
Summary of Data Used in Risk Assessment
North Percolation Pond Area Soil (0-2 ft-bgs) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-027	CFSB-028	CFSB-028	CFSB-030	CFSB-030	CFSB-199	CFSB-199	CFSB-199-DUP	CFSB-201	CFSB-201	CFSB-201	CFSB-202	CFSB-202	CFSB-202
Sample Lab IDs	460-115528-19	460-117381-1	460-117381-2	460-115528-20	460-115528-23	180-79434-34, 200-44138-3, 460-159538-4	180-79434-35, 200-44138-4, 460-159538-5	180-79434-36, 200-44138-5, 460-159538-6	180-79204-15, 200-44015-5, 460-159044-21	200-44015-6, 460-159044-22	180-79433-1	180-79204-17, 200-44015-7, 460-159044-23	180-79204-18, 200-44015-8, 460-159044-24	180-79433-2
Sample Name	CFSB-027-SO-0.5-2	CFSB-028-SO-0-0.5	CFSB-028-SO-0.5-2	CFSB-030-SO-0-0.5	CFSB-030-SO-0.5-2	CFSB-199-SO-0-0.5	CFSB-199-SO-0.5-2	CFSB-DUP46-SO	CFSB-201-SO-0-0.5	CFSB-201-SO-0.5-2	CFSB-201-SO-0-0.5	CFSB-202-SO-0-0.5	CFSB-202-SO-0.5-2	CFSB-202-SO-0-0.5
Sample Depth	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft
Chemical	6/13/2016	7/18/2016	7/18/2016	6/13/2016	6/13/2016	6/28/2018	6/28/2018	6/28/2018	6/22/2018	6/22/2018	6/29/2018	6/22/2018	6/22/2018	6/29/2018
PCB-1242 (Aroclor 1242)	0.01 U	0.01 U	0.0097 U	0.012 U	0.01 U	--	--	--	--	--	--	--	--	--
PCB-1248 (Aroclor 1248)	0.01 U	0.01 U	0.0097 U	0.012 U	0.01 U	--	--	--	--	--	--	--	--	--
PCB-1254 (Aroclor 1254)	0.011 U	0.01 U	0.01 U	0.012 U	0.01 U	--	--	--	--	--	--	--	--	--
PCB-1260 (Aroclor 1260)	0.011 U	0.01 U	0.01 U	0.012 U	0.01 U	--	--	--	--	--	--	--	--	--
PCB-1262 (Aroclor 1262)	0.011 U	0.01 U	0.01 U	0.012 U	0.01 U	--	--	--	--	--	--	--	--	--
PCB-1268 (Aroclor 1268)	0.011 U	0.01 U	0.01 U	0.012 U	0.01 U	--	--	--	--	--	--	--	--	--
Polychlorinated Biphenyl (PCBs)	0.011 U	0.01 U	0.01 U	0.012 U	0.01 U	--	--	--	--	--	--	--	--	--
SEMIVOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,2,4,5-Tetrachlorobenzene	0.71 U	0.056 U	0.027 U	0.064 U	0.14 U	0.46 U	0.047 U	0.047 U	--	--	0.016 U	--	0.031 U	0.0031 U
1,4-Dioxane (P-Dioxane)	2.6 U	0.2 U	0.096 U	0.23 U	0.5 U	3.3 U	0.34 U	0.34 U	--	--	0.12 U	--	0.22 U	0.022 U
2,3,4,6-Tetrachlorophenol	0.9 U	0.07 U	0.034 U	0.08 U	0.18 U	4.5 U	0.45 U	0.46 U	--	--	0.16 U	--	0.3 U	0.03 U
2,4,5-Trichlorophenol	0.95 U	0.075 U	0.036 U	0.085 U	0.19 U	0.77 U	0.077 U	0.078 U	--	--	0.027 U	--	0.051 U	0.0051 U
2,4,6-Trichlorophenol	0.27 U	0.021 U	0.01 U	0.024 U	0.054 U	0.59 U	0.06 U	0.06 U	--	--	0.021 U	--	0.039 U	0.0039 U
2,4-Dichlorophenol	0.23 U	0.018 U	0.0084 U	0.02 U	0.044 U	0.83 U	0.084 U	0.084 U	--	--	0.029 U	--	0.055 U	0.0055 U
2,4-Dimethylphenol	2.1 U	0.16 U	0.079 U	0.19 U	0.41 U	0.67 U	0.067 U	0.068 U	--	--	0.023 U	--	0.044 U	0.0044 U
2,4-Dinitrophenol	7.3 U	0.57 U	0.27 U	0.65 U	1.4 U	29 U	2.9 U	2.9 U	--	--	1 U	--	1.9 U	0.19 U
2,4-Dinitrotoluene	0.38 U	0.03 U	0.014 U	0.034 U	0.075 U	0.53 U	0.054 U	0.054 U	--	--	0.019 U	--	0.035 U	0.0036 U
2,6-Dinitrotoluene	0.51 U	0.04 U	0.019 U	0.045 U	0.1 U	0.66 U	0.067 U	0.067 U	--	--	0.023 U	--	0.044 U	0.0044 U
2-Chloronaphthalene	0.22 U	0.017 U	0.0081 U	0.019 U	0.043 U	0.49 U	0.05 U	0.05 U	--	--	0.017 U	--	0.033 U	0.0033 U
2-Chlorophenol	0.24 U	0.019 U	0.0091 U	0.022 U	0.048 U	0.5 U	0.05 U	0.051 U	--	--	0.018 U	--	0.033 U	0.0033 U
2-Methylnaphthalene	0.37 J	0.037 J	0.0079 U	0.063 J	0.09 J	0.8 J	0.14 J	0.076 J	--	--	0.058 J	--	0.034 U	0.018
2-Methylphenol (O-Cresol)	0.42 U	0.033 U	0.016 U	0.037 U	0.082 U	3.1 U	0.31 U	0.31 U	--	--	0.11 U	--	0.2 U	0.021 U
2-Nitroaniline	0.32 UJ	0.025 U	0.012 U	0.028 U	0.062 U	4.9 U	0.49 U	0.5 U	--	--	0.17 U	--	0.32 U	0.033 U
2-Nitrophenol	0.32 U	0.025 U	0.012 U	0.029 U	0.063 U	0.61 U	0.062 U	0.063 U	--	--	0.022 U	--	0.041 U	0.0041 U
3- And 4- Methylphenol (Total)	0.26 U	0.02 U	0.0095 U	0.023 U	0.05 U	--	--	--	--	--	--	--	--	--
3,3'-Dichlorobenzidine	1.1 U	0.084 U	0.04 U	0.095 U	0.21 U	10 U	1 U	1 U	--	--	0.35 U	--	0.66 U	0.067 U
3-Nitroaniline	0.28 U	0.022 U	0.011 U	0.025 U	0.056 U	2.7 U	0.28 U	0.28 U	--	--	0.096 U	--	0.18 U	0.018 U
4,6-Dinitro-2-Methylphenol	2.6 U	0.2 U	0.096 U	0.23 U	0.5 U	18 U	1.9 U	1.9 U	--	--	0.65 U	--	1.2 U	0.12 U
4-Bromophenyl Phenyl Ether	0.3 U	0.024 U	0.011 U	0.027 U	0.059 U	0.75 U	0.076 U	0.076 U	--	--	0.026 U	--	0.05 U	0.005 U
4-Chloro-3-Methylphenol	0.41 U	0.032 U	0.015 U	0.037 U	0.081 U	0.5 U	0.051 U	0.051 U	--	--	0.018 U	--	0.033 U	0.0034 U
4-Chloroaniline	0.25 U	0.019 U	0.0092 U	0.022 U	0.048 U	0.36 U	0.036 U	0.036 U	--	--	0.013 U	--	0.024 U	0.0024 U
4-Chlorophenyl Phenyl Ether	0.29 U	0.022 U	0.011 U	0.026 U	0.056 U	0.65 U	0.066 U	0.066 U	--	--	0.023 U	--	0.043 U	0.0043 U
4-Nitroaniline	0.36 U	0.028 U	0.014 U	0.032 U	0.071 U	0.52 U	0.053 U	0.053 U	--	--	0.018 U	--	0.034 U	0.0035 U
4-Nitrophenol	4.6 U	0.36 U	0.17 U	0.41 U	0.91 U	7.5 U	0.76 U	0.77 U	--	--	0.27 U	--	0.5 U	0.05 U
Acenaphthene	5.2 J	0.31 J	0.0087 U	0.36 J	0.49 J	4.3	0.75 J	0.38 J	--	--	0.075 J	--	0.041 U	0.044
Acenaphthylene	0.25 U	0.019 U	0.0092 U	0.022 U	0.048 U	0.47 U	0.047 U	0.048 U	--	--	0.017 J	--	0.07 J	0.0096 J
Acetophenone	0.21 U	0.016 U	0.0078 U	0.019 U	0.041 U	0.58 U	0.059 U	0.059 U	--	--	0.021 U	--	0.038 U	0.0039 U
Anthracene	9.3 J	0.89	0.034 U	0.85	1.7 J	20	2.8 J	1.4 J	--	--	0.26	--	0.8	0.32
Atrazine	0.43 U	0.033 U	0.016 U	0.038 U	0.084 U	4.7 UJ	0.47 UJ	0.48 UJ	--	--	0.17 U	--	0.31 UJ	0.031 U
Benzaldehyde	0.73 U	0.057 U	0.027 U	0.065 U	0.14 U	1.3 U	0.13 U	0.14 U	--	--	0.047 U	--	0.088 UR	0.0089 U
Benzo(A)Anthracene	60	4.9	0.03 U	6	12	110	12 J	6.7 J	--	--	1.5	--	0.78	1.4
Benzo(A)Pyrene	65	5.3	0.011 U	6.9	13	72	11 J	5.1 J	--	--	2.3	--	0.91	1.5
Benzo(B)Fluoranthene	83	8.8	0.014 U	13	19	160	24 J	10 J	--	--	4.1	--	2.3	5.1
Benzo(G,H,I)Perylene	44	5	0.021 U	8.2	14	95	15 J	6.8 J	--	--	5.4	--	1.4	1.4
Benzo(K)Fluoranthene	27	3.3	0.016 U	4.3	7.9	51	7.5 J	3.7 J	--	--	1.7	--	1.2	1.7
Benzyl Butyl Phthalate	0.3 U	0.55 J	0.011 U	0.026 U	0.058 U	7.4 U	0.75 U	0.75 U	--	--	0.26 U	--	0.49 U	0.049 U
Biphenyl (Diphenyl)	0.82 U	0.064 U	0.031 U	0.073 U	0.16 U	0.45 U	0.046 U	0.046 U	--	--	0.016 U	--	0.03 U	0.0047 J
Bis(2-Chloroethoxy) Methane	0.3 U	0.023 U	0.011 U	0.027 U	0.059 U	0.51 U	0.052 U	0.052 U	--	--	0.018 U	--	0.034 U	0.0034 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.23 U	0.018 U	0.0084 U	0.02 U	0.044 U	0.39 U	0.039 U	0.04 U	--	--	0.014 U	--	0.026 U	0.0026 U
Bis(2-Chloroisopropyl) Ether	0.39 U	0.031 U	0.015 U	0.035 U	0.077 U	0.79 U	0.08 U	0.081 U	--	--	0.028 U	--	0.053 U	0.0053 U
Bis(2-Ethylhexyl) Phthalate	0.37 U	0.17 J	0.014 U	0.033 U	0.074 U	11 U	1.2 U	1.2 U	--	--	0.4 U	--	0.75 U	0.076 U
Caprolactam	0.69 U	0.054 U	0.026 U	0.062 U	0.14 U	7 U	0.71 U	0.71 U	--	--	0.25 U	--	0.46 U	0.047 U
Carbazole	6.8 J	0.76	0.0089 U	1.2	1.7 J	7.3	1.1 J	0.63 J	--	--	0.18	--	0.14	0.12
Chrysene	70	8.8	0.011 J	11	22	150	22 J	11 J	--	--	2.4	--	1	1.8
Dibenz(A,H)Anthracene	14	1.4	0.019 U	2.2	4.2	24	3.7 J	1.7 J	--	--	0.93	--	0.38	0.4
Dibenzofuran	1.3 J	0.097 J	0.011 U	0.17 J	0.21 J	2.1 J	0.36 J	0.21 J	--	--	0.074 J	--	0.039 J	0.036 J
Diethyl Phthalate	0.27 U	0.021 U	0.01 U	0.024 U	0.054 U	3.2 U	0.33 U	0.33 U	--	--	0.11 U	--	0.21 U	0.022 J
Dimethyl Phthalate	0.28 U	0.022 U	0.01 U	0.025 U	0.055 U	0.39 U	0.039 U	0.04 U	--	--	0.014 U	--	0.026 U	0.0026 U

Table E-4
Summary of Data Used in Risk Assessment
North Percolation Pond Area Soil (0-2 ft-bgs) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-027	CFSB-028	CFSB-028	CFSB-030	CFSB-030	CFSB-199	CFSB-199	CFSB-199-DUP	CFSB-201	CFSB-201	CFSB-201	CFSB-202	CFSB-202	CFSB-202
Sample Lab IDs	460-115528-19	460-117381-1	460-117381-2	460-115528-20	460-115528-23	180-79434-34, 200-44138-3, 460-159538-4	180-79434-35, 200-44138-4, 460-159538-5	180-79434-36, 200-44138-5, 460-159538-6	180-79204-15, 200-44015-5, 460-159044-21	200-44015-6, 460-159044-22	180-79433-1	180-79204-17, 200-44015-7, 460-159044-23	180-79204-18, 200-44015-8, 460-159044-24	180-79433-2
Sample Name	CFSB-027-SO-0.5-2	CFSB-028-SO-0-0.5	CFSB-028-SO-0.5-2	CFSB-030-SO-0-0.5	CFSB-030-SO-0.5-2	CFSB-199-SO-0-0.5	CFSB-199-SO-0.5-2	CFSB-DUP46-SO	CFSB-201-SO-0-0.5	CFSB-201-SO-0.5-2	CFSB-201-SO-0-0.5	CFSB-202-SO-0-0.5	CFSB-202-SO-0.5-2	CFSB-202-SO-0-0.5
Sample Depth	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft
Chemical	6/13/2016	7/18/2016	7/18/2016	6/13/2016	6/13/2016	6/28/2018	6/28/2018	6/28/2018	6/22/2018	6/22/2018	6/29/2018	6/22/2018	6/22/2018	6/29/2018
Di-N-Butyl Phthalate	0.29 U	0.022 U	0.011 U	0.026 U	0.056 U	4.7 U	0.47 U	0.48 U	--	--	0.17 U	--	0.31 U	0.031 U
Di-N-Octylphthalate	0.49 U	0.038 U	0.018 U	0.043 U	0.096 U	6.2 U	0.63 U	0.64 U	--	--	0.22 U	--	0.41 U	0.042 U
Fluoranthene	100	7.5	0.011 U	11	14	270	27	17	--	--	2.3	--	1.2	1.8
Fluorene	3.4 J	0.21 J	0.0078 U	0.3 J	0.43 J	2.9	0.53	0.32	--	--	0.047 J	--	0.074 J	0.019
Hexachlorobenzene	0.39 U	0.03 U	0.015 U	0.035 U	0.076 U	0.77 U	0.078 U	0.078 U	--	--	0.027 U	--	0.051 U	0.0051 U
Hexachlorobutadiene	0.27 U	0.021 U	0.01 U	0.024 U	0.053 U	0.63 U	0.063 U	0.064 U	--	--	0.022 U	--	0.041 UJ	0.0042 U
Hexachlorocyclopentadiene	0.6 U	0.047 U	0.022 U	0.053 U	0.12 U	0.55 U	0.055 U	0.056 U	--	--	0.019 U	--	0.036 UJ	0.0037 U
Hexachloroethane	0.35 U	0.027 U	0.013 U	0.031 U	0.069 U	0.55 U	0.056 U	0.056 U	--	--	0.02 U	--	0.037 U	0.0037 U
Indeno(1,2,3-C,D)Pyrene	51	5.2	0.024 U	8.8	16	79	12 J	5.5 J	--	--	3.7	--	1.1	1.3
Isophorone	0.21 U	0.016 U	0.0077 U	0.018 U	0.04 U	0.55 U	0.055 U	0.056 U	--	--	0.019 U	--	0.036 U	0.0037 U
Naphthalene	0.81 J	0.077 J	0.0091 U	0.14 J	0.22 J	1.6 J	0.29	0.18 J	--	--	0.1	--	0.032 J	0.038
Nitrobenzene	0.3 U	0.024 U	0.011 U	0.027 U	0.059 U	3.9 U	0.4 U	0.4 U	--	--	0.14 U	--	0.26 U	0.026 U
N-Nitrosodi-N-Propylamine	0.32 U	0.025 U	0.012 U	0.029 U	0.063 U	0.73 U	0.074 U	0.074 U	--	--	0.026 U	--	0.048 U	0.0049 U
N-Nitrosodiphenylamine	0.87 U	0.068 U	0.032 U	0.078 U	0.17 U	3.6 U	0.36 U	0.36 U	--	--	0.13 U	--	0.24 U	0.024 U
Pentachlorophenol	1.2 U	0.091 U	0.043 U	0.1 U	0.23 U	17 U	1.7 U	1.8 U	--	--	0.61 U	--	1.1 U	0.12 U
Phenanthrene	43	3.7	0.0095 U	4.4	7.6	44	7.3 J	3.9 J	--	--	0.86	--	0.42	0.59
Phenol	0.31 U	0.024 U	0.012 U	0.028 U	0.26 J	3.2 U	0.33 U	0.33 U	--	--	0.11 U	--	0.21 U	0.022 U
Pyrene	87	7.7	0.016 U	9.6	15	290	30	20	--	--	2.9	--	1.1	1.8
SEMIVOLATILE ORGANIC COMPOUNDS-SIM (mg/kg)														
Acenaphthene	--	--	--	--	--	2.9 J	0.66 J	5.3 J	0.06 J	0.016 J	--	0.18 J	0.021 U	--
Acenaphthylene	--	--	--	--	--	1.2 U	0.28 U	1.5 U	0.037 U	0.0095 U	--	0.21 U	0.035 U	--
Anthracene	--	--	--	--	--	13	3.8 J	14 J	0.31	0.092	--	2.1	0.86	--
Benzo(A)Anthracene	--	--	--	--	--	79	16 J	96 J	2.2	0.66	--	9.1	1.6	--
Benzo(A)Pyrene	--	--	--	--	--	68	16 J	83 J	3.3	0.95	--	9.9	1.7	--
Benzo(B)Fluoranthene	--	--	--	--	--	110	27 J	110 J	5	1.6	--	24	4.4	--
Benzo(G,H,I)Perylene	--	--	--	--	--	63	13 J	61 J	4.8	1.5	--	12	2.2	--
Benzo(K)Fluoranthene	--	--	--	--	--	79	20	85	4.1	1.2	--	17	3.3	--
Benzo[E]Pyrene	--	--	--	--	--	76	19 J	71 J	3.9	1.1	--	15	2.7	--
C1-Chrysenes	--	--	--	--	--	34 J	7.9 J	36 J	1 J	0.32 J	--	5.1 J	0.99 J	--
C1-Fluoranthenes/Pyrenes	--	--	--	--	--	63 J	16 J	74 J	1.6 J	0.47 J	--	6.8 J	1.2 J	--
C1-Fluorenes	--	--	--	--	--	4.8 U	1.1 U	5.9 U	0.14 U	0.037 U	--	0.81 U	0.2 J	--
C1-Naphthalenes	--	--	--	--	--	4.8 U	1.1 U	5.9 U	0.14 U	0.037 U	--	0.81 U	0.14 U	--
C1-Phenanthrenes/Anthracenes	--	--	--	--	--	16 J	3.5 J	19 J	0.37 J	0.11 J	--	2.2 J	1 J	--
C2-Chrysenes	--	--	--	--	--	8.9 J	2.4 J	11 J	0.43 J	0.13 J	--	2.1 J	0.42 J	--
C2-Fluorenes	--	--	--	--	--	4.8 U	1.1 U	5.9 U	0.14 U	0.037 U	--	0.81 U	0.51 J	--
C2-Naphthalenes	--	--	--	--	--	4.8 U	1.1 U	5.9 U	0.14 U	0.037 U	--	0.81 U	0.14 U	--
C2-Phenanthrenes/Anthracenes	--	--	--	--	--	10 J	2.2 J	8.7 J	0.23 J	0.062 J	--	1.6 J	0.88 J	--
C3-Chrysenes	--	--	--	--	--	4.9 J	1.1 U	5.9 U	0.14 U	0.037 J	--	0.81 U	0.22 J	--
C3-Fluorenes	--	--	--	--	--	4.8 U	1.1 U	5.9 U	0.14 U	0.037 U	--	0.81 U	0.14 U	--
C3-Naphthalenes	--	--	--	--	--	4.8 U	1.1 J	5.9 UJ	0.14 U	0.037 U	--	0.81 U	0.14 U	--
C3-Phenanthrenes/Anthracenes	--	--	--	--	--	5.2 J	1.2 J	5.9 UJ	0.15 J	0.039 J	--	0.82 J	0.44 J	--
C4 Chrysenes	--	--	--	--	--	4.8 U	1.1 U	5.9 U	0.14 U	0.037 U	--	0.81 U	0.14 U	--
C4-Naphthalenes	--	--	--	--	--	4.8 U	1.1 U	5.9 U	0.14 U	0.037 U	--	0.81 U	0.29 J	--
C4-Phenanthrenes/Anthracenes	--	--	--	--	--	4.8 U	1.1 U	5.9 U	0.14 U	0.037 U	--	0.81 U	0.21 J	--
Chrysene	--	--	--	--	--	110	27 J	140 J	3.2	0.91	--	11	2	--
Dibenz(A,H)Anthracene	--	--	--	--	--	20	4.3 J	21 J	1.2	0.36	--	4.2	0.73	--
Fluoranthene	--	--	--	--	--	220	42 J	200 J	3.1	0.91	--	11	1.9	--
Fluorene	--	--	--	--	--	2.1 J	0.57 J	4.6 J	0.054 U	0.014 U	--	0.3 U	0.051 U	--
Indeno(1,2,3-C,D)Pyrene	--	--	--	--	--	57	12 J	56 J	4.2	1.3	--	12	2.1	--
Naphthalene	--	--	--	--	--	1.9 U	0.42 UJ	3.4 J	0.056 U	0.014 U	--	0.32 U	0.053 U	--
Perylene	--	--	--	--	--	19	4.7 J	22 J	0.87	0.24	--	2.5	0.43	--
Phenanthrene	--	--	--	--	--	31	7.4 J	63 J	0.75	0.23	--	2.7	0.48	--
Pyrene	--	--	--	--	--	190	38 J	190 J	3.7	1.1	--	13	2.1	--
VOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,1,1-Trichloroethane	0.00042 U	--	0.00038 U	--	0.00044 U	--	--	--	--	--	--	--	--	--
1,1,2,2-Tetrachloroethane	0.00019 U	--	0.00017 U	--	0.0002 U	--	--	--	--	--	--	--	--	--
1,1,2-Trichloro-1,2,2-Trifluoroethane	0.00048 U	--	0.00044 U	--	0.00051 U	--	--	--	--	--	--	--	--	--
1,1,2-Trichloroethane	0.00031 U	--	0.00028 U	--	0.00033 U	--	--	--	--	--	--	--	--	--

Table E-4
Summary of Data Used in Risk Assessment
North Percolation Pond Area Soil (0-2 ft-bgs) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-027	CFSB-028	CFSB-028	CFSB-030	CFSB-030	CFSB-199	CFSB-199	CFSB-199-DUP	CFSB-201	CFSB-201	CFSB-201	CFSB-202	CFSB-202	CFSB-202
Sample Lab IDs	460-115528-19	460-117381-1	460-117381-2	460-115528-20	460-115528-23	180-79434-34, 200-44138-3, 460-159538-4	180-79434-35, 200-44138-4, 460-159538-5	180-79434-36, 200-44138-5, 460-159538-6	180-79204-15, 200-44015-5, 460-159044-21	200-44015-6, 460-159044-22	180-79433-1	180-79204-17, 200-44015-7, 460-159044-23	180-79204-18, 200-44015-8, 460-159044-24	180-79433-2
Sample Name	CFSB-027-SO-0.5-2	CFSB-028-SO-0-0.5	CFSB-028-SO-0.5-2	CFSB-030-SO-0-0.5	CFSB-030-SO-0.5-2	CFSB-199-SO-0-0.5	CFSB-199-SO-0.5-2	CFSB-DUP46-SO	CFSB-201-SO-0-0.5	CFSB-201-SO-0.5-2	CFSB-201-SO-0-0.5	CFSB-202-SO-0-0.5	CFSB-202-SO-0.5-2	CFSB-202-SO-0-0.5
Sample Depth	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft
Chemical	6/13/2016	7/18/2016	7/18/2016	6/13/2016	6/13/2016	6/28/2018	6/28/2018	6/28/2018	6/22/2018	6/22/2018	6/29/2018	6/22/2018	6/22/2018	6/29/2018
1,1-Dichloroethane	0.00037 U	--	0.00034 U	--	0.0004 U	--	--	--	--	--	--	--	--	--
1,1-Dichloroethene	0.00045 U	--	0.00041 U	--	0.00048 U	--	--	--	--	--	--	--	--	--
1,2,3-Trichlorobenzene	0.00012 U	--	0.00011 UJ	--	0.00013 U	--	--	--	--	--	--	--	--	--
1,2,4-Trichlorobenzene	0.00035 U	--	0.00032 U	--	0.00037 U	--	--	--	--	--	--	--	--	--
1,2-Dibromo-3-Chloropropane	0.00052 U	--	0.00047 U	--	0.00055 U	--	--	--	--	--	--	--	--	--
1,2-Dibromoethane (Ethylene Dibromide)	0.00013 U	--	0.00012 U	--	0.00014 U	--	--	--	--	--	--	--	--	--
1,2-Dichlorobenzene	0.00015 U	--	0.00014 U	--	0.00016 U	--	--	--	--	--	--	--	--	--
1,2-Dichloroethane	0.00012 U	--	0.00011 U	--	0.00013 U	--	--	--	--	--	--	--	--	--
1,2-Dichloropropane	0.00019 U	--	0.00017 U	--	0.0002 U	--	--	--	--	--	--	--	--	--
1,3-Dichlorobenzene	0.00013 U	--	0.00012 U	--	0.00014 U	--	--	--	--	--	--	--	--	--
1,4-Dichlorobenzene	0.00014 U	--	0.00013 U	--	0.00015 U	--	--	--	--	--	--	--	--	--
2-Hexanone	0.001 U	--	0.00095 U	--	0.0011 U	--	--	--	--	--	--	--	--	--
Acetone	0.036 J+	--	0.018 J+	--	0.23 J+	--	--	--	--	--	--	--	--	--
Benzene	0.0031	--	0.0011	--	0.00043 J	--	--	--	--	--	--	--	--	--
Bromochloromethane	0.00019 U	--	0.00017 U	--	0.0002 U	--	--	--	--	--	--	--	--	--
Bromodichloromethane	0.00042 U	--	0.00038 U	--	0.00044 U	--	--	--	--	--	--	--	--	--
Bromoform	0.00014 U	--	0.00013 UJ	--	0.00015 U	--	--	--	--	--	--	--	--	--
Bromomethane	0.00035 U	--	0.00032 U	--	0.00037 U	--	--	--	--	--	--	--	--	--
Carbon Disulfide	0.005	--	0.00043 U	--	0.0059	--	--	--	--	--	--	--	--	--
Carbon Tetrachloride	0.00047 U	--	0.00043 U	--	0.0005 U	--	--	--	--	--	--	--	--	--
Chlorobenzene	0.00015 U	--	0.00014 U	--	0.00016 U	--	--	--	--	--	--	--	--	--
Chloroethane	0.00038 U	--	0.00035 U	--	0.00041 U	--	--	--	--	--	--	--	--	--
Chloroform	0.00023 U	--	0.00021 U	--	0.00024 U	--	--	--	--	--	--	--	--	--
Chloromethane	0.00042 U	--	0.00038 U	--	0.00044 U	--	--	--	--	--	--	--	--	--
Cis-1,2-Dichloroethylene	0.00024 U	--	0.00022 U	--	0.00026 U	--	--	--	--	--	--	--	--	--
Cis-1,3-Dichloropropene	0.00016 U	--	0.00015 U	--	0.00017 U	--	--	--	--	--	--	--	--	--
Cyclohexane	0.0086 J+	--	0.003	--	0.00054 U	--	--	--	--	--	--	--	--	--
Dibromochloromethane	0.00016 U	--	0.00015 U	--	0.00017 U	--	--	--	--	--	--	--	--	--
Dichlorodifluoromethane	0.00035 U	--	0.00032 UJ	--	0.00037 U	--	--	--	--	--	--	--	--	--
Ethylbenzene	0.0038	--	0.0015	--	0.00021 U	--	--	--	--	--	--	--	--	--
Isopropylbenzene (Cumene)	0.00052 J	--	0.0002 J	--	0.0002 U	--	--	--	--	--	--	--	--	--
M,P-Xylene	0.0091	--	0.0028	--	0.00013 U	--	--	--	--	--	--	--	--	--
Methyl Acetate	0.00099 U	--	0.00091 U	--	0.001 U	--	--	--	--	--	--	--	--	--
Methyl Ethyl Ketone (2-Butanone)	0.002 J	--	0.00077 U	--	0.024	--	--	--	--	--	--	--	--	--
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	0.0024 U	--	0.0022 U	--	0.0026 U	--	--	--	--	--	--	--	--	--
Methylcyclohexane	0.015 J+	--	0.0052	--	0.00058 U	--	--	--	--	--	--	--	--	--
Methylene Chloride	0.00035 U	--	0.00032 U	--	0.00037 U	--	--	--	--	--	--	--	--	--
O-Xylene (1,2-Dimethylbenzene)	0.0032	--	0.00094 J	--	0.00019 U	--	--	--	--	--	--	--	--	--
Styrene	0.00016 U	--	0.00015 U	--	0.00017 U	--	--	--	--	--	--	--	--	--
Tert-Butyl Methyl Ether	0.00019 U	--	0.00017 U	--	0.0002 U	--	--	--	--	--	--	--	--	--
Tetrachloroethylene (PCE)	0.00031 U	--	0.00028 U	--	0.00033 U	--	--	--	--	--	--	--	--	--
Toluene	0.013	--	0.0047	--	0.00033 J	--	--	--	--	--	--	--	--	--
Trans-1,2-Dichloroethene	0.00043 U	--	0.00039 U	--	0.00045 U	--	--	--	--	--	--	--	--	--
Trans-1,3-Dichloropropene	0.00011 U	--	0.0001 U	--	0.00012 U	--	--	--	--	--	--	--	--	--
Trichloroethylene (TCE)	0.00029 U	--	0.00026 U	--	0.0003 U	--	--	--	--	--	--	--	--	--
Trichlorofluoromethane	0.00037 U	--	0.00034 U	--	0.0004 U	--	--	--	--	--	--	--	--	--
Vinyl Chloride	0.00043 U	--	0.00039 U	--	0.00045 U	--	--	--	--	--	--	--	--	--

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-4
Summary of Data Used in Risk Assessment
North Percolation Pond Area Soil (0-2 ft-bgs) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-203	CFSB-203	CFSB-203-DUP	CFSB-204	CFSB-204	CFSB-214	CFSB-214	CFSB-272	CFSB-272	CFSB-272	CFSB-272	CFSB-273	CFSB-273	CFSB-273
Sample Lab IDs	180-79434-41, 200-44138-6, 460-159538-12	180-79434-42, 200-44138-7, 460-159538-13	180-79434-43, 200-44138-8, 460-159538-18	180-79204-13, 460-159044-19	460-159044-20	180-79204-5, 200-44015-10, 460-159044-5	180-79204-6, 200-44015-11, 460-159044-6	180-77440-14, 460-155481-14	180-77440-15, 460-155481-15	200-44138-1	200-44138-2	180-77440-1, 460-155481-1	180-77440-2, 460-155481-2	460-159044-9
Sample Name	CFSB-203-SO-0-0.5	CFSB-203-SO-0.5-2	CFSB-DUP47-SO	CFSB-204-SO-0-0.5	CFSB-204-SO-0.5-2	CFSB-214-SO-0-0.5	CFSB-214-SO-0.5-2	CFSB-272-SO-0-0.5	CFSB-272-SO-0.5-2	CFSB-272-SO-0-0.5	CFSB-272-SO-0.5-2	CFSB-273-SO-0-0.5	CFSB-273-SO-0.5-2	CFSB-273-SO-0-0.5
Sample Depth	0-0.5 ft	0.5-2 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft
Chemical	6/28/2018	6/28/2018	6/28/2018	6/22/2018	6/22/2018	6/22/2018	6/22/2018	5/4/2018	5/4/2018	6/28/2018	6/28/2018	5/4/2018	5/4/2018	6/22/2018
GENERAL CHEMISTRY (mg/kg)														
Fluoride	21.5	29.8	40.4	13.7 J-	10.2 J-	51.3 J-	16.7 J-	118 J	107 J	--	--	174 J	306 J	--
Cyanide	1.2 J+	0.78 J	1.5 J	6.4	3.5	0.52	0.22 J	2 J+	1.3 J+	--	--	64.4 J+	68.3 J+	--
METALS (mg/kg)														
"Chromium, Hexavalent - Estimated"	0.206083	0.262287	0.653041	0.987591	0.460341	--	--	0.594161	0.382725	--	--	0.60219	0.778832	--
"Chromium, Trivalent - Calculated"	--	--	--	--	--	6.805	5.52	--	--	--	--	--	--	8.71
"Chromium, Trivalent - Estimated"	7.49392	9.53771	23.747	35.9124	16.7397	--	--	21.6058	13.9173	--	--	21.8978	28.3212	--
Aluminum	10900 J	14400 J	22100	33500	22600	25500	6290	24800	14000	--	--	63300	69600	--
Antimony	0.27 U	0.29 U	0.32 UJ	0.4 U	0.32 U	0.53 J	0.23 U	0.43 J	0.34 U	--	--	0.92 J	1 J	--
Arsenic	2.5	5.7	5	10.6	9.4	5.4	2.4	8.5	6.9	--	--	14.3	34.1	--
Barium	19.6 J+	51.2 J+	58.6	217	112	128	43.5	101	84.9	--	--	258	1560	--
Beryllium	0.34 J	0.47	0.58	2.1	1.9	0.53	0.31 J	0.97	0.52	--	--	4.9	7.1	--
Cadmium	0.54 J	0.5 J	0.93 J	2.6	1.6	0.95 J	0.27 U	1.4	0.39 U	--	--	2.8	5.8	--
Calcium	427	1800	1720	4550	4080	20700	9770	3240	9920	--	--	23100	51300	--
Chromium, Total	7.7	9.8 J	24.4 J	36.9	17.2	7.2	5.6	22.2	14.3	--	--	22.5	29.1	8.8
Cobalt	1.2 J	3.4	3.6	4.5	5.8	4.2	3.3	5	5	--	--	7.2	7.4	--
Copper	6.4	10.6	14.7	65.4	23.3	23.8	11.7	27.7	15.9	--	--	32.5	9.7	--
Iron	1330 J+	8280 J+	5740	3500	10100	6770	7960	7360	9720	--	--	7090	11600	--
Lead	19.9 J	12 J	19.8	33.8	25.6	18.3	6.4	30.5	15.9	--	--	83.9	126	--
Magnesium	442 J	4390 J	3190	1280	6610	4060	5570	3490	6580	--	--	3250	6280	--
Manganese	12.8 J	87.5 J	47.5 J	29.9	108	256	189	88	88.7	--	--	42.6	136	--
Mercury	0.0099 U	0.01 U	0.012 U	0.058	0.025	0.04	0.047	0.029 J+	0.015 J+	--	--	0.12 J+	0.046 J+	--
Nickel	47	42.8 J	85.5 J	213	126	103	10.3	136	62.3	--	--	276	305	--
Potassium	101	459	374 J+	251	525	941	451	550	880	--	--	890	2150	--
Selenium	0.65 J	0.34 J	0.78 J	0.4 U	0.32 U	0.47 J	0.23 U	0.98 J	0.66 J	--	--	1 J	1.7 J	--
Silver	0.58 U	0.6 U	0.67 U	0.85 U	0.68 U	0.77 U	0.49 U	0.71 U	0.72 U	--	--	0.96 U	1 U	--
Sodium	69.9 J	30.5 U	100 J	122 J	76.7 J	134	28.3 J	316	117	--	--	1410	2390	--
Thallium	0.14 J	0.19 J	0.23 J	0.21 J	0.21 J	0.16 U	0.099 U	0.46	0.42 J	--	--	0.99	2.3	--
Vanadium	18.2	30.6	45.2	57.4	26.3	28.4	6.1	61	37.7	--	--	101	125	--
Zinc	107	108	165	351	173	136	29.2	185	91.8	--	--	312	675	--
METALS|HEXAVALENT CHROMIUM (mg/kg)														
Chromium, Hexavalent	--	--	--	--	--	0.79 UJ	0.16 UJ	--	--	--	--	--	--	0.18 UJ
PESTICIDES (mg/kg)														
Aldrin	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Alpha Bhc (Alpha Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Alpha Endosulfan	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Beta Bhc (Beta Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Beta Endosulfan	--	--	--	--	--	--	--	--	--	--	--	--	--	--
cis-Chlordane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Delta BHC (Delta Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dieldrin	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endosulfan Sulfate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin Aldehyde	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin Ketone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Gamma Bhc (Lindane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Heptachlor	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Heptachlor Epoxide	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methoxychlor	--	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDD	--	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDT	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Toxaphene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
trans-Chlordane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
POLYCHLORINATED BIPHENYLS (mg/kg)														
PCB-1016 (Aroclor 1016)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1221 (Aroclor 1221)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1232 (Aroclor 1232)	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Table E-4
Summary of Data Used in Risk Assessment
North Percolation Pond Area Soil (0-2 ft-bgs) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Sample Depth Chemical	CFSB-203 180-79434-41, 200-44138-6, 460-159538-12 CFSB-203-SO-0-0.5 0-0.5 ft 6/28/2018	CFSB-203 180-79434-42, 200-44138-7, 460-159538-13 CFSB-203-SO-0.5-2 0.5-2 ft 6/28/2018	CFSB-203-DUP 180-79434-43, 200-44138-8, 460-159538-18 CFSB-DUP47-SO 0.5-2 ft 6/28/2018	CFSB-204 180-79204-13, 460-159044-19 CFSB-204-SO-0-0.5 0-0.5 ft 6/22/2018	CFSB-204 460-159044-20 CFSB-204-SO-0.5-2 0.5-2 ft 6/22/2018	CFSB-214 180-79204-5, 200-44015-10, 460-159044-5 CFSB-214-SO-0-0.5 0-0.5 ft 6/22/2018	CFSB-214 180-79204-6, 200-44015-11, 460-159044-6 CFSB-214-SO-0.5-2 0.5-2 ft 6/22/2018	CFSB-272 180-77440-14, 460-155481-14 CFSB-272-SO-0-0.5 0-0.5 ft 5/4/2018	CFSB-272 180-77440-15, 460-155481-15 CFSB-272-SO-0.5-2 0.5-2 ft 5/4/2018	CFSB-272 200-44138-1 CFSB-272-SO-0-0.5 0-0.5 ft 6/28/2018	CFSB-272 200-44138-2 CFSB-272-SO-0.5-2 0.5-2 ft 6/28/2018	CFSB-273 180-77440-1, 460-155481-1 CFSB-273-SO-0-0.5 0-0.5 ft 5/4/2018	CFSB-273 180-77440-2, 460-155481-2 CFSB-273-SO-0.5-2 0.5-2 ft 5/4/2018	CFSB-273 460-159044-9 CFSB-273-SO-0-0.5 0-0.5 ft 6/22/2018
PCB-1242 (Aroclor 1242)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1248 (Aroclor 1248)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1254 (Aroclor 1254)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1260 (Aroclor 1260)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1262 (Aroclor 1262)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1268 (Aroclor 1268)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Polychlorinated Biphenyl (PCBs)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SEMIVOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,2,4,5-Tetrachlorobenzene	3.7 U	2.8 U	2.4 U	0.23 U	--	0.052 U	0.0077 U	8.6 U	3 U	--	--	0.12 U	0.049 U	--
1,4-Dioxane (P-Dioxane)	27 U	20 U	18 U	1.7 U	--	0.37 U	0.056 U	62 U	21 U	--	--	0.84 U	0.35 U	--
2,3,4,6-Tetrachlorophenol	36 U	27 U	23 U	2.2 U	--	0.5 UJ	0.075 UJ	83 U	29 U	--	--	1.1 U	0.47 U	--
2,4,5-Trichlorophenol	6.1 U	4.6 U	4 U	0.38 U	--	0.086 U	0.013 U	14 U	4.9 U	--	--	0.19 U	0.081 U	--
2,4,6-Trichlorophenol	4.7 U	3.5 U	3.1 U	0.29 U	--	0.066 U	0.0098 U	11 U	3.8 U	--	--	0.15 U	0.062 U	--
2,4-Dichlorophenol	6.6 U	5 U	4.3 U	0.41 U	--	0.092 U	0.014 U	15 U	5.3 U	--	--	0.21 U	0.088 U	--
2,4-Dimethylphenol	5.3 U	4 U	3.5 U	0.33 U	--	0.074 U	0.011 U	12 U	4.3 U	--	--	0.17 U	0.071 U	--
2,4-Dinitrophenol	230 U	170 U	150 U	14 U	--	3.2 UJ	0.48 UJ	540 U	190 U	--	--	7.2 U	3.1 U	--
2,4-Dinitrotoluene	4.3 U	3.2 U	2.8 U	0.27 U	--	0.06 U	0.0089 U	9.9 U	3.4 U	--	--	0.13 U	0.057 U	--
2,6-Dinitrotoluene	5.3 U	4 U	3.5 U	0.33 U	--	0.074 U	0.011 U	12 U	4.3 U	--	--	0.17 U	0.07 U	--
2-Chloronaphthalene	3.9 U	3 U	2.6 U	0.24 U	--	0.055 U	0.0082 U	9.2 U	3.2 U	--	--	0.12 U	0.052 U	--
2-Chlorophenol	4 U	3 U	2.6 U	0.25 U	--	0.056 U	0.0083 U	9.3 U	3.2 U	--	--	0.13 U	0.053 U	--
2-Methylnaphthalene	6.9 J	3.1 U	4.2 J	0.32 J	--	0.058 U	0.013 J	9.6 U	3.3 U	--	--	1.2	2.7	--
2-Methylphenol (O-Cresol)	25 U	18 U	16 U	1.5 U	--	0.34 U	0.051 U	57 U	20 U	--	--	0.77 U	0.33 U	--
2-Nitroaniline	39 U	29 U	26 U	2.4 U	--	0.55 U	0.082 U	91 U	31 U	--	--	1.2 U	0.52 U	--
2-Nitrophenol	4.9 U	3.7 U	3.2 U	0.3 U	--	0.069 U	0.01 U	11 U	3.9 U	--	--	0.15 U	0.065 U	--
3- And 4- Methylphenol (Total)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3,3'-Dichlorobenzidine	80 U	60 U	53 U	5 U	--	1.1 U	0.17 U	190 U	64 U	--	--	2.5 U	1.1 U	--
3-Nitroaniline	22 U	16 U	14 U	1.4 U	--	0.31 U	0.046 U	51 U	18 U	--	--	0.68 U	0.29 U	--
4,6-Dinitro-2-Methylphenol	150 U	110 U	97 U	9.2 U	--	2.1 U	0.31 U	340 U	120 U	--	--	4.6 U	2 U	--
4-Bromophenyl Phenyl Ether	6 U	4.5 U	3.9 U	0.37 U	--	0.084 U	0.013 U	14 U	4.8 U	--	--	0.19 U	0.079 U	--
4-Chloro-3-Methylphenol	4 U	3 U	2.7 U	0.25 U	--	0.056 U	0.0084 U	9.4 U	3.2 U	--	--	0.13 U	0.053 U	--
4-Chloroaniline	2.9 U	2.1 U	1.9 U	0.18 U	--	0.04 U	0.006 U	6.7 U	2.3 U	--	--	0.09 U	0.038 U	--
4-Chlorophenyl Phenyl Ether	5.2 U	3.9 U	3.4 U	0.32 U	--	0.073 U	0.011 U	12 U	4.2 U	--	--	0.16 U	0.069 U	--
4-Nitroaniline	4.2 U	3.1 U	2.7 U	0.26 U	--	0.058 U	0.0087 U	9.7 U	3.3 U	--	--	0.13 U	0.055 U	--
4-Nitrophenol	60 U	45 U	40 U	3.7 U	--	0.84 UJ	0.13 UJ	140 U	48 U	--	--	1.9 U	0.8 U	--
Acenaphthene	150	36 J	67 J	1.5	--	0.29	0.063	46	40	--	--	19	15	--
Acenaphthylene	3.8 U	2.8 U	2.5 U	0.23 J	--	0.053 U	0.0078 U	8.7 U	3 U	--	--	0.85	0.65	--
Acetophenone	4.6 U	3.5 U	3.1 U	0.29 U	--	0.065 U	0.0097 U	11 U	3.7 U	--	--	0.15 U	0.062 U	--
Anthracene	200	61 J	120 J	5	--	0.58	0.12	66	51	--	--	54	64	--
Atrazine	38 UJ	28 UJ	25 UJ	2.3 UJ	--	0.53 UJ	0.078 UJ	87 U	30 UJ	--	--	1.2 U	0.5 U	--
Benzaldehyde	11 U	8 U	7 U	0.66 UR	--	0.15 UR	0.022 UR	25 U	8.6 U	--	--	0.33 U	0.14 U	--
Benzo(A)Anthracene	1700	450 J	780 J	24	--	3.1	0.56	560	400	--	--	130	84	--
Benzo(A)Pyrene	2000	480 J	830 J	36	--	4.2	0.74	590	490	--	--	100	60	--
Benzo(B)Fluoranthene	2800	680	1100	64	--	5.3	1	880	670	--	--	190	120	--
Benzo(G,H,I)Perylene	2100	490 J	850 J	43	--	3.6	0.83	540	450	--	--	86	52	--
Benzo(K)Fluoranthene	870	220 J	390 J	24	--	1.9	0.44	290	210	--	--	62	37	--
Benzyl Butyl Phthalate	59 U	44 U	39 U	3.7 U	--	0.82 U	0.12 U	140 U	47 U	--	--	1.8 U	0.78 U	--
Biphenyl (Diphenyl)	3.6 U	2.7 U	2.4 U	0.22 U	--	0.05 U	0.0075 J	8.4 U	2.9 U	--	--	0.55 J	0.33 J	--
Bis(2-Chloroethoxy) Methane	4.1 U	3.1 U	2.7 U	0.25 U	--	0.057 U	0.0085 U	9.5 U	3.3 U	--	--	0.13 U	0.054 U	--
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	3.1 U	2.3 U	2 U	0.19 U	--	0.044 U	0.0065 U	7.3 U	2.5 U	--	--	0.098 U	0.041 U	--
Bis(2-Chloroisopropyl) Ether	6.3 U	4.8 U	4.2 U	0.39 U	--	0.089 U	0.013 U	15 U	5.1 U	--	--	0.2 U	0.084 U	--
Bis(2-Ethylhexyl) Phthalate	91 U	68 U	60 U	5.7 U	--	1.3 U	0.19 U	210 U	73 U	--	--	2.9 U	1.2 U	--
Caprolactam	56 U	42 U	37 U	3.5 U	--	0.78 U	0.12 U	130 U	45 U	--	--	1.8 U	0.74 U	--
Carbazole	190	57	94	3.5	--	0.67	0.15	56	44	--	--	11	7.5	--
Chrysene	1900	510	820	33	--	4.4	0.86	590	460	--	--	190	130	--
Dibenz(A,H)Anthracene	490	120 J	210 J	11	--	0.97	0.16	140	81	--	--	29	21	--
Dibenzofuran	28 J	9.2 J	15 J	0.6 J	--	0.11 J	0.027 J	8.7 U	6.6 J	--	--	4.2	4	--
Diethyl Phthalate	26 U	19 U	17 U	1.6 U	--	0.36 U	0.054 U	60 U	21 U	--	--	0.81 U	0.34 U	--
Dimethyl Phthalate	3.1 U	2.3 U	2 U	0.19 U	--	0.044 U	0.0065 U	7.3 U	2.5 U	--	--	0.098 U	0.041 U	--

Table E-4
Summary of Data Used in Risk Assessment
North Percolation Pond Area Soil (0-2 ft-bgs) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-203	CFSB-203	CFSB-203-DUP	CFSB-204	CFSB-204	CFSB-214	CFSB-214	CFSB-272	CFSB-272	CFSB-272	CFSB-272	CFSB-273	CFSB-273	CFSB-273
Sample Lab IDs	180-79434-41, 200-44138-6, 460-159538-12	180-79434-42, 200-44138-7, 460-159538-13	180-79434-43, 200-44138-8, 460-159538-18	180-79204-13, 460-159044-19	460-159044-20	180-79204-5, 200-44015-10, 460-159044-5	180-79204-6, 200-44015-11, 460-159044-6	180-77440-14, 460-155481-14	180-77440-15, 460-155481-15	200-44138-1	200-44138-2	180-77440-1, 460-155481-1	180-77440-2, 460-155481-2	460-159044-9
Sample Name	CFSB-203-SO-0-0.5	CFSB-203-SO-0.5-2	CFSB-DUP47-SO	CFSB-204-SO-0-0.5	CFSB-204-SO-0.5-2	CFSB-214-SO-0-0.5	CFSB-214-SO-0.5-2	CFSB-272-SO-0-0.5	CFSB-272-SO-0.5-2	CFSB-272-SO-0-0.5	CFSB-272-SO-0.5-2	CFSB-273-SO-0-0.5	CFSB-273-SO-0.5-2	CFSB-273-SO-0-0.5
Sample Depth	0-0.5 ft	0.5-2 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft
Chemical	6/28/2018	6/28/2018	6/28/2018	6/22/2018	6/22/2018	6/22/2018	6/22/2018	5/4/2018	5/4/2018	6/28/2018	6/28/2018	5/4/2018	5/4/2018	6/22/2018
Di-N-Butyl Phthalate	38 U	28 U	25 U	2.3 U	--	0.53 U	0.078 U	87 U	30 U	--	--	1.2 U	0.5 U	--
Di-N-Octylphthalate	50 U	37 U	33 U	3.1 U	--	0.7 U	0.1 U	120 U	40 U	--	--	1.6 U	0.66 U	--
Fluoranthene	2800	740 J	1400 J	42	--	5.5	1.1	880	620	--	--	480	350	--
Fluorene	61	19 J	35 J	0.71 J	--	0.18 J	0.043	20 J	16	--	--	10	13	--
Hexachlorobenzene	6.1 U	4.6 U	4 U	0.38 U	--	0.086 U	0.013 U	14 U	4.9 U	--	--	0.19 U	0.081 U	--
Hexachlorobutadiene	5 U	3.8 U	3.3 U	0.31 UJ	--	0.07 U	0.01 U	12 U	4 U	--	--	0.16 U	0.066 U	--
Hexachlorocyclopentadiene	4.4 U	3.3 U	2.9 U	0.27 UJ	--	0.061 UJ	0.0091 UJ	10 U	3.5 U	--	--	0.14 U	0.058 U	--
Hexachloroethane	4.4 U	3.3 U	2.9 U	0.27 U	--	0.062 U	0.0092 U	10 U	3.6 U	--	--	0.14 U	0.059 U	--
Indeno(1,2,3-C,D)Pyrene	1600	390 J	680 J	37	--	3.1	0.63	440	350	--	--	91	44	--
Isophorone	4.4 U	3.3 U	2.9 U	0.27 U	--	0.061 U	0.0091 U	10 U	3.5 U	--	--	0.14 U	0.058 U	--
Naphthalene	17	5.6 J	10 J	0.56 J	--	0.076 J	0.018 J	7.8 U	4.6 J	--	--	1.5	1.3	--
Nitrobenzene	31 U	24 U	21 U	1.9 U	--	0.44 U	0.066 U	73 U	25 U	--	--	0.98 U	0.42 U	--
N-Nitrosodi-N-Propylamine	5.8 U	4.4 U	3.8 U	0.36 U	--	0.081 U	0.012 U	14 U	4.7 U	--	--	0.18 U	0.077 U	--
N-Nitrosodiphenylamine	29 U	21 U	19 U	1.8 U	--	0.4 U	0.06 U	67 U	23 U	--	--	0.9 U	0.38 U	--
Pentachlorophenol	140 U	100 U	90 U	8.6 U	--	1.9 UJ	0.29 UJ	320 U	110 U	--	--	4.3 U	1.8 U	--
Phenanthrene	960	290 J	520 J	16	--	2.9	0.61	290	230	--	--	110	140	--
Phenol	26 U	19 U	17 U	1.6 U	--	0.36 U	0.054 U	61 U	21 U	--	--	0.81 U	0.34 U	--
Pyrene	2400	680 J	1300 J	39	--	5.6	1	750	570	--	--	420	270	--
SEMIVOLATILE ORGANIC COMPOUNDS-SIM (mg/kg)														
Acenaphthene	190	24 J	100 J	--	--	0.39	0.097	--	--	130	54	--	--	--
Acenaphthylene	26 U	6.2 U	14 U	--	--	0.041 U	0.0092 U	--	--	0.89 J	0.68 U	--	--	--
Anthracene	250	52 J	180 J	--	--	0.9	0.31	--	--	180	80	--	--	--
Benzo(A)Anthracene	2700	350 J	1300 J	--	--	4.1	1.1	--	--	1700	780	--	--	--
Benzo(A)Pyrene	3100	430 J	1700 J	--	--	4.7	1.3	--	--	1900	900	--	--	--
Benzo(B)Fluoranthene	3000	450 J	1800 J	--	--	5	1.7	--	--	2100	990	--	--	--
Benzo(G,H,I)Perylene	2200	340 J	1200 J	--	--	3.7	1.2	--	--	1400	660	--	--	--
Benzo(K)Fluoranthene	2400	340 J	1200 J	--	--	4.1	1.3	--	--	1300	610	--	--	--
Benzo[E]Pyrene	2100	320 J	1200 J	--	--	3.5	1.1	--	--	1300	640	--	--	--
C1-Chrysenes	880 J	140 J	470 J	--	--	1.6 J	0.45 J	--	--	490 J	220 J	--	--	--
C1-Fluoranthenes/Pyrenes	1400 J	240 J	800 J	--	--	3 J	0.88 J	--	--	770 J	380 J	--	--	--
C1-Fluorenes	100 U	24 U	55 U	--	--	0.16 U	0.036 U	--	--	13 J	8.3 J	--	--	--
C1-Naphthalenes	100 U	24 U	55 U	--	--	0.16 U	0.036 U	--	--	8.3 J	3.4 J	--	--	--
C1-Phenanthrenes/Anthracenes	360 J	74 J	230 J	--	--	1 J	0.29 J	--	--	220 J	95 J	--	--	--
C2-Chrysenes	230 J	38 J	110 J	--	--	0.58 J	0.16 J	--	--	150 J	71 J	--	--	--
C2-Fluorenes	100 U	24 U	55 U	--	--	0.16 U	0.036 U	--	--	9.5 J	5.4 J	--	--	--
C2-Naphthalenes	100 U	24 U	55 U	--	--	0.16 U	0.036 U	--	--	13 J	6.1 J	--	--	--
C2-Phenanthrenes/Anthracenes	160 J	32 J	89 J	--	--	0.45 J	0.15 J	--	--	98 J	43 J	--	--	--
C3-Chrysenes	100 U	24 U	55 U	--	--	0.27 J	0.072 J	--	--	46 J	25 J	--	--	--
C3-Fluorenes	100 U	24 U	55 U	--	--	0.16 U	0.036 U	--	--	20 J	9.6 J	--	--	--
C3-Naphthalenes	100 U	24 U	55 U	--	--	0.16 U	0.036 U	--	--	8.6 J	4.8 J	--	--	--
C3-Phenanthrenes/Anthracenes	100 U	24 U	55 U	--	--	0.25 J	0.096 J	--	--	47 J	19 J	--	--	--
C4 Chrysenes	100 U	24 U	55 U	--	--	0.16 U	0.037 J	--	--	16 J	9.1 J	--	--	--
C4-Naphthalenes	100 U	24 U	55 U	--	--	0.16 U	0.036 U	--	--	3.8 J	2.7 J	--	--	--
C4-Phenanthrenes/Anthracenes	100 U	24 U	55 U	--	--	0.16 U	0.058 J	--	--	12 J	6.7 J	--	--	--
Chrysene	2800	400 J	1400 J	--	--	5	1.6	--	--	1700	770	--	--	--
Dibenz(A,H)Anthracene	740	100 J	390 J	--	--	1.3	0.35	--	--	490	230	--	--	--
Fluoranthene	3700	700 J	2300 J	--	--	6.9	1.7	--	--	2200	1100	--	--	--
Fluorene	82 J	14 J	55 J	--	--	0.27	0.073	--	--	50	22	--	--	--
Indeno(1,2,3-C,D)Pyrene	2000	290 J	1100 J	--	--	3.5	1.1	--	--	1300	600	--	--	--
Naphthalene	39 U	9.5 U	21 U	--	--	0.11 J	0.028 J	--	--	12	5.5	--	--	--
Perylene	850	110 J	450 J	--	--	1.2	0.32	--	--	510	250	--	--	--
Phenanthrene	1300	230 J	920 J	--	--	3.7	1.1	--	--	760	360	--	--	--
Pyrene	3200	620 J	2100 J	--	--	7.2	1.7	--	--	2000	1000	--	--	--
VOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,1,1-Trichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,2,2-Tetrachloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,2-Trichloro-1,2,2-Trifluoroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,2-Trichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Table E-4
Summary of Data Used in Risk Assessment
North Percolation Pond Area Soil (0-2 ft-bgs) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-203	CFSB-203	CFSB-203-DUP	CFSB-204	CFSB-204	CFSB-214	CFSB-214	CFSB-272	CFSB-272	CFSB-272	CFSB-272	CFSB-273	CFSB-273	CFSB-273
Sample Lab IDs	180-79434-41, 200-44138-6, 460-159538-12	180-79434-42, 200-44138-7, 460-159538-13	180-79434-43, 200-44138-8, 460-159538-18	180-79204-13, 460-159044-19	460-159044-20	180-79204-5, 200-44015-10, 460-159044-5	180-79204-6, 200-44015-11, 460-159044-6	180-77440-14, 460-155481-14	180-77440-15, 460-155481-15	200-44138-1	200-44138-2	180-77440-1, 460-155481-1	180-77440-2, 460-155481-2	460-159044-9
Sample Name	CFSB-203-SO-0-0.5	CFSB-203-SO-0.5-2	CFSB-DUP47-SO	CFSB-204-SO-0-0.5	CFSB-204-SO-0.5-2	CFSB-214-SO-0-0.5	CFSB-214-SO-0.5-2	CFSB-272-SO-0-0.5	CFSB-272-SO-0.5-2	CFSB-272-SO-0-0.5	CFSB-272-SO-0.5-2	CFSB-273-SO-0-0.5	CFSB-273-SO-0.5-2	CFSB-273-SO-0-0.5
Sample Depth	0-0.5 ft	0.5-2 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft
Chemical	6/28/2018	6/28/2018	6/28/2018	6/22/2018	6/22/2018	6/22/2018	6/22/2018	5/4/2018	5/4/2018	6/28/2018	6/28/2018	5/4/2018	5/4/2018	6/22/2018
1,1-Dichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1-Dichloroethene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,3-Trichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,4-Trichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dibromo-3-Chloropropane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dibromoethane (Ethylene Dibromide)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichloropropane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,3-Dichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,4-Dichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Hexanone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acetone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromochloromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromodichloromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromoform	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromomethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Carbon Disulfide	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Carbon Tetrachloride	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chloroform	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chloromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cis-1,2-Dichloroethylene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cis-1,3-Dichloropropene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cyclohexane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibromochloromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dichlorodifluoromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Ethylbenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Isopropylbenzene (Cumene)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
M,P-Xylene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methyl Acetate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methyl Ethyl Ketone (2-Butanone)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methylcyclohexane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methylene Chloride	--	--	--	--	--	--	--	--	--	--	--	--	--	--
O-Xylene (1,2-Dimethylbenzene)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Styrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Tert-Butyl Methyl Ether	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Tetrachloroethylene (PCE)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Toluene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Trans-1,2-Dichloroethene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Trans-1,3-Dichloropropene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Trichloroethylene (TCE)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Trichlorofluoromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Vinyl Chloride	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-4
Summary of Data Used in Risk Assessment
North Percolation Pond Area Soil (0-2 ft-bgs) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-273	CFSB-279	CFSB-279	CFSB-279	CFSB-279	CFSB-280	CFSB-280	CFSB-280	CFSB-280	CFSB-281	CFSB-281	CFSB-281	CFSB-281	CFSB-019-DUP
Sample Lab IDs	460-159044-10	180-77673-11, 460-155989-31	180-77673-12, 460-155989-32	200-44015-1	200-44015-2	180-77673-16, 460-155989-38	180-77673-17, 460-155989-39	200-44015-3	200-44015-4	180-77440-8, 460-155481-8	180-77440-9, 460-155481-9	460-159044-7	460-159044-8	460-115008-12
Sample Name	CFSB-273-SO-0.5-2	CFSB-279-SO-0-0.5	CFSB-279-SO-0.5-2	CFSB-279-SO-0-0.5	CFSB-279-SO-0.5-2	CFSB-280-SO-0-0.5	CFSB-280-SO-0.5-2	CFSB-280-SO-0-0.5	CFSB-280-SO-0.5-2	CFSB-281-SO-0-0.5	CFSB-281-SO-0.5-2	CFSB-281-SO-0-0.5	CFSB-281-SO-0.5-2	CFSB-DUP13-SO
Sample Depth	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0.5-2 ft
Chemical	6/22/2018	5/8/2018	5/8/2018	6/22/2018	6/22/2018	5/8/2018	5/8/2018	6/22/2018	6/22/2018	5/4/2018	5/4/2018	6/22/2018	6/22/2018	6/4/2016
GENERAL CHEMISTRY (mg/kg)														
Fluoride	--	17.7 J	9.45 J	--	--	21.7 J	4.06 J	--	--	217 J	145 J	--	--	50.2 J
Cyanide	--	0.54	0.064 U	--	--	2.3	0.14 J	--	--	9.6 J+	31.9 J+	--	--	0.1 J
METALS (mg/kg)														
"Chromium, Hexavalent - Estimated"	--	0.444282	0.299757	--	--	0.634307	0.195377	--	--	0.864477	1.37835	--	--	0.289051
"Chromium, Trivalent - Calculated"	40.25	--	--	--	--	--	--	--	--	--	--	34.12	24.205	--
"Chromium, Trivalent - Estimated"	--	16.1557	10.9002	--	--	23.0657	7.10462	--	--	31.4355	50.1217	--	--	10.5109
Aluminum	--	7520	8750	--	--	30600	6730	--	--	67400	123000	--	--	7930 J
Antimony	--	0.25 UJ	0.24 UJ	--	--	0.29 U	0.26 U	--	--	2	2.6	--	--	0.38 UJ
Arsenic	--	2.6	5.6	--	--	13.1	12.3	--	--	21.1	32.3	--	--	3.8 J
Barium	--	47.9	70.6	--	--	171	73	--	--	222	526	--	--	85.6
Beryllium	--	0.47	0.31 J	--	--	3.1	0.66	--	--	4.4	15.7	--	--	0.39 J
Cadmium	--	0.29 J	0.28 U	--	--	2.8	0.3 U	--	--	5.4	9.6	--	--	0.29 UJ
Calcium	--	6400	27700	--	--	23000	14800	--	--	19400	82700	--	--	39300 J
Chromium, Total	40.4	16.6	11.2	--	--	23.7	7.3	--	--	32.3	51.5	34.8	24.4	10.8
Cobalt	--	2.9	4.8	--	--	5.5	4.4	--	--	12.9	16.8	--	--	5.7
Copper	--	19.6	12.4	--	--	37	19.1	--	--	57.1	29.7	--	--	202 J
Iron	--	4780	11600	--	--	7920	13900	--	--	8750	10700	--	--	11900
Lead	--	11.2	8.3	--	--	36.3	8.8	--	--	77.7	195	--	--	13.4 J
Magnesium	--	3680	13300	--	--	4930	7480	--	--	3620	7080	--	--	10300
Manganese	--	80.5 J	376 J	--	--	91	340	--	--	75.7	88.3	--	--	361 J
Mercury	--	0.018	0.026	--	--	0.029	0.014 J	--	--	0.088 J+	0.054 J+	--	--	0.014 U
Nickel	--	49.5	29.3	--	--	170	16.3	--	--	566	719	--	--	12.5 J
Potassium	--	347	531	--	--	521	493	--	--	668	2420	--	--	833 J+
Selenium	--	0.25 U	0.24 U	--	--	0.46 J	0.26 U	--	--	2.3 J	2.8 J	--	--	0.35 U
Silver	--	0.53 U	0.51 U	--	--	0.62 U	0.55 U	--	--	1 J	1.3 U	--	--	0.69 U
Sodium	--	28.4 J	28.7 J	--	--	112	27.7 U	--	--	774	1690	--	--	53 J
Thallium	--	0.11 U	0.1 U	--	--	0.22 J	0.11 U	--	--	0.78	4.5	--	--	0.14 U
Vanadium	--	19.7	10.8	--	--	40	14.8	--	--	167	186	--	--	11 J
Zinc	--	76.8	63.4	--	--	269	38.6	--	--	694	554	--	--	34.3 J
METALS|HEXAVALENT CHROMIUM (mg/kg)														
Chromium, Hexavalent	0.3 UJ	--	--	--	--	--	--	--	--	--	--	0.68 J-	0.39 UJ	--
PESTICIDES (mg/kg)														
Aldrin	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Alpha Bhc (Alpha Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Alpha Endosulfan	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Beta Bhc (Beta Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Beta Endosulfan	--	--	--	--	--	--	--	--	--	--	--	--	--	--
cis-Chlordane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Delta BHC (Delta Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dieldrin	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endosulfan Sulfate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin Aldehyde	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin Ketone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Gamma Bhc (Lindane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Heptachlor	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Heptachlor Epoxide	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methoxychlor	--	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDD	--	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDT	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Toxaphene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
trans-Chlordane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
POLYCHLORINATED BIPHENYLS (mg/kg)														
PCB-1016 (Aroclor 1016)	--	--	--	--	--	--	--	--	--	--	--	--	--	0.01 U
PCB-1221 (Aroclor 1221)	--	--	--	--	--	--	--	--	--	--	--	--	--	0.01 U
PCB-1232 (Aroclor 1232)	--	--	--	--	--	--	--	--	--	--	--	--	--	0.01 U

Table E-4
Summary of Data Used in Risk Assessment
North Percolation Pond Area Soil (0-2 ft-bgs) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-273	CFSB-279	CFSB-279	CFSB-279	CFSB-279	CFSB-280	CFSB-280	CFSB-280	CFSB-280	CFSB-281	CFSB-281	CFSB-281	CFSB-281	CFSB-019-DUP
Sample Lab IDs	460-159044-10	180-77673-11, 460-155989-31	180-77673-12, 460-155989-32	200-44015-1	200-44015-2	180-77673-16, 460-155989-38	180-77673-17, 460-155989-39	200-44015-3	200-44015-4	180-77440-8, 460-155481-8	180-77440-9, 460-155481-9	460-159044-7	460-159044-8	460-115008-12
Sample Name	CFSB-273-SO-0.5-2	CFSB-279-SO-0-0.5	CFSB-279-SO-0.5-2	CFSB-279-SO-0-0.5	CFSB-279-SO-0.5-2	CFSB-280-SO-0-0.5	CFSB-280-SO-0.5-2	CFSB-280-SO-0-0.5	CFSB-280-SO-0.5-2	CFSB-281-SO-0-0.5	CFSB-281-SO-0.5-2	CFSB-281-SO-0-0.5	CFSB-281-SO-0.5-2	CFSB-DUP13-SO
Sample Depth	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0.5-2 ft
Chemical	6/22/2018	5/8/2018	5/8/2018	6/22/2018	6/22/2018	5/8/2018	5/8/2018	6/22/2018	6/22/2018	5/4/2018	5/4/2018	6/22/2018	6/22/2018	6/4/2016
PCB-1242 (Aroclor 1242)	--	--	--	--	--	--	--	--	--	--	--	--	--	0.01 U
PCB-1248 (Aroclor 1248)	--	--	--	--	--	--	--	--	--	--	--	--	--	0.01 U
PCB-1254 (Aroclor 1254)	--	--	--	--	--	--	--	--	--	--	--	--	--	0.01 U
PCB-1260 (Aroclor 1260)	--	--	--	--	--	--	--	--	--	--	--	--	--	0.01 U
PCB-1262 (Aroclor 1262)	--	--	--	--	--	--	--	--	--	--	--	--	--	0.01 U
PCB-1268 (Aroclor 1268)	--	--	--	--	--	--	--	--	--	--	--	--	--	0.01 U
Polychlorinated Biphenyl (PCBs)	--	--	--	--	--	--	--	--	--	--	--	--	--	0.01 U
SEMIVOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,2,4,5-Tetrachlorobenzene	--	0.48 U	0.0015 U	--	--	0.059 U	0.0016 U	--	--	0.15 U	0.097 U	--	--	0.55 U
1,4-Dioxane (P-Dioxane)	--	3.5 U	0.011 U	--	--	0.43 U	0.011 U	--	--	1.1 U	0.7 U	--	--	2 U
2,3,4,6-Tetrachlorophenol	--	4.6 U	0.015 U	--	--	0.57 U	0.015 U	--	--	1.4 U	0.93 U	--	--	0.7 U
2,4,5-Trichlorophenol	--	0.79 U	0.0025 U	--	--	0.098 U	0.0026 U	--	--	0.24 U	0.16 U	--	--	0.74 U
2,4,6-Trichlorophenol	--	0.61 U	0.0019 U	--	--	0.075 U	0.002 U	--	--	0.19 U	0.12 U	--	--	0.21 U
2,4-Dichlorophenol	--	0.86 U	0.0027 U	--	--	0.11 U	0.0028 U	--	--	0.26 U	0.17 U	--	--	0.18 U
2,4-Dimethylphenol	--	0.69 U	0.0022 U	--	--	0.085 U	0.0023 U	--	--	0.21 U	0.14 U	--	--	1.6 U
2,4-Dinitrophenol	--	30 U	0.094 U	--	--	3.7 U	0.098 UJ	--	--	9.2 U	6 U	--	--	5.6 U
2,4-Dinitrotoluene	--	0.55 U	0.0017 U	--	--	0.068 U	0.0018 U	--	--	0.17 U	0.11 U	--	--	0.3 U
2,6-Dinitrotoluene	--	0.69 U	0.0022 U	--	--	0.085 U	0.0023 U	--	--	0.21 U	0.14 U	--	--	0.4 U
2-Chloronaphthalene	--	0.51 U	0.0016 U	--	--	0.063 U	0.0017 U	--	--	0.16 U	0.1 U	--	--	0.17 U
2-Chlorophenol	--	0.52 U	0.0016 U	--	--	0.064 U	0.0017 U	--	--	0.16 U	0.1 U	--	--	0.19 U
2-Methylnaphthalene	--	0.53 U	0.0055 J	--	--	0.066 U	0.0018 U	--	--	0.44 J	0.27 J	--	--	0.28 J
2-Methylphenol (O-Cresol)	--	3.2 U	0.01 U	--	--	0.39 U	0.01 U	--	--	0.98 U	0.64 U	--	--	0.32 U
2-Nitroaniline	--	5.1 U	0.016 U	--	--	0.63 U	0.017 U	--	--	1.6 U	1 U	--	--	0.25 U
2-Nitrophenol	--	0.64 U	0.002 U	--	--	0.079 U	0.0021 U	--	--	0.2 U	0.13 U	--	--	0.25 U
3- And 4- Methylphenol (Total)	--	--	--	--	--	--	--	--	--	--	--	--	--	0.2 U
3,3'-Dichlorobenzidine	--	10 U	0.033 U	--	--	1.3 U	0.034 U	--	--	3.2 U	2.1 U	--	--	0.83 U
3-Nitroaniline	--	2.8 U	0.0089 U	--	--	0.35 U	0.0093 U	--	--	0.87 U	0.57 U	--	--	0.22 U
4,6-Dinitro-2-Methylphenol	--	19 U	0.061 U	--	--	2.4 U	0.063 U	--	--	5.9 U	3.9 U	--	--	2 U
4-Bromophenyl Phenyl Ether	--	0.78 U	0.0025 U	--	--	0.096 U	0.0026 U	--	--	0.24 U	0.16 U	--	--	0.23 U
4-Chloro-3-Methylphenol	--	0.52 U	0.0017 U	--	--	0.065 U	0.0017 U	--	--	0.16 U	0.11 U	--	--	0.32 U
4-Chloroaniline	--	0.37 U	0.0012 U	--	--	0.046 U	0.0012 U	--	--	0.11 U	0.074 U	--	--	0.19 U
4-Chlorophenyl Phenyl Ether	--	0.67 U	0.0021 U	--	--	0.083 U	0.0022 U	--	--	0.21 U	0.14 U	--	--	0.22 U
4-Nitroaniline	--	0.54 U	0.0017 U	--	--	0.067 U	0.0018 U	--	--	0.17 U	0.11 U	--	--	0.28 U
4-Nitrophenol	--	7.8 U	0.025 U	--	--	0.96 U	0.026 U	--	--	2.4 U	1.6 U	--	--	3.6 U
Acenaphthene	--	3	0.042	--	--	0.2 J	0.0022 J	--	--	3	0.83	--	--	5.2 J
Acenaphthylene	--	0.49 U	0.0027 J	--	--	0.06 U	0.0016 U	--	--	0.15 U	0.098 U	--	--	0.19 U
Acetophenone	--	0.6 U	0.0019 U	--	--	0.075 U	0.002 U	--	--	0.19 U	0.12 U	--	--	0.16 U
Anthracene	--	9.9	0.13	--	--	0.76	0.0071 J	--	--	17	2.6	--	--	8
Atrazine	--	4.9 UJ	0.015 UJ	--	--	0.6 UJ	0.016 UJ	--	--	1.5 U	0.98 U	--	--	0.33 U
Benzaldehyde	--	1.4 U	0.0044 U	--	--	0.17 U	0.0045 UJ	--	--	0.42 U	0.28 U	--	--	0.57 U
Benzo(A)Anthracene	--	54	0.96	--	--	3.9	0.062	--	--	80	18	--	--	70
Benzo(A)Pyrene	--	55	0.92	--	--	5.3	0.078	--	--	55	20	--	--	98
Benzo(B)Fluoranthene	--	92	1.8	--	--	11	0.18	--	--	100	47	--	--	140
Benzo(G,H,I)Perylene	--	51	1.1	--	--	11	0.12	--	--	43	20	--	--	85
Benzo(K)Fluoranthene	--	31	0.56	--	--	3.4	0.057	--	--	29	14	--	--	41
Benzyl Butyl Phthalate	--	7.6 U	0.024 U	--	--	0.94 U	0.025 U	--	--	2.3 U	1.5 U	--	--	0.23 U
Biphenyl (Diphenyl)	--	0.47 U	0.0021 J	--	--	0.058 U	0.0015 U	--	--	0.14 U	0.094 U	--	--	0.64 U
Bis(2-Chloroethoxy) Methane	--	0.53 U	0.0017 U	--	--	0.065 U	0.0017 U	--	--	0.16 U	0.11 U	--	--	0.23 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	--	0.4 U	0.0013 U	--	--	0.05 U	0.0013 U	--	--	0.12 U	0.081 U	--	--	0.18 U
Bis(2-Chloroisopropyl) Ether	--	0.82 U	0.0026 U	--	--	0.1 U	0.0027 U	--	--	0.25 U	0.17 U	--	--	0.31 U
Bis(2-Ethylhexyl) Phthalate	--	12 U	0.037 U	--	--	1.5 U	0.039 U	--	--	3.6 U	2.4 U	--	--	0.29 U
Caprolactam	--	7.2 U	0.023 U	--	--	0.89 U	0.024 U	--	--	2.2 U	1.5 U	--	--	0.54 U
Carbazole	--	6.1	0.085	--	--	0.46	0.0043 J	--	--	4.3	0.88	--	--	7.3 J
Chrysene	--	69	1.2	--	--	5.5	0.088	--	--	110	54	--	--	82
Dibenz(A,H)Anthracene	--	12	0.23	--	--	2.2	0.021	--	--	12	5.6	--	--	20
Dibenzofuran	--	1.2 J	0.019 J	--	--	0.12 J	0.0016 U	--	--	1 J	0.39 J	--	--	1 J
Diethyl Phthalate	--	3.3 U	0.011 U	--	--	0.41 U	0.011 U	--	--	1 U	0.67 U	--	--	2.3 J
Dimethyl Phthalate	--	0.4 U	0.0013 U	--	--	0.05 U	0.0013 U	--	--	0.12 U	0.081 U	--	--	0.22 U

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Columbia Falls, Montana

Sample Location ID	CFSB-273	CFSB-279	CFSB-279	CFSB-279	CFSB-279	CFSB-280	CFSB-280	CFSB-280	CFSB-280	CFSB-281	CFSB-281	CFSB-281	CFSB-281	CFSB-019-DUP
Sample Lab IDs	460-159044-10	180-77673-11, 460-155989-31	180-77673-12, 460-155989-32	200-44015-1	200-44015-2	180-77673-16, 460-155989-38	180-77673-17, 460-155989-39	200-44015-3	200-44015-4	180-77440-8, 460-155481-8	180-77440-9, 460-155481-9	460-159044-7	460-159044-8	460-115008-12
Sample Name	CFSB-273-SO-0.5-2	CFSB-279-SO-0-0.5	CFSB-279-SO-0.5-2	CFSB-279-SO-0-0.5	CFSB-279-SO-0.5-2	CFSB-280-SO-0-0.5	CFSB-280-SO-0.5-2	CFSB-280-SO-0-0.5	CFSB-280-SO-0.5-2	CFSB-281-SO-0-0.5	CFSB-281-SO-0.5-2	CFSB-281-SO-0-0.5	CFSB-281-SO-0.5-2	CFSB-DUP13-SO
Sample Depth	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0.5-2 ft
Chemical	6/22/2018	5/8/2018	5/8/2018	6/22/2018	6/22/2018	5/8/2018	5/8/2018	6/22/2018	6/22/2018	5/4/2018	5/4/2018	6/22/2018	6/22/2018	6/4/2016
Di-N-Butyl Phthalate	--	4.9 U	0.015 U	--	--	0.6 U	0.016 U	--	--	1.5 U	0.98 U	--	--	0.22 U
Di-N-Octylphthalate	--	6.5 U	0.02 U	--	--	0.8 U	0.021 U	--	--	2 U	1.3 U	--	--	0.38 U
Fluoranthene	--	100	1.3	--	--	6.4	0.091	--	--	270	32	--	--	110
Fluorene	--	2.3	0.027	--	--	0.087 J	0.0014 U	--	--	2.5	0.7	--	--	2.3 J
Hexachlorobenzene	--	0.8 U	0.0025 U	--	--	0.098 U	0.0026 U	--	--	0.24 U	0.16 U	--	--	0.3 U
Hexachlorobutadiene	--	0.65 U	0.0021 U	--	--	0.08 U	0.0021 U	--	--	0.2 U	0.13 U	--	--	0.21 U
Hexachlorocyclopentadiene	--	0.57 U	0.0018 U	--	--	0.07 U	0.0019 U	--	--	0.17 U	0.11 U	--	--	0.46 U
Hexachloroethane	--	0.57 U	0.0018 U	--	--	0.071 U	0.0019 U	--	--	0.18 U	0.12 U	--	--	0.27 U
Indeno(1,2,3-C,D)Pyrene	--	43	0.85	--	--	8.5	0.095	--	--	36	16	--	--	88
Isophorone	--	0.57 U	0.0018 U	--	--	0.07 U	0.0019 U	--	--	0.17 U	0.11 U	--	--	0.16 U
Naphthalene	--	1.1 J	0.015	--	--	0.16 J	0.0015 J	--	--	0.7	0.28 J	--	--	0.6 J
Nitrobenzene	--	4.1 U	0.013 U	--	--	0.5 U	0.013 U	--	--	1.2 U	0.82 U	--	--	0.23 U
N-Nitrosodi-N-Propylamine	--	0.75 U	0.0024 U	--	--	0.093 U	0.0025 U	--	--	0.23 U	0.15 U	--	--	0.25 U
N-Nitrosodiphenylamine	--	3.7 U	0.012 U	--	--	0.46 U	0.012 U	--	--	1.1 U	0.74 U	--	--	0.68 U
Pentachlorophenol	--	18 U	0.056 U	--	--	2.2 U	0.059 U	--	--	5.5 U	3.6 U	--	--	0.9 U
Phenanthrene	--	35	0.47	--	--	2	0.025	--	--	37	11	--	--	38
Phenol	--	3.4 U	0.011 U	--	--	0.42 U	0.011 U	--	--	1 U	0.68 U	--	--	0.24 U
Pyrene	--	84	1.3	--	--	5.9	0.13	--	--	230	27	--	--	98
SEMIVOLATILE ORGANIC COMPOUNDS-SIM (mg/kg)														
Acenaphthene	--	--	--	0.12 J	0.039 J	--	--	0.15 J	0.098 J	--	--	--	--	--
Acenaphthylene	--	--	--	0.056 U	0.038 U	--	--	0.099 U	0.09 U	--	--	--	--	--
Anthracene	--	--	--	0.94	0.41	--	--	0.7	0.41	--	--	--	--	--
Benzo(A)Anthracene	--	--	--	5.7	3.1	--	--	3.8	3.1	--	--	--	--	--
Benzo(A)Pyrene	--	--	--	5.8	2.1	--	--	5.2	4.2	--	--	--	--	--
Benzo(B)Fluoranthene	--	--	--	16	5.2	--	--	8.6	8.5	--	--	--	--	--
Benzo(G,H,I)Perylene	--	--	--	4.5	1.4	--	--	8.4	7.4	--	--	--	--	--
Benzo(K)Fluoranthene	--	--	--	9.6	3.8	--	--	6.8	6.7	--	--	--	--	--
Benzo[E]Pyrene	--	--	--	8.2	3.1	--	--	6.3	6.1	--	--	--	--	--
C1-Chrysenes	--	--	--	2.8 J	1.3 J	--	--	1.6 J	1.4 J	--	--	--	--	--
C1-Fluoranthenes/Pyrenes	--	--	--	4.9 J	2.5 J	--	--	2.8 J	2.3 J	--	--	--	--	--
C1-Fluorenes	--	--	--	0.22 U	0.15 U	--	--	0.39 U	0.35 U	--	--	--	--	--
C1-Naphthalenes	--	--	--	0.22 U	0.15 U	--	--	0.39 U	0.35 U	--	--	--	--	--
C1-Phenanthrenes/Anthracenes	--	--	--	0.77 J	0.32 J	--	--	0.72 J	0.49 J	--	--	--	--	--
C2-Chrysenes	--	--	--	1.3 J	0.46 J	--	--	0.71 J	0.67 J	--	--	--	--	--
C2-Fluorenes	--	--	--	0.22 U	0.15 U	--	--	0.39 U	0.35 U	--	--	--	--	--
C2-Naphthalenes	--	--	--	0.22 U	0.15 U	--	--	0.39 U	0.35 U	--	--	--	--	--
C2-Phenanthrenes/Anthracenes	--	--	--	0.52 J	0.3 J	--	--	0.47 J	0.35 J	--	--	--	--	--
C3-Chrysenes	--	--	--	0.34 J	0.15 U	--	--	0.39 U	0.35 U	--	--	--	--	--
C3-Fluorenes	--	--	--	0.22 U	0.15 U	--	--	0.39 U	0.35 U	--	--	--	--	--
C3-Naphthalenes	--	--	--	0.22 U	0.15 U	--	--	0.39 U	0.35 U	--	--	--	--	--
C3-Phenanthrenes/Anthracenes	--	--	--	0.31 J	0.2 J	--	--	0.39 U	0.35 U	--	--	--	--	--
C4 Chrysenes	--	--	--	0.22 U	0.15 U	--	--	0.39 U	0.35 U	--	--	--	--	--
C4-Naphthalenes	--	--	--	0.22 U	0.15 U	--	--	0.39 U	0.35 U	--	--	--	--	--
C4-Phenanthrenes/Anthracenes	--	--	--	0.22 U	0.15 U	--	--	0.39 U	0.35 U	--	--	--	--	--
Chrysene	--	--	--	7.8	4.1	--	--	5.2	4.4	--	--	--	--	--
Dibenz(A,H)Anthracene	--	--	--	1.9	0.52	--	--	1.9	1.8	--	--	--	--	--
Fluoranthene	--	--	--	6.7	4.4	--	--	5.2	4.1	--	--	--	--	--
Fluorene	--	--	--	0.099 J	0.056 U	--	--	0.14 U	0.13 U	--	--	--	--	--
Indeno(1,2,3-C,D)Pyrene	--	--	--	5	1.5	--	--	7.1	6.5	--	--	--	--	--
Naphthalene	--	--	--	0.085 U	0.058 U	--	--	0.15 U	0.14 U	--	--	--	--	--
Perylene	--	--	--	1.5	0.6	--	--	1.5	1.1	--	--	--	--	--
Phenanthrene	--	--	--	1.6	0.53	--	--	1.6	1.1	--	--	--	--	--
Pyrene	--	--	--	6.9	4.4	--	--	6	4.5	--	--	--	--	--
VOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,1,1-Trichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00067 U
1,1,2,2-Tetrachloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	0.0003 U
1,1,2-Trichloro-1,2,2-Trifluoroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00078 U
1,1,2-Trichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	0.0005 U

Table E-4
Summary of Data Used in Risk Assessment
North Percolation Pond Area Soil (0-2 ft-bgs) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-273	CFSB-279	CFSB-279	CFSB-279	CFSB-279	CFSB-280	CFSB-280	CFSB-280	CFSB-280	CFSB-281	CFSB-281	CFSB-281	CFSB-281	CFSB-019-DUP
Sample Lab IDs	460-159044-10	180-77673-11, 460-155989-31	180-77673-12, 460-155989-32	200-44015-1	200-44015-2	180-77673-16, 460-155989-38	180-77673-17, 460-155989-39	200-44015-3	200-44015-4	180-77440-8, 460-155481-8	180-77440-9, 460-155481-9	460-159044-7	460-159044-8	460-115008-12
Sample Name	CFSB-273-SO-0.5-2	CFSB-279-SO-0-0.5	CFSB-279-SO-0.5-2	CFSB-279-SO-0-0.5	CFSB-279-SO-0.5-2	CFSB-280-SO-0-0.5	CFSB-280-SO-0.5-2	CFSB-280-SO-0-0.5	CFSB-280-SO-0.5-2	CFSB-281-SO-0-0.5	CFSB-281-SO-0.5-2	CFSB-281-SO-0-0.5	CFSB-281-SO-0.5-2	CFSB-DUP13-SO
Sample Depth	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0.5-2 ft
Chemical	6/22/2018	5/8/2018	5/8/2018	6/22/2018	6/22/2018	5/8/2018	5/8/2018	6/22/2018	6/22/2018	5/4/2018	5/4/2018	6/22/2018	6/22/2018	6/4/2016
1,1-Dichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	0.0006 U
1,1-Dichloroethene	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00073 U
1,2,3-Trichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00019 U
1,2,4-Trichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00057 U
1,2-Dibromo-3-Chloropropane	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00083 U
1,2-Dibromoethane (Ethylene Dibromide)	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00021 U
1,2-Dichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00025 U
1,2-Dichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00019 U
1,2-Dichloropropane	--	--	--	--	--	--	--	--	--	--	--	--	--	0.0003 U
1,3-Dichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00021 U
1,4-Dichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00023 U
2-Hexanone	--	--	--	--	--	--	--	--	--	--	--	--	--	0.0017 U
Acetone	--	--	--	--	--	--	--	--	--	--	--	--	--	0.0088 J
Benzene	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00095 J
Bromochloromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	0.0003 U
Bromodichloromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00067 U
Bromoform	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00023 U
Bromomethane	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00057 U
Carbon Disulfide	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00076 U
Carbon Tetrachloride	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00076 U
Chlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00025 U
Chloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00062 U
Chloroform	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00037 U
Chloromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00067 U
Cis-1,2-Dichloroethylene	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00039 U
Cis-1,3-Dichloropropene	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00027 U
Cyclohexane	--	--	--	--	--	--	--	--	--	--	--	--	--	0.0026
Dibromochloromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00027 U
Dichlorodifluoromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00057 U
Ethylbenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	0.0013 J
Isopropylbenzene (Cumene)	--	--	--	--	--	--	--	--	--	--	--	--	--	0.0003 U
M,P-Xylene	--	--	--	--	--	--	--	--	--	--	--	--	--	0.0051
Methyl Acetate	--	--	--	--	--	--	--	--	--	--	--	--	--	0.0016 U
Methyl Ethyl Ketone (2-Butanone)	--	--	--	--	--	--	--	--	--	--	--	--	--	0.0014 U
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	--	--	--	--	--	--	--	--	--	--	--	--	--	0.0039 U
Methylcyclohexane	--	--	--	--	--	--	--	--	--	--	--	--	--	0.0055
Methylene Chloride	--	--	--	--	--	--	--	--	--	--	--	--	--	0.004 J
O-Xylene (1,2-Dimethylbenzene)	--	--	--	--	--	--	--	--	--	--	--	--	--	0.0016 J
Styrene	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00027 U
Tert-Butyl Methyl Ether	--	--	--	--	--	--	--	--	--	--	--	--	--	0.0003 U
Tetrachloroethylene (PCE)	--	--	--	--	--	--	--	--	--	--	--	--	--	0.0005 U
Toluene	--	--	--	--	--	--	--	--	--	--	--	--	--	0.0056
Trans-1,2-Dichloroethene	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00069 U
Trans-1,3-Dichloropropene	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00018 U
Trichloroethylene (TCE)	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00046 U
Trichlorofluoromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	0.0006 U
Vinyl Chloride	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00069 U

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-5
Summary of Data Used in Risk Assessment
North Percolation Pond Area (Surface Water) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Chemical	CFSWP-023 460-130874-1 CFSWP-023-SW 4/3/2017	CFSWP-024 460-135444-5 CFSWP-024-SW 6/15/2017
GENERAL CHEMISTRY (µg/L)		
Fluoride	--	21500
Cyanide	--	2 U
Cyanide	7.6 J	2 U
METALS (µg/L)		
Aluminum	--	4780
Antimony	--	7.2
Arsenic	--	1 J
Barium	--	26.4
Beryllium	--	0.51 J
Cadmium	--	2.5
Calcium	--	7020
Chromium, Total	--	1.3 U
Cobalt	--	1.3 U
Copper	--	2 J
Iron	--	42.4 U
Lead	--	0.38 U
Magnesium	--	384
Manganese	--	31.8
Mercury	--	0.17 U
Nickel	--	22.1
Potassium	--	760
Selenium	--	0.73 U
Silver	--	1.3 U
Sodium	--	6180
Thallium	--	0.26 U
Vanadium	--	4.3
Zinc	--	512
Aluminum	109	8630
Antimony	0.62 U	7.7
Arsenic	0.64 U	2.4
Barium	234	43.4
Beryllium	0.24 U	0.71 J
Cadmium	0.71 U	3
Calcium	63300	7860
Chromium, Total	1.3 U	2.7 J
Cobalt	1.3 U	1.6 J
Copper	3.8 J	16.5
Iron	42.4 U	817
Lead	0.38 U	7.6
Magnesium	13900	804
Manganese	2.5 U	37.4
Mercury	0.17 U	0.17 U
Nickel	1.9 J	55.9
Potassium	646	814
Selenium	0.73 U	0.73 U
Silver	1.3 U	1.3 U
Sodium	5280	6730
Thallium	0.26 U	0.27 J
Vanadium	6.9	18
Zinc	7 U	537

Table E-5
Summary of Data Used in Risk Assessment
North Percolation Pond Area (Surface Water) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Chemical	CFSWP-023 460-130874-1 CFSWP-023-SW 4/3/2017	CFSWP-024 460-135444-5 CFSWP-024-SW 6/15/2017
PESTICIDES (µg/L)		
Aldrin	--	0.003 U
Alpha Bhc (Alpha Hexachlorocyclohexane)	--	0.007 U
Alpha Endosulfan	--	0.002 U
Beta Bhc (Beta Hexachlorocyclohexane)	--	0.004 U
Beta Endosulfan	--	0.004 U
cis-Chlordane	--	0.002 U
Delta BHC (Delta Hexachlorocyclohexane)	--	0.005 U
Dieldrin	--	0.003 U
Endosulfan Sulfate	--	0.006 U
Endrin	--	0.004 U
Endrin Aldehyde	--	0.008 U
Endrin Ketone	--	0.008 U
Gamma Bhc (Lindane)	--	0.012 U
Heptachlor	--	0.003 U
Heptachlor Epoxide	--	0.005 U
Methoxychlor	--	0.004 U
P,P'-DDD	--	0.006 U
P,P'-DDE	--	0.002 U
P,P'-DDT	--	0.004 U
Toxaphene	--	0.11 U
trans-Chlordane	--	0.003 U
POLYCHLORINATED BIPHENYLS (µg/L)		
PCB-1016 (Aroclor 1016)	--	0.1 U
PCB-1221 (Aroclor 1221)	--	0.1 U
PCB-1232 (Aroclor 1232)	--	0.1 U
PCB-1242 (Aroclor 1242)	--	0.1 U
PCB-1248 (Aroclor 1248)	--	0.1 U
PCB-1254 (Aroclor 1254)	--	0.099 U
PCB-1260 (Aroclor 1260)	--	0.099 U
PCB-1262 (Aroclor 1262)	--	0.099 U
PCB-1268 (Aroclor 1268)	--	0.099 U
Polychlorinated Biphenyl (PCBs)	--	0.1 U
SEMIVOLATILE ORGANIC COMPOUNDS (µg/L)		
1,2,4,5-Tetrachlorobenzene	--	0.43 U
1,4-Dioxane (P-Dioxane)	--	3.1 U
2,3,4,6-Tetrachlorophenol	--	0.69 U
2,4,5-Trichlorophenol	--	0.49 U
2,4,6-Trichlorophenol	--	0.53 U
2,4-Dichlorophenol	--	0.63 U
2,4-Dimethylphenol	--	0.91 U
2,4-Dinitrophenol	--	2.4 U
2,4-Dinitrotoluene	--	1 U
2,6-Dinitrotoluene	--	0.88 U
2-Chloronaphthalene	--	0.61 U
2-Chlorophenol	--	0.74 U
2-Methylnaphthalene	--	0.88 U
2-Methylphenol (O-Cresol)	--	1.3 U
2-Nitroaniline	--	0.65 U
2-Nitrophenol	--	0.59 U
3- And 4- Methylphenol (Total)	--	0.88 U
3,3'-Dichlorobenzidine	--	1 U

Table E-5
Summary of Data Used in Risk Assessment
North Percolation Pond Area (Surface Water) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Chemical	CFSWP-023 460-130874-1 CFSWP-023-SW 4/3/2017	CFSWP-024 460-135444-5 CFSWP-024-SW 6/15/2017
3-Nitroaniline	--	0.82 U
4,6-Dinitro-2-Methylphenol	--	2 U
4-Bromophenyl Phenyl Ether	--	1 U
4-Chloro-3-Methylphenol	--	0.76 U
4-Chloroaniline	--	0.73 U
4-Chlorophenyl Phenyl Ether	--	0.96 U
4-Nitroaniline	--	0.48 U
4-Nitrophenol	--	4.7 U
Acenaphthene	--	0.88 U
Acenaphthylene	--	0.65 U
Acetophenone	--	1 U
Anthracene	--	0.57 U
Atrazine	--	0.77 U
Benzaldehyde	--	0.86 U
Benzo(A)Anthracene	--	3
Benzo(A)Pyrene	--	3.9
Benzo(B)Fluoranthene	--	10
Benzo(G,H,I)Perylene	--	3.9 J
Benzo(K)Fluoranthene	--	0.18 U
Benzyl Butyl Phthalate	--	0.6 U
Biphenyl (Diphenyl)	--	0.63 U
Bis(2-Chloroethoxy) Methane	--	0.69 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	--	0.12 U
Bis(2-Chloroisopropyl) Ether	--	0.93 U
Bis(2-Ethylhexyl) Phthalate	--	0.72 U
Caprolactam	--	1.1 U
Carbazole	--	0.85 U
Chrysene	--	7.6
Dibenz(A,H)Anthracene	--	0.09 U
Dibenzofuran	--	0.85 U
Diethyl Phthalate	--	1 U
Dimethyl Phthalate	--	0.98 U
Di-N-Butyl Phthalate	--	0.82 U
Di-N-Octylphthalate	--	0.69 U
Fluoranthene	--	9.3 J
Fluorene	--	0.8 U
Hexachlorobenzene	--	0.47 U
Hexachlorobutadiene	--	0.76 U
Hexachlorocyclopentadiene	--	0.61 U
Hexachloroethane	--	0.09 U
Indeno(1,2,3-C,D)Pyrene	--	3.1
Isophorone	--	0.67 U
Naphthalene	--	0.8 U
Nitrobenzene	--	0.49 U
N-Nitrosodi-N-Propylamine	--	0.83 U
N-Nitrosodiphenylamine	--	0.74 U
Pentachlorophenol	--	2.2 U
Phenanthrene	--	1.5 J
Phenol	--	0.41 U
Pyrene	--	7 J

Table E-5
Summary of Data Used in Risk Assessment
North Percolation Pond Area (Surface Water) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Chemical	CFSWP-023 460-130874-1 CFSWP-023-SW 4/3/2017	CFSWP-024 460-135444-5 CFSWP-024-SW 6/15/2017
VOLATILE ORGANIC COMPOUNDS (µg/L)		
1,1,1-Trichloroethane	--	0.28 UJ
1,1,2,2-Tetrachloroethane	--	0.19 U
1,1,2-Trichloro-1,2,2-Trifluoroethane	--	0.34 U
1,1,2-Trichloroethane	--	0.08 U
1,1-Dichloroethane	--	0.24 U
1,1-Dichloroethene	--	0.34 U
1,2,3-Trichlorobenzene	--	0.35 U
1,2,4-Trichlorobenzene	--	0.27 U
1,2-Dibromo-3-Chloropropane	--	0.23 U
1,2-Dibromoethane (Ethylene Dibromide)	--	0.19 U
1,2-Dichlorobenzene	--	0.22 U
1,2-Dichloroethane	--	0.25 U
1,2-Dichloropropane	--	0.18 U
1,3-Dichlorobenzene	--	0.33 U
1,4-Dichlorobenzene	--	0.33 U
2-Hexanone	--	0.72 U
Acetone	--	12
Benzene	--	0.09 U
Bromochloromethane	--	0.3 U
Bromodichloromethane	--	0.15 U
Bromoform	--	0.18 U
Bromomethane	--	0.18 UJ
Carbon Disulfide	--	0.22 U
Carbon Tetrachloride	--	0.33 U
Chlorobenzene	--	0.24 U
Chloroethane	--	0.37 UJ
Chloroform	--	0.22 U
Chloromethane	--	0.22 U
Cis-1,2-Dichloroethylene	--	0.26 UJ
Cis-1,3-Dichloropropene	--	0.16 U
Cyclohexane	--	0.26 U
Dibromochloromethane	--	0.22 U
Dichlorodifluoromethane	--	0.14 U
Ethylbenzene	--	0.3 U
Isopropylbenzene (Cumene)	--	0.32 U
M,P-Xylene	--	0.28 U
Methyl Acetate	--	0.58 UJ
Methyl Ethyl Ketone (2-Butanone)	--	2.2 U
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	--	0.63 U
Methylcyclohexane	--	0.22 U
Methylene Chloride	--	0.21 UJ
O-Xylene (1,2-Dimethylbenzene)	--	0.32 U
Styrene	--	0.17 U
Tert-Butyl Methyl Ether	--	0.13 UJ
Tetrachloroethylene (PCE)	--	0.12 U
Toluene	--	0.25 U
Trans-1,2-Dichloroethene	--	0.18 UJ
Trans-1,3-Dichloropropene	--	0.19 U
Trichloroethylene (TCE)	--	0.22 U

Table E-5
Summary of Data Used in Risk Assessment
North Percolation Pond Area (Surface Water) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Chemical	CFSWP-023 460-130874-1 CFSWP-023-SW 4/3/2017	CFSWP-024 460-135444-5 CFSWP-024-SW 6/15/2017
Trichlorofluoromethane	--	0.15 U
Vinyl Chloride	--	0.06 U

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-6
Summary of Data Used in Risk Assessment
North Percolation Pond Area (Sediment) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Chemical	CFSDP-023 200-35201-11, 460-119830-1 CFSDP-023-SD 9/7/2016	CFSDP-023-DUP 460-119830-6 CFSDP-DUP2-SD 9/7/2016	CFSDP-024 200-35201-12, 460-119830-2 CFSDP-024-SD 9/7/2016
GENERAL CHEMISTRY (mg/kg)			
Fluoride	56.6 J	59.3 J	219
Cyanide	0.096 J	0.88 J	7.8 J-
METALS (mg/kg)			
Aluminum	20800	22100	112000
Antimony	0.39 UJ	0.53 J-	2.6 J-
Arsenic	7.6	7.6	26.4
Barium	539	469	317
Beryllium	1.6	1.5	4.5
Cadmium	2.7	2.6	8
Calcium	106000	102000	33400
Chromium, Total	53	52.1	42.3
Cobalt	5.3	5.4	18.5
Copper	56.4	58.6	83.6
Iron	2940	3030	9040
Lead	24.8	24.6	109
Magnesium	2660	2740	4020
Manganese	24.8	25.2	74.7
Mercury	0.028	0.03	0.1
Nickel	208	215	771
Potassium	351	403	1150
Selenium	0.89 J	0.95 J	3.4 J
Silver	0.76 U	0.72 U	1 J
Sodium	177	183	840
Thallium	0.26 J	0.28 J	1.2 J
Vanadium	66.1	63.3	233
Zinc	349	351	871
PESTICIDES (mg/kg)			
Aldrin	0.0011 U	0.0011 U	0.0012 U
Alpha Bhc (Alpha Hexachlorocyclohexane)	0.00085 U	0.00086 U	0.00094 U
Alpha Endosulfan	0.0013 U	0.0013 U	0.0014 U
Beta Bhc (Beta Hexachlorocyclohexane)	0.00091 U	0.00091 U	0.001 U
Beta Endosulfan	0.0015 U	0.0015 U	0.0016 U
cis-Chlordane	0.0015 U	0.0015 U	0.0017 U
Delta BHC (Delta Hexachlorocyclohexane)	0.001 U	0.001 U	0.0011 U
Dieldrin	0.0012 U	0.0012 U	0.0013 U
Endosulfan Sulfate	0.0011 U	0.0011 U	0.0012 U
Endrin	0.0012 U	0.0012 U	0.0013 U
Endrin Aldehyde	0.0012 U	0.0012 U	0.0013 U
Endrin Ketone	0.0013 U	0.0013 U	0.0014 U
Gamma Bhc (Lindane)	0.00084 U	0.00084 U	0.00092 U
Heptachlor	0.0012 U	0.0012 U	0.0013 U
Heptachlor Epoxide	0.0018 U	0.0018 U	0.002 U
Methoxychlor	0.002 U	0.002 U	0.0022 U
P,P'-DDD	0.0012 U	0.0012 U	0.0014 U
P,P'-DDE	0.0014 U	0.0014 U	0.0015 U
P,P'-DDT	0.00096 U	0.00097 U	0.0011 U
Toxaphene	0.027 U	0.027 U	0.03 U
trans-Chlordane	0.002 U	0.002 U	0.0022 U
POLYCHLORINATED BIPHENYLS (mg/kg)			
PCB-1016 (Aroclor 1016)	0.012 U	0.012 U	0.014 U
PCB-1221 (Aroclor 1221)	0.012 U	0.012 U	0.014 U
PCB-1232 (Aroclor 1232)	0.012 U	0.012 U	0.014 U
PCB-1242 (Aroclor 1242)	0.012 U	0.012 U	0.014 U
PCB-1248 (Aroclor 1248)	0.012 U	0.012 U	0.014 U
PCB-1254 (Aroclor 1254)	0.013 U	0.013 U	0.014 U
PCB-1260 (Aroclor 1260)	0.013 U	0.013 U	0.014 U
PCB-1262 (Aroclor 1262)	0.013 U	0.013 U	0.014 U
PCB-1268 (Aroclor 1268)	0.013 U	0.013 U	0.014 U
Polychlorinated Biphenyl (PCBs)	0.013 U	0.013 U	0.014 U

Table E-6
Summary of Data Used in Risk Assessment
North Percolation Pond Area (Sediment) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Chemical	CFSDP-023 200-35201-11, 460-119830-1 CFSDP-023-SD 9/7/2016	CFSDP-023-DUP 460-119830-6 CFSDP-DUP2-SD 9/7/2016	CFSDP-024 200-35201-12, 460-119830-2 CFSDP-024-SD 9/7/2016
SEMIVOLATILE ORGANIC COMPOUNDS (mg/kg)			
1,2,4,5-Tetrachlorobenzene	0.17 U	0.34 U	0.76 U
1,4-Dioxane (P-Dioxane)	0.62 U	1.2 U	2.7 U
2,3,4,6-Tetrachlorophenol	0.22 U	0.44 U	0.96 U
2,4,5-Trichlorophenol	0.23 U	0.46 U	1 U
2,4,6-Trichlorophenol	0.066 U	0.13 U	0.29 U
2,4-Dichlorophenol	0.054 U	0.11 U	0.24 U
2,4-Dimethylphenol	0.51 U	1 U	2.2 U
2,4-Dinitrophenol	1.7 U	3.5 U	7.7 U
2,4-Dinitrotoluene	0.091 U	0.18 U	0.4 U
2,6-Dinitrotoluene	0.12 U	0.25 U	0.54 U
2-Chloronaphthalene	0.052 U	0.11 U	0.23 U
2-Chlorophenol	0.059 U	0.12 U	0.26 U
2-Methylnaphthalene	0.13 J	0.15 J	0.52 J
2-Methylphenol (O-Cresol)	0.1 U	0.2 U	0.44 U
2-Nitroaniline	0.076 U	0.15 U	0.34 U
2-Nitrophenol	0.078 U	0.16 U	0.34 U
3- And 4- Methylphenol (Total)	0.061 U	0.12 U	0.27 U
3,3'-Dichlorobenzidine	0.26 U	0.52 U	1.1 U
3-Nitroaniline	0.068 U	0.14 U	0.3 U
4,6-Dinitro-2-Methylphenol	0.62 U	1.2 U	2.7 U
4-Bromophenyl Phenyl Ether	0.073 U	0.15 U	0.32 U
4-Chloro-3-Methylphenol	0.099 U	0.2 U	0.44 U
4-Chloroaniline	0.13 J	0.12 U	0.26 U
4-Chlorophenyl Phenyl Ether	0.069 U	0.14 U	0.3 U
4-Nitroaniline	0.087 U	0.18 U	0.38 U
4-Nitrophenol	1.1 U	2.2 U	4.9 U
Acenaphthene	0.28 J	0.32 J	4.1 J
Acenaphthylene	0.086 J	0.12 U	0.26 U
Acetophenone	0.05 U	0.1 U	0.22 U
Anthracene	1.7 J	1.3 J	9.9 J
Atrazine	0.1 U	0.21 U	0.45 U
Benzaldehyde	0.18 U	0.35 U	0.77 U
Benzo(A)Anthracene	14	15	76
Benzo(A)Pyrene	19	21	100
Benzo(B)Fluoranthene	40	55	210
Benzo(G,H,I)Perylene	13	20	150
Benzo(K)Fluoranthene	17	18	64
Benzyl Butyl Phthalate	0.071 U	0.14 U	0.31 U
Biphenyl (Diphenyl)	0.2 U	0.4 U	0.87 U
Bis(2-Chloroethoxy) Methane	0.072 U	0.14 U	0.32 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.054 U	0.11 U	0.24 U
Bis(2-Chloroisopropyl) Ether	0.095 U	0.19 U	0.42 U
Bis(2-Ethylhexyl) Phthalate	0.18 J	0.18 U	0.4 U
Caprolactam	0.17 U	0.33 U	0.73 U
Carbazole	1 J	0.97 J	9.6 J
Chrysene	18	19	150
Dibenz(A,H)Anthracene	4.8	6.1	40
Dibenzofuran	0.53 J	0.58 J	1.4 J
Diethyl Phthalate	0.066 U	0.13 U	0.29 U
Dimethyl Phthalate	0.067 U	0.13 U	0.3 U
Di-N-Butyl Phthalate	0.069 U	0.14 U	0.3 U
Di-N-Octylphthalate	0.12 U	0.24 U	0.52 U
Fluoranthene	21	17	120
Fluorene	0.11 J	0.12 J	2.1 J
Hexachlorobenzene	0.094 U	0.19 U	0.41 U
Hexachlorobutadiene	0.065 U	0.13 U	0.29 U
Hexachlorocyclopentadiene	0.14 U	0.29 U	0.63 U
Hexachloroethane	0.085 U	0.17 U	0.37 U
Indeno(1,2,3-C,D)Pyrene	15	23	140
Isophorone	0.05 U	0.1 U	0.22 U

Table E-6
Summary of Data Used in Risk Assessment
North Percolation Pond Area (Sediment) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Chemical	CFSDP-023 200-35201-11, 460-119830-1 CFSDP-023-SD 9/7/2016	CFSDP-023-DUP 460-119830-6 CFSDP-DUP2-SD 9/7/2016	CFSDP-024 200-35201-12, 460-119830-2 CFSDP-024-SD 9/7/2016
Naphthalene	0.39 J	0.45 J	0.89 J
Nitrobenzene	0.073 U	0.15 U	0.32 U
N-Nitrosodi-N-Propylamine	0.078 U	0.16 U	0.34 U
N-Nitrosodiphenylamine	0.21 U	0.42 U	0.92 U
Pentachlorophenol	0.28 U	0.56 U	1.2 U
Phenanthrene	6.2	6.9	41
Phenol	0.075 U	0.15 U	0.33 U
Pyrene	16	26	120

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-7
Summary of Data Used in Risk Assessment
Central Landfills Area Soil (0-0.5 ft-bgs) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFLP-007	CFLP-008	CFLP-009	CFLP-010	CFLP-011	CFLP-012	CFLP-013	CFLP-014	CFLP-015	CFLP-016	CFLP-017	CFLP-018	CFMW-002	CFMW-008A
Sample Lab IDs	180-78687-1, 200-43824-1, 460-158063-1	180-78687-3, 200-43824-3, 460-158063-3	180-78687-5, 200-43824-5, 460-158063-5	180-78687-7, 200-43824-7, 460-158063-7	180-78687-9, 200-43824-9, 460-158063-9	180-78687-11, 200-43824-11, 460-158063-11	180-78687-13, 200-43824-13, 460-158063-13	180-78687-15, 200-43824-15, 460-158063-15	180-78894-1, 200-43930-1, 460-158632-1	180-78894-3, 200-43930-3, 460-158632-3	180-78894-5, 200-43930-5, 460-158632-5	180-78894-7, 200-43930-7, 460-158632-7	460-115528-7	460-115528-1
Sample Name	CFLP-007-SO-0-0.5	CFLP-008-SO-0-0.5	CFLP-009-SO-0-0.5	CFLP-010-SO-0-0.5	CFLP-011-SO-0-0.5	CFLP-012-SO-0-0.5	CFLP-013-SO-0-0.5	CFLP-014-SO-0-0.5	CFLP-015-SO-0-0.5	CFLP-016-SO-0-0.5	CFLP-017-SO-0-0.5	CFLP-018-SO-0-0.5	CFMW-002-SO-0-0.5	CFMW-008a-SO-0-0.5
Sample Depth	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft
Chemical	6/9/2018	6/9/2018	6/9/2018	6/9/2018	6/9/2018	6/9/2018	6/9/2018	6/9/2018	6/16/2018	6/16/2018	6/16/2018	6/16/2018	6/13/2016	6/13/2016
GENERAL CHEMISTRY (mg/kg)														
Fluoride	20.3	22.2	3.24	41.4	4.79	31	6.68	4.31	6.34 J+	36.4 J+	8.44 J+	6.69 J+	56.7 J-	84.9 J-
Cyanide	0.11 J	0.06 U	0.058 U	0.094 J	0.077 J+	0.063 U	0.11 J+	0.066 U	0.09 J	0.33	0.14 J	0.23 J+	0.48 J	0.088 J
METALS (mg/kg)														
"Chromium, Hexavalent - Estimated"	0.246229	0.222141	0.206083	0.291727	0.275669	0.248905	0.29708	0.243552	0.235523	0.350608	0.382725	0.414842	0.275669	0.26764
"Chromium, Trivalent - Calculated"	--	--	--	--	--	--	--	--	--	--	--	--	--	--
"Chromium, Trivalent - Estimated"	8.95377	8.07786	7.49392	10.6083	10.0243	9.05109	10.8029	8.85645	8.56448	12.7494	13.9173	15.0852	10.0243	9.73236
Aluminum	12000	10600	7560	16100	16300	13800	16500	10300	10800	21900	19100	19700	14500	21000
Antimony	0.29 U	0.29 U	0.3 U	0.37 J	0.3 U	0.27 U	0.29 U	0.27 U	0.31 UJ	0.36 UJ	0.33 UJ	0.35 UJ	0.35 UJ	0.36 UJ
Arsenic	5.2	5.2	4.4	5.8	5.8	5.7	8.8	6.2	11.2	5.6	9.3	6.8	5.3	7.1
Barium	78	67.4	69.1	99.1	182	94.4	134	59.9	80.3	214	222	261	127	163
Beryllium	0.55	0.48	0.39 J	0.67	0.67	0.58	0.56	0.42	0.34 J	0.6	0.64	0.58	0.78	0.63
Cadmium	0.33 U	0.33 U	0.34 U	0.34 U	0.34 U	0.31 U	0.33 U	0.31 U	0.35 U	0.41 U	0.38 U	0.4 U	0.26 U	0.27 U
Calcium	29100	21300	24100	23600	9660	31800	3040	34700	71800	6100	5420	5660	68400 J	56600 J
Chromium, Total	9.2	8.3	7.7	10.9	10.3	9.3	11.1	9.1	8.8	13.1	14.3	15.5	10.3	10
Cobalt	5.8	5.5	5.2	6.1	6.3	5.8	6.2	5.3	5.1	6.2	7.6	6.3	4.8	4.7
Copper	14	13.9	11.7	19.9	14.4	16.8	15.1	14.6	17.7	19.9	26.4	22.6	12	15.2
Iron	13500	12600	12500	15600	15900	13400	17400	13400	13100	15300	20800	17200	13400	10800
Lead	10.5	9.3	7.4	14.8	9.7	11.5	13.2	9.8	10.5	12.9	11	13.7	13.5 J+	23.3 J+
Magnesium	9100	8880	9050	11000	7580	9450	9880	10800	13200	8410	8550	9540	11500	8170
Manganese	360	309	309	448	445	421	576	332	348 J	393 J	450 J	346 J	616 J	388 J
Mercury	0.025	0.016 J	0.013 J	0.034	0.017 J	0.022	0.026	0.025	0.029	0.023	0.02	0.023	0.014 J	0.023
Nickel	24.1	21.9	12.9	39	12.9	22.4	20.3	15	17	28.7	17.5	19.8	28.5 J+	32.4 J+
Potassium	993	868	619	1820	1110	1100	1300	916	931	1530	1140	1360	1280	1060
Selenium	0.29 U	0.28 U	0.3 U	0.29 U	0.3 U	0.26 U	0.29 U	0.26 U	0.31 U	0.38 J	0.37 J	0.44 J	0.33 U	0.34 J
Silver	0.61 U	0.6 U	0.63 U	0.62 U	0.63 U	0.56 U	0.61 U	0.56 U	0.65 U	0.76 U	0.7 U	0.74 U	0.64 U	0.65 U
Sodium	66.2 J	33.9 J	32 U	119	45.9 J	51.3 J	41.5 J	28.5 U	35.6 J	81.2 J	48.5 J	60.3 J	104	302
Thallium	0.12 U	0.12 U	0.13 U	0.14 J	0.13 U	0.11 U	0.12 U	0.11 U	0.13 U	0.15 U	0.14 U	0.15 U	0.13 U	0.13 U
Vanadium	12.4	11	7.9	20.2	13.1	12	14	8.2	10.2	16	27.7	13.8	21.1 J-	17.3 J-
Zinc	42.9	39	35.1	50.7	54.5	44.1	52.5	42.5	38.7	77.6	61.3	62.1	114 J-	57.1 J-
METALS|HEXAVALENT CHROMIUM (mg/kg)														
Chromium, Hexavalent	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PESTICIDES (mg/kg)														
Aldrin	--	--	--	--	--	--	--	--	--	--	--	--	0.00086 U	0.00089 U
Alpha Bhc (Alpha Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--	0.00065 U	0.00067 U
Alpha Endosulfan	--	--	--	--	--	--	--	--	--	--	--	--	0.00099 U	0.001 U
Beta Bhc (Beta Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--	0.00069 U	0.00072 U
Beta Endosulfan	--	--	--	--	--	--	--	--	--	--	--	--	0.0011 U	0.0012 U
cis-Chlordane	--	--	--	--	--	--	--	--	--	--	--	--	0.0012 U	0.0012 U
Delta BHC (Delta Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--	0.00078 U	0.0008 U
Dieldrin	--	--	--	--	--	--	--	--	--	--	--	--	0.00093 U	0.00096 U
Endosulfan Sulfate	--	--	--	--	--	--	--	--	--	--	--	--	0.00083 U	0.00086 U
Endrin	--	--	--	--	--	--	--	--	--	--	--	--	0.0009 U	0.00094 U
Endrin Aldehyde	--	--	--	--	--	--	--	--	--	--	--	--	0.00088 U	0.00091 U
Endrin Ketone	--	--	--	--	--	--	--	--	--	--	--	--	0.00099 U	0.001 U
Gamma Bhc (Lindane)	--	--	--	--	--	--	--	--	--	--	--	--	0.00064 U	0.00066 U
Heptachlor	--	--	--	--	--	--	--	--	--	--	--	--	0.00092 U	0.00095 U
Heptachlor Epoxide	--	--	--	--	--	--	--	--	--	--	--	--	0.0014 U	0.0014 U
Methoxychlor	--	--	--	--	--	--	--	--	--	--	--	--	0.0015 U	0.0016 U
P,P'-DDD	--	--	--	--	--	--	--	--	--	--	--	--	0.00094 U	0.00097 U
P,P'-DDE	--	--	--	--	--	--	--	--	--	--	--	--	0.001 U	0.0011 U
P,P'-DDT	--	--	--	--	--	--	--	--	--	--	--	--	0.00073 U	0.00076 U
Toxaphene	--	--	--	--	--	--	--	--	--	--	--	--	0.021 U	0.021 U
trans-Chlordane	--	--	--	--	--	--	--	--	--	--	--	--	0.0015 U	0.0016 U
POLYCHLORINATED BIPHENYLS (mg/kg)														
PCB-1016 (Aroclor 1016)	--	--	--	--	--	--	--	--	--	--	--	--	0.0095 U	0.0098 U
PCB-1221 (Aroclor 1221)	--	--	--	--	--	--	--	--	--	--	--	--	0.0095 U	0.0098 U
PCB-1232 (Aroclor 1232)	--	--	--	--	--	--	--	--	--	--	--	--	0.0095 U	0.0098 U

Table E-7
Summary of Data Used in Risk Assessment
Central Landfills Area Soil (0-0.5 ft-bgs) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFLP-007	CFLP-008	CFLP-009	CFLP-010	CFLP-011	CFLP-012	CFLP-013	CFLP-014	CFLP-015	CFLP-016	CFLP-017	CFLP-018	CFMW-002	CFMW-008A
Sample Lab IDs	180-78687-1, 200-43824-1, 460-158063-1	180-78687-3, 200-43824-3, 460-158063-3	180-78687-5, 200-43824-5, 460-158063-5	180-78687-7, 200-43824-7, 460-158063-7	180-78687-9, 200-43824-9, 460-158063-9	180-78687-11, 200-43824-11, 460-158063-11	180-78687-13, 200-43824-13, 460-158063-13	180-78687-15, 200-43824-15, 460-158063-15	180-78894-1, 200-43930-1, 460-158632-1	180-78894-3, 200-43930-3, 460-158632-3	180-78894-5, 200-43930-5, 460-158632-5	180-78894-7, 200-43930-7, 460-158632-7	460-115528-7	460-115528-1
Sample Name	CFLP-007-SO-0-0.5	CFLP-008-SO-0-0.5	CFLP-009-SO-0-0.5	CFLP-010-SO-0-0.5	CFLP-011-SO-0-0.5	CFLP-012-SO-0-0.5	CFLP-013-SO-0-0.5	CFLP-014-SO-0-0.5	CFLP-015-SO-0-0.5	CFLP-016-SO-0-0.5	CFLP-017-SO-0-0.5	CFLP-018-SO-0-0.5	CFMW-002-SO-0-0.5	CFMW-008a-SO-0-0.5
Sample Depth	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft
Chemical	6/9/2018	6/9/2018	6/9/2018	6/9/2018	6/9/2018	6/9/2018	6/9/2018	6/9/2018	6/16/2018	6/16/2018	6/16/2018	6/16/2018	6/13/2016	6/13/2016
PCB-1242 (Aroclor 1242)	--	--	--	--	--	--	--	--	--	--	--	--	0.0095 U	0.0098 U
PCB-1248 (Aroclor 1248)	--	--	--	--	--	--	--	--	--	--	--	--	0.0095 U	0.0098 U
PCB-1254 (Aroclor 1254)	--	--	--	--	--	--	--	--	--	--	--	--	0.0098 U	0.01 U
PCB-1260 (Aroclor 1260)	--	--	--	--	--	--	--	--	--	--	--	--	0.0098 U	0.01 U
PCB-1262 (Aroclor 1262)	--	--	--	--	--	--	--	--	--	--	--	--	0.0098 U	0.01 U
PCB-1268 (Aroclor 1268)	--	--	--	--	--	--	--	--	--	--	--	--	0.0098 U	0.01 U
Polychlorinated Biphenyl (PCBs)	--	--	--	--	--	--	--	--	--	--	--	--	0.0098 U	0.01 U
SEMIVOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,2,4,5-Tetrachlorobenzene	0.0031 U	0.0015 U	0.0015 U	0.0015 U	0.0016 U	0.0015 U	0.0016 U	0.003 UJ	0.0032 U	0.0097 U	0.0035 U	0.0017 U	0.026 U	0.14 U
1,4-Dioxane (P-Dioxane)	0.022 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.012 U	0.022 U	0.023 U	0.07 U	0.025 U	0.012 U	0.094 U	0.49 U
2,3,4,6-Tetrachlorophenol	0.03 U	0.014 U	0.014 U	0.014 U	0.015 U	0.015 U	0.015 U	0.029 UJ	0.031 U	0.093 U	0.033 U	0.017 U	0.033 UJ	0.17 U
2,4,5-Trichlorophenol	0.0051 U	0.0025 U	0.0024 U	0.0025 U	0.0026 U	0.0025 U	0.0026 U	0.0049 U	0.0053 U	0.016 U	0.0057 U	0.0028 U	0.035 U	0.18 U
2,4,6-Trichlorophenol	0.0039 U	0.0019 U	0.0019 U	0.0019 U	0.002 U	0.0019 U	0.002 U	0.0038 U	0.0041 U	0.012 U	0.0044 U	0.0022 U	0.01 U	0.052 U
2,4-Dichlorophenol	0.0055 U	0.0026 U	0.0026 U	0.0027 U	0.0028 U	0.0027 U	0.0029 U	0.0053 U	0.0057 U	0.017 U	0.0062 U	0.0031 U	0.0083 U	0.043 U
2,4-Dimethylphenol	0.0045 U	0.0021 U	0.0021 U	0.0021 U	0.0022 U	0.0022 U	0.0023 U	0.0043 U	0.0046 UJ	0.014 UJ	0.005 UJ	0.0025 UJ	0.077 UJ	0.4 U
2,4-Dinitrophenol	0.19 U	0.092 U	0.092 U	0.093 U	0.097 U	0.094 U	0.099 U	0.19 U	0.2 U	0.6 UJ	0.22 UJ	0.11 UJ	0.27 UJ	1.4 U
2,4-Dinitrotoluene	0.0036 U	0.0017 U	0.0017 U	0.0017 U	0.0018 U	0.0017 U	0.0018 U	0.0034 U	0.0037 U	0.011 U	0.004 U	0.002 U	0.014 U	0.072 U
2,6-Dinitrotoluene	0.0044 U	0.0021 U	0.0021 U	0.0021 U	0.0022 U	0.0022 U	0.0023 U	0.0043 U	0.0046 U	0.014 U	0.0049 U	0.0024 U	0.019 U	0.097 U
2-Chloronaphthalene	0.0033 U	0.0016 U	0.0016 U	0.0016 U	0.0017 U	0.0016 U	0.0017 U	0.0032 U	0.0034 U	0.01 U	0.0037 U	0.0018 U	0.008 U	0.041 U
2-Chlorophenol	0.0033 U	0.0016 U	0.0016 U	0.0016 U	0.0017 U	0.0016 U	0.0017 U	0.0032 U	0.0035 U	0.01 U	0.0037 U	0.0018 U	0.0089 UJ	0.046 U
2-Methylnaphthalene	0.0044 J	0.0016 J	0.0023 J	0.0017 J	0.0017 U	0.0017 U	0.002 J	0.0033 U	0.0036 U	0.011 J	0.0038 U	0.002 J	0.083 J	0.21 J
2-Methylphenol (O-Cresol)	0.021 U	0.0098 U	0.0098 U	0.0099 U	0.01 U	0.01 U	0.011 U	0.02 U	0.021 U	0.064 U	0.023 U	0.011 U	0.015 U	0.079 U
2-Nitroaniline	0.033 U	0.016 U	0.016 U	0.016 U	0.016 U	0.016 U	0.017 U	0.032 U	0.034 U	0.1 U	0.036 U	0.018 U	0.012 U	0.06 U
2-Nitrophenol	0.0041 U	0.002 U	0.002 U	0.002 U	0.0021 U	0.002 U	0.0021 U	0.004 U	0.0043 U	0.013 U	0.0046 U	0.0023 U	0.012 UJ	0.061 U
3- And 4- Methylphenol (Total)	--	--	--	--	--	--	--	--	--	--	--	--	0.0094 U	0.048 U
3,3'-Dichlorobenzidine	0.067 U	0.032 U	0.032 U	0.032 U	0.034 U	0.032 U	0.034 U	0.065 U	0.069 U	0.21 U	0.075 U	0.037 U	0.039 U	0.2 U
3-Nitroaniline	0.018 U	0.0087 U	0.0087 U	0.0088 U	0.0092 U	0.0089 U	0.0094 U	0.018 U	0.019 U	0.057 U	0.02 U	0.01 U	0.01 U	0.054 U
4,6-Dinitro-2-Methylphenol	0.12 U	0.059 U	0.059 U	0.059 U	0.062 U	0.06 U	0.064 U	0.12 U	0.13 U	0.39 U	0.14 U	0.068 U	0.094 UJ	0.49 U
4-Bromophenyl Phenyl Ether	0.005 U	0.0024 U	0.0024 U	0.0024 U	0.0025 U	0.0024 U	0.0026 U	0.0048 U	0.0052 U	0.016 U	0.0056 U	0.0028 U	0.011 U	0.057 U
4-Chloro-3-Methylphenol	0.0034 U	0.0016 U	0.0016 U	0.0016 U	0.0017 U	0.0016 U	0.0017 U	0.0033 U	0.0035 U	0.011 U	0.0038 U	0.0019 U	0.015 U	0.078 U
4-Chloroaniline	0.0024 U	0.0011 U	0.0011 U	0.0011 U	0.0012 U	0.0012 U	0.0012 U	0.0023 U	0.0025 U	0.0075 U	0.0027 U	0.0013 U	0.009 U	0.047 U
4-Chlorophenyl Phenyl Ether	0.0044 U	0.0021 U	0.0021 U	0.0021 U	0.0022 U	0.0021 U	0.0022 U	0.0042 U	0.0045 U	0.014 U	0.0049 U	0.0024 U	0.011 U	0.054 U
4-Nitroaniline	0.0035 U	0.0017 U	0.0017 U	0.0017 U	0.0018 U	0.0017 U	0.0018 U	0.0034 U	0.0036 U	0.011 U	0.0039 U	0.0019 U	0.013 U	0.069 U
4-Nitrophenol	0.05 U	0.024 U	0.024 U	0.024 U	0.025 U	0.024 U	0.026 U	0.049 UJ	0.052 U	0.16 UJ	0.056 UJ	0.028 UJ	0.17 U	0.87 U
Acenaphthene	0.047	0.019	0.019	0.014	0.0041 J	0.0075	0.015	0.007 J	0.0078 J	0.056	0.0083 J	0.01	0.032 J	1.1 J
Acenaphthylene	0.0031 U	0.0019 J	0.0015 U	0.0015 J	0.0016 U	0.0015 U	0.0016 J	0.003 U	0.0033 U	0.0098 U	0.0035 U	0.0017 U	0.009 U	0.047 U
Acetophenone	0.0039 U	0.0019 U	0.0019 U	0.0019 U	0.002 U	0.0019 U	0.002 U	0.0038 U	0.004 U	0.019 J	0.0043 U	0.0022 U	0.0077 U	0.04 U
Anthracene	0.069	0.046	0.034	0.028	0.0067 J	0.016	0.029	0.011 J	0.016	0.18	0.017	0.019	0.044 J	1.8
Atrazine	0.031 U	0.015 U	0.015 U	0.015 U	0.016 U	0.015 U	0.016 U	0.03 UJ	0.033 UJ	0.098 UJ	0.035 UJ	0.017 UJ	0.016 U	0.081 U
Benzaldehyde	0.0089 U	0.0043 U	0.0042 U	0.0043 U	0.0045 U	0.0043 U	0.0046 U	0.0086 UR	0.0092 UR	0.082 J-	0.0099 UR	0.0049 J-	0.027 UJ	0.14 U
Benzo(A)Anthracene	0.3	0.24	0.3	0.33	0.069	0.16	0.23	0.085	0.11	0.78	0.16	0.18	0.2	6.8
Benzo(A)Pyrene	0.34	0.26	0.31	0.39	0.084	0.2	0.3	0.13	0.17	1.1	0.23	0.27	0.25	7
Benzo(B)Fluoranthene	0.52	0.41	0.4	0.79	0.0018 U	0.36	0.49	0.16	0.24	1.3	0.32	0.36	0.48	12
Benzo(G,H,I)Perylene	0.39	0.3	0.28	0.65	0.1	0.27	0.38	0.12	0.16	1	0.24	0.28	0.29 J	7.3
Benzo(K)Fluoranthene	0.2	0.14	0.16	0.22	0.043	0.12	0.14	0.077	0.061	0.52	0.12	0.15	0.15	4.2
Benzyl Butyl Phthalate	0.049 U	0.024 U	0.023 U	0.024 U	0.025 U	0.024 U	0.025 U	0.048 U	0.053 J	0.15 U	0.055 U	0.027 U	0.011 U	0.056 U
Biphenyl (Diphenyl)	0.003 U	0.0014 U	0.0014 U	0.0014 U	0.0015 U	0.0015 U	0.0016 U	0.0029 U	0.0031 U	0.0094 U	0.0034 U	0.0017 U	0.03 U	0.16 U
Bis(2-Chloroethoxy) Methane	0.0034 U	0.0016 U	0.0016 U	0.0016 U	0.0017 U	0.0017 U	0.0018 U	0.0033 U	0.0035 U	0.011 U	0.0038 U	0.0019 U	0.011 U	0.057 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.0026 U	0.0012 U	0.0012 U	0.0012 U	0.0013 U	0.0013 U	0.0013 U	0.0025 U	0.0027 U	0.0081 U	0.0029 U	0.0014 U	0.0083 U	0.043 U
Bis(2-Chloroisopropyl) Ether	0.0053 U	0.0025 U	0.0025 U	0.0025 U	0.0027 U	0.0026 U	0.0027 U	0.0051 U	0.0055 U	0.017 U	0.0059 U	0.0029 U	0.014 U	0.075 U
Bis(2-Ethylhexyl) Phthalate	0.076 U	0.037 U	0.036 U	0.037 U	0.038 U	0.037 U	0.039 U	0.074 U	0.1 J	0.24 U	0.085 U	0.042 U	0.014 U	0.071 U
Caprolactam	0.047 U	0.022 U	0.022 U	0.022 U	0.023 U	0.023 U	0.024 U	0.045 U	0.048 U	0.15 U	0.052 U	0.026 U	0.025 UJ	0.13 U
Carbazole	0.056	0.041	0.044	0.046	0.014	0.024	0.042	0.016 J+	0.023	0.18	0.028	0.03	0.032 J	1.6 J
Chrysene	0.44	0.33	0.38	0.66	0.13	0.28	0.36	0.13	0.18	1.1	0.25	0.29	0.32 J	12
Dibenz(A,H)Anthracene	0.099 J+	0.075	0.082	0.15	0.0016 U	0.065	0.093	0.03	0.03	0.26	0.057	0.058	0.082	1.9
Dibenzofuran	0.014 J	0.0067 J	0.0049 J	0.0048 J	0.0016 U	0.003 J	0.0053 J	0.003 U	0.0033 U	0.027 J	0.0038 J	0.0039 J	0.014 J	0.41 J
Diethyl Phthalate	0.022 U	0.01 U	0.01 U	0.01 U	0.011 U	0.01 U	0.011 U	0.021 U	0.022 U	0.067 U	0.024 U	0.012 U	0.01 U	0.052 U
Dimethyl Phthalate	0.0026 U	0.0012 U	0.0012 U	0.0012 U	0.0013 U	0.0013 U	0.0013 U	0.0025 U	0.0027 U	0.0081 U	0.0029 U	0.0014 U	0.01 U	0.053 U

Table E-7
Summary of Data Used in Risk Assessment
Central Landfills Area Soil (0-0.5 ft-bgs) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFLP-007	CFLP-008	CFLP-009	CFLP-010	CFLP-011	CFLP-012	CFLP-013	CFLP-014	CFLP-015	CFLP-016	CFLP-017	CFLP-018	CFMW-002	CFMW-008A
Sample Lab IDs	180-78687-1, 200-43824-1, 460-158063-1	180-78687-3, 200-43824-3, 460-158063-3	180-78687-5, 200-43824-5, 460-158063-5	180-78687-7, 200-43824-7, 460-158063-7	180-78687-9, 200-43824-9, 460-158063-9	180-78687-11, 200-43824-11, 460-158063-11	180-78687-13, 200-43824-13, 460-158063-13	180-78687-15, 200-43824-15, 460-158063-15	180-78894-1, 200-43930-1, 460-158632-1	180-78894-3, 200-43930-3, 460-158632-3	180-78894-5, 200-43930-5, 460-158632-5	180-78894-7, 200-43930-7, 460-158632-7	460-115528-7	460-115528-1
Sample Name	CFLP-007-SO-0-0.5	CFLP-008-SO-0-0.5	CFLP-009-SO-0-0.5	CFLP-010-SO-0-0.5	CFLP-011-SO-0-0.5	CFLP-012-SO-0-0.5	CFLP-013-SO-0-0.5	CFLP-014-SO-0-0.5	CFLP-015-SO-0-0.5	CFLP-016-SO-0-0.5	CFLP-017-SO-0-0.5	CFLP-018-SO-0-0.5	CFMW-002-SO-0-0.5	CFMW-008a-SO-0-0.5
Sample Depth	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft
Chemical	6/9/2018	6/9/2018	6/9/2018	6/9/2018	6/9/2018	6/9/2018	6/9/2018	6/9/2018	6/16/2018	6/16/2018	6/16/2018	6/16/2018	6/13/2016	6/13/2016
Di-N-Butyl Phthalate	0.031 U	0.015 U	0.015 U	0.015 U	0.016 U	0.015 U	0.016 U	0.03 U	0.033 U	0.098 U	0.035 U	0.017 U	0.011 U	0.054 U
Di-N-Octylphthalate	0.042 U	0.02 U	0.02 U	0.02 U	0.021 U	0.02 U	0.022 U	0.04 U	0.043 U	0.13 U	0.047 U	0.023 U	0.096 J	0.092 U
Fluoranthene	0.62	0.53	0.53	0.58	0.15	0.32	0.45	0.15	0.22	1.5	0.26	0.3	0.38	13
Fluorene	0.027	0.016	0.012	0.0076	0.0031 J	0.0046 J	0.01	0.0047 J	0.0044 J	0.042 J	0.0068 J	0.0062 J	0.0077 U	0.83 J
Hexachlorobenzene	0.0051 U	0.0025 U	0.0024 U	0.0025 U	0.0026 U	0.0025 U	0.0027 U	0.005 U	0.0053 U	0.016 U	0.0057 U	0.0028 U	0.014 U	0.074 U
Hexachlorobutadiene	0.0042 U	0.002 U	0.002 U	0.002 U	0.0021 U	0.002 U	0.0022 U	0.004 UJ	0.0043 UJ	0.013 UJ	0.0047 UJ	0.0023 UJ	0.0099 U	0.051 U
Hexachlorocyclopentadiene	0.0037 U	0.0018 U	0.0017 U	0.0018 U	0.0018 U	0.0018 U	0.0019 U	0.0035 UJ	0.0038 U	0.011 U	0.0041 U	0.002 U	0.022 U	0.11 U
Hexachloroethane	0.0037 U	0.0018 U	0.0018 U	0.0018 U	0.0019 U	0.0018 U	0.0019 U	0.0036 U	0.0038 UJ	0.012 UJ	0.0041 UJ	0.002 UJ	0.013 U	0.067 U
Indeno(1,2,3-C,D)Pyrene	0.32	0.26	0.25	0.48	0.081	0.22	0.31	0.093	0.12	0.81	0.19	0.22	0.29	7.8
Isophorone	0.0037 U	0.0018 U	0.0017 U	0.0018 U	0.0018 U	0.0018 U	0.0019 U	0.0035 U	0.0038 U	0.011 U	0.0041 U	0.002 U	0.0075 U	0.039 U
Naphthalene	0.0063 J	0.0033 J	0.0023 J	0.0027 J	0.0014 J	0.0014 U	0.0051 J	0.0027 U	0.0029 U	0.02 J	0.0031 U	0.0028 J	0.036 J	0.51 J
Nitrobenzene	0.026 U	0.013 U	0.012 U	0.013 U	0.013 U	0.013 U	0.014 U	0.025 U	0.027 U	0.082 U	0.029 U	0.015 U	0.011 U	0.057 U
N-Nitrosodi-N-Propylamine	0.0049 U	0.0023 U	0.0023 U	0.0023 U	0.0024 U	0.0024 U	0.0025 U	0.0047 U	0.005 U	0.015 U	0.0054 U	0.0027 U	0.012 U	0.061 U
N-Nitrosodiphenylamine	0.024 U	0.011 U	0.011 U	0.011 U	0.012 U	0.012 U	0.012 U	0.023 U	0.025 U	0.075 U	0.027 U	0.013 U	0.032 UJ	0.16 U
Pentachlorophenol	0.12 U	0.055 U	0.055 U	0.055 U	0.058 U	0.056 U	0.059 U	0.11 UJ	0.12 U	0.36 U	0.13 U	0.064 U	0.043 UJ	0.22 U
Phenanthrene	0.32	0.24	0.23	0.17	0.044	0.1	0.17	0.069	0.11	0.95	0.12	0.13	0.22 J	7.8
Phenol	0.022 U	0.01 U	0.01 U	0.01 U	0.011 U	0.011 U	0.011 U	0.021 U	0.041 J	0.14 J	0.024 U	0.012 U	0.011 U	0.059 U
Pyrene	0.57	0.41	0.47	0.48	0.12	0.26	0.39	0.14	0.19	1.5	0.27	0.29	0.41	11

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-7
Summary of Data Used in Risk Assessment
Central Landfills Area Soil (0-0.5 ft-bgs) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-010	CFMW-012A	CFMW-016A	CFMW-018	CFMW-019A	CFMW-022	CFMW-023A	CFMW-029	CFSB-001	CFSB-002	CFSB-003	CFSB-004	CFSB-005	CFSB-006
Sample Lab IDs	460-114141-16	460-114275-1	460-115886-11	460-114141-34	460-114456-49	460-114828-29	460-115731-9	460-114141-13	460-114529-4	460-114529-7	460-114529-10	460-114529-1	460-114529-15	460-114456-18
Sample Name	CFMW-010-SO-0-0.5	CFMW-012A-SO-0-0.5	CFMW-016a-SO-0-0.5	CFMW-018-SO-0-0.5	CFMW-019a-SO-0-0.5	CFMW-022-SO-0-0.5	CFMW-023a-SO-0-0.5	CFMW-029-SO-0-0.5	CFSB-001-SO-0-0.5	CFSB-002-SO-0-0.5	CFSB-003-SO-0-0.5	CFSB-004-SO-0-0.5	CFSB-005-SO-0-0.5	CFSB-006-SO-0-0.5
Sample Depth	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft
Chemical	5/18/2016	5/20/2016	6/21/2016	5/19/2016	5/25/2016	6/2/2016	6/17/2016	5/18/2016	5/25/2016	5/25/2016	5/25/2016	5/25/2016	5/25/2016	5/23/2016
GENERAL CHEMISTRY (mg/kg)														
Fluoride	114 J-	91.9 J-	59.4 J	9.33 J-	37 J-	17.5 J	109 J-	105 J-	56.5 J	22.4 J	26.9 J	34.1 J	11.6 J	14.6 J
Cyanide	1.4	0.6	0.32	0.018 U	0.063 J	0.29	0.057 J	0.21	0.39	0.1 J	0.078 J	0.25	0.21	0.016 U
METALS (mg/kg)														
"Chromium, Hexavalent - Estimated"	0.339903	0.350608	0.315815	0.281022	0.219465	0.26764	0.232847	0.414842	0.33455	0.208759	0.33455	0.256934	0.2382	0.206083
"Chromium, Trivalent - Calculated"	--	--	--	--	--	--	--	--	--	--	--	--	--	--
"Chromium, Trivalent - Estimated"	12.3601	12.7494	11.4842	10.219	7.98054	9.73236	8.46715	15.0852	12.1655	7.59124	12.1655	9.34307	8.6618	7.49392
Aluminum	25700	16400	12600	10900 J	9620	10600	20200	19500	20400	10500	15900	8890	11300	7200
Antimony	0.37 UJ	0.44 UJ	0.41 UJ	0.35 UJ	0.37 UJ	0.4 UJ	0.42 UJ	0.33 UJ	0.44 U	0.37 U	0.4 UJ	0.34 U	0.38 UJ	0.32 UJ
Arsenic	6.2	6.6 J	4.8	11.3 J	3.9	4.8	6.1	5.4	7.3	5.2	7.9 J	4.4	5.6 J	3.6
Barium	235	131	105 J	97.4	91.7	68.8	166	81.5	265	90.2	121	77.7	111	77.4
Beryllium	0.84	0.6	0.61	0.4	0.36	0.33 J	0.55	0.99	0.81	0.4	0.49	0.44	0.48	0.36
Cadmium	0.28 U	0.33 U	0.31 U	0.26 U	0.28 U	0.3 U	0.32 U	0.27 J	0.33 U	0.28 U	0.3 U	0.26 U	0.29 U	0.24 U
Calcium	4460	2340 J	41300 J	59400	11200	35000	4540 J	25400	6020	10600	7630	39100	86800	34300
Chromium, Total	12.7	13.1	11.8 J	10.5	8.2	10	8.7	15.5	12.5	7.8	12.5	9.6	8.9	7.7
Cobalt	6.4	5.5	5.1	5.1	3.9	4.7	6 J+	5.8	6	4.3	6.7 J-	4.1	4.1 J-	4.4
Copper	13.7	10.6 J+	14	15.4 J	13.1 J	12.3	8 J	16.4	21.8	7260	17.7 J+	11.8	12.5 J+	9.1
Iron	20500	20600	14100	14000	11000	15300	12800	13700	16200	11500	18800	10900	12900	12000
Lead	13.5	15 J	23.3 J	12.4	11.9 J	9.1	13.4	48	18.5	10.5	12.1 J	18.1	12.4 J	6.1 J+
Magnesium	10900	13300 J	9170	13100	7480	10600	8920	11500	9090	9420	14100	7820	15600	12000
Manganese	529	533	446	405 J	368	368	444	333	521	385	443	361	446	313
Mercury	0.019	0.012 U	0.02	0.034	0.024	0.018	0.014 U	0.019	0.021	0.026	0.015 U	0.013 U	0.013 U	0.025
Nickel	22.2	14 J+	19.2	14.9	9.1	11.7	89 J-	46.5	18.4	11.2	17	10.7	14.6	9.3 J
Potassium	1430	927 J	1100	1160	847	593	1010	1100	1310	828	1400 J+	772	1060 J+	541 J
Selenium	0.35 U	0.41 U	0.38 U	0.32 U	0.34 U	0.37 U	0.39 U	1 J	0.67 J	0.35 U	0.37 U	0.32 U	0.36 U	0.3 U
Silver	0.68 U	0.8 U	0.75 U	0.63 U	0.67 U	0.73 U	0.77 U	0.6 U	0.8 U	0.68 U	0.73 U	0.62 U	0.7 U	0.58 U
Sodium	176	74 J	68.3 J	32.4 U	34.2 U	37.1 U	72.6 J	209	104 J	34.7 U	37.2 J	31.7 U	49.5 J	29.7 U
Thallium	0.14 J	0.17 U	0.15 U	0.13 U	0.14 U	0.15 U	0.16 U	0.14 J	0.16 U	0.14 U	0.15 U	0.13 U	0.14 U	0.12 U
Vanadium	23.7	17.7	12.2	10.4	8.6	10.7	21.7	22.8	15.6	9.3	11.2	8.1	10.6	6.2
Zinc	72.5	75.5 J	45.4	41.3	34.6	39	54.5	114	66.8	40.9	58.1	63.2	44.3	33.6
METALS|HEXAVALENT CHROMIUM (mg/kg)														
Chromium, Hexavalent	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PESTICIDES (mg/kg)														
Aldrin	0.00091 U	0.00092 U	0.0009 U	0.00091 U	0.0009 U	0.00092 U	0.00095 U	0.00087 U	--	--	--	--	--	--
Alpha Bhc (Alpha Hexachlorocyclohexane)	0.00069 U	0.0007 U	0.00068 U	0.00068 U	0.00068 U	0.0007 U	0.00072 U	0.00065 U	--	--	--	--	--	--
Alpha Endosulfan	0.0011 U	0.0011 U	0.001 U	0.001 U	0.001 U	0.0011 U	0.0011 U	0.001 U	--	--	--	--	--	--
Beta Bhc (Beta Hexachlorocyclohexane)	0.00073 U	0.00074 U	0.00072 U	0.00073 U	0.00072 U	0.00074 U	0.00077 U	0.0007 U	--	--	--	--	--	--
Beta Endosulfan	0.0012 U	0.0012 U	0.0012 U	0.0012 U	0.0012 U	0.0012 U	0.0012 U	0.0011 U	--	--	--	--	--	--
cis-Chlordane	0.0012 U	0.0012 U	0.0012 U	0.0012 U	0.0012 U	0.0012 U	0.0013 U	0.0012 U	--	--	--	--	--	--
Delta BHC (Delta Hexachlorocyclohexane)	0.00082 U	0.00083 U	0.00081 U	0.00082 U	0.00081 U	0.00083 U	0.00086 U	0.00078 U	--	--	--	--	--	--
Dieldrin	0.00098 U	0.00099 U	0.00097 U	0.00098 U	0.00097 U	0.00099 U	--	0.00093 U	--	--	--	--	--	--
Endosulfan Sulfate	0.00088 U	0.00089 U	0.00087 U	0.00087 U	0.00087 U	0.00089 U	0.00092 U	0.00084 U	--	--	--	--	--	--
Endrin	0.00096 U	0.00097 U	0.00095 U	0.00095 U	0.00094 U	0.00097 U	0.001 U	0.00091 U	--	--	--	--	--	--
Endrin Aldehyde	0.00094 U	0.00095 U	0.00093 U	0.00093 U	0.00092 U	0.00095 U	0.00098 U	0.00089 U	--	--	--	--	--	--
Endrin Ketone	0.0011 U	0.0011 U	0.001 U	0.001 U	0.001 U	0.0011 U	0.0011 U	0.001 U	--	--	--	--	--	--
Gamma Bhc (Lindane)	0.00068 U	0.00069 U	0.00067 U	0.00067 U	0.00067 U	0.00068 U	0.00071 U	0.00064 U	--	--	--	--	--	--
Heptachlor	0.00097 U	0.00098 U	0.00096 U	0.00096 U	0.00096 U	0.00098 U	0.001 U	0.00092 U	--	--	--	--	--	--
Heptachlor Epoxide	0.0015 U	0.0015 U	0.0015 U	0.0015 U	0.0015 U	0.0015 U	0.0015 U	0.0014 U	--	--	--	--	--	--
Methoxychlor	0.0016 U	0.0016 U	0.0016 U	0.0016 U	0.0016 U	0.0016 U	0.0017 U	0.0015 U	--	--	--	--	--	--
P,P'-DDD	0.00099 U	0.001 U	0.00098 U	0.00099 U	0.00098 U	0.001 U	0.001 U	0.00094 U	--	--	--	--	--	--
P,P'-DDE	0.0011 U	0.0011 U	0.0011 U	0.0011 U	0.0011 U	0.0011 U	0.0011 U	0.001 U	--	--	--	--	--	--
P,P'-DDT	0.00078 U	0.00079 U	0.00077 U	0.00077 U	0.00077 U	0.00079 U	0.00081 U	0.00074 U	--	--	--	--	--	--
Toxaphene	0.022 U	0.022 U	0.022 U	0.022 U	0.022 U	0.022 U	0.023 U	0.021 U	--	--	--	--	--	--
trans-Chlordane	0.0016 U	0.0017 U	0.0016 U	0.0016 U	0.0016 U	0.0017 U	0.0017 U	0.0016 U	--	--	--	--	--	--
POLYCHLORINATED BIPHENYLS (mg/kg)														
PCB-1016 (Aroclor 1016)	0.01 U	0.01 U	0.0099 U	0.01 U	0.0099 U	0.01 U	0.01 U	0.0095 U	0.012 U	0.01 U	0.012 U	0.01 U	0.011 U	0.0096 U
PCB-1221 (Aroclor 1221)	0.01 U	0.01 U	0.0099 U	0.01 U	0.0099 U	0.01 U	0.01 U	0.0095 U	0.012 U	0.01 U	0.012 U	0.01 U	0.011 U	0.0096 U
PCB-1232 (Aroclor 1232)	0.01 U	0.01 U	0.0099 U	0.01 U	0.0099 U	0.01 U	0.01 U	0.0095 U	0.012 U	0.01 U	0.012 U	0.01 U	0.011 U	0.0096 U

Table E-7
Summary of Data Used in Risk Assessment
Central Landfills Area Soil (0-0.5 ft-bgs) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-010	CFMW-012A	CFMW-016A	CFMW-018	CFMW-019A	CFMW-022	CFMW-023A	CFMW-029	CFSB-001	CFSB-002	CFSB-003	CFSB-004	CFSB-005	CFSB-006
Sample Lab IDs	460-114141-16	460-114275-1	460-115886-11	460-114141-34	460-114456-49	460-114828-29	460-115731-9	460-114141-13	460-114529-4	460-114529-7	460-114529-10	460-114529-1	460-114529-15	460-114456-18
Sample Name	CFMW-010-SO-0-0.5	CFMW-012A-SO-0-0.5	CFMW-016a-SO-0-0.5	CFMW-018-SO-0-0.5	CFMW-019a-SO-0-0.5	CFMW-022-SO-0-0.5	CFMW-023a-SO-0-0.5	CFMW-029-SO-0-0.5	CFSB-001-SO-0-0.5	CFSB-002-SO-0-0.5	CFSB-003-SO-0-0.5	CFSB-004-SO-0-0.5	CFSB-005-SO-0-0.5	CFSB-006-SO-0-0.5
Sample Depth	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft
Chemical	5/18/2016	5/20/2016	6/21/2016	5/19/2016	5/25/2016	6/2/2016	6/17/2016	5/18/2016	5/25/2016	5/25/2016	5/25/2016	5/25/2016	5/25/2016	5/23/2016
PCB-1242 (Aroclor 1242)	0.01 U	0.01 U	0.0099 U	0.01 U	0.0099 U	0.01 U	0.01 U	0.0095 U	0.012 U	0.01 U	0.012 U	0.01 U	0.011 U	0.0096 U
PCB-1248 (Aroclor 1248)	0.01 U	0.01 U	0.0099 U	0.01 U	0.0099 U	0.01 U	0.01 U	0.0095 U	0.012 U	0.01 U	0.012 U	0.01 U	0.011 U	0.0096 U
PCB-1254 (Aroclor 1254)	0.01 U	0.011 U	0.01 U	0.01 U	0.01 U	0.01 U	0.011 U	0.0099 U	0.013 U	0.011 U	0.012 U	0.01 U	0.011 U	0.0099 U
PCB-1260 (Aroclor 1260)	0.01 U	0.011 U	0.01 U	0.01 U	0.01 U	0.01 U	0.011 U	0.0099 U	0.013 U	0.011 U	0.012 U	0.01 U	0.011 U	0.0099 U
PCB-1262 (Aroclor 1262)	0.01 U	0.011 U	0.01 U	0.01 U	0.01 U	0.01 U	0.011 U	0.0099 U	0.013 U	0.011 U	0.012 U	0.01 U	0.011 U	0.0099 U
PCB-1268 (Aroclor 1268)	0.01 U	0.011 U	0.01 U	0.01 U	0.01 U	0.01 U	0.011 U	0.0099 U	0.013 U	0.011 U	0.012 U	0.01 U	0.011 U	0.0099 U
Polychlorinated Biphenyl (PCBs)	0.01 U	0.011 U	0.01 U	0.01 U	0.01 U	0.01 U	0.011 U	0.0099 U	0.013 U	0.011 U	0.012 U	0.01 U	0.011 U	0.0099 U
SEMIVOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,2,4,5-Tetrachlorobenzene	0.028 U	0.028 U	0.027 U	0.028 U	0.027 U	0.028 U	0.029 U	0.053 U	0.034 U	0.029 U	0.032 U	1.4 U	0.029 U	0.027 U
1,4-Dioxane (P-Dioxane)	0.1 U	0.1 U	0.098 U	0.099 U	0.098 U	0.1 U	0.1 U	0.19 U	0.12 U	0.1 U	0.11 U	4.9 U	0.11 U	0.096 U
2,3,4,6-Tetrachlorophenol	0.035 U	0.036 U	0.035 U	0.035 U	0.035 U	0.035 U	0.037 U	0.067 U	0.042 U	0.036 U	0.04 U	1.7 U	0.037 U	0.034 U
2,4,5-Trichlorophenol	0.037 U	0.038 U	0.037 U	0.037 U	0.037 U	0.037 U	0.039 U	0.071 U	0.045 U	0.039 U	0.043 U	1.8 U	0.039 U	0.036 U
2,4,6-Trichlorophenol	0.011 U	0.011 U	0.01 U	0.011 U	0.01 U	0.011 U	0.011 U	0.02 U	0.013 U	0.011 U	0.012 U	0.53 U	0.011 U	0.01 U
2,4-Dichlorophenol	0.0088 U	0.0089 U	0.0087 U	0.0087 U	0.0087 U	0.0089 U	0.0092 U	0.017 U	0.011 U	0.0092 U	0.01 U	0.44 U	0.0093 U	0.0084 U
2,4-Dimethylphenol	0.082 U	0.083 U	0.081 U	0.081 U	0.081 U	0.083 U	0.086 U	0.16 U	0.099 U	0.085 U	0.094 U	4.1 U	0.087 U	0.079 U
2,4-Dinitrophenol	0.28 U	0.29 U	0.28 U	0.28 U	0.28 U	0.28 U	0.29 U	0.54 U	0.34 U	0.29 U	0.32 U	14 U	0.3 U	0.27 U
2,4-Dinitrotoluene	0.015 U	0.015 U	0.015 U	0.015 U	0.015 U	0.015 U	0.015 U	0.028 U	0.018 U	0.015 U	0.017 U	0.73 U	0.016 U	0.014 U
2,6-Dinitrotoluene	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.021 U	0.038 U	0.024 U	0.021 U	0.023 U	0.99 U	0.021 U	0.019 U
2-Chloronaphthalene	0.0085 U	0.0086 U	0.0083 U	0.0084 U	0.0083 U	0.0085 U	0.0088 U	0.016 U	0.01 U	0.0088 U	0.0097 U	0.42 U	0.009 U	0.0081 U
2-Chlorophenol	0.0095 U	0.0096 U	0.0094 U	0.0094 U	0.0093 U	0.0096 U	0.0099 U	0.018 U	0.011 U	0.0099 U	0.011 U	0.47 U	0.01 U	0.0091 U
2-Methylnaphthalene	0.024 J	0.0083 U	0.11 J	0.0082 U	0.0084 J	0.0083 U	0.048 J	0.031 J	0.073 J	0.0086 U	0.0095 U	2 J	0.0087 U	0.0079 U
2-Methylphenol (O-Cresol)	0.016 U	0.016 U	0.016 U	0.016 U	0.016 U	0.016 U	0.017 U	0.031 U	0.02 U	0.017 U	0.019 U	0.81 U	0.017 U	0.016 U
2-Nitroaniline	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U	0.013 U	0.023 U	0.015 U	0.013 U	0.014 U	0.61 U	0.013 U	0.012 U
2-Nitrophenol	0.013 U	0.013 U	0.012 U	0.012 U	0.012 U	0.013 U	0.013 U	0.024 U	0.015 U	0.013 U	0.014 U	0.62 U	0.013 U	0.012 U
3- And 4- Methylphenol (Total)	0.0099 U	0.01 U	0.0098 U	0.0099 U	0.0098 U	0.01 U	0.01 U	0.019 U	0.012 U	0.01 U	0.011 U	0.49 U	0.011 U	0.0095 U
3,3'-Dichlorobenzidine	0.042 U	0.042 U	0.041 U	0.041 U	0.041 U	0.042 U	0.043 U	0.079 U	0.05 U	0.043 U	0.048 U	2.1 U	0.044 U	0.04 U
3-Nitroaniline	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.012 U	0.021 U	0.013 U	0.012 U	0.013 U	0.55 U	0.012 U	0.011 U
4,6-Dinitro-2-Methylphenol	0.099 U	0.1 U	0.098 U	0.099 U	0.098 U	0.1 U	0.1 U	0.19 U	0.12 U	0.1 U	0.11 U	4.9 U	0.11 U	0.095 U
4-Bromophenyl Phenyl Ether	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U	0.022 U	0.014 U	0.012 U	0.013 U	0.58 U	0.012 U	0.011 U
4-Chloro-3-Methylphenol	0.016 U	0.016 U	0.016 U	0.016 U	0.016 U	0.016 U	0.017 U	0.03 U	0.019 U	0.017 U	0.018 U	0.79 U	0.017 U	0.015 U
4-Chloroaniline	0.0096 U	0.0097 U	0.0095 U	0.0095 U	0.0094 U	0.0097 U	0.01 U	0.018 U	0.012 U	0.01 U	0.011 U	0.48 U	0.01 U	0.0092 U
4-Chlorophenyl Phenyl Ether	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.012 U	0.021 U	0.014 U	0.012 U	0.013 U	0.55 U	0.012 U	0.011 U
4-Nitroaniline	0.014 U	0.014 U	0.014 U	0.014 U	0.014 U	0.014 U	0.015 U	0.027 U	0.017 U	0.015 U	0.016 U	0.7 U	0.015 U	0.014 U
4-Nitrophenol	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.19 U	0.34 U	0.22 U	0.19 U	0.21 U	8.9 U	0.19 U	0.17 U
Acenaphthene	0.19 J	0.018 J	0.7	0.009 U	0.058 J	0.0091 U	0.061 J	0.2 J	0.061 J	0.018 J	0.01 U	22	0.025 J	0.0086 U
Acenaphthylene	0.0096 U	0.0097 U	0.0095 U	0.0095 U	0.0094 U	0.0097 U	0.01 U	0.018 U	0.022 J	0.01 U	0.011 U	0.54 J	0.01 U	0.0092 U
Acetophenone	0.0081 U	0.0082 U	0.008 U	0.0081 U	0.008 U	0.0082 U	0.0085 U	0.015 U	0.0098 U	0.0084 U	0.0093 U	0.4 U	0.0086 U	0.0078 U
Anthracene	0.4	0.036 U	1.2	0.035 U	0.093 J	0.036 U	0.072 J	0.34 J	0.16 J	0.037 U	0.041 U	47	0.042 J	0.034 U
Atrazine	0.017 U	0.017 U	0.016 U	0.016 U	0.016 U	0.017 U	0.017 U	0.032 U	0.02 U	0.017 U	0.019 U	0.82 U	0.018 U	0.016 U
Benzaldehyde	0.028 U	0.029 U	0.028 U	0.028 U	0.028 U	0.029 U	0.03 U	0.054 U	0.034 U	0.03 U	0.033 U	1.4 U	0.03 U	0.027 U
Benzo(A)Anthracene	2.1	0.15	2.7	0.15	0.34	0.069	0.26	2.8	0.46	0.19	0.085	100	0.19	0.03 U
Benzo(A)Pyrene	2.4	0.17	2.8	0.21	0.43	0.077	0.33	3.1	0.7	0.24	0.11	100	0.23	0.011 U
Benzo(B)Fluoranthene	3.6	0.23	3.3	0.33	0.62	0.23	0.55	6.5	1	0.36	0.19	120	0.36	0.015 J
Benzo(G,H,I)Perylene	2.7	0.2 J+	4.2	0.24 J	0.39	0.086 J	0.33 J	4.1	0.6	0.23 J	0.1 J	62	0.21 J	0.021 U
Benzo(K)Fluoranthene	1.3	0.083	1.3	0.12	0.22	0.078	0.19	2.2	0.38	0.15	0.076	50	0.15	0.016 U
Benzyl Butyl Phthalate	0.013 J	0.012 U	0.011 U	0.011 U	0.011 U	0.012 U	0.012 U	0.022 U	0.014 U	0.012 U	0.013 U	0.57 U	0.012 U	0.011 U
Biphenyl (Diphenyl)	0.032 U	0.032 U	0.035 J	0.032 U	0.031 U	0.032 U	0.033 U	0.06 U	0.038 U	0.033 U	0.037 U	1.6 U	0.034 U	0.03 U
Bis(2-Chloroethoxy) Methane	0.012 U	0.012 U	0.011 U	0.012 U	0.011 U	0.012 U	0.012 U	0.022 U	0.014 U	0.012 U	0.013 U	0.58 U	0.012 U	0.011 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.0088 U	0.0089 U	0.0087 U	0.0087 U	0.0087 U	0.0089 U	0.0092 U	0.017 U	0.011 U	0.0092 U	0.01 U	0.44 U	0.0093 U	0.0084 U
Bis(2-Chloroisopropyl) Ether	0.015 UJ	0.016 U	0.015 U	0.015 U	0.015 U	0.015 U	0.016 U	0.029 UJ	0.019 U	0.016 U	0.018 U	0.76 U	0.016 U	0.015 U
Bis(2-Ethylhexyl) Phthalate	0.057 J	0.015 U	0.014 U	0.062 J	0.014 U	0.015 U	0.015 U	0.079 J	0.18 J	0.015 U	0.017 U	0.72 U	0.015 U	0.051 J
Caprolactam	0.027 U	0.027 UJ	0.026 U	0.027 U	0.026 U	0.027 U	0.028 U	0.051 U	0.032 U	0.028 U	0.031 U	1.3 U	0.028 U	0.026 U
Carbazole	0.35 J	0.028 J	0.74	0.018 J	0.063 J	0.0093 U	0.058 J	0.29 J	0.13 J	0.027 J	0.011 J	32	0.033 J	0.0089 U
Chrysene	2.8	0.19 J	3.1	0.22 J	0.46	0.14 J	0.41	4.1	0.77	0.28 J	0.13 J	110	0.26 J	0.011 J
Dibenz(A,H)Anthracene	0.63	0.042 J+	0.91	0.04 J+	0.1	0.025 J	0.02 U	1.2	0.13	0.05	0.024 J	21	0.043	0.019 U
Dibenzofuran	0.092 J	0.011 U	0.3 J	0.011 U	0.027 J	0.011 U	0.021 J	0.06 J	0.031 J	0.012 U	0.013 U	10 J	0.012 U	0.011 U
Diethyl Phthalate	0.011 U	0.011 U	0.01 U	0.011 U	0.01 U	0.011 U	0.011 U	0.02 U	0.013 U	0.011 U	0.012 U	0.53 U	0.011 U	0.01 U
Dimethyl Phthalate	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.021 U	0.013 U	0.011 U	0.012 U	0.54 U	0.011 U	0.01 U

Table E-7
Summary of Data Used in Risk Assessment
Central Landfills Area Soil (0-0.5 ft-bgs) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-010	CFMW-012A	CFMW-016A	CFMW-018	CFMW-019A	CFMW-022	CFMW-023A	CFMW-029	CFSB-001	CFSB-002	CFSB-003	CFSB-004	CFSB-005	CFSB-006
Sample Lab IDs	460-114141-16	460-114275-1	460-115886-11	460-114141-34	460-114456-49	460-114828-29	460-115731-9	460-114141-13	460-114529-4	460-114529-7	460-114529-10	460-114529-1	460-114529-15	460-114456-18
Sample Name	CFMW-010-SO-0-0.5	CFMW-012A-SO-0-0.5	CFMW-016a-SO-0-0.5	CFMW-018-SO-0-0.5	CFMW-019a-SO-0-0.5	CFMW-022-SO-0-0.5	CFMW-023a-SO-0-0.5	CFMW-029-SO-0-0.5	CFSB-001-SO-0-0.5	CFSB-002-SO-0-0.5	CFSB-003-SO-0-0.5	CFSB-004-SO-0-0.5	CFSB-005-SO-0-0.5	CFSB-006-SO-0-0.5
Sample Depth	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft
Chemical	5/18/2016	5/20/2016	6/21/2016	5/19/2016	5/25/2016	6/2/2016	6/17/2016	5/18/2016	5/25/2016	5/25/2016	5/25/2016	5/25/2016	5/25/2016	5/23/2016
Di-N-Butyl Phthalate	0.011 U	0.011 U	0.023 J	0.011 U	0.011 U	0.011 U	0.052 J	0.021 U	0.014 U	0.012 U	0.013 U	0.55 U	0.012 U	0.017 J
Di-N-Octylphthalate	0.019 U	0.019 U	0.019 U	0.019 U	0.019 U	0.019 U	0.02 U	0.036 U	0.023 U	0.02 U	0.022 U	0.94 U	0.02 U	0.018 U
Fluoranthene	4.1	0.27 J	6.1	0.22 J	0.66	0.12 J	0.52	4	1	0.31 J	0.14 J	240	0.34 J	0.014 J
Fluorene	0.16 J	0.012 J	0.58	0.0081 U	0.046 J	0.0082 U	0.035 J	0.099 J	0.044 J	0.0084 U	0.0093 U	19	0.02 J	0.0078 U
Hexachlorobenzene	0.015 U	0.015 U	0.015 U	0.015 U	0.015 U	0.015 U	0.016 U	0.029 U	0.018 U	0.016 U	0.017 U	0.75 U	0.016 U	0.014 U
Hexachlorobutadiene	0.01 U	0.011 U	0.01 U	0.01 U	0.01 U	0.011 U	0.011 U	0.02 U	0.013 U	0.011 U	0.012 U	0.52 U	0.011 U	0.01 U
Hexachlorocyclopentadiene	0.023 U	0.024 U	0.023 U	0.023 U	0.023 U	0.023 U	0.024 U	0.044 U	0.028 U	0.024 U	0.027 U	1.2 U	0.025 U	0.022 UJ
Hexachloroethane	0.014 U	0.014 U	0.013 U	0.014 U	0.013 U	0.014 U	0.014 U	0.026 U	0.017 U	0.014 U	0.016 U	0.68 U	0.014 U	0.013 U
Indeno(1,2,3-C,D)Pyrene	2.9	0.19 J+	3.9	0.23 J+	0.42	0.088	0.34	5.1	0.54	0.18	0.097	76	0.2	0.024 U
Isophorone	0.008 U	0.0081 U	0.0079 U	0.008 U	0.0079 U	0.0081 U	0.0084 U	0.015 U	0.0097 U	0.0083 U	0.0092 U	0.4 U	0.0085 U	0.0077 U
Naphthalene	0.043 J	0.0096 U	0.29 J	0.0094 U	0.016 J	0.0096 U	0.015 J	0.032 J	0.044 J	0.0099 U	0.011 U	4.6 J	0.01 U	0.0091 U
Nitrobenzene	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U	0.022 U	0.014 U	0.012 U	0.013 U	0.58 U	0.012 U	0.011 U
N-Nitrosodi-N-Propylamine	0.013 U	0.013 U	0.012 U	0.012 U	0.012 U	0.013 U	0.013 U	0.024 U	0.015 U	0.013 U	0.014 U	0.62 U	0.013 U	0.012 U
N-Nitrosodiphenylamine	0.034 U	0.034 U	0.033 U	0.034 U	0.033 U	0.034 U	0.035 UJ	0.064 U	0.041 U	0.035 U	0.039 U	1.7 U	0.036 U	0.032 U
Pentachlorophenol	0.045 U	0.046 U	0.045 U	0.045 U	0.044 U	0.046 U	0.047 U	0.086 U	0.055 U	0.047 U	0.052 U	2.2 U	0.048 U	0.043 U
Phenanthrene	2.4	0.19 J	5.7	0.093 J	0.46	0.047 J	0.36 J	1.5	0.5	0.18 J	0.071 J	180	0.21 J	0.018 J
Phenol	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U	0.013 U	0.023 U	0.015 U	0.013 U	0.014 U	0.6 U	0.013 U	0.012 U
Pyrene	3.9	0.26 J	6.4	0.27 J	0.6	0.1 J	0.56	2.9	0.73	0.35 J	0.15 J	150	0.36 J	0.016 U

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-7
Summary of Data Used in Risk Assessment
Central Landfills Area Soil (0-0.5 ft-bgs) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-007	CFSB-008	CFSB-009	CFSB-009-DUP	CFSB-021	CFSB-022	CFSB-029	CFSB-033	CFSB-034	CFSB-035	CFSB-036	CFSB-037	CFSB-177	CFSB-177-DUP
Sample Lab IDs	460-114529-14	460-114456-20	460-114456-15	460-114456-24	460-114456-12	460-114456-6	460-114456-4	460-114456-5	460-114793-52	460-114793-45	460-114793-48	460-114793-49	180-79272-7, 460-159191-7	180-79272-15, 460-159191-15
Sample Name	CFSB-007-SO-0-0.5	CFSB-008-SO-0-0.5	CFSB-009-SO-0-0.5	CFSB-DUP6-SO	CFSB-021-SO-0-0.5	CFSB-022-SO-0-0.5	CFSB-029-SO-0-0.5	CFSB-033-SO-0-0.5	CFSB-034-SO-0-0.5	CFSB-035-SO-0-0.5	CFSB-036-SO-0-0.5	CFSB-037-SO-0-0.5	CFSB-177-SO-0-0.5	CFSB-DUP42-SO
Sample Depth	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft
Chemical	5/25/2016	5/23/2016	5/23/2016	5/24/2016	5/23/2016	5/23/2016	5/23/2016	5/23/2016	5/31/2016	5/31/2016	5/31/2016	5/31/2016	6/25/2018	6/25/2018
GENERAL CHEMISTRY (mg/kg)														
Fluoride	11.8 J	30.6 J	37.6 J	37.9 J+	89.9 J	28.9 J	62 J	95.8 J	210 J-	180 J	86.8 J	19.4 J	16 J-	17.2 J-
Cyanide	0.095 J	0.02 J	0.078 J	0.33	0.048 J	0.035 J	0.016 J	0.18	0.097 J	0.2	0.05 J	0.026 J	0.061 U	0.06 U
METALS (mg/kg)														
"Chromium, Hexavalent - Estimated"	0.289051	0.278345	0.326521	0.481752	0.299757	0.206083	0.254258	0.256934	0.251582	0.36399	2.26959	0.264964	0.187348	0.206083
"Chromium, Trivalent - Calculated"	--	--	--	--	--	--	--	--	--	--	--	--	--	--
"Chromium, Trivalent - Estimated"	10.5109	10.1217	11.8735	17.5182	10.9002	7.49392	9.24574	9.34307	9.14842	13.236	82.5304	9.63504	6.81265	7.49392
Aluminum	12600	15100	11400	20000	13600	8720	9790	12500	14800	10800	9820	12100	20700	21200
Antimony	0.38 UJ	0.39 UJ	0.43 UJ	0.47 UJ	0.37 UJ	0.38 UJ	0.33 UJ	0.38 UJ	0.49 UJ	0.45 U	0.57 J	0.43 UJ	0.26 UJ	0.25 UJ
Arsenic	4.4 J	11.8	7.1	5.2	6.7	6.7	4	4.7	3.7	6.2	6.2	5.5	4.1	4.2
Barium	109	105	117	319	72.3	91	58	55.3	80.8	73.4	76.7	89.9	420	376
Beryllium	0.51	0.65	0.55	0.85	0.45	0.38	0.39	0.43	0.47 J	0.42 J	0.37 J	0.44	0.91	0.74
Cadmium	0.29 U	0.29 U	0.32 U	0.36 U	0.28 U	0.29 U	0.25 U	0.29 U	0.37 U	0.34 U	0.33 U	0.33 U	0.3 U	0.29 U
Calcium	20500	2090	19400	7550 J	1770	18000	30500	36900	22000	13000	22200	23800	1400	1530
Chromium, Total	10.8	10.4	12.2	18	11.2	7.7	9.5	9.6	9.4	13.6	84.8	9.9	7	7.7
Cobalt	5.6 J-	5.5	5.4	6.3	5	3.9	4.7	4.8	5.1	5.1	6.8	5.2	6.5	7.2
Copper	15.1 J+	10.8	14.5	24.7 J+	11.6	8.8	12.7	13.3	13.9 J	21.9	60 J	18.8 J	8.5	7.9
Iron	14300	17900	14300	16400	16800	14700	13800	12700	13800	17800	37100	16000	12600	13300
Lead	9.9 J	11.6	11 J+	17.1	9.8 J+	19.3 J+	7.8 J+	10.4 J+	17 J	9.5	21.9 J	16.5 J	13.2	12.4
Magnesium	10100	11000	10500	12600	12000	11500	10800	12000	11300	9260	8360	12200	7060	8870
Manganese	437	419	337	333	156	471	334	311	367	760	548	487	529	460
Mercury	0.017 J	0.017 J	0.026	0.045	0.015 U	0.035	0.018 J	0.023	0.02	0.021	0.025	0.022	0.01 J	0.013 J
Nickel	16.3	13.6 J	10.6 J	13.2	12.4 J	8.9 J	11.3 J	20.4 J	19.8 J	41.4	80.5 J	15.1 J	12.1	13.8
Potassium	1230 J+	1340 J	864 J	1270 J+	1010 J	1020 J	810 J	758 J	730	546	635	772	1010	1050
Selenium	0.36 U	0.36 U	0.4 U	1.2 J	0.34 U	0.35 U	0.31 U	0.43 J	0.46 U	1.1 J	1.2 J	0.4 U	0.26 U	0.25 U
Silver	0.7 U	0.71 U	0.78 U	0.86 U	0.67 U	0.69 U	0.6 U	0.69 U	0.9 U	0.82 U	0.8 U	0.79 U	0.55 U	0.53 U
Sodium	45.5 J	36.2 U	57.7 J	81.6 J	34.4 U	35.4 U	30.5 U	57.9 J	92 J	340	63.9 J	40.2 U	56.5 J	54.8 J
Thallium	0.14 U	0.15 U	0.16 U	0.18 U	0.14 U	0.14 U	0.12 U	0.14 U	0.18 U	0.17 U	0.17 U	0.16 U	0.11 U	0.11 U
Vanadium	11.7	15.3	9.9	13	12.4	7.6	8.5	11.3	13	11.8	18.1	11.1	11.4 J+	11.3 J+
Zinc	46.2	39.6	44.3	58.6	44.3	48.6	39.6	42.2	51.5	28.9	52.5	42.4	48.4	54.1
METALS|HEXAVALENT CHROMIUM (mg/kg)														
Chromium, Hexavalent	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PESTICIDES (mg/kg)														
Aldrin	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Alpha Bhc (Alpha Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Alpha Endosulfan	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Beta Bhc (Beta Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Beta Endosulfan	--	--	--	--	--	--	--	--	--	--	--	--	--	--
cis-Chlordane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Delta BHC (Delta Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dieldrin	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endosulfan Sulfate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin Aldehyde	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin Ketone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Gamma Bhc (Lindane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Heptachlor	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Heptachlor Epoxide	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methoxychlor	--	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDD	--	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDT	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Toxaphene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
trans-Chlordane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
POLYCHLORINATED BIPHENYLS (mg/kg)														
PCB-1016 (Aroclor 1016)	0.01 U	0.011 U	0.011 U	0.013 U	0.011 U	0.011 U	0.0097 U	0.0099 U	0.011 U	0.0099 U	0.011 U	0.01 U	--	--
PCB-1221 (Aroclor 1221)	0.01 U	0.011 U	0.011 U	0.013 U	0.011 U	0.011 U	0.0097 U	0.0099 U	0.011 U	0.0099 U	0.011 U	0.01 U	--	--
PCB-1232 (Aroclor 1232)	0.01 U	0.011 U	0.011 U	0.013 U	0.011 U	0.011 U	0.0097 U	0.0099 U	0.011 U	0.0099 U	0.011 U	0.01 U	--	--

Table E-7
Summary of Data Used in Risk Assessment
Central Landfills Area Soil (0-0.5 ft-bgs) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-007	CFSB-008	CFSB-009	CFSB-009-DUP	CFSB-021	CFSB-022	CFSB-029	CFSB-033	CFSB-034	CFSB-035	CFSB-036	CFSB-037	CFSB-177	CFSB-177-DUP
Sample Lab IDs	460-114529-14	460-114456-20	460-114456-15	460-114456-24	460-114456-12	460-114456-6	460-114456-4	460-114456-5	460-114793-52	460-114793-45	460-114793-48	460-114793-49	180-79272-7, 460-159191-7	180-79272-15, 460-159191-15
Sample Name	CFSB-007-SO-0-0.5	CFSB-008-SO-0-0.5	CFSB-009-SO-0-0.5	CFSB-DUP6-SO	CFSB-021-SO-0-0.5	CFSB-022-SO-0-0.5	CFSB-029-SO-0-0.5	CFSB-033-SO-0-0.5	CFSB-034-SO-0-0.5	CFSB-035-SO-0-0.5	CFSB-036-SO-0-0.5	CFSB-037-SO-0-0.5	CFSB-177-SO-0-0.5	CFSB-DUP42-SO
Sample Depth	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft
Chemical	5/25/2016	5/23/2016	5/23/2016	5/24/2016	5/23/2016	5/23/2016	5/23/2016	5/23/2016	5/31/2016	5/31/2016	5/31/2016	5/31/2016	6/25/2018	6/25/2018
PCB-1242 (Aroclor 1242)	0.01 U	0.011 U	0.011 U	0.013 U	0.011 U	0.011 U	0.0097 U	0.0099 U	0.011 U	0.0099 U	0.011 U	0.01 U	--	--
PCB-1248 (Aroclor 1248)	0.01 U	0.011 U	0.011 U	0.013 U	0.011 U	0.011 U	0.0097 U	0.0099 U	0.011 U	0.0099 U	0.011 U	0.01 U	--	--
PCB-1254 (Aroclor 1254)	0.01 U	0.011 U	0.012 U	0.013 U	0.011 U	0.011 U	0.01 U	0.01 U	0.011 U	0.01 U	0.011 U	0.01 U	--	--
PCB-1260 (Aroclor 1260)	0.01 U	0.011 U	0.012 U	0.013 U	0.011 U	0.011 U	0.01 U	0.01 U	0.011 U	0.01 U	0.011 U	0.01 U	--	--
PCB-1262 (Aroclor 1262)	0.01 U	0.011 U	0.012 U	0.013 U	0.011 U	0.011 U	0.01 U	0.01 U	0.011 U	0.01 U	0.011 U	0.01 U	--	--
PCB-1268 (Aroclor 1268)	0.01 U	0.011 U	0.012 U	0.013 U	0.011 U	0.011 U	0.01 U	0.01 U	0.011 U	0.01 U	0.011 U	0.01 U	--	--
Polychlorinated Biphenyl (PCBs)	0.01 U	0.011 U	0.012 U	0.013 U	0.011 U	0.011 U	0.01 U	0.01 U	0.011 U	0.01 U	0.011 U	0.01 U	--	--
SEMIVOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,2,4,5-Tetrachlorobenzene	0.028 U	0.03 U	0.032 U	0.035 U	0.03 U	0.03 U	0.027 U	0.027 U	0.29 UJ	0.027 U	0.029 U	0.027 U	0.0015 U	0.0015 U
1,4-Dioxane (P-Dioxane)	0.1 U	0.11 U	0.11 U	0.13 U	0.11 U	0.11 U	0.096 U	0.099 U	1.1 UJ	0.099 U	0.11 U	0.099 U	0.011 U	0.011 U
2,3,4,6-Tetrachlorophenol	0.035 U	0.038 U	0.04 U	0.044 U	0.038 U	0.037 U	0.034 U	0.035 U	0.37 UJ	0.035 U	0.037 U	0.035 U	0.015 U	0.014 U
2,4,5-Trichlorophenol	0.037 U	0.04 U	0.042 U	0.047 U	0.04 U	0.04 U	0.036 U	0.037 U	0.39 UJ	0.037 U	0.039 U	0.037 U	0.0026 U	0.0025 U
2,4,6-Trichlorophenol	0.011 U	0.011 U	0.012 U	0.013 U	0.012 U	0.011 U	0.01 U	0.01 U	0.11 UJ	0.01 U	0.011 U	0.011 U	0.002 U	0.0019 U
2,4-Dichlorophenol	0.0089 U	0.0095 U	0.01 U	0.011 U	0.0095 U	0.0094 U	0.0085 U	0.0087 U	0.093 UJ	0.0087 U	0.0093 U	0.0087 U	0.0028 U	0.0027 U
2,4-Dimethylphenol	0.083 U	0.088 U	0.093 U	0.1 U	0.089 U	0.088 U	0.079 U	0.081 U	0.87 UJ	0.081 U	0.087 U	0.081 U	0.0022 U	0.0022 U
2,4-Dinitrophenol	0.28 U	0.3 UJ	0.32 U	0.35 U	0.31 U	0.3 U	0.27 U	0.28 U	3 UJ	0.28 U	0.3 U	0.28 U	0.096 U	0.093 U
2,4-Dinitrotoluene	0.015 U	0.016 U	0.017 U	0.019 U	0.016 U	0.016 U	0.014 U	0.015 U	0.16 UJ	0.015 U	0.016 U	0.015 U	0.0018 U	0.0017 U
2,6-Dinitrotoluene	0.02 U	0.021 U	0.023 U	0.025 U	0.022 U	0.021 U	0.019 U	0.02 U	0.21 UJ	0.02 U	0.021 U	0.02 U	0.0022 U	0.0021 U
2-Chloronaphthalene	0.0085 U	0.0091 U	0.0096 U	0.011 U	0.0092 U	0.009 U	0.0082 U	0.0084 U	0.089 UJ	0.0084 U	0.009 U	0.0084 U	0.0016 U	0.0016 U
2-Chlorophenol	0.0096 U	0.01 U	0.011 U	0.012 U	0.01 U	0.01 U	0.0091 U	0.0094 U	0.1 UJ	0.0094 U	0.01 U	0.0094 U	0.0017 U	0.0016 U
2-Methylnaphthalene	0.0083 U	0.0089 U	0.0094 U	0.01 U	0.021 J	0.0088 U	0.0079 U	0.0082 U	0.24 J-	0.0081 U	0.018 J	0.0082 U	0.0017 U	0.0017 U
2-Methylphenol (O-Cresol)	0.016 U	0.017 U	0.018 U	0.02 U	0.018 U	0.017 U	0.016 U	0.016 U	0.17 UJ	0.016 U	0.017 U	0.016 U	0.01 U	0.01 U
2-Nitroaniline	0.012 U	0.013 U	0.014 U	0.015 U	0.013 U	0.013 U	0.012 U	0.012 U	0.13 UJ	0.012 U	0.013 U	0.012 U	0.016 U	0.016 U
2-Nitrophenol	0.013 U	0.013 U	0.014 U	0.016 U	0.014 U	0.013 U	0.012 U	0.012 U	0.13 UJ	0.012 U	0.013 U	0.012 U	0.002 U	0.002 U
3- And 4- Methylphenol (Total)	0.01 U	0.011 U	0.026 J	0.012 U	0.048 J	0.011 U	0.0096 U	0.0098 U	0.1 UJ	0.0098 U	0.011 U	0.0098 U	--	--
3,3'-Dichlorobenzidine	0.042 U	0.045 U	0.047 U	0.052 U	0.045 U	0.044 U	0.04 U	0.041 U	0.44 UJ	0.041 U	0.044 U	0.041 U	0.033 U	0.032 U
3-Nitroaniline	0.011 U	0.012 U	0.013 U	0.014 U	0.012 U	0.012 U	0.011 U	0.011 U	0.12 UJ	0.011 U	0.012 U	0.011 U	0.0091 U	0.0088 U
4,6-Dinitro-2-Methylphenol	0.1 U	0.11 UJ	0.11 U	0.12 U	0.11 U	0.11 U	0.096 U	0.099 U	1 UJ	0.098 U	0.11 U	0.099 U	0.062 U	0.06 U
4-Bromophenyl Phenyl Ether	0.012 U	0.013 U	0.013 U	0.015 U	0.013 U	0.013 U	0.011 U	0.012 U	0.12 UJ	0.012 U	0.012 U	0.012 U	0.0025 U	0.0024 U
4-Chloro-3-Methylphenol	0.016 U	0.017 U	0.018 U	0.02 U	0.017 U	0.017 U	0.015 U	0.016 U	0.17 UJ	0.016 U	0.017 U	0.016 U	0.0017 U	0.0016 U
4-Chloroaniline	0.0097 U	0.01 U	0.011 U	0.012 U	0.01 U	0.01 U	0.0092 U	0.0095 U	0.1 UJ	0.0095 U	0.01 U	0.0095 U	0.0012 U	0.0012 U
4-Chlorophenyl Phenyl Ether	0.011 U	0.012 U	0.013 U	0.014 U	0.012 U	0.012 U	0.011 U	0.011 U	0.12 UJ	0.011 U	0.012 U	0.011 U	0.0022 U	0.0021 U
4-Nitroaniline	0.014 U	0.015 U	0.016 U	0.018 U	0.015 U	0.015 U	0.014 U	0.014 U	0.15 UJ	0.014 U	0.015 U	0.014 U	0.0017 U	0.0017 U
4-Nitrophenol	0.18 U	0.19 U	0.2 U	0.23 U	0.19 U	0.19 U	0.17 U	0.18 U	1.9 UJ	0.18 U	0.19 U	0.18 U	0.025 U	0.024 U
Acenaphthene	0.029 J	0.0097 U	0.01 U	0.012 J	0.11 J	0.053 J	0.021 J	0.051 J	1.7 J-	0.022 J	0.065 J	0.013 J	0.0021 U	0.0025 J
Acenaphthylene	0.0097 U	0.01 U	0.011 U	0.012 U	0.01 U	0.01 U	0.0092 U	0.0095 U	0.1 UJ	0.0095 U	0.01 U	0.0095 U	0.0016 U	0.0015 U
Acetophenone	0.0082 U	0.0087 U	0.0092 U	0.01 U	0.0088 U	0.0087 U	0.0078 U	0.008 U	0.086 UJ	0.008 U	0.0091 J	0.008 U	0.0019 U	0.0026 J
Anthracene	0.093 J	0.038 U	0.04 U	0.044 U	0.16 J	0.075 J	0.039 J	0.084 J	3.5 J-	0.059 J	0.14 J	0.035 U	0.0019 U	0.0025 J
Atrazine	0.017 U	0.018 U	0.019 U	0.021 U	0.018 U	0.018 U	0.016 U	0.016 U	0.17 UJ	0.016 U	0.018 U	0.016 U	0.016 UJ	0.015 UJ
Benzaldehyde	0.029 U	0.031 UJ	0.032 U	0.036 U	0.037 J	0.03 U	0.027 U	0.028 U	0.3 UJ	0.028 U	0.03 U	0.028 U	0.0049 J	0.0071 J
Benzo(A)Anthracene	0.41	0.034 U	0.077	0.093 J	0.85	0.61	0.31	0.6	19 J-	0.8	1	0.16	0.013 J	0.031 J
Benzo(A)Pyrene	0.44	0.012 U	0.095	0.12 J	1.1	0.8	0.39	0.7	25 J-	0.57	1	0.2	0.019 J	0.044 J
Benzo(B)Fluoranthene	0.84	0.016 U	0.19	0.24 J	1.8	1.2	0.79	1.5	29 J-	3.5	3.9	0.31	0.051 J	0.13 J
Benzo(G,H,I)Perylene	0.48	0.023 U	0.095 J	0.14 J	1.1	0.57	0.48	0.82	22 J-	0.86	2	0.25 J	0.027 J	0.075 J
Benzo(K)Fluoranthene	0.34	0.017 U	0.018 U	0.084 J	0.018 U	0.017 U	0.016 U	0.016 U	14 J-	0.9	1.2	0.11	0.018 J	0.032 J
Benzyl Butyl Phthalate	0.012 U	0.012 U	0.013 U	0.014 U	0.012 U	0.012 U	0.011 U	0.011 U	0.12 UJ	0.011 U	0.98	0.057 J	0.025 U	0.024 U
Biphenyl (Diphenyl)	0.032 U	0.034 U	0.036 U	0.04 U	0.035 U	0.034 U	0.031 U	0.031 U	0.34 UJ	0.031 U	0.034 U	0.032 U	0.0015 U	0.0015 U
Bis(2-Chloroethoxy) Methane	0.012 U	0.013 U	0.013 U	0.015 U	0.013 U	0.012 U	0.011 U	0.012 U	0.12 UJ	0.011 U	0.012 U	0.012 U	0.0017 U	0.0017 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.0089 U	0.0095 U	0.01 U	0.011 U	0.0095 U	0.0094 U	0.0085 U	0.0087 U	0.093 UJ	0.0087 U	0.0093 U	0.0087 U	0.0013 U	0.0013 U
Bis(2-Chloroisopropyl) Ether	0.015 U	0.017 U	0.017 U	0.019 U	0.017 U	0.016 U	0.015 U	0.015 U	0.16 UJ	0.015 U	0.016 U	0.015 U	0.0026 U	0.0026 U
Bis(2-Ethylhexyl) Phthalate	0.015 U	0.016 U	0.017 U	0.069 J	0.016 U	0.016 U	0.014 U	0.014 U	0.15 UJ	0.014 U	0.067 J+	0.087 J+	0.038 UJ	0.23 J
Caprolactam	0.027 U	0.029 UJ	0.031 U	0.034 U	0.029 U	0.029 U	0.026 U	0.027 U	0.28 UJ	0.066 J	0.028 U	0.027 U	0.023 U	0.023 U
Carbazole	0.061 J	0.01 U	0.012 J	0.027 J	0.16 J	0.066 J	0.045 J	0.12 J	2.8 J-	0.065 J	0.12 J	0.022 J	0.0018 J	0.0051 J
Chrysene	1.3	0.011 J	0.13 J	0.17 J	1.3	0.77	0.51	1	24 J-	1.8	2.3	0.23 J	0.029 J	0.073 J
Dibenz(A,H)Anthracene	0.13	0.021 U	0.023 J	0.04 J	0.3	0.11	0.12	0.23	5.2 J-	0.37	0.65	0.05	0.0054 J	0.012 J
Dibenzofuran	0.011 U	0.012 U	0.013 U	0.014 U	0.053 J	0.012 U	0.012 J	0.02 J	0.59 J-	0.012 J	0.037 J	0.011 U	0.0016 U	0.0026 J
Diethyl Phthalate	0.011 U	0.011 U	0.012 U	0.013 U	0.012 U	0.011 U	0.01 U	0.01 U	0.11 UJ	0.01 U	0.011 U	0.011 U	0.011 U	0.012 J
Dimethyl Phthalate	0.011 U	0.012 U	0.012 U	0.014 U	0.012 U	0.012 U	0.01 U	0.011 U	0.11 UJ	0.011 U	0.011 U	0.011 U	0.0013 U	0.0013 U

Table E-7
Summary of Data Used in Risk Assessment
Central Landfills Area Soil (0-0.5 ft-bgs) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-007	CFSB-008	CFSB-009	CFSB-009-DUP	CFSB-021	CFSB-022	CFSB-029	CFSB-033	CFSB-034	CFSB-035	CFSB-036	CFSB-037	CFSB-177	CFSB-177-DUP
Sample Lab IDs	460-114529-14	460-114456-20	460-114456-15	460-114456-24	460-114456-12	460-114456-6	460-114456-4	460-114456-5	460-114793-52	460-114793-45	460-114793-48	460-114793-49	180-79272-7, 460-159191-7	180-79272-15, 460-159191-15
Sample Name	CFSB-007-SO-0-0.5	CFSB-008-SO-0-0.5	CFSB-009-SO-0-0.5	CFSB-DUP6-SO	CFSB-021-SO-0-0.5	CFSB-022-SO-0-0.5	CFSB-029-SO-0-0.5	CFSB-033-SO-0-0.5	CFSB-034-SO-0-0.5	CFSB-035-SO-0-0.5	CFSB-036-SO-0-0.5	CFSB-037-SO-0-0.5	CFSB-177-SO-0-0.5	CFSB-DUP42-SO
Sample Depth	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft
Chemical	5/25/2016	5/23/2016	5/23/2016	5/24/2016	5/23/2016	5/23/2016	5/23/2016	5/23/2016	5/31/2016	5/31/2016	5/31/2016	5/31/2016	6/25/2018	6/25/2018
Di-N-Butyl Phthalate	0.011 U	0.012 U	0.013 U	0.014 U	0.012 U	0.012 U	0.011 U	0.056 J	0.12 UJ	0.011 U	0.012 U	0.011 U	0.016 U	0.015 U
Di-N-Octylphthalate	0.019 U	0.02 U	0.022 U	0.024 U	0.021 U	0.02 U	0.018 U	0.019 U	0.2 UJ	0.019 U	0.02 U	0.019 U	0.021 U	0.02 U
Fluoranthene	0.75	0.012 U	0.13 J	0.18 J	1.5	0.98	0.48	1.1	35 J-	0.78	1.6	0.28 J	0.026 J	0.078 J
Fluorene	0.02 J	0.0087 U	0.0092 U	0.01 U	0.087 J	0.023 J	0.016 J	0.031 J	1.1 J-	0.014 J	0.057 J	0.01 J	0.0014 U	0.0021 J
Hexachlorobenzene	0.015 U	0.016 U	0.017 U	0.019 U	0.016 U	0.016 U	0.015 U	0.015 U	0.16 UJ	0.015 U	0.016 U	0.015 U	0.0026 U	0.0025 U
Hexachlorobutadiene	0.011 U	0.011 U	0.012 U	0.013 U	0.011 U	0.011 U	0.01 U	0.01 U	0.11 UJ	0.01 U	0.011 U	0.01 U	0.0021 UJ	0.002 U
Hexachlorocyclopentadiene	0.023 U	0.025 UJ	0.026 U	0.029 UJ	0.025 U	0.025 U	0.022 U	0.023 U	0.25 UJ	0.023 U	0.025 UJ	0.023 UJ	0.0018 UJ	0.0018 U
Hexachloroethane	0.014 U	0.015 U	0.016 U	0.017 U	0.015 U	0.015 U	0.013 U	0.014 U	0.14 UJ	0.013 U	0.014 U	0.014 U	0.0018 U	0.0018 U
Indeno(1,2,3-C,D)Pyrene	0.42	0.027 U	0.092	0.14 J	1.1	0.52	0.44	0.82	23 J	1	2.2	0.28	0.021 J	0.061 J
Isophorone	0.25	0.0086 U	0.048 J	0.011 J	0.072 J	0.0086 U	0.034 J	0.036 J	0.085 UJ	0.016 J	0.069 J	0.011 J	0.0018 U	0.0018 U
Naphthalene	0.0097 J	0.01 U	0.011 U	0.012 U	0.051 J	0.01 U	0.011 J	0.011 J	0.45 J-	0.014 J	0.052 J	0.0094 U	0.0018 J	0.0014 U
Nitrobenzene	0.012 U	0.013 U	0.013 U	0.015 U	0.013 U	0.013 U	0.011 U	0.012 U	0.12 UJ	0.012 U	0.012 U	0.012 U	0.013 U	0.013 U
N-Nitrosodi-N-Propylamine	0.013 U	0.013 U	0.014 U	0.016 U	0.014 U	0.013 U	0.012 U	0.012 U	0.13 UJ	0.012 U	0.013 U	0.012 U	0.0024 U	0.0024 U
N-Nitrosodiphenylamine	0.034 U	0.036 U	0.038 U	0.042 U	0.037 U	0.036 U	0.033 U	0.034 U	0.36 UJ	0.033 U	0.036 U	0.034 U	0.012 U	0.012 U
Pentachlorophenol	0.046 U	0.049 UJ	0.051 U	0.057 U	0.049 U	0.048 U	0.043 U	0.045 U	0.48 UJ	0.045 U	0.048 U	0.045 U	0.057 U	0.056 U
Phenanthrene	0.36 J	0.011 U	0.068 J	0.12 J	0.89	0.37 J	0.26 J	0.48	18 J-	0.3 J	0.78	0.14 J	0.01 J	0.024 J
Phenol	0.012 U	0.013 U	0.014 U	0.015 U	0.013 U	0.013 U	0.012 U	0.012 U	0.13 UJ	0.012 U	0.016 J	0.012 U	0.011 U	0.011 U
Pyrene	0.8	0.018 U	0.15 J	0.17 J	1.7	1.1	0.59	1.3	36 J-	0.73	1.6	0.29 J	0.028 J	0.078 J

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-7
Summary of Data Used in Risk Assessment
Central Landfills Area Soil (0-0.5 ft-bgs) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-178	CFSB-179	CFSB-180	CFSB-219	CFSB-220	CFSB-221	CFSB-222	CFSB-223	CFSB-224	CFSB-225	CFSB-226	CFSB-227	CFSB-228	CFSB-229
Sample Lab IDs	180-79272-9, 460-159191-9	180-79272-11, 460-159191-11	180-79272-13, 460-159191-13	180-78894-14, 460-158632-14	180-79204-11, 460-159044-17	180-77673-1, 460-155989-21	180-77673-3, 460-155989-23	460-155989-14	460-155989-12	460-155989-10	460-155989-8	460-155989-6	460-155989-16	460-155989-4
Sample Name	CFSB-178-SO-0-0.5	CFSB-179-SO-0-0.5	CFSB-180-SO-0-0.5	CFSB-219-SO-0-0.5	CFSB-220-SO-0-0.5	CFSB-221-SO-0-0.5	CFSB-222-SO-0-0.5	CFSB-223-SO-0-0.5	CFSB-224-SO-0-0.5	CFSB-225-SO-0-0.5	CFSB-226-SO-0-0.5	CFSB-227-SO-0-0.5	CFSB-228-SO-0-0.5	CFSB-229-SO-0-0.5
Sample Depth	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft
Chemical	6/25/2018	6/25/2018	6/25/2018	6/16/2018	6/22/2018	5/7/2018	5/7/2018	5/7/2018	5/7/2018	5/7/2018	5/7/2018	5/7/2018	5/7/2018	5/7/2018
GENERAL CHEMISTRY (mg/kg)														
Fluoride	17 J-	14.9 J-	32.6 J-	7.47 J+	7.8 J-	3.27 J+	16.1 J+	--	--	--	--	--	--	--
Cyanide	0.12 J	0.06 U	0.084 U	0.12 J+	0.071 U	0.073 U	0.07 U	--	--	--	--	--	--	--
METALS (mg/kg)														
"Chromium, Hexavalent - Estimated"	0.216788	0.323844	0.0642336	0.337226	0.240876	0.289051	0.2382	--	--	--	--	--	--	--
"Chromium, Trivalent - Calculated"	--	--	--	--	--	--	--	--	--	--	--	--	--	--
"Chromium, Trivalent - Estimated"	7.88321	11.7762	2.33577	12.2628	8.75912	10.5109	8.6618	--	--	--	--	--	--	--
Aluminum	15600	14100	4710	18600	17100	17000	14900	--	--	--	--	--	--	--
Antimony	0.26 UJ	0.26 UJ	0.34 UJ	0.31 UJ	0.32 U	0.33 UJ	0.28 UJ	--	--	--	--	--	--	--
Arsenic	5.1	9.5	9.7	5.5	5.6	6.3	5.2	--	--	--	--	--	--	--
Barium	368	140	415	333	240	122	133	--	--	--	--	--	--	--
Beryllium	0.48	0.62	0.31 J	0.56	0.6	0.51	0.54	--	--	--	--	--	--	--
Cadmium	0.3 U	0.3 U	0.39 U	0.36 U	0.36 U	0.38 U	0.33 U	--	--	--	--	--	--	--
Calcium	2690	1780	279000	2130	2180	1680	1800	--	--	--	--	--	--	--
Chromium, Total	8.1	12.1	2.4	12.6	9	10.8	8.9	--	--	--	--	--	--	--
Cobalt	5.8	6.3	1.5 J	6	6.2	5.4	4.8	--	--	--	--	--	--	--
Copper	9.1	8.6	25.2	10.8	6.7	9.5	9.1	--	--	--	--	--	--	--
Iron	13200	18900	2940	21000	16200	17500	14100	--	--	--	--	--	--	--
Lead	12.5	15.9	7.1	13.8	12	10.8	10.2	--	--	--	--	--	--	--
Magnesium	6210	11600	2890	11000	8270	9950	8670	--	--	--	--	--	--	--
Manganese	1140	598	525	1050 J	958	278 J	458 J	--	--	--	--	--	--	--
Mercury	0.018	0.011 J	0.024	0.018 J	0.019	0.011 U	0.021	--	--	--	--	--	--	--
Nickel	14.2	15.9	8.6	15.2	11.5	13.2	25.2	--	--	--	--	--	--	--
Potassium	1340	1060	337	1440	1100	854	918	--	--	--	--	--	--	--
Selenium	0.26 U	0.26 U	0.46 J	0.31 U	0.31 U	0.33 U	0.28 U	--	--	--	--	--	--	--
Silver	0.54 U	0.55 U	0.71 U	0.66 U	0.67 U	0.7 U	0.6 U	--	--	--	--	--	--	--
Sodium	51.1 J	27.6 U	67.4 J	40.7 J	33.9 U	35.7 U	30.4 U	--	--	--	--	--	--	--
Thallium	0.11 U	0.11 U	0.14 U	0.14 J	0.14 U	0.14 U	0.12 U	--	--	--	--	--	--	--
Vanadium	11.5 J+	12.2 J+	4 J+	14.6	14.3	14.4	14.5	--	--	--	--	--	--	--
Zinc	61.8	57.2	29.8	95.1	57.8	44.8	46.3	--	--	--	--	--	--	--
METALS|HEXAVALENT CHROMIUM (mg/kg)														
Chromium, Hexavalent	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PESTICIDES (mg/kg)														
Aldrin	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Alpha Bhc (Alpha Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Alpha Endosulfan	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Beta Bhc (Beta Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Beta Endosulfan	--	--	--	--	--	--	--	--	--	--	--	--	--	--
cis-Chlordane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Delta BHC (Delta Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dieldrin	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endosulfan Sulfate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin Aldehyde	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin Ketone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Gamma Bhc (Lindane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Heptachlor	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Heptachlor Epoxide	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methoxychlor	--	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDD	--	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDT	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Toxaphene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
trans-Chlordane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
POLYCHLORINATED BIPHENYLS (mg/kg)														
PCB-1016 (Aroclor 1016)	--	--	--	--	--	--	--	0.0094 U	0.01 U	0.0096 U	0.0093 U	0.0095 U	0.0094 U	0.0091 U
PCB-1221 (Aroclor 1221)	--	--	--	--	--	--	--	0.0094 U	0.01 U	0.0096 U	0.0093 U	0.0095 U	0.0094 U	0.0091 U
PCB-1232 (Aroclor 1232)	--	--	--	--	--	--	--	0.0094 U	0.01 U	0.0096 U	0.0093 U	0.0095 U	0.0094 U	0.0091 U

Table E-7
Summary of Data Used in Risk Assessment
Central Landfills Area Soil (0-0.5 ft-bgs) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-178	CFSB-179	CFSB-180	CFSB-219	CFSB-220	CFSB-221	CFSB-222	CFSB-223	CFSB-224	CFSB-225	CFSB-226	CFSB-227	CFSB-228	CFSB-229
Sample Lab IDs	180-79272-9, 460-159191-9	180-79272-11, 460-159191-11	180-79272-13, 460-159191-13	180-78894-14, 460-158632-14	180-79204-11, 460-159044-17	180-77673-1, 460-155989-21	180-77673-3, 460-155989-23	460-155989-14	460-155989-12	460-155989-10	460-155989-8	460-155989-6	460-155989-16	460-155989-4
Sample Name	CFSB-178-SO-0-0.5	CFSB-179-SO-0-0.5	CFSB-180-SO-0-0.5	CFSB-219-SO-0-0.5	CFSB-220-SO-0-0.5	CFSB-221-SO-0-0.5	CFSB-222-SO-0-0.5	CFSB-223-SO-0-0.5	CFSB-224-SO-0-0.5	CFSB-225-SO-0-0.5	CFSB-226-SO-0-0.5	CFSB-227-SO-0-0.5	CFSB-228-SO-0-0.5	CFSB-229-SO-0-0.5
Sample Depth	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft
Chemical	6/25/2018	6/25/2018	6/25/2018	6/16/2018	6/22/2018	5/7/2018	5/7/2018	5/7/2018	5/7/2018	5/7/2018	5/7/2018	5/7/2018	5/7/2018	5/7/2018
PCB-1242 (Aroclor 1242)	--	--	--	--	--	--	--	0.0094 U	0.01 U	0.0096 U	0.0093 U	0.0095 U	0.0094 U	0.0091 U
PCB-1248 (Aroclor 1248)	--	--	--	--	--	--	--	0.0094 U	0.01 U	0.0096 U	0.0093 U	0.0095 U	0.0094 U	0.0091 U
PCB-1254 (Aroclor 1254)	--	--	--	--	--	--	--	0.062 J	0.01 U	0.0099 U	0.0096 U	1.2	0.0097 U	0.0094 U
PCB-1260 (Aroclor 1260)	--	--	--	--	--	--	--	0.0097 U	0.01 U	0.0099 U	0.0096 U	0.0098 U	0.0097 U	0.0094 U
PCB-1262 (Aroclor 1262)	--	--	--	--	--	--	--	0.0097 U	0.01 U	0.0099 U	0.0096 U	0.0098 U	0.0097 U	0.0094 U
PCB-1268 (Aroclor 1268)	--	--	--	--	--	--	--	0.0097 U	0.01 U	0.0099 U	0.0096 U	0.0098 U	0.0097 U	0.0094 U
Polychlorinated Biphenyl (PCBs)	--	--	--	--	--	--	--	0.062 J	0.01 U	0.0099 U	0.0096 U	1.2	0.0097 U	0.0094 U
SEMIVOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,2,4,5-Tetrachlorobenzene	0.0048 U	0.003 U	0.0042 U	0.0016 UJ	0.0016 U	0.0016 U	0.0017 U	--	--	--	--	--	--	--
1,4-Dioxane (P-Dioxane)	0.034 U	0.022 U	0.03 U	0.012 U	0.012 U	0.012 U	0.013 U	--	--	--	--	--	--	--
2,3,4,6-Tetrachlorophenol	0.046 U	0.029 U	0.04 U	0.016 U	0.016 UJ	0.016 U	0.017 U	--	--	--	--	--	--	--
2,4,5-Trichlorophenol	0.0079 U	0.005 U	0.0069 U	0.0027 U	0.0027 U	0.0027 U	0.0029 U	--	--	--	--	--	--	--
2,4,6-Trichlorophenol	0.0061 U	0.0038 U	0.0053 U	0.0021 U	0.0021 U	0.0021 U	0.0022 U	--	--	--	--	--	--	--
2,4-Dichlorophenol	0.0085 U	0.0054 U	0.0074 U	0.0029 U	0.0029 U	0.0029 U	0.0031 U	--	--	--	--	--	--	--
2,4-Dimethylphenol	0.0069 UJ	0.0043 U	0.006 U	0.0023 U	0.0023 U	0.0023 U	0.0025 U	--	--	--	--	--	--	--
2,4-Dinitrophenol	0.3 UR	0.19 U	0.26 U	0.1 U	0.1 UJ	0.1 U	0.11 U	--	--	--	--	--	--	--
2,4-Dinitrotoluene	0.0055 U	0.0035 U	0.0048 U	0.0019 U	0.0019 U	0.0019 U	0.002 U	--	--	--	--	--	--	--
2,6-Dinitrotoluene	0.0068 U	0.0043 U	0.006 U	0.0023 U	0.0023 U	0.0023 U	0.0025 U	--	--	--	--	--	--	--
2-Chloronaphthalene	0.0051 U	0.0032 U	0.0044 U	0.0017 U	0.0017 U	0.0017 U	0.0019 U	--	--	--	--	--	--	--
2-Chlorophenol	0.0051 U	0.0032 U	0.0045 U	0.0017 U	0.0017 U	0.0018 U	0.0019 U	--	--	--	--	--	--	--
2-Methylnaphthalene	0.0053 U	0.0033 U	0.0046 U	0.0018 U	0.0028 J	0.0018 U	0.0019 U	--	--	--	--	--	--	--
2-Methylphenol (O-Cresol)	0.032 U	0.02 U	0.028 U	0.011 U	0.011 U	0.011 U	0.012 U	--	--	--	--	--	--	--
2-Nitroaniline	0.05 U	0.032 U	0.044 U	0.017 U	0.017 U	0.017 U	0.018 U	--	--	--	--	--	--	--
2-Nitrophenol	0.0063 U	0.004 U	0.0055 U	0.0022 U	0.0021 U	0.0022 U	0.0023 U	--	--	--	--	--	--	--
3- And 4- Methylphenol (Total)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3,3'-Dichlorobenzidine	0.1 UR	0.065 U	0.09 U	0.035 U	0.035 U	0.035 UR	0.038 U	--	--	--	--	--	--	--
3-Nitroaniline	0.028 U	0.018 U	0.025 U	0.0096 U	0.0095 U	0.0096 UJ	0.01 U	--	--	--	--	--	--	--
4,6-Dinitro-2-Methylphenol	0.19 U	0.12 U	0.17 U	0.065 U	0.064 U	0.065 U	0.07 U	--	--	--	--	--	--	--
4-Bromophenyl Phenyl Ether	0.0077 U	0.0049 U	0.0067 U	0.0026 U	0.0026 U	0.0026 U	0.0028 U	--	--	--	--	--	--	--
4-Chloro-3-Methylphenol	0.0052 U	0.0033 U	0.0045 U	0.0018 U	0.0018 U	0.0018 U	0.0019 U	--	--	--	--	--	--	--
4-Chloroaniline	0.0037 UJ	0.0023 U	0.0032 U	0.0013 U	0.0012 U	0.0013 UJ	0.0013 U	--	--	--	--	--	--	--
4-Chlorophenyl Phenyl Ether	0.0067 U	0.0042 U	0.0058 U	0.0023 U	0.0023 U	0.0023 U	0.0024 U	--	--	--	--	--	--	--
4-Nitroaniline	0.0054 U	0.0034 U	0.0047 U	0.0018 U	0.0018 U	0.0018 UJ	0.002 U	--	--	--	--	--	--	--
4-Nitrophenol	0.078 U	0.049 U	0.068 U	0.026 U	0.026 UJ	0.026 U	0.028 U	--	--	--	--	--	--	--
Acenaphthene	0.011 J	0.004 U	0.015 J	0.0046 J	0.0066 J	0.0022 U	0.011	--	--	--	--	--	--	--
Acenaphthylene	0.0048 U	0.0031 U	0.0042 U	0.0016 U	0.0016 U	0.0016 U	0.0018 U	--	--	--	--	--	--	--
Acetophenone	0.006 U	0.0038 U	0.0052 U	0.002 U	0.0037 J	0.002 U	0.0022 U	--	--	--	--	--	--	--
Anthracene	0.017 J	0.0062 J	0.026	0.0072 J	0.0089	0.0077	0.019	--	--	--	--	--	--	--
Atrazine	0.048 UJ	0.031 UJ	0.042 UJ	0.016 UJ	0.016 UJ	0.016 UJ	0.018 UJ	--	--	--	--	--	--	--
Benzaldehyde	0.014 UR	0.0087 UR	0.013 J	0.0049 J-	0.0071 J	0.0047 U	0.005 U	--	--	--	--	--	--	--
Benzo(A)Anthracene	0.2	0.057	0.15	0.042	0.044	0.053	0.092	--	--	--	--	--	--	--
Benzo(A)Pyrene	0.37	0.11	0.22	0.06	0.057	0.069	0.12	--	--	--	--	--	--	--
Benzo(B)Fluoranthene	0.94 J-	0.36	0.44	0.11	0.1	0.1	0.23	--	--	--	--	--	--	--
Benzo(G,H,I)Perylene	0.48 J-	0.17	0.32	0.072	0.066	0.077	0.17	--	--	--	--	--	--	--
Benzo(K)Fluoranthene	0.26	0.11	0.13	0.04	0.035	0.04	0.067	--	--	--	--	--	--	--
Benzyl Butyl Phthalate	0.076 U	0.048 U	0.066 U	0.026 U	0.026 U	0.026 U	0.028 U	--	--	--	--	--	--	--
Biphenyl (Diphenyl)	0.0046 U	0.0029 U	0.004 U	0.0016 U	0.0055 J	0.0016 U	0.0017 U	--	--	--	--	--	--	--
Bis(2-Chloroethoxy) Methane	0.0053 U	0.0033 U	0.0046 U	0.0018 U	0.0018 U	0.0018 U	0.0019 U	--	--	--	--	--	--	--
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.004 U	0.0025 U	0.0035 U	0.0014 U	0.0014 U	0.0014 U	0.0015 U	--	--	--	--	--	--	--
Bis(2-Chloroisopropyl) Ether	0.0082 U	0.0052 U	0.0071 U	0.0028 U	0.0028 U	0.0028 U	0.003 U	--	--	--	--	--	--	--
Bis(2-Ethylhexyl) Phthalate	0.12 U	0.074 U	0.15 J	0.04 U	0.045 J	0.04 U	0.043 U	--	--	--	--	--	--	--
Caprolactam	0.072 UJ	0.045 U	0.063 U	0.024 U	0.024 U	0.025 UJ	0.026 U	--	--	--	--	--	--	--
Carbazole	0.039	0.015	0.039	0.016	0.012	0.0083	0.022	--	--	--	--	--	--	--
Chrysene	0.51 J-	0.2	0.28	0.072	0.075	0.079	0.15	--	--	--	--	--	--	--
Dibenz(A,H)Anthracene	0.082	0.028	0.068	0.014	0.015	0.016	0.038	--	--	--	--	--	--	--
Dibenzofuran	0.0048 U	0.0031 U	0.0084 J	0.003 J	0.0054 J	0.0016 J	0.0045 J	--	--	--	--	--	--	--
Diethyl Phthalate	0.033 U	0.021 U	0.029 U	0.011 U	0.011 U	0.011 U	0.012 U	--	--	--	--	--	--	--
Dimethyl Phthalate	0.004 U	0.0025 U	0.0035 U	0.0014 U	0.0014 U	0.0014 U	0.0015 U	--	--	--	--	--	--	--

Table E-7
Summary of Data Used in Risk Assessment
Central Landfills Area Soil (0-0.5 ft-bgs) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-178	CFSB-179	CFSB-180	CFSB-219	CFSB-220	CFSB-221	CFSB-222	CFSB-223	CFSB-224	CFSB-225	CFSB-226	CFSB-227	CFSB-228	CFSB-229
Sample Lab IDs	180-79272-9, 460-159191-9	180-79272-11, 460-159191-11	180-79272-13, 460-159191-13	180-78894-14, 460-158632-14	180-79204-11, 460-159044-17	180-77673-1, 460-155989-21	180-77673-3, 460-155989-23	460-155989-14	460-155989-12	460-155989-10	460-155989-8	460-155989-6	460-155989-16	460-155989-4
Sample Name	CFSB-178-SO-0-0.5	CFSB-179-SO-0-0.5	CFSB-180-SO-0-0.5	CFSB-219-SO-0-0.5	CFSB-220-SO-0-0.5	CFSB-221-SO-0-0.5	CFSB-222-SO-0-0.5	CFSB-223-SO-0-0.5	CFSB-224-SO-0-0.5	CFSB-225-SO-0-0.5	CFSB-226-SO-0-0.5	CFSB-227-SO-0-0.5	CFSB-228-SO-0-0.5	CFSB-229-SO-0-0.5
Sample Depth	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft
Chemical	6/25/2018	6/25/2018	6/25/2018	6/16/2018	6/22/2018	5/7/2018	5/7/2018	5/7/2018	5/7/2018	5/7/2018	5/7/2018	5/7/2018	5/7/2018	5/7/2018
Di-N-Butyl Phthalate	0.048 U	0.031 U	0.042 U	0.016 U	0.016 U	0.016 U	0.018 U	--	--	--	--	--	--	--
Di-N-Octylphthalate	0.064 U	0.041 U	0.056 U	0.022 U	0.022 U	0.022 U	0.024 U	--	--	--	--	--	--	--
Fluoranthene	0.44 J-	0.15	0.29	0.083	0.094	0.11	0.2	--	--	--	--	--	--	--
Fluorene	0.0059 J	0.0034 J	0.012 J	0.005 J	0.0066 J	0.0028 J	0.008 J	--	--	--	--	--	--	--
Hexachlorobenzene	0.0079 U	0.005 U	0.0069 U	0.0027 U	0.0027 U	0.0027 U	0.0029 U	--	--	--	--	--	--	--
Hexachlorobutadiene	0.0065 UJ	0.0041 UJ	0.0056 U	0.0022 U	0.0022 U	0.0022 U	0.0024 U	--	--	--	--	--	--	--
Hexachlorocyclopentadiene	0.0056 UJ	0.0036 UJ	0.0049 U	0.0019 U	0.0019 UJ	0.0019 U	0.0021 U	--	--	--	--	--	--	--
Hexachloroethane	0.0057 U	0.0036 U	0.005 U	0.0019 U	0.0019 U	0.0019 U	0.0021 U	--	--	--	--	--	--	--
Indeno(1,2,3-C,D)Pyrene	0.37	0.14	0.26	0.062	0.052	0.066	0.14	--	--	--	--	--	--	--
Isophorone	0.0056 U	0.0036 U	0.0049 U	0.0019 U	0.0019 U	0.0019 U	0.0021 U	--	--	--	--	--	--	--
Naphthalene	0.0043 J	0.003 J	0.0058 J	0.0063 J	0.0045 J	0.0015 U	0.0029 J	--	--	--	--	--	--	--
Nitrobenzene	0.04 U	0.026 U	0.035 U	0.014 U	0.014 U	0.014 U	0.015 U	--	--	--	--	--	--	--
N-Nitrosodi-N-Propylamine	0.0075 U	0.0047 U	0.0065 U	0.0026 U	0.0025 U	0.0026 U	0.0027 U	--	--	--	--	--	--	--
N-Nitrosodiphenylamine	0.037 UJ	0.023 U	0.032 U	0.013 U	0.012 U	0.013 U	0.013 U	--	--	--	--	--	--	--
Pentachlorophenol	0.18 U	0.11 U	0.15 U	0.06 U	0.06 UJ	0.061 U	0.065 U	--	--	--	--	--	--	--
Phenanthrene	0.13	0.048	0.15	0.052	0.059	0.043	0.094	--	--	--	--	--	--	--
Phenol	0.033 U	0.021 U	0.029 U	0.011 U	0.011 U	0.011 U	0.012 U	--	--	--	--	--	--	--
Pyrene	0.49	0.16	0.31	0.077	0.079	0.093	0.16	--	--	--	--	--	--	--

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-7
Summary of Data Used in Risk Assessment
Central Landfills Area Soil (0-0.5 ft-bgs) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-230	CFSB-230-DUP	CFSB-261	CFSB-262	CFSB-263	CFSB-264	CFSB-265	CFSB-270	CFSB-271	CFSB-277	CFSB-283	CFSB-284	CFSB-289	CFSB-289
Sample Lab IDs	460-155989-1	460-155989-2	180-77393-48, 460-155369-4	180-77393-59, 460-155369-15	180-77393-63, 460-155369-21	180-77393-72, 460-155369-30	180-77393-76, 460-155369-34	180-77393-55, 460-155369-11	180-77393-45, 460-155369-1	180-77393-80, 460-155369-38	180-78894-10, 460-158632-10	180-78894-11, 460-158632-11	460-159538-16	320-43709-8
Sample Name	CFSB-230-SO-0-0.5	CFSB-DUP34-SO	CFSB-261-SO-0-0.5	CFSB-262-SO-0-0.5	CFSB-263-SO-0-0.5	CFSB-264-SO-0-0.5	CFSB-265-SO-0-0.5	CFSB-270-SO-0-0.5	CFSB-271-SO-0-0.5	CFSB-277-SO-0-0.5	CFSB-283-SO-0-0.5	CFSB-284-SO-0-0.5	CFSB-289-SO-0-0.5	CFSB-289-SO-0-0.5
Sample Depth	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft
Chemical	5/7/2018	5/7/2018	5/2/2018	5/2/2018	5/2/2018	5/3/2018	5/3/2018	5/2/2018	5/2/2018	5/3/2018	6/16/2018	6/16/2018	6/28/2018	9/27/2018
GENERAL CHEMISTRY (mg/kg)														
Fluoride	--	--	568 J-	23.4 J-	10.8 J-	9.41 J-	5.89 J-	796 J-	40 J-	17.3 J-	1.69 J+	1.51 J+	--	--
Cyanide	--	--	9.9	0.49	0.14 J	0.061 U	0.065 J	2 J	1.1	0.063 U	0.37 J+	0.12 J+	--	--
METALS (mg/kg)														
"Chromium, Hexavalent - Estimated"	--	--	0.393431	0.259611	0.259611	0.232847	0.246229	0.372019	0.305109	0.36399	0.377372	0.29708	--	--
"Chromium, Trivalent - Calculated"	--	--	--	--	--	--	--	--	--	--	--	--	16.525	--
"Chromium, Trivalent - Estimated"	--	--	14.3066	9.44039	9.44039	8.46715	8.95377	13.528	11.0949	13.236	13.7226	10.8029	--	--
Aluminum	--	--	30800	12500	13200	7890	8860	22600	23300	8550	20000	14900	--	--
Antimony	--	--	0.26 UJ	0.25 UJ	0.24 UJ	0.3 UJ	0.32 UJ	0.25 UJ	0.27 UJ	0.3 UJ	0.48 UJ	0.5 UJ	--	--
Arsenic	--	--	7.3	5	4.4	3.6	4.1	7.2	7	5.5	7.8	6	--	--
Barium	--	--	227	122	178	99.7	77.5	196	264	68.7	260	148	--	--
Beryllium	--	--	1.5	0.55	0.53	0.42	0.35 J	0.96	0.86	0.27 J	0.84	0.59 J	--	--
Cadmium	--	--	0.3 U	0.28 U	0.28 U	0.34 U	0.36 U	0.28 U	0.31 U	0.34 U	0.55 U	0.57 U	--	--
Calcium	--	--	12300	2910	7740	30800	32500	2960	3110	50700	10300	8370	--	--
Chromium, Total	--	--	14.7	9.7	9.7	8.7	9.2	13.9	11.4	13.6	14.1	11.1	16.8	--
Cobalt	--	--	5.3	5	5.8	4.9	5.1	6.3	6.7	9.5	9	7.2	--	--
Copper	--	--	12.5	10.8 J	15.9 J	10.9 J	12.9 J	13.3 J	13.1	16.8 J	25.3	20	--	--
Iron	--	--	20200	15600	14500	12000	12200	20700	20400	12600	20000	16400	--	--
Lead	--	--	14.9	10.3 J	11.2 J	6.7 J+	7.3 J+	26.3 J	13.4	8.8 J+	16.8	13.4	--	--
Magnesium	--	--	11100	7750 J	7000 J	10700	10000	9220 J	9820	12800	10400	8110	--	--
Manganese	--	--	584	520 J	546 J	335 J	340 J	548 J	760	439 J	1570 J	729 J	--	--
Mercury	--	--	0.01 U	0.014 J	0.025 J+	0.012 J+	0.018 J+	0.01 U	0.011 U	0.021 J+	0.032	0.028	--	--
Nickel	--	--	16.6	13.4	14.5	10.8	15.4	20	13.8	17.5	33.6	26.1	--	--
Potassium	--	--	1500	972	843	615	541	1310	1200	680	1340	872	--	--
Selenium	--	--	0.26 U	0.25 U	0.24 U	0.29 U	0.31 U	0.24 U	0.26 U	0.29 U	0.56 J	0.5 U	--	--
Silver	--	--	0.55 U	0.52 UJ	0.51 UJ	0.62 UJ	0.67 UJ	0.52 UJ	0.56 U	0.63 UJ	1 U	1.1 U	--	--
Sodium	--	--	4390	46.8 J	45.9 J	43.9 J	33.8 U	3120	86.2 J	43.1 J	50.8 U	53.5 U	--	--
Thallium	--	--	0.14 J	0.11 U	0.1 U	0.13 U	0.14 U	0.13 J	0.11 J	0.13 U	0.2 U	0.21 U	--	--
Vanadium	--	--	24.2	13.6	11.7	6.9	8.1	23.5	20.6	9.4	16	11.4	--	--
Zinc	--	--	61.5	49.2	52	33.9	33.3	63.3	61.8	36.6	108	61.1	--	--
METALS|HEXAVALENT CHROMIUM (mg/kg)														
Chromium, Hexavalent	--	--	--	--	--	--	--	--	--	--	--	--	0.55 UJ	--
PESTICIDES (mg/kg)														
Aldrin	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Alpha Bhc (Alpha Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Alpha Endosulfan	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Beta Bhc (Beta Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Beta Endosulfan	--	--	--	--	--	--	--	--	--	--	--	--	--	--
cis-Chlordane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Delta BHC (Delta Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dieldrin	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endosulfan Sulfate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin Aldehyde	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin Ketone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Gamma Bhc (Lindane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Heptachlor	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Heptachlor Epoxide	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methoxychlor	--	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDD	--	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDT	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Toxaphene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
trans-Chlordane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
POLYCHLORINATED BIPHENYLS (mg/kg)														
PCB-1016 (Aroclor 1016)	0.0093 U	0.0093 U	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1221 (Aroclor 1221)	0.0093 U	0.0093 U	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1232 (Aroclor 1232)	0.0093 U	0.0093 U	--	--	--	--	--	--	--	--	--	--	--	--

Table E-7
Summary of Data Used in Risk Assessment
Central Landfills Area Soil (0-0.5 ft-bgs) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-230	CFSB-230-DUP	CFSB-261	CFSB-262	CFSB-263	CFSB-264	CFSB-265	CFSB-270	CFSB-271	CFSB-277	CFSB-283	CFSB-284	CFSB-289	CFSB-289
Sample Lab IDs	460-155989-1	460-155989-2	180-77393-48, 460-155369-4	180-77393-59, 460-155369-15	180-77393-63, 460-155369-21	180-77393-72, 460-155369-30	180-77393-76, 460-155369-34	180-77393-55, 460-155369-11	180-77393-45, 460-155369-1	180-77393-80, 460-155369-38	180-78894-10, 460-158632-10	180-78894-11, 460-158632-11	460-159538-16	320-43709-8
Sample Name	CFSB-230-SO-0-0.5	CFSB-DUP34-SO	CFSB-261-SO-0-0.5	CFSB-262-SO-0-0.5	CFSB-263-SO-0-0.5	CFSB-264-SO-0-0.5	CFSB-265-SO-0-0.5	CFSB-270-SO-0-0.5	CFSB-271-SO-0-0.5	CFSB-277-SO-0-0.5	CFSB-283-SO-0-0.5	CFSB-284-SO-0-0.5	CFSB-289-SO-0-0.5	CFSB-289-SO-0-0.5
Sample Depth	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft
Chemical	5/7/2018	5/7/2018	5/2/2018	5/2/2018	5/2/2018	5/3/2018	5/3/2018	5/2/2018	5/2/2018	5/3/2018	6/16/2018	6/16/2018	6/28/2018	9/27/2018
PCB-1242 (Aroclor 1242)	0.0093 U	0.0093 U	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1248 (Aroclor 1248)	0.0093 U	0.0093 U	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1254 (Aroclor 1254)	0.0097 U	0.0096 U	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1260 (Aroclor 1260)	0.0097 U	0.0096 U	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1262 (Aroclor 1262)	0.0097 U	0.0096 U	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1268 (Aroclor 1268)	0.0097 U	0.0096 U	--	--	--	--	--	--	--	--	--	--	--	--
Polychlorinated Biphenyl (PCBs)	0.0097 U	0.0096 U	--	--	--	--	--	--	--	--	--	--	--	--
SEMIVOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,2,4,5-Tetrachlorobenzene	--	--	0.0064 U	0.0016 U	0.0032 U	0.003 U	0.0015 U	0.0016 U	0.0017 U	0.006 U	0.0062 UJ	0.0085 UJ	--	--
1,4-Dioxane (P-Dioxane)	--	--	0.046 U	0.012 U	0.023 U	0.022 U	0.011 U	0.011 U	0.012 U	0.043 U	0.045 U	0.061 U	--	--
2,3,4,6-Tetrachlorophenol	--	--	0.062 U	0.016 U	0.031 U	0.029 U	0.014 U	0.015 U	0.017 U	0.057 U	0.06 U	0.082 U	--	--
2,4,5-Trichlorophenol	--	--	0.011 U	0.0027 U	0.0053 U	0.005 U	0.0025 U	0.0026 U	0.0028 U	0.0098 U	0.01 U	0.014 U	--	--
2,4,6-Trichlorophenol	--	--	0.0082 U	0.0021 U	0.0041 U	0.0038 U	0.0019 U	0.002 U	0.0022 U	0.0076 U	0.0079 U	0.011 U	--	--
2,4-Dichlorophenol	--	--	0.011 U	0.0029 U	0.0057 U	0.0054 U	0.0027 U	0.0028 U	0.0031 U	0.011 U	0.011 U	0.015 U	--	--
2,4-Dimethylphenol	--	--	0.0092 U	0.0023 U	0.0046 U	0.0043 U	0.0022 U	0.0023 U	0.0025 U	0.0086 U	0.0089 U	0.012 U	--	--
2,4-Dinitrophenol	--	--	0.4 U	0.1 U	0.2 UJ	0.19 UJ	0.093 UJ	0.099 U	0.11 U	0.37 UJ	0.39 U	0.53 U	--	--
2,4-Dinitrotoluene	--	--	0.0074 U	0.0019 U	0.0037 U	0.0035 U	0.0017 U	0.0018 U	0.002 U	0.0069 U	0.0071 U	0.0097 U	--	--
2,6-Dinitrotoluene	--	--	0.0092 U	0.0023 U	0.0046 U	0.0043 U	0.0021 U	0.0023 U	0.0024 U	0.0085 U	0.0089 U	0.012 U	--	--
2-Chloronaphthalene	--	--	0.0068 U	0.0017 U	0.0034 U	0.0032 U	0.0016 U	0.0017 U	0.0018 U	0.0063 U	0.0066 U	0.009 U	--	--
2-Chlorophenol	--	--	0.0069 U	0.0017 U	0.0035 U	0.0033 U	0.0016 U	0.0017 U	0.0018 U	0.0064 U	0.0067 U	0.0091 U	--	--
2-Methylnaphthalene	--	--	0.0071 U	0.0039 J	0.0036 U	0.0034 U	0.0017 U	0.0018 U	0.0019 U	0.0066 U	0.0088 J	0.015 J	--	--
2-Methylphenol (O-Cresol)	--	--	0.043 U	0.011 U	0.021 U	0.02 U	0.0099 U	0.011 U	0.011 U	0.04 U	0.041 U	0.056 U	--	--
2-Nitroaniline	--	--	0.068 U	0.017 U	0.034 U	0.032 U	0.016 U	0.017 U	0.018 U	0.063 U	0.065 U	0.089 U	--	--
2-Nitrophenol	--	--	0.0085 U	0.0021 U	0.0043 U	0.004 U	0.002 U	0.0021 U	0.0023 U	0.0079 U	0.0082 U	0.011 U	--	--
3- And 4- Methylphenol (Total)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3,3'-Dichlorobenzidine	--	--	0.14 U	0.035 U	0.069 U	0.065 U	0.032 U	0.034 U	0.037 U	0.13 U	0.13 U	0.18 U	--	--
3-Nitroaniline	--	--	0.038 U	0.0095 U	0.019 U	0.018 U	0.0088 U	0.0093 U	0.01 U	0.035 U	0.036 U	0.05 U	--	--
4,6-Dinitro-2-Methylphenol	--	--	0.26 U	0.065 U	0.13 UJ	0.12 UJ	0.06 UJ	0.063 U	0.068 U	0.24 UJ	0.25 U	0.34 U	--	--
4-Bromophenyl Phenyl Ether	--	--	0.01 U	0.0026 U	0.0052 U	0.0049 U	0.0024 U	0.0026 U	0.0028 U	0.0096 U	0.01 U	0.014 U	--	--
4-Chloro-3-Methylphenol	--	--	0.007 U	0.0018 U	0.0035 U	0.0033 U	0.0016 U	0.0017 U	0.0019 U	0.0065 U	0.0067 U	0.0092 U	--	--
4-Chloroaniline	--	--	0.0049 U	0.0012 U	0.0025 U	0.0023 U	0.0012 U	0.0012 U	0.0013 U	0.0046 U	0.0048 U	0.0065 U	--	--
4-Chlorophenyl Phenyl Ether	--	--	0.009 U	0.0023 U	0.0045 U	0.0042 U	0.0021 U	0.0022 U	0.0024 U	0.0083 U	0.0087 U	0.012 U	--	--
4-Nitroaniline	--	--	0.0072 U	0.0018 U	0.0036 U	0.0034 U	0.0017 U	0.0018 U	0.0019 U	0.0067 U	0.007 U	0.0095 U	--	--
4-Nitrophenol	--	--	0.1 U	0.026 U	0.052 U	0.049 U	0.024 U	0.026 U	0.028 U	0.097 U	0.1 U	0.14 U	--	--
Acenaphthene	--	--	0.02 J	0.038	0.0043 U	0.0075 J	0.0042 J	0.0042 J	0.0092	0.04	0.072	0.061	--	--
Acenaphthylene	--	--	0.0065 U	0.0016 U	0.0033 U	0.0031 U	0.0015 U	0.0016 U	0.0017 U	0.006 U	0.0063 U	0.0086 U	--	--
Acetophenone	--	--	0.0081 U	0.002 U	0.004 U	0.0038 U	0.0019 U	0.002 U	0.0022 U	0.0075 U	0.0078 U	0.011 U	--	--
Anthracene	--	--	0.033	0.064	0.0092 J	0.015	0.0091	0.0085	0.018	0.072	0.14	0.12	--	--
Atrazine	--	--	0.065 U	0.016 U	0.033 U	0.031 U	0.015 U	0.016 U	0.017 U	0.06 U	0.063 UJ	0.086 UJ	--	--
Benzaldehyde	--	--	0.018 U	0.0046 U	0.0092 UR	0.0087 UR	0.0043 UR	0.0046 U	0.0049 U	0.017 UR	0.018 UR	0.024 UR	--	--
Benzo(A)Anthracene	--	--	0.18	0.31	0.073	0.084	0.11	0.045	0.07	0.39	1	0.6	--	--
Benzo(A)Pyrene	--	--	0.17	0.3	0.084	0.092	0.15	0.045	0.067	0.49	1.4	0.77	--	--
Benzo(B)Fluoranthene	--	--	0.31	0.53	0.17	0.12	0.26	0.093	0.13	0.76	1.7	1.3	--	--
Benzo(G,H,I)Perylene	--	--	0.21	0.29	0.099	0.099	0.16	0.059	0.083	0.63	1.3	0.85	--	--
Benzo(K)Fluoranthene	--	--	0.11	0.17	0.041	0.053	0.057	0.032	0.044	0.3	0.75	0.43	--	--
Benzyl Butyl Phthalate	--	--	0.1 U	0.026 U	0.051 U	0.048 U	0.024 U	0.025 U	0.027 U	0.095 U	0.098 U	0.13 U	--	--
Biphenyl (Diphenyl)	--	--	0.0062 U	0.0016 U	0.0031 U	0.0029 U	0.0015 U	0.0015 U	0.0017 U	0.0058 U	0.006 U	0.0082 U	--	--
Bis(2-Chloroethoxy) Methane	--	--	0.0071 U	0.0018 U	0.0035 U	0.0033 U	0.0017 U	0.0018 U	0.0019 U	0.0066 U	0.0068 U	0.0093 U	--	--
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	--	--	0.0054 U	0.0014 U	0.0027 U	0.0025 U	0.0013 U	0.0013 U	0.0014 U	0.005 U	0.0052 U	0.0071 U	--	--
Bis(2-Chloroisopropyl) Ether	--	--	0.011 U	0.0028 U	0.0055 U	0.0052 U	0.0026 U	0.0027 U	0.0029 U	0.01 U	0.011 U	0.015 U	--	--
Bis(2-Ethylhexyl) Phthalate	--	--	0.16 U	0.04 U	0.079 U	2.5	0.037 U	0.039 U	0.042 U	0.15 U	0.15 U	0.21 U	--	--
Caprolactam	--	--	0.097 U	0.024 U	0.048 U	0.046 U	0.023 U	0.024 U	0.026 U	0.09 U	0.093 U	0.13 U	--	--
Carbazole	--	--	0.032	0.052	0.014 J	0.014	0.016	0.0098	0.014	0.074	0.18	0.14	--	--
Chrysene	--	--	0.27	0.43	0.14	0.092	0.2	0.082	0.11	0.58	1.4	1.1	--	--
Dibenz(A,H)Anthracene	--	--	0.047	0.083	0.021	0.023	0.037	0.0016 U	0.021	0.15	0.24	0.22	--	--
Dibenzofuran	--	--	0.0071 J	0.015 J	0.0033 U	0.0031 U	0.0015 U	0.0026 J	0.0027 J	0.013 J	0.022 J	0.029 J	--	--
Diethyl Phthalate	--	--	0.045 U	0.011 U	0.022 U	0.021 U	0.01 U	0.011 U	0.012 U	0.041 U	0.043 U	0.059 U	--	--
Dimethyl Phthalate	--	--	0.0054 U	0.0014 U	0.0027 U	0.0025 U	0.0013 U	0.0013 U	0.0014 U	0.005 U	0.0052 U	0.0071 U	--	--

Table E-7
Summary of Data Used in Risk Assessment
Central Landfills Area Soil (0-0.5 ft-bgs) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-230	CFSB-230-DUP	CFSB-261	CFSB-262	CFSB-263	CFSB-264	CFSB-265	CFSB-270	CFSB-271	CFSB-277	CFSB-283	CFSB-284	CFSB-289	CFSB-289
Sample Lab IDs	460-155989-1	460-155989-2	180-77393-48, 460-155369-4	180-77393-59, 460-155369-15	180-77393-63, 460-155369-21	180-77393-72, 460-155369-30	180-77393-76, 460-155369-34	180-77393-55, 460-155369-11	180-77393-45, 460-155369-1	180-77393-80, 460-155369-38	180-78894-10, 460-158632-10	180-78894-11, 460-158632-11	460-159538-16	320-43709-8
Sample Name	CFSB-230-SO-0-0.5	CFSB-DUP34-SO	CFSB-261-SO-0-0.5	CFSB-262-SO-0-0.5	CFSB-263-SO-0-0.5	CFSB-264-SO-0-0.5	CFSB-265-SO-0-0.5	CFSB-270-SO-0-0.5	CFSB-271-SO-0-0.5	CFSB-277-SO-0-0.5	CFSB-283-SO-0-0.5	CFSB-284-SO-0-0.5	CFSB-289-SO-0-0.5	CFSB-289-SO-0-0.5
Sample Depth	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft
Chemical	5/7/2018	5/7/2018	5/2/2018	5/2/2018	5/2/2018	5/3/2018	5/3/2018	5/2/2018	5/2/2018	5/3/2018	6/16/2018	6/16/2018	6/28/2018	9/27/2018
Di-N-Butyl Phthalate	--	--	0.065 U	0.016 U	0.033 U	0.031 U	0.015 U	0.016 U	0.017 U	0.06 U	0.063 U	0.086 U	--	--
Di-N-Octylphthalate	--	--	0.086 U	0.022 U	0.043 U	0.041 U	0.02 U	0.021 U	0.023 U	0.08 U	0.083 U	0.11 U	--	--
Fluoranthene	--	--	0.41	0.63	0.13	0.15	0.2	0.11	0.15	0.75	1.8	1.2	--	--
Fluorene	--	--	0.015 J	0.028	0.0029 U	0.0045 J	0.0025 J	0.0038 J	0.007 J	0.027 J	0.042	0.037 J	--	--
Hexachlorobenzene	--	--	0.011 U	0.0027 U	0.0053 U	0.005 U	0.0025 U	0.0026 U	0.0028 U	0.0099 U	0.01 U	0.014 U	--	--
Hexachlorobutadiene	--	--	0.0087 U	0.0022 U	0.0043 U	0.0041 U	0.002 U	0.0021 U	0.0023 U	0.0081 U	0.0084 U	0.011 U	--	--
Hexachlorocyclopentadiene	--	--	0.0076 U	0.0019 U	0.0038 U	0.0036 U	0.0018 U	0.0019 U	0.002 U	0.007 U	0.0073 U	0.01 U	--	--
Hexachloroethane	--	--	0.0077 U	0.0019 U	0.0038 U	0.0036 U	0.0018 U	0.0019 U	0.002 U	0.0071 U	0.0074 U	0.01 U	--	--
Indeno(1,2,3-C,D)Pyrene	--	--	0.16	0.24	0.083	0.076	0.12	0.045	0.062	0.48	0.99	0.66	--	--
Isophorone	--	--	0.0076 U	0.0019 U	0.0038 U	0.0036 U	0.0018 U	0.0019 U	0.002 U	0.007 U	0.0073 U	0.01 U	--	--
Naphthalene	--	--	0.0058 U	0.009	0.0029 U	0.0027 U	0.0014 U	0.0014 U	0.0015 U	0.011 J	0.024 J	0.045	--	--
Nitrobenzene	--	--	0.054 U	0.014 U	0.027 U	0.026 U	0.013 U	0.013 U	0.014 U	0.05 U	0.052 U	0.072 U	--	--
N-Nitrosodi-N-Propylamine	--	--	0.01 U	0.0025 U	0.005 U	0.0047 U	0.0024 U	0.0025 U	0.0027 U	0.0093 U	0.0097 U	0.013 U	--	--
N-Nitrosodiphenylamine	--	--	0.049 U	0.012 U	0.025 U	0.023 U	0.012 U	0.012 U	0.013 U	0.046 U	0.048 U	0.065 U	--	--
Pentachlorophenol	--	--	0.24 U	0.06 U	0.12 U	0.11 UJ	0.056 UJ	0.059 U	0.064 U	0.22 U	0.23 U	0.31 U	--	--
Phenanthrene	--	--	0.19	0.3	0.044	0.074	0.057	0.04	0.07	0.35	0.81	0.64	--	--
Phenol	--	--	0.045 U	0.011 U	0.023 U	0.021 U	0.011 U	0.011 U	0.012 U	0.042 U	0.043 U	0.059 U	--	--
Pyrene	--	--	0.32	0.54	0.13	0.15	0.2	0.087	0.12	0.77	1.5	1.1	--	--

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-7
Summary of Data Used in Risk Assessment
Central Landfills Area Soil (0-0.5 ft-bgs) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-290	CFSB-290	CFSB-291	CFSB-292
Sample Lab IDs	460-159538-2	320-43709-6	460-159044-11	460-159044-25
Sample Name	CFSB-290-SO-0-0.5	CFSB-290-SO-0-0.5	CFSB-291-SO-0-0.5	CFSB-292-SO-0-0.5
Sample Depth	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft
Chemical	6/28/2018	9/27/2018	6/22/2018	6/22/2018
GENERAL CHEMISTRY (mg/kg)				
Fluoride	--	--	--	--
Cyanide	--	--	--	--
METALS (mg/kg)				
"Chromium, Hexavalent - Estimated"	--	--	--	--
"Chromium, Trivalent - Calculated"	0.215 U	--	11.02	8.42
"Chromium, Trivalent - Estimated"	--	--	--	--
Aluminum	--	--	--	--
Antimony	--	--	--	--
Arsenic	--	--	--	--
Barium	--	--	--	--
Beryllium	--	--	--	--
Cadmium	--	--	--	--
Calcium	--	--	--	--
Chromium, Total	0.58 U	--	11.1	8.5
Cobalt	--	--	--	--
Copper	--	--	--	--
Iron	--	--	--	--
Lead	--	--	--	--
Magnesium	--	--	--	--
Manganese	--	--	--	--
Mercury	--	--	--	--
Nickel	--	--	--	--
Potassium	--	--	--	--
Selenium	--	--	--	--
Silver	--	--	--	--
Sodium	--	--	--	--
Thallium	--	--	--	--
Vanadium	--	--	--	--
Zinc	--	--	--	--
METALS|HEXAVALENT CHROMIUM (mg/kg)				
Chromium, Hexavalent	0.15 UJ	--	0.16 UJ	0.16 UJ
PESTICIDES (mg/kg)				
Aldrin	--	--	--	--
Alpha Bhc (Alpha Hexachlorocyclohexane)	--	--	--	--
Alpha Endosulfan	--	--	--	--
Beta Bhc (Beta Hexachlorocyclohexane)	--	--	--	--
Beta Endosulfan	--	--	--	--
cis-Chlordane	--	--	--	--
Delta BHC (Delta Hexachlorocyclohexane)	--	--	--	--
Dieldrin	--	--	--	--
Endosulfan Sulfate	--	--	--	--
Endrin	--	--	--	--
Endrin Aldehyde	--	--	--	--
Endrin Ketone	--	--	--	--
Gamma Bhc (Lindane)	--	--	--	--
Heptachlor	--	--	--	--
Heptachlor Epoxide	--	--	--	--
Methoxychlor	--	--	--	--
P,P'-DDD	--	--	--	--
P,P'-DDE	--	--	--	--
P,P'-DDT	--	--	--	--
Toxaphene	--	--	--	--
trans-Chlordane	--	--	--	--
POLYCHLORINATED BIPHENYLS (mg/kg)				
PCB-1016 (Aroclor 1016)	--	--	--	--
PCB-1221 (Aroclor 1221)	--	--	--	--
PCB-1232 (Aroclor 1232)	--	--	--	--

Table E-7
Summary of Data Used in Risk Assessment
Central Landfills Area Soil (0-0.5 ft-bgs) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-290	CFSB-290	CFSB-291	CFSB-292
Sample Lab IDs	460-159538-2	320-43709-6	460-159044-11	460-159044-25
Sample Name	CFSB-290-SO-0-0.5	CFSB-290-SO-0-0.5	CFSB-291-SO-0-0.5	CFSB-292-SO-0-0.5
Sample Depth	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft
Chemical	6/28/2018	9/27/2018	6/22/2018	6/22/2018
PCB-1242 (Aroclor 1242)	--	--	--	--
PCB-1248 (Aroclor 1248)	--	--	--	--
PCB-1254 (Aroclor 1254)	--	--	--	--
PCB-1260 (Aroclor 1260)	--	--	--	--
PCB-1262 (Aroclor 1262)	--	--	--	--
PCB-1268 (Aroclor 1268)	--	--	--	--
Polychlorinated Biphenyl (PCBs)	--	--	--	--
SEMIVOLATILE ORGANIC COMPOUNDS (mg/kg)				
1,2,4,5-Tetrachlorobenzene	--	--	--	--
1,4-Dioxane (P-Dioxane)	--	--	--	--
2,3,4,6-Tetrachlorophenol	--	--	--	--
2,4,5-Trichlorophenol	--	--	--	--
2,4,6-Trichlorophenol	--	--	--	--
2,4-Dichlorophenol	--	--	--	--
2,4-Dimethylphenol	--	--	--	--
2,4-Dinitrophenol	--	--	--	--
2,4-Dinitrotoluene	--	--	--	--
2,6-Dinitrotoluene	--	--	--	--
2-Chloronaphthalene	--	--	--	--
2-Chlorophenol	--	--	--	--
2-Methylnaphthalene	--	--	--	--
2-Methylphenol (O-Cresol)	--	--	--	--
2-Nitroaniline	--	--	--	--
2-Nitrophenol	--	--	--	--
3- And 4- Methylphenol (Total)	--	--	--	--
3,3'-Dichlorobenzidine	--	--	--	--
3-Nitroaniline	--	--	--	--
4,6-Dinitro-2-Methylphenol	--	--	--	--
4-Bromophenyl Phenyl Ether	--	--	--	--
4-Chloro-3-Methylphenol	--	--	--	--
4-Chloroaniline	--	--	--	--
4-Chlorophenyl Phenyl Ether	--	--	--	--
4-Nitroaniline	--	--	--	--
4-Nitrophenol	--	--	--	--
Acenaphthene	--	--	--	--
Acenaphthylene	--	--	--	--
Acetophenone	--	--	--	--
Anthracene	--	--	--	--
Atrazine	--	--	--	--
Benzaldehyde	--	--	--	--
Benzo(A)Anthracene	--	--	--	--
Benzo(A)Pyrene	--	--	--	--
Benzo(B)Fluoranthene	--	--	--	--
Benzo(G,H,I)Perylene	--	--	--	--
Benzo(K)Fluoranthene	--	--	--	--
Benzyl Butyl Phthalate	--	--	--	--
Biphenyl (Diphenyl)	--	--	--	--
Bis(2-Chloroethoxy) Methane	--	--	--	--
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	--	--	--	--
Bis(2-Chloroisopropyl) Ether	--	--	--	--
Bis(2-Ethylhexyl) Phthalate	--	--	--	--
Caprolactam	--	--	--	--
Carbazole	--	--	--	--
Chrysene	--	--	--	--
Dibenz(A,H)Anthracene	--	--	--	--
Dibenzofuran	--	--	--	--
Diethyl Phthalate	--	--	--	--
Dimethyl Phthalate	--	--	--	--

Table E-7
Summary of Data Used in Risk Assessment
Central Landfills Area Soil (0-0.5 ft-bgs) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-290	CFSB-290	CFSB-291	CFSB-292
Sample Lab IDs	460-159538-2	320-43709-6	460-159044-11	460-159044-25
Sample Name	CFSB-290-SO-0-0.5	CFSB-290-SO-0-0.5	CFSB-291-SO-0-0.5	CFSB-292-SO-0-0.5
Sample Depth	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft
Chemical	6/28/2018	9/27/2018	6/22/2018	6/22/2018
Di-N-Butyl Phthalate	--	--	--	--
Di-N-Octylphthalate	--	--	--	--
Fluoranthene	--	--	--	--
Fluorene	--	--	--	--
Hexachlorobenzene	--	--	--	--
Hexachlorobutadiene	--	--	--	--
Hexachlorocyclopentadiene	--	--	--	--
Hexachloroethane	--	--	--	--
Indeno(1,2,3-C,D)Pyrene	--	--	--	--
Isophorone	--	--	--	--
Naphthalene	--	--	--	--
Nitrobenzene	--	--	--	--
N-Nitrosodi-N-Propylamine	--	--	--	--
N-Nitrosodiphenylamine	--	--	--	--
Pentachlorophenol	--	--	--	--
Phenanthrene	--	--	--	--
Phenol	--	--	--	--
Pyrene	--	--	--	--

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-8
Summary of Data Used in Risk Assessment
Central Landfills Area Soil (0-2 ft-bgs) - Current
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFLP-007	CFLP-007	CFLP-008	CFLP-008	CFLP-009	CFLP-009	CFLP-010	CFLP-010	CFLP-011	CFLP-011	CFLP-012	CFLP-012	CFLP-013	CFLP-013
Sample Lab IDs	180-78687-1, 200-43824-1, 460-158063-1	180-78687-2, 200-43824-2, 460-158063-2	180-78687-3, 200-43824-3, 460-158063-3	180-78687-4, 200-43824-4, 460-158063-4	180-78687-5, 200-43824-5, 460-158063-5	180-78687-6, 200-43824-6, 460-158063-6	180-78687-7, 200-43824-7, 460-158063-7	180-78687-8, 200-43824-8, 460-158063-8	180-78687-9, 200-43824-9, 460-158063-9	180-78687-10, 200-43824-10, 460-158063-10	180-78687-11, 200-43824-11, 460-158063-11	180-78687-12, 200-43824-12, 460-158063-12	180-78687-13, 200-43824-13, 460-158063-13	180-78687-14, 200-43824-14, 460-158063-14
Sample Name	CFLP-007-SO-0-0.5	CFLP-007-SO-0.5-2	CFLP-008-SO-0-0.5	CFLP-008-SO-0.5-2	CFLP-009-SO-0-0.5	CFLP-009-SO-0.5-2	CFLP-010-SO-0-0.5	CFLP-010-SO-0.5-2	CFLP-011-SO-0-0.5	CFLP-011-SO-0.5-2	CFLP-012-SO-0-0.5	CFLP-012-SO-0.5-2	CFLP-013-SO-0-0.5	CFLP-013-SO-0.5-2
Sample Depth	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft
Chemical	6/9/2018	6/9/2018	6/9/2018	6/9/2018	6/9/2018	6/9/2018	6/9/2018	6/9/2018	6/9/2018	6/9/2018	6/9/2018	6/9/2018	6/9/2018	6/9/2018
GENERAL CHEMISTRY (mg/kg)														
Fluoride	20.3	58.1	22.2	54.5	3.24	250	41.4	20.3	4.79	3.96	31	239	6.68	10.8
Cyanide	0.11 J	0.062 J	0.06 U	0.057 U	0.058 U	0.086 U	0.094 J	0.067 U	0.077 J+	0.064 U	0.063 U	0.15 J+	0.11 J+	0.064 U
METALS (mg/kg)														
"Chromium, Hexavalent - Estimated"	0.246229	0.246229	0.222141	0.248905	0.206083	0.382725	0.291727	0.270316	0.275669	0.264964	0.248905	0.537956	0.29708	0.329197
"Chromium, Trivalent - Calculated"	--	--	--	--	--	--	--	--	--	--	--	--	--	--
"Chromium, Trivalent - Estimated"	8.95377	8.95377	8.07786	9.05109	7.49392	13.9173	10.6083	9.82968	10.0243	9.63504	9.05109	19.562	10.8029	11.9708
Aluminum	12000	12800	10600	10000	7560	24700	16100	12900	16300	12800	13800	36800	16500	13800
Antimony	0.29 U	0.29 U	0.29 U	0.27 U	0.3 U	1.5	0.37 J	0.31 U	0.3 U	0.31 U	0.27 U	1.2 J	0.29 U	0.32 U
Arsenic	5.2	5.1	5.2	4.7	4.4	17.9	5.8	5.4	5.8	5.8	5.7	16.8	8.8	7
Barium	78	106	67.4	82.9	69.1	146	99.1	109	182	97.3	94.4	288	134	163
Beryllium	0.55	0.68	0.48	0.49	0.39 J	4.7	0.67	0.65	0.67	0.56	0.58	4	0.56	0.75
Cadmium	0.33 U	0.34 U	0.33 U	0.32 U	0.34 U	1.6	0.34 U	0.35 U	0.34 U	0.35 U	0.31 U	0.87 J	0.33 U	0.37 U
Calcium	29100	23700	21300	28700	24100	222000	23600	29300	9660	29800	31800	180000	3040	27500
Chromium, Total	9.2	9.2	8.3	9.3	7.7	14.3	10.9	10.1	10.3	9.9	9.3	20.1	11.1	12.3
Cobalt	5.8	5.8	5.5	5.2	5.2	13	6.1	6.3	6.3	5.6	5.8	10.3	6.2	6.7
Copper	14	13.6	13.9	14.2	11.7	10.7	19.9	17.3	14.4	13.6	16.8	17	15.1	17.7
Iron	13500	13100	12600	13200	12500	7330	15600	14700	15900	15700	13400	13700	17400	17000
Lead	10.5	10.1	9.3	10.8	7.4	63.7	14.8	12.1	9.7	10	11.5	53.3	13.2	11
Magnesium	9100	9170	8880	10100	9050	8310	11000	9930	7580	11300	9450	11500	9880	11400
Manganese	360	362	309	342	309	129	448	460	445	431	421	328	576	397
Mercury	0.025	0.019	0.016 J	0.015 J	0.013 J	0.024	0.034	0.018	0.017 J	0.021	0.022	0.032	0.026	0.028
Nickel	24.1	30.2	21.9	16.5	12.9	534	39	19.5	12.9	11.4	22.4	276	20.3	15.4
Potassium	993	1150	868	902	619	6510	1820	1370	1110	845	1100	10900	1300	1700
Selenium	0.29 U	0.29 U	0.28 U	0.27 U	0.3 U	3 J	0.29 U	0.3 U	0.3 U	0.31 U	0.26 U	2.1 J	0.29 U	0.32 U
Silver	0.61 U	0.62 U	0.6 U	0.58 U	0.63 U	0.94 U	0.62 U	0.65 U	0.63 U	0.65 U	0.56 U	1.1 U	0.61 U	0.68 U
Sodium	66.2 J	65.4 J	33.9 J	39.7 J	32 U	5160	119	46.3 J	45.9 J	88 J	51.3 J	5170	41.5 J	41.3 J
Thallium	0.12 U	0.12 U	0.12 U	0.12 U	0.13 U	1.1	0.14 J	0.13 U	0.13 U	0.13 U	0.11 U	0.94	0.12 U	0.14 U
Vanadium	12.4	12.9	11	10.2	7.9	151	20.2	12.8	13.1	9.3	12	113	14	12.9
Zinc	42.9	42.9	39	42.4	35.1	52.6	50.7	48	54.5	46.7	44.1	63	52.5	49
METALS|HEXAVALENT CHROMIUM (mg/kg)														
Chromium, Hexavalent	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PESTICIDES (mg/kg)														
Aldrin	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Alpha Bhc (Alpha Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Alpha Endosulfan	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Beta Bhc (Beta Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Beta Endosulfan	--	--	--	--	--	--	--	--	--	--	--	--	--	--
cis-Chlordane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Delta BHC (Delta Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dieldrin	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endosulfan Sulfate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin Aldehyde	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin Ketone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Gamma Bhc (Lindane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Heptachlor	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Heptachlor Epoxide	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methoxychlor	--	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDD	--	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDT	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Toxaphene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
trans-Chlordane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
POLYCHLORINATED BIPHENYLS (mg/kg)														
PCB-1016 (Aroclor 1016)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1221 (Aroclor 1221)	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Table E-8
Summary of Data Used in Risk Assessment
Central Landfills Area Soil (0-2 ft-bgs) - Current
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFLP-007	CFLP-007	CFLP-008	CFLP-008	CFLP-009	CFLP-009	CFLP-010	CFLP-010	CFLP-011	CFLP-011	CFLP-012	CFLP-012	CFLP-013	CFLP-013
Sample Lab IDs	180-78687-1, 200-43824-1, 460-158063-1	180-78687-2, 200-43824-2, 460-158063-2	180-78687-3, 200-43824-3, 460-158063-3	180-78687-4, 200-43824-4, 460-158063-4	180-78687-5, 200-43824-5, 460-158063-5	180-78687-6, 200-43824-6, 460-158063-6	180-78687-7, 200-43824-7, 460-158063-7	180-78687-8, 200-43824-8, 460-158063-8	180-78687-9, 200-43824-9, 460-158063-9	180-78687-10, 200-43824-10, 460-158063-10	180-78687-11, 200-43824-11, 460-158063-11	180-78687-12, 200-43824-12, 460-158063-12	180-78687-13, 200-43824-13, 460-158063-13	180-78687-14, 200-43824-14, 460-158063-14
Sample Name	CFLP-007-SO-0-0.5	CFLP-007-SO-0.5-2	CFLP-008-SO-0-0.5	CFLP-008-SO-0.5-2	CFLP-009-SO-0-0.5	CFLP-009-SO-0.5-2	CFLP-010-SO-0-0.5	CFLP-010-SO-0.5-2	CFLP-011-SO-0-0.5	CFLP-011-SO-0.5-2	CFLP-012-SO-0-0.5	CFLP-012-SO-0.5-2	CFLP-013-SO-0-0.5	CFLP-013-SO-0.5-2
Sample Depth	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft
Chemical	6/9/2018	6/9/2018	6/9/2018	6/9/2018	6/9/2018	6/9/2018	6/9/2018	6/9/2018	6/9/2018	6/9/2018	6/9/2018	6/9/2018	6/9/2018	6/9/2018
PCB-1232 (Aroclor 1232)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1242 (Aroclor 1242)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1248 (Aroclor 1248)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1254 (Aroclor 1254)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1260 (Aroclor 1260)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1262 (Aroclor 1262)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1268 (Aroclor 1268)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Polychlorinated Biphenyl (PCBs)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SEMIVOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,2,4,5-Tetrachlorobenzene	0.0031 U	0.0015 U	0.0015 U	0.0015 U	0.0015 U	0.035 U	0.0015 U	0.0015 U	0.0016 U	0.0015 U	0.0015 U	0.0083 U	0.0016 U	0.0016 U
1,4-Dioxane (P-Dioxane)	0.022 U	0.011 U	0.011 U	0.011 U	0.011 U	0.25 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.06 U	0.012 U	0.012 U
2,3,4,6-Tetrachlorophenol	0.03 U	0.015 U	0.014 U	0.014 U	0.014 U	0.34 U	0.014 U	0.015 U	0.015 U	0.015 U	0.015 U	0.08 U	0.015 U	0.016 U
2,4,5-Trichlorophenol	0.0051 U	0.0025 U	0.0025 U	0.0025 U	0.0024 U	0.058 U	0.0025 U	0.0025 U	0.0026 U	0.0025 U	0.0025 U	0.014 U	0.0026 U	0.0027 U
2,4,6-Trichlorophenol	0.0039 U	0.0019 U	0.0019 U	0.0019 U	0.0019 U	0.045 U	0.0019 U	0.002 U	0.002 U	0.0019 U	0.0019 U	0.011 U	0.002 U	0.0021 U
2,4-Dichlorophenol	0.0055 U	0.0027 U	0.0026 U	0.0027 U	0.0026 U	0.063 U	0.0027 U	0.0027 U	0.0028 U	0.0027 U	0.0027 U	0.015 U	0.0029 U	0.0029 U
2,4-Dimethylphenol	0.0045 U	0.0022 U	0.0021 U	0.0022 U	0.0021 U	0.051 U	0.0021 U	0.0022 U	0.0022 U	0.0022 U	0.0022 U	0.012 U	0.0023 U	0.0023 U
2,4-Dinitrophenol	0.19 U	0.094 U	0.092 U	0.093 U	0.092 U	2.2 U	0.093 U	0.096 U	0.097 U	0.094 U	0.094 U	0.52 U	0.099 U	0.1 U
2,4-Dinitrotoluene	0.0036 U	0.0017 U	0.0017 U	0.0017 U	0.0017 U	0.041 U	0.0017 U	0.0018 U	0.0018 U	0.0017 U	0.0017 U	0.0096 U	0.0018 U	0.0019 U
2,6-Dinitrotoluene	0.0044 U	0.0022 U	0.0021 U	0.0021 U	0.0021 U	0.05 U	0.0021 U	0.0022 U	0.0022 U	0.0022 U	0.0022 U	0.012 U	0.0023 U	0.0023 U
2-Chloronaphthalene	0.0033 U	0.0016 U	0.0016 U	0.0016 U	0.0016 U	0.037 U	0.0016 U	0.0016 U	0.0017 U	0.0016 U	0.0016 U	0.0088 U	0.0017 U	0.0017 U
2-Chlorophenol	0.0033 U	0.0016 U	0.0016 U	0.0016 U	0.0016 U	0.038 U	0.0016 U	0.0017 U	0.0017 U	0.0016 U	0.0016 U	0.0089 U	0.0017 U	0.0017 U
2-Methylnaphthalene	0.0044 J	0.0017 U	0.0016 J	0.0017 U	0.0023 J	0.039 U	0.0017 J	0.0017 U	0.0017 U	0.0017 U	0.0017 U	0.0092 U	0.002 J	0.0018 U
2-Methylphenol (O-Cresol)	0.021 U	0.01 U	0.0098 U	0.0099 U	0.0098 U	0.23 U	0.0099 U	0.01 U	0.01 U	0.01 U	0.01 U	0.055 U	0.011 U	0.011 U
2-Nitroaniline	0.033 U	0.016 U	0.016 U	0.016 U	0.016 U	0.37 U	0.016 U	0.016 U	0.016 U	0.016 U	0.016 U	0.088 U	0.017 U	0.017 U
2-Nitrophenol	0.0041 U	0.002 U	0.002 U	0.002 U	0.002 U	0.047 U	0.002 U	0.002 U	0.0021 U	0.002 U	0.002 U	0.011 U	0.0021 U	0.0022 U
3- And 4- Methylphenol (Total)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3,3'-Dichlorobenzidine	0.067 U	0.033 U	0.032 U	0.032 U	0.032 U	0.76 U	0.032 U	0.033 U	0.034 U	0.033 U	0.032 U	0.18 U	0.034 U	0.035 U
3-Nitroaniline	0.018 U	0.0089 U	0.0087 U	0.0088 U	0.0087 U	0.21 U	0.0088 U	0.0091 U	0.0092 U	0.0089 U	0.0089 U	0.049 U	0.0094 U	0.0096 U
4,6-Dinitro-2-Methylphenol	0.12 U	0.06 U	0.059 U	0.06 U	0.059 U	1.4 U	0.059 U	0.061 U	0.062 U	0.06 U	0.06 U	0.33 U	0.064 U	0.065 U
4-Bromophenyl Phenyl Ether	0.005 U	0.0024 U	0.0024 U	0.0024 U	0.0024 U	0.057 U	0.0024 U	0.0025 U	0.0025 U	0.0024 U	0.0024 U	0.013 U	0.0026 U	0.0026 U
4-Chloro-3-Methylphenol	0.0034 U	0.0016 U	0.0016 U	0.0016 U	0.0016 U	0.038 U	0.0016 U	0.0017 U	0.0017 U	0.0016 U	0.0016 U	0.009 U	0.0017 U	0.0018 U
4-Chloroaniline	0.0024 U	0.0012 U	0.0011 U	0.0012 U	0.0011 U	0.027 U	0.0011 U	0.0012 U	0.0012 U	0.0012 U	0.0012 U	0.0064 U	0.0012 U	0.0013 U
4-Chlorophenyl Phenyl Ether	0.0044 U	0.0021 U	0.0021 U	0.0021 U	0.0021 U	0.049 U	0.0021 U	0.0022 U	0.0022 U	0.0021 U	0.0021 U	0.012 U	0.0022 U	0.0023 U
4-Nitroaniline	0.0035 U	0.0017 U	0.0017 U	0.0017 U	0.0017 U	0.04 U	0.0017 U	0.0017 U	0.0018 U	0.0017 U	0.0017 U	0.0093 U	0.0018 U	0.0018 U
4-Nitrophenol	0.05 U	0.025 U	0.024 U	0.024 U	0.024 U	0.57 U	0.024 U	0.025 U	0.025 U	0.025 U	0.024 U	0.13 U	0.026 U	0.026 U
Acenaphthene	0.047	0.0076	0.019	0.013	0.019	0.047 U	0.014	0.0073	0.0041 J	0.002 U	0.0075	0.011 U	0.015	0.0022 U
Acenaphthylene	0.0031 U	0.0015 U	0.0019 J	0.0027 J	0.0015 U	0.036 U	0.0015 J	0.0016 U	0.0016 U	0.0015 U	0.0015 U	0.0084 U	0.0016 J	0.0016 U
Acetophenone	0.0039 U	0.0019 U	0.0019 U	0.0019 U	0.0019 U	0.044 U	0.0019 U	0.0019 U	0.002 U	0.0019 U	0.0019 U	0.01 U	0.002 U	0.002 U
Anthracene	0.069	0.011	0.046	0.025	0.034	0.51	0.028	0.013	0.0067 J	0.0042 J	0.016	0.034 J	0.029	0.002 J
Atrazine	0.031 U	0.015 U	0.015 U	0.015 U	0.015 U	0.36 U	0.015 U	0.016 U	0.016 U	0.015 U	0.015 U	0.084 U	0.016 U	0.016 U
Benzaldehyde	0.0089 U	0.0043 U	0.0043 U	0.0043 U	0.0042 U	0.1 U	0.0043 U	0.0044 U	0.0045 U	0.0043 U	0.0043 U	0.024 U	0.0046 U	0.0047 U
Benzo(A)Anthracene	0.3	0.051	0.24	0.1	0.3	20	0.33	0.1	0.069	0.02	0.16	0.47	0.23	0.013
Benzo(A)Pyrene	0.34	0.055	0.26	0.12	0.31	14	0.39	0.11	0.084	0.022	0.2	1	0.3	0.016
Benzo(B)Fluoranthene	0.52	0.1	0.41	0.2	0.4	43	0.79	0.25	0.0018 U	0.037	0.36	1.7	0.49	0.021
Benzo(G,H,I)Perylene	0.39	0.079	0.3	0.19	0.28	22	0.65	0.39	0.1	0.025	0.27	5.1	0.38	0.019
Benzo(K)Fluoranthene	0.2	0.032	0.14	0.071	0.16	11	0.22	0.096	0.043	0.012	0.12	0.99	0.14	0.013
Benzyl Butyl Phthalate	0.049 U	0.024 U	0.024 U	0.024 U	0.023 U	0.56 U	0.024 U	0.024 U	0.025 U	0.024 U	0.024 U	0.13 U	0.025 U	0.026 U
Biphenyl (Diphenyl)	0.003 U	0.0015 U	0.0014 U	0.0015 U	0.0014 U	0.034 U	0.0014 U	0.0015 U	0.0015 U	0.0015 U	0.0015 U	0.0081 U	0.0016 U	0.0016 U
Bis(2-Chloroethoxy) Methane	0.0034 U	0.0017 U	0.0016 U	0.0017 U	0.0016 U	0.039 U	0.0016 U	0.0017 U	0.0017 U	0.0017 U	0.0017 U	0.0092 U	0.0018 U	0.0018 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.0026 U	0.0013 U	0.0012 U	0.0013 U	0.0012 U	0.03 U	0.0012 U	0.0013 U	0.0013 U	0.0013 U	0.0013 U	0.007 U	0.0013 U	0.0014 U
Bis(2-Chloroisopropyl) Ether	0.0053 U	0.0026 U	0.0025 U	0.0026 U	0.0025 U	0.06 U	0.0025 U	0.0026 U	0.0027 U	0.0026 U	0.0026 U	0.014 U	0.0027 U	0.0028 U
Bis(2-Ethylhexyl) Phthalate	0.076 U	0.037 U	0.037 U	0.037 U	0.036 U	0.87 U	0.037 U	0.038 U	0.038 U	0.037 U	0.037 U	0.2 U	0.039 U	0.04 U
Caprolactam	0.047 U	0.023 U	0.022 U	0.023 U	0.022 U	0.53 U	0.022 U	0.023 U	0.023 U	0.023 U	0.023 U	0.12 U	0.024 U	0.024 U
Carbazole	0.056	0.0099	0.041	0.022	0.044	0.33	0.046	0.017	0.014	0.0045 J	0.024	0.047	0.042	0.003 J
Chrysene	0.44	0.075	0.33	0.15	0.38	63	0.66	0.22	0.13	0.034	0.28	2.5	0.36	0.018
Dibenz(A,H)Anthracene	0.099 J+	0.0016 U	0.075	0.045	0.082	6.2	0.15	0.069	0.0016 U	0.007	0.065	1	0.093	0.0055 J
Dibenzofuran	0.014 J	0.0027 J	0.0067 J	0.0047 J	0.0049 J	0.036 J	0.0048 J	0.0033 J	0.0016 U	0.0015 U	0.003 J	0.0085 J	0.0053 J	0.0016 U

Table E-8
Summary of Data Used in Risk Assessment
Central Landfills Area Soil (0-2 ft-bgs) - Current
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFLP-007	CFLP-007	CFLP-008	CFLP-008	CFLP-009	CFLP-009	CFLP-010	CFLP-010	CFLP-011	CFLP-011	CFLP-012	CFLP-012	CFLP-013	CFLP-013
Sample Lab IDs	180-78687-1, 200-43824-1, 460-158063-1	180-78687-2, 200-43824-2, 460-158063-2	180-78687-3, 200-43824-3, 460-158063-3	180-78687-4, 200-43824-4, 460-158063-4	180-78687-5, 200-43824-5, 460-158063-5	180-78687-6, 200-43824-6, 460-158063-6	180-78687-7, 200-43824-7, 460-158063-7	180-78687-8, 200-43824-8, 460-158063-8	180-78687-9, 200-43824-9, 460-158063-9	180-78687-10, 200-43824-10, 460-158063-10	180-78687-11, 200-43824-11, 460-158063-11	180-78687-12, 200-43824-12, 460-158063-12	180-78687-13, 200-43824-13, 460-158063-13	180-78687-14, 200-43824-14, 460-158063-14
Sample Name	CFLP-007-SO-0-0.5	CFLP-007-SO-0.5-2	CFLP-008-SO-0-0.5	CFLP-008-SO-0.5-2	CFLP-009-SO-0-0.5	CFLP-009-SO-0.5-2	CFLP-010-SO-0-0.5	CFLP-010-SO-0.5-2	CFLP-011-SO-0-0.5	CFLP-011-SO-0.5-2	CFLP-012-SO-0-0.5	CFLP-012-SO-0.5-2	CFLP-013-SO-0-0.5	CFLP-013-SO-0.5-2
Sample Depth	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft
Chemical	6/9/2018	6/9/2018	6/9/2018	6/9/2018	6/9/2018	6/9/2018	6/9/2018	6/9/2018	6/9/2018	6/9/2018	6/9/2018	6/9/2018	6/9/2018	6/9/2018
Diethyl Phthalate	0.022 U	0.011 U	0.01 U	0.01 U	0.01 U	0.24 U	0.01 U	0.011 U	0.011 U	0.01 U	0.01 U	0.058 U	0.011 U	0.011 U
Dimethyl Phthalate	0.0026 U	0.0013 U	0.0012 U	0.0013 U	0.0012 U	0.03 U	0.0012 U	0.0013 U	0.0013 U	0.0013 U	0.0013 U	0.007 U	0.0013 U	0.0014 U
Di-N-Butyl Phthalate	0.031 U	0.015 U	0.015 U	0.015 U	0.015 U	0.36 U	0.015 U	0.016 U	0.016 U	0.015 U	0.015 U	0.084 U	0.016 U	0.016 U
Di-N-Octylphthalate	0.042 U	0.02 U	0.02 U	0.02 U	0.02 U	0.47 U	0.02 U	0.021 U	0.021 U	0.02 U	0.02 U	0.11 U	0.022 U	0.022 U
Fluoranthene	0.62	0.11	0.53	0.25	0.53	25	0.58	0.17	0.15	0.04	0.32	0.33	0.45	0.025
Fluorene	0.027	0.0048 J	0.016	0.01	0.012	0.032 U	0.0076	0.0052 J	0.0031 J	0.0014 U	0.0046 J	0.0075 U	0.01	0.0015 U
Hexachlorobenzene	0.0051 U	0.0025 U	0.0025 U	0.0025 U	0.0024 U	0.058 U	0.0025 U	0.0026 U	0.0026 U	0.0025 U	0.0025 U	0.014 U	0.0027 U	0.0027 U
Hexachlorobutadiene	0.0042 U	0.002 U	0.002 U	0.002 U	0.002 U	0.048 U	0.002 U	0.0021 U	0.0021 U	0.002 U	0.002 U	0.011 U	0.0022 U	0.0022 U
Hexachlorocyclopentadiene	0.0037 U	0.0018 U	0.0018 U	0.0018 U	0.0017 U	0.042 U	0.0018 U	0.0018 U	0.0018 U	0.0018 U	0.0018 U	0.0098 U	0.0019 U	0.0019 U
Hexachloroethane	0.0037 U	0.0018 U	0.0018 U	0.0018 U	0.0018 U	0.042 U	0.0018 U	0.0018 U	0.0019 U	0.0018 U	0.0018 U	0.0099 U	0.0019 U	0.0019 U
Indeno(1,2,3-C,D)Pyrene	0.32	0.065	0.26	0.17	0.25	16	0.48	0.21	0.081	0.02	0.22	3	0.31	0.015
Isophorone	0.0037 U	0.0018 U	0.0018 U	0.0018 U	0.0017 U	0.042 U	0.0018 U	0.0018 U	0.0018 U	0.0018 U	0.0018 U	0.0098 U	0.0019 U	0.0019 U
Naphthalene	0.0063 J	0.0014 U	0.0033 J	0.0032 J	0.0023 J	0.032 U	0.0027 J	0.002 J	0.0014 J	0.0014 U	0.0014 U	0.0075 U	0.0051 J	0.0015 U
Nitrobenzene	0.026 U	0.013 U	0.013 U	0.013 U	0.012 U	0.3 U	0.013 U	0.013 U	0.013 U	0.013 U	0.013 U	0.07 U	0.014 U	0.014 U
N-Nitrosodi-N-Propylamine	0.0049 U	0.0024 U	0.0023 U	0.0023 U	0.0023 U	0.055 U	0.0023 U	0.0024 U	0.0024 U	0.0024 U	0.0024 U	0.013 U	0.0025 U	0.0025 U
N-Nitrosodiphenylamine	0.024 U	0.012 U	0.011 U	0.012 U	0.011 U	0.27 U	0.011 U	0.012 U	0.012 U	0.012 U	0.012 U	0.064 U	0.012 U	0.013 U
Pentachlorophenol	0.12 U	0.056 U	0.055 U	0.056 U	0.055 U	1.3 U	0.055 U	0.057 U	0.058 U	0.056 U	0.056 U	0.31 U	0.059 U	0.06 U
Phenanthrene	0.32	0.06	0.24	0.12	0.23	1	0.17	0.07	0.044	0.019	0.1	0.12	0.17	0.011
Phenol	0.022 U	0.011 U	0.01 U	0.01 U	0.01 U	0.25 U	0.01 U	0.011 U	0.011 U	0.011 U	0.011 U	0.058 U	0.011 U	0.011 U
Pyrene	0.57	0.098	0.41	0.2	0.47	16	0.48	0.15	0.12	0.034	0.26	0.29	0.39	0.02
VOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,1,1-Trichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,2,2-Tetrachloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,2-Trichloro-1,2,2-Trifluoroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,2-Trichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1-Dichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1-Dichloroethene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,3-Trichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,4-Trichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dibromo-3-Chloropropane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dibromoethane (Ethylene Dibromide)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichloropropane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,3-Dichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,4-Dichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Hexanone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acetone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromochloromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromodichloromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromoform	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromomethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Carbon Disulfide	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Carbon Tetrachloride	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chloroform	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chloromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cis-1,2-Dichloroethylene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cis-1,3-Dichloropropene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cyclohexane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibromochloromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dichlorodifluoromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Ethylbenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Isopropylbenzene (Cumene)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
M,P-Xylene	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Table E-8
Summary of Data Used in Risk Assessment
Central Landfills Area Soil (0-2 ft-bgs) - Current
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFLP-007	CFLP-007	CFLP-008	CFLP-008	CFLP-009	CFLP-009	CFLP-010	CFLP-010	CFLP-011	CFLP-011	CFLP-012	CFLP-012	CFLP-013	CFLP-013
Sample Lab IDs	180-78687-1, 200-43824-1, 460-158063-1	180-78687-2, 200-43824-2, 460-158063-2	180-78687-3, 200-43824-3, 460-158063-3	180-78687-4, 200-43824-4, 460-158063-4	180-78687-5, 200-43824-5, 460-158063-5	180-78687-6, 200-43824-6, 460-158063-6	180-78687-7, 200-43824-7, 460-158063-7	180-78687-8, 200-43824-8, 460-158063-8	180-78687-9, 200-43824-9, 460-158063-9	180-78687-10, 200-43824-10, 460-158063-10	180-78687-11, 200-43824-11, 460-158063-11	180-78687-12, 200-43824-12, 460-158063-12	180-78687-13, 200-43824-13, 460-158063-13	180-78687-14, 200-43824-14, 460-158063-14
Sample Name	CFLP-007-SO-0-0.5	CFLP-007-SO-0.5-2	CFLP-008-SO-0-0.5	CFLP-008-SO-0.5-2	CFLP-009-SO-0-0.5	CFLP-009-SO-0.5-2	CFLP-010-SO-0-0.5	CFLP-010-SO-0.5-2	CFLP-011-SO-0-0.5	CFLP-011-SO-0.5-2	CFLP-012-SO-0-0.5	CFLP-012-SO-0.5-2	CFLP-013-SO-0-0.5	CFLP-013-SO-0.5-2
Sample Depth	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft
Chemical	6/9/2018	6/9/2018	6/9/2018	6/9/2018	6/9/2018	6/9/2018	6/9/2018	6/9/2018	6/9/2018	6/9/2018	6/9/2018	6/9/2018	6/9/2018	6/9/2018
Methyl Acetate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methyl Ethyl Ketone (2-Butanone)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methylcyclohexane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methylene Chloride	--	--	--	--	--	--	--	--	--	--	--	--	--	--
O-Xylene (1,2-Dimethylbenzene)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Styrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Tert-Butyl Methyl Ether	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Tetrachloroethylene (PCE)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Toluene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Trans-1,2-Dichloroethene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Trans-1,3-Dichloropropene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Trichloroethylene (TCE)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Trichlorofluoromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Vinyl Chloride	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-8
Summary of Data Used in Risk Assessment
Central Landfills Area Soil (0-2 ft-bgs) - Current
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFLP-014	CFLP-014	CFLP-015	CFLP-015	CFLP-016	CFLP-016	CFLP-017	CFLP-017	CFLP-018	CFLP-018	CFMW-002	CFMW-002	CFMW-008A	CFMW-008A
Sample Lab IDs	180-78687-15, 200-43824-15, 460-158063-15	180-78687-16, 200-43824-16, 460-158063-16	180-78894-1, 200-43930-1, 460-158632-1	180-78894-2, 200-43930-2, 460-158632-2	180-78894-3, 200-43930-3, 460-158632-3	180-78894-4, 200-43930-4, 460-158632-4	180-78894-5, 200-43930-5, 460-158632-5	180-78894-6, 200-43930-6, 460-158632-6	180-78894-7, 200-43930-7, 460-158632-7	180-78894-8, 200-43930-8, 460-158632-8	460-115528-7	460-115528-8	460-115528-1	460-115528-3
Sample Name	CFLP-014-SO-0-0.5	CFLP-014-SO-0.5-2	CFLP-015-SO-0-0.5	CFLP-015-SO-0.5-2	CFLP-016-SO-0-0.5	CFLP-016-SO-0.5-2	CFLP-017-SO-0-0.5	CFLP-017-SO-0.5-2	CFLP-018-SO-0-0.5	CFLP-018-SO-0.5-2	CFMW-002-SO-0-0.5	CFMW-002-SO-0.5-2	CFMW-008a-SO-0-0.5	CFMW-008a-SO-0.5-2
Sample Depth	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft
Chemical	6/9/2018	6/9/2018	6/16/2018	6/16/2018	6/16/2018	6/16/2018	6/16/2018	6/16/2018	6/16/2018	6/16/2018	6/13/2016	6/13/2016	6/13/2016	6/13/2016
GENERAL CHEMISTRY (mg/kg)														
Fluoride	4.31	3.66	6.34 J+	5.76 J+	36.4 J+	36.3 J+	8.44 J+	11.7 J+	6.69 J+	7.17 J+	56.7 J-	166 J+	84.9 J-	180 J+
Cyanide	0.066 U	0.061 U	0.09 J	0.065 U	0.33	0.071 U	0.14 J	0.071 J+	0.23 J+	0.11 J+	0.48 J	0.59 J	0.088 J	0.016 UJ
METALS (mg/kg)														
"Chromium, Hexavalent - Estimated"	0.243552	0.235523	0.235523	0.235523	0.350608	0.347932	0.382725	0.275669	0.414842	0.339903	0.275669	0.339903	0.26764	0.187348
"Chromium, Trivalent - Calculated"	--	--	--	--	--	--	--	--	--	--	--	--	--	--
"Chromium, Trivalent - Estimated"	8.85645	8.56448	8.56448	8.56448	12.7494	12.6521	13.9173	10.0243	15.0852	12.3601	10.0243	12.3601	9.73236	6.81265
Aluminum	10300	9380	10800	9340	21900	15900	19100	12900	19700	15400	14500	24900	21000	8610
Antimony	0.27 U	0.3 U	0.31 UJ	0.32 UJ	0.36 UJ	0.33 UJ	0.33 UJ	0.3 UJ	0.35 UJ	0.31 UJ	0.35 UJ	0.35 UJ	0.36 UJ	0.32 UJ
Arsenic	6.2	5.9	11.2	10.5	5.6	7	9.3	7.4	6.8	6.9	5.3	6.5	7.1	4
Barium	59.9	64.5	80.3	103	214	148	222	123	261	155	127	181	163	55.6
Beryllium	0.42	0.39 J	0.34 J	0.39 J	0.6	0.55	0.64	0.44	0.58	0.48	0.78	0.76	0.63	0.27 J
Cadmium	0.31 U	0.34 U	0.35 U	0.36 U	0.41 U	0.38 U	0.38 U	0.34 U	0.4 U	0.35 U	0.26 U	0.26 U	0.27 U	0.24 U
Calcium	34700	40200	71800	63200	6100	20400	5420	36000	5660	11200	68400 J	7360 J	56600 J	26100 J
Chromium, Total	9.1	8.8	8.8	8.8	13.1	13	14.3	10.3	15.5	12.7	10.3	12.7	10	7
Cobalt	5.3	5.7	5.1	5.3	6.2	7.8	7.6	5.5	6.3	6	4.8	6.4	4.7	3.5
Copper	14.6	14	17.7	13.9	19.9	31.4	26.4	16.8	22.6	19.9	12	14.5	15.2	8.4
Iron	13400	13400	13100	13400	15300	19600	20800	15800	17200	17600	13400	19600	10800	9950
Lead	9.8	10.1	10.5	9.8	12.9	14.1	11	10.3	13.7	12	13.5 J+	12.2 J+	23.3 J+	11.2 J+
Magnesium	10800	9340	13200	14000	8410	11800	8550	11800	9540	10800	11500	12100	8170	8110
Manganese	332	383	348 J	357 J	393 J	470 J	450 J	380 J	346 J	370 J	616 J	728 J	388 J	247 J
Mercury	0.025	0.027	0.029	0.022	0.023	0.037	0.02	0.026	0.023	0.025	0.014 J	0.013 U	0.023	0.016 J
Nickel	15	12.8	17	11	28.7	17.8	17.5	12.7	19.8	14.7	28.5 J+	15.5 J+	32.4 J+	15.8 J+
Potassium	916	707	931	963	1530	1360	1140	776	1360	925	1280	1220	1060	585
Selenium	0.26 U	0.29 U	0.31 U	0.31 U	0.38 J	0.33 U	0.37 J	0.3 U	0.44 J	0.3 U	0.33 U	0.33 U	0.34 J	0.3 U
Silver	0.56 U	0.63 U	0.65 U	0.67 U	0.76 U	0.71 U	0.7 U	0.63 U	0.74 U	0.65 U	0.64 U	0.64 U	0.65 U	0.58 U
Sodium	28.5 U	31.7 U	35.6 J	33.9 U	81.2 J	52.6 J	48.5 J	43.1 J	60.3 J	34.9 J	104	279	302	89.5
Thallium	0.11 U	0.13 U	0.13 U	0.14 U	0.15 U	0.14 U	0.14 U	0.13 U	0.15 U	0.13 U	0.13 U	0.13 J	0.13 U	0.12 U
Vanadium	8.2	8	10.2	9.3	16	12.4	27.7	10.5	13.8	11.4	21.1 J-	23.1 J-	17.3 J-	9.5 J-
Zinc	42.5	38.8	38.7	35.7	77.6	60.5	61.3	46.1	62.1	51	114 J-	111 J-	57.1 J-	32.3 J-
METALS|HEXAVALENT CHROMIUM (mg/kg)														
Chromium, Hexavalent	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PESTICIDES (mg/kg)														
Aldrin	--	--	--	--	--	--	--	--	--	--	0.00086 U	--	0.00089 U	--
Alpha Bhc (Alpha Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	0.00065 U	--	0.00067 U	--
Alpha Endosulfan	--	--	--	--	--	--	--	--	--	--	0.00099 U	--	0.001 U	--
Beta Bhc (Beta Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	0.00069 U	--	0.00072 U	--
Beta Endosulfan	--	--	--	--	--	--	--	--	--	--	0.0011 U	--	0.0012 U	--
cis-Chlordane	--	--	--	--	--	--	--	--	--	--	0.0012 U	--	0.0012 U	--
Delta BHC (Delta Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	0.00078 U	--	0.0008 U	--
Dieldrin	--	--	--	--	--	--	--	--	--	--	0.00093 U	--	0.00096 U	--
Endosulfan Sulfate	--	--	--	--	--	--	--	--	--	--	0.00083 U	--	0.00086 U	--
Endrin	--	--	--	--	--	--	--	--	--	--	0.0009 U	--	0.00094 U	--
Endrin Aldehyde	--	--	--	--	--	--	--	--	--	--	0.00088 U	--	0.00091 U	--
Endrin Ketone	--	--	--	--	--	--	--	--	--	--	0.00099 U	--	0.001 U	--
Gamma Bhc (Lindane)	--	--	--	--	--	--	--	--	--	--	0.00064 U	--	0.00066 U	--
Heptachlor	--	--	--	--	--	--	--	--	--	--	0.00092 U	--	0.00095 U	--
Heptachlor Epoxide	--	--	--	--	--	--	--	--	--	--	0.0014 U	--	0.0014 U	--
Methoxychlor	--	--	--	--	--	--	--	--	--	--	0.0015 U	--	0.0016 U	--
P,P'-DDD	--	--	--	--	--	--	--	--	--	--	0.00094 U	--	0.00097 U	--
P,P'-DDE	--	--	--	--	--	--	--	--	--	--	0.001 U	--	0.0011 U	--
P,P'-DDT	--	--	--	--	--	--	--	--	--	--	0.00073 U	--	0.00076 U	--
Toxaphene	--	--	--	--	--	--	--	--	--	--	0.021 U	--	0.021 U	--
trans-Chlordane	--	--	--	--	--	--	--	--	--	--	0.0015 U	--	0.0016 U	--
POLYCHLORINATED BIPHENYLS (mg/kg)														
PCB-1016 (Aroclor 1016)	--	--	--	--	--	--	--	--	--	--	0.0095 U	0.01 U	0.0098 U	0.0094 U
PCB-1221 (Aroclor 1221)	--	--	--	--	--	--	--	--	--	--	0.0095 U	0.01 U	0.0098 U	0.0094 U

Table E-8
Summary of Data Used in Risk Assessment
Central Landfills Area Soil (0-2 ft-bgs) - Current
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFLP-014	CFLP-014	CFLP-015	CFLP-015	CFLP-016	CFLP-016	CFLP-017	CFLP-017	CFLP-018	CFLP-018	CFMW-002	CFMW-002	CFMW-008A	CFMW-008A
Sample Lab IDs	180-78687-15, 200-43824-15, 460-158063-15	180-78687-16, 200-43824-16, 460-158063-16	180-78894-1, 200-43930-1, 460-158632-1	180-78894-2, 200-43930-2, 460-158632-2	180-78894-3, 200-43930-3, 460-158632-3	180-78894-4, 200-43930-4, 460-158632-4	180-78894-5, 200-43930-5, 460-158632-5	180-78894-6, 200-43930-6, 460-158632-6	180-78894-7, 200-43930-7, 460-158632-7	180-78894-8, 200-43930-8, 460-158632-8	460-115528-7	460-115528-8	460-115528-1	460-115528-3
Sample Name	CFLP-014-SO-0-0.5	CFLP-014-SO-0.5-2	CFLP-015-SO-0-0.5	CFLP-015-SO-0.5-2	CFLP-016-SO-0-0.5	CFLP-016-SO-0.5-2	CFLP-017-SO-0-0.5	CFLP-017-SO-0.5-2	CFLP-018-SO-0-0.5	CFLP-018-SO-0.5-2	CFMW-002-SO-0-0.5	CFMW-002-SO-0.5-2	CFMW-008a-SO-0-0.5	CFMW-008a-SO-0.5-2
Sample Depth	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft
Chemical	6/9/2018	6/9/2018	6/16/2018	6/16/2018	6/16/2018	6/16/2018	6/16/2018	6/16/2018	6/16/2018	6/16/2018	6/13/2016	6/13/2016	6/13/2016	6/13/2016
PCB-1232 (Aroclor 1232)	--	--	--	--	--	--	--	--	--	--	0.0095 U	0.01 U	0.0098 U	0.0094 U
PCB-1242 (Aroclor 1242)	--	--	--	--	--	--	--	--	--	--	0.0095 U	0.01 U	0.0098 U	0.0094 U
PCB-1248 (Aroclor 1248)	--	--	--	--	--	--	--	--	--	--	0.0095 U	0.01 U	0.0098 U	0.0094 U
PCB-1254 (Aroclor 1254)	--	--	--	--	--	--	--	--	--	--	0.0098 U	0.01 U	0.01 U	0.0097 U
PCB-1260 (Aroclor 1260)	--	--	--	--	--	--	--	--	--	--	0.0098 U	0.01 U	0.01 U	0.0097 U
PCB-1262 (Aroclor 1262)	--	--	--	--	--	--	--	--	--	--	0.0098 U	0.01 U	0.01 U	0.0097 U
PCB-1268 (Aroclor 1268)	--	--	--	--	--	--	--	--	--	--	0.0098 U	0.01 U	0.01 U	0.0097 U
Polychlorinated Biphenyl (PCBs)	--	--	--	--	--	--	--	--	--	--	0.0098 U	0.01 U	0.01 U	0.0097 U
SEMIVOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,2,4,5-Tetrachlorobenzene	0.003 UJ	0.003 UJ	0.0032 U	0.0016 U	0.0097 U	0.0048 U	0.0035 U	0.0016 U	0.0017 U	0.0031 U	0.026 U	0.028 U	0.14 U	0.26 U
1,4-Dioxane (P-Dioxane)	0.022 U	0.022 U	0.023 U	0.011 U	0.07 U	0.035 U	0.025 U	0.012 U	0.012 U	0.023 U	0.094 U	0.1 U	0.49 U	0.93 U
2,3,4,6-Tetrachlorophenol	0.029 UJ	0.029 UJ	0.031 U	0.015 U	0.093 U	0.046 U	0.033 U	0.015 U	0.017 U	0.03 U	0.033 UJ	0.035 U	0.17 U	0.33 U
2,4,5-Trichlorophenol	0.0049 U	0.005 U	0.0053 U	0.0026 U	0.016 U	0.0079 U	0.0057 U	0.0026 U	0.0028 U	0.0052 U	0.035 U	0.037 U	0.18 U	0.35 U
2,4,6-Trichlorophenol	0.0038 U	0.0038 U	0.0041 U	0.002 U	0.012 U	0.0061 U	0.0044 U	0.002 U	0.0022 U	0.004 U	0.01 U	0.011 U	0.052 U	0.099 U
2,4-Dichlorophenol	0.0053 U	0.0054 U	0.0057 U	0.0028 U	0.017 U	0.0086 U	0.0062 U	0.0028 U	0.0031 U	0.0056 U	0.0083 U	0.0088 U	0.043 U	0.082 U
2,4-Dimethylphenol	0.0043 U	0.0043 U	0.0046 UJ	0.0023 UJ	0.014 UJ	0.0069 UJ	0.005 UJ	0.0023 UJ	0.0025 UJ	0.0045 U	0.077 UJ	0.082 U	0.4 U	0.77 U
2,4-Dinitrophenol	0.19 U	0.19 U	0.2 U	0.098 U	0.6 UJ	0.3 UJ	0.22 UJ	0.099 UJ	0.11 UJ	0.2 U	0.27 UJ	0.28 U	1.4 U	2.6 U
2,4-Dinitrotoluene	0.0034 U	0.0035 U	0.0037 U	0.0018 U	0.011 U	0.0055 U	0.004 U	0.0018 U	0.002 U	0.0036 U	0.014 U	0.015 U	0.072 U	0.14 U
2,6-Dinitrotoluene	0.0043 U	0.0043 U	0.0046 U	0.0022 U	0.014 U	0.0069 U	0.0049 U	0.0023 U	0.0024 U	0.0045 U	0.019 U	0.02 U	0.097 U	0.19 U
2-Chloronaphthalene	0.0032 U	0.0032 U	0.0034 U	0.0017 U	0.01 U	0.0051 U	0.0037 U	0.0017 U	0.0018 U	0.0033 U	0.008 U	0.0085 U	0.041 U	0.079 U
2-Chlorophenol	0.0032 U	0.0032 U	0.0035 U	0.0017 U	0.01 U	0.0052 U	0.0037 U	0.0017 U	0.0018 U	0.0034 U	0.0089 UJ	0.0095 U	0.046 U	0.088 U
2-Methylnaphthalene	0.0033 U	0.0033 U	0.0036 U	0.0017 U	0.011 J	0.0053 U	0.0038 U	0.0018 U	0.002 J	0.0035 U	0.083 J	0.01 J	0.21 J	0.092 J
2-Methylphenol (O-Cresol)	0.02 U	0.02 U	0.021 U	0.01 U	0.064 U	0.032 U	0.023 U	0.011 U	0.011 U	0.021 U	0.015 U	0.016 U	0.079 U	0.15 U
2-Nitroaniline	0.032 U	0.032 U	0.034 U	0.017 U	0.1 U	0.051 U	0.036 U	0.017 U	0.018 U	0.033 U	0.012 U	0.012 U	0.06 U	0.11 U
2-Nitrophenol	0.004 U	0.004 U	0.0043 U	0.0021 U	0.013 U	0.0064 U	0.0046 U	0.0021 U	0.0023 U	0.0042 U	0.012 UJ	0.013 U	0.061 U	0.12 U
3- And 4- Methylphenol (Total)	--	--	--	--	--	--	--	--	--	--	0.0094 U	0.01 U	0.048 U	0.093 U
3,3'-Dichlorobenzidine	0.065 U	0.065 U	0.069 U	0.034 U	0.21 U	0.1 U	0.075 U	0.034 U	0.037 U	0.068 U	0.039 U	0.042 U	0.2 U	0.39 U
3-Nitroaniline	0.018 U	0.018 U	0.019 U	0.0092 U	0.057 U	0.028 U	0.02 U	0.0094 U	0.01 U	0.018 U	0.01 U	0.011 U	0.054 U	0.1 U
4,6-Dinitro-2-Methylphenol	0.12 U	0.12 U	0.13 U	0.063 U	0.39 U	0.19 U	0.14 U	0.064 U	0.068 U	0.13 U	0.094 UJ	0.1 U	0.49 U	0.93 U
4-Bromophenyl Phenyl Ether	0.0048 U	0.0049 U	0.0052 U	0.0025 U	0.016 U	0.0078 U	0.0056 U	0.0026 U	0.0028 U	0.0051 U	0.011 U	0.012 U	0.057 U	0.11 U
4-Chloro-3-Methylphenol	0.0033 U	0.0033 U	0.0035 U	0.0017 U	0.011 U	0.0052 U	0.0038 U	0.0017 U	0.0019 U	0.0034 U	0.015 U	0.016 U	0.078 U	0.15 U
4-Chloroaniline	0.0023 U	0.0023 U	0.0025 U	0.0012 U	0.0075 U	0.0037 U	0.0027 U	0.0012 U	0.0013 U	0.0024 U	0.009 U	0.0096 U	0.047 U	0.089 U
4-Chlorophenyl Phenyl Ether	0.0042 U	0.0042 U	0.0045 U	0.0022 U	0.014 U	0.0067 U	0.0049 U	0.0022 U	0.0024 U	0.0044 U	0.011 U	0.011 U	0.054 U	0.1 U
4-Nitroaniline	0.0034 U	0.0034 U	0.0036 U	0.0018 U	0.011 U	0.0054 U	0.0039 U	0.0018 U	0.0019 U	0.0035 U	0.013 U	0.014 U	0.069 U	0.13 U
4-Nitrophenol	0.049 UJ	0.049 UJ	0.052 U	0.025 U	0.16 UJ	0.078 UJ	0.056 UJ	0.026 UJ	0.028 UJ	0.051 U	0.17 U	0.18 U	0.87 U	1.7 U
Acenaphthene	0.007 J	0.011 J	0.0078 J	0.0021 U	0.056	0.019 J	0.0083 J	0.0021 U	0.01	0.0073 J	0.032 J	0.009 U	1.1 J	0.35 J
Acenaphthylene	0.003 U	0.0031 U	0.0033 U	0.0016 U	0.0098 U	0.0049 U	0.0035 U	0.0016 U	0.0017 U	0.0032 U	0.009 U	0.0096 U	0.047 U	0.089 U
Acetophenone	0.0038 U	0.0038 U	0.004 U	0.002 U	0.019 J	0.006 U	0.0043 U	0.002 U	0.0022 U	0.0039 U	0.0077 U	0.0081 U	0.04 U	0.076 U
Anthracene	0.011 J	0.021	0.016	0.0019 U	0.18	0.046	0.017	0.0044 J	0.019	0.014 J	0.044 J	0.036 U	1.8	0.65 J
Atrazine	0.03 UJ	0.031 UJ	0.033 UJ	0.016 UJ	0.098 UJ	0.049 UJ	0.035 UJ	0.016 UJ	0.017 UJ	0.032 UJ	0.016 U	0.017 U	0.081 U	0.15 U
Benzaldehyde	0.0086 UR	0.0087 UR	0.0092 UR	0.0045 UR	0.082 J-	0.014 UR	0.0099 UR	0.0046 UR	0.0049 J-	0.009 UR	0.027 UJ	0.029 U	0.14 U	0.27 U
Benzo(A)Anthracene	0.085	0.19	0.11	0.014	0.78	0.21	0.16	0.022	0.18	0.066	0.2	0.031 U	6.8	2.2
Benzo(A)Pyrene	0.13	0.28	0.17	0.02	1.1	0.27	0.23	0.03	0.27	0.09	0.25	0.011 U	7	2.4
Benzo(B)Fluoranthene	0.16	0.36	0.24	0.027	1.3	0.33	0.32	0.04	0.36	0.099	0.48	0.015 U	12	3.8
Benzo(G,H,I)Perylene	0.12	0.26	0.16	0.02	1	0.25	0.24	0.032	0.28	0.083	0.29 J	0.021 U	7.3	1.5 J
Benzo(K)Fluoranthene	0.077	0.16	0.061	0.012	0.52	0.13	0.12	0.017	0.15	0.06	0.15	0.016 U	4.2	1.6
Benzyl Butyl Phthalate	0.048 U	0.048 U	0.053 J	0.025 U	0.15 U	0.076 U	0.055 U	0.025 U	0.027 U	0.05 U	0.011 U	0.012 U	0.056 U	0.11 U
Biphenyl (Diphenyl)	0.0029 U	0.0029 U	0.0031 U	0.0015 U	0.0094 U	0.0047 U	0.0034 U	0.0016 U	0.0017 U	0.003 U	0.03 U	0.032 U	0.16 U	0.3 U
Bis(2-Chloroethoxy) Methane	0.0033 U	0.0033 U	0.0035 U	0.0017 U	0.011 U	0.0053 U	0.0038 U	0.0018 U	0.0019 U	0.0035 U	0.011 U	0.012 U	0.057 U	0.11 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.0025 U	0.0025 U	0.0027 U	0.0013 U	0.0081 U	0.004 U	0.0029 U	0.0013 U	0.0014 U	0.0026 U	0.0083 U	0.0088 U	0.043 U	0.082 U
Bis(2-Chloroisopropyl) Ether	0.0051 U	0.0052 U	0.0055 U	0.0027 U	0.017 U	0.0082 U	0.0059 U	0.0027 U	0.0029 U	0.0054 U	0.014 U	0.015 U	0.075 U	0.14 U
Bis(2-Ethylhexyl) Phthalate	0.074 U	0.074 U	0.1 J	0.039 U	0.24 U	0.12 U	0.085 U	0.039 U	0.042 U	0.077 U	0.014 U	0.015 U	0.071 U	0.14 U
Caprolactam	0.045 U	0.045 U	0.048 U	0.024 U	0.15 U	0.072 U	0.052 U	0.024 U	0.026 U	0.047 U	0.025 UJ	0.027 U	0.13 U	0.25 U
Carbazole	0.016 J+	0.033 J+	0.023	0.0027 J	0.18	0.044	0.028	0.0046 J	0.03	0.014 J	0.032 J	0.0093 U	1.6 J	0.6 J
Chrysene	0.13	0.3	0.18	0.022	1.1	0.29	0.25	0.033	0.29	0.093	0.32 J	0.018 J	12	3.7
Dibenz(A,H)Anthracene	0.03	0.053	0.03	0.0051 J	0.26	0.064	0.057	0.0081	0.058	0.02	0.082	0.019 U	1.9	0.5
Dibenzofuran	0.003 U	0.0045 J	0.0033 U	0.0016 U	0.027 J	0.0078 J	0.0038 J	0.0016 U	0.0039 J	0.0032 U	0.014 J	0.011 U	0.41 J	0.18 J

Table E-8
Summary of Data Used in Risk Assessment
Central Landfills Area Soil (0-2 ft-bgs) - Current
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFLP-014	CFLP-014	CFLP-015	CFLP-015	CFLP-016	CFLP-016	CFLP-017	CFLP-017	CFLP-018	CFLP-018	CFMW-002	CFMW-002	CFMW-008A	CFMW-008A
Sample Lab IDs	180-78687-15, 200-43824-15, 460-158063-15	180-78687-16, 200-43824-16, 460-158063-16	180-78894-1, 200-43930-1, 460-158632-1	180-78894-2, 200-43930-2, 460-158632-2	180-78894-3, 200-43930-3, 460-158632-3	180-78894-4, 200-43930-4, 460-158632-4	180-78894-5, 200-43930-5, 460-158632-5	180-78894-6, 200-43930-6, 460-158632-6	180-78894-7, 200-43930-7, 460-158632-7	180-78894-8, 200-43930-8, 460-158632-8	460-115528-7	460-115528-8	460-115528-1	460-115528-3
Sample Name	CFLP-014-SO-0-0.5	CFLP-014-SO-0.5-2	CFLP-015-SO-0-0.5	CFLP-015-SO-0.5-2	CFLP-016-SO-0-0.5	CFLP-016-SO-0.5-2	CFLP-017-SO-0-0.5	CFLP-017-SO-0.5-2	CFLP-018-SO-0-0.5	CFLP-018-SO-0.5-2	CFMW-002-SO-0-0.5	CFMW-002-SO-0.5-2	CFMW-008a-SO-0-0.5	CFMW-008a-SO-0.5-2
Sample Depth	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft
Chemical	6/9/2018	6/9/2018	6/16/2018	6/16/2018	6/16/2018	6/16/2018	6/16/2018	6/16/2018	6/16/2018	6/16/2018	6/13/2016	6/13/2016	6/13/2016	6/13/2016
Diethyl Phthalate	0.021 U	0.021 U	0.022 U	0.011 U	0.067 U	0.033 U	0.024 U	0.011 U	0.012 U	0.022 U	0.01 U	0.011 U	0.052 U	0.099 U
Dimethyl Phthalate	0.0025 U	0.0025 U	0.0027 U	0.0013 U	0.0081 U	0.004 U	0.0029 U	0.0013 U	0.0014 U	0.0026 U	0.01 U	0.011 U	0.053 U	0.1 U
Di-N-Butyl Phthalate	0.03 U	0.031 U	0.033 U	0.016 U	0.098 U	0.049 U	0.035 U	0.016 U	0.017 U	0.032 U	0.011 U	0.011 U	0.054 U	0.1 U
Di-N-Octylphthalate	0.04 U	0.041 U	0.043 U	0.021 U	0.13 U	0.065 U	0.047 U	0.021 U	0.023 U	0.042 U	0.096 J	0.019 U	0.092 U	0.18 U
Fluoranthene	0.15	0.32	0.22	0.025	1.5	0.42	0.26	0.038	0.3	0.13	0.38	0.021 J	13	6.1
Fluorene	0.0047 J	0.0066 J	0.0044 J	0.0014 U	0.042 J	0.015 J	0.0068 J	0.0016 J	0.0062 J	0.0047 J	0.0077 U	0.0081 U	0.83 J	0.3 J
Hexachlorobenzene	0.005 U	0.005 U	0.0053 U	0.0026 U	0.016 U	0.008 U	0.0057 U	0.0026 U	0.0028 U	0.0052 U	0.014 U	0.015 U	0.074 U	0.14 U
Hexachlorobutadiene	0.004 UJ	0.0041 UJ	0.0043 UJ	0.0021 UJ	0.013 UJ	0.0065 UJ	0.0047 UJ	0.0022 UJ	0.0023 UJ	0.0042 U	0.0099 U	0.011 U	0.051 U	0.098 U
Hexachlorocyclopentadiene	0.0035 UJ	0.0036 UJ	0.0038 U	0.0019 U	0.011 U	0.0057 U	0.0041 U	0.0019 U	0.002 U	0.0037 U	0.022 U	0.023 U	0.11 U	0.22 U
Hexachloroethane	0.0036 U	0.0036 U	0.0038 UJ	0.0019 UJ	0.012 UJ	0.0057 UJ	0.0041 UJ	0.0019 UJ	0.002 UJ	0.0037 U	0.013 U	0.014 U	0.067 U	0.13 U
Indeno(1,2,3-C,D)Pyrene	0.093	0.22	0.12	0.016	0.81	0.2	0.19	0.025	0.22	0.07	0.29	0.025 U	7.8	1.8
Isophorone	0.0035 U	0.0036 U	0.0038 U	0.0019 U	0.011 U	0.0057 U	0.0041 U	0.0019 U	0.002 U	0.0037 U	0.0075 U	0.008 U	0.039 U	0.075 U
Naphthalene	0.0027 U	0.0038 J	0.0029 U	0.0014 U	0.02 J	0.0053 J	0.0031 U	0.0014 U	0.0028 J	0.0028 U	0.036 J	0.0095 U	0.51 J	0.088 U
Nitrobenzene	0.025 U	0.026 U	0.027 U	0.013 U	0.082 U	0.041 U	0.029 U	0.014 U	0.015 U	0.027 U	0.011 U	0.012 U	0.057 U	0.11 U
N-Nitrosodi-N-Propylamine	0.0047 U	0.0047 U	0.005 U	0.0025 U	0.015 U	0.0075 U	0.0054 U	0.0025 U	0.0027 U	0.0049 U	0.012 U	0.013 U	0.061 U	0.12 U
N-Nitrosodiphenylamine	0.023 U	0.023 U	0.025 U	0.012 U	0.075 U	0.037 U	0.027 U	0.012 U	0.013 U	0.024 U	0.032 UJ	0.034 U	0.16 U	0.32 U
Pentachlorophenol	0.11 UJ	0.11 UJ	0.12 U	0.058 U	0.36 U	0.18 U	0.13 U	0.059 U	0.064 U	0.12 U	0.043 UJ	0.045 U	0.22 U	0.42 U
Phenanthrene	0.069	0.13	0.11	0.014	0.95	0.24	0.12	0.024	0.13	0.072	0.22 J	0.01 U	7.8	3.6
Phenol	0.021 U	0.021 U	0.041 J	0.011 U	0.14 J	0.034 U	0.024 U	0.011 U	0.012 U	0.022 U	0.011 U	0.012 U	0.059 U	0.11 U
Pyrene	0.14	0.31	0.19	0.022	1.5	0.56	0.27	0.04	0.29	0.12	0.41	0.017 U	11	3.4 J
VOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,1,1-Trichloroethane	--	--	--	--	--	--	--	--	--	--	--	0.00029 U	--	0.00037 U
1,1,2,2-Tetrachloroethane	--	--	--	--	--	--	--	--	--	--	--	0.00013 U	--	0.00017 U
1,1,2-Trichloro-1,2,2-Trifluoroethane	--	--	--	--	--	--	--	--	--	--	--	0.00034 U	--	0.00043 U
1,1,2-Trichloroethane	--	--	--	--	--	--	--	--	--	--	--	0.00021 U	--	0.00028 U
1,1-Dichloroethane	--	--	--	--	--	--	--	--	--	--	--	0.00026 U	--	0.00034 U
1,1-Dichloroethene	--	--	--	--	--	--	--	--	--	--	--	0.00031 U	--	0.0004 U
1,2,3-Trichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	0.000084 U	--	0.00011 U
1,2,4-Trichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	0.00024 U	--	0.00032 U
1,2-Dibromo-3-Chloropropane	--	--	--	--	--	--	--	--	--	--	--	0.00036 U	--	0.00046 U
1,2-Dibromoethane (Ethylene Dibromide)	--	--	--	--	--	--	--	--	--	--	--	0.000091 U	--	0.00012 U
1,2-Dichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	0.00011 U	--	0.00014 U
1,2-Dichloroethane	--	--	--	--	--	--	--	--	--	--	--	0.000084 U	--	0.00011 U
1,2-Dichloropropane	--	--	--	--	--	--	--	--	--	--	--	0.00013 U	--	0.00017 U
1,3-Dichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	0.000091 U	--	0.00012 U
1,4-Dichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	0.000099 U	--	0.00013 U
2-Hexanone	--	--	--	--	--	--	--	--	--	--	--	0.00072 U	--	0.00093 U
Acetone	--	--	--	--	--	--	--	--	--	--	--	0.019 J+	--	0.13 J+
Benzene	--	--	--	--	--	--	--	--	--	--	--	0.00021 J	--	0.0097
Bromochloromethane	--	--	--	--	--	--	--	--	--	--	--	0.00013 U	--	0.00017 U
Bromodichloromethane	--	--	--	--	--	--	--	--	--	--	--	0.00029 U	--	0.00037 U
Bromoform	--	--	--	--	--	--	--	--	--	--	--	0.000099 UJ	--	0.00013 U
Bromomethane	--	--	--	--	--	--	--	--	--	--	--	0.00024 U	--	0.00032 U
Carbon Disulfide	--	--	--	--	--	--	--	--	--	--	--	0.00033 U	--	0.0019
Carbon Tetrachloride	--	--	--	--	--	--	--	--	--	--	--	0.00033 U	--	0.00042 U
Chlorobenzene	--	--	--	--	--	--	--	--	--	--	--	0.00011 U	--	0.00014 U
Chloroethane	--	--	--	--	--	--	--	--	--	--	--	0.00027 U	--	0.00035 U
Chloroform	--	--	--	--	--	--	--	--	--	--	--	0.00016 U	--	0.00021 U
Chloromethane	--	--	--	--	--	--	--	--	--	--	--	0.00029 U	--	0.00037 U
Cis-1,2-Dichloroethylene	--	--	--	--	--	--	--	--	--	--	--	0.00017 U	--	0.00022 U
Cis-1,3-Dichloropropene	--	--	--	--	--	--	--	--	--	--	--	0.00011 U	--	0.00015 U
Cyclohexane	--	--	--	--	--	--	--	--	--	--	--	0.00035 U	--	0.00052 J+
Dibromochloromethane	--	--	--	--	--	--	--	--	--	--	--	0.00011 U	--	0.00015 U
Dichlorodifluoromethane	--	--	--	--	--	--	--	--	--	--	--	0.00024 U	--	0.00032 U
Ethylbenzene	--	--	--	--	--	--	--	--	--	--	--	0.00014 U	--	0.0024
Isopropylbenzene (Cumene)	--	--	--	--	--	--	--	--	--	--	--	0.00013 U	--	0.00034 J
M,P-Xylene	--	--	--	--	--	--	--	--	--	--	--	0.000084 U	--	0.0038

Table E-8
Summary of Data Used in Risk Assessment
Central Landfills Area Soil (0-2 ft-bgs) - Current
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFLP-014	CFLP-014	CFLP-015	CFLP-015	CFLP-016	CFLP-016	CFLP-017	CFLP-017	CFLP-018	CFLP-018	CFMW-002	CFMW-002	CFMW-008A	CFMW-008A
Sample Lab IDs	180-78687-15, 200-43824-15, 460-158063-15	180-78687-16, 200-43824-16, 460-158063-16	180-78894-1, 200-43930-1, 460-158632-1	180-78894-2, 200-43930-2, 460-158632-2	180-78894-3, 200-43930-3, 460-158632-3	180-78894-4, 200-43930-4, 460-158632-4	180-78894-5, 200-43930-5, 460-158632-5	180-78894-6, 200-43930-6, 460-158632-6	180-78894-7, 200-43930-7, 460-158632-7	180-78894-8, 200-43930-8, 460-158632-8	460-115528-7	460-115528-8	460-115528-1	460-115528-3
Sample Name	CFLP-014-SO-0-0.5	CFLP-014-SO-0.5-2	CFLP-015-SO-0-0.5	CFLP-015-SO-0.5-2	CFLP-016-SO-0-0.5	CFLP-016-SO-0.5-2	CFLP-017-SO-0-0.5	CFLP-017-SO-0.5-2	CFLP-018-SO-0-0.5	CFLP-018-SO-0.5-2	CFMW-002-SO-0-0.5	CFMW-002-SO-0.5-2	CFMW-008a-SO-0-0.5	CFMW-008a-SO-0.5-2
Sample Depth	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft
Chemical	6/9/2018	6/9/2018	6/16/2018	6/16/2018	6/16/2018	6/16/2018	6/16/2018	6/16/2018	6/16/2018	6/16/2018	6/13/2016	6/13/2016	6/13/2016	6/13/2016
Methyl Acetate	--	--	--	--	--	--	--	--	--	--	--	0.00069 U	--	0.017 J+
Methyl Ethyl Ketone (2-Butanone)	--	--	--	--	--	--	--	--	--	--	--	0.0013 J	--	0.012
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	--	--	--	--	--	--	--	--	--	--	--	0.0017 U	--	0.0022 U
Methylcyclohexane	--	--	--	--	--	--	--	--	--	--	--	0.00038 U	--	0.00062 J+
Methylene Chloride	--	--	--	--	--	--	--	--	--	--	--	0.00024 U	--	0.00032 U
O-Xylene (1,2-Dimethylbenzene)	--	--	--	--	--	--	--	--	--	--	--	0.00012 U	--	0.0016
Styrene	--	--	--	--	--	--	--	--	--	--	--	0.00011 U	--	0.00015 U
Tert-Butyl Methyl Ether	--	--	--	--	--	--	--	--	--	--	--	0.00013 U	--	0.00017 U
Tetrachloroethylene (PCE)	--	--	--	--	--	--	--	--	--	--	--	0.00021 U	--	0.00034 J
Toluene	--	--	--	--	--	--	--	--	--	--	--	0.00015 J	--	0.012
Trans-1,2-Dichloroethene	--	--	--	--	--	--	--	--	--	--	--	0.0003 U	--	0.00038 U
Trans-1,3-Dichloropropene	--	--	--	--	--	--	--	--	--	--	--	0.000076 U	--	0.000099 U
Trichloroethylene (TCE)	--	--	--	--	--	--	--	--	--	--	--	0.0002 U	--	0.00026 U
Trichlorofluoromethane	--	--	--	--	--	--	--	--	--	--	--	0.00026 U	--	0.00034 U
Vinyl Chloride	--	--	--	--	--	--	--	--	--	--	--	0.0003 U	--	0.00038 U

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-8
Summary of Data Used in Risk Assessment
Central Landfills Area Soil (0-2 ft-bgs) - Current
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-010	CFMW-010	CFMW-012A	CFMW-012A	CFMW-012A-DUP	CFMW-016A	CFMW-016A	CFMW-018	CFMW-018	CFMW-019A	CFMW-019A	CFMW-019A-DUP	CFMW-022	CFMW-022
Sample Lab IDs	460-114141-16	460-114141-17	460-114275-1	460-114275-3	460-114275-5	460-115886-11	460-115886-12	460-114141-34	460-114141-35	460-114456-49	460-114456-50	460-114456-52	460-114828-29	460-114828-28
Sample Name	CFMW-010-SO-0-0.5	CFMW-010-SO-0.5-2.0	CFMW-012A-SO-0-0.5	CFMW-012A-SO-0.5-2	CFMW-DUP3-SO	CFMW-016a-SO-0-0.5	CFMW-016a-SO-0.5-2	CFMW-018-SO-0-0.5	CFMW-018-SO-0.5-2.0	CFMW-019a-SO-0-0.5	CFMW-019a-SO-0.5-2	CFMW-DUP5-SO	CFMW-022-SO-0-0.5	CFMW-022-SO-0.5-2
Sample Depth	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft
Chemical	5/18/2016	5/18/2016	5/20/2016	5/20/2016	5/20/2016	6/21/2016	6/21/2016	5/19/2016	5/19/2016	5/25/2016	5/25/2016	5/25/2016	6/2/2016	6/2/2016
GENERAL CHEMISTRY (mg/kg)														
Fluoride	114 J-	101 J-	91.9 J-	59.3 J-	80.8 J-	59.4 J	25.4 J	9.33 J-	7.71 J-	37 J-	62.2 J-	44.2 J-	17.5 J	9.45 J
Cyanide	1.4	0.32	0.6	0.46	0.51	0.32	0.018 U	0.018 U	0.018 U	0.063 J	0.024 J	0.018 U	0.29	0.045 J
METALS (mg/kg)														
"Chromium, Hexavalent - Estimated"	0.339903	0.326521	0.350608	0.305109	0.337226	0.315815	0.326521	0.281022	0.251582	0.219465	0.254258	0.23285	0.26764	0.259611
"Chromium, Trivalent - Calculated"	--	--	--	--	--	--	--	--	--	--	--	--	--	--
"Chromium, Trivalent - Estimated"	12.3601	11.8735	12.7494	11.0949	12.2628	11.4842	11.8735	10.219	9.14842	7.98054	9.24574	8.46715	9.73236	9.44039
Aluminum	25700	22100	16400	13400	15200	12600	11800	10900 J	9270 J	9620	18100	15000	10600	9380
Antimony	0.37 UJ	0.35 UJ	0.44 UJ	0.45 UJ	0.45 UJ	0.41 UJ	0.41 UJ	0.35 UJ	0.35 UJ	0.37 UJ	0.36 UJ	0.39 UJ	0.4 UJ	0.39 UJ
Arsenic	6.2	7.7	6.6 J	5.7 J	5.7 J	4.8	5	11.3 J	10.2 J	3.9	4.3	3.8	4.8	7.8
Barium	235	171	131	112	90	105 J	125 J	97.4	49.9	91.7	164	139	68.8	54.1
Beryllium	0.84	0.78	0.6	0.46	0.46	0.61	0.38 J	0.4	0.4	0.36	0.55	0.62	0.33 J	0.29 J
Cadmium	0.28 U	0.32 J	0.33 U	0.34 U	0.35 U	0.31 U	0.31 U	0.26 U	0.27 U	0.28 U	0.27 U	0.29 U	0.3 U	0.29 U
Calcium	4460	2370	2340 J	4310 J	6710 J	41300 J	16300 J	59400	67000	11200	2280	1820	35000	95300
Chromium, Total	12.7	12.2	13.1	11.4	12.6	11.8 J	12.2 J	10.5	9.4	8.2	9.5	8.7	10	9.7
Cobalt	6.4	6.6	5.5	4.3	4.4	5.1	6.2	5.1	4.7	3.9	5.8	4.5	4.7	5.1
Copper	13.7	12	10.6 J+	18.6 J+	12.3 J+	14	16.9	15.4 J	11.6 J	13.1 J	11 J+	11.1 J	12.3	15.2
Iron	20500	19700	20600	19800	19500	14100	16700	14000	14700	11000	15100	13400	15300	12600
Lead	13.5	15.3	15 J	8.7 J	8.7 J	23.3 J	8.8 J	12.4	9.8	11.9 J	10.3	8.5 J	9.1	9.1
Magnesium	10900	11500	13300 J	13200 J	14200 J	9170	11500	13100	18800	7480	8850	8380	10600	12300
Manganese	529	577	533	694	438	446	483	405 J	436 J	368	350	297	368	337
Mercury	0.019	0.024	0.012 U	0.019	0.014 J	0.02	0.076	0.034	0.031	0.024	0.014 U	0.013 U	0.018	0.031 J+
Nickel	22.2	12.9	14 J+	11.8 J+	13.4 J+	19.2	12.5	14.9	11.8	9.1	10.3	9.1	11.7	10.1
Potassium	1430	1250	927 J	1080 J	845 J	1100	984	1160	861	847	1200 J+	1200	593	727
Selenium	0.35 U	0.33 U	0.41 U	0.42 U	0.43 U	0.38 U	0.38 U	0.32 U	0.33 U	0.34 U	0.34 U	0.36 U	0.37 U	0.36 U
Silver	0.68 U	0.65 U	0.8 U	0.83 U	0.83 U	0.75 U	0.75 U	0.63 U	0.64 U	0.67 U	0.66 U	0.71 U	0.73 U	0.71 U
Sodium	176	119	74 J	49.9 J	53.7 J	68.3 J	39 J	32.4 U	32.8 U	34.2 U	94.3	77.5 J	37.1 U	36.2 U
Thallium	0.14 J	0.15 J	0.17 U	0.17 U	0.17 U	0.15 U	0.15 U	0.13 U	0.13 U	0.14 U	0.14 J	0.15 U	0.15 U	0.15 U
Vanadium	23.7	19.3	17.7	11.9	12.4	12.2	9.7	10.4	8.7	8.6	14.6	12.6	10.7	7.2
Zinc	72.5	75.7	75.5 J	43.9 J	45 J	45.4	47.9	41.3	37.8	34.6	39.6	37.9	39	30.4
METALS|HEXAVALENT CHROMIUM (mg/kg)														
Chromium, Hexavalent	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PESTICIDES (mg/kg)														
Aldrin	0.00091 U	--	0.00092 U	--	--	0.0009 U	--	0.00091 U	--	0.0009 U	--	--	0.00092 U	--
Alpha Bhc (Alpha Hexachlorocyclohexane)	0.00069 U	--	0.0007 U	--	--	0.00068 U	--	0.00068 U	--	0.00068 U	--	--	0.0007 U	--
Alpha Endosulfan	0.0011 U	--	0.0011 U	--	--	0.001 U	--	0.001 U	--	0.001 U	--	--	0.0011 U	--
Beta Bhc (Beta Hexachlorocyclohexane)	0.00073 U	--	0.00074 U	--	--	0.00072 U	--	0.00073 U	--	0.00072 U	--	--	0.00074 U	--
Beta Endosulfan	0.0012 U	--	0.0012 U	--	--	0.0012 U	--	0.0012 U	--	0.0012 U	--	--	0.0012 U	--
cis-Chlordane	0.0012 U	--	0.0012 U	--	--	0.0012 U	--	0.0012 U	--	0.0012 U	--	--	0.0012 U	--
Delta BHC (Delta Hexachlorocyclohexane)	0.00082 U	--	0.00083 U	--	--	0.00081 U	--	0.00082 U	--	0.00081 U	--	--	0.00083 U	--
Dieldrin	0.00098 U	--	0.00099 U	--	--	0.00097 U	--	0.00098 U	--	0.00097 U	--	--	0.00099 U	--
Endosulfan Sulfate	0.00088 U	--	0.00089 U	--	--	0.00087 U	--	0.00087 U	--	0.00087 U	--	--	0.00089 U	--
Endrin	0.00096 U	--	0.00097 U	--	--	0.00095 U	--	0.00095 U	--	0.00094 U	--	--	0.00097 U	--
Endrin Aldehyde	0.00094 U	--	0.00095 U	--	--	0.00093 U	--	0.00093 U	--	0.00092 U	--	--	0.00095 U	--
Endrin Ketone	0.0011 U	--	0.0011 U	--	--	0.001 U	--	0.001 U	--	0.001 U	--	--	0.0011 U	--
Gamma Bhc (Lindane)	0.00068 U	--	0.00069 U	--	--	0.00067 U	--	0.00067 U	--	0.00067 U	--	--	0.00068 U	--
Heptachlor	0.00097 U	--	0.00098 U	--	--	0.00096 U	--	0.00096 U	--	0.00096 U	--	--	0.00098 U	--
Heptachlor Epoxide	0.0015 U	--	0.0015 U	--	--	0.0015 U	--	0.0015 U	--	0.0015 U	--	--	0.0015 U	--
Methoxychlor	0.0016 U	--	0.0016 U	--	--	0.0016 U	--	0.0016 U	--	0.0016 U	--	--	0.0016 U	--
P,P'-DDD	0.00099 U	--	0.001 U	--	--	0.00098 U	--	0.00099 U	--	0.00098 U	--	--	0.001 U	--
P,P'-DDE	0.0011 U	--	0.0011 U	--	--	0.0011 U	--	0.0011 U	--	0.0011 U	--	--	0.0011 U	--
P,P'-DDT	0.00078 U	--	0.00079 U	--	--	0.00077 U	--	0.00077 U	--	0.00077 U	--	--	0.00079 U	--
Toxaphene	0.022 U	--	0.022 U	--	--	0.022 U	--	0.022 U	--	0.022 U	--	--	0.022 U	--
trans-Chlordane	0.0016 U	--	0.0017 U	--	--	0.0016 U	--	0.0016 U	--	0.0016 U	--	--	0.0017 U	--
POLYCHLORINATED BIPHENYLS (mg/kg)														
PCB-1016 (Aroclor 1016)	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.0099 U	0.0096 U	0.01 U	0.01 U	0.0099 U	0.011 U	0.01 U	0.01 U	0.0094 U
PCB-1221 (Aroclor 1221)	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.0099 U	0.0096 U	0.01 U	0.01 U	0.0099 U	0.011 U	0.01 U	0.01 U	0.0094 U

Table E-8
Summary of Data Used in Risk Assessment
Central Landfills Area Soil (0-2 ft-bgs) - Current
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-010	CFMW-010	CFMW-012A	CFMW-012A	CFMW-012A-DUP	CFMW-016A	CFMW-016A	CFMW-018	CFMW-018	CFMW-019A	CFMW-019A	CFMW-019A-DUP	CFMW-022	CFMW-022
Sample Lab IDs	460-114141-16	460-114141-17	460-114275-1	460-114275-3	460-114275-5	460-115886-11	460-115886-12	460-114141-34	460-114141-35	460-114456-49	460-114456-50	460-114456-52	460-114828-29	460-114828-28
Sample Name	CFMW-010-SO-0-0.5	CFMW-010-SO-0.5-2.0	CFMW-012A-SO-0-0.5	CFMW-012A-SO-0.5-2	CFMW-DUP3-SO	CFMW-016a-SO-0-0.5	CFMW-016a-SO-0.5-2	CFMW-018-SO-0-0.5	CFMW-018-SO-0.5-2.0	CFMW-019a-SO-0-0.5	CFMW-019a-SO-0.5-2	CFMW-DUP5-SO	CFMW-022-SO-0-0.5	CFMW-022-SO-0.5-2
Sample Depth	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft
Chemical	5/18/2016	5/18/2016	5/20/2016	5/20/2016	5/20/2016	6/21/2016	6/21/2016	5/19/2016	5/19/2016	5/25/2016	5/25/2016	5/25/2016	6/2/2016	6/2/2016
PCB-1232 (Aroclor 1232)	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.0099 U	0.0096 U	0.01 U	0.01 U	0.0099 U	0.011 U	0.01 U	0.01 U	0.0094 U
PCB-1242 (Aroclor 1242)	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.0099 U	0.0096 U	0.01 U	0.01 U	0.0099 U	0.011 U	0.01 U	0.01 U	0.0094 U
PCB-1248 (Aroclor 1248)	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.0099 U	0.0096 U	0.01 U	0.01 U	0.0099 U	0.011 U	0.01 U	0.01 U	0.0094 U
PCB-1254 (Aroclor 1254)	0.01 U	0.01 U	0.011 U	0.011 U	0.011 U	0.01 U	0.0099 U	0.01 U	0.01 U	0.01 U	0.011 U	0.011 U	0.01 U	0.0097 U
PCB-1260 (Aroclor 1260)	0.01 U	0.01 U	0.011 U	0.011 U	0.011 U	0.01 U	0.0099 U	0.01 U	0.01 U	0.01 U	0.011 U	0.011 U	0.01 U	0.0097 U
PCB-1262 (Aroclor 1262)	0.01 U	0.01 U	0.011 U	0.011 U	0.011 U	0.01 U	0.0099 U	0.01 U	0.01 U	0.01 U	0.011 U	0.011 U	0.01 U	0.0097 U
PCB-1268 (Aroclor 1268)	0.01 U	0.01 U	0.011 U	0.011 U	0.011 U	0.01 U	0.0099 U	0.01 U	0.01 U	0.01 U	0.011 U	0.011 U	0.01 U	0.0097 U
Polychlorinated Biphenyl (PCBs)	0.01 U	0.01 U	0.011 U	0.011 U	0.011 U	0.01 U	0.0099 U	0.01 U	0.01 U	0.01 U	0.011 U	0.011 U	0.01 U	0.0097 U
SEMIVOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,2,4,5-Tetrachlorobenzene	0.028 U	0.028 U	0.028 U	0.029 U	0.029 U	0.027 U	0.027 U	0.028 U	0.028 U	0.027 U	0.029 U	0.029 U	0.028 U	0.026 U
1,4-Dioxane (P-Dioxane)	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.098 U	0.095 U	0.099 U	0.1 U	0.098 U	0.1 U	0.1 U	0.1 U	0.093 U
2,3,4,6-Tetrachlorophenol	0.035 U	0.035 U	0.036 U	0.036 U	0.036 U	0.035 U	0.034 U	0.035 U	0.035 U	0.035 U	0.037 UJ	0.036 U	0.035 U	0.033 U
2,4,5-Trichlorophenol	0.037 U	0.037 U	0.038 U	0.038 U	0.039 U	0.037 U	0.036 U	0.037 U	0.037 U	0.037 U	0.039 UJ	0.038 U	0.037 U	0.035 U
2,4,6-Trichlorophenol	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.01 U	0.01 U	0.011 U	0.011 U	0.01 U	0.011 UJ	0.011 U	0.011 U	0.0099 U
2,4-Dichlorophenol	0.0088 U	0.0089 U	0.0089 U	0.0091 U	0.0091 U	0.0087 U	0.0084 U	0.0087 U	0.0088 U	0.0087 U	0.0092 UJ	0.0091 U	0.0089 U	0.0082 U
2,4-Dimethylphenol	0.082 U	0.083 U	0.083 U	0.085 U	0.085 U	0.081 U	0.079 U	0.081 U	0.082 U	0.081 U	0.086 UJ	0.085 U	0.083 U	0.077 U
2,4-Dinitrophenol	0.28 U	0.28 U	0.29 U	0.29 U	0.29 U	0.28 U	0.27 U	0.28 U	0.28 U	0.28 U	0.3 UJ	0.29 U	0.28 U	0.26 U
2,4-Dinitrotoluene	0.015 U	0.015 U	0.015 U	0.015 U	0.015 U	0.015 U	0.014 U	0.015 U	0.015 U	0.015 U	0.015 U	0.015 U	0.015 U	0.014 U
2,6-Dinitrotoluene	0.02 U	0.02 U	0.02 U	0.02 U	0.021 U	0.02 U	0.019 U	0.02 U	0.02 U	0.02 U	0.021 U	0.021 U	0.02 U	0.019 U
2-Chloronaphthalene	0.0085 U	0.0085 U	0.0086 U	0.0087 U	0.0088 U	0.0083 U	0.0081 U	0.0084 U	0.0085 U	0.0083 U	0.0089 U	0.0088 U	0.0085 U	0.0079 U
2-Chlorophenol	0.0095 U	0.0095 U	0.0096 U	0.0098 U	0.0098 U	0.0094 U	0.0091 U	0.0094 U	0.0095 U	0.0093 U	0.0099 UJ	0.0098 U	0.0096 U	0.0089 U
2-Methylnaphthalene	0.024 J	0.0083 U	0.0083 U	0.0085 U	0.0086 U	0.11 J	0.0079 U	0.0082 U	0.0083 U	0.0084 J	0.0086 U	0.0085 U	0.0083 U	0.0077 U
2-Methylphenol (O-Cresol)	0.016 U	0.016 U	0.016 U	0.017 U	0.017 U	0.016 U	0.016 U	0.016 U	0.016 U	0.016 U	0.017 U	0.017 U	0.016 U	0.015 U
2-Nitroaniline	0.012 U	0.012 U	0.012 U	0.013 U	0.013 U	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U	0.013 U	0.013 U	0.012 U	0.012 U
2-Nitrophenol	0.013 U	0.013 U	0.013 U	0.013 U	0.013 U	0.012 U	0.012 U	0.012 U	0.013 U	0.012 U	0.013 UJ	0.013 U	0.013 U	0.012 U
3- And 4- Methylphenol (Total)	0.0099 U	0.01 U	0.01 U	0.01 U	0.01 U	0.0098 U	0.0095 U	0.0099 U	0.01 U	0.0098 U	0.01 U	0.01 U	0.01 U	0.0093 U
3,3'-Dichlorobenzidine	0.042 U	0.042 U	0.042 U	0.043 U	0.043 U	0.041 U	0.04 U	0.041 U	0.042 U	0.041 U	0.044 U	0.043 U	0.042 U	0.039 U
3-Nitroaniline	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.012 U	0.011 U	0.011 U	0.01 U
4,6-Dinitro-2-Methylphenol	0.099 U	0.1 U	0.1 U	0.1 U	0.1 U	0.098 U	0.095 U	0.099 U	0.1 U	0.098 U	0.1 UJ	0.1 U	0.1 U	0.093 U
4-Bromophenyl Phenyl Ether	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U	0.011 U	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U	0.011 U
4-Chloro-3-Methylphenol	0.016 U	0.016 U	0.016 U	0.017 U	0.017 U	0.016 U	0.015 U	0.016 U	0.016 U	0.016 U	0.017 U	0.017 U	0.016 U	0.015 U
4-Chloroaniline	0.0096 U	0.0097 U	0.0097 U	0.0099 U	0.01 U	0.0095 U	0.0092 U	0.0095 U	0.0096 U	0.0094 U	0.01 U	0.0099 U	0.0097 U	0.009 U
4-Chlorophenyl Phenyl Ether	0.011 U	0.011 U	0.011 U	0.012 U	0.012 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.012 U	0.012 U	0.011 U	0.01 U
4-Nitroaniline	0.014 U	0.014 U	0.014 U	0.015 U	0.015 U	0.014 U	0.013 U	0.014 U	0.014 U	0.014 U	0.015 U	0.015 U	0.014 U	0.013 U
4-Nitrophenol	0.18 U	0.18 UJ	0.18 U	0.19 U	0.19 U	0.18 U	0.17 U	0.18 U	0.18 U	0.18 U	0.19 U	0.19 U	0.18 U	0.17 U
Acenaphthene	0.19 J	0.0091 U	0.018 J	0.0093 U	0.012 J	0.7	0.0086 U	0.009 U	0.0091 U	0.058 J	0.0095 U	0.023 J	0.0091 U	0.0084 U
Acenaphthylene	0.0096 U	0.0097 U	0.0097 U	0.0099 U	0.01 U	0.0095 U	0.0092 U	0.0095 U	0.0096 U	0.0094 U	0.01 U	0.0099 U	0.0097 U	0.009 U
Acetophenone	0.0081 U	0.0082 U	0.0082 U	0.0084 U	0.0084 U	0.008 U	0.0078 U	0.0081 U	0.0082 U	0.008 U	0.0085 U	0.0084 U	0.0082 U	0.0076 U
Anthracene	0.4	0.036 U	0.036 U	0.037 U	0.037 U	1.2	0.034 U	0.035 U	0.036 U	0.093 J	0.037 U	0.037 U	0.036 U	0.033 U
Atrazine	0.017 U	0.017 U	0.017 U	0.017 U	0.017 U	0.016 U	0.016 U	0.016 U	0.017 U	0.016 U	0.017 U	0.017 U	0.017 U	0.016 U
Benzaldehyde	0.028 U	0.029 U	0.029 U	0.029 U	0.03 U	0.028 U	0.027 U	0.028 U	0.029 U	0.028 U	0.03 UJ	0.029 U	0.029 U	0.027 U
Benzo(A)Anthracene	2.1	0.031 U	0.15	0.07	0.049	2.7	0.03 U	0.15	0.038	0.34	0.048	0.13	0.069	0.097 J
Benzo(A)Pyrene	2.4	0.014 J	0.17	0.07	0.048	2.8	0.015 J	0.21	0.046	0.43	0.049	0.17	0.077	0.011 U
Benzo(B)Fluoranthene	3.6	0.019 J	0.23	0.092	0.061	3.3	0.02 J	0.33	0.069	0.62	0.073	0.23	0.23	0.35 J
Benzo(G,H,I)Perylene	2.7	0.022 U	0.2 J+	0.055 J+	0.042 J+	4.2	0.021 U	0.24 J	0.045 J	0.39	0.04 J	0.13 J	0.086 J	0.02 U
Benzo(K)Fluoranthene	1.3	0.016 U	0.083	0.041	0.031 J	1.3	0.016 U	0.12	0.023 J	0.22	0.028 J	0.09	0.078	0.075 J
Benzyl Butyl Phthalate	0.013 J	0.012 U	0.012 U	0.012 U	0.012 U	0.011 U	0.011 U	0.011 U	0.012 U	0.011 U	0.028 J	0.012 U	0.012 U	0.011 U
Biphenyl (Diphenyl)	0.032 U	0.032 U	0.032 U	0.033 U	0.033 U	0.035 J	0.03 U	0.032 U	0.032 U	0.031 U	0.033 U	0.033 U	0.032 U	0.03 U
Bis(2-Chloroethoxy) Methane	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U	0.011 U	0.011 U	0.012 U	0.012 U	0.011 U	0.012 U	0.012 U	0.012 U	0.011 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.0088 U	0.0089 U	0.0089 U	0.0091 U	0.0091 U	0.0087 U	0.0084 U	0.0087 U	0.0088 U	0.0087 U	0.0092 U	0.0091 U	0.0089 U	0.0082 U
Bis(2-Chloroisopropyl) Ether	0.015 UJ	0.015 UJ	0.016 U	0.016 U	0.016 U	0.015 U	0.015 U	0.015 U	0.015 U	0.015 U	0.016 U	0.016 U	0.015 U	0.014 U
Bis(2-Ethylhexyl) Phthalate	0.057 J	0.015 U	0.015 U	0.015 U	0.015 U	0.014 U	0.014 U	0.062 J	0.015 U	0.014 U	0.015 U	0.015 U	0.015 U	0.014 U
Caprolactam	0.027 U	0.027 U	0.027 UJ	0.028 UJ	0.028 UJ	0.026 U	0.026 U	0.027 U	0.027 U	0.026 U	0.028 UJ	0.028 U	0.027 U	0.025 U
Carbazole	0.35 J	0.0093 U	0.028 J	0.012 J	0.0096 UJ	0.74	0.0089 U	0.018 J	0.0093 U	0.063 J	0.0097 U	0.021 J	0.0093 U	0.0087 U
Chrysene	2.8	0.017 J	0.19 J	0.085 J	0.06 J	3.1	0.013 J	0.22 J	0.048 J	0.46	0.053 J	0.19 J	0.14 J	0.19 J
Dibenz(A,H)Anthracene	0.63	0.02 U	0.042 J+	0.02 U	0.02 U	0.91	0.019 U	0.04 J+	0.019 U	0.1	0.02 U	0.039 J+	0.025 J	0.018 U
Dibenzofuran	0.092 J	0.011 U	0.011 U	0.012 U	0.012 U	0.3 J	0.011 U	0.011 U	0.011 U	0.027 J	0.012 U	0.012 U	0.011 U	0.011 U

Table E-8
Summary of Data Used in Risk Assessment
Central Landfills Area Soil (0-2 ft-bgs) - Current
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-010	CFMW-010	CFMW-012A	CFMW-012A	CFMW-012A-DUP	CFMW-016A	CFMW-016A	CFMW-018	CFMW-018	CFMW-019A	CFMW-019A	CFMW-019A-DUP	CFMW-022	CFMW-022
Sample Lab IDs	460-114141-16	460-114141-17	460-114275-1	460-114275-3	460-114275-5	460-115886-11	460-115886-12	460-114141-34	460-114141-35	460-114456-49	460-114456-50	460-114456-52	460-114828-29	460-114828-28
Sample Name	CFMW-010-SO-0-0.5	CFMW-010-SO-0.5-2.0	CFMW-012A-SO-0-0.5	CFMW-012A-SO-0.5-2	CFMW-DUP3-SO	CFMW-016a-SO-0-0.5	CFMW-016a-SO-0.5-2	CFMW-018-SO-0-0.5	CFMW-018-SO-0.5-2.0	CFMW-019a-SO-0-0.5	CFMW-019a-SO-0.5-2	CFMW-DUP5-SO	CFMW-022-SO-0-0.5	CFMW-022-SO-0.5-2
Sample Depth	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft
Chemical	5/18/2016	5/18/2016	5/20/2016	5/20/2016	5/20/2016	6/21/2016	6/21/2016	5/19/2016	5/19/2016	5/25/2016	5/25/2016	5/25/2016	6/2/2016	6/2/2016
Diethyl Phthalate	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.01 U	0.01 U	0.011 U	0.011 U	0.01 U	0.011 U	0.011 U	0.011 U	0.0099 U
Dimethyl Phthalate	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.01 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.01 U
Di-N-Butyl Phthalate	0.011 U	0.011 U	0.011 U	0.012 U	0.012 U	0.023 J	0.011 U	0.011 U	0.011 U	0.011 U	0.012 U	0.012 U	0.011 U	0.01 U
Di-N-Octylphthalate	0.019 U	0.019 U	0.019 U	0.02 U	0.02 U	0.019 U	0.018 U	0.019 U	0.019 U	0.019 U	0.02 U	0.02 U	0.019 U	0.018 U
Fluoranthene	4.1	0.021 J	0.27 J	0.12 J	0.09 J	6.1	0.017 J	0.22 J	0.047 J	0.66	0.071 J	0.25 J	0.12 J	0.13 J
Fluorene	0.16 J	0.0082 U	0.012 J	0.0084 U	0.0085 J	0.58	0.0078 U	0.0081 U	0.0082 U	0.046 J	0.0085 U	0.018 J	0.0082 U	0.0076 U
Hexachlorobenzene	0.015 U	0.015 U	0.015 U	0.016 U	0.016 U	0.015 U	0.014 U	0.015 U	0.015 U	0.015 U	0.016 U	0.016 U	0.015 U	0.014 U
Hexachlorobutadiene	0.01 U	0.011 U	0.011 U	0.011 U	0.011 U	0.01 U	0.01 U	0.01 U	0.011 U	0.01 U	0.011 U	0.011 U	0.011 U	0.0098 U
Hexachlorocyclopentadiene	0.023 U	0.023 U	0.024 U	0.024 U	0.024 U	0.023 U	0.022 U	0.023 U	0.023 U	0.023 U	0.024 UJ	0.024 UJ	0.023 U	0.022 U
Hexachloroethane	0.014 U	0.014 U	0.014 U	0.014 U	0.014 U	0.013 U	0.013 U	0.014 U	0.014 U	0.013 U	0.014 U	0.014 U	0.014 U	0.013 U
Indeno(1,2,3-C,D)Pyrene	2.9	0.025 U	0.19 J+	0.059 J+	0.046 J+	3.9	0.024 U	0.23 J+	0.038 J+	0.42	0.045 J+	0.14 J+	0.088	0.023 U
Isophorone	0.008 U	0.0081 U	0.0081 U	0.0083 U	0.0083 U	0.0079 U	0.0077 U	0.008 U	0.008 U	0.0079 U	0.0084 U	0.0083 U	0.0081 U	0.0075 U
Naphthalene	0.043 J	0.0095 U	0.0096 U	0.0098 U	0.0098 U	0.29 J	0.0091 U	0.0094 U	0.0095 U	0.016 J	0.0099 U	0.01 J	0.0096 U	0.0089 U
Nitrobenzene	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U	0.011 U	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U	0.011 U
N-Nitrosodi-N-Propylamine	0.013 U	0.013 U	0.013 U	0.013 U	0.013 U	0.012 U	0.012 U	0.012 U	0.013 U	0.012 U	0.013 U	0.013 U	0.013 U	0.012 U
N-Nitrosodiphenylamine	0.034 U	0.034 U	0.034 U	0.035 U	0.035 U	0.033 U	0.032 U	0.034 U	0.034 U	0.033 U	0.035 UJ	0.035 U	0.034 U	0.032 U
Pentachlorophenol	0.045 U	0.045 U	0.046 U	0.047 U	0.047 U	0.045 U	0.043 U	0.045 U	0.045 U	0.044 U	0.047 UJ	0.047 U	0.046 U	0.042 U
Phenanthrene	2.4	0.013 J	0.19 J	0.087 J	0.073 J	5.7	0.014 J	0.093 J	0.027 J	0.46	0.05 J	0.16 J	0.047 J	0.0093 U
Phenol	0.012 U	0.012 U	0.012 U	0.013 U	0.013 U	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U	0.013 U	0.013 U	0.012 U	0.011 U
Pyrene	3.9	0.017 U	0.26 J	0.15 J	0.092 J	6.4	0.018 J	0.27 J	0.063 J	0.6	0.071 J	0.24 J	0.1 J	0.12 J
VOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,1,1-Trichloroethane	--	0.00036 U	--	0.00055 U	0.0004 U	--	0.00034 U	--	0.00042 U	--	0.00036 U	0.00034 U	--	0.00032 U
1,1,2,2-Tetrachloroethane	--	0.00016 U	--	0.00025 U	0.00018 U	--	0.00015 U	--	0.00019 U	--	0.00016 U	0.00015 U	--	0.00014 U
1,1,2-Trichloro-1,2,2-Trifluoroethane	--	0.00042 U	--	0.00064 U	0.00046 U	--	0.00039 U	--	0.00048 U	--	0.00042 U	0.0004 U	--	0.00037 U
1,1,2-Trichloroethane	--	0.00027 U	--	0.00041 U	0.00029 U	--	0.00025 U	--	0.00031 U	--	0.00027 U	0.00025 U	--	0.00024 U
1,1-Dichloroethane	--	0.00032 U	--	0.0005 U	0.00035 U	--	0.0003 U	--	0.00037 U	--	0.00033 U	0.00031 U	--	0.00029 U
1,1-Dichloroethene	--	0.00039 U	--	0.0006 U	0.00043 U	--	0.00037 U	--	0.00045 U	--	0.00039 U	0.00037 U	--	0.00034 U
1,2,3-Trichlorobenzene	--	0.0001 U	--	0.00016 U	0.00011 U	--	0.000099 U	--	0.00012 U	--	0.00011 U	9.9E-05 U	--	0.000093 U
1,2,4-Trichlorobenzene	--	0.0003 U	--	0.00047 U	0.00033 U	--	0.00029 U	--	0.00035 U	--	0.00031 U	0.00029 U	--	0.00027 U
1,2-Dibromo-3-Chloropropane	--	0.00045 U	--	0.00069 U	0.00049 U	--	0.00042 U	--	0.00052 U	--	0.00045 U	0.00042 U	--	0.0004 U
1,2-Dibromoethane (Ethylene Dibromide)	--	0.00011 U	--	0.00018 U	0.00012 U	--	0.00011 U	--	0.00013 U	--	0.00011 U	0.00011 U	--	0.0001 U
1,2-Dichlorobenzene	--	0.00013 U	--	0.0002 U	0.00015 U	--	0.00013 U	--	0.00015 U	--	0.00013 U	0.00013 U	--	0.00012 U
1,2-Dichloroethane	--	0.0001 U	--	0.00016 U	0.00011 U	--	0.000099 U	--	0.00012 U	--	0.00011 U	9.9E-05 U	--	0.000093 U
1,2-Dichloropropane	--	0.00016 U	--	0.00025 U	0.00018 U	--	0.00015 U	--	0.00019 U	--	0.00016 U	0.00015 U	--	0.00014 U
1,3-Dichlorobenzene	--	0.00011 U	--	0.00018 U	0.00012 U	--	0.00011 U	--	0.00013 U	--	0.00011 U	0.00011 U	--	0.0001 U
1,4-Dichlorobenzene	--	0.00012 U	--	0.00019 U	0.00014 U	--	0.00012 U	--	0.00014 U	--	0.00012 U	0.00012 U	--	0.00011 U
2-Hexanone	--	0.00089 U	--	0.0014 U	0.00098 U	--	0.00084 U	--	0.001 U	--	0.0009 U	0.00085 U	--	0.00079 U
Acetone	--	0.027	--	0.031 J	0.011 J	--	0.024 J+	--	0.0088	--	0.001 UJ	0.049 J	--	0.02
Benzene	--	0.00019 U	--	0.00029 U	0.00021 U	--	0.00034 J	--	0.00022 U	--	0.00023 J	0.0009 J	--	0.00017 U
Bromochloromethane	--	0.00016 U	--	0.00025 U	0.00018 U	--	0.00015 U	--	0.00019 U	--	0.00016 U	0.00015 U	--	0.00014 U
Bromodichloromethane	--	0.00036 U	--	0.00055 U	0.0004 U	--	0.00034 U	--	0.00042 U	--	0.00036 U	0.00034 U	--	0.00032 U
Bromoform	--	0.00012 U	--	0.00019 U	0.00014 U	--	0.00012 U	--	0.00014 U	--	0.00012 U	0.00012 U	--	0.00011 U
Bromomethane	--	0.0003 U	--	0.00047 UJ	0.00033 U	--	0.00029 U	--	0.00035 U	--	0.00031 U	0.00029 UJ	--	0.00027 U
Carbon Disulfide	--	0.00063 J	--	0.0041 J	0.0019 J	--	0.0005 J	--	0.00047 U	--	0.00041 U	0.00039 U	--	0.0014 J
Carbon Tetrachloride	--	0.00041 U	--	0.00063 U	0.00045 U	--	0.00039 U	--	0.00047 U	--	0.00041 U	0.00039 U	--	0.00036 U
Chlorobenzene	--	0.00013 U	--	0.0002 U	0.00015 U	--	0.00013 U	--	0.00015 U	--	0.00013 U	0.00013 U	--	0.00012 U
Chloroethane	--	0.00033 U	--	0.00051 U	0.00036 U	--	0.00031 U	--	0.00039 U	--	0.00033 U	0.00032 UJ	--	0.00029 U
Chloroform	--	0.0002 U	--	0.00031 U	0.00022 U	--	0.00019 U	--	0.00023 U	--	0.0002 U	0.00019 U	--	0.00018 U
Chloromethane	--	0.00036 U	--	0.00055 UJ	0.0004 U	--	0.00034 U	--	0.00042 U	--	0.00036 U	0.00034 U	--	0.00032 U
Cis-1,2-Dichloroethylene	--	0.00021 U	--	0.00032 U	0.00023 U	--	0.0002 U	--	0.00024 U	--	0.00021 U	0.0002 U	--	0.00019 U
Cis-1,3-Dichloropropene	--	0.00014 U	--	0.00022 U	0.00016 U	--	0.00013 U	--	0.00017 U	--	0.00014 U	0.00014 U	--	0.00013 U
Cyclohexane	--	0.00044 U	--	0.00067 U	0.00048 U	--	0.00041 U	--	0.00051 U	--	0.00044 U	0.00041 U	--	0.00039 U
Dibromochloromethane	--	0.00014 U	--	0.00022 U	0.00016 U	--	0.00013 U	--	0.00017 U	--	0.00014 U	0.00014 U	--	0.00013 U
Dichlorodifluoromethane	--	0.0003 U	--	0.00047 U	0.00033 U	--	0.00029 U	--	0.00035 U	--	0.00031 U	0.00029 U	--	0.00027 U
Ethylbenzene	--	0.00017 U	--	0.00026 U	0.00019 U	--	0.00016 U	--	0.0002 U	--	0.00017 U	0.00016 U	--	0.00015 U
Isopropylbenzene (Cumene)	--	0.00016 U	--	0.00025 U	0.00018 U	--	0.00015 U	--	0.00019 U	--	0.00016 U	0.00015 U	--	0.00014 U
M,P-Xylene	--	0.0001 U	--	0.00016 U	0.00011 U	--	0.000099 U	--	0.00012 U	--	0.00011 U	9.9E-05 U	--	0.00012 J

Table E-8
Summary of Data Used in Risk Assessment
Central Landfills Area Soil (0-2 ft-bgs) - Current
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-010	CFMW-010	CFMW-012A	CFMW-012A	CFMW-012A-DUP	CFMW-016A	CFMW-016A	CFMW-018	CFMW-018	CFMW-019A	CFMW-019A	CFMW-019A-DUP	CFMW-022	CFMW-022
Sample Lab IDs	460-114141-16	460-114141-17	460-114275-1	460-114275-3	460-114275-5	460-115886-11	460-115886-12	460-114141-34	460-114141-35	460-114456-49	460-114456-50	460-114456-52	460-114828-29	460-114828-28
Sample Name	CFMW-010-SO-0-0.5	CFMW-010-SO-0.5-2.0	CFMW-012A-SO-0-0.5	CFMW-012A-SO-0.5-2	CFMW-DUP3-SO	CFMW-016a-SO-0-0.5	CFMW-016a-SO-0.5-2	CFMW-018-SO-0-0.5	CFMW-018-SO-0.5-2.0	CFMW-019a-SO-0-0.5	CFMW-019a-SO-0.5-2	CFMW-DUP5-SO	CFMW-022-SO-0-0.5	CFMW-022-SO-0.5-2
Sample Depth	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft
Chemical	5/18/2016	5/18/2016	5/20/2016	5/20/2016	5/20/2016	6/21/2016	6/21/2016	5/19/2016	5/19/2016	5/25/2016	5/25/2016	5/25/2016	6/2/2016	6/2/2016
Methyl Acetate	--	0.00085 U	--	0.0013 U	0.00094 U	--	0.00081 U	--	0.00099 U	--	0.00086 UJ	0.0058 J	--	0.00076 U
Methyl Ethyl Ketone (2-Butanone)	--	0.00073 U	--	0.0011 U	0.0008 U	--	0.0017 J	--	0.00085 U	--	0.00074 U	0.00069 U	--	0.00065 U
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	--	0.0021 U	--	0.0032 U	0.0023 U	--	0.002 U	--	0.0024 U	--	0.0021 U	0.002 U	--	0.0019 U
Methylcyclohexane	--	0.00047 U	--	0.00073 U	0.00052 U	--	0.00045 U	--	0.00055 U	--	0.00048 U	0.00045 U	--	0.00042 U
Methylene Chloride	--	0.0003 U	--	0.00047 U	0.00033 U	--	0.00029 U	--	0.00035 U	--	0.00031 U	0.00029 U	--	0.00027 U
O-Xylene (1,2-Dimethylbenzene)	--	0.00015 U	--	0.00023 U	0.00017 U	--	0.00014 U	--	0.00018 U	--	0.00015 U	0.00014 U	--	0.00013 U
Styrene	--	0.00014 U	--	0.00022 U	0.00016 U	--	0.00013 U	--	0.00017 U	--	0.00014 U	0.00014 U	--	0.00013 U
Tert-Butyl Methyl Ether	--	0.00016 U	--	0.00025 U	0.00018 U	--	0.00015 U	--	0.00019 U	--	0.00016 U	0.00015 U	--	0.00014 U
Tetrachloroethylene (PCE)	--	0.00027 U	--	0.00041 U	0.00029 U	--	0.00025 U	--	0.00031 U	--	0.00027 U	0.00025 U	--	0.00024 U
Toluene	--	0.00018 U	--	0.00032 J	0.0002 J	--	0.00044 J	--	0.00022 J	--	0.0002 J	0.00027 J	--	0.00021 J
Trans-1,2-Dichloroethene	--	0.00037 U	--	0.00057 U	0.00041 U	--	0.00035 U	--	0.00043 U	--	0.00037 U	0.00035 U	--	0.00033 U
Trans-1,3-Dichloropropene	--	0.000095 U	--	0.00015 U	0.0001 U	--	0.00009 U	--	0.00011 U	--	0.000096 U	0.00009 U	--	0.000084 U
Trichloroethylene (TCE)	--	0.00025 U	--	0.00038 U	0.00027 U	--	0.00023 U	--	0.00029 U	--	0.00025 U	0.00023 U	--	0.00022 U
Trichlorofluoromethane	--	0.00032 U	--	0.0005 U	0.00035 U	--	0.0003 U	--	0.00037 U	--	0.00033 U	0.00031 U	--	0.00029 U
Vinyl Chloride	--	0.00037 U	--	0.00057 U	0.00041 U	--	0.00035 U	--	0.00043 U	--	0.00037 U	0.00035 U	--	0.00033 U

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-8
Summary of Data Used in Risk Assessment
Central Landfills Area Soil (0-2 ft-bgs) - Current
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-022-DUP	CFMW-023A	CFMW-023A	CFMW-029	CFMW-029	CFSB-001	CFSB-001	CFSB-002	CFSB-002	CFSB-003	CFSB-003	CFSB-004	CFSB-004	CFSB-005
Sample Lab IDs	460-114828-30	460-115731-9	460-115731-10	460-114141-13	460-114141-14	460-114529-4	460-114529-5	460-114529-7	460-114529-8	460-114529-10	460-114529-11	460-114529-1	460-114529-2	460-114529-15
Sample Name	CFMW-DUP12-SO	CFMW-023a-SO-0-0.5	CFMW-023a-SO-0.5-2	CFMW-029-SO-0-0.5	CFMW-029-SO-0.5-2.0	CFSB-001-SO-0-0.5	CFSB-001-SO-0.5-2	CFSB-002-SO-0-0.5	CFSB-002-SO-0.5-2	CFSB-003-SO-0-0.5	CFSB-003-SO-0.5-2	CFSB-004-SO-0-0.5	CFSB-004-SO-0.5-2	CFSB-005-SO-0-0.5
Sample Depth	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft
Chemical	6/2/2016	6/17/2016	6/17/2016	5/18/2016	5/18/2016	5/25/2016	5/25/2016	5/25/2016	5/25/2016	5/25/2016	5/25/2016	5/25/2016	5/25/2016	5/25/2016
GENERAL CHEMISTRY (mg/kg)														
Fluoride	10.1 J	109 J-	58.5	105 J-	50.3 J-	56.5 J	53.7 J	22.4 J	28 J	26.9 J	16.3 J	34.1 J	39 J	11.6 J
Cyanide	0.079 J	0.057 J	0.02 J	0.21	0.058 J	0.39	0.046 J	0.1 J	0.1 J	0.078 J	0.038 J	0.25	0.6	0.21
METALS (mg/kg)														
"Chromium, Hexavalent - Estimated"	0.219465	0.232847	0.414842	0.414842	0.278345	0.33455	0.219465	0.208759	0.264964	0.33455	0.281022	0.256934	0.254258	0.2382
"Chromium, Trivalent - Calculated"	--	--	--	--	--	--	--	--	--	--	--	--	--	--
"Chromium, Trivalent - Estimated"	7.98054	8.46715	15.0852	15.0852	10.1217	12.1655	7.98054	7.59124	9.63504	12.1655	10.219	9.34307	9.24574	8.6618
Aluminum	7860	20200	16100	19500	11900	20400	10100	10500	11600	15900	12100	8890	8960	11300
Antimony	0.42 UJ	0.42 UJ	0.47 UJ	0.33 UJ	0.34 UJ	0.44 U	0.37 U	0.37 U	0.4 U	0.4 UJ	0.37 UJ	0.34 U	0.36 U	0.38 UJ
Arsenic	4.2 J	6.1	8.4	5.4	4.5	7.3	3.2	5.2	5.3	7.9 J	12 J	4.4	3.7	5.6 J
Barium	69.6	166	111	81.5	126	265	75.6	90.2	62.7	121	76.5	77.7	204	111
Beryllium	0.27 J	0.55	0.6	0.99	0.48	0.81	0.4	0.4	0.54	0.49	0.43	0.44	0.42	0.48
Cadmium	0.32 U	0.32 U	0.36 U	0.27 J	0.26 U	0.33 U	0.28 U	0.28 U	0.31 U	0.3 U	0.28 U	0.26 U	0.78 J	0.29 U
Calcium	29500 J	4540 J	2160 J	25400	21800	6020	6770	10600	24800	7630	38600	39100	14100	86800
Chromium, Total	8.2	8.7	15.5	15.5	10.4	12.5	8.2	7.8	9.9	12.5	10.5	9.6	9.5	8.9
Cobalt	4.9	6 J+	6.9 J+	5.8	5.6	6	4.1	4.3	5.2	6.7 J-	6.1 J-	4.1	4.2	4.1 J-
Copper	12.1	8 J	11.9 J	16.4	28.6	21.8	8.9	7260	34	17.7 J+	20.5 J+	11.8	13.9	12.5 J+
Iron	12900	12800	18100	13700	13500	16200	11100	11500	14800	18800	16000	10900	13400	12900
Lead	5.9	13.4	13.6	48	12.1	18.5	9.1	10.5	11.1	12.1 J	13.4 J	18.1	16.6	12.4 J
Magnesium	11000	8920	12400	11500	9500	9090	7940	9420	12700	14100	14200	7820	7930	15600
Manganese	378	444	442	333	429	521	331	385	436	443	397	361	886	446
Mercury	0.028	0.014 U	0.04	0.019	0.015 J	0.021	0.017 J	0.026	0.026	0.015 U	0.012 U	0.013 U	0.012 U	0.013 U
Nickel	10.1	89 J-	12 J-	46.5	13.6	18.4	10.5	11.2	12.7	17	12.3	10.7	13.8	14.6
Potassium	657	1010	1380	1100	814	1310	593	828	795	1400 J+	1060 J+	772	842	1060 J+
Selenium	0.39 U	0.39 U	0.44 U	1 J	0.32 U	0.67 J	0.34 U	0.35 U	0.38 U	0.37 U	0.34 U	0.32 U	0.35 J	0.36 U
Silver	0.77 U	0.77 U	0.87 U	0.6 U	0.63 U	0.8 U	0.67 U	0.68 U	0.74 U	0.73 U	0.67 U	0.62 U	0.65 U	0.7 U
Sodium	39.4 U	72.6 J	44.2 U	209	58.1 J	104 J	38.1 J	34.7 U	37.6 U	37.2 J	34.3 U	31.7 U	48.2 J	49.5 J
Thallium	0.16 U	0.16 U	0.18 U	0.14 J	0.13 U	0.16 U	0.14 U	0.14 U	0.15 U	0.15 U	0.14 U	0.13 U	0.14 J	0.14 U
Vanadium	6.4	21.7	15.4	22.8	11.1	15.6	8.3	9.3	8.1	11.2	9.2	8.1	10.5	10.6
Zinc	32.6	54.5	45.7	114	61.5	66.8	50.4	40.9	40.9	58.1	44.3	63.2	113	44.3
METALS|HEXAVALENT CHROMIUM (mg/kg)														
Chromium, Hexavalent	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PESTICIDES (mg/kg)														
Aldrin	--	0.00095 U	--	0.00087 U	--	--	--	--	--	--	--	--	--	--
Alpha Bhc (Alpha Hexachlorocyclohexane)	--	0.00072 U	--	0.00065 U	--	--	--	--	--	--	--	--	--	--
Alpha Endosulfan	--	0.0011 U	--	0.001 U	--	--	--	--	--	--	--	--	--	--
Beta Bhc (Beta Hexachlorocyclohexane)	--	0.00077 U	--	0.0007 U	--	--	--	--	--	--	--	--	--	--
Beta Endosulfan	--	0.0012 U	--	0.0011 U	--	--	--	--	--	--	--	--	--	--
cis-Chlordane	--	0.0013 U	--	0.0012 U	--	--	--	--	--	--	--	--	--	--
Delta BHC (Delta Hexachlorocyclohexane)	--	0.00086 U	--	0.00078 U	--	--	--	--	--	--	--	--	--	--
Dieldrin	--	--	--	0.00093 U	--	--	--	--	--	--	--	--	--	--
Endosulfan Sulfate	--	0.00092 U	--	0.00084 U	--	--	--	--	--	--	--	--	--	--
Endrin	--	0.001 U	--	0.00091 U	--	--	--	--	--	--	--	--	--	--
Endrin Aldehyde	--	0.00098 U	--	0.00089 U	--	--	--	--	--	--	--	--	--	--
Endrin Ketone	--	0.0011 U	--	0.001 U	--	--	--	--	--	--	--	--	--	--
Gamma Bhc (Lindane)	--	0.00071 U	--	0.00064 U	--	--	--	--	--	--	--	--	--	--
Heptachlor	--	0.001 U	--	0.00092 U	--	--	--	--	--	--	--	--	--	--
Heptachlor Epoxide	--	0.0015 U	--	0.0014 U	--	--	--	--	--	--	--	--	--	--
Methoxychlor	--	0.0017 U	--	0.0015 U	--	--	--	--	--	--	--	--	--	--
P,P'-DDD	--	0.001 U	--	0.00094 U	--	--	--	--	--	--	--	--	--	--
P,P'-DDE	--	0.0011 U	--	0.001 U	--	--	--	--	--	--	--	--	--	--
P,P'-DDT	--	0.00081 U	--	0.00074 U	--	--	--	--	--	--	--	--	--	--
Toxaphene	--	0.023 U	--	0.021 U	--	--	--	--	--	--	--	--	--	--
trans-Chlordane	--	0.0017 U	--	0.0016 U	--	--	--	--	--	--	--	--	--	--
POLYCHLORINATED BIPHENYLS (mg/kg)														
PCB-1016 (Aroclor 1016)	0.0094 U	0.01 U	0.01 U	0.0095 U	0.0095 U	0.012 U	0.01 U	0.01 U	0.011 U	0.012 U	0.0098 U	0.01 U	0.0098 U	0.011 U
PCB-1221 (Aroclor 1221)	0.0094 U	0.01 U	0.01 U	0.0095 U	0.0095 U	0.012 U	0.01 U	0.01 U	0.011 U	0.012 U	0.0098 U	0.01 U	0.0098 U	0.011 U

Table E-8
Summary of Data Used in Risk Assessment
Central Landfills Area Soil (0-2 ft-bgs) - Current
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-022-DUP	CFMW-023A	CFMW-023A	CFMW-029	CFMW-029	CFSB-001	CFSB-001	CFSB-002	CFSB-002	CFSB-003	CFSB-003	CFSB-004	CFSB-004	CFSB-005
Sample Lab IDs	460-114828-30	460-115731-9	460-115731-10	460-114141-13	460-114141-14	460-114529-4	460-114529-5	460-114529-7	460-114529-8	460-114529-10	460-114529-11	460-114529-1	460-114529-2	460-114529-15
Sample Name	CFMW-DUP12-SO	CFMW-023a-SO-0-0.5	CFMW-023a-SO-0.5-2	CFMW-029-SO-0-0.5	CFMW-029-SO-0.5-2.0	CFSB-001-SO-0-0.5	CFSB-001-SO-0.5-2	CFSB-002-SO-0-0.5	CFSB-002-SO-0.5-2	CFSB-003-SO-0-0.5	CFSB-003-SO-0.5-2	CFSB-004-SO-0-0.5	CFSB-004-SO-0.5-2	CFSB-005-SO-0-0.5
Sample Depth	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft
Chemical	6/2/2016	6/17/2016	6/17/2016	5/18/2016	5/18/2016	5/25/2016	5/25/2016	5/25/2016	5/25/2016	5/25/2016	5/25/2016	5/25/2016	5/25/2016	5/25/2016
PCB-1232 (Aroclor 1232)	0.0094 U	0.01 U	0.01 U	0.0095 U	0.0095 U	0.012 U	0.01 U	0.01 U	0.011 U	0.012 U	0.0098 U	0.01 U	0.0098 U	0.011 U
PCB-1242 (Aroclor 1242)	0.0094 U	0.01 U	0.01 U	0.0095 U	0.0095 U	0.012 U	0.01 U	0.01 U	0.011 U	0.012 U	0.0098 U	0.01 U	0.0098 U	0.011 U
PCB-1248 (Aroclor 1248)	0.0094 U	0.01 U	0.01 U	0.0095 U	0.0095 U	0.012 U	0.01 U	0.01 U	0.011 U	0.012 U	0.0098 U	0.01 U	0.0098 U	0.011 U
PCB-1254 (Aroclor 1254)	0.0097 U	0.011 U	0.011 U	0.0099 U	0.0098 U	0.013 U	0.01 U	0.011 U	0.011 U	0.012 U	0.01 U	0.01 U	0.01 U	0.011 U
PCB-1260 (Aroclor 1260)	0.0097 U	0.011 U	0.011 U	0.0099 U	0.0098 U	0.013 U	0.01 U	0.011 U	0.011 U	0.012 U	0.01 U	0.01 U	0.01 U	0.011 U
PCB-1262 (Aroclor 1262)	0.0097 U	0.011 U	0.011 U	0.0099 U	0.0098 U	0.013 U	0.01 U	0.011 U	0.011 U	0.012 U	0.01 U	0.01 U	0.01 U	0.011 U
PCB-1268 (Aroclor 1268)	0.0097 U	0.011 U	0.011 U	0.0099 U	0.0098 U	0.013 U	0.01 U	0.011 U	0.011 U	0.012 U	0.01 U	0.01 U	0.01 U	0.011 U
Polychlorinated Biphenyl (PCBs)	0.0097 U	0.011 U	0.011 U	0.0099 U	0.0098 U	0.013 U	0.01 U	0.011 U	0.011 U	0.012 U	0.01 U	0.01 U	0.01 U	0.011 U
SEMIVOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,2,4,5-Tetrachlorobenzene	0.026 U	0.029 U	0.028 U	0.053 U	0.026 U	0.034 U	0.028 U	0.029 U	0.03 U	0.032 U	0.027 U	1.4 U	1.4 U	0.029 U
1,4-Dioxane (P-Dioxane)	0.093 U	0.1 U	0.1 U	0.19 U	0.094 U	0.12 U	0.1 U	0.1 U	0.11 U	0.11 U	0.097 U	4.9 U	4.9 U	0.11 U
2,3,4,6-Tetrachlorophenol	0.033 U	0.037 U	0.036 U	0.067 U	0.033 U	0.042 U	0.035 U	0.036 U	0.038 U	0.04 U	0.034 U	1.7 U	1.7 U	0.037 U
2,4,5-Trichlorophenol	0.035 U	0.039 U	0.038 U	0.071 U	0.035 U	0.045 U	0.037 U	0.039 U	0.04 U	0.043 U	0.036 U	1.8 U	1.8 U	0.039 U
2,4,6-Trichlorophenol	0.0099 U	0.011 U	0.011 U	0.02 U	0.01 U	0.013 U	0.011 U	0.011 U	0.011 U	0.012 U	0.01 U	0.53 U	0.52 U	0.011 U
2,4-Dichlorophenol	0.0082 U	0.0092 U	0.009 U	0.017 U	0.0083 U	0.011 U	0.0088 U	0.0092 U	0.0095 U	0.01 U	0.0086 U	0.44 U	0.43 U	0.0093 U
2,4-Dimethylphenol	0.077 U	0.086 U	0.084 U	0.16 U	0.077 U	0.099 U	0.082 U	0.085 U	0.088 U	0.094 U	0.08 U	4.1 U	4 U	0.087 U
2,4-Dinitrophenol	0.26 U	0.29 U	0.29 U	0.54 U	0.27 U	0.34 U	0.28 U	0.29 U	0.3 U	0.32 U	0.27 U	14 U	14 U	0.3 U
2,4-Dinitrotoluene	0.014 U	0.015 U	0.015 U	0.028 U	0.014 U	0.018 U	0.015 U	0.015 U	0.016 U	0.017 U	0.014 U	0.73 U	0.72 U	0.016 U
2,6-Dinitrotoluene	0.019 U	0.021 U	0.02 U	0.038 U	0.019 U	0.024 U	0.02 U	0.021 U	0.021 U	0.023 U	0.019 U	0.99 U	0.97 U	0.021 U
2-Chloronaphthalene	0.0079 U	0.0088 U	0.0086 U	0.016 U	0.008 U	0.01 U	0.0085 U	0.0088 U	0.0091 U	0.0097 U	0.0082 U	0.42 U	0.41 U	0.009 U
2-Chlorophenol	0.0089 U	0.0099 U	0.0097 U	0.018 U	0.0089 U	0.011 U	0.0095 U	0.0099 U	0.01 U	0.011 U	0.0092 U	0.47 U	0.46 U	0.01 U
2-Methylnaphthalene	0.0077 U	0.048 J	0.0084 U	0.031 J	0.0078 U	0.073 J	0.011 J	0.0086 U	0.0089 U	0.0095 U	0.008 U	2 J	3.9 J	0.0087 U
2-Methylphenol (O-Cresol)	0.015 U	0.017 U	0.017 U	0.031 U	0.015 U	0.02 U	0.016 U	0.017 U	0.017 U	0.019 U	0.016 U	0.81 U	0.79 U	0.017 U
2-Nitroaniline	0.011 U	0.013 U	0.013 U	0.023 U	0.012 U	0.015 U	0.012 U	0.013 U	0.013 U	0.014 U	0.012 U	0.61 U	0.6 U	0.013 U
2-Nitrophenol	0.012 U	0.013 U	0.013 U	0.024 U	0.012 U	0.015 U	0.013 U	0.013 U	0.013 U	0.014 U	0.012 U	0.62 U	0.61 U	0.013 U
3- And 4- Methylphenol (Total)	0.0093 U	0.01 U	0.01 U	0.019 U	0.0094 U	0.012 U	0.01 U	0.01 U	0.011 U	0.011 U	0.0097 U	0.49 U	1 J	0.011 U
3,3'-Dichlorobenzidine	0.039 U	0.043 U	0.042 U	0.079 U	0.039 U	0.05 U	0.042 U	0.043 U	0.045 U	0.048 U	0.041 U	2.1 U	2 U	0.044 U
3-Nitroaniline	0.01 U	0.012 U	0.011 U	0.021 U	0.01 U	0.013 U	0.011 U	0.012 U	0.012 U	0.013 U	0.011 U	0.55 U	0.54 U	0.012 U
4,6-Dinitro-2-Methylphenol	0.093 U	0.1 U	0.1 U	0.19 U	0.094 U	0.12 U	0.1 U	0.1 U	0.11 U	0.11 U	0.097 U	4.9 U	4.9 U	0.11 U
4-Bromophenyl Phenyl Ether	0.011 U	0.012 U	0.012 U	0.022 U	0.011 U	0.014 U	0.012 U	0.012 U	0.013 U	0.013 U	0.011 U	0.58 U	0.57 U	0.012 U
4-Chloro-3-Methylphenol	0.015 U	0.017 U	0.016 U	0.03 U	0.015 U	0.019 U	0.016 U	0.017 U	0.017 U	0.018 U	0.016 U	0.79 U	0.78 U	0.017 U
4-Chloroaniline	0.009 U	0.01 U	0.0098 U	0.018 U	0.009 U	0.012 U	0.0096 U	0.01 U	0.01 U	0.011 U	0.0093 U	0.48 U	0.47 U	0.01 U
4-Chlorophenyl Phenyl Ether	0.01 U	0.012 U	0.011 U	0.021 U	0.011 U	0.014 U	0.011 U	0.012 U	0.012 U	0.013 U	0.011 U	0.55 U	0.55 U	0.012 U
4-Nitroaniline	0.013 U	0.015 U	0.014 U	0.027 U	0.013 U	0.017 U	0.014 U	0.015 U	0.015 U	0.016 U	0.014 U	0.7 U	0.69 U	0.015 U
4-Nitrophenol	0.17 U	0.19 U	0.18 U	0.34 U	0.17 U	0.22 U	0.18 U	0.19 U	0.19 U	0.21 U	0.17 U	8.9 U	8.8 U	0.19 U
Acenaphthene	0.0084 U	0.061 J	0.0092 U	0.2 J	0.031 J	0.061 J	0.026 J	0.018 J	0.012 J	0.01 U	0.0088 U	22	28	0.025 J
Acenaphthylene	0.009 U	0.01 U	0.0098 U	0.018 U	0.009 U	0.022 J	0.0096 U	0.01 U	0.01 U	0.011 U	0.0093 U	0.54 J	1 J	0.01 U
Acetophenone	0.0076 U	0.0085 U	0.0083 U	0.015 U	0.0077 U	0.0098 U	0.0082 U	0.0084 U	0.0087 U	0.0093 U	0.0079 U	0.4 U	0.4 U	0.0086 U
Anthracene	0.033 U	0.072 J	0.036 U	0.34 J	0.065 J	0.16 J	0.045 J	0.037 U	0.038 U	0.041 U	0.034 U	47	48	0.042 J
Atrazine	0.016 U	0.017 U	0.017 U	0.032 U	0.016 U	0.02 U	0.017 U	0.017 U	0.018 U	0.019 U	0.016 U	0.82 U	0.81 U	0.018 U
Benzaldehyde	0.027 U	0.03 U	0.029 U	0.054 U	0.027 U	0.034 U	0.029 U	0.03 U	0.031 U	0.033 U	0.028 U	1.4 U	1.4 U	0.03 U
Benzo(A)Anthracene	0.029 UJ	0.26	0.032 U	2.8	0.26	0.46	0.18	0.19	0.16	0.085	0.03 U	100	89	0.19
Benzo(A)Pyrene	0.011 U	0.33	0.011 U	3.1	0.32	0.7	0.25	0.24	0.25	0.11	0.027 J	100	75	0.23
Benzo(B)Fluoranthene	0.014 UJ	0.55	0.015 U	6.5	0.43	1	0.31	0.36	0.59	0.19	0.046	120	100	0.36
Benzo(G,H,I)Perylene	0.02 U	0.33 J	0.022 U	4.1	0.42	0.6	0.37	0.23 J	0.32 J	0.1 J	0.021 J	62	47	0.21 J
Benzo(K)Fluoranthene	0.015 UJ	0.19	0.017 U	2.2	0.17	0.38	0.14	0.15	0.2	0.076	0.018 J	50	38	0.15
Benzyl Butyl Phthalate	0.011 U	0.012 U	0.012 U	0.022 U	0.011 U	0.014 U	0.012 U	0.012 U	0.012 U	0.013 U	0.011 U	0.57 U	0.56 U	0.012 U
Biphenyl (Diphenyl)	0.03 U	0.033 U	0.032 U	0.06 U	0.03 U	0.038 U	0.032 U	0.033 U	0.034 U	0.037 U	0.031 U	1.6 U	1.6 U	0.034 U
Bis(2-Chloroethoxy) Methane	0.011 U	0.012 U	0.012 U	0.022 U	0.011 U	0.014 U	0.012 U	0.012 U	0.012 U	0.013 U	0.011 U	0.58 U	0.57 U	0.012 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.0082 U	0.0092 U	0.009 U	0.017 U	0.0083 U	0.011 U	0.0088 U	0.0092 U	0.0095 U	0.01 U	0.0086 U	0.44 U	0.43 U	0.0093 U
Bis(2-Chloroisopropyl) Ether	0.014 U	0.016 U	0.016 U	0.029 UJ	0.014 UJ	0.019 U	0.015 U	0.016 U	0.017 U	0.018 U	0.015 U	0.76 U	0.75 U	0.016 U
Bis(2-Ethylhexyl) Phthalate	0.014 U	0.015 U	0.015 U	0.079 J	0.014 U	0.18 J	0.052 J	0.015 U	0.016 U	0.017 U	0.014 U	0.72 U	0.71 U	0.015 U
Caprolactam	0.025 U	0.028 U	0.027 U	0.051 U	0.025 U	0.032 U	0.027 U	0.028 U	0.029 U	0.031 U	0.026 U	1.3 U	1.3 U	0.028 U
Carbazole	0.0086 U	0.058 J	0.0094 U	0.29 J	0.046 J	0.13 J	0.037 J	0.027 J	0.021 J	0.011 J	0.009 U	32	24	0.033 J
Chrysene	0.0095 UJ	0.41	0.01 U	4.1	0.36	0.77	0.28 J	0.28 J	0.29 J	0.13 J	0.033 J	110	110	0.26 J
Dibenz(A,H)Anthracene	0.018 U	0.02 U	0.02 U	1.2	0.078	0.13	0.08 J+	0.05	0.074	0.024 J	0.019 U	21	19	0.043
Dibenzofuran	0.011 U	0.021 J	0.011 U	0.06 J	0.016 J	0.031 J	0.011 U	0.012 U	0.012 U	0.013 U	0.011 U	10 J	15 J	0.012 U

Table E-8
Summary of Data Used in Risk Assessment
Central Landfills Area Soil (0-2 ft-bgs) - Current
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-022-DUP	CFMW-023A	CFMW-023A	CFMW-029	CFMW-029	CFSB-001	CFSB-001	CFSB-002	CFSB-002	CFSB-003	CFSB-003	CFSB-004	CFSB-004	CFSB-005
Sample Lab IDs	460-114828-30	460-115731-9	460-115731-10	460-114141-13	460-114141-14	460-114529-4	460-114529-5	460-114529-7	460-114529-8	460-114529-10	460-114529-11	460-114529-1	460-114529-2	460-114529-15
Sample Name	CFMW-DUP12-SO	CFMW-023a-SO-0-0.5	CFMW-023a-SO-0.5-2	CFMW-029-SO-0-0.5	CFMW-029-SO-0.5-2.0	CFSB-001-SO-0-0.5	CFSB-001-SO-0.5-2	CFSB-002-SO-0-0.5	CFSB-002-SO-0.5-2	CFSB-003-SO-0-0.5	CFSB-003-SO-0.5-2	CFSB-004-SO-0-0.5	CFSB-004-SO-0.5-2	CFSB-005-SO-0-0.5
Sample Depth	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft
Chemical	6/2/2016	6/17/2016	6/17/2016	5/18/2016	5/18/2016	5/25/2016	5/25/2016	5/25/2016	5/25/2016	5/25/2016	5/25/2016	5/25/2016	5/25/2016	5/25/2016
Diethyl Phthalate	0.0099 U	0.011 U	0.011 U	0.02 U	0.01 U	0.013 U	0.011 U	0.011 U	0.011 U	0.012 U	0.01 U	0.53 U	0.52 U	0.011 U
Dimethyl Phthalate	0.01 U	0.011 U	0.011 U	0.021 U	0.01 U	0.013 U	0.011 U	0.011 U	0.012 U	0.012 U	0.011 U	0.54 U	0.53 U	0.011 U
Di-N-Butyl Phthalate	0.01 U	0.052 J	0.038 J	0.021 U	0.011 U	0.014 U	0.011 U	0.012 U	0.012 U	0.013 U	0.011 U	0.55 U	0.55 U	0.012 U
Di-N-Octylphthalate	0.018 U	0.02 U	0.019 U	0.036 U	0.018 U	0.023 U	0.019 U	0.02 U	0.02 U	0.022 U	0.018 U	0.94 U	0.93 U	0.02 U
Fluoranthene	0.01 UJ	0.52	0.011 U	4	0.46	1	0.33 J	0.31 J	0.25 J	0.14 J	0.037 J	240	240	0.34 J
Fluorene	0.0076 U	0.035 J	0.0083 U	0.099 J	0.026 J	0.044 J	0.018 J	0.0084 U	0.0087 U	0.0093 U	0.0079 U	19	25	0.02 J
Hexachlorobenzene	0.014 U	0.016 U	0.015 U	0.029 U	0.014 U	0.018 U	0.015 U	0.016 U	0.016 U	0.017 U	0.015 U	0.75 U	0.74 U	0.016 U
Hexachlorobutadiene	0.0098 U	0.011 U	0.011 U	0.02 U	0.0099 U	0.013 U	0.011 U	0.011 U	0.011 U	0.012 U	0.01 U	0.52 U	0.51 U	0.011 U
Hexachlorocyclopentadiene	0.022 U	0.024 U	0.024 U	0.044 U	0.022 U	0.028 U	0.023 UJ	0.024 U	0.025 U	0.027 U	0.023 U	1.2 U	1.1 U	0.025 U
Hexachloroethane	0.013 U	0.014 U	0.014 U	0.026 U	0.013 U	0.017 U	0.014 U	0.014 U	0.015 U	0.016 U	0.013 U	0.68 U	0.67 U	0.014 U
Indeno(1,2,3-C,D)Pyrene	0.023 U	0.34	0.025 U	5.1	0.42	0.54	0.32 J+	0.18	0.25	0.097	0.024 U	76	57	0.2
Isophorone	0.0075 U	0.0084 U	0.0082 U	0.015 U	0.0076 U	0.0097 U	0.008 U	0.0083 U	0.0086 U	0.0092 U	0.0078 U	0.4 U	1.4 J	0.0085 U
Naphthalene	0.0089 U	0.015 J	0.0097 U	0.032 J	0.011 J	0.044 J	0.011 J	0.0099 U	0.01 U	0.011 U	0.0092 U	4.6 J	10 J	0.01 U
Nitrobenzene	0.011 U	0.012 U	0.012 U	0.022 U	0.011 U	0.014 U	0.012 U	0.012 U	0.013 U	0.013 U	0.011 U	0.58 U	0.57 U	0.012 U
N-Nitrosodi-N-Propylamine	0.012 U	0.013 U	0.013 U	0.024 U	0.012 U	0.015 U	0.013 U	0.013 U	0.013 U	0.014 U	0.012 U	0.62 U	0.61 U	0.013 U
N-Nitrosodiphenylamine	0.032 U	0.035 UJ	0.034 UJ	0.064 U	0.032 U	0.041 U	0.034 U	0.035 U	0.036 U	0.039 U	0.033 U	1.7 U	1.7 U	0.036 U
Pentachlorophenol	0.042 U	0.047 U	0.046 U	0.086 U	0.043 U	0.055 U	0.045 U	0.047 U	0.049 U	0.052 U	0.044 U	2.2 U	2.2 U	0.048 U
Phenanthrene	0.0093 U	0.36 J	0.01 U	1.5	0.29 J	0.5	0.22 J	0.18 J	0.12 J	0.071 J	0.02 J	180	240	0.21 J
Phenol	0.011 U	0.013 U	0.012 U	0.023 U	0.011 U	0.015 U	0.012 U	0.013 U	0.013 U	0.014 U	0.012 U	0.6 U	1.2 J	0.013 U
Pyrene	0.016 UJ	0.56	0.017 U	2.9	0.38	0.73	0.31 J	0.35 J	0.26 J	0.15 J	0.038 J	150	130	0.36 J
VOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,1,1-Trichloroethane	0.00034 U	--	0.0003 U	--	0.00032 U	--	0.00041 U	--	0.00038 U	--	0.00031 U	--	0.00043 U	--
1,1,2,2-Tetrachloroethane	0.00015 U	--	0.00014 U	--	0.00014 U	--	0.00018 U	--	0.00017 U	--	0.00014 U	--	0.00019 U	--
1,1,2-Trichloro-1,2,2-Trifluoroethane	0.00039 U	--	0.00035 U	--	0.00037 U	--	0.00047 U	--	0.00044 U	--	0.00036 U	--	0.00049 U	--
1,1,2-Trichloroethane	0.00025 U	--	0.00022 U	--	0.00023 U	--	0.0003 U	--	0.00028 U	--	0.00023 U	--	0.00031 U	--
1,1-Dichloroethane	0.0003 U	--	0.00027 U	--	0.00028 U	--	0.00036 U	--	0.00034 U	--	0.00028 U	--	0.00038 U	--
1,1-Dichloroethene	0.00036 U	--	0.00033 U	--	0.00034 U	--	0.00044 U	--	0.00041 U	--	0.00034 U	--	0.00046 U	--
1,2,3-Trichlorobenzene	0.000097 U	--	0.000088 U	--	0.000092 U	--	0.00012 U	--	0.00011 U	--	0.000091 U	--	0.00012 U	--
1,2,4-Trichlorobenzene	0.00028 U	--	0.00025 U	--	0.00027 U	--	0.00034 U	--	0.00032 U	--	0.00026 U	--	0.00036 U	--
1,2-Dibromo-3-Chloropropane	0.00042 U	--	0.00037 U	--	0.00039 U	--	0.0005 U	--	0.00047 U	--	0.00039 U	--	0.00053 U	--
1,2-Dibromoethane (Ethylene Dibromide)	0.00011 U	--	0.000096 U	--	0.0001 U	--	0.00013 U	--	0.00012 U	--	0.000099 U	--	0.00013 U	--
1,2-Dichlorobenzene	0.00012 U	--	0.00011 U	--	0.00012 U	--	0.00015 U	--	0.00014 U	--	0.00012 U	--	0.00016 U	--
1,2-Dichloroethane	0.000097 U	--	0.000088 U	--	0.000092 U	--	0.00012 U	--	0.00011 U	--	0.000091 U	--	0.00012 U	--
1,2-Dichloropropane	0.00015 U	--	0.00014 U	--	0.00014 U	--	0.00018 U	--	0.00017 U	--	0.00014 U	--	0.00019 U	--
1,3-Dichlorobenzene	0.00011 U	--	0.000096 U	--	0.0001 U	--	0.00013 U	--	0.00012 U	--	0.000099 U	--	0.00013 U	--
1,4-Dichlorobenzene	0.00012 U	--	0.0001 U	--	0.00011 U	--	0.00014 U	--	0.00013 U	--	0.00011 U	--	0.00015 U	--
2-Hexanone	0.00083 U	--	0.00075 U	--	0.00079 U	--	0.001 U	--	0.00094 U	--	0.00078 U	--	0.0011 U	--
Acetone	0.022	--	0.024 J+	--	0.033	--	0.029	--	0.041	--	0.041	--	0.019	--
Benzene	0.00018 U	--	0.00016 U	--	0.00038 J	--	0.00021 U	--	0.0002 U	--	0.0003 J	--	0.00038 J	--
Bromochloromethane	0.00015 U	--	0.00014 U	--	0.00014 U	--	0.00018 U	--	0.00017 U	--	0.00014 U	--	0.00019 U	--
Bromodichloromethane	0.00034 U	--	0.0003 U	--	0.00032 U	--	0.00041 U	--	0.00038 U	--	0.00031 U	--	0.00043 U	--
Bromoform	0.00012 U	--	0.0001 U	--	0.00011 U	--	0.00014 U	--	0.00013 U	--	0.00011 U	--	0.00015 U	--
Bromomethane	0.00028 U	--	0.00025 U	--	0.00027 U	--	0.00034 UJ	--	0.00032 UJ	--	0.00026 UJ	--	0.00036 UJ	--
Carbon Disulfide	0.0024 J	--	0.00034 U	--	0.00072 J	--	0.00046 U	--	0.00043 U	--	0.00036 U	--	0.0022	--
Carbon Tetrachloride	0.00038 U	--	0.00034 U	--	0.00036 U	--	0.00046 U	--	0.00043 U	--	0.00036 U	--	0.00048 U	--
Chlorobenzene	0.00012 U	--	0.00011 U	--	0.00012 U	--	0.00015 U	--	0.00014 U	--	0.00012 U	--	0.00016 U	--
Chloroethane	0.00031 U	--	0.00028 U	--	0.00029 U	--	0.00038 UJ	--	0.00035 UJ	--	0.00029 UJ	--	0.00039 UJ	--
Chloroform	0.00019 U	--	0.00017 U	--	0.00018 U	--	0.00023 U	--	0.00021 U	--	0.00017 U	--	0.00024 U	--
Chloromethane	0.00034 U	--	0.0003 U	--	0.00032 U	--	0.00041 U	--	0.00038 U	--	0.00031 U	--	0.00043 U	--
Cis-1,2-Dichloroethylene	0.00019 U	--	0.00018 U	--	0.00018 U	--	0.00024 U	--	0.00022 U	--	0.00018 U	--	0.00025 U	--
Cis-1,3-Dichloropropene	0.00013 U	--	0.00012 U	--	0.00013 U	--	0.00016 U	--	0.00015 U	--	0.00012 U	--	0.00017 U	--
Cyclohexane	0.00041 U	--	0.00037 U	--	0.00038 U	--	0.00049 U	--	0.00046 U	--	0.00038 U	--	0.00052 U	--
Dibromochloromethane	0.00013 U	--	0.00012 U	--	0.00013 U	--	0.00016 U	--	0.00015 U	--	0.00012 U	--	0.00017 U	--
Dichlorodifluoromethane	0.00028 U	--	0.00025 U	--	0.00027 U	--	0.00034 U	--	0.00032 U	--	0.00026 U	--	0.00036 U	--
Ethylbenzene	0.00016 U	--	0.00014 U	--	0.00015 U	--	0.00019 U	--	0.00018 U	--	0.00015 U	--	0.0002 U	--
Isopropylbenzene (Cumene)	0.00015 U	--	0.00014 U	--	0.00014 U	--	0.00018 U	--	0.00017 U	--	0.00014 U	--	0.00019 U	--
M,P-Xylene	0.0002 J	--	0.000088 U	--	0.000092 U	--	0.00012 U	--	0.00011 U	--	0.000091 U	--	0.00048 J	--

Table E-8
Summary of Data Used in Risk Assessment
Central Landfills Area Soil (0-2 ft-bgs) - Current
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-022-DUP	CFMW-023A	CFMW-023A	CFMW-029	CFMW-029	CFSB-001	CFSB-001	CFSB-002	CFSB-002	CFSB-003	CFSB-003	CFSB-004	CFSB-004	CFSB-005
Sample Lab IDs	460-114828-30	460-115731-9	460-115731-10	460-114141-13	460-114141-14	460-114529-4	460-114529-5	460-114529-7	460-114529-8	460-114529-10	460-114529-11	460-114529-1	460-114529-2	460-114529-15
Sample Name	CFMW-DUP12-SO	CFMW-023a-SO-0-0.5	CFMW-023a-SO-0.5-2	CFMW-029-SO-0-0.5	CFMW-029-SO-0.5-2.0	CFSB-001-SO-0-0.5	CFSB-001-SO-0.5-2	CFSB-002-SO-0-0.5	CFSB-002-SO-0.5-2	CFSB-003-SO-0-0.5	CFSB-003-SO-0.5-2	CFSB-004-SO-0-0.5	CFSB-004-SO-0.5-2	CFSB-005-SO-0-0.5
Sample Depth	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft
Chemical	6/2/2016	6/17/2016	6/17/2016	5/18/2016	5/18/2016	5/25/2016	5/25/2016	5/25/2016	5/25/2016	5/25/2016	5/25/2016	5/25/2016	5/25/2016	5/25/2016
Methyl Acetate	0.0008 U	--	0.012	--	0.00075 U	--	0.00096 U	--	0.0009 U	--	0.00074 U	--	0.001 U	--
Methyl Ethyl Ketone (2-Butanone)	0.00068 U	--	0.0018 J	--	0.00064 U	--	0.00083 U	--	0.00077 U	--	0.00064 U	--	0.00086 U	--
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	0.002 U	--	0.0018 U	--	0.0019 U	--	0.0024 U	--	0.0022 U	--	0.0018 U	--	0.0025 U	--
Methylcyclohexane	0.00047 J	--	0.0004 U	--	0.00042 J	--	0.00054 U	--	0.0005 U	--	0.00041 U	--	0.001 J	--
Methylene Chloride	0.00028 U	--	0.00025 U	--	0.00027 U	--	0.00034 U	--	0.00032 U	--	0.00026 U	--	0.00036 U	--
O-Xylene (1,2-Dimethylbenzene)	0.00014 U	--	0.00013 U	--	0.00013 U	--	0.00017 U	--	0.00016 U	--	0.00013 U	--	0.00018 U	--
Styrene	0.00013 U	--	0.00012 U	--	0.00013 U	--	0.00016 U	--	0.00015 U	--	0.00012 U	--	0.00017 U	--
Tert-Butyl Methyl Ether	0.00015 U	--	0.00014 U	--	0.00014 U	--	0.00018 U	--	0.00017 U	--	0.00014 U	--	0.00019 U	--
Tetrachloroethylene (PCE)	0.00025 U	--	0.00022 U	--	0.00023 U	--	0.0003 U	--	0.00028 U	--	0.00023 U	--	0.00031 U	--
Toluene	0.00036 J	--	0.00016 J	--	0.00048 J	--	0.0002 U	--	0.00019 U	--	0.00025 J	--	0.00098 J	--
Trans-1,2-Dichloroethene	0.00035 U	--	0.00031 U	--	0.00033 U	--	0.00042 U	--	0.00039 U	--	0.00032 U	--	0.00044 U	--
Trans-1,3-Dichloropropene	0.000089 U	--	0.00008 U	--	0.000084 U	--	0.00011 U	--	0.0001 U	--	0.000083 U	--	0.00011 U	--
Trichloroethylene (TCE)	0.00023 U	--	0.00021 U	--	0.00022 U	--	0.00028 U	--	0.00026 U	--	0.00022 U	--	0.00029 U	--
Trichlorofluoromethane	0.0003 U	--	0.00027 U	--	0.00028 U	--	0.00036 U	--	0.00034 U	--	0.00028 U	--	0.00038 U	--
Vinyl Chloride	0.00035 U	--	0.00031 U	--	0.00033 U	--	0.00042 U	--	0.00039 U	--	0.00032 U	--	0.00044 U	--

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-8
Summary of Data Used in Risk Assessment
Central Landfills Area Soil (0-2 ft-bgs) - Current
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-005	CFSB-006	CFSB-006	CFSB-007	CFSB-007	CFSB-008	CFSB-008	CFSB-008-DUP	CFSB-009	CFSB-009	CFSB-009-DUP	CFSB-021	CFSB-021	CFSB-022
Sample Lab IDs	460-114529-17	460-114456-18	460-114456-22	460-114529-14	460-114529-16	460-114456-20	460-114456-17	460-114456-19	460-114456-15	460-114456-13	460-114456-24	460-114456-12	460-114456-9	460-114456-6
Sample Name	CFSB-005-SO-0.5-2	CFSB-006-SO-0-0.5	CFSB-006-SO-0.5-2	CFSB-007-SO-0-0.5	CFSB-007-SO-0.5-2	CFSB-008-SO-0-0.5	CFSB-008-SO-0.5-2	CFSB-DUP4-SO	CFSB-009-SO-0-0.5	CFSB-009-SO-0.5-2	CFSB-DUP6-SO	CFSB-021-SO-0-0.5	CFSB-021-SO-0.5-2	CFSB-022-SO-0-0.5
Sample Depth	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft
Chemical	5/25/2016	5/23/2016	5/23/2016	5/25/2016	5/25/2016	5/23/2016	5/23/2016	5/23/2016	5/23/2016	5/23/2016	5/24/2016	5/23/2016	5/23/2016	5/23/2016
GENERAL CHEMISTRY (mg/kg)														
Fluoride	20.4 J	14.6 J	5.6 J+	11.8 J	25 J	30.6 J	16.2 J	45.4 J	37.6 J	17.9 J	37.9 J+	89.9 J	81.1 J	28.9 J
Cyanide	0.026 J	0.016 U	0.11 J	0.095 J	0.029 J	0.02 J	0.036 J	0.02 J	0.078 J	0.018 U	0.33	0.048 J	0.021 J	0.035 J
METALS (mg/kg)														
"Chromium, Hexavalent - Estimated"	0.353285	0.206083	0.192701	0.289051	0.232847	0.278345	0.232847	0.211436	0.326521	0.214112	0.481752	0.299757	0.173966	0.206083
"Chromium, Trivalent - Calculated"	--	--	--	--	--	--	--	--	--	--	--	--	--	--
"Chromium, Trivalent - Estimated"	12.8467	7.49392	7.0073	10.5109	8.46715	10.1217	8.46715	7.68856	11.8735	7.78589	17.5182	10.9002	6.32603	7.49392
Aluminum	13200	7200	8230	12600	10200	15100	7990	11800	11400	10400	20000	13600	7000	8720
Antimony	0.38 UJ	0.32 UJ	0.39 UJ	0.38 UJ	0.36 UJ	0.39 UJ	0.37 UJ	0.37 UJ	0.43 UJ	0.36 UJ	0.47 UJ	0.37 UJ	0.32 UJ	0.38 UJ
Arsenic	3.7 J	3.6	4	4.4 J	3.1 J	11.8	7.2	11.8	7.1	3.7	5.2	6.7	2.8	6.7
Barium	102	77.4	112	109	90.9	105	41.7	62.1	117	75.7	319	72.3	99.9	91
Beryllium	0.47	0.36	0.28 J	0.51	0.39	0.65	0.24 J	0.4	0.55	0.47	0.85	0.45	0.3 J	0.38
Cadmium	0.29 U	0.24 U	0.3 U	0.29 U	0.28 U	0.29 U	0.28 U	0.28 U	0.32 U	0.27 U	0.36 U	0.28 U	0.24 U	0.29 U
Calcium	17000	34300	23400	20500	3990	2090	49600 J	1210 J	19400	5920	7550 J	1770	87500	18000
Chromium, Total	13.2	7.7	7.2	10.8	8.7	10.4	8.7	7.9	12.2	8	18	11.2	6.5	7.7
Cobalt	11.7 J-	4.4	8	5.6 J-	5.3 J-	5.5	5	4	5.4	4.1	6.3	5	3.5	3.9
Copper	13.7 J+	9.1	8.9 J+	15.1 J+	14.2 J+	10.8	8.2 J	19.6 J	14.5	10.1	24.7 J+	11.6	19.1	8.8
Iron	25000	12000	10700	14300	12100	17900	10400	12000	14300	11300	16400	16800	9060	14700
Lead	7.7 J	6.1 J+	7.1	9.9 J	6.9 J	11.6	19 J	84.2 J	11 J+	8.2 J+	17.1	9.8 J+	8.4 J+	19.3 J+
Magnesium	13400	12000	13300	10100	7430	11000	9670	8450	10500	7900	12600	12000	11700	11500
Manganese	433	313	348	437	302	419	557 J	147 J	337	168	333	156	320	471
Mercury	0.013 U	0.025	0.015 J	0.017 J	0.013 U	0.017 J	0.04	0.067	0.026	0.015 J	0.045	0.015 U	0.024	0.035
Nickel	13.9	9.3 J	10.5	16.3	10.3	13.6 J	8.7 J	7.9 J	10.6 J	9.4 J	13.2	12.4 J	7.8 J	8.9 J
Potassium	1150 J+	541 J	818 J+	1230 J+	858 J+	1340 J	613 J	883 J	864 J	643 J	1270 J+	1010 J	561 J	1020 J
Selenium	0.35 U	0.3 U	0.37 U	0.36 U	0.34 U	0.36 U	0.34 U	0.35 U	0.4 U	0.34 U	1.2 J	0.34 U	0.3 U	0.35 U
Silver	0.69 U	0.58 U	0.72 U	0.7 U	0.66 U	0.71 U	0.67 U	0.68 U	0.78 U	0.66 U	0.86 U	0.67 U	0.58 U	0.69 U
Sodium	35.2 U	29.7 U	36.8 U	45.5 J	45.2 J	36.2 U	34.3 U	34.6 U	57.7 J	37.7 J	81.6 J	34.4 U	33 J	35.4 U
Thallium	0.14 U	0.12 U	0.15 U	0.14 U	0.14 U	0.15 U	0.14 U	0.14 U	0.16 U	0.14 U	0.18 U	0.14 U	0.12 U	0.14 U
Vanadium	20.7	6.2	6.4	11.7	10	15.3	6.9	7.5	9.9	8.1	13	12.4	5	7.6
Zinc	63.2	33.6	38.2	46.2	35.7	39.6	39.6	27.9	44.3	37	58.6	44.3	29.8	48.6
METALS|HEXAVALENT CHROMIUM (mg/kg)														
Chromium, Hexavalent	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PESTICIDES (mg/kg)														
Aldrin	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Alpha Bhc (Alpha Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Alpha Endosulfan	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Beta Bhc (Beta Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Beta Endosulfan	--	--	--	--	--	--	--	--	--	--	--	--	--	--
cis-Chlordane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Delta BHC (Delta Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dieldrin	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endosulfan Sulfate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin Aldehyde	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin Ketone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Gamma Bhc (Lindane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Heptachlor	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Heptachlor Epoxide	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methoxychlor	--	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDD	--	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDT	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Toxaphene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
trans-Chlordane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
POLYCHLORINATED BIPHENYLS (mg/kg)														
PCB-1016 (Aroclor 1016)	0.01 U	0.0096 U	0.011 U	0.01 U	0.01 U	0.011 U	0.01 U	0.01 U	0.011 U	0.0099 U	0.013 U	0.011 U	0.0095 U	0.011 U
PCB-1221 (Aroclor 1221)	0.01 U	0.0096 U	0.011 U	0.01 U	0.01 U	0.011 U	0.01 U	0.01 U	0.011 U	0.0099 U	0.013 U	0.011 U	0.0095 U	0.011 U

Table E-8
Summary of Data Used in Risk Assessment
Central Landfills Area Soil (0-2 ft-bgs) - Current
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-005	CFSB-006	CFSB-006	CFSB-007	CFSB-007	CFSB-008	CFSB-008	CFSB-008-DUP	CFSB-009	CFSB-009	CFSB-009-DUP	CFSB-021	CFSB-021	CFSB-022
Sample Lab IDs	460-114529-17	460-114456-18	460-114456-22	460-114529-14	460-114529-16	460-114456-20	460-114456-17	460-114456-19	460-114456-15	460-114456-13	460-114456-24	460-114456-12	460-114456-9	460-114456-6
Sample Name	CFSB-005-SO-0.5-2	CFSB-006-SO-0-0.5	CFSB-006-SO-0.5-2	CFSB-007-SO-0-0.5	CFSB-007-SO-0.5-2	CFSB-008-SO-0-0.5	CFSB-008-SO-0.5-2	CFSB-DUP4-SO	CFSB-009-SO-0-0.5	CFSB-009-SO-0.5-2	CFSB-DUP6-SO	CFSB-021-SO-0-0.5	CFSB-021-SO-0.5-2	CFSB-022-SO-0-0.5
Sample Depth	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft
Chemical	5/25/2016	5/23/2016	5/23/2016	5/25/2016	5/25/2016	5/23/2016	5/23/2016	5/23/2016	5/23/2016	5/23/2016	5/24/2016	5/23/2016	5/23/2016	5/23/2016
PCB-1232 (Aroclor 1232)	0.01 U	0.0096 U	0.011 U	0.01 U	0.01 U	0.011 U	0.01 U	0.01 U	0.011 U	0.0099 U	0.013 U	0.011 U	0.0095 U	0.011 U
PCB-1242 (Aroclor 1242)	0.01 U	0.0096 U	0.011 U	0.01 U	0.01 U	0.011 U	0.01 U	0.01 U	0.011 U	0.0099 U	0.013 U	0.011 U	0.0095 U	0.011 U
PCB-1248 (Aroclor 1248)	0.01 U	0.0096 U	0.011 U	0.01 U	0.01 U	0.011 U	0.01 U	0.01 U	0.011 U	0.0099 U	0.013 U	0.011 U	0.0095 U	0.011 U
PCB-1254 (Aroclor 1254)	0.01 U	0.0099 U	0.012 U	0.01 U	0.01 U	0.011 U	0.011 U	0.011 U	0.012 U	0.01 U	0.013 U	0.011 U	0.0099 U	0.011 U
PCB-1260 (Aroclor 1260)	0.01 U	0.0099 U	0.012 U	0.01 U	0.01 U	0.011 U	0.011 U	0.011 U	0.012 U	0.01 U	0.013 U	0.011 U	0.0099 U	0.011 U
PCB-1262 (Aroclor 1262)	0.01 U	0.0099 U	0.012 U	0.01 U	0.01 U	0.011 U	0.011 U	0.011 U	0.012 U	0.01 U	0.013 U	0.011 U	0.0099 U	0.011 U
PCB-1268 (Aroclor 1268)	0.01 U	0.0099 U	0.012 U	0.01 U	0.01 U	0.011 U	0.011 U	0.011 U	0.012 U	0.01 U	0.013 U	0.011 U	0.0099 U	0.011 U
Polychlorinated Biphenyl (PCBs)	0.01 U	0.0099 U	0.012 U	0.01 U	0.01 U	0.011 U	0.011 U	0.011 U	0.012 U	0.01 U	0.013 U	0.011 U	0.0099 U	0.011 U
SEMIVOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,2,4,5-Tetrachlorobenzene	0.028 U	0.027 U	0.031 U	0.028 U	0.028 U	0.03 U	0.028 U	0.029 U	0.032 U	0.027 U	0.035 U	0.03 U	0.026 U	0.03 U
1,4-Dioxane (P-Dioxane)	0.1 U	0.096 U	0.11 U	0.1 U	0.1 U	0.11 U	0.1 U	0.1 U	0.11 U	0.099 U	0.13 U	0.11 U	0.095 U	0.11 U
2,3,4,6-Tetrachlorophenol	0.035 U	0.034 U	0.039 U	0.035 U	0.035 U	0.038 U	0.036 U	0.036 U	0.04 U	0.035 U	0.044 U	0.038 U	0.033 U	0.037 U
2,4,5-Trichlorophenol	0.037 U	0.036 U	0.041 U	0.037 U	0.037 U	0.04 U	0.038 U	0.038 U	0.042 U	0.037 U	0.047 U	0.04 U	0.035 U	0.04 U
2,4,6-Trichlorophenol	0.011 U	0.01 U	0.012 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.012 U	0.01 U	0.013 U	0.012 U	0.01 U	0.011 U
2,4-Dichlorophenol	0.0088 U	0.0084 U	0.0098 U	0.0089 U	0.0089 U	0.0095 U	0.009 U	0.009 U	0.01 U	0.0087 U	0.011 U	0.0095 U	0.0084 U	0.0094 U
2,4-Dimethylphenol	0.082 U	0.079 U	0.091 U	0.083 U	0.083 U	0.088 U	0.084 U	0.084 U	0.093 U	0.081 U	0.1 U	0.089 U	0.078 U	0.088 U
2,4-Dinitrophenol	0.28 U	0.27 U	0.31 U	0.28 U	0.28 U	0.3 UJ	0.29 U	0.29 U	0.32 U	0.28 U	0.35 U	0.31 U	0.27 U	0.3 U
2,4-Dinitrotoluene	0.015 U	0.014 U	0.016 U	0.015 U	0.015 U	0.016 U	0.015 U	0.015 U	0.017 U	0.015 U	0.019 U	0.016 U	0.014 U	0.016 U
2,6-Dinitrotoluene	0.02 U	0.019 U	0.022 U	0.02 U	0.02 U	0.021 U	0.02 U	0.02 U	0.023 U	0.02 U	0.025 U	0.022 U	0.019 U	0.021 U
2-Chloronaphthalene	0.0085 U	0.0081 U	0.0094 U	0.0085 U	0.0085 U	0.0091 U	0.0086 U	0.0087 U	0.0096 U	0.0084 U	0.011 U	0.0092 U	0.008 U	0.009 U
2-Chlorophenol	0.0095 U	0.0091 U	0.011 U	0.0096 U	0.0096 U	0.01 U	0.0097 U	0.0097 U	0.011 U	0.0094 U	0.012 U	0.01 U	0.009 U	0.01 U
2-Methylnaphthalene	0.0082 U	0.0079 U	0.0092 U	0.0083 U	0.0083 U	0.0089 U	0.0084 U	0.0085 U	0.0094 U	0.0081 U	0.01 U	0.021 J	0.0078 U	0.0088 U
2-Methylphenol (O-Cresol)	0.016 U	0.016 U	0.018 U	0.016 U	0.016 U	0.017 U	0.017 U	0.017 U	0.018 U	0.016 U	0.02 U	0.018 U	0.015 U	0.017 U
2-Nitroaniline	0.012 U	0.012 U	0.014 U	0.012 U	0.012 U	0.013 U	0.013 U	0.013 U	0.014 U	0.012 U	0.015 U	0.013 U	0.012 U	0.013 U
2-Nitrophenol	0.013 U	0.012 U	0.014 U	0.013 U	0.013 U	0.013 U	0.013 U	0.013 U	0.014 U	0.012 U	0.016 U	0.014 U	0.012 U	0.013 U
3- And 4- Methylphenol (Total)	0.0099 U	0.0095 U	0.011 U	0.01 U	0.01 U	0.011 U	0.01 U	0.01 U	0.026 J	0.0098 U	0.012 U	0.048 J	0.0094 U	0.011 U
3,3'-Dichlorobenzidine	0.042 U	0.04 U	0.046 U	0.042 U	0.042 U	0.045 U	0.042 U	0.043 U	0.047 U	0.041 U	0.052 U	0.045 U	0.04 U	0.044 U
3-Nitroaniline	0.011 U	0.011 U	0.012 U	0.011 U	0.011 U	0.012 U	0.011 U	0.011 U	0.013 U	0.011 U	0.014 U	0.012 U	0.01 U	0.012 U
4,6-Dinitro-2-Methylphenol	0.099 U	0.095 U	0.11 U	0.1 U	0.1 U	0.11 UJ	0.1 U	0.1 U	0.11 U	0.098 U	0.12 U	0.11 U	0.094 U	0.11 U
4-Bromophenyl Phenyl Ether	0.012 U	0.011 U	0.013 U	0.012 U	0.012 U	0.013 U	0.012 U	0.012 U	0.013 U	0.012 U	0.015 U	0.013 U	0.011 U	0.013 U
4-Chloro-3-Methylphenol	0.016 U	0.015 U	0.018 U	0.016 U	0.016 U	0.017 U	0.016 U	0.016 U	0.018 U	0.016 U	0.02 U	0.017 U	0.015 U	0.017 U
4-Chloroaniline	0.0096 U	0.0092 U	0.011 U	0.0097 U	0.0097 U	0.01 U	0.0098 U	0.0099 U	0.011 U	0.0095 U	0.012 U	0.01 U	0.0091 U	0.01 U
4-Chlorophenyl Phenyl Ether	0.011 U	0.011 U	0.012 U	0.011 U	0.011 U	0.012 U	0.011 U	0.011 U	0.013 U	0.011 U	0.014 U	0.012 U	0.011 U	0.012 U
4-Nitroaniline	0.014 U	0.014 U	0.016 U	0.014 U	0.014 U	0.015 U	0.014 U	0.014 U	0.016 U	0.014 U	0.018 U	0.015 U	0.013 U	0.015 U
4-Nitrophenol	0.18 U	0.17 U	0.2 U	0.18 U	0.18 U	0.19 U	0.18 U	0.18 U	0.2 U	0.18 U	0.23 U	0.19 U	0.17 U	0.19 U
Acenaphthene	0.009 U	0.0086 U	0.01 U	0.029 J	0.064 J	0.0097 U	0.0092 U	0.0093 U	0.01 U	0.0089 U	0.012 J	0.11 J	0.0086 U	0.053 J
Acenaphthylene	0.0096 U	0.0092 U	0.011 U	0.0097 U	0.0097 U	0.01 U	0.0098 U	0.0099 U	0.011 U	0.0095 U	0.012 U	0.01 U	0.0091 U	0.01 U
Acetophenone	0.0081 U	0.0078 U	0.009 U	0.0082 U	0.0082 U	0.0087 U	0.0083 U	0.0084 U	0.0092 U	0.008 U	0.01 U	0.0088 U	0.0077 U	0.0087 U
Anthracene	0.035 U	0.034 U	0.039 U	0.093 J	0.14 J	0.038 U	0.036 U	0.036 U	0.04 U	0.035 U	0.044 U	0.16 J	0.034 U	0.075 J
Atrazine	0.017 U	0.016 U	0.018 U	0.017 U	0.017 U	0.018 U	0.017 U	0.017 U	0.019 U	0.016 U	0.021 U	0.018 U	0.016 U	0.018 U
Benzaldehyde	0.028 U	0.027 U	0.032 U	0.029 U	0.029 U	0.031 UJ	0.029 U	0.029 U	0.032 U	0.028 U	0.036 U	0.037 J	0.027 U	0.03 U
Benzo(A)Anthracene	0.036 J	0.03 U	0.051	0.41	0.27	0.034 U	0.07 J	0.032 UJ	0.077	0.031 U	0.093 J	0.85	0.081	0.61
Benzo(A)Pyrene	0.04	0.011 U	0.055	0.44	0.27	0.012 U	0.1 J	0.012 UJ	0.095	0.017 J	0.12 J	1.1	0.1	0.8
Benzo(B)Fluoranthene	0.064	0.015 J	0.1	0.84	0.34	0.016 U	0.15 J	0.015 UJ	0.19	0.041	0.24 J	1.8	0.18	1.2
Benzo(G,H,I)Perylene	0.033 J	0.021 U	0.058 J	0.48	0.15 J	0.023 U	0.1 J	0.022 UJ	0.095 J	0.021 U	0.14 J	1.1	0.078 J	0.57
Benzo(K)Fluoranthene	0.023 J	0.016 U	0.037 J	0.34	0.16	0.017 U	0.062 J	0.017 UJ	0.018 U	0.016 U	0.084 J	0.018 U	0.071	0.017 U
Benzyl Butyl Phthalate	0.011 U	0.011 U	0.013 U	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U	0.013 U	0.011 U	0.014 U	0.012 U	0.011 U	0.012 U
Biphenyl (Diphenyl)	0.032 U	0.03 U	0.035 U	0.032 U	0.032 U	0.034 U	0.032 U	0.033 U	0.036 U	0.031 U	0.04 U	0.035 U	0.03 U	0.034 U
Bis(2-Chloroethoxy) Methane	0.012 U	0.011 U	0.013 U	0.012 U	0.012 U	0.013 U	0.012 U	0.012 U	0.013 U	0.011 U	0.015 U	0.013 U	0.011 U	0.012 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.0088 U	0.0084 U	0.0098 U	0.0089 U	0.0089 U	0.0095 U	0.009 U	0.009 U	0.01 U	0.0087 U	0.011 U	0.0095 U	0.0084 U	0.0094 U
Bis(2-Chloroisopropyl) Ether	0.015 U	0.015 U	0.017 U	0.015 U	0.015 U	0.017 U	0.016 U	0.016 U	0.017 U	0.015 U	0.019 U	0.017 U	0.015 U	0.016 U
Bis(2-Ethylhexyl) Phthalate	0.015 U	0.051 J	0.016 U	0.015 U	0.015 U	0.016 U	0.025 J	0.015 U	0.017 U	0.014 U	0.069 J	0.016 U	0.014 U	0.016 U
Caprolactam	0.027 U	0.026 U	0.03 U	0.027 U	0.027 U	0.029 UJ	0.027 U	0.028 U	0.031 U	0.027 U	0.034 U	0.029 U	0.025 U	0.029 U
Carbazole	0.0092 U	0.0089 U	0.01 U	0.061 J	0.089 J	0.01 U	0.0097 J	0.0095 U	0.012 J	0.0091 U	0.027 J	0.16 J	0.011 J	0.066 J
Chrysene	0.05 J	0.011 J	0.069 J	1.3	0.3 J	0.011 J	0.11 J	0.01 UJ	0.13 J	0.026 J	0.17 J	1.3	0.13 J	0.77
Dibenz(A,H)Anthracene	0.019 U	0.019 U	0.022 U	0.13	0.05	0.021 U	0.027 J	0.02 U	0.023 J	0.019 U	0.04 J	0.3	0.019 J	0.11
Dibenzofuran	0.011 U	0.011 U	0.013 U	0.011 U	0.029 J	0.012 U	0.012 U	0.012 U	0.013 U	0.011 U	0.014 U	0.053 J	0.011 U	0.012 U

Table E-8
Summary of Data Used in Risk Assessment
Central Landfills Area Soil (0-2 ft-bgs) - Current
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-005	CFSB-006	CFSB-006	CFSB-007	CFSB-007	CFSB-008	CFSB-008	CFSB-008-DUP	CFSB-009	CFSB-009	CFSB-009-DUP	CFSB-021	CFSB-021	CFSB-022
Sample Lab IDs	460-114529-17	460-114456-18	460-114456-22	460-114529-14	460-114529-16	460-114456-20	460-114456-17	460-114456-19	460-114456-15	460-114456-13	460-114456-24	460-114456-12	460-114456-9	460-114456-6
Sample Name	CFSB-005-SO-0.5-2	CFSB-006-SO-0-0.5	CFSB-006-SO-0.5-2	CFSB-007-SO-0-0.5	CFSB-007-SO-0.5-2	CFSB-008-SO-0-0.5	CFSB-008-SO-0.5-2	CFSB-DUP4-SO	CFSB-009-SO-0-0.5	CFSB-009-SO-0.5-2	CFSB-DUP6-SO	CFSB-021-SO-0-0.5	CFSB-021-SO-0.5-2	CFSB-022-SO-0-0.5
Sample Depth	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft
Chemical	5/25/2016	5/23/2016	5/23/2016	5/25/2016	5/25/2016	5/23/2016	5/23/2016	5/23/2016	5/23/2016	5/23/2016	5/24/2016	5/23/2016	5/23/2016	5/23/2016
Diethyl Phthalate	0.011 U	0.01 U	0.012 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.012 U	0.01 U	0.013 U	0.012 U	0.01 U	0.011 U
Dimethyl Phthalate	0.011 U	0.01 U	0.012 U	0.011 U	0.011 U	0.012 U	0.011 U	0.011 U	0.012 U	0.011 U	0.014 U	0.012 U	0.01 U	0.012 U
Di-N-Butyl Phthalate	0.011 U	0.017 J	0.012 U	0.011 U	0.011 U	0.012 U	0.011 U	0.011 U	0.013 U	0.011 U	0.014 U	0.012 U	0.011 U	0.012 U
Di-N-Octylphthalate	0.019 U	0.018 U	0.021 U	0.019 U	0.019 U	0.02 U	0.019 U	0.019 U	0.022 U	0.61	0.024 U	0.021 U	0.018 U	0.02 U
Fluoranthene	0.055 J	0.014 J	0.081 J	0.75	0.59	0.012 U	0.14 J	0.011 UJ	0.13 J	0.023 J	0.18 J	1.5	0.14 J	0.98
Fluorene	0.0081 U	0.0078 U	0.009 U	0.02 J	0.063 J	0.0087 U	0.0083 U	0.0084 U	0.0092 U	0.008 U	0.01 U	0.087 J	0.0077 U	0.023 J
Hexachlorobenzene	0.015 U	0.014 U	0.017 U	0.015 U	0.015 U	0.016 U	0.015 U	0.016 U	0.017 U	0.015 U	0.019 U	0.016 U	0.014 U	0.016 U
Hexachlorobutadiene	0.01 U	0.01 U	0.012 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.012 U	0.01 U	0.013 U	0.011 U	0.01 U	0.011 U
Hexachlorocyclopentadiene	0.023 U	0.022 UJ	0.026 UJ	0.023 U	0.023 U	0.025 UJ	0.024 UJ	0.024 UJ	0.026 U	0.023 U	0.029 UJ	0.025 U	0.022 U	0.025 U
Hexachloroethane	0.014 U	0.013 U	0.015 U	0.014 U	0.014 U	0.015 U	0.014 U	0.014 U	0.016 U	0.013 U	0.017 U	0.015 U	0.013 U	0.015 U
Indeno(1,2,3-C,D)Pyrene	0.03 J	0.024 U	0.058 J+	0.42	0.16	0.027 U	0.11 J	0.026 UJ	0.092	0.025 U	0.14 J	1.1	0.078	0.52
Isophorone	0.008 U	0.0077 U	0.012 J	0.25	0.0081 U	0.0086 U	0.0082 U	0.0082 U	0.048 J	0.017 J	0.011 J	0.072 J	0.019 J	0.0086 U
Naphthalene	0.0095 U	0.0091 U	0.011 U	0.0097 J	0.0096 U	0.01 U	0.0097 U	0.0097 U	0.011 U	0.0094 U	0.012 U	0.051 J	0.009 U	0.01 U
Nitrobenzene	0.012 U	0.011 U	0.013 U	0.012 U	0.012 U	0.013 U	0.012 U	0.012 U	0.013 U	0.012 U	0.015 U	0.013 U	0.011 U	0.013 U
N-Nitrosodi-N-Propylamine	0.013 U	0.012 U	0.014 U	0.013 U	0.013 U	0.013 U	0.013 U	0.013 U	0.014 U	0.012 U	0.016 U	0.014 U	0.012 U	0.013 U
N-Nitrosodiphenylamine	0.034 U	0.032 U	0.038 U	0.034 U	0.034 U	0.036 U	0.035 U	0.035 U	0.038 U	0.033 U	0.042 U	0.037 U	0.032 U	0.036 U
Pentachlorophenol	0.045 U	0.043 U	0.05 U	0.046 U	0.046 U	0.049 UJ	0.046 U	0.046 U	0.051 U	0.045 U	0.057 U	0.049 U	0.043 U	0.048 U
Phenanthrene	0.032 J	0.018 J	0.037 J	0.36 J	0.56	0.011 U	0.057 J	0.01 UJ	0.068 J	0.013 J	0.12 J	0.89	0.078 J	0.37 J
Phenol	0.012 U	0.012 U	0.014 U	0.012 U	0.012 U	0.013 U	0.012 U	0.013 U	0.014 U	0.012 U	0.015 U	0.013 U	0.012 U	0.013 U
Pyrene	0.054 J	0.016 U	0.084 J	0.8	0.53	0.018 U	0.12 J	0.017 UJ	0.15 J	0.027 J	0.17 J	1.7	0.17 J	1.1
VOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,1,1-Trichloroethane	0.00032 U	--	0.00038 U	--	0.0003 U	--	0.0003 U	0.00034 U	--	0.00029 U	--	--	0.00042 U	--
1,1,2,2-Tetrachloroethane	0.00014 U	--	0.00017 U	--	0.00014 U	--	0.00013 U	0.00015 U	--	0.00013 U	--	--	0.00019 U	--
1,1,2-Trichloro-1,2,2-Trifluoroethane	0.00037 U	--	0.00043 U	--	0.00035 U	--	0.00035 U	0.0004 U	--	0.00034 U	--	--	0.00048 U	--
1,1,2-Trichloroethane	0.00024 U	--	0.00028 U	--	0.00022 U	--	0.00022 U	0.00025 U	--	0.00022 U	--	--	0.00031 U	--
1,1-Dichloroethane	0.00029 U	--	0.00034 U	--	0.00027 U	--	0.00027 U	0.00031 U	--	0.00026 U	--	--	0.00037 U	--
1,1-Dichloroethene	0.00035 U	--	0.00041 U	--	0.00033 U	--	0.00032 U	0.00037 U	--	0.00032 U	--	--	0.00045 U	--
1,2,3-Trichlorobenzene	0.000093 U	--	0.00011 U	--	0.000087 U	--	0.000087 U	0.000099 U	--	0.000085 U	--	--	0.00012 U	--
1,2,4-Trichlorobenzene	0.00027 U	--	0.00032 U	--	0.00025 U	--	0.00025 U	0.00029 U	--	0.00025 U	--	--	0.00035 U	--
1,2-Dibromo-3-Chloropropane	0.0004 U	--	0.00046 U	--	0.00037 U	--	0.00037 U	0.00042 U	--	0.00036 U	--	--	0.00052 U	--
1,2-Dibromoethane (Ethylene Dibromide)	0.0001 U	--	0.00012 U	--	0.000095 U	--	0.000094 U	0.00011 U	--	0.000093 U	--	--	0.00013 U	--
1,2-Dichlorobenzene	0.00012 U	--	0.00014 U	--	0.00011 U	--	0.00011 U	0.00013 U	--	0.00011 U	--	--	0.00015 U	--
1,2-Dichloroethane	0.000093 U	--	0.00011 U	--	0.000087 U	--	0.000087 U	0.000099 U	--	0.000085 U	--	--	0.00012 U	--
1,2-Dichloropropane	0.00014 U	--	0.00017 U	--	0.00014 U	--	0.00013 U	0.00015 U	--	0.00013 U	--	--	0.00019 U	--
1,3-Dichlorobenzene	0.0001 U	--	0.00012 U	--	0.000095 U	--	0.000094 U	0.00011 U	--	0.000093 U	--	--	0.00013 U	--
1,4-Dichlorobenzene	0.00011 U	--	0.00013 U	--	0.0001 U	--	0.0001 U	0.00012 U	--	0.0001 U	--	--	0.00014 U	--
2-Hexanone	0.00079 U	--	0.00093 U	--	0.00075 U	--	0.00074 U	0.00085 U	--	0.00073 U	--	--	0.001 U	--
Acetone	0.033	--	0.031	--	0.042	--	0.048	0.045	--	0.022	--	--	0.022	--
Benzene	0.00017 U	--	0.0002 U	--	0.00044 J	--	0.00024 J	0.00051 J	--	0.00016 U	--	--	0.00022 U	--
Bromochloromethane	0.00014 U	--	0.00017 U	--	0.00014 U	--	0.00013 U	0.00015 U	--	0.00013 U	--	--	0.00019 U	--
Bromodichloromethane	0.00032 U	--	0.00038 U	--	0.0003 U	--	0.0003 U	0.00034 U	--	0.00029 U	--	--	0.00042 U	--
Bromoform	0.00011 U	--	0.00013 U	--	0.0001 U	--	0.0001 U	0.00012 U	--	0.0001 U	--	--	0.00014 U	--
Bromomethane	0.00027 UJ	--	0.00032 U	--	0.00025 UJ	--	0.00025 U	0.00029 U	--	0.00025 U	--	--	0.00035 U	--
Carbon Disulfide	0.001	--	0.00042 U	--	0.00034 U	--	0.00034 U	0.00039 U	--	0.00033 U	--	--	0.00047 U	--
Carbon Tetrachloride	0.00036 U	--	0.00042 U	--	0.00034 U	--	0.00034 U	0.00039 U	--	0.00033 U	--	--	0.00047 U	--
Chlorobenzene	0.00012 U	--	0.00014 U	--	0.00011 U	--	0.00011 U	0.00013 U	--	0.00011 U	--	--	0.00015 U	--
Chloroethane	0.00029 UJ	--	0.00035 U	--	0.00028 UJ	--	0.00028 U	0.00032 U	--	0.00027 U	--	--	0.00039 U	--
Chloroform	0.00018 U	--	0.00021 U	--	0.00017 U	--	0.00017 U	0.00019 U	--	0.00016 U	--	--	0.00023 U	--
Chloromethane	0.00032 U	--	0.00038 U	--	0.0003 U	--	0.0003 U	0.00034 U	--	0.00029 U	--	--	0.00042 U	--
Cis-1,2-Dichloroethylene	0.00019 U	--	0.00022 U	--	0.00017 U	--	0.00017 U	0.0002 U	--	0.00017 U	--	--	0.00024 U	--
Cis-1,3-Dichloropropene	0.00013 U	--	0.00015 U	--	0.00012 U	--	0.00012 U	0.00014 U	--	0.00012 U	--	--	0.00017 U	--
Cyclohexane	0.00039 U	--	0.00045 U	--	0.00037 U	--	0.00036 U	0.00041 U	--	0.00036 U	--	--	0.00051 U	--
Dibromochloromethane	0.00013 U	--	0.00015 U	--	0.00012 U	--	0.00012 U	0.00014 U	--	0.00012 U	--	--	0.00017 U	--
Dichlorodifluoromethane	0.00027 U	--	0.00032 U	--	0.00025 U	--	0.00025 U	0.00029 U	--	0.00025 U	--	--	0.00035 U	--
Ethylbenzene	0.00015 U	--	0.00018 U	--	0.00014 U	--	0.00014 U	0.00016 U	--	0.00014 U	--	--	0.0002 U	--
Isopropylbenzene (Cumene)	0.00014 U	--	0.00017 U	--	0.00014 U	--	0.00013 U	0.00015 U	--	0.00013 U	--	--	0.00019 U	--
M,P-Xylene	0.00014 J	--	0.00023 J	--	0.000087 U	--	0.000087 UJ	0.00017 J	--	0.000085 U	--	--	0.00012 U	--

Table E-8
Summary of Data Used in Risk Assessment
Central Landfills Area Soil (0-2 ft-bgs) - Current
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-005	CFSB-006	CFSB-006	CFSB-007	CFSB-007	CFSB-008	CFSB-008	CFSB-008-DUP	CFSB-009	CFSB-009	CFSB-009-DUP	CFSB-021	CFSB-021	CFSB-022
Sample Lab IDs	460-114529-17	460-114456-18	460-114456-22	460-114529-14	460-114529-16	460-114456-20	460-114456-17	460-114456-19	460-114456-15	460-114456-13	460-114456-24	460-114456-12	460-114456-9	460-114456-6
Sample Name	CFSB-005-SO-0.5-2	CFSB-006-SO-0-0.5	CFSB-006-SO-0.5-2	CFSB-007-SO-0-0.5	CFSB-007-SO-0.5-2	CFSB-008-SO-0-0.5	CFSB-008-SO-0.5-2	CFSB-DUP4-SO	CFSB-009-SO-0-0.5	CFSB-009-SO-0.5-2	CFSB-DUP6-SO	CFSB-021-SO-0-0.5	CFSB-021-SO-0.5-2	CFSB-022-SO-0-0.5
Sample Depth	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft
Chemical	5/25/2016	5/23/2016	5/23/2016	5/25/2016	5/25/2016	5/23/2016	5/23/2016	5/23/2016	5/23/2016	5/23/2016	5/24/2016	5/23/2016	5/23/2016	5/23/2016
Methyl Acetate	0.00076 U	--	0.0031 J	--	0.00071 U	--	0.0029 J	0.00081 UJ	--	0.0028 J	--	--	0.00099 U	--
Methyl Ethyl Ketone (2-Butanone)	0.00065 U	--	0.0015 J	--	0.00061 U	--	0.0009 J	0.00069 U	--	0.0006 U	--	--	0.00085 U	--
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	0.0019 U	--	0.0022 U	--	0.0018 U	--	0.0017 U	0.002 U	--	0.0017 U	--	--	0.0024 U	--
Methylcyclohexane	0.00042 U	--	0.00049 U	--	0.0004 U	--	0.00039 UJ	0.00078 J	--	0.00039 U	--	--	0.00055 U	--
Methylene Chloride	0.00027 U	--	0.00032 U	--	0.00025 U	--	0.00025 U	0.00029 U	--	0.00025 U	--	--	0.00035 U	--
O-Xylene (1,2-Dimethylbenzene)	0.00013 U	--	0.00016 U	--	0.00013 U	--	0.00013 U	0.00014 U	--	0.00012 U	--	--	0.00018 U	--
Styrene	0.00013 U	--	0.00015 U	--	0.00012 U	--	0.00012 U	0.00014 U	--	0.00012 U	--	--	0.00017 U	--
Tert-Butyl Methyl Ether	0.00014 U	--	0.00017 U	--	0.00014 U	--	0.00013 U	0.00015 U	--	0.00013 U	--	--	0.00019 U	--
Tetrachloroethylene (PCE)	0.00024 U	--	0.00028 U	--	0.00022 U	--	0.00022 U	0.00025 U	--	0.00022 U	--	--	0.00031 U	--
Toluene	0.00034 J	--	0.0004 J	--	0.00024 J	--	0.00072 J	0.00061 J	--	0.0003 J	--	--	0.00021 U	--
Trans-1,2-Dichloroethene	0.00033 U	--	0.00039 U	--	0.00031 U	--	0.00031 U	0.00035 U	--	0.0003 U	--	--	0.00043 U	--
Trans-1,3-Dichloropropene	0.000084 U	--	0.000099 U	--	0.000079 U	--	0.000079 U	0.00009 U	--	0.000078 U	--	--	0.00011 U	--
Trichloroethylene (TCE)	0.00022 U	--	0.00026 U	--	0.00021 U	--	0.0002 U	0.00023 U	--	0.0002 U	--	--	0.00029 U	--
Trichlorofluoromethane	0.00029 U	--	0.00034 U	--	0.00027 U	--	0.00027 U	0.00031 U	--	0.00026 U	--	--	0.00037 U	--
Vinyl Chloride	0.00033 U	--	0.00039 U	--	0.00031 U	--	0.00031 U	0.00035 U	--	0.0003 U	--	--	0.00043 U	--

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-8
Summary of Data Used in Risk Assessment
Central Landfills Area Soil (0-2 ft-bgs) - Current
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-022	CFSB-029	CFSB-029	CFSB-033	CFSB-033	CFSB-034	CFSB-034	CFSB-035	CFSB-035	CFSB-036	CFSB-036	CFSB-037	CFSB-037	CFSB-177
Sample Lab IDs	460-114456-7	460-114456-4	460-114456-3	460-114456-5	460-114456-10	460-114793-52	460-114793-51	460-114793-45	460-114793-46	460-114793-48	460-114793-53	460-114793-49	460-114793-54	180-79272-7, 460-159191-7
Sample Name	CFSB-022-SO-0.5-2	CFSB-029-SO-0-0.5	CFSB-029-SO-0.5-2	CFSB-033-SO-0-0.5	CFSB-033-SO-0.5-2	CFSB-034-SO-0-0.5	CFSB-034-SO-0.5-2	CFSB-035-SO-0-0.5	CFSB-035-SO-0.5-2	CFSB-036-SO-0-0.5	CFSB-036-SO-0.5-2	CFSB-037-SO-0-0.5	CFSB-037-SO-0.5-2	CFSB-177-SO-0-0.5
Sample Depth	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft
Chemical	5/23/2016	5/23/2016	5/23/2016	5/23/2016	5/23/2016	5/31/2016	5/31/2016	5/31/2016	5/31/2016	5/31/2016	5/31/2016	5/31/2016	5/31/2016	6/25/2018
GENERAL CHEMISTRY (mg/kg)														
Fluoride	24.7 J	62 J	21.7 J	95.8 J	75.3 J	210 J-	20.4 J	180 J	116 J	86.8 J	104 J-	19.4 J	15.5 J	16 J-
Cyanide	0.072 J	0.016 J	0.015 U	0.18	0.85	0.097 J	0.02 J	0.2	0.051 J	0.05 J	0.024 J	0.026 J	0.029 J	0.061 U
METALS (mg/kg)														
"Chromium, Hexavalent - Estimated"	0.176642	0.254258	0.224818	0.256934	0.275669	0.251582	0.232847	0.36399	0.289051	2.26959	0.26764	0.264964	0.291727	0.187348
"Chromium, Trivalent - Calculated"	--	--	--	--	--	--	--	--	--	--	--	--	--	--
"Chromium, Trivalent - Estimated"	6.42336	9.24574	8.17518	9.34307	10.0243	9.14842	8.46715	13.236	10.5109	82.5304	9.73236	9.63504	10.6083	6.81265
Aluminum	7510	9790	8220	12500	12100	14800	9920	10800	10900	9820	8750	12100	9600	20700
Antimony	0.37 UJ	0.33 UJ	0.32 UJ	0.38 UJ	0.37 UJ	0.49 UJ	0.46 UJ	0.45 U	0.41 UJ	0.57 J	0.43 UJ	0.43 UJ	0.4 UJ	0.26 UJ
Arsenic	4.1	4	3.8	4.7	6	3.7	4.7	6.2	4.2	6.2	3.9	5.5	4.8	4.1
Barium	102	58	40.7	55.3	82.9	80.8	89.5	73.4	67.3	76.7	48.3	89.9	69.3	420
Beryllium	0.36	0.39	0.32	0.43	0.51	0.47 J	0.4 J	0.42 J	0.41	0.37 J	0.36 J	0.44	0.38 J	0.91
Cadmium	0.28 U	0.25 U	0.24 U	0.29 U	0.28 U	0.37 U	0.35 U	0.34 U	0.31 U	0.33 U	0.32 U	0.33 U	0.31 U	0.3 U
Calcium	27800	30500	23300	36900	18200	22000	17600	13000	13300	22200	26600	23800	26200	1400
Chromium, Total	6.6	9.5	8.4	9.6	10.3	9.4	8.7	13.6	10.8	84.8	10	9.9	10.9	7
Cobalt	3.5	4.7	4.5	4.8	4.3	5.1	4.6	5.1	4.7	6.8	4.8	5.2	4.7	6.5
Copper	10.3	12.7	9.9	13.3	45.7	13.9 J	13.4 J	21.9	19.5 J	60 J	14.6 J	18.8 J	13.7 J	8.5
Iron	9860	13800	11500	12700	14100	13800	13800	17800	16900	37100	12800	16000	13400	12600
Lead	7.8 J+	7.8 J+	8.7 J+	10.4 J+	13.7 J+	17 J	8 J	9.5	7.9 J	21.9 J	9.4 J	16.5 J	10 J	13.2
Magnesium	8020	10800	8610	12000	10700	11300	12500	9260	9500	8360	9740	12200	10500	7060
Manganese	478	334	218	311	323	367	366	760	446	548	334	487	348	529
Mercury	0.042	0.018 J	0.012 J	0.023	0.012 J	0.02	0.02 J	0.021	0.025	0.025	0.026	0.022	0.021	0.01 J
Nickel	7.4 J	11.3 J	9.8 J	20.4 J	18.1 J	19.8 J	9.7 J	41.4	21 J	80.5 J	26.7 J	15.1 J	10.4 J	12.1
Potassium	756 J	810 J	557 J	758 J	957 J	730	925	546	878	635	621	772	676	1010
Selenium	0.35 U	0.31 U	0.3 U	0.43 J	0.35 U	0.46 U	0.43 U	1.1 J	0.62 J	1.2 J	0.49 J	0.4 U	0.38 U	0.26 U
Silver	0.68 U	0.6 U	0.59 U	0.69 U	0.68 U	0.9 U	0.84 U	0.82 U	0.75 U	0.8 U	0.78 U	0.79 U	0.74 U	0.55 U
Sodium	34.6 U	30.5 U	30.1 U	57.9 J	88.3 J	92 J	248	340	508	63.9 J	137	40.2 U	42.6 J	56.5 J
Thallium	0.14 U	0.12 U	0.12 U	0.14 U	0.14 U	0.18 U	0.17 U	0.17 U	0.15 U	0.17 U	0.16 U	0.16 U	0.15 U	0.11 U
Vanadium	5.7	8.5	6.4	11.3	16.4	13	9.7	11.8	10	18.1	10.9	11.1	8.4	11.4 J+
Zinc	34.6	39.6	30.9	42.2	69.4	51.5	35	28.9	33	52.5	41.2	42.4	37.8	48.4
METALS|HEXAVALENT CHROMIUM (mg/kg)														
Chromium, Hexavalent	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PESTICIDES (mg/kg)														
Aldrin	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Alpha Bhc (Alpha Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Alpha Endosulfan	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Beta Bhc (Beta Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Beta Endosulfan	--	--	--	--	--	--	--	--	--	--	--	--	--	--
cis-Chlordane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Delta BHC (Delta Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dieldrin	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endosulfan Sulfate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin Aldehyde	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin Ketone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Gamma Bhc (Lindane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Heptachlor	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Heptachlor Epoxide	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methoxychlor	--	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDD	--	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDT	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Toxaphene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
trans-Chlordane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
POLYCHLORINATED BIPHENYLS (mg/kg)														
PCB-1016 (Aroclor 1016)	0.011 U	0.0097 U	0.0095 U	0.0099 U	0.0097 U	0.011 U	0.011 U	0.0099 U	0.0098 U	0.011 U	0.01 U	0.01 U	0.0098 U	--
PCB-1221 (Aroclor 1221)	0.011 U	0.0097 U	0.0095 U	0.0099 U	0.0097 U	0.011 U	0.011 U	0.0099 U	0.0098 U	0.011 U	0.01 U	0.01 U	0.0098 U	--

Table E-8
Summary of Data Used in Risk Assessment
Central Landfills Area Soil (0-2 ft-bgs) - Current
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-022	CFSB-029	CFSB-029	CFSB-033	CFSB-033	CFSB-034	CFSB-034	CFSB-035	CFSB-035	CFSB-036	CFSB-036	CFSB-037	CFSB-037	CFSB-177
Sample Lab IDs	460-114456-7	460-114456-4	460-114456-3	460-114456-5	460-114456-10	460-114793-52	460-114793-51	460-114793-45	460-114793-46	460-114793-48	460-114793-53	460-114793-49	460-114793-54	180-79272-7, 460-159191-7
Sample Name	CFSB-022-SO-0.5-2	CFSB-029-SO-0-0.5	CFSB-029-SO-0.5-2	CFSB-033-SO-0-0.5	CFSB-033-SO-0.5-2	CFSB-034-SO-0-0.5	CFSB-034-SO-0.5-2	CFSB-035-SO-0-0.5	CFSB-035-SO-0.5-2	CFSB-036-SO-0-0.5	CFSB-036-SO-0.5-2	CFSB-037-SO-0-0.5	CFSB-037-SO-0.5-2	CFSB-177-SO-0-0.5
Sample Depth	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft
Chemical	5/23/2016	5/23/2016	5/23/2016	5/23/2016	5/23/2016	5/31/2016	5/31/2016	5/31/2016	5/31/2016	5/31/2016	5/31/2016	5/31/2016	5/31/2016	6/25/2018
PCB-1232 (Aroclor 1232)	0.011 U	0.0097 U	0.0095 U	0.0099 U	0.0097 U	0.011 U	0.011 U	0.0099 U	0.0098 U	0.011 U	0.01 U	0.01 U	0.0098 U	--
PCB-1242 (Aroclor 1242)	0.011 U	0.0097 U	0.0095 U	0.0099 U	0.0097 U	0.011 U	0.011 U	0.0099 U	0.0098 U	0.011 U	0.01 U	0.01 U	0.0098 U	--
PCB-1248 (Aroclor 1248)	0.011 U	0.0097 U	0.0095 U	0.0099 U	0.0097 U	0.011 U	0.011 U	0.0099 U	0.0098 U	0.011 U	0.01 U	0.01 U	0.0098 U	--
PCB-1254 (Aroclor 1254)	0.011 U	0.01 U	0.0098 U	0.01 U	0.01 U	0.011 U	0.011 U	0.01 U	0.01 U	0.011 U	0.01 U	0.01 U	0.01 U	--
PCB-1260 (Aroclor 1260)	0.011 U	0.01 U	0.0098 U	0.01 U	0.01 U	0.011 U	0.011 U	0.01 U	0.01 U	0.011 U	0.01 U	0.01 U	0.01 U	--
PCB-1262 (Aroclor 1262)	0.011 U	0.01 U	0.0098 U	0.01 U	0.01 U	0.011 U	0.011 U	0.01 U	0.01 U	0.011 U	0.01 U	0.01 U	0.01 U	--
PCB-1268 (Aroclor 1268)	0.011 U	0.01 U	0.0098 U	0.01 U	0.01 U	0.011 U	0.011 U	0.01 U	0.01 U	0.011 U	0.01 U	0.01 U	0.01 U	--
Polychlorinated Biphenyl (PCBs)	0.011 U	0.01 U	0.0098 U	0.01 U	0.01 U	0.011 U	0.011 U	0.01 U	0.01 U	0.011 U	0.01 U	0.01 U	0.01 U	--
SEMIVOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,2,4,5-Tetrachlorobenzene	0.03 U	0.027 U	0.026 U	0.027 U	0.13 U	0.29 UJ	0.03 UJ	0.027 U	0.027 U	0.029 U	0.028 UJ	0.027 U	0.027 UJ	0.0015 U
1,4-Dioxane (P-Dioxane)	0.11 U	0.096 U	0.094 U	0.099 U	0.48 U	1.1 UJ	0.11 UJ	0.099 U	0.097 U	0.11 U	0.1 UJ	0.099 U	0.097 UJ	0.011 U
2,3,4,6-Tetrachlorophenol	0.038 U	0.034 U	0.033 U	0.035 U	0.17 U	0.37 UJ	0.038 UJ	0.035 U	0.034 U	0.037 U	0.035 UJ	0.035 U	0.034 UJ	0.015 U
2,4,5-Trichlorophenol	0.04 U	0.036 U	0.035 U	0.037 U	0.18 U	0.39 UJ	0.04 UJ	0.037 U	0.036 U	0.039 U	0.037 UJ	0.037 U	0.036 UJ	0.0026 U
2,4,6-Trichlorophenol	0.011 U	0.01 U	0.01 U	0.01 U	0.051 U	0.11 UJ	0.011 UJ	0.01 U	0.01 U	0.011 U	0.011 UJ	0.011 U	0.01 UJ	0.002 U
2,4-Dichlorophenol	0.0095 U	0.0085 U	0.0083 U	0.0087 U	0.042 U	0.093 UJ	0.0095 UJ	0.0087 U	0.0086 U	0.0093 U	0.0088 UJ	0.0087 U	0.0086 UJ	0.0028 U
2,4-Dimethylphenol	0.088 U	0.079 U	0.077 U	0.081 U	0.39 U	0.87 UJ	0.088 UJ	0.081 U	0.08 U	0.087 U	0.082 UJ	0.081 U	0.08 UJ	0.0022 U
2,4-Dinitrophenol	0.3 U	0.27 U	0.27 U	0.28 U	1.4 U	3 UJ	0.3 UJ	0.28 U	0.27 U	0.3 U	0.28 UJ	0.28 U	0.27 UJ	0.096 U
2,4-Dinitrotoluene	0.016 U	0.014 U	0.014 U	0.015 U	0.071 U	0.16 UJ	0.016 UJ	0.015 U	0.014 U	0.016 U	0.015 UJ	0.015 U	0.014 UJ	0.0018 U
2,6-Dinitrotoluene	0.021 U	0.019 U	0.019 U	0.02 U	0.096 U	0.21 UJ	0.021 UJ	0.02 U	0.019 U	0.021 U	0.02 UJ	0.02 U	0.019 UJ	0.0022 U
2-Chloronaphthalene	0.0091 U	0.0082 U	0.008 U	0.0084 U	0.041 U	0.089 UJ	0.0091 UJ	0.0084 U	0.0082 U	0.009 U	0.0085 UJ	0.0084 U	0.0082 UJ	0.0016 U
2-Chlorophenol	0.01 U	0.0091 U	0.0089 U	0.0094 U	0.046 U	0.1 UJ	0.01 UJ	0.0094 U	0.0092 U	0.01 U	0.0095 UJ	0.0094 U	0.0092 UJ	0.0017 U
2-Methylnaphthalene	0.0089 U	0.0079 U	0.009 J	0.0082 U	0.04 U	0.24 J-	0.0089 UJ	0.0081 U	0.008 U	0.018 J	0.0083 UJ	0.0082 U	0.008 UJ	0.0017 U
2-Methylphenol (O-Cresol)	0.017 U	0.016 U	0.015 U	0.016 U	0.078 U	0.17 UJ	0.018 UJ	0.016 U	0.016 U	0.017 U	0.016 UJ	0.016 U	0.016 UJ	0.01 U
2-Nitroaniline	0.013 U	0.012 U	0.012 U	0.012 U	0.059 U	0.13 UJ	0.013 UJ	0.012 U	0.012 U	0.013 U	0.012 UJ	0.012 U	0.012 UJ	0.016 U
2-Nitrophenol	0.013 U	0.012 U	0.012 U	0.012 U	0.06 U	0.13 UJ	0.013 UJ	0.012 U	0.012 U	0.013 U	0.013 UJ	0.012 U	0.012 UJ	0.002 U
3- And 4- Methylphenol (Total)	0.011 U	0.0096 U	0.012 J	0.0098 U	0.048 U	0.1 UJ	0.011 UJ	0.0098 U	0.0097 U	0.011 U	0.01 UJ	0.0098 U	0.0097 UJ	--
3,3'-Dichlorobenzidine	0.045 U	0.04 U	0.039 U	0.041 U	0.2 U	0.44 UJ	0.045 UJ	0.041 U	0.041 U	0.044 U	0.042 UJ	0.041 U	0.04 UJ	0.033 U
3-Nitroaniline	0.012 U	0.011 U	0.01 U	0.011 U	0.053 U	0.12 UJ	0.012 UJ	0.011 U	0.011 U	0.012 U	0.011 UJ	0.011 U	0.011 UJ	0.0091 U
4,6-Dinitro-2-Methylphenol	0.11 U	0.096 U	0.094 U	0.099 U	0.48 U	1 UJ	0.11 UJ	0.098 U	0.097 U	0.11 U	0.1 UJ	0.099 U	0.097 UJ	0.062 U
4-Bromophenyl Phenyl Ether	0.013 U	0.011 U	0.011 U	0.012 U	0.056 U	0.12 UJ	0.013 UJ	0.012 U	0.011 U	0.012 U	0.012 UJ	0.012 U	0.011 UJ	0.0025 U
4-Chloro-3-Methylphenol	0.017 U	0.015 U	0.015 U	0.016 U	0.077 U	0.17 UJ	0.017 UJ	0.016 U	0.016 U	0.017 U	0.016 UJ	0.016 U	0.016 UJ	0.0017 U
4-Chloroaniline	0.01 U	0.0092 U	0.009 U	0.0095 U	0.046 U	0.1 UJ	0.01 UJ	0.0095 U	0.0093 U	0.01 U	0.0096 UJ	0.0095 U	0.0093 UJ	0.0012 U
4-Chlorophenyl Phenyl Ether	0.012 U	0.011 U	0.011 U	0.011 U	0.054 U	0.12 UJ	0.012 UJ	0.011 U	0.011 U	0.012 U	0.011 UJ	0.011 U	0.011 UJ	0.0022 U
4-Nitroaniline	0.015 U	0.014 U	0.013 U	0.014 U	0.068 U	0.15 UJ	0.015 UJ	0.014 U	0.014 U	0.015 U	0.014 UJ	0.014 U	0.014 UJ	0.0017 U
4-Nitrophenol	0.19 U	0.17 U	0.17 U	0.18 U	0.86 U	1.9 UJ	0.19 UJ	0.18 U	0.17 U	0.19 U	0.18 UJ	0.18 U	0.17 UJ	0.025 U
Acenaphthene	0.018 J	0.021 J	0.041 J	0.051 J	0.043 U	1.7 J-	0.012 J	0.022 J	0.0088 U	0.065 J	0.014 J-	0.013 J	0.0088 UJ	0.0021 U
Acenaphthylene	0.01 U	0.0092 U	0.009 U	0.0095 U	0.046 U	0.1 UJ	0.01 UJ	0.0095 U	0.0093 U	0.01 U	0.0096 UJ	0.0095 U	0.0093 UJ	0.0016 U
Acetophenone	0.0087 U	0.0078 U	0.0077 U	0.008 U	0.039 U	0.086 UJ	0.0088 UJ	0.008 U	0.0079 U	0.0091 J	0.0081 UJ	0.008 U	0.0079 UJ	0.0019 U
Anthracene	0.038 U	0.039 J	0.072 J	0.084 J	0.17 U	3.5 J-	0.038 U	0.059 J	0.034 U	0.14 J	0.056 J-	0.035 U	0.034 UJ	0.0019 U
Atrazine	0.018 U	0.016 U	0.016 U	0.016 U	0.08 U	0.17 UJ	0.018 UJ	0.016 U	0.016 U	0.018 U	0.017 UJ	0.016 U	0.016 UJ	0.016 UJ
Benzaldehyde	0.031 U	0.027 U	0.027 U	0.028 U	0.14 U	0.3 UJ	0.031 UJ	0.028 U	0.028 U	0.03 U	0.029 UJ	0.028 U	0.028 UJ	0.0049 J
Benzo(A)Anthracene	0.18	0.31	0.63	0.6	0.81	19 J-	0.1	0.8	0.24	1	0.49 J-	0.16	0.1 J-	0.013 J
Benzo(A)Pyrene	0.2	0.39	0.82	0.7	1.1	25 J-	0.12	0.57	0.19	1	0.42 J-	0.2	0.11 J-	0.019 J
Benzo(B)Fluoranthene	0.33	0.79	1.5	1.5	2	29 J-	0.15	3.5	1.1	3.9	1.8 J-	0.31	0.16 J-	0.051 J
Benzo(G,H,I)Perylene	0.14 J	0.48	1.1	0.82	1.6 J	22 J-	0.15 J	0.86	0.29 J	2	0.97 J-	0.25 J	0.13 J-	0.027 J
Benzo(K)Fluoranthene	0.14	0.016 U	0.51	0.016 U	0.66	14 J-	0.057	0.9	0.31	1.2	0.57 J-	0.11	0.053 J-	0.018 J
Benzyl Butyl Phthalate	0.012 U	0.011 U	0.011 U	0.011 U	0.055 U	0.12 UJ	0.012 UJ	0.011 U	0.011 U	0.98	0.22 J-	0.057 J	0.034 J-	0.025 U
Biphenyl (Diphenyl)	0.034 U	0.031 U	0.03 U	0.031 U	0.15 U	0.34 UJ	0.034 UJ	0.031 U	0.031 U	0.034 U	0.032 UJ	0.032 U	0.031 UJ	0.0015 U
Bis(2-Chloroethoxy) Methane	0.013 U	0.011 U	0.011 U	0.012 U	0.056 U	0.12 UJ	0.013 UJ	0.011 U	0.011 U	0.012 U	0.012 UJ	0.012 U	0.011 UJ	0.0017 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.0095 U	0.0085 U	0.0083 U	0.0087 U	0.042 U	0.093 UJ	0.0095 UJ	0.0087 U	0.0086 U	0.0093 U	0.0088 UJ	0.0087 U	0.0086 UJ	0.0013 U
Bis(2-Chloroisopropyl) Ether	0.017 U	0.015 U	0.014 U	0.015 U	0.074 U	0.16 UJ	0.017 UJ	0.015 U	0.015 U	0.016 U	0.015 UJ	0.015 U	0.015 UJ	0.0026 U
Bis(2-Ethylhexyl) Phthalate	0.016 U	0.014 U	0.014 U	0.014 U	0.07 U	0.15 UJ	0.016 UJ	0.014 U	0.014 U	0.067 J+	0.015 UJ	0.087 J+	0.069 J	0.038 UJ
Caprolactam	0.029 U	0.026 U	0.025 U	0.027 U	0.13 U	0.28 UJ	0.029 UJ	0.066 J	0.039 J	0.028 U	0.027 UJ	0.027 U	0.026 UJ	0.023 U
Carbazole	0.017 J	0.045 J	0.08 J	0.12 J	0.4 J	2.8 J-	0.018 J	0.065 J	0.028 J	0.12 J	0.059 J-	0.022 J	0.013 J-	0.0018 J
Chrysene	0.25 J	0.51	0.93	1	2.3	24 J-	0.13 J	1.8	0.57	2.3	1.1 J-	0.23 J	0.12 J-	0.029 J
Dibenz(A,H)Anthracene	0.038 J	0.12	0.26	0.23	0.43	5.2 J-	0.021 U	0.37	0.13	0.65	0.35 J-	0.05	0.027 J-	0.0054 J
Dibenzofuran	0.012 U	0.012 J	0.014 J	0.02 J	0.054 U	0.59 J-	0.012 U	0.012 J	0.011 U	0.037 J	0.011 UJ	0.011 U	0.011 UJ	0.0016 U

Table E-8
Summary of Data Used in Risk Assessment
Central Landfills Area Soil (0-2 ft-bgs) - Current
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-022	CFSB-029	CFSB-029	CFSB-033	CFSB-033	CFSB-034	CFSB-034	CFSB-035	CFSB-035	CFSB-036	CFSB-036	CFSB-037	CFSB-037	CFSB-177
Sample Lab IDs	460-114456-7	460-114456-4	460-114456-3	460-114456-5	460-114456-10	460-114793-52	460-114793-51	460-114793-45	460-114793-46	460-114793-48	460-114793-53	460-114793-49	460-114793-54	180-79272-7, 460-159191-7
Sample Name	CFSB-022-SO-0.5-2	CFSB-029-SO-0-0.5	CFSB-029-SO-0.5-2	CFSB-033-SO-0-0.5	CFSB-033-SO-0.5-2	CFSB-034-SO-0-0.5	CFSB-034-SO-0.5-2	CFSB-035-SO-0-0.5	CFSB-035-SO-0.5-2	CFSB-036-SO-0-0.5	CFSB-036-SO-0.5-2	CFSB-037-SO-0-0.5	CFSB-037-SO-0.5-2	CFSB-177-SO-0-0.5
Sample Depth	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft
Chemical	5/23/2016	5/23/2016	5/23/2016	5/23/2016	5/23/2016	5/31/2016	5/31/2016	5/31/2016	5/31/2016	5/31/2016	5/31/2016	5/31/2016	5/31/2016	6/25/2018
Diethyl Phthalate	0.011 U	0.01 U	0.01 U	0.01 U	0.051 U	0.11 UJ	0.011 UJ	0.01 U	0.01 U	0.011 U	0.011 UJ	0.011 U	0.01 UJ	0.011 U
Dimethyl Phthalate	0.012 U	0.01 U	0.01 U	0.011 U	0.052 U	0.11 UJ	0.012 UJ	0.011 U	0.011 U	0.011 U	0.011 UJ	0.011 U	0.011 UJ	0.0013 U
Di-N-Butyl Phthalate	0.012 U	0.011 U	0.011 U	0.056 J	0.054 U	0.12 UJ	0.012 UJ	0.011 U	0.011 U	0.012 U	0.013 J-	0.011 U	0.011 UJ	0.016 U
Di-N-Octylphthalate	0.02 U	0.018 U	0.018 U	0.019 U	0.091 U	0.2 UJ	0.02 UJ	0.019 U	0.018 U	0.02 U	0.019 UJ	0.019 U	0.018 UJ	0.021 U
Fluoranthene	0.38 J	0.48	0.87	1.1	2.2	35 J-	0.18 J	0.78	0.29 J	1.6	0.62 J-	0.28 J	0.15 J-	0.026 J
Fluorene	0.012 J	0.016 J	0.024 J	0.031 J	0.039 U	1.1 J-	0.0088 U	0.014 J	0.0079 U	0.057 J	0.01 J-	0.01 J	0.0079 UJ	0.0014 U
Hexachlorobenzene	0.016 U	0.015 U	0.014 U	0.015 U	0.073 U	0.16 UJ	0.016 UJ	0.015 U	0.015 U	0.016 U	0.015 UJ	0.015 U	0.015 UJ	0.0026 U
Hexachlorobutadiene	0.011 U	0.01 U	0.0099 U	0.01 U	0.05 U	0.11 UJ	0.011 UJ	0.01 U	0.01 U	0.011 U	0.011 UJ	0.01 U	0.01 UJ	0.0021 UJ
Hexachlorocyclopentadiene	0.025 U	0.022 U	0.022 U	0.023 U	0.11 U	0.25 UJ	0.025 UJ	0.023 U	0.023 U	0.025 UJ	0.023 UJ	0.023 UJ	0.023 UJ	0.0018 UJ
Hexachloroethane	0.015 U	0.013 U	0.013 U	0.014 U	0.066 U	0.14 UJ	0.015 UJ	0.013 U	0.013 U	0.014 U	0.014 UJ	0.014 U	0.013 UJ	0.0018 U
Indeno(1,2,3-C,D)Pyrene	0.14	0.44	0.98	0.82	1.4	23 J	0.13	1	0.32	2.2	1.1 J	0.28	0.14 J	0.021 J
Isophorone	0.024 J	0.034 J	0.11 J	0.036 J	0.039 U	0.085 UJ	0.0086 UJ	0.016 J	0.0078 U	0.069 J	0.008 UJ	0.011 J	0.0078 UJ	0.0018 U
Naphthalene	0.01 U	0.011 J	0.01 J	0.011 J	0.046 U	0.45 J-	0.01 U	0.014 J	0.0092 U	0.052 J	0.0095 UJ	0.0094 U	0.0092 UJ	0.0018 J
Nitrobenzene	0.013 U	0.011 U	0.011 U	0.012 U	0.056 U	0.12 UJ	0.013 UJ	0.012 U	0.011 U	0.012 U	0.012 UJ	0.012 U	0.011 UJ	0.013 U
N-Nitrosodi-N-Propylamine	0.013 U	0.012 U	0.012 U	0.012 U	0.06 U	0.13 UJ	0.013 UJ	0.012 U	0.012 U	0.013 U	0.013 UJ	0.012 U	0.012 UJ	0.0024 U
N-Nitrosodiphenylamine	0.036 U	0.033 U	0.032 U	0.034 U	0.16 U	0.36 UJ	0.036 UJ	0.033 U	0.033 U	0.036 U	0.034 UJ	0.034 U	0.033 UJ	0.012 U
Pentachlorophenol	0.049 U	0.043 U	0.043 U	0.045 U	0.22 U	0.48 UJ	0.049 UJ	0.045 U	0.044 U	0.048 U	0.045 UJ	0.045 U	0.044 UJ	0.057 U
Phenanthrene	0.15 J	0.26 J	0.37	0.48	0.66 J	18 J-	0.12 J	0.3 J	0.13 J	0.78	0.24 J-	0.14 J	0.094 J-	0.01 J
Phenol	0.013 U	0.012 U	0.011 U	0.012 U	0.059 U	0.13 UJ	0.013 UJ	0.012 U	0.012 U	0.016 J	0.012 UJ	0.012 U	0.012 UJ	0.011 U
Pyrene	0.46	0.59	0.92	1.3	1.7 J	36 J-	0.25 J	0.73	0.26 J	1.6	0.66 J-	0.29 J	0.17 J-	0.028 J
VOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,1,1-Trichloroethane	0.00034 U	--	0.00031 U	--	0.00032 U	--	0.00036 U	--	0.00032 U	--	0.00039 U	--	0.00028 U	--
1,1,2,2-Tetrachloroethane	0.00015 U	--	0.00014 U	--	0.00015 U	--	0.00016 U	--	0.00014 U	--	0.00017 U	--	0.00013 U	--
1,1,2-Trichloro-1,2,2-Trifluoroethane	0.0004 U	--	0.00036 U	--	0.00038 U	--	0.00042 U	--	0.00037 U	--	0.00045 U	--	0.00033 U	--
1,1,2-Trichloroethane	0.00025 U	--	0.00023 U	--	0.00024 U	--	0.00027 U	--	0.00024 U	--	0.00028 U	--	0.00021 U	--
1,1-Dichloroethane	0.00031 U	--	0.00028 U	--	0.00029 U	--	0.00032 U	--	0.00029 U	--	0.00035 U	--	0.00025 U	--
1,1-Dichloroethene	0.00037 U	--	0.00033 U	--	0.00035 U	--	0.00039 U	--	0.00035 U	--	0.00042 U	--	0.0003 U	--
1,2,3-Trichlorobenzene	0.0001 U	--	0.00009 U	--	0.000094 U	--	0.0001 U	--	0.000093 U	--	0.00011 U	--	0.000082 U	--
1,2,4-Trichlorobenzene	0.00029 U	--	0.00026 U	--	0.00027 U	--	0.0003 U	--	0.00027 U	--	0.00032 U	--	0.00024 U	--
1,2-Dibromo-3-Chloropropane	0.00043 U	--	0.00038 U	--	0.0004 U	--	0.00045 U	--	0.0004 U	--	0.00048 U	--	0.00035 U	--
1,2-Dibromoethane (Ethylene Dibromide)	0.00011 U	--	0.000098 U	--	0.0001 U	--	0.00011 U	--	0.0001 U	--	0.00012 U	--	0.000089 U	--
1,2-Dichlorobenzene	0.00013 U	--	0.00011 U	--	0.00012 U	--	0.00013 U	--	0.00012 U	--	0.00014 U	--	0.0001 U	--
1,2-Dichloroethane	0.0001 U	--	0.00009 U	--	0.000094 U	--	0.0001 U	--	0.000093 U	--	0.00011 U	--	0.000082 U	--
1,2-Dichloropropane	0.00015 U	--	0.00014 U	--	0.00015 U	--	0.00016 U	--	0.00014 U	--	0.00017 U	--	0.00013 U	--
1,3-Dichlorobenzene	0.00011 U	--	0.000098 U	--	0.0001 U	--	0.00011 U	--	0.0001 U	--	0.00012 U	--	0.000089 U	--
1,4-Dichlorobenzene	0.00012 U	--	0.00011 U	--	0.00011 U	--	0.00012 U	--	0.00011 U	--	0.00013 U	--	0.000097 U	--
2-Hexanone	0.00085 U	--	0.00077 U	--	0.0008 U	--	0.00089 U	--	0.00079 U	--	0.00095 U	--	0.0007 U	--
Acetone	0.023	--	0.012	--	0.02	--	0.019	--	0.014	--	0.0011 U	--	0.0079	--
Benzene	0.00018 U	--	0.00017 J	--	0.00026 J	--	0.00019 U	--	0.00017 U	--	0.00026 J	--	0.00015 U	--
Bromochloromethane	0.00015 U	--	0.00014 U	--	0.00015 U	--	0.00016 U	--	0.00014 U	--	0.00017 U	--	0.00013 U	--
Bromodichloromethane	0.00034 U	--	0.00031 U	--	0.00032 U	--	0.00036 U	--	0.00032 U	--	0.00039 U	--	0.00028 U	--
Bromoform	0.00012 U	--	0.00011 U	--	0.00011 U	--	0.00012 U	--	0.00011 U	--	0.00013 U	--	0.000097 U	--
Bromomethane	0.00029 U	--	0.00026 U	--	0.00027 U	--	0.00045 J	--	0.00027 U	--	0.00032 U	--	0.00024 U	--
Carbon Disulfide	0.00039 U	--	0.0018	--	0.0033	--	0.0012	--	0.0017	--	0.00044 U	--	0.00039 J	--
Carbon Tetrachloride	0.00039 U	--	0.00035 U	--	0.00037 U	--	0.00041 U	--	0.00036 U	--	0.00044 U	--	0.00032 U	--
Chlorobenzene	0.00013 U	--	0.00011 U	--	0.00012 U	--	0.00013 U	--	0.00012 U	--	0.00014 U	--	0.0001 U	--
Chloroethane	0.00032 U	--	0.00029 U	--	0.0003 U	--	0.00033 U	--	0.0003 U	--	0.00036 U	--	0.00026 U	--
Chloroform	0.00019 U	--	0.00017 U	--	0.00018 U	--	0.0002 U	--	0.00018 U	--	0.00021 U	--	0.00016 U	--
Chloromethane	0.00034 U	--	0.00031 U	--	0.00032 U	--	0.00036 U	--	0.00032 U	--	0.00039 U	--	0.00028 U	--
Cis-1,2-Dichloroethylene	0.0002 U	--	0.00018 U	--	0.00019 U	--	0.00021 U	--	0.00019 U	--	0.00022 U	--	0.00016 U	--
Cis-1,3-Dichloropropene	0.00014 U	--	0.00012 U	--	0.00013 U	--	0.00014 U	--	0.00013 U	--	0.00015 U	--	0.00011 U	--
Cyclohexane	0.00042 U	--	0.00038 U	--	0.00039 U	--	0.00044 U	--	0.00039 U	--	0.00047 U	--	0.00034 U	--
Dibromochloromethane	0.00014 U	--	0.00012 U	--	0.00013 U	--	0.00014 U	--	0.00013 U	--	0.00015 U	--	0.00011 U	--
Dichlorodifluoromethane	0.00029 U	--	0.00026 U	--	0.00027 U	--	0.0003 U	--	0.00027 U	--	0.00032 U	--	0.00024 U	--
Ethylbenzene	0.00016 U	--	0.00015 U	--	0.00015 U	--	0.00017 U	--	0.00015 U	--	0.00018 U	--	0.00013 U	--
Isopropylbenzene (Cumene)	0.00015 U	--	0.00014 U	--	0.00015 U	--	0.00016 U	--	0.00014 U	--	0.00017 U	--	0.00013 U	--
M,P-Xylene	0.0001 U	--	0.00033 J	--	0.00021 J	--	0.00022 J	--	0.00016 J	--	0.00065 J	--	0.000082 U	--

Table E-8
Summary of Data Used in Risk Assessment
Central Landfills Area Soil (0-2 ft-bgs) - Current
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-022	CFSB-029	CFSB-029	CFSB-033	CFSB-033	CFSB-034	CFSB-034	CFSB-035	CFSB-035	CFSB-036	CFSB-036	CFSB-037	CFSB-037	CFSB-177
Sample Lab IDs	460-114456-7	460-114456-4	460-114456-3	460-114456-5	460-114456-10	460-114793-52	460-114793-51	460-114793-45	460-114793-46	460-114793-48	460-114793-53	460-114793-49	460-114793-54	180-79272-7, 460-159191-7
Sample Name	CFSB-022-SO-0.5-2	CFSB-029-SO-0-0.5	CFSB-029-SO-0.5-2	CFSB-033-SO-0-0.5	CFSB-033-SO-0.5-2	CFSB-034-SO-0-0.5	CFSB-034-SO-0.5-2	CFSB-035-SO-0-0.5	CFSB-035-SO-0.5-2	CFSB-036-SO-0-0.5	CFSB-036-SO-0.5-2	CFSB-037-SO-0-0.5	CFSB-037-SO-0.5-2	CFSB-177-SO-0-0.5
Sample Depth	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft
Chemical	5/23/2016	5/23/2016	5/23/2016	5/23/2016	5/23/2016	5/31/2016	5/31/2016	5/31/2016	5/31/2016	5/31/2016	5/31/2016	5/31/2016	5/31/2016	6/25/2018
Methyl Acetate	0.013	--	0.011	--	0.00077 U	--	0.00086 U	--	0.00076 U	--	0.00091 U	--	0.00067 U	--
Methyl Ethyl Ketone (2-Butanone)	0.0007 U	--	0.00063 U	--	0.00066 U	--	0.00073 U	--	0.00065 U	--	0.00078 U	--	0.00057 U	--
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	0.002 U	--	0.0018 U	--	0.0019 U	--	0.0021 U	--	0.0019 U	--	0.0023 U	--	0.0017 U	--
Methylcyclohexane	0.00045 U	--	0.00041 U	--	0.00043 J	--	0.00048 U	--	0.00042 U	--	0.00086 J	--	0.00037 U	--
Methylene Chloride	0.00029 U	--	0.00026 U	--	0.00056 J	--	0.0003 U	--	0.00027 U	--	0.00032 U	--	0.00024 U	--
O-Xylene (1,2-Dimethylbenzene)	0.00014 U	--	0.00013 U	--	0.00014 U	--	0.00015 U	--	0.00014 U	--	0.00022 J	--	0.00012 U	--
Styrene	0.00014 U	--	0.00012 U	--	0.00013 U	--	0.00014 U	--	0.00013 U	--	0.00015 U	--	0.00011 U	--
Tert-Butyl Methyl Ether	0.00015 U	--	0.00014 U	--	0.00015 U	--	0.00016 U	--	0.00014 U	--	0.00017 U	--	0.00013 U	--
Tetrachloroethylene (PCE)	0.00025 U	--	0.00023 U	--	0.00024 U	--	0.00027 U	--	0.00024 U	--	0.00028 U	--	0.00021 U	--
Toluene	0.00017 U	--	0.00042 J	--	0.0005 J	--	0.00039 J	--	0.00025 J	--	0.00093 J	--	0.0002 J	--
Trans-1,2-Dichloroethene	0.00035 U	--	0.00032 U	--	0.00033 U	--	0.00037 U	--	0.00033 U	--	0.0004 U	--	0.00029 U	--
Trans-1,3-Dichloropropene	0.00009 U	--	0.000082 U	--	0.000085 U	--	0.000095 U	--	0.000085 U	--	0.0001 U	--	0.000074 U	--
Trichloroethylene (TCE)	0.00024 U	--	0.00021 U	--	0.00022 U	--	0.00025 U	--	0.00022 U	--	0.00026 U	--	0.00019 U	--
Trichlorofluoromethane	0.00031 U	--	0.00028 U	--	0.00029 U	--	0.00032 U	--	0.00029 U	--	0.00035 U	--	0.00025 U	--
Vinyl Chloride	0.00035 U	--	0.00032 U	--	0.00033 U	--	0.00037 U	--	0.00033 U	--	0.0004 U	--	0.00029 U	--

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-8
Summary of Data Used in Risk Assessment
Central Landfills Area Soil (0-2 ft-bgs) - Current
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-177-DUP	CFSB-177	CFSB-178	CFSB-178	CFSB-179	CFSB-179	CFSB-180	CFSB-180	CFSB-219	CFSB-219	CFSB-220	CFSB-220	CFSB-221	CFSB-221
Sample Lab IDs	180-79272-15, 460-159191-15	180-79272-8, 460-159191-8	180-79272-9, 460-159191-9	180-79272-10, 460-159191-10	180-79272-11, 460-159191-11	180-79272-12, 460-159191-12	180-79272-13, 460-159191-13	180-79272-14, 460-159191-14	180-78894-14, 460-158632-14	180-78894-15, 460-158632-15	180-79204-11, 460-159044-17	180-79204-12, 460-159044-18	180-77673-1, 460-155989-21	180-77673-2, 460-155989-22
Sample Name	CFSB-DUP42-SO	CFSB-177-SO-0.5-2	CFSB-178-SO-0-0.5	CFSB-178-SO-0.5-2	CFSB-179-SO-0-0.5	CFSB-179-SO-0.5-2	CFSB-180-SO-0-0.5	CFSB-180-SO-0.5-2	CFSB-219-SO-0-0.5	CFSB-219-SO-0.5-2	CFSB-220-SO-0-0.5	CFSB-220-SO-0.5-2	CFSB-221-SO-0-0.5	CFSB-221-SO-0.5-2
Sample Depth	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft
Chemical	6/25/2018	6/25/2018	6/25/2018	6/25/2018	6/25/2018	6/25/2018	6/25/2018	6/25/2018	6/16/2018	6/16/2018	6/22/2018	6/22/2018	5/7/2018	5/7/2018
GENERAL CHEMISTRY (mg/kg)														
Fluoride	17.2 J-	16.9 J-	17 J-	17.6 J-	14.9 J-	16.5 J-	32.6 J-	46 J-	7.47 J+	9.99 J+	7.8 J-	5.2 J-	3.27 J+	4.79 J+
Cyanide	0.06 U	0.068 U	0.12 J	0.1 J	0.06 U	0.062 U	0.084 U	0.089 U	0.12 J+	0.083 J+	0.071 U	0.06 U	0.073 U	0.07 U
METALS (mg/kg)														
"Chromium, Hexavalent - Estimated"	0.206083	0.152555	0.216788	0.289051	0.323844	0.366667	0.0642336	0.0722628	0.337226	0.347932	0.240876	0.235523	0.289051	0.240876
"Chromium, Trivalent - Calculated"	--	--	--	--	--	--	--	--	--	--	--	--	--	--
"Chromium, Trivalent - Estimated"	7.49392	5.54745	7.88321	10.5109	11.7762	13.3333	2.33577	2.62774	12.2628	12.6521	8.75912	8.56448	10.5109	8.75912
Aluminum	21200	17200	15600	21100	14100	15900	4710	4500	18600	20600	17100	11000	17000	12900
Antimony	0.25 UJ	0.23 UJ	0.26 UJ	0.26 UJ	0.26 UJ	0.24 UJ	0.34 UJ	0.34 UJ	0.31 UJ	0.3 UJ	0.32 U	0.31 U	0.33 UJ	0.27 UJ
Arsenic	4.2	3.3	5.1	7.9	9.5	8.2	9.7	10.4	5.5	6	5.6	5.4	6.3	6.2
Barium	376	317	368	360	140	97.3	415	436	333	253	240	75.4	122	60.2
Beryllium	0.74	0.62	0.48	0.77	0.62	0.74	0.31 J	0.34 J	0.56	0.66	0.6	0.5	0.51	0.54
Cadmium	0.29 U	0.27 U	0.3 U	0.3 U	0.3 U	0.27 U	0.39 U	0.39 U	0.36 U	0.34 U	0.36 U	0.36 U	0.38 U	0.31 U
Calcium	1530	1200	2690	2490	1780	1320	279000	313000	2130	1650	2180	921	1680	1080
Chromium, Total	7.7	5.7	8.1	10.8	12.1	13.7	2.4	2.7	12.6	13	9	8.8	10.8	9
Cobalt	7.2	5.3	5.8	7.2	6.3	6.7	1.5 J	1.8 J	6	6.3	6.2	4.6	5.4	6.3
Copper	7.9	5.9	9.1	12.7	8.6	8.5	25.2	28.4	10.8	10.7	6.7	8.4	9.5	16.8
Iron	13300	10700	13200	19300	18900	17800	2940	3580	21000	20000	16200	13500	17500	14200
Lead	12.4	10.5	12.5	16.9	15.9	10.9	7.1	5.9	13.8	12.9	12	7.9	10.8	9.5
Magnesium	8870	5970	6210	9080	11600	18200	2890	3900	11000	10600	8270	7990	9950	9860
Manganese	460	484	1140	989	598	503	525	536	1050 J	506 J	958	230	278 J	379 J
Mercury	0.013 J	0.01 U	0.018	0.014 J	0.011 J	0.01 U	0.024	0.015 J	0.018 J	0.011 U	0.019	0.0096 U	0.011 U	0.031
Nickel	13.8	10.5	14.2	14.7	15.9	14.6	8.6	4.9	15.2	14	11.5	9.7	13.2	10
Potassium	1050	914	1340	1680	1060	816	337	332	1440	1380	1100	584	854	572
Selenium	0.25 U	0.23 U	0.26 U	0.26 U	0.26 U	0.24 U	0.46 J	0.36 J	0.31 U	0.3 U	0.31 U	0.31 U	0.33 U	0.26 U
Silver	0.53 U	0.49 U	0.54 U	0.55 U	0.55 U	0.51 U	0.71 U	0.72 U	0.66 U	0.63 U	0.67 U	0.66 U	0.7 U	0.56 U
Sodium	54.8 J	45.2 J	51.1 J	45 J	27.6 U	25.6 U	67.4 J	76.2 J	40.7 J	46.1 J	33.9 U	33.5 U	35.7 U	28.4 U
Thallium	0.11 U	0.099 U	0.11 U	0.13 J	0.11 U	0.1 U	0.14 U	0.15 U	0.14 J	0.13 J	0.14 U	0.13 U	0.14 U	0.11 U
Vanadium	11.3 J+	9.5 J+	11.5 J+	15.6 J+	12.2 J+	13.3 J+	4 J+	3 J+	14.6	15.5	14.3	9.4	14.4	9.4
Zinc	54.1	45.3	61.8	71.3	57.2	43.8	29.8	28.7	95.1	74.4	57.8	36.1	44.8	32.7
METALS|HEXAVALENT CHROMIUM (mg/kg)														
Chromium, Hexavalent	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PESTICIDES (mg/kg)														
Aldrin	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Alpha Bhc (Alpha Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Alpha Endosulfan	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Beta Bhc (Beta Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Beta Endosulfan	--	--	--	--	--	--	--	--	--	--	--	--	--	--
cis-Chlordane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Delta BHC (Delta Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dieldrin	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endosulfan Sulfate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin Aldehyde	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin Ketone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Gamma Bhc (Lindane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Heptachlor	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Heptachlor Epoxide	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methoxychlor	--	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDD	--	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDT	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Toxaphene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
trans-Chlordane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
POLYCHLORINATED BIPHENYLS (mg/kg)														
PCB-1016 (Aroclor 1016)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1221 (Aroclor 1221)	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Table E-8
Summary of Data Used in Risk Assessment
Central Landfills Area Soil (0-2 ft-bgs) - Current
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-177-DUP	CFSB-177	CFSB-178	CFSB-178	CFSB-179	CFSB-179	CFSB-180	CFSB-180	CFSB-219	CFSB-219	CFSB-220	CFSB-220	CFSB-221	CFSB-221
Sample Lab IDs	180-79272-15, 460-159191-15	180-79272-8, 460-159191-8	180-79272-9, 460-159191-9	180-79272-10, 460-159191-10	180-79272-11, 460-159191-11	180-79272-12, 460-159191-12	180-79272-13, 460-159191-13	180-79272-14, 460-159191-14	180-78894-14, 460-158632-14	180-78894-15, 460-158632-15	180-79204-11, 460-159044-17	180-79204-12, 460-159044-18	180-77673-1, 460-155989-21	180-77673-2, 460-155989-22
Sample Name	CFSB-DUP42-SO	CFSB-177-SO-0.5-2	CFSB-178-SO-0-0.5	CFSB-178-SO-0.5-2	CFSB-179-SO-0-0.5	CFSB-179-SO-0.5-2	CFSB-180-SO-0-0.5	CFSB-180-SO-0.5-2	CFSB-219-SO-0-0.5	CFSB-219-SO-0.5-2	CFSB-220-SO-0-0.5	CFSB-220-SO-0.5-2	CFSB-221-SO-0-0.5	CFSB-221-SO-0.5-2
Sample Depth	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft
Chemical	6/25/2018	6/25/2018	6/25/2018	6/25/2018	6/25/2018	6/25/2018	6/25/2018	6/25/2018	6/16/2018	6/16/2018	6/22/2018	6/22/2018	5/7/2018	5/7/2018
PCB-1232 (Aroclor 1232)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1242 (Aroclor 1242)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1248 (Aroclor 1248)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1254 (Aroclor 1254)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1260 (Aroclor 1260)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1262 (Aroclor 1262)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1268 (Aroclor 1268)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Polychlorinated Biphenyl (PCBs)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SEMIVOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,2,4,5-Tetrachlorobenzene	0.0015 U	0.0015 U	0.0048 U	0.0016 U	0.003 U	0.003 U	0.0042 U	0.0041 U	0.0016 UJ	0.0017 UJ	0.0016 U	0.0015 U	0.0016 U	0.0016 U
1,4-Dioxane (P-Dioxane)	0.011 U	0.011 U	0.034 U	0.011 U	0.022 U	0.022 U	0.03 U	0.03 U	0.012 U	0.012 U	0.012 U	0.011 U	0.012 U	0.012 U
2,3,4,6-Tetrachlorophenol	0.014 U	0.015 U	0.046 U	0.015 U	0.029 U	0.029 U	0.04 U	0.04 U	0.016 U	0.016 U	0.016 UJ	0.015 UJ	0.016 U	0.016 U
2,4,5-Trichlorophenol	0.0025 U	0.0026 U	0.0079 U	0.0026 U	0.005 U	0.005 U	0.0069 U	0.0068 U	0.0027 U	0.0028 U	0.0027 U	0.0025 U	0.0027 U	0.0027 U
2,4,6-Trichlorophenol	0.0019 U	0.002 U	0.0061 U	0.002 U	0.0038 U	0.0038 U	0.0053 U	0.0052 U	0.0021 U	0.0021 U	0.0021 U	0.0019 U	0.0021 U	0.0021 U
2,4-Dichlorophenol	0.0027 U	0.0028 U	0.0085 U	0.0028 U	0.0054 U	0.0054 U	0.0074 U	0.0073 U	0.0029 U	0.003 U	0.0029 U	0.0027 U	0.0029 U	0.0029 U
2,4-Dimethylphenol	0.0022 U	0.0022 U	0.0069 UJ	0.0022 U	0.0043 U	0.0044 U	0.006 U	0.0059 U	0.0023 U	0.0024 U	0.0023 U	0.0022 U	0.0023 U	0.0024 U
2,4-Dinitrophenol	0.093 U	0.096 U	0.3 UR	0.097 U	0.19 U	0.19 U	0.26 U	0.26 U	0.1 U	0.1 U	0.1 UJ	0.094 UJ	0.1 U	0.1 U
2,4-Dinitrotoluene	0.0017 U	0.0018 U	0.0055 U	0.0018 U	0.0035 U	0.0035 U	0.0048 U	0.0047 U	0.0019 U	0.0019 U	0.0019 U	0.0017 U	0.0019 U	0.0019 U
2,6-Dinitrotoluene	0.0021 U	0.0022 U	0.0068 U	0.0022 U	0.0043 U	0.0043 U	0.006 U	0.0059 U	0.0023 U	0.0024 U	0.0023 U	0.0022 U	0.0023 U	0.0024 U
2-Chloronaphthalene	0.0016 U	0.0016 U	0.0051 U	0.0017 U	0.0032 U	0.0032 U	0.0044 U	0.0044 U	0.0017 U	0.0018 U	0.0017 U	0.0016 U	0.0017 U	0.0018 U
2-Chlorophenol	0.0016 U	0.0017 U	0.0051 U	0.0017 U	0.0032 U	0.0033 U	0.0045 U	0.0044 U	0.0017 U	0.0018 U	0.0017 U	0.0016 U	0.0018 U	0.0018 U
2-Methylnaphthalene	0.0017 U	0.0017 U	0.0053 U	0.0017 U	0.0033 U	0.0034 U	0.0046 U	0.0046 U	0.0018 U	0.0018 U	0.0028 J	0.0018 J	0.0018 U	0.0018 U
2-Methylphenol (O-Cresol)	0.01 U	0.01 U	0.032 U	0.01 U	0.02 U	0.02 U	0.028 U	0.027 U	0.011 U	0.011 U	0.011 U	0.01 U	0.011 U	0.011 U
2-Nitroaniline	0.016 U	0.016 U	0.05 U	0.016 U	0.032 U	0.032 U	0.044 U	0.043 U	0.017 U	0.018 U	0.017 U	0.016 U	0.017 U	0.017 U
2-Nitrophenol	0.002 U	0.002 U	0.0063 U	0.0021 U	0.004 U	0.004 U	0.0055 U	0.0054 U	0.0022 U	0.0022 U	0.0021 U	0.002 U	0.0022 U	0.0022 U
3- And 4- Methylphenol (Total)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3,3'-Dichlorobenzidine	0.032 U	0.033 U	0.1 UR	0.034 U	0.065 U	0.065 U	0.09 U	0.089 U	0.035 U	0.036 U	0.035 U	0.033 U	0.035 UR	0.036 U
3-Nitroaniline	0.0088 U	0.0091 U	0.028 U	0.0092 U	0.018 U	0.018 U	0.025 U	0.024 U	0.0096 U	0.0098 U	0.0095 U	0.0089 U	0.0096 UJ	0.0097 U
4,6-Dinitro-2-Methylphenol	0.06 U	0.062 U	0.19 U	0.062 U	0.12 U	0.12 U	0.17 U	0.16 U	0.065 U	0.066 U	0.064 U	0.06 U	0.065 U	0.066 U
4-Bromophenyl Phenyl Ether	0.0024 U	0.0025 U	0.0077 U	0.0025 U	0.0049 U	0.0049 U	0.0067 U	0.0066 U	0.0026 U	0.0027 U	0.0026 U	0.0024 U	0.0026 U	0.0027 U
4-Chloro-3-Methylphenol	0.0016 U	0.0017 U	0.0052 U	0.0017 U	0.0033 U	0.0033 U	0.0045 U	0.0045 U	0.0018 U	0.0018 U	0.0018 U	0.0016 U	0.0018 U	0.0018 U
4-Chloroaniline	0.0012 U	0.0012 U	0.0037 UJ	0.0012 U	0.0023 U	0.0023 U	0.0032 U	0.0032 U	0.0013 U	0.0013 U	0.0012 U	0.0012 U	0.0013 UJ	0.0013 U
4-Chlorophenyl Phenyl Ether	0.0021 U	0.0022 U	0.0067 U	0.0022 U	0.0042 U	0.0042 U	0.0058 U	0.0058 U	0.0023 U	0.0023 U	0.0023 U	0.0021 U	0.0023 U	0.0023 U
4-Nitroaniline	0.0017 U	0.0017 U	0.0054 U	0.0018 U	0.0034 U	0.0034 U	0.0047 U	0.0046 U	0.0018 U	0.0019 U	0.0018 U	0.0017 U	0.0018 UJ	0.0019 U
4-Nitrophenol	0.024 U	0.025 U	0.078 U	0.025 U	0.049 U	0.049 U	0.068 U	0.067 U	0.026 U	0.027 U	0.026 UJ	0.025 UJ	0.026 U	0.027 U
Acenaphthene	0.0025 J	0.0021 U	0.011 J	0.0021 U	0.004 U	0.004 U	0.015 J	0.0094 J	0.0046 J	0.0022 U	0.0066 J	0.0024 J	0.0022 U	0.0022 U
Acenaphthylene	0.0015 U	0.0016 U	0.0048 U	0.0016 U	0.0031 U	0.0031 U	0.0042 U	0.0042 U	0.0016 U	0.0017 U	0.0016 U	0.0015 U	0.0016 U	0.0017 U
Acetophenone	0.0026 J	0.0022 J	0.006 U	0.0023 J	0.0038 U	0.0038 U	0.0052 U	0.0052 U	0.002 U	0.0021 U	0.0037 J	0.0022 J	0.002 U	0.0021 U
Anthracene	0.0025 J	0.0023 J	0.017 J	0.002 J	0.0062 J	0.0036 U	0.026	0.017 J	0.0072 J	0.002 U	0.0089	0.0018 U	0.0077	0.002 U
Atrazine	0.015 UJ	0.016 UJ	0.048 UJ	0.016 UJ	0.031 UJ	0.031 UJ	0.042 UJ	0.042 UJ	0.016 UJ	0.017 UJ	0.016 UJ	0.015 UJ	0.016 UJ	0.017 UJ
Benzaldehyde	0.0071 J	0.005 J	0.014 UR	0.0058 J	0.0087 UR	0.0087 UR	0.013 J	0.012 U	0.0049 J-	0.0048 UR	0.0071 J	0.0043 UR	0.0047 U	0.0047 U
Benzo(A)Anthracene	0.031 J	0.027	0.2	0.023	0.057	0.031	0.15	0.1	0.042	0.0051 J	0.044	0.005 J	0.053	0.0089
Benzo(A)Pyrene	0.044 J	0.044	0.37	0.037	0.11	0.058	0.22	0.14	0.06	0.0078	0.057	0.0066 J	0.069	0.018
Benzo(B)Fluoranthene	0.13 J	0.11	0.94 J-	0.098	0.36	0.2	0.44	0.27	0.11	0.012	0.1	0.011	0.1	0.017
Benzo(G,H,I)Perylene	0.075 J	0.056	0.48 J-	0.052	0.17	0.088	0.32	0.19	0.072	0.0073 J	0.066	0.0072	0.077	0.012
Benzo(K)Fluoranthene	0.032 J	0.034	0.26	0.032	0.11	0.067	0.13	0.1	0.04	0.0046 J	0.035	0.0034 J	0.04	0.0044 J
Benzyl Butyl Phthalate	0.024 U	0.025 U	0.076 U	0.025 U	0.048 U	0.048 U	0.066 U	0.065 U	0.026 U	0.026 U	0.026 U	0.024 U	0.026 U	0.026 U
Biphenyl (Diphenyl)	0.0015 U	0.0015 U	0.0046 U	0.0015 U	0.0029 U	0.0029 U	0.004 U	0.004 U	0.0016 U	0.0016 U	0.0055 J	0.0035 J	0.0016 U	0.0016 U
Bis(2-Chloroethoxy) Methane	0.0017 U	0.0017 U	0.0053 U	0.0017 U	0.0033 U	0.0033 U	0.0046 U	0.0045 U	0.0018 U	0.0018 U	0.0018 U	0.0017 U	0.0018 U	0.0018 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.0013 U	0.0013 U	0.004 U	0.0013 U	0.0025 U	0.0025 U	0.0035 U	0.0034 U	0.0014 U	0.0014 U	0.0014 U	0.0013 U	0.0014 U	0.0014 U
Bis(2-Chloroisopropyl) Ether	0.0026 U	0.0026 U	0.0082 U	0.0027 U	0.0052 U	0.0052 U	0.0071 U	0.007 U	0.0028 U	0.0029 U	0.0028 U	0.0026 U	0.0028 U	0.0028 U
Bis(2-Ethylhexyl) Phthalate	0.23 J	0.038 U	0.12 U	0.038 U	0.074 U	0.075 U	0.15 J	0.1 U	0.04 U	0.041 U	0.045 J	0.037 U	0.04 U	0.041 U
Caprolactam	0.023 U	0.023 U	0.072 UJ	0.023 U	0.045 U	0.046 U	0.063 U	0.062 U	0.024 U	0.025 U	0.024 U	0.023 U	0.025 UJ	0.025 U
Carbazole	0.0051 J	0.0051 J	0.039	0.004 J	0.015	0.0074 J	0.039	0.025	0.016	0.0018 U	0.012	0.0016 U	0.0083	0.002 J
Chrysene	0.073 J	0.061	0.51 J-	0.058	0.2	0.11	0.28	0.18	0.072	0.008	0.075	0.0078	0.079	0.013
Dibenz(A,H)Anthracene	0.012 J	0.011	0.082	0.0074	0.028	0.015	0.068	0.04	0.014	0.0019 J	0.015	0.0017 J	0.016	0.0017 U
Dibenzofuran	0.0026 J	0.0016 U	0.0048 U	0.0019 J	0.0031 U	0.0031 U	0.0084 J	0.0055 J	0.003 J	0.0017 U	0.0054 J	0.0028 J	0.0016 J	0.0017 U

Table E-8
Summary of Data Used in Risk Assessment
Central Landfills Area Soil (0-2 ft-bgs) - Current
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-177-DUP	CFSB-177	CFSB-178	CFSB-178	CFSB-179	CFSB-179	CFSB-180	CFSB-180	CFSB-219	CFSB-219	CFSB-220	CFSB-220	CFSB-221	CFSB-221
Sample Lab IDs	180-79272-15, 460-159191-15	180-79272-8, 460-159191-8	180-79272-9, 460-159191-9	180-79272-10, 460-159191-10	180-79272-11, 460-159191-11	180-79272-12, 460-159191-12	180-79272-13, 460-159191-13	180-79272-14, 460-159191-14	180-78894-14, 460-158632-14	180-78894-15, 460-158632-15	180-79204-11, 460-159044-17	180-79204-12, 460-159044-18	180-77673-1, 460-155989-21	180-77673-2, 460-155989-22
Sample Name	CFSB-DUP42-SO	CFSB-177-SO-0.5-2	CFSB-178-SO-0-0.5	CFSB-178-SO-0.5-2	CFSB-179-SO-0-0.5	CFSB-179-SO-0.5-2	CFSB-180-SO-0-0.5	CFSB-180-SO-0.5-2	CFSB-219-SO-0-0.5	CFSB-219-SO-0.5-2	CFSB-220-SO-0-0.5	CFSB-220-SO-0.5-2	CFSB-221-SO-0-0.5	CFSB-221-SO-0.5-2
Sample Depth	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft
Chemical	6/25/2018	6/25/2018	6/25/2018	6/25/2018	6/25/2018	6/25/2018	6/25/2018	6/25/2018	6/16/2018	6/16/2018	6/22/2018	6/22/2018	5/7/2018	5/7/2018
Diethyl Phthalate	0.012 J	0.011 U	0.033 U	0.011 U	0.021 U	0.021 U	0.029 U	0.028 U	0.011 U	0.012 U	0.011 U	0.01 U	0.011 U	0.011 U
Dimethyl Phthalate	0.0013 U	0.0013 U	0.004 U	0.0013 U	0.0025 U	0.0025 U	0.0035 U	0.0034 U	0.0014 U	0.0014 U	0.0014 U	0.0013 U	0.0014 U	0.0014 U
Di-N-Butyl Phthalate	0.015 U	0.016 U	0.048 U	0.016 U	0.031 U	0.031 U	0.042 U	0.042 U	0.016 U	0.017 U	0.016 U	0.015 U	0.016 U	0.017 U
Di-N-Octylphthalate	0.02 U	0.021 U	0.064 U	0.021 U	0.041 U	0.041 U	0.056 U	0.055 U	0.022 U	0.022 U	0.022 U	0.02 U	0.022 U	0.022 U
Fluoranthene	0.078 J	0.058	0.44 J-	0.05	0.15	0.089	0.29	0.18	0.083	0.011	0.094	0.01	0.11	0.018
Fluorene	0.0021 J	0.0014 J	0.0059 J	0.0017 J	0.0034 J	0.0028 U	0.012 J	0.0074 J	0.005 J	0.0015 U	0.0066 J	0.0025 J	0.0028 J	0.0015 U
Hexachlorobenzene	0.0025 U	0.0026 U	0.0079 U	0.0026 U	0.005 U	0.005 U	0.0069 U	0.0068 U	0.0027 U	0.0028 U	0.0027 U	0.0025 U	0.0027 U	0.0027 U
Hexachlorobutadiene	0.002 U	0.0021 UJ	0.0065 UJ	0.0021 UJ	0.0041 UJ	0.0041 UJ	0.0056 U	0.0056 U	0.0022 U	0.0023 U	0.0022 U	0.002 U	0.0022 U	0.0022 U
Hexachlorocyclopentadiene	0.0018 U	0.0018 UJ	0.0056 UJ	0.0018 UJ	0.0036 UJ	0.0036 UJ	0.0049 U	0.0048 U	0.0019 U	0.002 U	0.0019 UJ	0.0018 UJ	0.0019 U	0.0019 U
Hexachloroethane	0.0018 U	0.0018 U	0.0057 U	0.0019 U	0.0036 U	0.0036 U	0.005 U	0.0049 U	0.0019 U	0.002 U	0.0019 U	0.0018 U	0.0019 U	0.002 U
Indeno(1,2,3-C,D)Pyrene	0.061 J	0.045	0.37	0.038	0.14	0.08	0.26	0.16	0.062	0.0071 J	0.052	0.0055 J	0.066	0.01
Isophorone	0.0018 U	0.0018 U	0.0056 U	0.0018 U	0.0036 U	0.0036 U	0.0049 U	0.0048 U	0.0019 U	0.002 U	0.0019 U	0.0018 U	0.0019 U	0.0019 U
Naphthalene	0.0014 U	0.0021 J	0.0043 J	0.0026 J	0.003 J	0.0027 U	0.0058 J	0.0037 U	0.0063 J	0.0022 J	0.0045 J	0.002 J	0.0015 U	0.0015 U
Nitrobenzene	0.013 U	0.013 U	0.04 U	0.013 U	0.026 U	0.026 U	0.035 U	0.035 U	0.014 U	0.014 U	0.014 U	0.013 U	0.014 U	0.014 U
N-Nitrosodi-N-Propylamine	0.0024 U	0.0024 U	0.0075 U	0.0024 U	0.0047 U	0.0048 U	0.0065 U	0.0064 U	0.0026 U	0.0026 U	0.0025 U	0.0024 U	0.0026 U	0.0026 U
N-Nitrosodiphenylamine	0.012 U	0.012 U	0.037 UJ	0.012 U	0.023 U	0.023 U	0.032 U	0.032 U	0.013 U	0.013 U	0.012 U	0.012 U	0.013 U	0.013 U
Pentachlorophenol	0.056 U	0.057 U	0.18 U	0.058 U	0.11 U	0.11 U	0.15 U	0.15 U	0.06 U	0.062 U	0.06 UJ	0.056 UJ	0.061 U	0.061 U
Phenanthrene	0.024 J	0.019	0.13	0.018	0.048	0.028	0.15	0.089	0.052	0.0095	0.059	0.011	0.043	0.011
Phenol	0.011 U	0.011 U	0.033 U	0.011 U	0.021 U	0.021 U	0.029 U	0.029 U	0.011 U	0.012 U	0.011 U	0.011 U	0.011 U	0.012 U
Pyrene	0.078 J	0.058	0.49	0.052	0.16	0.088	0.31	0.2	0.077	0.0093	0.079	0.0083	0.093	0.016
VOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,1,1-Trichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,2,2-Tetrachloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,2-Trichloro-1,2,2-Trifluoroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,2-Trichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1-Dichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1-Dichloroethene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,3-Trichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,4-Trichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dibromo-3-Chloropropane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dibromoethane (Ethylene Dibromide)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichloropropane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,3-Dichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,4-Dichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Hexanone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acetone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromochloromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromodichloromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromoform	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromomethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Carbon Disulfide	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Carbon Tetrachloride	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chloroform	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chloromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cis-1,2-Dichloroethylene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cis-1,3-Dichloropropene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cyclohexane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibromochloromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dichlorodifluoromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Ethylbenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Isopropylbenzene (Cumene)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
M,P-Xylene	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Table E-8
Summary of Data Used in Risk Assessment
Central Landfills Area Soil (0-2 ft-bgs) - Current
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-177-DUP	CFSB-177	CFSB-178	CFSB-178	CFSB-179	CFSB-179	CFSB-180	CFSB-180	CFSB-219	CFSB-219	CFSB-220	CFSB-220	CFSB-221	CFSB-221
Sample Lab IDs	180-79272-15, 460-159191-15	180-79272-8, 460-159191-8	180-79272-9, 460-159191-9	180-79272-10, 460-159191-10	180-79272-11, 460-159191-11	180-79272-12, 460-159191-12	180-79272-13, 460-159191-13	180-79272-14, 460-159191-14	180-78894-14, 460-158632-14	180-78894-15, 460-158632-15	180-79204-11, 460-159044-17	180-79204-12, 460-159044-18	180-77673-1, 460-155989-21	180-77673-2, 460-155989-22
Sample Name	CFSB-DUP42-SO	CFSB-177-SO-0.5-2	CFSB-178-SO-0-0.5	CFSB-178-SO-0.5-2	CFSB-179-SO-0-0.5	CFSB-179-SO-0.5-2	CFSB-180-SO-0-0.5	CFSB-180-SO-0.5-2	CFSB-219-SO-0-0.5	CFSB-219-SO-0.5-2	CFSB-220-SO-0-0.5	CFSB-220-SO-0.5-2	CFSB-221-SO-0-0.5	CFSB-221-SO-0.5-2
Sample Depth	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft
Chemical	6/25/2018	6/25/2018	6/25/2018	6/25/2018	6/25/2018	6/25/2018	6/25/2018	6/25/2018	6/16/2018	6/16/2018	6/22/2018	6/22/2018	5/7/2018	5/7/2018
Methyl Acetate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methyl Ethyl Ketone (2-Butanone)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methylcyclohexane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methylene Chloride	--	--	--	--	--	--	--	--	--	--	--	--	--	--
O-Xylene (1,2-Dimethylbenzene)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Styrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Tert-Butyl Methyl Ether	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Tetrachloroethylene (PCE)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Toluene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Trans-1,2-Dichloroethene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Trans-1,3-Dichloropropene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Trichloroethylene (TCE)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Trichlorofluoromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Vinyl Chloride	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-8
Summary of Data Used in Risk Assessment
Central Landfills Area Soil (0-2 ft-bgs) - Current
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-222	CFSB-222	CFSB-223	CFSB-223	CFSB-224	CFSB-224	CFSB-225	CFSB-225	CFSB-226	CFSB-226	CFSB-227	CFSB-227	CFSB-228	CFSB-228
Sample Lab IDs	180-77673-3, 460-155989-23	180-77673-4, 460-155989-24	460-155989-14	460-155989-15	460-155989-12	460-155989-13	460-155989-10	460-155989-11	460-155989-8	460-155989-9	460-155989-6	460-155989-7	460-155989-16	460-155989-17
Sample Name	CFSB-222-SO-0-0.5	CFSB-222-SO-0.5-2	CFSB-223-SO-0-0.5	CFSB-223-SO-0.5-2	CFSB-224-SO-0-0.5	CFSB-224-SO-0.5-2	CFSB-225-SO-0-0.5	CFSB-225-SO-0.5-2	CFSB-226-SO-0-0.5	CFSB-226-SO-0.5-2	CFSB-227-SO-0-0.5	CFSB-227-SO-0.5-2	CFSB-228-SO-0-0.5	CFSB-228-SO-0.5-2
Sample Depth	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft
Chemical	5/7/2018	5/7/2018	5/7/2018	5/7/2018	5/7/2018	5/7/2018	5/7/2018	5/7/2018	5/7/2018	5/7/2018	5/7/2018	5/7/2018	5/7/2018	5/7/2018
GENERAL CHEMISTRY (mg/kg)														
Fluoride	16.1 J+	31 J+	--	--	--	--	--	--	--	--	--	--	--	--
Cyanide	0.07 U	0.31	--	--	--	--	--	--	--	--	--	--	--	--
METALS (mg/kg)														
"Chromium, Hexavalent - Estimated"	0.2382	0.294404	--	--	--	--	--	--	--	--	--	--	--	--
"Chromium, Trivalent - Calculated"	--	--	--	--	--	--	--	--	--	--	--	--	--	--
"Chromium, Trivalent - Estimated"	8.6618	10.7056	--	--	--	--	--	--	--	--	--	--	--	--
Aluminum	14900	16600	--	--	--	--	--	--	--	--	--	--	--	--
Antimony	0.28 UJ	0.29 UJ	--	--	--	--	--	--	--	--	--	--	--	--
Arsenic	5.2	8.2	--	--	--	--	--	--	--	--	--	--	--	--
Barium	133	214	--	--	--	--	--	--	--	--	--	--	--	--
Beryllium	0.54	0.7	--	--	--	--	--	--	--	--	--	--	--	--
Cadmium	0.33 U	0.33 U	--	--	--	--	--	--	--	--	--	--	--	--
Calcium	1800	2050	--	--	--	--	--	--	--	--	--	--	--	--
Chromium, Total	8.9	11	--	--	--	--	--	--	--	--	--	--	--	--
Cobalt	4.8	6.4	--	--	--	--	--	--	--	--	--	--	--	--
Copper	9.1	8.1	--	--	--	--	--	--	--	--	--	--	--	--
Iron	14100	20300	--	--	--	--	--	--	--	--	--	--	--	--
Lead	10.2	12.2	--	--	--	--	--	--	--	--	--	--	--	--
Magnesium	8670	9200	--	--	--	--	--	--	--	--	--	--	--	--
Manganese	458 J	842 J	--	--	--	--	--	--	--	--	--	--	--	--
Mercury	0.021	0.017 J	--	--	--	--	--	--	--	--	--	--	--	--
Nickel	25.2	20.5	--	--	--	--	--	--	--	--	--	--	--	--
Potassium	918	895	--	--	--	--	--	--	--	--	--	--	--	--
Selenium	0.28 U	0.29 U	--	--	--	--	--	--	--	--	--	--	--	--
Silver	0.6 U	0.61 U	--	--	--	--	--	--	--	--	--	--	--	--
Sodium	30.4 U	40.1 J	--	--	--	--	--	--	--	--	--	--	--	--
Thallium	0.12 U	0.12 U	--	--	--	--	--	--	--	--	--	--	--	--
Vanadium	14.5	21.2	--	--	--	--	--	--	--	--	--	--	--	--
Zinc	46.3	46.5	--	--	--	--	--	--	--	--	--	--	--	--
METALS|HEXAVALENT CHROMIUM (mg/kg)														
Chromium, Hexavalent	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PESTICIDES (mg/kg)														
Aldrin	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Alpha Bhc (Alpha Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Alpha Endosulfan	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Beta Bhc (Beta Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Beta Endosulfan	--	--	--	--	--	--	--	--	--	--	--	--	--	--
cis-Chlordane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Delta BHC (Delta Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dieldrin	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endosulfan Sulfate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin Aldehyde	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin Ketone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Gamma Bhc (Lindane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Heptachlor	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Heptachlor Epoxide	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methoxychlor	--	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDD	--	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDT	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Toxaphene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
trans-Chlordane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
POLYCHLORINATED BIPHENYLS (mg/kg)														
PCB-1016 (Aroclor 1016)	--	--	0.0094 U	0.0094 U	0.01 U	0.0097 U	0.0096 U	0.0095 U	0.0093 U	0.0093 U	0.0095 U	0.0094 U	0.0094 U	0.0097 U
PCB-1221 (Aroclor 1221)	--	--	0.0094 U	0.0094 U	0.01 U	0.0097 U	0.0096 U	0.0095 U	0.0093 U	0.0093 U	0.0095 U	0.0094 U	0.0094 U	0.0097 U

Table E-8
Summary of Data Used in Risk Assessment
Central Landfills Area Soil (0-2 ft-bgs) - Current
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-222	CFSB-222	CFSB-223	CFSB-223	CFSB-224	CFSB-224	CFSB-225	CFSB-225	CFSB-226	CFSB-226	CFSB-227	CFSB-227	CFSB-228	CFSB-228
Sample Lab IDs	180-77673-3, 460-155989-23	180-77673-4, 460-155989-24	460-155989-14	460-155989-15	460-155989-12	460-155989-13	460-155989-10	460-155989-11	460-155989-8	460-155989-9	460-155989-6	460-155989-7	460-155989-16	460-155989-17
Sample Name	CFSB-222-SO-0-0.5	CFSB-222-SO-0.5-2	CFSB-223-SO-0-0.5	CFSB-223-SO-0.5-2	CFSB-224-SO-0-0.5	CFSB-224-SO-0.5-2	CFSB-225-SO-0-0.5	CFSB-225-SO-0.5-2	CFSB-226-SO-0-0.5	CFSB-226-SO-0.5-2	CFSB-227-SO-0-0.5	CFSB-227-SO-0.5-2	CFSB-228-SO-0-0.5	CFSB-228-SO-0.5-2
Sample Depth	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft
Chemical	5/7/2018	5/7/2018	5/7/2018	5/7/2018	5/7/2018	5/7/2018	5/7/2018	5/7/2018	5/7/2018	5/7/2018	5/7/2018	5/7/2018	5/7/2018	5/7/2018
PCB-1232 (Aroclor 1232)	--	--	0.0094 U	0.0094 U	0.01 U	0.0097 U	0.0096 U	0.0095 U	0.0093 U	0.0093 U	0.0095 U	0.0094 U	0.0094 U	0.0097 U
PCB-1242 (Aroclor 1242)	--	--	0.0094 U	0.0094 U	0.01 U	0.0097 U	0.0096 U	0.0095 U	0.0093 U	0.0093 U	0.0095 U	0.0094 U	0.0094 U	0.0097 U
PCB-1248 (Aroclor 1248)	--	--	0.0094 U	0.0094 U	0.01 U	0.0097 U	0.0096 U	0.0095 U	0.0093 U	0.0093 U	0.0095 U	0.0094 U	0.0094 U	0.0097 U
PCB-1254 (Aroclor 1254)	--	--	0.062 J	0.08	0.01 U	0.4	0.0099 U	0.0099 U	0.0096 U	0.0096 U	1.2	0.91	0.0097 U	0.01 U
PCB-1260 (Aroclor 1260)	--	--	0.0097 U	0.0097 U	0.01 U	0.01 U	0.0099 U	0.0099 U	0.0096 U	0.0096 U	0.0098 U	0.0097 U	0.0097 U	0.01 U
PCB-1262 (Aroclor 1262)	--	--	0.0097 U	0.0097 U	0.01 U	0.01 U	0.0099 U	0.0099 U	0.0096 U	0.0096 U	0.0098 U	0.0097 U	0.0097 U	0.01 U
PCB-1268 (Aroclor 1268)	--	--	0.0097 U	0.0097 U	0.01 U	0.01 U	0.0099 U	0.0099 U	0.0096 U	0.0096 U	0.0098 U	0.0097 U	0.0097 U	0.01 U
Polychlorinated Biphenyl (PCBs)	--	--	0.062 J	0.08	0.01 U	0.4	0.0099 U	0.0099 U	0.0096 U	0.0096 U	1.2	0.91	0.0097 U	0.01 U
SEMIVOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,2,4,5-Tetrachlorobenzene	0.0017 U	0.0018 U	--	--	--	--	--	--	--	--	--	--	--	--
1,4-Dioxane (P-Dioxane)	0.013 U	0.013 U	--	--	--	--	--	--	--	--	--	--	--	--
2,3,4,6-Tetrachlorophenol	0.017 U	0.017 U	--	--	--	--	--	--	--	--	--	--	--	--
2,4,5-Trichlorophenol	0.0029 U	0.003 U	--	--	--	--	--	--	--	--	--	--	--	--
2,4,6-Trichlorophenol	0.0022 U	0.0023 U	--	--	--	--	--	--	--	--	--	--	--	--
2,4-Dichlorophenol	0.0031 U	0.0032 U	--	--	--	--	--	--	--	--	--	--	--	--
2,4-Dimethylphenol	0.0025 U	0.0026 U	--	--	--	--	--	--	--	--	--	--	--	--
2,4-Dinitrophenol	0.11 U	0.11 U	--	--	--	--	--	--	--	--	--	--	--	--
2,4-Dinitrotoluene	0.002 U	0.0021 U	--	--	--	--	--	--	--	--	--	--	--	--
2,6-Dinitrotoluene	0.0025 U	0.0026 U	--	--	--	--	--	--	--	--	--	--	--	--
2-Chloronaphthalene	0.0019 U	0.0019 U	--	--	--	--	--	--	--	--	--	--	--	--
2-Chlorophenol	0.0019 U	0.0019 U	--	--	--	--	--	--	--	--	--	--	--	--
2-Methylnaphthalene	0.0019 U	0.002 U	--	--	--	--	--	--	--	--	--	--	--	--
2-Methylphenol (O-Cresol)	0.012 U	0.012 U	--	--	--	--	--	--	--	--	--	--	--	--
2-Nitroaniline	0.018 U	0.019 U	--	--	--	--	--	--	--	--	--	--	--	--
2-Nitrophenol	0.0023 U	0.0024 U	--	--	--	--	--	--	--	--	--	--	--	--
3- And 4- Methylphenol (Total)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3,3'-Dichlorobenzidine	0.038 U	0.039 U	--	--	--	--	--	--	--	--	--	--	--	--
3-Nitroaniline	0.01 U	0.011 U	--	--	--	--	--	--	--	--	--	--	--	--
4,6-Dinitro-2-Methylphenol	0.07 U	0.072 U	--	--	--	--	--	--	--	--	--	--	--	--
4-Bromophenyl Phenyl Ether	0.0028 U	0.0029 U	--	--	--	--	--	--	--	--	--	--	--	--
4-Chloro-3-Methylphenol	0.0019 U	0.002 U	--	--	--	--	--	--	--	--	--	--	--	--
4-Chloroaniline	0.0013 U	0.0014 U	--	--	--	--	--	--	--	--	--	--	--	--
4-Chlorophenyl Phenyl Ether	0.0024 U	0.0025 U	--	--	--	--	--	--	--	--	--	--	--	--
4-Nitroaniline	0.002 U	0.002 U	--	--	--	--	--	--	--	--	--	--	--	--
4-Nitrophenol	0.028 U	0.029 U	--	--	--	--	--	--	--	--	--	--	--	--
Acenaphthene	0.011	0.012	--	--	--	--	--	--	--	--	--	--	--	--
Acenaphthylene	0.0018 U	0.0018 U	--	--	--	--	--	--	--	--	--	--	--	--
Acetophenone	0.0022 U	0.0023 U	--	--	--	--	--	--	--	--	--	--	--	--
Anthracene	0.019	0.022	--	--	--	--	--	--	--	--	--	--	--	--
Atrazine	0.018 UJ	0.018 UJ	--	--	--	--	--	--	--	--	--	--	--	--
Benzaldehyde	0.005 U	0.006 J	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(A)Anthracene	0.092	0.097	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(A)Pyrene	0.12	0.13	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(B)Fluoranthene	0.23	0.32	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(G,H,I)Perylene	0.17	0.21	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(K)Fluoranthene	0.067	0.072	--	--	--	--	--	--	--	--	--	--	--	--
Benzyl Butyl Phthalate	0.028 U	0.028 U	--	--	--	--	--	--	--	--	--	--	--	--
Biphenyl (Diphenyl)	0.0017 U	0.0017 U	--	--	--	--	--	--	--	--	--	--	--	--
Bis(2-Chloroethoxy) Methane	0.0019 U	0.002 U	--	--	--	--	--	--	--	--	--	--	--	--
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.0015 U	0.0015 U	--	--	--	--	--	--	--	--	--	--	--	--
Bis(2-Chloroisopropyl) Ether	0.003 U	0.0031 U	--	--	--	--	--	--	--	--	--	--	--	--
Bis(2-Ethylhexyl) Phthalate	0.043 U	0.044 U	--	--	--	--	--	--	--	--	--	--	--	--
Caprolactam	0.026 U	0.027 U	--	--	--	--	--	--	--	--	--	--	--	--
Carbazole	0.022	0.026	--	--	--	--	--	--	--	--	--	--	--	--
Chrysene	0.15	0.17	--	--	--	--	--	--	--	--	--	--	--	--
Dibenz(A,H)Anthracene	0.038	0.041	--	--	--	--	--	--	--	--	--	--	--	--
Dibenzofuran	0.0045 J	0.0063 J	--	--	--	--	--	--	--	--	--	--	--	--

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Columbia Falls, Montana

Sample Location ID	CFSB-222	CFSB-222	CFSB-223	CFSB-223	CFSB-224	CFSB-224	CFSB-225	CFSB-225	CFSB-226	CFSB-226	CFSB-227	CFSB-227	CFSB-228	CFSB-228
Sample Lab IDs	180-77673-3, 460-155989-23	180-77673-4, 460-155989-24	460-155989-14	460-155989-15	460-155989-12	460-155989-13	460-155989-10	460-155989-11	460-155989-8	460-155989-9	460-155989-6	460-155989-7	460-155989-16	460-155989-17
Sample Name	CFSB-222-SO-0-0.5	CFSB-222-SO-0.5-2	CFSB-223-SO-0-0.5	CFSB-223-SO-0.5-2	CFSB-224-SO-0-0.5	CFSB-224-SO-0.5-2	CFSB-225-SO-0-0.5	CFSB-225-SO-0.5-2	CFSB-226-SO-0-0.5	CFSB-226-SO-0.5-2	CFSB-227-SO-0-0.5	CFSB-227-SO-0.5-2	CFSB-228-SO-0-0.5	CFSB-228-SO-0.5-2
Sample Depth	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft
Chemical	5/7/2018	5/7/2018	5/7/2018	5/7/2018	5/7/2018	5/7/2018	5/7/2018	5/7/2018	5/7/2018	5/7/2018	5/7/2018	5/7/2018	5/7/2018	5/7/2018
Diethyl Phthalate	0.012 U	0.012 U	--	--	--	--	--	--	--	--	--	--	--	--
Dimethyl Phthalate	0.0015 U	0.0015 U	--	--	--	--	--	--	--	--	--	--	--	--
Di-N-Butyl Phthalate	0.018 U	0.018 U	--	--	--	--	--	--	--	--	--	--	--	--
Di-N-Octylphthalate	0.024 U	0.024 U	--	--	--	--	--	--	--	--	--	--	--	--
Fluoranthene	0.2	0.21	--	--	--	--	--	--	--	--	--	--	--	--
Fluorene	0.008 J	0.01	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorobenzene	0.0029 U	0.003 U	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorobutadiene	0.0024 U	0.0024 U	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorocyclopentadiene	0.0021 U	0.0021 U	--	--	--	--	--	--	--	--	--	--	--	--
Hexachloroethane	0.0021 U	0.0021 U	--	--	--	--	--	--	--	--	--	--	--	--
Indeno(1,2,3-C,D)Pyrene	0.14	0.16	--	--	--	--	--	--	--	--	--	--	--	--
Isophorone	0.0021 U	0.0021 U	--	--	--	--	--	--	--	--	--	--	--	--
Naphthalene	0.0029 J	0.0037 J	--	--	--	--	--	--	--	--	--	--	--	--
Nitrobenzene	0.015 U	0.015 U	--	--	--	--	--	--	--	--	--	--	--	--
N-Nitrosodi-N-Propylamine	0.0027 U	0.0028 U	--	--	--	--	--	--	--	--	--	--	--	--
N-Nitrosodiphenylamine	0.013 U	0.014 U	--	--	--	--	--	--	--	--	--	--	--	--
Pentachlorophenol	0.065 U	0.067 U	--	--	--	--	--	--	--	--	--	--	--	--
Phenanthrene	0.094	0.11	--	--	--	--	--	--	--	--	--	--	--	--
Phenol	0.012 U	0.013 U	--	--	--	--	--	--	--	--	--	--	--	--
Pyrene	0.16	0.17	--	--	--	--	--	--	--	--	--	--	--	--
VOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,1,1-Trichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,2,2-Tetrachloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,2-Trichloro-1,2,2-Trifluoroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,2-Trichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1-Dichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1-Dichloroethene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,3-Trichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,4-Trichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dibromo-3-Chloropropane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dibromoethane (Ethylene Dibromide)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichloropropane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,3-Dichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,4-Dichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Hexanone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acetone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromochloromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromodichloromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromoform	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromomethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Carbon Disulfide	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Carbon Tetrachloride	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chloroform	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chloromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cis-1,2-Dichloroethylene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cis-1,3-Dichloropropene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cyclohexane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibromochloromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dichlorodifluoromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Ethylbenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Isopropylbenzene (Cumene)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
M,P-Xylene	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Table E-8
Summary of Data Used in Risk Assessment
Central Landfills Area Soil (0-2 ft-bgs) - Current
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-222	CFSB-222	CFSB-223	CFSB-223	CFSB-224	CFSB-224	CFSB-225	CFSB-225	CFSB-226	CFSB-226	CFSB-227	CFSB-227	CFSB-228	CFSB-228
Sample Lab IDs	180-77673-3, 460-155989-23	180-77673-4, 460-155989-24	460-155989-14	460-155989-15	460-155989-12	460-155989-13	460-155989-10	460-155989-11	460-155989-8	460-155989-9	460-155989-6	460-155989-7	460-155989-16	460-155989-17
Sample Name	CFSB-222-SO-0-0.5	CFSB-222-SO-0.5-2	CFSB-223-SO-0-0.5	CFSB-223-SO-0.5-2	CFSB-224-SO-0-0.5	CFSB-224-SO-0.5-2	CFSB-225-SO-0-0.5	CFSB-225-SO-0.5-2	CFSB-226-SO-0-0.5	CFSB-226-SO-0.5-2	CFSB-227-SO-0-0.5	CFSB-227-SO-0.5-2	CFSB-228-SO-0-0.5	CFSB-228-SO-0.5-2
Sample Depth	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft
Chemical	5/7/2018	5/7/2018	5/7/2018	5/7/2018	5/7/2018	5/7/2018	5/7/2018	5/7/2018	5/7/2018	5/7/2018	5/7/2018	5/7/2018	5/7/2018	5/7/2018
Methyl Acetate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methyl Ethyl Ketone (2-Butanone)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methylcyclohexane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methylene Chloride	--	--	--	--	--	--	--	--	--	--	--	--	--	--
O-Xylene (1,2-Dimethylbenzene)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Styrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Tert-Butyl Methyl Ether	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Tetrachloroethylene (PCE)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Toluene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Trans-1,2-Dichloroethene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Trans-1,3-Dichloropropene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Trichloroethylene (TCE)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Trichlorofluoromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Vinyl Chloride	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-8
Summary of Data Used in Risk Assessment
Central Landfills Area Soil (0-2 ft-bgs) - Current
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-229	CFSB-229	CFSB-230	CFSB-230-DUP	CFSB-230	CFSB-261	CFSB-261	CFSB-262	CFSB-262	CFSB-263	CFSB-263	CFSB-264	CFSB-264	CFSB-265
Sample Lab IDs	460-155989-4	460-155989-5	460-155989-1	460-155989-2	460-155989-3	180-77393-48, 460-155369-4	180-77393-49, 460-155369-5	180-77393-59, 460-155369-15	180-77393-60, 460-155369-16	180-77393-63, 460-155369-21	180-77393-64, 460-155369-22	180-77393-72, 460-155369-30	180-77393-73, 460-155369-31	180-77393-76, 460-155369-34
Sample Name	CFSB-229-SO-0-0.5	CFSB-229-SO-0.5-2	CFSB-230-SO-0-0.5	CFSB-DUP34-SO	CFSB-230-SO-0.5-2	CFSB-261-SO-0-0.5	CFSB-261-SO-0.5-2	CFSB-262-SO-0-0.5	CFSB-262-SO-0.5-2	CFSB-263-SO-0-0.5	CFSB-263-SO-0.5-2	CFSB-264-SO-0-0.5	CFSB-264-SO-0.5-2	CFSB-265-SO-0-0.5
Sample Depth	0-0.5 ft	0.5-2 ft	0-0.5 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft
Chemical	5/7/2018	5/7/2018	5/7/2018	5/7/2018	5/7/2018	5/2/2018	5/2/2018	5/2/2018	5/2/2018	5/2/2018	5/2/2018	5/3/2018	5/3/2018	5/3/2018
GENERAL CHEMISTRY (mg/kg)														
Fluoride	--	--	--	--	--	568 J-	349 J-	23.4 J-	16.7 J-	10.8 J-	4.12 J-	9.41 J-	7.05 J-	5.89 J-
Cyanide	--	--	--	--	--	9.9	13	0.49	0.38	0.14 J	0.19 J	0.061 U	0.065 U	0.065 J
METALS (mg/kg)														
"Chromium, Hexavalent - Estimated"	--	--	--	--	--	0.393431	0.264964	0.259611	0.235523	0.259611	0.208759	0.232847	0.248905	0.246229
"Chromium, Trivalent - Calculated"	--	--	--	--	--	--	--	--	--	--	--	--	--	--
"Chromium, Trivalent - Estimated"	--	--	--	--	--	14.3066	9.63504	9.44039	8.56448	9.44039	7.59124	8.46715	9.05109	8.95377
Aluminum	--	--	--	--	--	30800	15100	12500	10300	13200	8780	7890	8610	8860
Antimony	--	--	--	--	--	0.26 UJ	0.25 UJ	0.25 UJ	0.24 UJ	0.24 UJ	0.3 UJ	0.3 UJ	0.29 UJ	0.32 UJ
Arsenic	--	--	--	--	--	7.3	4.2	5	5.9	4.4	3.4	3.6	4	4.1
Barium	--	--	--	--	--	227	115	122	59.6	178	115	99.7	71.3	77.5
Beryllium	--	--	--	--	--	1.5	0.65	0.55	0.33	0.53	0.17 U	0.42	0.16 U	0.35 J
Cadmium	--	--	--	--	--	0.3 U	0.28 U	0.28 U	0.28 U	0.28 U	0.35 U	0.34 U	0.33 U	0.36 U
Calcium	--	--	--	--	--	12300	3400	2910	18000	7740	16800	30800	23000	32500
Chromium, Total	--	--	--	--	--	14.7	9.9	9.7	8.8	9.7	7.8	8.7	9.3	9.2
Cobalt	--	--	--	--	--	5.3	5	5	10.5	5.8	4.7	4.9	5.1	5.1
Copper	--	--	--	--	--	12.5	13.4	10.8 J	13.8 J	15.9 J	16.8 J	10.9 J	18 J	12.9 J
Iron	--	--	--	--	--	20200	13500	15600	14100	14500	11800	12000	13400	12200
Lead	--	--	--	--	--	14.9	10.9	10.3 J	15 J	11.2 J	6 J+	6.7 J+	6.5 J+	7.3 J+
Magnesium	--	--	--	--	--	11100	7360	7750 J	8920 J	7000 J	8460	10700	10800	10000
Manganese	--	--	--	--	--	584	509	520 J	398 J	546 J	327 J	335 J	316 J	340 J
Mercury	--	--	--	--	--	0.01 U	0.01 U	0.014 J	0.053	0.025 J+	0.029 J+	0.012 J+	0.017 J+	0.018 J+
Nickel	--	--	--	--	--	16.6	11	13.4	9.6	14.5	10.1	10.8	10.5	15.4
Potassium	--	--	--	--	--	1500	755	972	624	843	639	615	636	541
Selenium	--	--	--	--	--	0.26 U	0.24 U	0.25 U	0.24 U	0.24 U	0.3 U	0.29 U	0.29 U	0.31 U
Silver	--	--	--	--	--	0.55 U	0.52 U	0.52 UJ	0.51 UJ	0.51 UJ	0.64 UJ	0.62 UJ	0.61 UJ	0.67 UJ
Sodium	--	--	--	--	--	4390	1990	46.8 J	25.8 U	45.9 J	49.5 J	43.9 J	45.1 J	33.8 U
Thallium	--	--	--	--	--	0.14 J	0.1 U	0.11 U	0.1 U	0.1 U	0.13 U	0.13 U	0.12 U	0.14 U
Vanadium	--	--	--	--	--	24.2	11.5	13.6	7.7	11.7	6.2	6.9	8	8.1
Zinc	--	--	--	--	--	61.5	37.5	49.2	39.6	52	36.4	33.9	35.1	33.3
METALS|HEXAVALENT CHROMIUM (mg/kg)														
Chromium, Hexavalent	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PESTICIDES (mg/kg)														
Aldrin	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Alpha Bhc (Alpha Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Alpha Endosulfan	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Beta Bhc (Beta Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Beta Endosulfan	--	--	--	--	--	--	--	--	--	--	--	--	--	--
cis-Chlordane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Delta BHC (Delta Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dieldrin	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endosulfan Sulfate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin Aldehyde	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin Ketone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Gamma Bhc (Lindane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Heptachlor	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Heptachlor Epoxide	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methoxychlor	--	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDD	--	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDT	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Toxaphene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
trans-Chlordane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
POLYCHLORINATED BIPHENYLS (mg/kg)														
PCB-1016 (Aroclor 1016)	0.0091 U	0.0093 U	0.0093 U	0.0093 U	0.0093 U	--	--	--	--	--	--	--	--	--
PCB-1221 (Aroclor 1221)	0.0091 U	0.0093 U	0.0093 U	0.0093 U	0.0093 U	--	--	--	--	--	--	--	--	--

Table E-8
Summary of Data Used in Risk Assessment
Central Landfills Area Soil (0-2 ft-bgs) - Current
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-229	CFSB-229	CFSB-230	CFSB-230-DUP	CFSB-230	CFSB-261	CFSB-261	CFSB-262	CFSB-262	CFSB-263	CFSB-263	CFSB-264	CFSB-264	CFSB-265
Sample Lab IDs	460-155989-4	460-155989-5	460-155989-1	460-155989-2	460-155989-3	180-77393-48, 460-155369-4	180-77393-49, 460-155369-5	180-77393-59, 460-155369-15	180-77393-60, 460-155369-16	180-77393-63, 460-155369-21	180-77393-64, 460-155369-22	180-77393-72, 460-155369-30	180-77393-73, 460-155369-31	180-77393-76, 460-155369-34
Sample Name	CFSB-229-SO-0-0.5	CFSB-229-SO-0.5-2	CFSB-230-SO-0-0.5	CFSB-DUP34-SO	CFSB-230-SO-0.5-2	CFSB-261-SO-0-0.5	CFSB-261-SO-0.5-2	CFSB-262-SO-0-0.5	CFSB-262-SO-0.5-2	CFSB-263-SO-0-0.5	CFSB-263-SO-0.5-2	CFSB-264-SO-0-0.5	CFSB-264-SO-0.5-2	CFSB-265-SO-0-0.5
Sample Depth	0-0.5 ft	0.5-2 ft	0-0.5 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft
Chemical	5/7/2018	5/7/2018	5/7/2018	5/7/2018	5/7/2018	5/2/2018	5/2/2018	5/2/2018	5/2/2018	5/2/2018	5/2/2018	5/3/2018	5/3/2018	5/3/2018
PCB-1232 (Aroclor 1232)	0.0091 U	0.0093 U	0.0093 U	0.0093 U	0.0093 U	--	--	--	--	--	--	--	--	--
PCB-1242 (Aroclor 1242)	0.0091 U	0.0093 U	0.0093 U	0.0093 U	0.0093 U	--	--	--	--	--	--	--	--	--
PCB-1248 (Aroclor 1248)	0.0091 U	0.0093 U	0.0093 U	0.0093 U	0.0093 U	--	--	--	--	--	--	--	--	--
PCB-1254 (Aroclor 1254)	0.0094 U	0.18 J+	0.0097 U	0.0096 U	0.0097 U	--	--	--	--	--	--	--	--	--
PCB-1260 (Aroclor 1260)	0.0094 U	0.0096 U	0.0097 U	0.0096 U	0.0097 U	--	--	--	--	--	--	--	--	--
PCB-1262 (Aroclor 1262)	0.0094 U	0.0096 U	0.0097 U	0.0096 U	0.0097 U	--	--	--	--	--	--	--	--	--
PCB-1268 (Aroclor 1268)	0.0094 U	0.0096 U	0.0097 U	0.0096 U	0.0097 U	--	--	--	--	--	--	--	--	--
Polychlorinated Biphenyl (PCBs)	0.0094 U	0.18 J+	0.0097 U	0.0096 U	0.0097 U	--	--	--	--	--	--	--	--	--
SEMIVOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,2,4,5-Tetrachlorobenzene	--	--	--	--	--	0.0064 U	0.0031 U	0.0016 U	0.0015 U	0.0032 U	0.0015 U	0.003 U	0.0015 U	0.0015 U
1,4-Dioxane (P-Dioxane)	--	--	--	--	--	0.046 U	0.023 U	0.012 U	0.011 U	0.023 U	0.011 U	0.022 U	0.011 U	0.011 U
2,3,4,6-Tetrachlorophenol	--	--	--	--	--	0.062 U	0.03 U	0.016 U	0.015 U	0.031 U	0.015 U	0.029 U	0.015 U	0.014 U
2,4,5-Trichlorophenol	--	--	--	--	--	0.011 U	0.0052 U	0.0027 U	0.0026 U	0.0053 U	0.0025 U	0.005 U	0.0025 U	0.0025 U
2,4,6-Trichlorophenol	--	--	--	--	--	0.0082 U	0.004 U	0.0021 U	0.002 U	0.0041 U	0.0019 U	0.0038 U	0.0019 U	0.0019 U
2,4-Dichlorophenol	--	--	--	--	--	0.011 U	0.0056 U	0.0029 U	0.0028 U	0.0057 U	0.0027 U	0.0054 U	0.0027 U	0.0027 U
2,4-Dimethylphenol	--	--	--	--	--	0.0092 U	0.0045 U	0.0023 U	0.0022 U	0.0046 U	0.0022 U	0.0043 U	0.0022 U	0.0022 U
2,4-Dinitrophenol	--	--	--	--	--	0.4 U	0.19 U	0.1 U	0.097 U	0.2 UJ	0.095 UJ	0.19 UJ	0.095 UJ	0.093 UJ
2,4-Dinitrotoluene	--	--	--	--	--	0.0074 U	0.0036 U	0.0019 U	0.0018 U	0.0037 U	0.0018 U	0.0035 U	0.0018 U	0.0017 U
2,6-Dinitrotoluene	--	--	--	--	--	0.0092 U	0.0045 U	0.0023 U	0.0022 U	0.0046 U	0.0022 U	0.0043 U	0.0022 U	0.0021 U
2-Chloronaphthalene	--	--	--	--	--	0.0068 U	0.0033 U	0.0017 U	0.0016 U	0.0034 U	0.0016 U	0.0032 U	0.0016 U	0.0016 U
2-Chlorophenol	--	--	--	--	--	0.0069 U	0.0034 U	0.0017 U	0.0017 U	0.0035 U	0.0016 U	0.0033 U	0.0016 U	0.0016 U
2-Methylnaphthalene	--	--	--	--	--	0.0071 U	0.0035 U	0.0039 J	0.0017 U	0.0036 U	0.0017 U	0.0034 U	0.0017 U	0.0017 U
2-Methylphenol (O-Cresol)	--	--	--	--	--	0.043 U	0.021 U	0.011 U	0.01 U	0.021 U	0.01 U	0.02 U	0.01 U	0.0099 U
2-Nitroaniline	--	--	--	--	--	0.068 U	0.033 U	0.017 U	0.016 U	0.034 U	0.016 U	0.032 U	0.016 U	0.016 U
2-Nitrophenol	--	--	--	--	--	0.0085 U	0.0041 U	0.0021 U	0.0021 U	0.0043 U	0.002 U	0.004 U	0.002 U	0.002 U
3- And 4- Methylphenol (Total)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3,3'-Dichlorobenzidine	--	--	--	--	--	0.14 U	0.067 U	0.035 U	0.033 U	0.069 U	0.033 U	0.065 U	0.033 U	0.032 U
3-Nitroaniline	--	--	--	--	--	0.038 U	0.018 U	0.0095 U	0.0091 U	0.019 U	0.009 U	0.018 U	0.009 U	0.0088 U
4,6-Dinitro-2-Methylphenol	--	--	--	--	--	0.26 U	0.12 U	0.065 U	0.062 U	0.13 UJ	0.061 UJ	0.12 UJ	0.061 UJ	0.06 UJ
4-Bromophenyl Phenyl Ether	--	--	--	--	--	0.01 U	0.0051 U	0.0026 U	0.0025 U	0.0052 U	0.0025 U	0.0049 U	0.0025 U	0.0024 U
4-Chloro-3-Methylphenol	--	--	--	--	--	0.007 U	0.0034 U	0.0018 U	0.0017 U	0.0035 U	0.0017 U	0.0033 U	0.0017 U	0.0016 U
4-Chloroaniline	--	--	--	--	--	0.0049 U	0.0024 U	0.0012 U	0.0012 U	0.0025 U	0.0012 U	0.0023 U	0.0012 U	0.0012 U
4-Chlorophenyl Phenyl Ether	--	--	--	--	--	0.009 U	0.0044 U	0.0023 U	0.0022 U	0.0045 U	0.0021 U	0.0042 U	0.0021 U	0.0021 U
4-Nitroaniline	--	--	--	--	--	0.0072 U	0.0035 U	0.0018 U	0.0017 U	0.0036 U	0.0017 U	0.0034 U	0.0017 U	0.0017 U
4-Nitrophenol	--	--	--	--	--	0.1 U	0.051 U	0.026 U	0.025 U	0.052 U	0.025 U	0.049 U	0.025 U	0.024 U
Acenaphthene	--	--	--	--	--	0.02 J	0.021	0.038	0.0021 U	0.0043 U	0.002 U	0.0075 J	0.002 U	0.0042 J
Acenaphthylene	--	--	--	--	--	0.0065 U	0.0032 U	0.0016 U	0.0016 U	0.0033 U	0.0015 U	0.0031 U	0.0015 U	0.0015 U
Acetophenone	--	--	--	--	--	0.0081 U	0.0039 U	0.002 U	0.0019 U	0.004 U	0.0019 U	0.0038 U	0.0019 U	0.0019 U
Anthracene	--	--	--	--	--	0.033	0.036	0.064	0.0019 U	0.0092 J	0.0018 U	0.015	0.0018 U	0.0091
Atrazine	--	--	--	--	--	0.065 U	0.032 U	0.016 U	0.016 U	0.033 U	0.015 U	0.031 U	0.015 U	0.015 U
Benzaldehyde	--	--	--	--	--	0.018 U	0.009 U	0.0046 U	0.0045 U	0.0092 UR	0.0044 UR	0.0087 UR	0.0044 UR	0.0043 UR
Benzo(A)Anthracene	--	--	--	--	--	0.18	0.14	0.31	0.0056 J	0.073	0.0079	0.084	0.0058 J	0.11
Benzo(A)Pyrene	--	--	--	--	--	0.17	0.12	0.3	0.0057 J	0.084	0.0086	0.092	0.0062 J	0.15
Benzo(B)Fluoranthene	--	--	--	--	--	0.31	0.21	0.53	0.0094	0.17	0.014	0.12	0.0093	0.26
Benzo(G,H,I)Perylene	--	--	--	--	--	0.21	0.14	0.29	0.0051 J	0.099	0.011	0.099	0.0059 J	0.16
Benzo(K)Fluoranthene	--	--	--	--	--	0.11	0.081	0.17	0.0027 J	0.041	0.0082	0.053	0.0035 J	0.057
Benzyl Butyl Phthalate	--	--	--	--	--	0.1 U	0.05 U	0.026 U	0.025 U	0.051 U	0.024 U	0.048 U	0.024 U	0.024 U
Biphenyl (Diphenyl)	--	--	--	--	--	0.0062 U	0.003 U	0.0016 U	0.0015 U	0.0031 U	0.0015 U	0.0029 U	0.0015 U	0.0015 U
Bis(2-Chloroethoxy) Methane	--	--	--	--	--	0.0071 U	0.0034 U	0.0018 U	0.0017 U	0.0035 U	0.0017 U	0.0033 U	0.0017 U	0.0017 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	--	--	--	--	--	0.0054 U	0.0026 U	0.0014 U	0.0013 U	0.0027 U	0.0013 U	0.0025 U	0.0013 U	0.0013 U
Bis(2-Chloroisopropyl) Ether	--	--	--	--	--	0.011 U	0.0054 U	0.0028 U	0.0027 U	0.0055 U	0.0026 U	0.0052 U	0.0026 U	0.0026 U
Bis(2-Ethylhexyl) Phthalate	--	--	--	--	--	0.16 U	0.077 U	0.04 U	0.038 U	0.079 U	0.038 U	2.5	0.037 U	0.037 U
Caprolactam	--	--	--	--	--	0.097 U	0.047 U	0.024 U	0.023 U	0.048 U	0.023 U	0.046 U	0.023 U	0.023 U
Carbazole	--	--	--	--	--	0.032	0.028	0.052	0.0017 U	0.014 J	0.0017 J	0.014	0.0016 U	0.016
Chrysene	--	--	--	--	--	0.27	0.18	0.43	0.007 J	0.14	0.017	0.092	0.0075	0.2
Dibenz(A,H)Anthracene	--	--	--	--	--	0.047	0.038	0.083	0.0016 U	0.021	0.0021 J	0.023	0.0016 J	0.037
Dibenzofuran	--	--	--	--	--	0.0071 J	0.0061 J	0.015 J	0.0016 U	0.0033 U	0.0015 U	0.0031 U	0.0015 U	0.0015 U

Table E-8
Summary of Data Used in Risk Assessment
Central Landfills Area Soil (0-2 ft-bgs) - Current
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-229	CFSB-229	CFSB-230	CFSB-230-DUP	CFSB-230	CFSB-261	CFSB-261	CFSB-262	CFSB-262	CFSB-263	CFSB-263	CFSB-264	CFSB-264	CFSB-265
Sample Lab IDs	460-155989-4	460-155989-5	460-155989-1	460-155989-2	460-155989-3	180-77393-48, 460-155369-4	180-77393-49, 460-155369-5	180-77393-59, 460-155369-15	180-77393-60, 460-155369-16	180-77393-63, 460-155369-21	180-77393-64, 460-155369-22	180-77393-72, 460-155369-30	180-77393-73, 460-155369-31	180-77393-76, 460-155369-34
Sample Name	CFSB-229-SO-0-0.5	CFSB-229-SO-0.5-2	CFSB-230-SO-0-0.5	CFSB-DUP34-SO	CFSB-230-SO-0.5-2	CFSB-261-SO-0-0.5	CFSB-261-SO-0.5-2	CFSB-262-SO-0-0.5	CFSB-262-SO-0.5-2	CFSB-263-SO-0-0.5	CFSB-263-SO-0.5-2	CFSB-264-SO-0-0.5	CFSB-264-SO-0.5-2	CFSB-265-SO-0-0.5
Sample Depth	0-0.5 ft	0.5-2 ft	0-0.5 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft
Chemical	5/7/2018	5/7/2018	5/7/2018	5/7/2018	5/7/2018	5/2/2018	5/2/2018	5/2/2018	5/2/2018	5/2/2018	5/2/2018	5/3/2018	5/3/2018	5/3/2018
Diethyl Phthalate	--	--	--	--	--	0.045 U	0.022 U	0.011 U	0.011 U	0.022 U	0.011 U	0.021 U	0.011 U	0.01 U
Dimethyl Phthalate	--	--	--	--	--	0.0054 U	0.0026 U	0.0014 U	0.0013 U	0.0027 U	0.0013 U	0.0025 U	0.0013 U	0.0013 U
Di-N-Butyl Phthalate	--	--	--	--	--	0.065 U	0.032 U	0.016 U	0.016 U	0.033 U	0.015 U	0.031 U	0.015 U	0.015 U
Di-N-Octylphthalate	--	--	--	--	--	0.086 U	0.042 U	0.022 U	0.021 U	0.043 U	0.021 U	0.041 U	0.02 U	0.02 U
Fluoranthene	--	--	--	--	--	0.41	0.32	0.63	0.01	0.13	0.017	0.15	0.011	0.2
Fluorene	--	--	--	--	--	0.015 J	0.014 J	0.028	0.0014 U	0.0029 U	0.0014 U	0.0045 J	0.0014 U	0.0025 J
Hexachlorobenzene	--	--	--	--	--	0.011 U	0.0052 U	0.0027 U	0.0026 U	0.0053 U	0.0025 U	0.005 U	0.0025 U	0.0025 U
Hexachlorobutadiene	--	--	--	--	--	0.0087 U	0.0042 U	0.0022 U	0.0021 U	0.0043 U	0.0021 U	0.0041 U	0.0021 U	0.002 U
Hexachlorocyclopentadiene	--	--	--	--	--	0.0076 U	0.0037 U	0.0019 U	0.0018 U	0.0038 U	0.0018 U	0.0036 U	0.0018 U	0.0018 U
Hexachloroethane	--	--	--	--	--	0.0077 U	0.0037 U	0.0019 U	0.0019 U	0.0038 U	0.0018 U	0.0036 U	0.0018 U	0.0018 U
Indeno(1,2,3-C,D)Pyrene	--	--	--	--	--	0.16	0.11	0.24	0.0031 J	0.083	0.0088	0.076	0.005 J	0.12
Isophorone	--	--	--	--	--	0.0076 U	0.0037 U	0.0019 U	0.0018 U	0.0038 U	0.0018 U	0.0036 U	0.0018 U	0.0018 U
Naphthalene	--	--	--	--	--	0.0058 U	0.0032 J	0.009	0.0014 U	0.0029 U	0.0014 U	0.0027 U	0.0014 U	0.0014 U
Nitrobenzene	--	--	--	--	--	0.054 U	0.026 U	0.014 U	0.013 U	0.027 U	0.013 U	0.026 U	0.013 U	0.013 U
N-Nitrosodi-N-Propylamine	--	--	--	--	--	0.01 U	0.0049 U	0.0025 U	0.0024 U	0.005 U	0.0024 U	0.0047 U	0.0024 U	0.0024 U
N-Nitrosodiphenylamine	--	--	--	--	--	0.049 U	0.024 U	0.012 U	0.012 U	0.025 U	0.012 U	0.023 U	0.012 U	0.012 U
Pentachlorophenol	--	--	--	--	--	0.24 U	0.12 U	0.06 U	0.058 U	0.12 U	0.057 U	0.11 UJ	0.057 U	0.056 UJ
Phenanthrene	--	--	--	--	--	0.19	0.18	0.3	0.0055 J	0.044	0.0052 J	0.074	0.0054 J	0.057
Phenol	--	--	--	--	--	0.045 U	0.022 U	0.011 U	0.011 U	0.023 U	0.011 U	0.021 U	0.011 U	0.011 U
Pyrene	--	--	--	--	--	0.32	0.24	0.54	0.0083	0.13	0.015	0.15	0.01	0.2
VOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,1,1-Trichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,2,2-Tetrachloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,2-Trichloro-1,2,2-Trifluoroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,2-Trichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1-Dichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1-Dichloroethene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,3-Trichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,4-Trichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dibromo-3-Chloropropane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dibromoethane (Ethylene Dibromide)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichloropropane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,3-Dichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,4-Dichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Hexanone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acetone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromochloromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromodichloromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromoform	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromomethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Carbon Disulfide	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Carbon Tetrachloride	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chloroform	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chloromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cis-1,2-Dichloroethylene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cis-1,3-Dichloropropene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cyclohexane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibromochloromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dichlorodifluoromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Ethylbenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Isopropylbenzene (Cumene)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
M,P-Xylene	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Table E-8
Summary of Data Used in Risk Assessment
Central Landfills Area Soil (0-2 ft-bgs) - Current
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-229	CFSB-229	CFSB-230	CFSB-230-DUP	CFSB-230	CFSB-261	CFSB-261	CFSB-262	CFSB-262	CFSB-263	CFSB-263	CFSB-264	CFSB-264	CFSB-265
Sample Lab IDs	460-155989-4	460-155989-5	460-155989-1	460-155989-2	460-155989-3	180-77393-48, 460-155369-4	180-77393-49, 460-155369-5	180-77393-59, 460-155369-15	180-77393-60, 460-155369-16	180-77393-63, 460-155369-21	180-77393-64, 460-155369-22	180-77393-72, 460-155369-30	180-77393-73, 460-155369-31	180-77393-76, 460-155369-34
Sample Name	CFSB-229-SO-0-0.5	CFSB-229-SO-0.5-2	CFSB-230-SO-0-0.5	CFSB-DUP34-SO	CFSB-230-SO-0.5-2	CFSB-261-SO-0-0.5	CFSB-261-SO-0.5-2	CFSB-262-SO-0-0.5	CFSB-262-SO-0.5-2	CFSB-263-SO-0-0.5	CFSB-263-SO-0.5-2	CFSB-264-SO-0-0.5	CFSB-264-SO-0.5-2	CFSB-265-SO-0-0.5
Sample Depth	0-0.5 ft	0.5-2 ft	0-0.5 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft
Chemical	5/7/2018	5/7/2018	5/7/2018	5/7/2018	5/7/2018	5/2/2018	5/2/2018	5/2/2018	5/2/2018	5/2/2018	5/2/2018	5/3/2018	5/3/2018	5/3/2018
Methyl Acetate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methyl Ethyl Ketone (2-Butanone)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methylcyclohexane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methylene Chloride	--	--	--	--	--	--	--	--	--	--	--	--	--	--
O-Xylene (1,2-Dimethylbenzene)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Styrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Tert-Butyl Methyl Ether	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Tetrachloroethylene (PCE)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Toluene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Trans-1,2-Dichloroethene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Trans-1,3-Dichloropropene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Trichloroethylene (TCE)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Trichlorofluoromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Vinyl Chloride	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-8
Summary of Data Used in Risk Assessment
Central Landfills Area Soil (0-2 ft-bgs) - Current
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-265	CFSB-270	CFSB-270	CFSB-271	CFSB-271	CFSB-277	CFSB-277	CFSB-283	CFSB-284	CFSB-289	CFSB-289	CFSB-289	CFSB-289	CFSB-290
Sample Lab IDs	180-77393-77, 460-155369-35	180-77393-55, 460-155369-11	180-77393-56, 460-155369-12	180-77393-45, 460-155369-1	180-77393-46, 460-155369-2	180-77393-80, 460-155369-38	180-77393-81, 460-155369-39	180-78894-10, 460-158632-10	180-78894-11, 460-158632-11	460-159538-16	460-159538-17	320-43709-8	320-43709-9	460-159538-2
Sample Name	CFSB-265-SO-0.5-2	CFSB-270-SO-0-0.5	CFSB-270-SO-0.5-2	CFSB-271-SO-0-0.5	CFSB-271-SO-0.5-2	CFSB-277-SO-0-0.5	CFSB-277-SO-0.5-2	CFSB-283-SO-0-0.5	CFSB-284-SO-0-0.5	CFSB-289-SO-0-0.5	CFSB-289-SO-0.5-2	CFSB-289-SO-0-0.5	CFSB-289-SO-0.5-2	CFSB-290-SO-0-0.5
Sample Depth	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft
Chemical	5/3/2018	5/2/2018	5/2/2018	5/2/2018	5/2/2018	5/3/2018	5/3/2018	6/16/2018	6/16/2018	6/28/2018	6/28/2018	9/27/2018	9/27/2018	6/28/2018
GENERAL CHEMISTRY (mg/kg)														
Fluoride	5.17 J-	796 J-	538 J-	40 J-	36.3 J-	17.3 J-	11.4 J-	1.69 J+	1.51 J+	--	--	--	--	--
Cyanide	0.065 U	2 J	4.3	1.1	0.35	0.063 U	0.066 U	0.37 J+	0.12 J+	--	--	--	--	--
METALS (mg/kg)														
"Chromium, Hexavalent - Estimated"	0.291727	0.372019	0.366667	0.305109	0.313139	0.36399	0.278345	0.377372	0.29708	--	--	--	--	--
"Chromium, Trivalent - Calculated"	--	--	--	--	--	--	--	--	--	16.525	9.615	--	--	0.215 U
"Chromium, Trivalent - Estimated"	10.6083	13.528	13.3333	11.0949	11.3869	13.236	10.1217	13.7226	10.8029	--	--	--	--	--
Aluminum	9090	22600	20000	23300	16500	8550	8490	20000	14900	--	--	--	--	--
Antimony	0.29 UJ	0.25 UJ	0.25 UJ	0.27 UJ	0.27 UJ	0.3 UJ	0.3 UJ	0.48 UJ	0.5 UJ	--	--	--	--	--
Arsenic	8.8	7.2	9	7	6.5	5.5	4.6	7.8	6	--	--	--	--	--
Barium	99.5	196	137	264	126	68.7	70.8	260	148	--	--	--	--	--
Beryllium	0.4	0.96	0.97	0.86	0.56	0.27 J	0.42	0.84	0.59 J	--	--	--	--	--
Cadmium	0.33 U	0.28 U	0.29 U	0.31 U	0.31 U	0.34 U	0.35 U	0.55 U	0.57 U	--	--	--	--	--
Calcium	39700	2960	3170	3110	2570	50700	46500	10300	8370	--	--	--	--	--
Chromium, Total	10.9	13.9	13.7	11.4	11.7	13.6	10.4	14.1	11.1	16.8	9.7	--	--	0.58 U
Cobalt	6	6.3	6.9	6.7	7.3	9.5	5	9	7.2	--	--	--	--	--
Copper	20.6 J	13.3 J	13.5 J	13.1	10.5	16.8 J	14.1 J	25.3	20	--	--	--	--	--
Iron	16000	20700	21000	20400	17400	12600	13700	20000	16400	--	--	--	--	--
Lead	11 J+	26.3 J	14.7 J	13.4	9.3	8.8 J+	7.6 J+	16.8	13.4	--	--	--	--	--
Magnesium	12100	9220 J	10900 J	9820	11100	12800	12100	10400	8110	--	--	--	--	--
Manganese	425 J	548 J	1050 J	760	501	439 J	326 J	1570 J	729 J	--	--	--	--	--
Mercury	0.016 J+	0.01 U	0.021	0.011 U	0.02	0.021 J+	0.014 J+	0.032	0.028	--	--	--	--	--
Nickel	14.7	20	15.4	13.8	12.8	17.5	12.8	33.6	26.1	--	--	--	--	--
Potassium	671	1310	1390	1200	822	680	691	1340	872	--	--	--	--	--
Selenium	0.29 U	0.24 U	0.25 U	0.26 U	0.27 U	0.29 U	0.3 U	0.56 J	0.5 U	--	--	--	--	--
Silver	0.61 UJ	0.52 UJ	0.54 UJ	0.56 U	0.58 U	0.63 UJ	0.64 UJ	1 U	1.1 U	--	--	--	--	--
Sodium	40.1 J	3120	2530	86.2 J	44.8 J	43.1 J	44.4 J	50.8 U	53.5 U	--	--	--	--	--
Thallium	0.12 U	0.13 J	0.13 J	0.11 J	0.12 U	0.13 U	0.13 U	0.2 U	0.21 U	--	--	--	--	--
Vanadium	8.4	23.5	21.6	20.6	13.5	9.4	9.5	16	11.4	--	--	--	--	--
Zinc	38	63.3	51.8	61.8	48.4	36.6	36.5	108	61.1	--	--	--	--	--
METALS|HEXAVALENT CHROMIUM (mg/kg)														
Chromium, Hexavalent	--	--	--	--	--	--	--	--	--	0.55 UJ	0.17 UJ	--	--	0.15 UJ
PESTICIDES (mg/kg)														
Aldrin	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Alpha Bhc (Alpha Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Alpha Endosulfan	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Beta Bhc (Beta Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Beta Endosulfan	--	--	--	--	--	--	--	--	--	--	--	--	--	--
cis-Chlordane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Delta BHC (Delta Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dieldrin	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endosulfan Sulfate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin Aldehyde	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin Ketone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Gamma Bhc (Lindane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Heptachlor	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Heptachlor Epoxide	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methoxychlor	--	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDD	--	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDT	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Toxaphene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
trans-Chlordane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
POLYCHLORINATED BIPHENYLS (mg/kg)														
PCB-1016 (Aroclor 1016)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1221 (Aroclor 1221)	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Table E-8
Summary of Data Used in Risk Assessment
Central Landfills Area Soil (0-2 ft-bgs) - Current
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-265	CFSB-270	CFSB-270	CFSB-271	CFSB-271	CFSB-277	CFSB-277	CFSB-283	CFSB-284	CFSB-289	CFSB-289	CFSB-289	CFSB-289	CFSB-290
Sample Lab IDs	180-77393-77, 460-155369-35	180-77393-55, 460-155369-11	180-77393-56, 460-155369-12	180-77393-45, 460-155369-1	180-77393-46, 460-155369-2	180-77393-80, 460-155369-38	180-77393-81, 460-155369-39	180-78894-10, 460-158632-10	180-78894-11, 460-158632-11	460-159538-16	460-159538-17	320-43709-8	320-43709-9	460-159538-2
Sample Name	CFSB-265-SO-0.5-2	CFSB-270-SO-0-0.5	CFSB-270-SO-0.5-2	CFSB-271-SO-0-0.5	CFSB-271-SO-0.5-2	CFSB-277-SO-0-0.5	CFSB-277-SO-0.5-2	CFSB-283-SO-0-0.5	CFSB-284-SO-0-0.5	CFSB-289-SO-0-0.5	CFSB-289-SO-0.5-2	CFSB-289-SO-0-0.5	CFSB-289-SO-0.5-2	CFSB-290-SO-0-0.5
Sample Depth	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft
Chemical	5/3/2018	5/2/2018	5/2/2018	5/2/2018	5/2/2018	5/3/2018	5/3/2018	6/16/2018	6/16/2018	6/28/2018	6/28/2018	9/27/2018	9/27/2018	6/28/2018
PCB-1232 (Aroclor 1232)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1242 (Aroclor 1242)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1248 (Aroclor 1248)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1254 (Aroclor 1254)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1260 (Aroclor 1260)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1262 (Aroclor 1262)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1268 (Aroclor 1268)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Polychlorinated Biphenyl (PCBs)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SEMIVOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,2,4,5-Tetrachlorobenzene	0.0015 U	0.0016 U	0.0016 U	0.0017 U	0.0016 U	0.006 U	0.003 U	0.0062 UJ	0.0085 UJ	--	--	--	--	--
1,4-Dioxane (P-Dioxane)	0.011 U	0.011 U	0.012 U	0.012 U	0.012 U	0.043 U	0.022 U	0.045 U	0.061 U	--	--	--	--	--
2,3,4,6-Tetrachlorophenol	0.015 U	0.015 U	0.016 U	0.017 U	0.016 U	0.057 U	0.029 U	0.06 U	0.082 U	--	--	--	--	--
2,4,5-Trichlorophenol	0.0025 U	0.0026 U	0.0027 U	0.0028 U	0.0027 U	0.0098 U	0.0049 U	0.01 U	0.014 U	--	--	--	--	--
2,4,6-Trichlorophenol	0.002 U	0.002 U	0.002 U	0.0022 U	0.0021 U	0.0076 U	0.0038 U	0.0079 U	0.011 U	--	--	--	--	--
2,4-Dichlorophenol	0.0027 U	0.0028 U	0.0029 U	0.0031 U	0.0029 U	0.011 U	0.0053 U	0.011 U	0.015 U	--	--	--	--	--
2,4-Dimethylphenol	0.0022 U	0.0023 U	0.0023 U	0.0025 U	0.0023 U	0.0086 U	0.0043 U	0.0089 U	0.012 U	--	--	--	--	--
2,4-Dinitrophenol	0.096 UJ	0.099 U	0.1 U	0.11 U	0.1 U	0.37 UJ	0.19 UJ	0.39 U	0.53 U	--	--	--	--	--
2,4-Dinitrotoluene	0.0018 U	0.0018 U	0.0019 U	0.002 U	0.0019 U	0.0069 U	0.0034 U	0.0071 U	0.0097 U	--	--	--	--	--
2,6-Dinitrotoluene	0.0022 U	0.0023 U	0.0023 U	0.0024 U	0.0023 U	0.0085 U	0.0043 U	0.0089 U	0.012 U	--	--	--	--	--
2-Chloronaphthalene	0.0016 U	0.0017 U	0.0017 U	0.0018 U	0.0017 U	0.0063 U	0.0032 U	0.0066 U	0.009 U	--	--	--	--	--
2-Chlorophenol	0.0017 U	0.0017 U	0.0017 U	0.0018 U	0.0018 U	0.0064 U	0.0032 U	0.0067 U	0.0091 U	--	--	--	--	--
2-Methylnaphthalene	0.0017 U	0.0018 U	0.0018 U	0.0019 U	0.0018 U	0.0066 U	0.0033 U	0.0088 J	0.015 J	--	--	--	--	--
2-Methylphenol (O-Cresol)	0.01 U	0.011 U	0.011 U	0.011 U	0.011 U	0.04 U	0.02 U	0.041 U	0.056 U	--	--	--	--	--
2-Nitroaniline	0.016 U	0.017 U	0.017 U	0.018 U	0.017 U	0.063 U	0.031 U	0.065 U	0.089 U	--	--	--	--	--
2-Nitrophenol	0.002 U	0.0021 U	0.0021 U	0.0023 U	0.0022 U	0.0079 U	0.004 U	0.0082 U	0.011 U	--	--	--	--	--
3- And 4- Methylphenol (Total)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3,3'-Dichlorobenzidine	0.033 U	0.034 U	0.035 U	0.037 U	0.035 U	0.13 U	0.064 U	0.13 U	0.18 U	--	--	--	--	--
3-Nitroaniline	0.009 U	0.0093 U	0.0095 U	0.01 U	0.0096 U	0.035 U	0.018 U	0.036 U	0.05 U	--	--	--	--	--
4,6-Dinitro-2-Methylphenol	0.061 UJ	0.063 U	0.064 U	0.068 U	0.065 U	0.24 UJ	0.12 UJ	0.25 U	0.34 U	--	--	--	--	--
4-Bromophenyl Phenyl Ether	0.0025 U	0.0026 U	0.0026 U	0.0028 U	0.0026 U	0.0096 U	0.0048 U	0.01 U	0.014 U	--	--	--	--	--
4-Chloro-3-Methylphenol	0.0017 U	0.0017 U	0.0018 U	0.0019 U	0.0018 U	0.0065 U	0.0033 U	0.0067 U	0.0092 U	--	--	--	--	--
4-Chloroaniline	0.0012 U	0.0012 U	0.0012 U	0.0013 U	0.0013 U	0.0046 U	0.0023 U	0.0048 U	0.0065 U	--	--	--	--	--
4-Chlorophenyl Phenyl Ether	0.0022 U	0.0022 U	0.0023 U	0.0024 U	0.0023 U	0.0083 U	0.0042 U	0.0087 U	0.012 U	--	--	--	--	--
4-Nitroaniline	0.0017 U	0.0018 U	0.0018 U	0.0019 U	0.0018 U	0.0067 U	0.0034 U	0.007 U	0.0095 U	--	--	--	--	--
4-Nitrophenol	0.025 U	0.026 U	0.026 U	0.028 U	0.026 U	0.097 U	0.048 U	0.1 U	0.14 U	--	--	--	--	--
Acenaphthene	0.0022 J	0.0042 J	0.0045 J	0.0092	0.0022 U	0.04	0.0094 J	0.072	0.061	--	--	--	--	--
Acenaphthylene	0.0016 U	0.0016 U	0.0016 U	0.0017 U	0.0016 U	0.006 U	0.003 U	0.0063 U	0.0086 U	--	--	--	--	--
Acetophenone	0.0019 U	0.002 U	0.002 U	0.0022 U	0.002 U	0.0075 U	0.0037 U	0.0078 U	0.011 U	--	--	--	--	--
Anthracene	0.0048 J	0.0085	0.0079	0.018	0.0025 J	0.072	0.019	0.14	0.12	--	--	--	--	--
Atrazine	0.016 U	0.016 U	0.016 U	0.017 U	0.016 U	0.06 U	0.03 U	0.063 UJ	0.086 UJ	--	--	--	--	--
Benzaldehyde	0.0044 UR	0.0046 U	0.0046 U	0.0049 U	0.0047 U	0.017 UR	0.0086 UR	0.018 UR	0.024 UR	--	--	--	--	--
Benzo(A)Anthracene	0.051	0.045	0.035	0.07	0.015	0.39	0.11	1	0.6	--	--	--	--	--
Benzo(A)Pyrene	0.069	0.045	0.031	0.067	0.014	0.49	0.14	1.4	0.77	--	--	--	--	--
Benzo(B)Fluoranthene	0.12	0.093	0.06	0.13	0.03	0.76	0.2	1.7	1.3	--	--	--	--	--
Benzo(G,H,I)Perylene	0.076	0.059	0.039	0.083	0.02	0.63	0.18	1.3	0.85	--	--	--	--	--
Benzo(K)Fluoranthene	0.044	0.032	0.023	0.044	0.011	0.3	0.087	0.75	0.43	--	--	--	--	--
Benzyl Butyl Phthalate	0.024 U	0.025 U	0.026 U	0.027 U	0.026 U	0.095 U	0.047 U	0.098 U	0.13 U	--	--	--	--	--
Biphenyl (Diphenyl)	0.0015 U	0.0015 U	0.0016 U	0.0017 U	0.0016 U	0.0058 U	0.0029 U	0.006 U	0.0082 U	--	--	--	--	--
Bis(2-Chloroethoxy) Methane	0.0017 U	0.0018 U	0.0018 U	0.0019 U	0.0018 U	0.0066 U	0.0033 U	0.0068 U	0.0093 U	--	--	--	--	--
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.0013 U	0.0013 U	0.0014 U	0.0014 U	0.0014 U	0.005 U	0.0025 U	0.0052 U	0.0071 U	--	--	--	--	--
Bis(2-Chloroisopropyl) Ether	0.0026 U	0.0027 U	0.0028 U	0.0029 U	0.0028 U	0.01 U	0.0051 U	0.011 U	0.015 U	--	--	--	--	--
Bis(2-Ethylhexyl) Phthalate	0.038 U	0.039 U	0.04 U	0.042 U	0.04 U	0.15 U	0.073 U	0.15 U	0.21 U	--	--	--	--	--
Caprolactam	0.023 U	0.024 U	0.024 U	0.026 U	0.025 U	0.09 U	0.045 U	0.093 U	0.13 U	--	--	--	--	--
Carbazole	0.012	0.0098	0.0062 J	0.014	0.0029 J	0.074	0.022	0.18	0.14	--	--	--	--	--
Chrysene	0.097	0.082	0.05	0.11	0.024	0.58	0.17	1.4	1.1	--	--	--	--	--
Dibenz(A,H)Anthracene	0.016	0.0016 U	0.0096	0.021	0.0053 J	0.15	0.036	0.24	0.22	--	--	--	--	--
Dibenzofuran	0.0016 U	0.0026 J	0.0016 U	0.0027 J	0.0016 U	0.013 J	0.0031 J	0.022 J	0.029 J	--	--	--	--	--

Table E-8
Summary of Data Used in Risk Assessment
Central Landfills Area Soil (0-2 ft-bgs) - Current
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-265	CFSB-270	CFSB-270	CFSB-271	CFSB-271	CFSB-277	CFSB-277	CFSB-283	CFSB-284	CFSB-289	CFSB-289	CFSB-289	CFSB-289	CFSB-290
Sample Lab IDs	180-77393-77, 460-155369-35	180-77393-55, 460-155369-11	180-77393-56, 460-155369-12	180-77393-45, 460-155369-1	180-77393-46, 460-155369-2	180-77393-80, 460-155369-38	180-77393-81, 460-155369-39	180-78894-10, 460-158632-10	180-78894-11, 460-158632-11	460-159538-16	460-159538-17	320-43709-8	320-43709-9	460-159538-2
Sample Name	CFSB-265-SO-0.5-2	CFSB-270-SO-0-0.5	CFSB-270-SO-0.5-2	CFSB-271-SO-0-0.5	CFSB-271-SO-0.5-2	CFSB-277-SO-0-0.5	CFSB-277-SO-0.5-2	CFSB-283-SO-0-0.5	CFSB-284-SO-0-0.5	CFSB-289-SO-0-0.5	CFSB-289-SO-0.5-2	CFSB-289-SO-0-0.5	CFSB-289-SO-0.5-2	CFSB-290-SO-0-0.5
Sample Depth	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft
Chemical	5/3/2018	5/2/2018	5/2/2018	5/2/2018	5/2/2018	5/3/2018	5/3/2018	6/16/2018	6/16/2018	6/28/2018	6/28/2018	9/27/2018	9/27/2018	6/28/2018
Diethyl Phthalate	0.011 U	0.011 U	0.011 U	0.012 U	0.011 U	0.041 U	0.021 U	0.043 U	0.059 U	--	--	--	--	--
Dimethyl Phthalate	0.0013 U	0.0013 U	0.0014 U	0.0014 U	0.0014 U	0.005 U	0.0025 U	0.0052 U	0.0071 U	--	--	--	--	--
Di-N-Butyl Phthalate	0.016 U	0.016 U	0.016 U	0.017 U	0.016 U	0.06 U	0.03 U	0.063 U	0.086 U	--	--	--	--	--
Di-N-Octylphthalate	0.021 U	0.021 U	0.022 U	0.023 U	0.022 U	0.08 U	0.04 U	0.083 U	0.11 U	--	--	--	--	--
Fluoranthene	0.12	0.11	0.072	0.15	0.033	0.75	0.21	1.8	1.2	--	--	--	--	--
Fluorene	0.0014 J	0.0038 J	0.0032 J	0.007 J	0.0015 U	0.027 J	0.0049 J	0.042	0.037 J	--	--	--	--	--
Hexachlorobenzene	0.0025 U	0.0026 U	0.0027 U	0.0028 U	0.0027 U	0.0099 U	0.0049 U	0.01 U	0.014 U	--	--	--	--	--
Hexachlorobutadiene	0.0021 U	0.0021 U	0.0022 U	0.0023 U	0.0022 U	0.0081 U	0.004 U	0.0084 U	0.011 U	--	--	--	--	--
Hexachlorocyclopentadiene	0.0018 U	0.0019 U	0.0019 U	0.002 U	0.0019 U	0.007 U	0.0035 U	0.0073 U	0.01 U	--	--	--	--	--
Hexachloroethane	0.0018 U	0.0019 U	0.0019 U	0.002 U	0.0019 U	0.0071 U	0.0036 U	0.0074 U	0.01 U	--	--	--	--	--
Indeno(1,2,3-C,D)Pyrene	0.062	0.045	0.033	0.062	0.015	0.48	0.14	0.99	0.66	--	--	--	--	--
Isophorone	0.0018 U	0.0019 U	0.0019 U	0.002 U	0.0019 U	0.007 U	0.0035 U	0.0073 U	0.01 U	--	--	--	--	--
Naphthalene	0.0014 U	0.0014 U	0.0015 U	0.0015 U	0.0015 U	0.011 J	0.0027 U	0.024 J	0.045	--	--	--	--	--
Nitrobenzene	0.013 U	0.013 U	0.014 U	0.014 U	0.014 U	0.05 U	0.025 U	0.052 U	0.072 U	--	--	--	--	--
N-Nitrosodi-N-Propylamine	0.0024 U	0.0025 U	0.0025 U	0.0027 U	0.0026 U	0.0093 U	0.0047 U	0.0097 U	0.013 U	--	--	--	--	--
N-Nitrosodiphenylamine	0.012 U	0.012 U	0.012 U	0.013 U	0.013 U	0.046 U	0.023 U	0.048 U	0.065 U	--	--	--	--	--
Pentachlorophenol	0.057 UJ	0.059 U	0.06 U	0.064 U	0.061 U	0.22 U	0.11 U	0.23 U	0.31 U	--	--	--	--	--
Phenanthrene	0.034	0.04	0.036	0.07	0.012	0.35	0.092	0.81	0.64	--	--	--	--	--
Phenol	0.011 U	0.011 U	0.011 U	0.012 U	0.011 U	0.042 U	0.021 U	0.043 U	0.059 U	--	--	--	--	--
Pyrene	0.1	0.087	0.061	0.12	0.025	0.77	0.22	1.5	1.1	--	--	--	--	--
VOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,1,1-Trichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,2,2-Tetrachloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,2-Trichloro-1,2,2-Trifluoroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,2-Trichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1-Dichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1-Dichloroethene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,3-Trichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,4-Trichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dibromo-3-Chloropropane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dibromoethane (Ethylene Dibromide)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichloropropane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,3-Dichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,4-Dichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Hexanone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acetone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromochloromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromodichloromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromoform	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromomethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Carbon Disulfide	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Carbon Tetrachloride	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chloroform	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chloromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cis-1,2-Dichloroethylene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cis-1,3-Dichloropropene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cyclohexane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibromochloromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dichlorodifluoromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Ethylbenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Isopropylbenzene (Cumene)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
M,P-Xylene	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Table E-8
Summary of Data Used in Risk Assessment
Central Landfills Area Soil (0-2 ft-bgs) - Current
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-265	CFSB-270	CFSB-270	CFSB-271	CFSB-271	CFSB-277	CFSB-277	CFSB-283	CFSB-284	CFSB-289	CFSB-289	CFSB-289	CFSB-289	CFSB-290
Sample Lab IDs	180-77393-77, 460-155369-35	180-77393-55, 460-155369-11	180-77393-56, 460-155369-12	180-77393-45, 460-155369-1	180-77393-46, 460-155369-2	180-77393-80, 460-155369-38	180-77393-81, 460-155369-39	180-78894-10, 460-158632-10	180-78894-11, 460-158632-11	460-159538-16	460-159538-17	320-43709-8	320-43709-9	460-159538-2
Sample Name	CFSB-265-SO-0.5-2	CFSB-270-SO-0-0.5	CFSB-270-SO-0.5-2	CFSB-271-SO-0-0.5	CFSB-271-SO-0.5-2	CFSB-277-SO-0-0.5	CFSB-277-SO-0.5-2	CFSB-283-SO-0-0.5	CFSB-284-SO-0-0.5	CFSB-289-SO-0-0.5	CFSB-289-SO-0.5-2	CFSB-289-SO-0-0.5	CFSB-289-SO-0.5-2	CFSB-290-SO-0-0.5
Sample Depth	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft
Chemical	5/3/2018	5/2/2018	5/2/2018	5/2/2018	5/2/2018	5/3/2018	5/3/2018	6/16/2018	6/16/2018	6/28/2018	6/28/2018	9/27/2018	9/27/2018	6/28/2018
Methyl Acetate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methyl Ethyl Ketone (2-Butanone)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methylcyclohexane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methylene Chloride	--	--	--	--	--	--	--	--	--	--	--	--	--	--
O-Xylene (1,2-Dimethylbenzene)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Styrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Tert-Butyl Methyl Ether	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Tetrachloroethylene (PCE)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Toluene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Trans-1,2-Dichloroethene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Trans-1,3-Dichloropropene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Trichloroethylene (TCE)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Trichlorofluoromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Vinyl Chloride	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-8
Summary of Data Used in Risk Assessment
Central Landfills Area Soil (0-2 ft-bgs) - Current
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-290	CFSB-290	CFSB-290	CFSB-291	CFSB-291	CFSB-292	CFSB-292
Sample Lab IDs	460-159538-3	320-43709-6	320-43709-7	460-159044-11	460-159044-12	460-159044-25	460-159044-26
Sample Name	CFSB-290-SO-0.5-2	CFSB-290-SO-0-0.5	CFSB-290-SO-0.5-2	CFSB-291-SO-0-0.5	CFSB-291-SO-0.5-2	CFSB-292-SO-0-0.5	CFSB-292-SO-0.5-2
Sample Depth	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft
Chemical	6/28/2018	9/27/2018	9/27/2018	6/22/2018	6/22/2018	6/22/2018	6/22/2018
GENERAL CHEMISTRY (mg/kg)							
Fluoride	--	--	--	--	--	--	--
Cyanide	--	--	--	--	--	--	--
METALS (mg/kg)							
"Chromium, Hexavalent - Estimated"	--	--	--	--	--	--	--
"Chromium, Trivalent - Calculated"	8.725	--	--	11.02	9.92	8.42	9.8735
"Chromium, Trivalent - Estimated"	--	--	--	--	--	--	--
Aluminum	--	--	--	--	--	--	--
Antimony	--	--	--	--	--	--	--
Arsenic	--	--	--	--	--	--	--
Barium	--	--	--	--	--	--	--
Beryllium	--	--	--	--	--	--	--
Cadmium	--	--	--	--	--	--	--
Calcium	--	--	--	--	--	--	--
Chromium, Total	8.8	--	--	11.1	10	8.5	9.9
Cobalt	--	--	--	--	--	--	--
Copper	--	--	--	--	--	--	--
Iron	--	--	--	--	--	--	--
Lead	--	--	--	--	--	--	--
Magnesium	--	--	--	--	--	--	--
Manganese	--	--	--	--	--	--	--
Mercury	--	--	--	--	--	--	--
Nickel	--	--	--	--	--	--	--
Potassium	--	--	--	--	--	--	--
Selenium	--	--	--	--	--	--	--
Silver	--	--	--	--	--	--	--
Sodium	--	--	--	--	--	--	--
Thallium	--	--	--	--	--	--	--
Vanadium	--	--	--	--	--	--	--
Zinc	--	--	--	--	--	--	--
METALS|HEXAVALENT CHROMIUM (mg/kg)							
Chromium, Hexavalent	0.15 UJ	--	--	0.16 UJ	0.16 UJ	0.16 UJ	0.053 U
PESTICIDES (mg/kg)							
Aldrin	--	--	--	--	--	--	--
Alpha Bhc (Alpha Hexachlorocyclohexane)	--	--	--	--	--	--	--
Alpha Endosulfan	--	--	--	--	--	--	--
Beta Bhc (Beta Hexachlorocyclohexane)	--	--	--	--	--	--	--
Beta Endosulfan	--	--	--	--	--	--	--
cis-Chlordane	--	--	--	--	--	--	--
Delta BHC (Delta Hexachlorocyclohexane)	--	--	--	--	--	--	--
Dieldrin	--	--	--	--	--	--	--
Endosulfan Sulfate	--	--	--	--	--	--	--
Endrin	--	--	--	--	--	--	--
Endrin Aldehyde	--	--	--	--	--	--	--
Endrin Ketone	--	--	--	--	--	--	--
Gamma Bhc (Lindane)	--	--	--	--	--	--	--
Heptachlor	--	--	--	--	--	--	--
Heptachlor Epoxide	--	--	--	--	--	--	--
Methoxychlor	--	--	--	--	--	--	--
P,P'-DDD	--	--	--	--	--	--	--
P,P'-DDE	--	--	--	--	--	--	--
P,P'-DDT	--	--	--	--	--	--	--
Toxaphene	--	--	--	--	--	--	--
trans-Chlordane	--	--	--	--	--	--	--
POLYCHLORINATED BIPHENYLS (mg/kg)							
PCB-1016 (Aroclor 1016)	--	--	--	--	--	--	--
PCB-1221 (Aroclor 1221)	--	--	--	--	--	--	--

Table E-8
Summary of Data Used in Risk Assessment
Central Landfills Area Soil (0-2 ft-bgs) - Current
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-290	CFSB-290	CFSB-290	CFSB-291	CFSB-291	CFSB-292	CFSB-292
Sample Lab IDs	460-159538-3	320-43709-6	320-43709-7	460-159044-11	460-159044-12	460-159044-25	460-159044-26
Sample Name	CFSB-290-SO-0.5-2	CFSB-290-SO-0-0.5	CFSB-290-SO-0.5-2	CFSB-291-SO-0-0.5	CFSB-291-SO-0.5-2	CFSB-292-SO-0-0.5	CFSB-292-SO-0.5-2
Sample Depth	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft
Chemical	6/28/2018	9/27/2018	9/27/2018	6/22/2018	6/22/2018	6/22/2018	6/22/2018
PCB-1232 (Aroclor 1232)	--	--	--	--	--	--	--
PCB-1242 (Aroclor 1242)	--	--	--	--	--	--	--
PCB-1248 (Aroclor 1248)	--	--	--	--	--	--	--
PCB-1254 (Aroclor 1254)	--	--	--	--	--	--	--
PCB-1260 (Aroclor 1260)	--	--	--	--	--	--	--
PCB-1262 (Aroclor 1262)	--	--	--	--	--	--	--
PCB-1268 (Aroclor 1268)	--	--	--	--	--	--	--
Polychlorinated Biphenyl (PCBs)	--	--	--	--	--	--	--
SEMIVOLATILE ORGANIC COMPOUNDS (mg/kg)							
1,2,4,5-Tetrachlorobenzene	--	--	--	--	--	--	--
1,4-Dioxane (P-Dioxane)	--	--	--	--	--	--	--
2,3,4,6-Tetrachlorophenol	--	--	--	--	--	--	--
2,4,5-Trichlorophenol	--	--	--	--	--	--	--
2,4,6-Trichlorophenol	--	--	--	--	--	--	--
2,4-Dichlorophenol	--	--	--	--	--	--	--
2,4-Dimethylphenol	--	--	--	--	--	--	--
2,4-Dinitrophenol	--	--	--	--	--	--	--
2,4-Dinitrotoluene	--	--	--	--	--	--	--
2,6-Dinitrotoluene	--	--	--	--	--	--	--
2-Chloronaphthalene	--	--	--	--	--	--	--
2-Chlorophenol	--	--	--	--	--	--	--
2-Methylnaphthalene	--	--	--	--	--	--	--
2-Methylphenol (O-Cresol)	--	--	--	--	--	--	--
2-Nitroaniline	--	--	--	--	--	--	--
2-Nitrophenol	--	--	--	--	--	--	--
3- And 4- Methylphenol (Total)	--	--	--	--	--	--	--
3,3'-Dichlorobenzidine	--	--	--	--	--	--	--
3-Nitroaniline	--	--	--	--	--	--	--
4,6-Dinitro-2-Methylphenol	--	--	--	--	--	--	--
4-Bromophenyl Phenyl Ether	--	--	--	--	--	--	--
4-Chloro-3-Methylphenol	--	--	--	--	--	--	--
4-Chloroaniline	--	--	--	--	--	--	--
4-Chlorophenyl Phenyl Ether	--	--	--	--	--	--	--
4-Nitroaniline	--	--	--	--	--	--	--
4-Nitrophenol	--	--	--	--	--	--	--
Acenaphthene	--	--	--	--	--	--	--
Acenaphthylene	--	--	--	--	--	--	--
Acetophenone	--	--	--	--	--	--	--
Anthracene	--	--	--	--	--	--	--
Atrazine	--	--	--	--	--	--	--
Benzaldehyde	--	--	--	--	--	--	--
Benzo(A)Anthracene	--	--	--	--	--	--	--
Benzo(A)Pyrene	--	--	--	--	--	--	--
Benzo(B)Fluoranthene	--	--	--	--	--	--	--
Benzo(G,H,I)Perylene	--	--	--	--	--	--	--
Benzo(K)Fluoranthene	--	--	--	--	--	--	--
Benzyl Butyl Phthalate	--	--	--	--	--	--	--
Biphenyl (Diphenyl)	--	--	--	--	--	--	--
Bis(2-Chloroethoxy) Methane	--	--	--	--	--	--	--
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	--	--	--	--	--	--	--
Bis(2-Chloroisopropyl) Ether	--	--	--	--	--	--	--
Bis(2-Ethylhexyl) Phthalate	--	--	--	--	--	--	--
Caprolactam	--	--	--	--	--	--	--
Carbazole	--	--	--	--	--	--	--
Chrysene	--	--	--	--	--	--	--
Dibenz(A,H)Anthracene	--	--	--	--	--	--	--
Dibenzofuran	--	--	--	--	--	--	--

Table E-8
Summary of Data Used in Risk Assessment
Central Landfills Area Soil (0-2 ft-bgs) - Current
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-290	CFSB-290	CFSB-290	CFSB-291	CFSB-291	CFSB-292	CFSB-292
Sample Lab IDs	460-159538-3	320-43709-6	320-43709-7	460-159044-11	460-159044-12	460-159044-25	460-159044-26
Sample Name	CFSB-290-SO-0.5-2	CFSB-290-SO-0-0.5	CFSB-290-SO-0.5-2	CFSB-291-SO-0-0.5	CFSB-291-SO-0.5-2	CFSB-292-SO-0-0.5	CFSB-292-SO-0.5-2
Sample Depth	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft
Chemical	6/28/2018	9/27/2018	9/27/2018	6/22/2018	6/22/2018	6/22/2018	6/22/2018
Diethyl Phthalate	--	--	--	--	--	--	--
Dimethyl Phthalate	--	--	--	--	--	--	--
Di-N-Butyl Phthalate	--	--	--	--	--	--	--
Di-N-Octylphthalate	--	--	--	--	--	--	--
Fluoranthene	--	--	--	--	--	--	--
Fluorene	--	--	--	--	--	--	--
Hexachlorobenzene	--	--	--	--	--	--	--
Hexachlorobutadiene	--	--	--	--	--	--	--
Hexachlorocyclopentadiene	--	--	--	--	--	--	--
Hexachloroethane	--	--	--	--	--	--	--
Indeno(1,2,3-C,D)Pyrene	--	--	--	--	--	--	--
Isophorone	--	--	--	--	--	--	--
Naphthalene	--	--	--	--	--	--	--
Nitrobenzene	--	--	--	--	--	--	--
N-Nitrosodi-N-Propylamine	--	--	--	--	--	--	--
N-Nitrosodiphenylamine	--	--	--	--	--	--	--
Pentachlorophenol	--	--	--	--	--	--	--
Phenanthrene	--	--	--	--	--	--	--
Phenol	--	--	--	--	--	--	--
Pyrene	--	--	--	--	--	--	--
VOLATILE ORGANIC COMPOUNDS (mg/kg)							
1,1,1-Trichloroethane	--	--	--	--	--	--	--
1,1,2,2-Tetrachloroethane	--	--	--	--	--	--	--
1,1,2-Trichloro-1,2,2-Trifluoroethane	--	--	--	--	--	--	--
1,1,2-Trichloroethane	--	--	--	--	--	--	--
1,1-Dichloroethane	--	--	--	--	--	--	--
1,1-Dichloroethene	--	--	--	--	--	--	--
1,2,3-Trichlorobenzene	--	--	--	--	--	--	--
1,2,4-Trichlorobenzene	--	--	--	--	--	--	--
1,2-Dibromo-3-Chloropropane	--	--	--	--	--	--	--
1,2-Dibromoethane (Ethylene Dibromide)	--	--	--	--	--	--	--
1,2-Dichlorobenzene	--	--	--	--	--	--	--
1,2-Dichloroethane	--	--	--	--	--	--	--
1,2-Dichloropropane	--	--	--	--	--	--	--
1,3-Dichlorobenzene	--	--	--	--	--	--	--
1,4-Dichlorobenzene	--	--	--	--	--	--	--
2-Hexanone	--	--	--	--	--	--	--
Acetone	--	--	--	--	--	--	--
Benzene	--	--	--	--	--	--	--
Bromochloromethane	--	--	--	--	--	--	--
Bromodichloromethane	--	--	--	--	--	--	--
Bromoform	--	--	--	--	--	--	--
Bromomethane	--	--	--	--	--	--	--
Carbon Disulfide	--	--	--	--	--	--	--
Carbon Tetrachloride	--	--	--	--	--	--	--
Chlorobenzene	--	--	--	--	--	--	--
Chloroethane	--	--	--	--	--	--	--
Chloroform	--	--	--	--	--	--	--
Chloromethane	--	--	--	--	--	--	--
Cis-1,2-Dichloroethylene	--	--	--	--	--	--	--
Cis-1,3-Dichloropropene	--	--	--	--	--	--	--
Cyclohexane	--	--	--	--	--	--	--
Dibromochloromethane	--	--	--	--	--	--	--
Dichlorodifluoromethane	--	--	--	--	--	--	--
Ethylbenzene	--	--	--	--	--	--	--
Isopropylbenzene (Cumene)	--	--	--	--	--	--	--
M,P-Xylene	--	--	--	--	--	--	--

Table E-8
Summary of Data Used in Risk Assessment
Central Landfills Area Soil (0-2 ft-bgs) - Current
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-290	CFSB-290	CFSB-290	CFSB-291	CFSB-291	CFSB-292	CFSB-292
Sample Lab IDs	460-159538-3	320-43709-6	320-43709-7	460-159044-11	460-159044-12	460-159044-25	460-159044-26
Sample Name	CFSB-290-SO-0.5-2	CFSB-290-SO-0-0.5	CFSB-290-SO-0.5-2	CFSB-291-SO-0-0.5	CFSB-291-SO-0.5-2	CFSB-292-SO-0-0.5	CFSB-292-SO-0.5-2
Sample Depth	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft
Chemical	6/28/2018	9/27/2018	9/27/2018	6/22/2018	6/22/2018	6/22/2018	6/22/2018
Methyl Acetate	--	--	--	--	--	--	--
Methyl Ethyl Ketone (2-Butanone)	--	--	--	--	--	--	--
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	--	--	--	--	--	--	--
Methylcyclohexane	--	--	--	--	--	--	--
Methylene Chloride	--	--	--	--	--	--	--
O-Xylene (1,2-Dimethylbenzene)	--	--	--	--	--	--	--
Styrene	--	--	--	--	--	--	--
Tert-Butyl Methyl Ether	--	--	--	--	--	--	--
Tetrachloroethylene (PCE)	--	--	--	--	--	--	--
Toluene	--	--	--	--	--	--	--
Trans-1,2-Dichloroethene	--	--	--	--	--	--	--
Trans-1,3-Dichloropropene	--	--	--	--	--	--	--
Trichloroethylene (TCE)	--	--	--	--	--	--	--
Trichlorofluoromethane	--	--	--	--	--	--	--
Vinyl Chloride	--	--	--	--	--	--	--

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-9
Summary of Data Used in Risk Assessment
Central Landfills Area (soil 0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFLP-007	CFLP-007	CFLP-008	CFLP-008	CFLP-009	CFLP-009	CFLP-010	CFLP-010	CFLP-011	CFLP-011	CFLP-012	CFLP-012	CFLP-013	CFLP-013
Sample Lab IDs	180-78687-1, 200-43824-1, 460-158063-1	180-78687-2, 200-43824-2, 460-158063-2	180-78687-3, 200-43824-3, 460-158063-3	180-78687-4, 200-43824-4, 460-158063-4	180-78687-5, 200-43824-5, 460-158063-5	180-78687-6, 200-43824-6, 460-158063-6	180-78687-7, 200-43824-7, 460-158063-7	180-78687-8, 200-43824-8, 460-158063-8	180-78687-9, 200-43824-9, 460-158063-9	180-78687-10, 200-43824-10, 460-158063-10	180-78687-11, 200-43824-11, 460-158063-11	180-78687-12, 200-43824-12, 460-158063-12	180-78687-13, 200-43824-13, 460-158063-13	180-78687-14, 200-43824-14, 460-158063-14
Sample Name	CFLP-007-SO-0-0.5	CFLP-007-SO-0.5-2	CFLP-008-SO-0-0.5	CFLP-008-SO-0.5-2	CFLP-009-SO-0-0.5	CFLP-009-SO-0.5-2	CFLP-010-SO-0-0.5	CFLP-010-SO-0.5-2	CFLP-011-SO-0-0.5	CFLP-011-SO-0.5-2	CFLP-012-SO-0-0.5	CFLP-012-SO-0.5-2	CFLP-013-SO-0-0.5	CFLP-013-SO-0.5-2
Sample Depth	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft
Chemical	6/9/2018	6/9/2018	6/9/2018	6/9/2018	6/9/2018	6/9/2018	6/9/2018	6/9/2018	6/9/2018	6/9/2018	6/9/2018	6/9/2018	6/9/2018	6/9/2018
GENERAL CHEMISTRY (mg/kg)														
Fluoride	20.3	58.1	22.2	54.5	3.24	250	41.4	20.3	4.79	3.96	31	239	6.68	10.8
Cyanide	0.11 J	0.062 J	0.06 U	0.057 U	0.058 U	0.086 U	0.094 J	0.067 U	0.077 J+	0.064 U	0.063 U	0.15 J+	0.11 J+	0.064 U
METALS (mg/kg)														
"Chromium, Hexavalent - Estimated"	0.246229	0.246229	0.222141	0.248905	0.206083	0.382725	0.291727	0.270316	0.275669	0.264964	0.248905	0.537956	0.29708	0.329197
"Chromium, Trivalent - Calculated"	--	--	--	--	--	--	--	--	--	--	--	--	--	--
"Chromium, Trivalent - Estimated"	8.95377	8.95377	8.07786	9.05109	7.49392	13.9173	10.6083	9.82968	10.0243	9.63504	9.05109	19.562	10.8029	11.9708
Aluminum	12000	12800	10600	10000	7560	24700	16100	12900	16300	12800	13800	36800	16500	13800
Antimony	0.29 U	0.29 U	0.29 U	0.27 U	0.3 U	1.5	0.37 J	0.31 U	0.3 U	0.31 U	0.27 U	1.2 J	0.29 U	0.32 U
Arsenic	5.2	5.1	5.2	4.7	4.4	17.9	5.8	5.4	5.8	5.8	5.7	16.8	8.8	7
Barium	78	106	67.4	82.9	69.1	146	99.1	109	182	97.3	94.4	288	134	163
Beryllium	0.55	0.68	0.48	0.49	0.39 J	4.7	0.67	0.65	0.67	0.56	0.58	4	0.56	0.75
Cadmium	0.33 U	0.34 U	0.33 U	0.32 U	0.34 U	1.6	0.34 U	0.35 U	0.34 U	0.35 U	0.31 U	0.87 J	0.33 U	0.37 U
Calcium	29100	23700	21300	28700	24100	222000	23600	29300	9660	29800	31800	180000	3040	27500
Chromium, Total	9.2	9.2	8.3	9.3	7.7	14.3	10.9	10.1	10.3	9.9	9.3	20.1	11.1	12.3
Cobalt	5.8	5.8	5.5	5.2	5.2	13	6.1	6.3	6.3	5.6	5.8	10.3	6.2	6.7
Copper	14	13.6	13.9	14.2	11.7	10.7	19.9	17.3	14.4	13.6	16.8	17	15.1	17.7
Iron	13500	13100	12600	13200	12500	7330	15600	14700	15900	15700	13400	13700	17400	17000
Lead	10.5	10.1	9.3	10.8	7.4	63.7	14.8	12.1	9.7	10	11.5	53.3	13.2	11
Magnesium	9100	9170	8880	10100	9050	8310	11000	9930	7580	11300	9450	11500	9880	11400
Manganese	360	362	309	342	309	129	448	460	445	431	421	328	576	397
Mercury	0.025	0.019	0.016 J	0.015 J	0.013 J	0.024	0.034	0.018	0.017 J	0.021	0.022	0.032	0.026	0.028
Nickel	24.1	30.2	21.9	16.5	12.9	534	39	19.5	12.9	11.4	22.4	276	20.3	15.4
Potassium	993	1150	868	902	619	6510	1820	1370	1110	845	1100	10900	1300	1700
Selenium	0.29 U	0.29 U	0.28 U	0.27 U	0.3 U	3 J	0.29 U	0.3 U	0.3 U	0.31 U	0.26 U	2.1 J	0.29 U	0.32 U
Silver	0.61 U	0.62 U	0.6 U	0.58 U	0.63 U	0.94 U	0.62 U	0.65 U	0.63 U	0.65 U	0.56 U	1.1 U	0.61 U	0.68 U
Sodium	66.2 J	65.4 J	33.9 J	39.7 J	32 U	5160	119	46.3 J	45.9 J	88 J	51.3 J	5170	41.5 J	41.3 J
Thallium	0.12 U	0.12 U	0.12 U	0.12 U	0.13 U	1.1	0.14 J	0.13 U	0.13 U	0.13 U	0.11 U	0.94	0.12 U	0.14 U
Vanadium	12.4	12.9	11	10.2	7.9	151	20.2	12.8	13.1	9.3	12	113	14	12.9
Zinc	42.9	42.9	39	42.4	35.1	52.6	50.7	48	54.5	46.7	44.1	63	52.5	49
METALS|HEXAVALENT CHROMIUM (mg/kg)														
Chromium, Hexavalent	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PESTICIDES (mg/kg)														
Aldrin	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Alpha Bhc (Alpha Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Alpha Endosulfan	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Beta Bhc (Beta Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Beta Endosulfan	--	--	--	--	--	--	--	--	--	--	--	--	--	--
cis-Chlordane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Delta BHC (Delta Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dieldrin	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endosulfan Sulfate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin Aldehyde	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin Ketone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Gamma Bhc (Lindane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Heptachlor	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Heptachlor Epoxide	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methoxychlor	--	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDD	--	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDT	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Toxaphene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
trans-Chlordane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
POLYCHLORINATED BIPHENYLS (mg/kg)														
PCB-1016 (Aroclor 1016)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1221 (Aroclor 1221)	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Table E-9
Summary of Data Used in Risk Assessment
Central Landfills Area (soil 0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Sample Depth Chemical	CFLP-007 180-78687-1, 200-43824-1, 460-158063-1 CFLP-007-SO-0-0.5 0-0.5 ft 6/9/2018	CFLP-007 180-78687-2, 200-43824-2, 460-158063-2 CFLP-007-SO-0.5-2 0.5-2 ft 6/9/2018	CFLP-008 180-78687-3, 200-43824-3, 460-158063-3 CFLP-008-SO-0-0.5 0-0.5 ft 6/9/2018	CFLP-008 180-78687-4, 200-43824-4, 460-158063-4 CFLP-008-SO-0.5-2 0.5-2 ft 6/9/2018	CFLP-009 180-78687-5, 200-43824-5, 460-158063-5 CFLP-009-SO-0-0.5 0-0.5 ft 6/9/2018	CFLP-009 180-78687-6, 200-43824-6, 460-158063-6 CFLP-009-SO-0.5-2 0.5-2 ft 6/9/2018	CFLP-010 180-78687-7, 200-43824-7, 460-158063-7 CFLP-010-SO-0-0.5 0-0.5 ft 6/9/2018	CFLP-010 180-78687-8, 200-43824-8, 460-158063-8 CFLP-010-SO-0.5-2 0.5-2 ft 6/9/2018	CFLP-011 180-78687-9, 200-43824-9, 460-158063-9 CFLP-011-SO-0-0.5 0-0.5 ft 6/9/2018	CFLP-011 180-78687-10, 200-43824-10, 460-158063-10 CFLP-011-SO-0.5-2 0.5-2 ft 6/9/2018	CFLP-012 180-78687-11, 200-43824-11, 460-158063-11 CFLP-012-SO-0-0.5 0-0.5 ft 6/9/2018	CFLP-012 180-78687-12, 200-43824-12, 460-158063-12 CFLP-012-SO-0.5-2 0.5-2 ft 6/9/2018	CFLP-013 180-78687-13, 200-43824-13, 460-158063-13 CFLP-013-SO-0-0.5 0-0.5 ft 6/9/2018	CFLP-013 180-78687-14, 200-43824-14, 460-158063-14 CFLP-013-SO-0.5-2 0.5-2 ft 6/9/2018
PCB-1232 (Aroclor 1232)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1242 (Aroclor 1242)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1248 (Aroclor 1248)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1254 (Aroclor 1254)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1260 (Aroclor 1260)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1262 (Aroclor 1262)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1268 (Aroclor 1268)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Polychlorinated Biphenyl (PCBs)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SEMIVOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,2,4,5-Tetrachlorobenzene	0.0031 U	0.0015 U	0.0015 U	0.0015 U	0.0015 U	0.035 U	0.0015 U	0.0015 U	0.0016 U	0.0015 U	0.0015 U	0.0083 U	0.0016 U	0.0016 U
1,4-Dioxane (P-Dioxane)	0.022 U	0.011 U	0.011 U	0.011 U	0.011 U	0.25 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.06 U	0.012 U	0.012 U
2,3,4,6-Tetrachlorophenol	0.03 U	0.015 U	0.014 U	0.014 U	0.014 U	0.34 U	0.014 U	0.015 U	0.015 U	0.015 U	0.015 U	0.08 U	0.015 U	0.016 U
2,4,5-Trichlorophenol	0.0051 U	0.0025 U	0.0025 U	0.0025 U	0.0024 U	0.058 U	0.0025 U	0.0025 U	0.0026 U	0.0025 U	0.0025 U	0.014 U	0.0026 U	0.0027 U
2,4,6-Trichlorophenol	0.0039 U	0.0019 U	0.0019 U	0.0019 U	0.0019 U	0.045 U	0.0019 U	0.002 U	0.002 U	0.0019 U	0.0019 U	0.011 U	0.002 U	0.0021 U
2,4-Dichlorophenol	0.0055 U	0.0027 U	0.0026 U	0.0027 U	0.0026 U	0.063 U	0.0027 U	0.0027 U	0.0028 U	0.0027 U	0.0027 U	0.015 U	0.0029 U	0.0029 U
2,4-Dimethylphenol	0.0045 U	0.0022 U	0.0021 U	0.0022 U	0.0021 U	0.051 U	0.0021 U	0.0022 U	0.0022 U	0.0022 U	0.0022 U	0.012 U	0.0023 U	0.0023 U
2,4-Dinitrophenol	0.19 U	0.094 U	0.092 U	0.093 U	0.092 U	2.2 U	0.093 U	0.096 U	0.097 U	0.094 U	0.094 U	0.52 U	0.099 U	0.1 U
2,4-Dinitrotoluene	0.0036 U	0.0017 U	0.0017 U	0.0017 U	0.0017 U	0.041 U	0.0017 U	0.0018 U	0.0018 U	0.0017 U	0.0017 U	0.0096 U	0.0018 U	0.0019 U
2,6-Dinitrotoluene	0.0044 U	0.0022 U	0.0021 U	0.0021 U	0.0021 U	0.05 U	0.0021 U	0.0022 U	0.0022 U	0.0022 U	0.0022 U	0.012 U	0.0023 U	0.0023 U
2-Chloronaphthalene	0.0033 U	0.0016 U	0.0016 U	0.0016 U	0.0016 U	0.037 U	0.0016 U	0.0016 U	0.0017 U	0.0016 U	0.0016 U	0.0088 U	0.0017 U	0.0017 U
2-Chlorophenol	0.0033 U	0.0016 U	0.0016 U	0.0016 U	0.0016 U	0.038 U	0.0016 U	0.0017 U	0.0017 U	0.0016 U	0.0016 U	0.0089 U	0.0017 U	0.0017 U
2-Methylnaphthalene	0.0044 J	0.0017 U	0.0016 J	0.0017 U	0.0023 J	0.039 U	0.0017 J	0.0017 U	0.0017 U	0.0017 U	0.0017 U	0.0092 U	0.002 J	0.0018 U
2-Methylphenol (O-Cresol)	0.021 U	0.01 U	0.0098 U	0.0099 U	0.0098 U	0.23 U	0.0099 U	0.01 U	0.01 U	0.01 U	0.01 U	0.055 U	0.011 U	0.011 U
2-Nitroaniline	0.033 U	0.016 U	0.016 U	0.016 U	0.016 U	0.37 U	0.016 U	0.016 U	0.016 U	0.016 U	0.016 U	0.088 U	0.017 U	0.017 U
2-Nitrophenol	0.0041 U	0.002 U	0.002 U	0.002 U	0.002 U	0.047 U	0.002 U	0.002 U	0.0021 U	0.002 U	0.002 U	0.011 U	0.0021 U	0.0022 U
3- And 4- Methylphenol (Total)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3,3'-Dichlorobenzidine	0.067 U	0.033 U	0.032 U	0.032 U	0.032 U	0.76 U	0.032 U	0.033 U	0.034 U	0.033 U	0.032 U	0.18 U	0.034 U	0.035 U
3-Nitroaniline	0.018 U	0.0089 U	0.0087 U	0.0088 U	0.0087 U	0.21 U	0.0088 U	0.0091 U	0.0092 U	0.0089 U	0.0089 U	0.049 U	0.0094 U	0.0096 U
4,6-Dinitro-2-Methylphenol	0.12 U	0.06 U	0.059 U	0.06 U	0.059 U	1.4 U	0.059 U	0.061 U	0.062 U	0.06 U	0.06 U	0.33 U	0.064 U	0.065 U
4-Bromophenyl Phenyl Ether	0.005 U	0.0024 U	0.0024 U	0.0024 U	0.0024 U	0.057 U	0.0024 U	0.0025 U	0.0025 U	0.0024 U	0.0024 U	0.013 U	0.0026 U	0.0026 U
4-Chloro-3-Methylphenol	0.0034 U	0.0016 U	0.0016 U	0.0016 U	0.0016 U	0.038 U	0.0016 U	0.0017 U	0.0017 U	0.0016 U	0.0016 U	0.009 U	0.0017 U	0.0018 U
4-Chloroaniline	0.0024 U	0.0012 U	0.0011 U	0.0012 U	0.0011 U	0.027 U	0.0011 U	0.0012 U	0.0012 U	0.0012 U	0.0012 U	0.0064 U	0.0012 U	0.0013 U
4-Chlorophenyl Phenyl Ether	0.0044 U	0.0021 U	0.0021 U	0.0021 U	0.0021 U	0.049 U	0.0021 U	0.0022 U	0.0022 U	0.0021 U	0.0021 U	0.012 U	0.0022 U	0.0023 U
4-Nitroaniline	0.0035 U	0.0017 U	0.0017 U	0.0017 U	0.0017 U	0.04 U	0.0017 U	0.0017 U	0.0018 U	0.0017 U	0.0017 U	0.0093 U	0.0018 U	0.0018 U
4-Nitrophenol	0.05 U	0.025 U	0.024 U	0.024 U	0.024 U	0.57 U	0.024 U	0.025 U	0.025 U	0.025 U	0.024 U	0.13 U	0.026 U	0.026 U
Acenaphthene	0.047	0.0076	0.019	0.013	0.019	0.047 U	0.014	0.0073	0.0041 J	0.002 U	0.0075	0.011 U	0.015	0.0022 U
Acenaphthylene	0.0031 U	0.0015 U	0.0019 J	0.0027 J	0.0015 U	0.036 U	0.0015 J	0.0016 U	0.0016 U	0.0015 U	0.0015 U	0.0084 U	0.0016 J	0.0016 U
Acetophenone	0.0039 U	0.0019 U	0.0019 U	0.0019 U	0.0019 U	0.044 U	0.0019 U	0.0019 U	0.002 U	0.0019 U	0.0019 U	0.01 U	0.002 U	0.002 U
Anthracene	0.069	0.011	0.046	0.025	0.034	0.51	0.028	0.013	0.0067 J	0.0042 J	0.016	0.034 J	0.029	0.002 J
Atrazine	0.031 U	0.015 U	0.015 U	0.015 U	0.015 U	0.36 U	0.015 U	0.016 U	0.016 U	0.015 U	0.015 U	0.084 U	0.016 U	0.016 U
Benzaldehyde	0.0089 U	0.0043 U	0.0043 U	0.0043 U	0.0042 U	0.1 U	0.0043 U	0.0044 U	0.0045 U	0.0043 U	0.0043 U	0.024 U	0.0046 U	0.0047 U
Benzo(A)Anthracene	0.3	0.051	0.24	0.1	0.3	20	0.33	0.1	0.069	0.02	0.16	0.47	0.23	0.013
Benzo(A)Pyrene	0.34	0.055	0.26	0.12	0.31	14	0.39	0.11	0.084	0.022	0.2	1	0.3	0.016
Benzo(B)Fluoranthene	0.52	0.1	0.41	0.2	0.4	43	0.79	0.25	0.0018 U	0.037	0.36	1.7	0.49	0.021
Benzo(G,H,I)Perylene	0.39	0.079	0.3	0.19	0.28	22	0.65	0.39	0.1	0.025	0.27	5.1	0.38	0.019
Benzo(K)Fluoranthene	0.2	0.032	0.14	0.071	0.16	11	0.22	0.096	0.043	0.012	0.12	0.99	0.14	0.013
Benzyl Butyl Phthalate	0.049 U	0.024 U	0.024 U	0.024 U	0.023 U	0.56 U	0.024 U	0.024 U	0.025 U	0.024 U	0.024 U	0.13 U	0.025 U	0.026 U
Biphenyl (Diphenyl)	0.003 U	0.0015 U	0.0014 U	0.0015 U	0.0014 U	0.034 U	0.0014 U	0.0015 U	0.0015 U	0.0015 U	0.0015 U	0.0081 U	0.0016 U	0.0016 U
Bis(2-Chloroethoxy) Methane	0.0034 U	0.0017 U	0.0016 U	0.0017 U	0.0016 U	0.039 U	0.0016 U	0.0017 U	0.0017 U	0.0017 U	0.0017 U	0.0092 U	0.0018 U	0.0018 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.0026 U	0.0013 U	0.0012 U	0.0013 U	0.0012 U	0.03 U	0.0012 U	0.0013 U	0.0013 U	0.0013 U	0.0013 U	0.007 U	0.0013 U	0.0014 U
Bis(2-Chloroisopropyl) Ether	0.0053 U	0.0026 U	0.0025 U	0.0026 U	0.0025 U	0.06 U	0.0025 U	0.0026 U	0.0027 U	0.0026 U	0.0026 U	0.014 U	0.0027 U	0.0028 U
Bis(2-Ethylhexyl) Phthalate	0.076 U	0.037 U	0.037 U	0.037 U	0.036 U	0.87 U	0.037 U	0.038 U	0.038 U	0.037 U	0.037 U	0.2 U	0.039 U	0.04 U
Caprolactam	0.047 U	0.023 U	0.022 U	0.023 U	0.022 U	0.53 U	0.022 U	0.023 U	0.023 U	0.023 U	0.023 U	0.12 U	0.024 U	0.024 U
Carbazole	0.056	0.0099	0.041	0.022	0.044	0.33	0.046	0.017	0.014	0.0045 J	0.024	0.047	0.042	0.003 J
Chrysene	0.44	0.075	0.33	0.15	0.38	63	0.66	0.22	0.13	0.034	0.28	2.5	0.36	0.018
Dibenz(A,H)Anthracene	0.099 J+	0.0016 U	0.075	0.045	0.082	6.2	0.15	0.069	0.0016 U	0.007	0.065	1	0.093	0.0055 J
Dibenzofuran	0.014 J	0.0027 J	0.0067 J	0.0047 J	0.0049 J	0.036 J	0.0048 J	0.0033 J	0.0016 U	0.0015 U	0.003 J	0.0085 J	0.0053 J	0.0016 U

Table E-9
Summary of Data Used in Risk Assessment
Central Landfills Area (soil 0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFLP-007	CFLP-007	CFLP-008	CFLP-008	CFLP-009	CFLP-009	CFLP-010	CFLP-010	CFLP-011	CFLP-011	CFLP-012	CFLP-012	CFLP-013	CFLP-013
Sample Lab IDs	180-78687-1, 200-43824-1, 460-158063-1	180-78687-2, 200-43824-2, 460-158063-2	180-78687-3, 200-43824-3, 460-158063-3	180-78687-4, 200-43824-4, 460-158063-4	180-78687-5, 200-43824-5, 460-158063-5	180-78687-6, 200-43824-6, 460-158063-6	180-78687-7, 200-43824-7, 460-158063-7	180-78687-8, 200-43824-8, 460-158063-8	180-78687-9, 200-43824-9, 460-158063-9	180-78687-10, 200-43824-10, 460-158063-10	180-78687-11, 200-43824-11, 460-158063-11	180-78687-12, 200-43824-12, 460-158063-12	180-78687-13, 200-43824-13, 460-158063-13	180-78687-14, 200-43824-14, 460-158063-14
Sample Name	CFLP-007-SO-0-0.5	CFLP-007-SO-0.5-2	CFLP-008-SO-0-0.5	CFLP-008-SO-0.5-2	CFLP-009-SO-0-0.5	CFLP-009-SO-0.5-2	CFLP-010-SO-0-0.5	CFLP-010-SO-0.5-2	CFLP-011-SO-0-0.5	CFLP-011-SO-0.5-2	CFLP-012-SO-0-0.5	CFLP-012-SO-0.5-2	CFLP-013-SO-0-0.5	CFLP-013-SO-0.5-2
Sample Depth	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft
Chemical	6/9/2018	6/9/2018	6/9/2018	6/9/2018	6/9/2018	6/9/2018	6/9/2018	6/9/2018	6/9/2018	6/9/2018	6/9/2018	6/9/2018	6/9/2018	6/9/2018
Diethyl Phthalate	0.022 U	0.011 U	0.01 U	0.01 U	0.01 U	0.24 U	0.01 U	0.011 U	0.011 U	0.01 U	0.01 U	0.058 U	0.011 U	0.011 U
Dimethyl Phthalate	0.0026 U	0.0013 U	0.0012 U	0.0013 U	0.0012 U	0.03 U	0.0012 U	0.0013 U	0.0013 U	0.0013 U	0.0013 U	0.007 U	0.0013 U	0.0014 U
Di-N-Butyl Phthalate	0.031 U	0.015 U	0.015 U	0.015 U	0.015 U	0.36 U	0.015 U	0.016 U	0.016 U	0.015 U	0.015 U	0.084 U	0.016 U	0.016 U
Di-N-Octylphthalate	0.042 U	0.02 U	0.02 U	0.02 U	0.02 U	0.47 U	0.02 U	0.021 U	0.021 U	0.02 U	0.02 U	0.11 U	0.022 U	0.022 U
Fluoranthene	0.62	0.11	0.53	0.25	0.53	25	0.58	0.17	0.15	0.04	0.32	0.33	0.45	0.025
Fluorene	0.027	0.0048 J	0.016	0.01	0.012	0.032 U	0.0076	0.0052 J	0.0031 J	0.0014 U	0.0046 J	0.0075 U	0.01	0.0015 U
Hexachlorobenzene	0.0051 U	0.0025 U	0.0025 U	0.0025 U	0.0024 U	0.058 U	0.0025 U	0.0026 U	0.0026 U	0.0025 U	0.0025 U	0.014 U	0.0027 U	0.0027 U
Hexachlorobutadiene	0.0042 U	0.002 U	0.002 U	0.002 U	0.002 U	0.048 U	0.002 U	0.0021 U	0.0021 U	0.002 U	0.002 U	0.011 U	0.0022 U	0.0022 U
Hexachlorocyclopentadiene	0.0037 U	0.0018 U	0.0018 U	0.0018 U	0.0017 U	0.042 U	0.0018 U	0.0018 U	0.0018 U	0.0018 U	0.0018 U	0.0098 U	0.0019 U	0.0019 U
Hexachloroethane	0.0037 U	0.0018 U	0.0018 U	0.0018 U	0.0018 U	0.042 U	0.0018 U	0.0018 U	0.0019 U	0.0018 U	0.0018 U	0.0099 U	0.0019 U	0.0019 U
Indeno(1,2,3-C,D)Pyrene	0.32	0.065	0.26	0.17	0.25	16	0.48	0.21	0.081	0.02	0.22	3	0.31	0.015
Isophorone	0.0037 U	0.0018 U	0.0018 U	0.0018 U	0.0017 U	0.042 U	0.0018 U	0.0018 U	0.0018 U	0.0018 U	0.0018 U	0.0098 U	0.0019 U	0.0019 U
Naphthalene	0.0063 J	0.0014 U	0.0033 J	0.0032 J	0.0023 J	0.032 U	0.0027 J	0.002 J	0.0014 J	0.0014 U	0.0014 U	0.0075 U	0.0051 J	0.0015 U
Nitrobenzene	0.026 U	0.013 U	0.013 U	0.013 U	0.012 U	0.3 U	0.013 U	0.013 U	0.013 U	0.013 U	0.013 U	0.07 U	0.014 U	0.014 U
N-Nitrosodi-N-Propylamine	0.0049 U	0.0024 U	0.0023 U	0.0023 U	0.0023 U	0.055 U	0.0023 U	0.0024 U	0.0024 U	0.0024 U	0.0024 U	0.013 U	0.0025 U	0.0025 U
N-Nitrosodiphenylamine	0.024 U	0.012 U	0.011 U	0.012 U	0.011 U	0.27 U	0.011 U	0.012 U	0.012 U	0.012 U	0.012 U	0.064 U	0.012 U	0.013 U
Pentachlorophenol	0.12 U	0.056 U	0.055 U	0.056 U	0.055 U	1.3 U	0.055 U	0.057 U	0.058 U	0.056 U	0.056 U	0.31 U	0.059 U	0.06 U
Phenanthrene	0.32	0.06	0.24	0.12	0.23	1	0.17	0.07	0.044	0.019	0.1	0.12	0.17	0.011
Phenol	0.022 U	0.011 U	0.01 U	0.01 U	0.01 U	0.25 U	0.01 U	0.011 U	0.011 U	0.011 U	0.011 U	0.058 U	0.011 U	0.011 U
Pyrene	0.57	0.098	0.41	0.2	0.47	16	0.48	0.15	0.12	0.034	0.26	0.29	0.39	0.02
VOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,1,1-Trichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,2,2-Tetrachloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,2-Trichloro-1,2,2-Trifluoroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,2-Trichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1-Dichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1-Dichloroethene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,3-Trichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,4-Trichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dibromo-3-Chloropropane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dibromoethane (Ethylene Dibromide)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichloropropane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,3-Dichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,4-Dichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Hexanone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acetone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromochloromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromodichloromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromoform	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromomethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Carbon Disulfide	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Carbon Tetrachloride	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chloroform	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chloromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cis-1,2-Dichloroethylene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cis-1,3-Dichloropropene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cyclohexane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibromochloromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dichlorodifluoromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Ethylbenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Isopropylbenzene (Cumene)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
M,P-Xylene	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Table E-9
Summary of Data Used in Risk Assessment
Central Landfills Area (soil 0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFLP-007	CFLP-007	CFLP-008	CFLP-008	CFLP-009	CFLP-009	CFLP-010	CFLP-010	CFLP-011	CFLP-011	CFLP-012	CFLP-012	CFLP-013	CFLP-013
Sample Lab IDs	180-78687-1, 200-43824-1, 460-158063-1	180-78687-2, 200-43824-2, 460-158063-2	180-78687-3, 200-43824-3, 460-158063-3	180-78687-4, 200-43824-4, 460-158063-4	180-78687-5, 200-43824-5, 460-158063-5	180-78687-6, 200-43824-6, 460-158063-6	180-78687-7, 200-43824-7, 460-158063-7	180-78687-8, 200-43824-8, 460-158063-8	180-78687-9, 200-43824-9, 460-158063-9	180-78687-10, 200-43824-10, 460-158063-10	180-78687-11, 200-43824-11, 460-158063-11	180-78687-12, 200-43824-12, 460-158063-12	180-78687-13, 200-43824-13, 460-158063-13	180-78687-14, 200-43824-14, 460-158063-14
Sample Name	CFLP-007-SO-0-0.5	CFLP-007-SO-0.5-2	CFLP-008-SO-0-0.5	CFLP-008-SO-0.5-2	CFLP-009-SO-0-0.5	CFLP-009-SO-0.5-2	CFLP-010-SO-0-0.5	CFLP-010-SO-0.5-2	CFLP-011-SO-0-0.5	CFLP-011-SO-0.5-2	CFLP-012-SO-0-0.5	CFLP-012-SO-0.5-2	CFLP-013-SO-0-0.5	CFLP-013-SO-0.5-2
Sample Depth	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft
Chemical	6/9/2018	6/9/2018	6/9/2018	6/9/2018	6/9/2018	6/9/2018	6/9/2018	6/9/2018	6/9/2018	6/9/2018	6/9/2018	6/9/2018	6/9/2018	6/9/2018
Methyl Acetate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methyl Ethyl Ketone (2-Butanone)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methylcyclohexane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methylene Chloride	--	--	--	--	--	--	--	--	--	--	--	--	--	--
O-Xylene (1,2-Dimethylbenzene)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Styrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Tert-Butyl Methyl Ether	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Tetrachloroethylene (PCE)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Toluene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Trans-1,2-Dichloroethene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Trans-1,3-Dichloropropene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Trichloroethylene (TCE)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Trichlorofluoromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Vinyl Chloride	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-9
Summary of Data Used in Risk Assessment
Central Landfills Area (soil 0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFLP-014	CFLP-014	CFLP-015	CFLP-015	CFLP-016	CFLP-016	CFLP-017	CFLP-017	CFLP-018	CFLP-018	CFMW-002	CFMW-002	CFMW-002	CFMW-008A
Sample Lab IDs	180-78687-15, 200-43824-15, 460-158063-15	180-78687-16, 200-43824-16, 460-158063-16	180-78894-1, 200-43930-1, 460-158632-1	180-78894-2, 200-43930-2, 460-158632-2	180-78894-3, 200-43930-3, 460-158632-3	180-78894-4, 200-43930-4, 460-158632-4	180-78894-5, 200-43930-5, 460-158632-5	180-78894-6, 200-43930-6, 460-158632-6	180-78894-7, 200-43930-7, 460-158632-7	180-78894-8, 200-43930-8, 460-158632-8	460-115528-7	460-115528-8	460-115528-9	460-115528-1
Sample Name	CFLP-014-SO-0-0.5	CFLP-014-SO-0.5-2	CFLP-015-SO-0-0.5	CFLP-015-SO-0.5-2	CFLP-016-SO-0-0.5	CFLP-016-SO-0.5-2	CFLP-017-SO-0-0.5	CFLP-017-SO-0.5-2	CFLP-018-SO-0-0.5	CFLP-018-SO-0.5-2	CFMW-002-SO-0-0.5	CFMW-002-SO-0.5-2	CFMW-002-SO-10-12	CFMW-008a-SO-0-0.5
Sample Depth	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft
Chemical	6/9/2018	6/9/2018	6/16/2018	6/16/2018	6/16/2018	6/16/2018	6/16/2018	6/16/2018	6/16/2018	6/16/2018	6/13/2016	6/13/2016	6/13/2016	6/13/2016
GENERAL CHEMISTRY (mg/kg)														
Fluoride	4.31	3.66	6.34 J+	5.76 J+	36.4 J+	36.3 J+	8.44 J+	11.7 J+	6.69 J+	7.17 J+	56.7 J-	166 J+	10.2 J-	84.9 J-
Cyanide	0.066 U	0.061 U	0.09 J	0.065 U	0.33	0.071 U	0.14 J	0.071 J+	0.23 J+	0.11 J+	0.48 J	0.59 J	0.076 J	0.088 J
METALS (mg/kg)														
"Chromium, Hexavalent - Estimated"	0.243552	0.235523	0.235523	0.235523	0.350608	0.347932	0.382725	0.275669	0.414842	0.339903	0.275669	0.339903	0.20073	0.26764
"Chromium, Trivalent - Calculated"	--	--	--	--	--	--	--	--	--	--	--	--	--	--
"Chromium, Trivalent - Estimated"	8.85645	8.56448	8.56448	8.56448	12.7494	12.6521	13.9173	10.0243	15.0852	12.3601	10.0243	12.3601	7.29927	9.73236
Aluminum	10300	9380	10800	9340	21900	15900	19100	12900	19700	15400	14500	24900	6320	21000
Antimony	0.27 U	0.3 U	0.31 UJ	0.32 UJ	0.36 UJ	0.33 UJ	0.33 UJ	0.3 UJ	0.35 UJ	0.31 UJ	0.35 UJ	0.35 UJ	0.32 UJ	0.36 UJ
Arsenic	6.2	5.9	11.2	10.5	5.6	7	9.3	7.4	6.8	6.9	5.3	6.5	3.2	7.1
Barium	59.9	64.5	80.3	103	214	148	222	123	261	155	127	181	29.5	163
Beryllium	0.42	0.39 J	0.34 J	0.39 J	0.6	0.55	0.64	0.44	0.58	0.48	0.78	0.76	0.25 J	0.63
Cadmium	0.31 U	0.34 U	0.35 U	0.36 U	0.41 U	0.38 U	0.38 U	0.34 U	0.4 U	0.35 U	0.26 U	0.26 U	0.25 U	0.27 U
Calcium	34700	40200	71800	63200	6100	20400	5420	36000	5660	11200	68400 J	7360 J	35500 J	56600 J
Chromium, Total	9.1	8.8	8.8	8.8	13.1	13	14.3	10.3	15.5	12.7	10.3	12.7	7.5	10
Cobalt	5.3	5.7	5.1	5.3	6.2	7.8	7.6	5.5	6.3	6	4.8	6.4	3.4	4.7
Copper	14.6	14	17.7	13.9	19.9	31.4	26.4	16.8	22.6	19.9	12	14.5	11.9	15.2
Iron	13400	13400	13100	13400	15300	19600	20800	15800	17200	17600	13400	19600	9650	10800
Lead	9.8	10.1	10.5	9.8	12.9	14.1	11	10.3	13.7	12	13.5 J+	12.2 J+	3.7 J+	23.3 J+
Magnesium	10800	9340	13200	14000	8410	11800	8550	11800	9540	10800	11500	12100	12400	8170
Manganese	332	383	348 J	357 J	393 J	470 J	450 J	380 J	346 J	370 J	616 J	728 J	270 J	388 J
Mercury	0.025	0.027	0.029	0.022	0.023	0.037	0.02	0.026	0.023	0.025	0.014 J	0.013 U	0.019	0.023
Nickel	15	12.8	17	11	28.7	17.8	17.5	12.7	19.8	14.7	28.5 J+	15.5 J+	7.3 J+	32.4 J+
Potassium	916	707	931	963	1530	1360	1140	776	1360	925	1280	1220	628	1060
Selenium	0.26 U	0.29 U	0.31 U	0.31 U	0.38 J	0.33 U	0.37 J	0.3 U	0.44 J	0.3 U	0.33 U	0.33 U	0.3 U	0.34 J
Silver	0.56 U	0.63 U	0.65 U	0.67 U	0.76 U	0.71 U	0.7 U	0.63 U	0.74 U	0.65 U	0.64 U	0.64 U	0.59 U	0.65 U
Sodium	28.5 U	31.7 U	35.6 J	33.9 U	81.2 J	52.6 J	48.5 J	43.1 J	60.3 J	34.9 J	104	279	37 J	302
Thallium	0.11 U	0.13 U	0.13 U	0.14 U	0.15 U	0.14 U	0.14 U	0.13 U	0.15 U	0.13 U	0.13 U	0.13 J	0.12 U	0.13 U
Vanadium	8.2	8	10.2	9.3	16	12.4	27.7	10.5	13.8	11.4	21.1 J-	23.1 J-	4.4 J-	17.3 J-
Zinc	42.5	38.8	38.7	35.7	77.6	60.5	61.3	46.1	62.1	51	114 J-	111 J-	40.3 J-	57.1 J-
METALS|HEXAVALENT CHROMIUM (mg/kg)														
Chromium, Hexavalent	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PESTICIDES (mg/kg)														
Aldrin	--	--	--	--	--	--	--	--	--	--	0.00086 U	--	--	0.00089 U
Alpha Bhc (Alpha Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	0.00065 U	--	--	0.00067 U
Alpha Endosulfan	--	--	--	--	--	--	--	--	--	--	0.00099 U	--	--	0.001 U
Beta Bhc (Beta Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	0.00069 U	--	--	0.00072 U
Beta Endosulfan	--	--	--	--	--	--	--	--	--	--	0.0011 U	--	--	0.0012 U
cis-Chlordane	--	--	--	--	--	--	--	--	--	--	0.0012 U	--	--	0.0012 U
Delta BHC (Delta Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	0.00078 U	--	--	0.0008 U
Dieldrin	--	--	--	--	--	--	--	--	--	--	0.00093 U	--	--	0.00096 U
Endosulfan Sulfate	--	--	--	--	--	--	--	--	--	--	0.00083 U	--	--	0.00086 U
Endrin	--	--	--	--	--	--	--	--	--	--	0.0009 U	--	--	0.00094 U
Endrin Aldehyde	--	--	--	--	--	--	--	--	--	--	0.00088 U	--	--	0.00091 U
Endrin Ketone	--	--	--	--	--	--	--	--	--	--	0.00099 U	--	--	0.001 U
Gamma Bhc (Lindane)	--	--	--	--	--	--	--	--	--	--	0.00064 U	--	--	0.00066 U
Heptachlor	--	--	--	--	--	--	--	--	--	--	0.00092 U	--	--	0.00095 U
Heptachlor Epoxide	--	--	--	--	--	--	--	--	--	--	0.0014 U	--	--	0.0014 U
Methoxychlor	--	--	--	--	--	--	--	--	--	--	0.0015 U	--	--	0.0016 U
P,P'-DDD	--	--	--	--	--	--	--	--	--	--	0.00094 U	--	--	0.00097 U
P,P'-DDE	--	--	--	--	--	--	--	--	--	--	0.001 U	--	--	0.0011 U
P,P'-DDT	--	--	--	--	--	--	--	--	--	--	0.00073 U	--	--	0.00076 U
Toxaphene	--	--	--	--	--	--	--	--	--	--	0.021 U	--	--	0.021 U
trans-Chlordane	--	--	--	--	--	--	--	--	--	--	0.0015 U	--	--	0.0016 U
POLYCHLORINATED BIPHENYLS (mg/kg)														
PCB-1016 (Aroclor 1016)	--	--	--	--	--	--	--	--	--	--	0.0095 U	0.01 U	0.0094 U	0.0098 U
PCB-1221 (Aroclor 1221)	--	--	--	--	--	--	--	--	--	--	0.0095 U	0.01 U	0.0094 U	0.0098 U

Table E-9
Summary of Data Used in Risk Assessment
Central Landfills Area (soil 0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFLP-014	CFLP-014	CFLP-015	CFLP-015	CFLP-016	CFLP-016	CFLP-017	CFLP-017	CFLP-018	CFLP-018	CFMW-002	CFMW-002	CFMW-002	CFMW-008A
Sample Lab IDs	180-78687-15, 200-43824-15, 460-158063-15	180-78687-16, 200-43824-16, 460-158063-16	180-78894-1, 200-43930-1, 460-158632-1	180-78894-2, 200-43930-2, 460-158632-2	180-78894-3, 200-43930-3, 460-158632-3	180-78894-4, 200-43930-4, 460-158632-4	180-78894-5, 200-43930-5, 460-158632-5	180-78894-6, 200-43930-6, 460-158632-6	180-78894-7, 200-43930-7, 460-158632-7	180-78894-8, 200-43930-8, 460-158632-8	460-115528-7	460-115528-8	460-115528-9	460-115528-1
Sample Name	CFLP-014-SO-0-0.5	CFLP-014-SO-0.5-2	CFLP-015-SO-0-0.5	CFLP-015-SO-0.5-2	CFLP-016-SO-0-0.5	CFLP-016-SO-0.5-2	CFLP-017-SO-0-0.5	CFLP-017-SO-0.5-2	CFLP-018-SO-0-0.5	CFLP-018-SO-0.5-2	CFMW-002-SO-0-0.5	CFMW-002-SO-0.5-2	CFMW-002-SO-10-12	CFMW-008a-SO-0-0.5
Sample Depth	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft
Chemical	6/9/2018	6/9/2018	6/16/2018	6/16/2018	6/16/2018	6/16/2018	6/16/2018	6/16/2018	6/16/2018	6/16/2018	6/13/2016	6/13/2016	6/13/2016	6/13/2016
PCB-1232 (Aroclor 1232)	--	--	--	--	--	--	--	--	--	--	0.0095 U	0.01 U	0.0094 U	0.0098 U
PCB-1242 (Aroclor 1242)	--	--	--	--	--	--	--	--	--	--	0.0095 U	0.01 U	0.0094 U	0.0098 U
PCB-1248 (Aroclor 1248)	--	--	--	--	--	--	--	--	--	--	0.0095 U	0.01 U	0.0094 U	0.0098 U
PCB-1254 (Aroclor 1254)	--	--	--	--	--	--	--	--	--	--	0.0098 U	0.01 U	0.0097 U	0.01 U
PCB-1260 (Aroclor 1260)	--	--	--	--	--	--	--	--	--	--	0.0098 U	0.01 U	0.0097 U	0.01 U
PCB-1262 (Aroclor 1262)	--	--	--	--	--	--	--	--	--	--	0.0098 U	0.01 U	0.0097 U	0.01 U
PCB-1268 (Aroclor 1268)	--	--	--	--	--	--	--	--	--	--	0.0098 U	0.01 U	0.0097 U	0.01 U
Polychlorinated Biphenyl (PCBs)	--	--	--	--	--	--	--	--	--	--	0.0098 U	0.01 U	0.0097 U	0.01 U
SEMIVOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,2,4,5-Tetrachlorobenzene	0.003 UJ	0.003 UJ	0.0032 U	0.0016 U	0.0097 U	0.0048 U	0.0035 U	0.0016 U	0.0017 U	0.0031 U	0.026 U	0.028 U	0.026 U	0.14 U
1,4-Dioxane (P-Dioxane)	0.022 U	0.022 U	0.023 U	0.011 U	0.07 U	0.035 U	0.025 U	0.012 U	0.012 U	0.023 U	0.094 U	0.1 U	0.093 U	0.49 U
2,3,4,6-Tetrachlorophenol	0.029 UJ	0.029 UJ	0.031 U	0.015 U	0.093 U	0.046 U	0.033 U	0.015 U	0.017 U	0.03 U	0.033 UJ	0.035 U	0.033 U	0.17 U
2,4,5-Trichlorophenol	0.0049 U	0.005 U	0.0053 U	0.0026 U	0.016 U	0.0079 U	0.0057 U	0.0026 U	0.0028 U	0.0052 U	0.035 U	0.037 U	0.035 U	0.18 U
2,4,6-Trichlorophenol	0.0038 U	0.0038 U	0.0041 U	0.002 U	0.012 U	0.0061 U	0.0044 U	0.002 U	0.0022 U	0.004 U	0.01 U	0.011 U	0.0099 U	0.052 U
2,4-Dichlorophenol	0.0053 U	0.0054 U	0.0057 U	0.0028 U	0.017 U	0.0086 U	0.0062 U	0.0028 U	0.0031 U	0.0056 U	0.0083 U	0.0088 U	0.0082 U	0.043 U
2,4-Dimethylphenol	0.0043 U	0.0043 U	0.0046 UJ	0.0023 UJ	0.014 UJ	0.0069 UJ	0.005 UJ	0.0023 UJ	0.0025 UJ	0.0045 U	0.077 UJ	0.082 U	0.077 U	0.4 U
2,4-Dinitrophenol	0.19 U	0.19 U	0.2 U	0.098 U	0.6 UJ	0.3 UJ	0.22 UJ	0.099 UJ	0.11 UJ	0.2 U	0.27 UJ	0.28 U	0.26 U	1.4 U
2,4-Dinitrotoluene	0.0034 U	0.0035 U	0.0037 U	0.0018 U	0.011 U	0.0055 U	0.004 U	0.0018 U	0.002 U	0.0036 U	0.014 U	0.015 U	0.014 U	0.072 U
2,6-Dinitrotoluene	0.0043 U	0.0043 U	0.0046 U	0.0022 U	0.014 U	0.0069 U	0.0049 U	0.0023 U	0.0024 U	0.0045 U	0.019 U	0.02 U	0.019 U	0.097 U
2-Chloronaphthalene	0.0032 U	0.0032 U	0.0034 U	0.0017 U	0.01 U	0.0051 U	0.0037 U	0.0017 U	0.0018 U	0.0033 U	0.008 U	0.0085 U	0.0079 U	0.041 U
2-Chlorophenol	0.0032 U	0.0032 U	0.0035 U	0.0017 U	0.01 U	0.0052 U	0.0037 U	0.0017 U	0.0018 U	0.0034 U	0.0089 UJ	0.0095 U	0.0089 U	0.046 U
2-Methylnaphthalene	0.0033 U	0.0033 U	0.0036 U	0.0017 U	0.011 J	0.0053 U	0.0038 U	0.0018 U	0.002 J	0.0035 U	0.083 J	0.01 J	0.0077 U	0.21 J
2-Methylphenol (O-Cresol)	0.02 U	0.02 U	0.021 U	0.01 U	0.064 U	0.032 U	0.023 U	0.011 U	0.011 U	0.021 U	0.015 U	0.016 U	0.015 U	0.079 U
2-Nitroaniline	0.032 U	0.032 U	0.034 U	0.017 U	0.1 U	0.051 U	0.036 U	0.017 U	0.018 U	0.033 U	0.012 U	0.012 U	0.011 U	0.06 U
2-Nitrophenol	0.004 U	0.004 U	0.0043 U	0.0021 U	0.013 U	0.0064 U	0.0046 U	0.0021 U	0.0023 U	0.0042 U	0.012 UJ	0.013 U	0.012 U	0.061 U
3- And 4- Methylphenol (Total)	--	--	--	--	--	--	--	--	--	--	0.0094 U	0.01 U	0.0093 U	0.048 U
3,3'-Dichlorobenzidine	0.065 U	0.065 U	0.069 U	0.034 U	0.21 U	0.1 U	0.075 U	0.034 U	0.037 U	0.068 U	0.039 U	0.042 U	0.039 U	0.2 U
3-Nitroaniline	0.018 U	0.018 U	0.019 U	0.0092 U	0.057 U	0.028 U	0.02 U	0.0094 U	0.01 U	0.018 U	0.01 U	0.011 U	0.01 U	0.054 U
4,6-Dinitro-2-Methylphenol	0.12 U	0.12 U	0.13 U	0.063 U	0.39 U	0.19 U	0.14 U	0.064 U	0.068 U	0.13 U	0.094 UJ	0.1 U	0.093 U	0.49 U
4-Bromophenyl Phenyl Ether	0.0048 U	0.0049 U	0.0052 U	0.0025 U	0.016 U	0.0078 U	0.0056 U	0.0026 U	0.0028 U	0.0051 U	0.011 U	0.012 U	0.011 U	0.057 U
4-Chloro-3-Methylphenol	0.0033 U	0.0033 U	0.0035 U	0.0017 U	0.011 U	0.0052 U	0.0038 U	0.0017 U	0.0019 U	0.0034 U	0.015 U	0.016 U	0.015 U	0.078 U
4-Chloroaniline	0.0023 U	0.0023 U	0.0025 U	0.0012 U	0.0075 U	0.0037 U	0.0027 U	0.0012 U	0.0013 U	0.0024 U	0.009 U	0.0096 U	0.009 U	0.047 U
4-Chlorophenyl Phenyl Ether	0.0042 U	0.0042 U	0.0045 U	0.0022 U	0.014 U	0.0067 U	0.0049 U	0.0022 U	0.0024 U	0.0044 U	0.011 U	0.011 U	0.01 U	0.054 U
4-Nitroaniline	0.0034 U	0.0034 U	0.0036 U	0.0018 U	0.011 U	0.0054 U	0.0039 U	0.0018 U	0.0019 U	0.0035 U	0.013 U	0.014 U	0.013 U	0.069 U
4-Nitrophenol	0.049 UJ	0.049 UJ	0.052 U	0.025 U	0.16 UJ	0.078 UJ	0.056 UJ	0.026 UJ	0.028 UJ	0.051 U	0.17 U	0.18 U	0.17 U	0.87 U
Acenaphthene	0.007 J	0.011 J	0.0078 J	0.0021 U	0.056	0.019 J	0.0083 J	0.0021 U	0.01	0.0073 J	0.032 J	0.009 U	0.0084 U	1.1 J
Acenaphthylene	0.003 U	0.0031 U	0.0033 U	0.0016 U	0.0098 U	0.0049 U	0.0035 U	0.0016 U	0.0017 U	0.0032 U	0.009 U	0.0096 U	0.009 U	0.047 U
Acetophenone	0.0038 U	0.0038 U	0.004 U	0.002 U	0.019 J	0.006 U	0.0043 U	0.002 U	0.0022 U	0.0039 U	0.0077 U	0.0081 U	0.0076 U	0.04 U
Anthracene	0.011 J	0.021	0.016	0.0019 U	0.18	0.046	0.017	0.0044 J	0.019	0.014 J	0.044 J	0.036 U	0.033 U	1.8
Atrazine	0.03 UJ	0.031 UJ	0.033 UJ	0.016 UJ	0.098 UJ	0.049 UJ	0.035 UJ	0.016 UJ	0.017 UJ	0.032 UJ	0.016 U	0.017 U	0.015 U	0.081 U
Benzaldehyde	0.0086 UR	0.0087 UR	0.0092 UR	0.0045 UR	0.082 J-	0.014 UR	0.0099 UR	0.0046 UR	0.0049 J-	0.009 UR	0.027 UJ	0.029 U	0.027 U	0.14 U
Benzo(A)Anthracene	0.085	0.19	0.11	0.014	0.78	0.21	0.16	0.022	0.18	0.066	0.2	0.031 U	0.029 U	6.8
Benzo(A)Pyrene	0.13	0.28	0.17	0.02	1.1	0.27	0.23	0.03	0.27	0.09	0.25	0.011 U	0.011 U	7
Benzo(B)Fluoranthene	0.16	0.36	0.24	0.027	1.3	0.33	0.32	0.04	0.36	0.099	0.48	0.015 U	0.014 U	12
Benzo(G,H,I)Perylene	0.12	0.26	0.16	0.02	1	0.25	0.24	0.032	0.28	0.083	0.29 J	0.021 U	0.02 U	7.3
Benzo(K)Fluoranthene	0.077	0.16	0.061	0.012	0.52	0.13	0.12	0.017	0.15	0.06	0.15	0.016 U	0.015 U	4.2
Benzyl Butyl Phthalate	0.048 U	0.048 U	0.053 J	0.025 U	0.15 U	0.076 U	0.055 U	0.025 U	0.027 U	0.05 U	0.011 U	0.012 U	0.011 U	0.056 U
Biphenyl (Diphenyl)	0.0029 U	0.0029 U	0.0031 U	0.0015 U	0.0094 U	0.0047 U	0.0034 U	0.0016 U	0.0017 U	0.003 U	0.03 U	0.032 U	0.03 U	0.16 U
Bis(2-Chloroethoxy) Methane	0.0033 U	0.0033 U	0.0035 U	0.0017 U	0.011 U	0.0053 U	0.0038 U	0.0018 U	0.0019 U	0.0035 U	0.011 U	0.012 U	0.011 U	0.057 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.0025 U	0.0025 U	0.0027 U	0.0013 U	0.0081 U	0.004 U	0.0029 U	0.0013 U	0.0014 U	0.0026 U	0.0083 U	0.0088 U	0.0082 U	0.043 U
Bis(2-Chloroisopropyl) Ether	0.0051 U	0.0052 U	0.0055 U	0.0027 U	0.017 U	0.0082 U	0.0059 U	0.0027 U	0.0029 U	0.0054 U	0.014 U	0.015 U	0.014 U	0.075 U
Bis(2-Ethylhexyl) Phthalate	0.074 U	0.074 U	0.1 J	0.039 U	0.24 U	0.12 U	0.085 U	0.039 U	0.042 U	0.077 U	0.014 U	0.015 U	0.014 U	0.071 U
Caprolactam	0.045 U	0.045 U	0.048 U	0.024 U	0.15 U	0.072 U	0.052 U	0.024 U	0.026 U	0.047 U	0.025 UJ	0.027 U	0.025 U	0.13 U
Carbazole	0.016 J+	0.033 J+	0.023	0.0027 J	0.18	0.044	0.028	0.0046 J	0.03	0.014 J	0.032 J	0.0093 U	0.0086 U	1.6 J
Chrysene	0.13	0.3	0.18	0.022	1.1	0.29	0.25	0.033	0.29	0.093	0.32 J	0.018 J	0.0095 U	12
Dibenz(A,H)Anthracene	0.03	0.053	0.03	0.0051 J	0.26	0.064	0.057	0.0081	0.058	0.02	0.082	0.019 U	0.018 U	1.9
Dibenzofuran	0.003 U	0.0045 J	0.0033 U	0.0016 U	0.027 J	0.0078 J	0.0038 J	0.0016 U	0.0039 J	0.0032 U	0.014 J	0.011 U	0.011 U	0.41 J

Table E-9
Summary of Data Used in Risk Assessment
Central Landfills Area (soil 0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFLP-014	CFLP-014	CFLP-015	CFLP-015	CFLP-016	CFLP-016	CFLP-017	CFLP-017	CFLP-018	CFLP-018	CFMW-002	CFMW-002	CFMW-002	CFMW-008A
Sample Lab IDs	180-78687-15, 200-43824-15, 460-158063-15	180-78687-16, 200-43824-16, 460-158063-16	180-78894-1, 200-43930-1, 460-158632-1	180-78894-2, 200-43930-2, 460-158632-2	180-78894-3, 200-43930-3, 460-158632-3	180-78894-4, 200-43930-4, 460-158632-4	180-78894-5, 200-43930-5, 460-158632-5	180-78894-6, 200-43930-6, 460-158632-6	180-78894-7, 200-43930-7, 460-158632-7	180-78894-8, 200-43930-8, 460-158632-8	460-115528-7	460-115528-8	460-115528-9	460-115528-1
Sample Name	CFLP-014-SO-0-0.5	CFLP-014-SO-0.5-2	CFLP-015-SO-0-0.5	CFLP-015-SO-0.5-2	CFLP-016-SO-0-0.5	CFLP-016-SO-0.5-2	CFLP-017-SO-0-0.5	CFLP-017-SO-0.5-2	CFLP-018-SO-0-0.5	CFLP-018-SO-0.5-2	CFMW-002-SO-0-0.5	CFMW-002-SO-0.5-2	CFMW-002-SO-10-12	CFMW-008a-SO-0-0.5
Sample Depth	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft
Chemical	6/9/2018	6/9/2018	6/16/2018	6/16/2018	6/16/2018	6/16/2018	6/16/2018	6/16/2018	6/16/2018	6/16/2018	6/13/2016	6/13/2016	6/13/2016	6/13/2016
Diethyl Phthalate	0.021 U	0.021 U	0.022 U	0.011 U	0.067 U	0.033 U	0.024 U	0.011 U	0.012 U	0.022 U	0.01 U	0.011 U	0.0099 U	0.052 U
Dimethyl Phthalate	0.0025 U	0.0025 U	0.0027 U	0.0013 U	0.0081 U	0.004 U	0.0029 U	0.0013 U	0.0014 U	0.0026 U	0.01 U	0.011 U	0.01 U	0.053 U
Di-N-Butyl Phthalate	0.03 U	0.031 U	0.033 U	0.016 U	0.098 U	0.049 U	0.035 U	0.016 U	0.017 U	0.032 U	0.011 U	0.011 U	0.01 U	0.054 U
Di-N-Octylphthalate	0.04 U	0.041 U	0.043 U	0.021 U	0.13 U	0.065 U	0.047 U	0.021 U	0.023 U	0.042 U	0.096 J	0.019 U	0.018 U	0.092 U
Fluoranthene	0.15	0.32	0.22	0.025	1.5	0.42	0.26	0.038	0.3	0.13	0.38	0.021 J	0.01 U	13
Fluorene	0.0047 J	0.0066 J	0.0044 J	0.0014 U	0.042 J	0.015 J	0.0068 J	0.0016 J	0.0062 J	0.0047 J	0.0077 U	0.0081 U	0.0076 U	0.83 J
Hexachlorobenzene	0.005 U	0.005 U	0.0053 U	0.0026 U	0.016 U	0.008 U	0.0057 U	0.0026 U	0.0028 U	0.0052 U	0.014 U	0.015 U	0.014 U	0.074 U
Hexachlorobutadiene	0.004 UJ	0.0041 UJ	0.0043 UJ	0.0021 UJ	0.013 UJ	0.0065 UJ	0.0047 UJ	0.0022 UJ	0.0023 UJ	0.0042 U	0.0099 U	0.011 U	0.0098 U	0.051 U
Hexachlorocyclopentadiene	0.0035 UJ	0.0036 UJ	0.0038 U	0.0019 U	0.011 U	0.0057 U	0.0041 U	0.0019 U	0.002 U	0.0037 U	0.022 U	0.023 U	0.022 U	0.11 U
Hexachloroethane	0.0036 U	0.0036 U	0.0038 UJ	0.0019 UJ	0.012 UJ	0.0057 UJ	0.0041 UJ	0.0019 UJ	0.002 UJ	0.0037 U	0.013 U	0.014 U	0.013 U	0.067 U
Indeno(1,2,3-C,D)Pyrene	0.093	0.22	0.12	0.016	0.81	0.2	0.19	0.025	0.22	0.07	0.29	0.025 U	0.023 U	7.8
Isophorone	0.0035 U	0.0036 U	0.0038 U	0.0019 U	0.011 U	0.0057 U	0.0041 U	0.0019 U	0.002 U	0.0037 U	0.0075 U	0.008 U	0.0075 U	0.039 U
Naphthalene	0.0027 U	0.0038 J	0.0029 U	0.0014 U	0.02 J	0.0053 J	0.0031 U	0.0014 U	0.0028 J	0.0028 U	0.036 J	0.0095 U	0.0089 U	0.51 J
Nitrobenzene	0.025 U	0.026 U	0.027 U	0.013 U	0.082 U	0.041 U	0.029 U	0.014 U	0.015 U	0.027 U	0.011 U	0.012 U	0.011 U	0.057 U
N-Nitrosodi-N-Propylamine	0.0047 U	0.0047 U	0.005 U	0.0025 U	0.015 U	0.0075 U	0.0054 U	0.0025 U	0.0027 U	0.0049 U	0.012 U	0.013 U	0.012 U	0.061 U
N-Nitrosodiphenylamine	0.023 U	0.023 U	0.025 U	0.012 U	0.075 U	0.037 U	0.027 U	0.012 U	0.013 U	0.024 U	0.032 UJ	0.034 U	0.032 U	0.16 U
Pentachlorophenol	0.11 UJ	0.11 UJ	0.12 U	0.058 U	0.36 U	0.18 U	0.13 U	0.059 U	0.064 U	0.12 U	0.043 UJ	0.045 U	0.042 U	0.22 U
Phenanthrene	0.069	0.13	0.11	0.014	0.95	0.24	0.12	0.024	0.13	0.072	0.22 J	0.01 U	0.0093 U	7.8
Phenol	0.021 U	0.021 U	0.041 J	0.011 U	0.14 J	0.034 U	0.024 U	0.011 U	0.012 U	0.022 U	0.011 U	0.012 U	0.011 U	0.059 U
Pyrene	0.14	0.31	0.19	0.022	1.5	0.56	0.27	0.04	0.29	0.12	0.41	0.017 U	0.016 U	11
VOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,1,1-Trichloroethane	--	--	--	--	--	--	--	--	--	--	--	0.00029 U	0.00036 U	--
1,1,2,2-Tetrachloroethane	--	--	--	--	--	--	--	--	--	--	--	0.00013 U	0.00016 U	--
1,1,2-Trichloro-1,2,2-Trifluoroethane	--	--	--	--	--	--	--	--	--	--	--	0.00034 U	0.00042 U	--
1,1,2-Trichloroethane	--	--	--	--	--	--	--	--	--	--	--	0.00021 U	0.00027 U	--
1,1-Dichloroethane	--	--	--	--	--	--	--	--	--	--	--	0.00026 U	0.00032 U	--
1,1-Dichloroethene	--	--	--	--	--	--	--	--	--	--	--	0.00031 U	0.00039 U	--
1,2,3-Trichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	0.000084 U	0.00011 U	--
1,2,4-Trichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	0.00024 U	0.00031 U	--
1,2-Dibromo-3-Chloropropane	--	--	--	--	--	--	--	--	--	--	--	0.00036 U	0.00045 U	--
1,2-Dibromoethane (Ethylene Dibromide)	--	--	--	--	--	--	--	--	--	--	--	0.000091 U	0.00011 U	--
1,2-Dichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	0.00011 U	0.00013 U	--
1,2-Dichloroethane	--	--	--	--	--	--	--	--	--	--	--	0.000084 U	0.00011 U	--
1,2-Dichloropropane	--	--	--	--	--	--	--	--	--	--	--	0.00013 U	0.00016 U	--
1,3-Dichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	0.000091 U	0.00011 U	--
1,4-Dichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	0.000099 U	0.00012 U	--
2-Hexanone	--	--	--	--	--	--	--	--	--	--	--	0.00072 U	0.0009 U	--
Acetone	--	--	--	--	--	--	--	--	--	--	--	0.019 J+	0.019 J+	--
Benzene	--	--	--	--	--	--	--	--	--	--	--	0.00021 J	0.00019 U	--
Bromochloromethane	--	--	--	--	--	--	--	--	--	--	--	0.00013 U	0.00016 U	--
Bromodichloromethane	--	--	--	--	--	--	--	--	--	--	--	0.00029 U	0.00036 U	--
Bromoform	--	--	--	--	--	--	--	--	--	--	--	0.000099 UJ	0.00012 U	--
Bromomethane	--	--	--	--	--	--	--	--	--	--	--	0.00024 U	0.00031 U	--
Carbon Disulfide	--	--	--	--	--	--	--	--	--	--	--	0.00033 U	0.00046 J	--
Carbon Tetrachloride	--	--	--	--	--	--	--	--	--	--	--	0.00033 U	0.00041 U	--
Chlorobenzene	--	--	--	--	--	--	--	--	--	--	--	0.00011 U	0.00013 U	--
Chloroethane	--	--	--	--	--	--	--	--	--	--	--	0.00027 U	0.00033 U	--
Chloroform	--	--	--	--	--	--	--	--	--	--	--	0.00016 U	0.0002 U	--
Chloromethane	--	--	--	--	--	--	--	--	--	--	--	0.00029 U	0.00036 U	--
Cis-1,2-Dichloroethylene	--	--	--	--	--	--	--	--	--	--	--	0.00017 U	0.00021 U	--
Cis-1,3-Dichloropropene	--	--	--	--	--	--	--	--	--	--	--	0.00011 U	0.00014 U	--
Cyclohexane	--	--	--	--	--	--	--	--	--	--	--	0.00035 U	0.00044 U	--
Dibromochloromethane	--	--	--	--	--	--	--	--	--	--	--	0.00011 U	0.00014 U	--
Dichlorodifluoromethane	--	--	--	--	--	--	--	--	--	--	--	0.00024 U	0.00031 U	--
Ethylbenzene	--	--	--	--	--	--	--	--	--	--	--	0.00014 U	0.00017 U	--
Isopropylbenzene (Cumene)	--	--	--	--	--	--	--	--	--	--	--	0.00013 U	0.00016 U	--
M,P-Xylene	--	--	--	--	--	--	--	--	--	--	--	0.000084 U	0.00011 U	--

Table E-9
Summary of Data Used in Risk Assessment
Central Landfills Area (soil 0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFLP-014	CFLP-014	CFLP-015	CFLP-015	CFLP-016	CFLP-016	CFLP-017	CFLP-017	CFLP-018	CFLP-018	CFMW-002	CFMW-002	CFMW-002	CFMW-008A
Sample Lab IDs	180-78687-15, 200-43824-15, 460-158063-15	180-78687-16, 200-43824-16, 460-158063-16	180-78894-1, 200-43930-1, 460-158632-1	180-78894-2, 200-43930-2, 460-158632-2	180-78894-3, 200-43930-3, 460-158632-3	180-78894-4, 200-43930-4, 460-158632-4	180-78894-5, 200-43930-5, 460-158632-5	180-78894-6, 200-43930-6, 460-158632-6	180-78894-7, 200-43930-7, 460-158632-7	180-78894-8, 200-43930-8, 460-158632-8	460-115528-7	460-115528-8	460-115528-9	460-115528-1
Sample Name	CFLP-014-SO-0-0.5	CFLP-014-SO-0.5-2	CFLP-015-SO-0-0.5	CFLP-015-SO-0.5-2	CFLP-016-SO-0-0.5	CFLP-016-SO-0.5-2	CFLP-017-SO-0-0.5	CFLP-017-SO-0.5-2	CFLP-018-SO-0-0.5	CFLP-018-SO-0.5-2	CFMW-002-SO-0-0.5	CFMW-002-SO-0.5-2	CFMW-002-SO-10-12	CFMW-008a-SO-0-0.5
Sample Depth	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft
Chemical	6/9/2018	6/9/2018	6/16/2018	6/16/2018	6/16/2018	6/16/2018	6/16/2018	6/16/2018	6/16/2018	6/16/2018	6/13/2016	6/13/2016	6/13/2016	6/13/2016
Methyl Acetate	--	--	--	--	--	--	--	--	--	--	--	0.00069 U	0.00086 U	--
Methyl Ethyl Ketone (2-Butanone)	--	--	--	--	--	--	--	--	--	--	--	0.0013 J	0.00074 U	--
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	--	--	--	--	--	--	--	--	--	--	--	0.0017 U	0.0021 U	--
Methylcyclohexane	--	--	--	--	--	--	--	--	--	--	--	0.00038 U	0.00048 U	--
Methylene Chloride	--	--	--	--	--	--	--	--	--	--	--	0.00024 U	0.00061 J	--
O-Xylene (1,2-Dimethylbenzene)	--	--	--	--	--	--	--	--	--	--	--	0.00012 U	0.00015 U	--
Styrene	--	--	--	--	--	--	--	--	--	--	--	0.00011 U	0.00014 U	--
Tert-Butyl Methyl Ether	--	--	--	--	--	--	--	--	--	--	--	0.00013 U	0.00016 U	--
Tetrachloroethylene (PCE)	--	--	--	--	--	--	--	--	--	--	--	0.00021 U	0.00027 U	--
Toluene	--	--	--	--	--	--	--	--	--	--	--	0.00015 J	0.00018 U	--
Trans-1,2-Dichloroethene	--	--	--	--	--	--	--	--	--	--	--	0.0003 U	0.00037 U	--
Trans-1,3-Dichloropropene	--	--	--	--	--	--	--	--	--	--	--	0.000076 U	0.000095 U	--
Trichloroethylene (TCE)	--	--	--	--	--	--	--	--	--	--	--	0.0002 U	0.00025 U	--
Trichlorofluoromethane	--	--	--	--	--	--	--	--	--	--	--	0.00026 U	0.00032 U	--
Vinyl Chloride	--	--	--	--	--	--	--	--	--	--	--	0.0003 U	0.00037 U	--

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-9
Summary of Data Used in Risk Assessment
Central Landfills Area (soil 0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-008A	CFMW-008A	CFMW-008A-DUP	CFMW-010	CFMW-010	CFMW-010	CFMW-012A	CFMW-012A	CFMW-012A-DUP	CFMW-012A	CFMW-016A	CFMW-016A	CFMW-016A	CFMW-018
Sample Lab IDs	460-115528-3	460-115528-4	460-115528-5	460-114141-16	460-114141-17	460-114141-18	460-114275-1	460-114275-3	460-114275-5	460-114275-4	460-115886-11	460-115886-12	460-115886-13	460-114141-34
Sample Name	CFMW-008a-SO-0.5-2	CFMW-008a-SO-10-12	CFMW-DUP14-SO	CFMW-010-SO-0-0.5	CFMW-010-SO-0.5-2.0	CFMW-010-SO-10-12	CFMW-012A-SO-0-0.5	CFMW-012A-SO-0.5-2	CFMW-DUP3-SO	CFMW-012A-SO-10-12	CFMW-016a-SO-0-0.5	CFMW-016a-SO-0.5-2	CFMW-016a-SO-10-12	CFMW-018-SO-0-0.5
Sample Depth	0.5-2 ft	10-12 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft
Chemical	6/13/2016	6/13/2016	6/13/2016	5/18/2016	5/18/2016	5/18/2016	5/20/2016	5/20/2016	5/20/2016	5/20/2016	6/21/2016	6/21/2016	6/21/2016	5/19/2016
GENERAL CHEMISTRY (mg/kg)														
Fluoride	180 J+	3.98 J-	3.25 J-	114 J-	101 J-	11.6 J-	91.9 J-	59.3 J-	80.8 J-	13.7 J-	59.4 J	25.4 J	6.29 J	9.33 J-
Cyanide	0.016 UJ	0.015 UJ	0.015 UJ	1.4	0.32	0.033 J	0.6	0.46	0.51	0.2	0.32	0.018 U	0.042 J	0.018 U
METALS (mg/kg)														
"Chromium, Hexavalent - Estimated"	0.187348	0.224818	0.219465	0.339903	0.326521	0.168613	0.350608	0.305109	0.337226	0.262287	0.315815	0.326521	0.291727	0.281022
"Chromium, Trivalent - Calculated"	--	--	--	--	--	--	--	--	--	--	--	--	--	--
"Chromium, Trivalent - Estimated"	6.81265	8.17518	7.98054	12.3601	11.8735	6.13139	12.7494	11.0949	12.2628	9.53771	11.4842	11.8735	10.6083	10.219
Aluminum	8610	10000	8380	25700	22100	5380	16400	13400	15200	8090	12600	11800	14700	10900 J
Antimony	0.32 UJ	0.34 UJ	0.32 UJ	0.37 UJ	0.35 UJ	0.34 UJ	0.44 UJ	0.45 UJ	0.45 UJ	0.42 UJ	0.41 UJ	0.41 UJ	0.4 UJ	0.35 UJ
Arsenic	4	7.7	6.3	6.2	7.7	3.1	6.6 J	5.7 J	5.7 J	5 J	4.8	5	4.2	11.3 J
Barium	55.6	71.4	70.2	235	171	33	131	112	90	48.3	105 J	125 J	133 J	97.4
Beryllium	0.27 J	0.4	0.32	0.84	0.78	0.2 J	0.6	0.46	0.46	0.33 J	0.61	0.38 J	0.48	0.4
Cadmium	0.24 U	0.26 U	0.25 U	0.28 U	0.32 J	0.26 U	0.33 U	0.34 U	0.35 U	0.32 U	0.31 U	0.31 U	0.31 U	0.26 U
Calcium	26100 J	57600 J	56800 J	4460	2370	31100	2340 J	4310 J	6710 J	48300 J	41300 J	16300 J	10500 J	59400
Chromium, Total	7	8.4	8.2	12.7	12.2	6.3	13.1	11.4	12.6	9.8	11.8 J	12.2 J	10.9 J	10.5
Cobalt	3.5	5	3.9	6.4	6.6	3.2	5.5	4.3	4.4	4.6	5.1	6.2	5.6	5.1
Copper	8.4	10.8	13	13.7	12	11.6	10.6 J+	18.6 J+	12.3 J+	10.1 J+	14	16.9	18	15.4 J
Iron	9950	13800	11500	20500	19700	8950	20600	19800	19500	11900	14100	16700	15900	14000
Lead	11.2 J+	8.4 J+	7.4 J+	13.5	15.3	3.8	15 J	8.7 J	8.7 J	7.1 J	23.3 J	8.8 J	10.3 J	12.4
Magnesium	8110	15100	11600	10900	11500	8710	13300 J	13200 J	14200 J	14200 J	9170	11500	9720	13100
Manganese	247 J	376 J	415 J	529	577	277	533	694	438	371	446	483	325	405 J
Mercury	0.016 J	0.015 J	0.017	0.019	0.024	0.018	0.012 U	0.019	0.014 J	0.023	0.02	0.076	0.025	0.034
Nickel	15.8 J+	9.8 J+	8.1 J+	22.2	12.9	7.4	14 J+	11.8 J+	13.4 J+	9.4 J+	19.2	12.5	11.8	14.9
Potassium	585	576	589	1430	1250	384	927 J	1080 J	845 J	757 J	1100	984	1070	1160
Selenium	0.3 U	0.32 U	0.3 U	0.35 U	0.33 U	0.32 U	0.41 U	0.42 U	0.43 U	0.39 U	0.38 U	0.38 U	0.38 U	0.32 U
Silver	0.58 U	0.63 U	0.59 U	0.68 U	0.65 U	0.62 U	0.8 U	0.83 U	0.83 U	0.77 U	0.75 U	0.75 U	0.74 U	0.63 U
Sodium	89.5	31.9 U	30.3 U	176	119	61.9 J	74 J	49.9 J	53.7 J	39.2 U	68.3 J	39 J	37.8 U	32.4 U
Thallium	0.12 U	0.13 U	0.12 U	0.14 J	0.15 J	0.13 U	0.17 U	0.17 U	0.17 U	0.16 U	0.15 U	0.15 U	0.15 U	0.13 U
Vanadium	9.5 J-	6.6 J-	5.2 J-	23.7	19.3	3.5	17.7	11.9	12.4	5.3	12.2	9.7	14.7	10.4
Zinc	32.3 J-	37.9 J-	30 J-	72.5	75.7	25.2	75.5 J	43.9 J	45 J	38.6 J	45.4	47.9	50.1	41.3
METALS|HEXAVALENT CHROMIUM (mg/kg)														
Chromium, Hexavalent	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PESTICIDES (mg/kg)														
Aldrin	--	--	--	0.00091 U	--	--	0.00092 U	--	--	--	0.0009 U	--	--	0.00091 U
Alpha Bhc (Alpha Hexachlorocyclohexane)	--	--	--	0.00069 U	--	--	0.0007 U	--	--	--	0.00068 U	--	--	0.00068 U
Alpha Endosulfan	--	--	--	0.0011 U	--	--	0.0011 U	--	--	--	0.001 U	--	--	0.001 U
Beta Bhc (Beta Hexachlorocyclohexane)	--	--	--	0.00073 U	--	--	0.00074 U	--	--	--	0.00072 U	--	--	0.00073 U
Beta Endosulfan	--	--	--	0.0012 U	--	--	0.0012 U	--	--	--	0.0012 U	--	--	0.0012 U
cis-Chlordane	--	--	--	0.0012 U	--	--	0.0012 U	--	--	--	0.0012 U	--	--	0.0012 U
Delta BHC (Delta Hexachlorocyclohexane)	--	--	--	0.00082 U	--	--	0.00083 U	--	--	--	0.00081 U	--	--	0.00082 U
Dieldrin	--	--	--	0.00098 U	--	--	0.00099 U	--	--	--	0.00097 U	--	--	0.00098 U
Endosulfan Sulfate	--	--	--	0.00088 U	--	--	0.00089 U	--	--	--	0.00087 U	--	--	0.00087 U
Endrin	--	--	--	0.00096 U	--	--	0.00097 U	--	--	--	0.00095 U	--	--	0.00095 U
Endrin Aldehyde	--	--	--	0.00094 U	--	--	0.00095 U	--	--	--	0.00093 U	--	--	0.00093 U
Endrin Ketone	--	--	--	0.0011 U	--	--	0.0011 U	--	--	--	0.001 U	--	--	0.001 U
Gamma Bhc (Lindane)	--	--	--	0.00068 U	--	--	0.00069 U	--	--	--	0.00067 U	--	--	0.00067 U
Heptachlor	--	--	--	0.00097 U	--	--	0.00098 U	--	--	--	0.00096 U	--	--	0.00096 U
Heptachlor Epoxide	--	--	--	0.0015 U	--	--	0.0015 U	--	--	--	0.0015 U	--	--	0.0015 U
Methoxychlor	--	--	--	0.0016 U	--	--	0.0016 U	--	--	--	0.0016 U	--	--	0.0016 U
P,P'-DDD	--	--	--	0.00099 U	--	--	0.001 U	--	--	--	0.00098 U	--	--	0.00099 U
P,P'-DDE	--	--	--	0.0011 U	--	--	0.0011 U	--	--	--	0.0011 U	--	--	0.0011 U
P,P'-DDT	--	--	--	0.00078 U	--	--	0.00079 U	--	--	--	0.00077 U	--	--	0.00077 U
Toxaphene	--	--	--	0.022 U	--	--	0.022 U	--	--	--	0.022 U	--	--	0.022 U
trans-Chlordane	--	--	--	0.0016 U	--	--	0.0017 U	--	--	--	0.0016 U	--	--	0.0016 U
POLYCHLORINATED BIPHENYLS (mg/kg)														
PCB-1016 (Aroclor 1016)	0.0094 U	0.0097 U	0.0096 U	0.01 U	0.01 U	0.0094 U	0.01 U	0.01 U	0.01 U	0.0094 U	0.0099 U	0.0096 U	0.01 U	0.01 U
PCB-1221 (Aroclor 1221)	0.0094 U	0.0097 U	0.0096 U	0.01 U	0.01 U	0.0094 U	0.01 U	0.01 U	0.01 U	0.0094 U	0.0099 U	0.0096 U	0.01 U	0.01 U

Table E-9
Summary of Data Used in Risk Assessment
Central Landfills Area (soil 0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-008A	CFMW-008A	CFMW-008A-DUP	CFMW-010	CFMW-010	CFMW-010	CFMW-012A	CFMW-012A	CFMW-012A-DUP	CFMW-012A	CFMW-016A	CFMW-016A	CFMW-016A	CFMW-018
Sample Lab IDs	460-115528-3	460-115528-4	460-115528-5	460-114141-16	460-114141-17	460-114141-18	460-114275-1	460-114275-3	460-114275-5	460-114275-4	460-115886-11	460-115886-12	460-115886-13	460-114141-34
Sample Name	CFMW-008a-SO-0.5-2	CFMW-008a-SO-10-12	CFMW-DUP14-SO	CFMW-010-SO-0-0.5	CFMW-010-SO-0.5-2.0	CFMW-010-SO-10-12	CFMW-012A-SO-0-0.5	CFMW-012A-SO-0.5-2	CFMW-DUP3-SO	CFMW-012A-SO-10-12	CFMW-016a-SO-0-0.5	CFMW-016a-SO-0.5-2	CFMW-016a-SO-10-12	CFMW-018-SO-0-0.5
Sample Depth	0.5-2 ft	10-12 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft
Chemical	6/13/2016	6/13/2016	6/13/2016	5/18/2016	5/18/2016	5/18/2016	5/20/2016	5/20/2016	5/20/2016	5/20/2016	6/21/2016	6/21/2016	6/21/2016	5/19/2016
PCB-1232 (Aroclor 1232)	0.0094 U	0.0097 U	0.0096 U	0.01 U	0.01 U	0.0094 U	0.01 U	0.01 U	0.01 U	0.0094 U	0.0099 U	0.0096 U	0.01 U	0.01 U
PCB-1242 (Aroclor 1242)	0.0094 U	0.0097 U	0.0096 U	0.01 U	0.01 U	0.0094 U	0.01 U	0.01 U	0.01 U	0.0094 U	0.0099 U	0.0096 U	0.01 U	0.01 U
PCB-1248 (Aroclor 1248)	0.0094 U	0.0097 U	0.0096 U	0.01 U	0.01 U	0.0094 U	0.01 U	0.01 U	0.01 U	0.0094 U	0.0099 U	0.0096 U	0.01 U	0.01 U
PCB-1254 (Aroclor 1254)	0.0097 U	0.01 U	0.0099 U	0.01 U	0.01 U	0.0097 U	0.011 U	0.011 U	0.011 U	0.0098 U	0.01 U	0.0099 U	0.01 U	0.01 U
PCB-1260 (Aroclor 1260)	0.0097 U	0.01 U	0.0099 U	0.01 U	0.01 U	0.0097 U	0.011 U	0.011 U	0.011 U	0.0098 U	0.01 U	0.0099 U	0.01 U	0.01 U
PCB-1262 (Aroclor 1262)	0.0097 U	0.01 U	0.0099 U	0.01 U	0.01 U	0.0097 U	0.011 U	0.011 U	0.011 U	0.0098 U	0.01 U	0.0099 U	0.01 U	0.01 U
PCB-1268 (Aroclor 1268)	0.0097 U	0.01 U	0.0099 U	0.01 U	0.01 U	0.0097 U	0.011 U	0.011 U	0.011 U	0.0098 U	0.01 U	0.0099 U	0.01 U	0.01 U
Polychlorinated Biphenyl (PCBs)	0.0097 U	0.01 U	0.0099 U	0.01 U	0.01 U	0.0097 U	0.011 U	0.011 U	0.011 U	0.0098 U	0.01 U	0.0099 U	0.01 U	0.01 U
SEMIVOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,2,4,5-Tetrachlorobenzene	0.26 U	0.027 U	0.026 U	0.028 U	0.028 U	0.026 U	0.028 U	0.029 U	0.029 U	0.026 U	0.027 U	0.027 U	0.028 U	0.028 U
1,4-Dioxane (P-Dioxane)	0.93 U	0.096 U	0.095 U	0.1 U	0.1 U	0.093 U	0.1 U	0.1 U	0.1 U	0.094 U	0.098 U	0.095 U	0.1 U	0.099 U
2,3,4,6-Tetrachlorophenol	0.33 U	0.034 U	0.033 U	0.035 U	0.035 U	0.033 U	0.036 U	0.036 U	0.036 U	0.033 UJ	0.035 U	0.034 U	0.035 U	0.035 U
2,4,5-Trichlorophenol	0.35 U	0.036 U	0.035 U	0.037 U	0.037 U	0.035 U	0.038 U	0.038 U	0.039 U	0.035 UJ	0.037 U	0.036 U	0.037 U	0.037 U
2,4,6-Trichlorophenol	0.099 U	0.01 U	0.01 U	0.011 U	0.011 U	0.0099 U	0.011 U	0.011 U	0.011 U	0.01 U	0.01 U	0.01 U	0.011 U	0.011 U
2,4-Dichlorophenol	0.082 U	0.0085 U	0.0084 U	0.0088 U	0.0089 U	0.0082 U	0.0089 U	0.0091 U	0.0091 U	0.0083 U	0.0087 U	0.0084 U	0.0088 U	0.0087 U
2,4-Dimethylphenol	0.77 U	0.079 U	0.078 U	0.082 U	0.083 U	0.077 U	0.083 U	0.085 U	0.085 U	0.077 U	0.081 U	0.079 U	0.082 U	0.081 U
2,4-Dinitrophenol	2.6 U	0.27 U	0.27 U	0.28 U	0.28 U	0.26 U	0.29 U	0.29 U	0.29 U	0.27 UJ	0.28 U	0.27 U	0.28 U	0.28 U
2,4-Dinitrotoluene	0.14 U	0.014 U	0.014 U	0.015 U	0.015 U	0.014 U	0.015 U	0.015 U	0.015 U	0.014 U	0.015 U	0.014 U	0.015 U	0.015 U
2,6-Dinitrotoluene	0.19 U	0.019 U	0.019 U	0.02 U	0.02 U	0.019 U	0.02 U	0.02 U	0.021 U	0.019 U	0.02 U	0.019 U	0.02 U	0.02 U
2-Chloronaphthalene	0.079 U	0.0082 U	0.008 U	0.0085 U	0.0085 U	0.0079 U	0.0086 U	0.0087 U	0.0088 U	0.008 U	0.0083 U	0.0081 U	0.0085 U	0.0084 U
2-Chlorophenol	0.088 U	0.0091 U	0.009 U	0.0095 U	0.0095 U	0.0088 U	0.0096 U	0.0098 U	0.0098 U	0.0089 U	0.0094 U	0.0091 U	0.0095 U	0.0094 U
2-Methylnaphthalene	0.092 J	0.17 J	0.0089 J	0.024 J	0.0083 U	0.0077 U	0.0083 U	0.0085 U	0.0086 U	0.0077 U	0.11 J	0.0079 U	0.0083 U	0.0082 U
2-Methylphenol (O-Cresol)	0.15 U	0.016 U	0.015 U	0.016 U	0.016 U	0.015 U	0.016 U	0.017 U	0.017 U	0.015 U	0.016 U	0.016 U	0.016 U	0.016 U
2-Nitroaniline	0.11 U	0.012 U	0.012 U	0.012 U	0.012 U	0.011 U	0.012 U	0.013 U	0.013 U	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U
2-Nitrophenol	0.12 U	0.012 U	0.012 U	0.013 U	0.013 U	0.012 U	0.013 U	0.013 U	0.013 U	0.012 UJ	0.012 U	0.012 U	0.013 U	0.012 U
3- And 4- Methylphenol (Total)	0.093 U	0.0096 U	0.0094 U	0.0099 U	0.01 U	0.0093 U	0.01 U	0.01 U	0.01 U	0.0093 U	0.0098 U	0.0095 U	0.01 U	0.0099 U
3,3'-Dichlorobenzidine	0.39 U	0.04 U	0.04 U	0.042 U	0.042 U	0.039 U	0.042 U	0.043 U	0.043 U	0.039 U	0.041 U	0.04 U	0.042 U	0.041 U
3-Nitroaniline	0.1 U	0.011 U	0.011 U	0.011 U	0.011 U	0.01 U	0.011 U	0.011 U	0.011 U	0.01 U	0.011 U	0.011 U	0.011 U	0.011 U
4,6-Dinitro-2-Methylphenol	0.93 U	0.096 U	0.095 U	0.099 U	0.1 U	0.093 U	0.1 U	0.1 U	0.1 U	0.094 UJ	0.098 U	0.095 U	0.1 U	0.099 U
4-Bromophenyl Phenyl Ether	0.11 U	0.011 U	0.011 U	0.012 U	0.012 U	0.011 U	0.012 U	0.012 U	0.012 U	0.011 U	0.012 U	0.011 U	0.012 U	0.012 U
4-Chloro-3-Methylphenol	0.15 U	0.015 U	0.015 U	0.016 U	0.016 U	0.015 U	0.016 U	0.017 U	0.017 U	0.015 U	0.016 U	0.015 U	0.016 U	0.016 U
4-Chloroaniline	0.089 U	0.0092 U	0.0091 U	0.0096 U	0.0097 U	0.009 U	0.0097 U	0.0099 U	0.01 U	0.009 U	0.0095 U	0.0092 U	0.0096 U	0.0095 U
4-Chlorophenyl Phenyl Ether	0.1 U	0.011 U	0.011 U	0.011 U	0.011 U	0.01 U	0.011 U	0.012 U	0.012 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U
4-Nitroaniline	0.13 U	0.014 U	0.013 U	0.014 U	0.014 U	0.013 U	0.014 U	0.015 U	0.015 U	0.013 U	0.014 U	0.013 U	0.014 U	0.014 U
4-Nitrophenol	1.7 U	0.17 U	0.17 U	0.18 U	0.18 UJ	0.17 UJ	0.18 U	0.19 U	0.19 U	0.17 U	0.18 U	0.17 U	0.18 U	0.18 U
Acenaphthene	0.35 J	0.0087 U	0.0086 U	0.19 J	0.0091 U	0.0084 U	0.018 J	0.0093 U	0.012 J	0.0085 U	0.7	0.0086 U	0.01 J	0.009 U
Acenaphthylene	0.089 U	0.0092 U	0.0091 U	0.0096 U	0.0097 U	0.009 U	0.0097 U	0.0099 U	0.01 U	0.009 U	0.0095 U	0.0092 U	0.0096 U	0.0095 U
Acetophenone	0.076 U	0.0078 U	0.0077 U	0.0081 U	0.0082 U	0.0076 U	0.0082 U	0.0084 U	0.0084 U	0.0076 U	0.008 U	0.0078 U	0.0081 U	0.0081 U
Anthracene	0.65 J	0.034 U	0.034 U	0.4	0.036 U	0.033 U	0.036 U	0.037 U	0.037 U	0.033 U	1.2	0.034 U	0.036 U	0.035 U
Atrazine	0.15 U	0.016 U	0.016 U	0.017 U	0.017 U	0.015 U	0.017 U	0.017 U	0.017 U	0.016 U	0.016 U	0.016 U	0.017 U	0.016 U
Benzaldehyde	0.27 U	0.027 U	0.027 U	0.028 U	0.029 U	0.027 U	0.029 U	0.029 U	0.03 U	0.027 U	0.028 U	0.027 U	0.029 U	0.028 U
Benzo(A)Anthracene	2.2	0.03 U	0.03 U	2.1	0.031 U	0.029 U	0.15	0.07	0.049	0.029 U	2.7	0.03 U	0.05	0.15
Benzo(A)Pyrene	2.4	0.011 U	0.011 U	2.4	0.014 J	0.011 U	0.17	0.07	0.048	0.011 U	2.8	0.015 J	0.058	0.21
Benzo(B)Fluoranthene	3.8	0.014 U	0.014 U	3.6	0.019 J	0.014 U	0.23	0.092	0.061	0.014 U	3.3	0.02 J	0.12	0.33
Benzo(G,H,I)Perylene	1.5 J	0.021 U	0.02 U	2.7	0.022 U	0.02 U	0.2 J+	0.055 J+	0.042 J+	0.02 U	4.2	0.021 U	0.064 J	0.24 J
Benzo(K)Fluoranthene	1.6	0.016 U	0.015 U	1.3	0.016 U	0.015 U	0.083	0.041	0.031 J	0.015 U	1.3	0.016 U	0.042	0.12
Benzyl Butyl Phthalate	0.11 U	0.011 U	0.011 U	0.013 J	0.012 U	0.011 U	0.012 U	0.012 U	0.012 U	0.011 U	0.011 U	0.011 U	0.012 U	0.011 U
Biphenyl (Diphenyl)	0.3 U	0.031 U	0.03 U	0.032 U	0.032 U	0.03 U	0.032 U	0.033 U	0.033 U	0.03 U	0.035 J	0.03 U	0.032 U	0.032 U
Bis(2-Chloroethoxy) Methane	0.11 U	0.011 U	0.011 U	0.012 U	0.012 U	0.011 U	0.012 U	0.012 U	0.012 U	0.011 U	0.011 U	0.011 U	0.012 U	0.012 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.082 U	0.0085 U	0.0084 U	0.0088 U	0.0089 U	0.0082 U	0.0089 U	0.0091 U	0.0091 U	0.0083 U	0.0087 U	0.0084 U	0.0088 U	0.0087 U
Bis(2-Chloroisopropyl) Ether	0.14 U	0.015 U	0.015 U	0.015 UJ	0.015 UJ	0.014 UJ	0.016 U	0.016 U	0.016 U	0.014 U	0.015 U	0.015 U	0.015 U	0.015 U
Bis(2-Ethylhexyl) Phthalate	0.14 U	0.014 U	0.014 U	0.057 J	0.015 U	0.014 U	0.015 U	0.015 U	0.015 U	0.014 U	0.014 U	0.014 U	0.015 U	0.062 J
Caprolactam	0.25 U	0.026 U	0.026 U	0.027 U	0.027 U	0.025 U	0.027 UJ	0.028 UJ	0.028 UJ	0.025 U	0.026 U	0.026 U	0.027 U	0.027 U
Carbazole	0.6 J	0.0089 U	0.0088 U	0.35 J	0.0093 U	0.0086 U	0.028 J	0.012 J	0.0096 UJ	0.0087 U	0.74	0.0089 U	0.0093 U	0.018 J
Chrysene	3.7	0.0098 U	0.0097 U	2.8	0.017 J	0.0095 U	0.19 J	0.085 J	0.06 J	0.0095 U	3.1	0.013 J	0.091 J	0.22 J
Dibenz(A,H)Anthracene	0.5	0.019 U	0.018 U	0.63	0.02 U	0.018 U	0.042 J+	0.02 U	0.02 U	0.018 U	0.91	0.019 U	0.021 J	0.04 J+
Dibenzofuran	0.18 J	0.014 J	0.011 U	0.092 J	0.011 U	0.011 U	0.011 U	0.012 U	0.012 U	0.011 U	0.3 J	0.011 U	0.011 U	0.011 U

Table E-9
Summary of Data Used in Risk Assessment
Central Landfills Area (soil 0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-008A	CFMW-008A	CFMW-008A-DUP	CFMW-010	CFMW-010	CFMW-010	CFMW-012A	CFMW-012A	CFMW-012A-DUP	CFMW-012A	CFMW-016A	CFMW-016A	CFMW-016A	CFMW-018
Sample Lab IDs	460-115528-3	460-115528-4	460-115528-5	460-114141-16	460-114141-17	460-114141-18	460-114275-1	460-114275-3	460-114275-5	460-114275-4	460-115886-11	460-115886-12	460-115886-13	460-114141-34
Sample Name	CFMW-008a-SO-0.5-2	CFMW-008a-SO-10-12	CFMW-DUP14-SO	CFMW-010-SO-0-0.5	CFMW-010-SO-0.5-2.0	CFMW-010-SO-10-12	CFMW-012A-SO-0-0.5	CFMW-012A-SO-0.5-2	CFMW-DUP3-SO	CFMW-012A-SO-10-12	CFMW-016a-SO-0-0.5	CFMW-016a-SO-0.5-2	CFMW-016a-SO-10-12	CFMW-018-SO-0-0.5
Sample Depth	0.5-2 ft	10-12 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft
Chemical	6/13/2016	6/13/2016	6/13/2016	5/18/2016	5/18/2016	5/18/2016	5/20/2016	5/20/2016	5/20/2016	5/20/2016	6/21/2016	6/21/2016	6/21/2016	5/19/2016
Diethyl Phthalate	0.099 U	0.01 U	0.01 U	0.011 U	0.011 U	0.0099 U	0.011 U	0.011 U	0.011 U	0.01 U	0.01 U	0.01 U	0.011 U	0.011 U
Dimethyl Phthalate	0.1 U	0.01 U	0.01 U	0.011 U	0.011 U	0.01 U	0.011 U	0.011 U	0.011 U	0.01 U	0.011 U	0.01 U	0.011 U	0.011 U
Di-N-Butyl Phthalate	0.1 U	0.011 U	0.011 U	0.011 U	0.011 U	0.01 U	0.011 U	0.012 U	0.012 U	0.011 U	0.023 J	0.011 U	0.02 J	0.011 U
Di-N-Octylphthalate	0.18 U	0.018 U	0.018 U	0.019 U	0.019 U	0.018 U	0.019 U	0.02 U	0.02 U	0.018 U	0.019 U	0.018 U	0.019 U	0.019 U
Fluoranthene	6.1	0.011 U	0.011 U	4.1	0.021 J	0.01 U	0.27 J	0.12 J	0.09 J	0.01 U	6.1	0.017 J	0.096 J	0.22 J
Fluorene	0.3 J	0.019 J	0.0077 UJ	0.16 J	0.0082 U	0.0076 U	0.012 J	0.0084 U	0.0085 J	0.0076 U	0.58	0.0078 U	0.0088 J	0.0081 U
Hexachlorobenzene	0.14 U	0.015 U	0.014 U	0.015 U	0.015 U	0.014 U	0.015 U	0.016 U	0.016 U	0.014 U	0.015 U	0.014 U	0.015 U	0.015 U
Hexachlorobutadiene	0.098 U	0.01 U	0.01 U	0.01 U	0.011 U	0.0098 U	0.011 U	0.011 U	0.011 U	0.0099 U	0.01 U	0.01 U	0.011 U	0.01 U
Hexachlorocyclopentadiene	0.22 U	0.022 U	0.022 U	0.023 U	0.023 U	0.022 U	0.024 U	0.024 U	0.024 U	0.022 U	0.023 U	0.022 U	0.023 U	0.023 U
Hexachloroethane	0.13 U	0.013 U	0.013 U	0.014 U	0.014 U	0.013 U	0.014 U	0.014 U	0.014 U	0.013 U	0.013 U	0.013 U	0.014 U	0.014 U
Indeno(1,2,3-C,D)Pyrene	1.8	0.024 U	0.024 U	2.9	0.025 U	0.023 U	0.19 J+	0.059 J+	0.046 J+	0.023 U	3.9	0.024 U	0.053	0.23 J+
Isophorone	0.075 U	0.0077 U	0.0076 U	0.008 U	0.0081 U	0.0075 U	0.0081 U	0.0083 U	0.0083 U	0.0075 U	0.0079 U	0.0077 U	0.008 U	0.008 U
Naphthalene	0.088 U	0.16 J	0.009 UJ	0.043 J	0.0095 U	0.0088 U	0.0096 U	0.0098 U	0.0098 U	0.0089 U	0.29 J	0.0091 U	0.0095 U	0.0094 U
Nitrobenzene	0.11 U	0.011 U	0.011 U	0.012 U	0.012 U	0.011 U	0.012 U	0.012 U	0.012 U	0.011 U	0.012 U	0.011 U	0.012 U	0.012 U
N-Nitrosodi-N-Propylamine	0.12 U	0.012 U	0.012 U	0.013 U	0.013 U	0.012 U	0.013 U	0.013 U	0.013 U	0.012 U	0.012 U	0.012 U	0.013 U	0.012 U
N-Nitrosodiphenylamine	0.32 U	0.033 U	0.032 U	0.034 U	0.034 U	0.032 U	0.034 U	0.035 U	0.035 U	0.032 U	0.033 U	0.032 U	0.034 U	0.034 U
Pentachlorophenol	0.42 U	0.044 U	0.043 U	0.045 U	0.045 U	0.042 U	0.046 U	0.047 U	0.047 U	0.042 UJ	0.045 U	0.043 U	0.045 U	0.045 U
Phenanthrene	3.6	0.02 J	0.0094 UJ	2.4	0.013 J	0.0093 U	0.19 J	0.087 J	0.073 J	0.0093 U	5.7	0.014 J	0.068 J	0.093 J
Phenol	0.11 U	0.012 U	0.012 U	0.012 U	0.012 U	0.011 U	0.012 U	0.013 U	0.013 U	0.011 U	0.012 U	0.012 U	0.012 U	0.012 U
Pyrene	3.4 J	0.016 U	0.016 U	3.9	0.017 U	0.016 U	0.26 J	0.15 J	0.092 J	0.016 U	6.4	0.018 J	0.1 J	0.27 J
VOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,1,1-Trichloroethane	0.00037 U	0.00043 U	0.00033 U	--	0.00036 U	0.00016 U	--	0.00055 U	0.0004 U	0.00054 UJ	--	0.00034 U	0.00031 U	--
1,1,2,2-Tetrachloroethane	0.00017 U	0.00019 U	0.00015 U	--	0.00016 U	0.000074 U	--	0.00025 U	0.00018 U	0.00024 U	--	0.00015 U	0.00014 U	--
1,1,2-Trichloro-1,2,2-Trifluoroethane	0.00043 U	0.0005 U	0.00039 U	--	0.00042 U	0.00019 U	--	0.00064 U	0.00046 U	0.00063 U	--	0.00039 U	0.00035 U	--
1,1,2-Trichloroethane	0.00028 U	0.00032 U	0.00025 U	--	0.00027 U	0.00012 U	--	0.00041 U	0.00029 U	0.0004 U	--	0.00025 U	0.00023 U	--
1,1-Dichloroethane	0.00034 U	0.00038 U	0.0003 U	--	0.00032 U	0.00015 U	--	0.0005 U	0.00035 U	0.00049 UJ	--	0.0003 U	0.00027 U	--
1,1-Dichloroethene	0.0004 U	0.00046 U	0.00036 U	--	0.00039 U	0.00018 U	--	0.0006 U	0.00043 U	0.00059 U	--	0.00037 U	0.00033 U	--
1,2,3-Trichlorobenzene	0.00011 U	0.00012 U	0.000097 U	--	0.0001 U	0.000048 U	--	0.00016 U	0.00011 U	0.00016 UJ	--	0.000099 U	0.000089 U	--
1,2,4-Trichlorobenzene	0.00032 U	0.00036 U	0.00028 U	--	0.0003 U	0.00014 U	--	0.00047 U	0.00033 U	0.00046 UJ	--	0.00029 U	0.00026 U	--
1,2-Dibromo-3-Chloropropane	0.00046 U	0.00053 U	0.00041 U	--	0.00045 U	0.0002 U	--	0.00069 U	0.00049 U	0.00067 U	--	0.00042 U	0.00038 U	--
1,2-Dibromoethane (Ethylene Dibromide)	0.00012 U	0.00014 U	0.00011 U	--	0.00011 U	0.000052 U	--	0.00018 U	0.00012 U	0.00017 U	--	0.00011 U	0.000097 U	--
1,2-Dichlorobenzene	0.00014 U	0.00016 U	0.00012 U	--	0.00013 U	0.000061 U	--	0.0002 U	0.00015 U	0.0002 UJ	--	0.00013 U	0.00011 U	--
1,2-Dichloroethane	0.00011 U	0.00012 U	0.000097 U	--	0.0001 U	0.000048 U	--	0.00016 U	0.00011 U	0.00016 U	--	0.000099 U	0.000089 U	--
1,2-Dichloropropane	0.00017 U	0.00019 U	0.00015 U	--	0.00016 U	0.000074 U	--	0.00025 U	0.00018 U	0.00024 U	--	0.00015 U	0.00014 U	--
1,3-Dichlorobenzene	0.00012 U	0.00014 U	0.00011 U	--	0.00011 U	0.000052 U	--	0.00018 U	0.00012 U	0.00017 UJ	--	0.00011 U	0.000097 U	--
1,4-Dichlorobenzene	0.00013 U	0.00015 U	0.00011 U	--	0.00012 U	0.000056 U	--	0.00019 U	0.00014 U	0.00019 UJ	--	0.00012 U	0.0001 U	--
2-Hexanone	0.00093 U	0.0011 U	0.00083 U	--	0.00089 U	0.00041 U	--	0.0014 U	0.00098 U	0.0013 UJ	--	0.00084 U	0.00076 U	--
Acetone	0.13 J+	0.035 J+	0.024 J+	--	0.027	0.00046 U	--	0.031 J	0.011 J	0.0015 U	--	0.024 J+	0.063 J+	--
Benzene	0.0097	0.00023 U	0.00018 U	--	0.00019 U	0.000087 U	--	0.00029 U	0.00021 U	0.00029 UJ	--	0.00034 J	0.00095	--
Bromochloromethane	0.00017 U	0.00019 U	0.00015 U	--	0.00016 U	0.000074 U	--	0.00025 U	0.00018 U	0.00024 U	--	0.00015 U	0.00014 U	--
Bromodichloromethane	0.00037 U	0.00043 U	0.00033 U	--	0.00036 U	0.00016 U	--	0.00055 U	0.0004 U	0.00054 U	--	0.00034 U	0.00031 U	--
Bromoform	0.00013 U	0.00015 U	0.00011 U	--	0.00012 U	0.000056 U	--	0.00019 U	0.00014 U	0.00019 U	--	0.00012 U	0.0001 U	--
Bromomethane	0.00032 U	0.00036 U	0.00028 U	--	0.0003 U	0.00014 U	--	0.00047 UJ	0.00033 U	0.00046 UJ	--	0.00029 U	0.00026 U	--
Carbon Disulfide	0.0019	0.00048 U	0.00038 U	--	0.00063 J	0.00019 U	--	0.0041 J	0.0019 J	0.00062 U	--	0.0005 J	0.00057 J	--
Carbon Tetrachloride	0.00042 U	0.00048 U	0.00038 U	--	0.00041 U	0.00019 U	--	0.00063 U	0.00045 U	0.00062 U	--	0.00039 U	0.00035 U	--
Chlorobenzene	0.00014 U	0.00016 U	0.00012 U	--	0.00013 U	0.000061 U	--	0.0002 U	0.00015 U	0.0002 UJ	--	0.00013 U	0.00011 U	--
Chloroethane	0.00035 U	0.00039 U	0.00031 U	--	0.00033 U	0.00015 U	--	0.00051 U	0.00036 U	0.0005 U	--	0.00031 U	0.00028 U	--
Chloroform	0.00021 U	0.00024 U	0.00018 U	--	0.0002 U	0.000091 U	--	0.00031 U	0.00022 U	0.0003 UJ	--	0.00019 U	0.00017 U	--
Chloromethane	0.00037 U	0.00043 U	0.00033 U	--	0.00036 U	0.00016 U	--	0.00055 UJ	0.0004 U	0.00054 U	--	0.00034 U	0.00031 U	--
Cis-1,2-Dichloroethylene	0.00022 U	0.00025 U	0.00019 U	--	0.00021 U	0.000095 U	--	0.00032 U	0.00023 U	0.00031 UJ	--	0.0002 U	0.00018 U	--
Cis-1,3-Dichloropropene	0.00015 U	0.00017 U	0.00013 U	--	0.00014 U	0.000065 U	--	0.00022 U	0.00016 U	0.00021 UJ	--	0.00013 U	0.00012 U	--
Cyclohexane	0.00052 J+	0.00052 U	0.0004 U	--	0.00044 U	0.0002 U	--	0.00067 U	0.00048 U	0.00066 UJ	--	0.00041 U	0.00037 U	--
Dibromochloromethane	0.00015 U	0.00017 U	0.00013 U	--	0.00014 U	0.000065 U	--	0.00022 U	0.00016 U	0.00021 U	--	0.00013 U	0.00012 U	--
Dichlorodifluoromethane	0.00032 U	0.00036 U	0.00028 U	--	0.0003 U	0.00014 U	--	0.00047 U	0.00033 U	0.00046 U	--	0.00029 U	0.00026 U	--
Ethylbenzene	0.0024	0.0002 U	0.00016 U	--	0.00017 U	0.000078 U	--	0.00026 U	0.00019 U	0.00026 UJ	--	0.00016 U	0.00042 J	--
Isopropylbenzene (Cumene)	0.00034 J	0.00019 U	0.00015 U	--	0.00016 U	0.000074 U	--	0.00025 U	0.00018 U	0.00024 UJ	--	0.00015 U	0.00014 U	--
M,P-Xylene	0.0038	0.00012 U	0.000097 U	--	0.0001 U	0.000048 U	--	0.00016 U	0.00011 U	0.00016 UJ	--	0.000099 U	0.0017	--

Table E-9
Summary of Data Used in Risk Assessment
Central Landfills Area (soil 0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-008A	CFMW-008A	CFMW-008A-DUP	CFMW-010	CFMW-010	CFMW-010	CFMW-012A	CFMW-012A	CFMW-012A-DUP	CFMW-012A	CFMW-016A	CFMW-016A	CFMW-016A	CFMW-018
Sample Lab IDs	460-115528-3	460-115528-4	460-115528-5	460-114141-16	460-114141-17	460-114141-18	460-114275-1	460-114275-3	460-114275-5	460-114275-4	460-115886-11	460-115886-12	460-115886-13	460-114141-34
Sample Name	CFMW-008a-SO-0.5-2	CFMW-008a-SO-10-12	CFMW-DUP14-SO	CFMW-010-SO-0-0.5	CFMW-010-SO-0.5-2.0	CFMW-010-SO-10-12	CFMW-012A-SO-0-0.5	CFMW-012A-SO-0.5-2	CFMW-DUP3-SO	CFMW-012A-SO-10-12	CFMW-016a-SO-0-0.5	CFMW-016a-SO-0.5-2	CFMW-016a-SO-10-12	CFMW-018-SO-0-0.5
Sample Depth	0.5-2 ft	10-12 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft
Chemical	6/13/2016	6/13/2016	6/13/2016	5/18/2016	5/18/2016	5/18/2016	5/20/2016	5/20/2016	5/20/2016	5/20/2016	6/21/2016	6/21/2016	6/21/2016	5/19/2016
Methyl Acetate	0.017 J+	0.001 U	0.00079 U	--	0.00085 U	0.00039 U	--	0.0013 U	0.00094 U	0.0013 U	--	0.00081 U	0.00073 U	--
Methyl Ethyl Ketone (2-Butanone)	0.012	0.0023 J	0.0017 J	--	0.00073 U	0.00033 U	--	0.0011 U	0.0008 U	0.0011 U	--	0.0017 J	0.0047	--
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	0.0022 U	0.0025 U	0.002 U	--	0.0021 U	0.00096 U	--	0.0032 U	0.0023 U	0.0032 UJ	--	0.002 U	0.0018 U	--
Methylcyclohexane	0.00062 J+	0.00056 U	0.00044 U	--	0.00047 U	0.00022 U	--	0.00073 U	0.00052 U	0.00072 UJ	--	0.00045 U	0.0004 U	--
Methylene Chloride	0.00032 U	0.00036 U	0.00028 U	--	0.0003 U	0.00014 U	--	0.00047 U	0.00033 U	0.00046 U	--	0.00029 U	0.00026 U	--
O-Xylene (1,2-Dimethylbenzene)	0.0016	0.00018 U	0.00014 U	--	0.00015 U	0.000069 U	--	0.00023 U	0.00017 U	0.00023 UJ	--	0.00014 U	0.0009	--
Styrene	0.00015 U	0.00017 U	0.00013 U	--	0.00014 U	0.000065 U	--	0.00022 U	0.00016 U	0.00021 UJ	--	0.00013 U	0.00012 U	--
Tert-Butyl Methyl Ether	0.00017 U	0.00019 U	0.00015 U	--	0.00016 U	0.000074 U	--	0.00025 U	0.00018 U	0.00024 UJ	--	0.00015 U	0.00014 U	--
Tetrachloroethylene (PCE)	0.00034 J	0.00032 U	0.00025 U	--	0.00027 U	0.00012 U	--	0.00041 U	0.00029 U	0.0004 U	--	0.00025 U	0.00023 U	--
Toluene	0.012	0.00022 J	0.00019 J	--	0.00018 U	0.000082 U	--	0.00032 J	0.0002 J	0.00027 UJ	--	0.00044 J	0.0013	--
Trans-1,2-Dichloroethene	0.00038 U	0.00044 U	0.00034 U	--	0.00037 U	0.00017 U	--	0.00057 U	0.00041 U	0.00056 UJ	--	0.00035 U	0.00031 U	--
Trans-1,3-Dichloropropene	0.000099 U	0.00011 U	0.000088 U	--	0.000095 U	0.000043 U	--	0.00015 U	0.0001 U	0.00014 UJ	--	0.00009 U	0.000081 U	--
Trichloroethylene (TCE)	0.00026 U	0.00029 U	0.00023 U	--	0.00025 U	0.00011 U	--	0.00038 U	0.00027 U	0.00037 UJ	--	0.00023 U	0.00021 U	--
Trichlorofluoromethane	0.00034 U	0.00038 U	0.0003 U	--	0.00032 U	0.00015 U	--	0.0005 U	0.00035 U	0.00049 U	--	0.0003 U	0.00027 U	--
Vinyl Chloride	0.00038 U	0.00044 U	0.00034 U	--	0.00037 U	0.00017 U	--	0.00057 U	0.00041 U	0.00056 UJ	--	0.00035 U	0.00031 U	--

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-9
Summary of Data Used in Risk Assessment
Central Landfills Area (soil 0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-018	CFMW-018	CFMW-018-DUP	CFMW-019A	CFMW-019A	CFMW-019A-DUP	CFMW-019A	CFMW-022	CFMW-022	CFMW-022-DUP	CFMW-022	CFMW-023A	CFMW-023A	CFMW-023A
Sample Lab IDs	460-114141-35	460-114141-36	460-114141-37	460-114456-49	460-114456-50	460-114456-52	460-114456-51	460-114828-29	460-114828-28	460-114828-30	460-114828-27	460-115731-9	460-115731-10	460-115731-11
Sample Name	CFMW-018-SO-0.5-2.0	CFMW-018-SO-10-12	CFMW-DUP2-SO	CFMW-019a-SO-0-0.5	CFMW-019a-SO-0.5-2	CFMW-DUP5-SO	CFMW-019a-SO-10-12	CFMW-022-SO-0-0.5	CFMW-022-SO-0.5-2	CFMW-DUP12-SO	CFMW-022-SO-10-12	CFMW-023a-SO-0-0.5	CFMW-023a-SO-0.5-2	CFMW-023a-SO-10-12
Sample Depth	0.5-2 ft	10-12 ft	10-12 ft	0-0.5 ft	0.5-2 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft
Chemical	5/19/2016	5/19/2016	5/19/2016	5/25/2016	5/25/2016	5/25/2016	5/25/2016	6/2/2016	6/2/2016	6/2/2016	6/2/2016	6/17/2016	6/17/2016	6/17/2016
GENERAL CHEMISTRY (mg/kg)														
Fluoride	7.71 J-	4.07 J-	4.03 J-	37 J-	62.2 J-	44.2 J-	1.3 J-	17.5 J	9.45 J	10.1 J	63.3 J	109 J-	58.5	3.69
Cyanide	0.018 U	0.017 U	0.016 U	0.063 J	0.024 J	0.018 U	0.015 U	0.29	0.045 J	0.079 J	0.42	0.057 J	0.02 J	0.016 U
METALS (mg/kg)														
"Chromium, Hexavalent - Estimated"	0.251582	0.219465	0.235523	0.219465	0.254258	0.232847	0.20073	0.26764	0.259611	0.219465	0.248905	0.232847	0.414842	0.26764
"Chromium, Trivalent - Calculated"	--	--	--	--	--	--	--	--	--	--	--	--	--	--
"Chromium, Trivalent - Estimated"	9.14842	7.98054	8.56448	7.98054	9.24574	8.46715	7.29927	9.73236	9.44039	7.98054	9.05109	8.46715	15.0852	9.73236
Aluminum	9270 J	6030 J	7290 J	9620	18100	15000	7510	10600	9380	7860	11000 J	20200	16100	9810
Antimony	0.35 UJ	0.34 UJ	0.31 UJ	0.37 UJ	0.36 UJ	0.39 UJ	0.34 UJ	0.4 UJ	0.39 UJ	0.42 UJ	0.46 UJ	0.42 UJ	0.47 UJ	0.43 UJ
Arsenic	10.2 J	4.7 J	4.5 J	3.9	4.3	3.8	4.1	4.8	7.8	4.2 J	3.4 J	6.1	8.4	5.3
Barium	49.9	48	46.4	91.7	164	139	62.2	68.8	54.1	69.6	75.5 J	166	111	133
Beryllium	0.4	0.3 J	0.32	0.36	0.55	0.62	0.33	0.33 J	0.29 J	0.27 J	0.45	0.55	0.6	0.34 J
Cadmium	0.27 U	0.26 U	0.24 U	0.28 U	0.27 U	0.29 U	0.26 U	0.3 U	0.29 U	0.32 U	0.35 U	0.32 U	0.36 U	0.32 U
Calcium	67000	35100	32300	11200	2280	1820	53300	35000	95300	29500 J	16500	4540 J	2160 J	60200 J
Chromium, Total	9.4	8.2	8.8	8.2	9.5	8.7	7.5	10	9.7	8.2	9.3 J	8.7	15.5	10
Cobalt	4.7	4.5	5.4	3.9	5.8	4.5	4.2	4.7	5.1	4.9	4.8	6 J+	6.9 J+	5.7 J+
Copper	11.6 J	9.5 J	11.1 J	13.1 J	11 J+	11.1 J	8.5 J	12.3	15.2	12.1	19.4	8 J	11.9 J	9.7 J
Iron	14700	12700	13800	11000	15100	13400	11700	15300	12600	12900	13700 J	12800	18100	13100
Lead	9.8	6	6	11.9 J	10.3	8.5 J	5.4 J	9.1	9.1	5.9	8.9 J	13.4	13.6	8.7
Magnesium	18800	10400	11400	7480	8850	8380	12300	10600	12300	11000	11700	8920	12400	16100
Manganese	436 J	362 J	352 J	368	350	297	324	368	337	378	334 J	444	442	360
Mercury	0.031	0.011 J	0.011 U	0.024	0.014 U	0.013 U	0.011 U	0.018	0.031 J+	0.028	0.022	0.014 U	0.04	0.026
Nickel	11.8	9	10.4	9.1	10.3	9.1	8.4	11.7	10.1	10.1	10.4	89 J-	12 J-	9.4 J-
Potassium	861	455	507	847	1200 J+	1200	658	593	727	657	776	1010	1380	763
Selenium	0.33 U	0.32 U	0.29 U	0.34 U	0.34 U	0.36 U	0.32 U	0.37 U	0.36 U	0.39 U	0.43 U	0.39 U	0.44 U	0.4 U
Silver	0.64 U	0.63 U	0.57 U	0.67 U	0.66 U	0.71 U	0.62 U	0.73 U	0.71 U	0.77 U	0.85 U	0.77 U	0.87 U	0.78 U
Sodium	32.8 U	32.1 U	29.3 U	34.2 U	94.3	77.5 J	56.1 J	37.1 U	36.2 U	39.4 U	95 J	72.6 J	44.2 U	57.6 J
Thallium	0.13 U	0.13 U	0.12 U	0.14 U	0.14 J	0.15 U	0.13 U	0.15 U	0.15 U	0.16 U	0.17 U	0.16 U	0.18 U	0.16 U
Vanadium	8.7	6.9	7.4	8.6	14.6	12.6	6.6	10.7	7.2	6.4	9.1 J	21.7	15.4	5.9
Zinc	37.8	30.9	35	34.6	39.6	37.9	31.6	39	30.4	32.6	38 J	54.5	45.7	35.5
METALS|HEXAVALENT CHROMIUM (mg/kg)														
Chromium, Hexavalent	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PESTICIDES (mg/kg)														
Aldrin	--	--	--	0.0009 U	--	--	--	0.00092 U	--	--	--	0.00095 U	--	--
Alpha Bhc (Alpha Hexachlorocyclohexane)	--	--	--	0.00068 U	--	--	--	0.0007 U	--	--	--	0.00072 U	--	--
Alpha Endosulfan	--	--	--	0.001 U	--	--	--	0.0011 U	--	--	--	0.0011 U	--	--
Beta Bhc (Beta Hexachlorocyclohexane)	--	--	--	0.00072 U	--	--	--	0.00074 U	--	--	--	0.00077 U	--	--
Beta Endosulfan	--	--	--	0.0012 U	--	--	--	0.0012 U	--	--	--	0.0012 U	--	--
cis-Chlordane	--	--	--	0.0012 U	--	--	--	0.0012 U	--	--	--	0.0013 U	--	--
Delta BHC (Delta Hexachlorocyclohexane)	--	--	--	0.00081 U	--	--	--	0.00083 U	--	--	--	0.00086 U	--	--
Dieldrin	--	--	--	0.00097 U	--	--	--	0.00099 U	--	--	--	--	--	--
Endosulfan Sulfate	--	--	--	0.00087 U	--	--	--	0.00089 U	--	--	--	0.00092 U	--	--
Endrin	--	--	--	0.00094 U	--	--	--	0.00097 U	--	--	--	0.001 U	--	--
Endrin Aldehyde	--	--	--	0.00092 U	--	--	--	0.00095 U	--	--	--	0.00098 U	--	--
Endrin Ketone	--	--	--	0.001 U	--	--	--	0.0011 U	--	--	--	0.0011 U	--	--
Gamma Bhc (Lindane)	--	--	--	0.00067 U	--	--	--	0.00068 U	--	--	--	0.00071 U	--	--
Heptachlor	--	--	--	0.00096 U	--	--	--	0.00098 U	--	--	--	0.001 U	--	--
Heptachlor Epoxide	--	--	--	0.0015 U	--	--	--	0.0015 U	--	--	--	0.0015 U	--	--
Methoxychlor	--	--	--	0.0016 U	--	--	--	0.0016 U	--	--	--	0.0017 U	--	--
P,P'-DDD	--	--	--	0.00098 U	--	--	--	0.001 U	--	--	--	0.001 U	--	--
P,P'-DDE	--	--	--	0.0011 U	--	--	--	0.0011 U	--	--	--	0.0011 U	--	--
P,P'-DDT	--	--	--	0.00077 U	--	--	--	0.00079 U	--	--	--	0.00081 U	--	--
Toxaphene	--	--	--	0.022 U	--	--	--	0.022 U	--	--	--	0.023 U	--	--
trans-Chlordane	--	--	--	0.0016 U	--	--	--	0.0017 U	--	--	--	0.0017 U	--	--
POLYCHLORINATED BIPHENYLS (mg/kg)														
PCB-1016 (Aroclor 1016)	0.01 U	0.0093 U	0.0093 U	0.0099 U	0.011 U	0.01 U	0.0093 U	0.01 U	0.0094 U	0.0094 U	0.01 U	0.01 U	0.01 U	0.0097 U
PCB-1221 (Aroclor 1221)	0.01 U	0.0093 U	0.0093 U	0.0099 U	0.011 U	0.01 U	0.0093 U	0.01 U	0.0094 U	0.0094 U	0.01 U	0.01 U	0.01 U	0.0097 U

Table E-9
Summary of Data Used in Risk Assessment
Central Landfills Area (soil 0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-018	CFMW-018	CFMW-018-DUP	CFMW-019A	CFMW-019A	CFMW-019A-DUP	CFMW-019A	CFMW-022	CFMW-022	CFMW-022-DUP	CFMW-022	CFMW-023A	CFMW-023A	CFMW-023A
Sample Lab IDs	460-114141-35	460-114141-36	460-114141-37	460-114456-49	460-114456-50	460-114456-52	460-114456-51	460-114828-29	460-114828-28	460-114828-30	460-114828-27	460-115731-9	460-115731-10	460-115731-11
Sample Name	CFMW-018-SO-0.5-2.0	CFMW-018-SO-10-12	CFMW-DUP2-SO	CFMW-019a-SO-0-0.5	CFMW-019a-SO-0.5-2	CFMW-DUP5-SO	CFMW-019a-SO-10-12	CFMW-022-SO-0-0.5	CFMW-022-SO-0.5-2	CFMW-DUP12-SO	CFMW-022-SO-10-12	CFMW-023a-SO-0-0.5	CFMW-023a-SO-0.5-2	CFMW-023a-SO-10-12
Sample Depth	0.5-2 ft	10-12 ft	10-12 ft	0-0.5 ft	0.5-2 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft
Chemical	5/19/2016	5/19/2016	5/19/2016	5/25/2016	5/25/2016	5/25/2016	5/25/2016	6/2/2016	6/2/2016	6/2/2016	6/2/2016	6/17/2016	6/17/2016	6/17/2016
PCB-1232 (Aroclor 1232)	0.01 U	0.0093 U	0.0093 U	0.0099 U	0.011 U	0.01 U	0.0093 U	0.01 U	0.0094 U	0.0094 U	0.01 U	0.01 U	0.01 U	0.0097 U
PCB-1242 (Aroclor 1242)	0.01 U	0.0093 U	0.0093 U	0.0099 U	0.011 U	0.01 U	0.0093 U	0.01 U	0.0094 U	0.0094 U	0.01 U	0.01 U	0.01 U	0.0097 U
PCB-1248 (Aroclor 1248)	0.01 U	0.0093 U	0.0093 U	0.0099 U	0.011 U	0.01 U	0.0093 U	0.01 U	0.0094 U	0.0094 U	0.01 U	0.01 U	0.01 U	0.0097 U
PCB-1254 (Aroclor 1254)	0.01 U	0.0096 U	0.0096 U	0.01 U	0.011 U	0.011 U	0.0096 U	0.01 U	0.0097 U	0.0097 U	0.011 U	0.011 U	0.011 U	0.01 U
PCB-1260 (Aroclor 1260)	0.01 U	0.0096 U	0.0096 U	0.01 U	0.011 U	0.011 U	0.0096 U	0.01 U	0.0097 U	0.0097 U	0.011 U	0.011 U	0.011 U	0.01 U
PCB-1262 (Aroclor 1262)	0.01 U	0.0096 U	0.0096 U	0.01 U	0.011 U	0.011 U	0.0096 U	0.01 U	0.0097 U	0.0097 U	0.011 U	0.011 U	0.011 U	0.01 U
PCB-1268 (Aroclor 1268)	0.01 U	0.0096 U	0.0096 U	0.01 U	0.011 U	0.011 U	0.0096 U	0.01 U	0.0097 U	0.0097 U	0.011 U	0.011 U	0.011 U	0.01 U
Polychlorinated Biphenyl (PCBs)	0.01 U	0.0096 U	0.0096 U	0.01 U	0.011 U	0.011 U	0.0096 U	0.01 U	0.0097 U	0.0097 U	0.011 U	0.011 U	0.011 U	0.01 U
SEMIVOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,2,4,5-Tetrachlorobenzene	0.028 U	0.026 U	0.026 U	0.027 U	0.029 U	0.029 U	0.026 U	0.028 U	0.026 U	0.026 U	0.028 UJ	0.029 U	0.028 U	0.027 U
1,4-Dioxane (P-Dioxane)	0.1 U	0.092 U	0.092 U	0.098 U	0.1 U	0.1 U	0.092 U	0.1 U	0.093 U	0.093 U	0.1 U	0.1 U	0.1 U	0.096 U
2,3,4,6-Tetrachlorophenol	0.035 U	0.032 U	0.032 U	0.035 U	0.037 UJ	0.036 U	0.032 UJ	0.035 U	0.033 U	0.033 U	0.036 UJ	0.037 U	0.036 U	0.034 U
2,4,5-Trichlorophenol	0.037 U	0.034 U	0.034 U	0.037 U	0.039 UJ	0.038 U	0.034 U	0.037 U	0.035 U	0.035 U	0.038 UJ	0.039 U	0.038 U	0.036 U
2,4,6-Trichlorophenol	0.011 U	0.0098 U	0.0098 U	0.01 U	0.011 UJ	0.011 U	0.0098 U	0.011 U	0.0099 U	0.0099 U	0.011 UJ	0.011 U	0.011 U	0.01 U
2,4-Dichlorophenol	0.0088 U	0.0081 U	0.0081 U	0.0087 U	0.0092 UJ	0.0091 U	0.0081 U	0.0089 U	0.0082 U	0.0082 U	0.009 UJ	0.0092 U	0.009 U	0.0085 U
2,4-Dimethylphenol	0.082 U	0.076 U	0.076 U	0.081 U	0.086 UJ	0.085 U	0.076 U	0.083 U	0.077 U	0.077 U	0.084 U	0.086 U	0.084 U	0.079 U
2,4-Dinitrophenol	0.28 U	0.26 U	0.26 U	0.28 U	0.3 UJ	0.29 U	0.26 UR	0.28 U	0.26 U	0.26 U	0.29 UR	0.29 U	0.29 U	0.27 U
2,4-Dinitrotoluene	0.015 U	0.014 U	0.014 U	0.015 U	0.015 U	0.015 U	0.014 U	0.015 U	0.014 U	0.014 U	0.015 U	0.015 U	0.015 U	0.014 U
2,6-Dinitrotoluene	0.02 U	0.018 U	0.018 U	0.02 U	0.021 U	0.021 U	0.018 U	0.02 U	0.019 U	0.019 U	0.02 U	0.021 U	0.02 U	0.019 U
2-Chloronaphthalene	0.0085 U	0.0078 U	0.0078 U	0.0083 U	0.0089 U	0.0088 U	0.0078 U	0.0085 U	0.0079 U	0.0079 U	0.0087 U	0.0088 U	0.0086 U	0.0082 U
2-Chlorophenol	0.0095 U	0.0088 U	0.0088 U	0.0093 U	0.0099 UJ	0.0098 U	0.0088 U	0.0096 U	0.0089 U	0.0089 U	0.0097 U	0.0099 U	0.0097 U	0.0092 U
2-Methylnaphthalene	0.0083 U	0.0076 U	0.0076 U	0.0084 J	0.0086 U	0.0085 U	0.0076 U	0.0083 U	0.0077 U	0.0077 U	0.0085 U	0.048 J	0.0084 U	0.008 U
2-Methylphenol (O-Cresol)	0.016 U	0.015 U	0.015 U	0.016 U	0.017 U	0.017 U	0.015 U	0.016 U	0.015 U	0.015 U	0.017 U	0.017 U	0.017 U	0.016 U
2-Nitroaniline	0.012 U	0.011 U	0.011 U	0.012 U	0.013 U	0.013 U	0.011 U	0.012 U	0.012 U	0.011 U	0.013 U	0.013 U	0.013 U	0.012 U
2-Nitrophenol	0.013 U	0.012 U	0.012 U	0.012 U	0.013 UJ	0.013 U	0.012 U	0.013 U	0.012 U	0.012 U	0.013 UJ	0.013 U	0.013 U	0.012 U
3- And 4- Methylphenol (Total)	0.01 U	0.0092 U	0.0092 U	0.0098 U	0.01 U	0.01 U	0.0092 U	0.01 U	0.0093 U	0.0093 U	0.01 U	0.01 U	0.01 U	0.0096 U
3,3'-Dichlorobenzidine	0.042 U	0.039 U	0.039 U	0.041 U	0.044 U	0.043 U	0.039 U	0.042 U	0.039 U	0.039 U	0.043 U	0.043 U	0.042 U	0.04 U
3-Nitroaniline	0.011 U	0.01 U	0.01 U	0.011 U	0.012 U	0.011 U	0.01 U	0.011 U	0.01 U	0.01 U	0.011 U	0.012 U	0.011 U	0.011 U
4,6-Dinitro-2-Methylphenol	0.1 U	0.092 U	0.092 U	0.098 U	0.1 UJ	0.1 U	0.092 UJ	0.1 U	0.093 U	0.093 U	0.1 UJ	0.1 U	0.1 U	0.096 U
4-Bromophenyl Phenyl Ether	0.012 U	0.011 U	0.011 U	0.012 U	0.012 U	0.012 U	0.011 U	0.012 U	0.011 U	0.011 U	0.012 UJ	0.012 U	0.012 U	0.011 U
4-Chloro-3-Methylphenol	0.016 U	0.015 U	0.015 U	0.016 U	0.017 U	0.017 U	0.015 U	0.016 U	0.015 U	0.015 U	0.016 U	0.017 U	0.016 U	0.015 U
4-Chloroaniline	0.0096 U	0.0089 U	0.0089 U	0.0094 U	0.01 U	0.0099 U	0.0089 U	0.0097 U	0.009 U	0.009 U	0.0098 U	0.01 U	0.0098 U	0.0093 U
4-Chlorophenyl Phenyl Ether	0.011 U	0.01 U	0.01 U	0.011 U	0.012 U	0.012 U	0.01 U	0.011 U	0.01 U	0.01 U	0.011 U	0.012 U	0.011 U	0.011 U
4-Nitroaniline	0.014 U	0.013 U	0.013 U	0.014 U	0.015 U	0.015 U	0.013 U	0.014 U	0.013 U	0.013 U	0.014 U	0.015 U	0.014 U	0.014 U
4-Nitrophenol	0.18 U	0.17 U	0.17 U	0.18 U	0.19 U	0.19 U	0.17 U	0.18 U	0.17 U	0.17 U	0.18 U	0.19 U	0.18 U	0.17 U
Acenaphthene	0.0091 U	0.0083 U	0.0084 U	0.058 J	0.0095 U	0.023 J	0.0084 U	0.0091 U	0.0084 U	0.0084 U	0.011 J	0.061 J	0.0092 U	0.0087 U
Acenaphthylene	0.0096 U	0.0089 U	0.0089 U	0.0094 U	0.01 U	0.0099 U	0.0089 U	0.0097 U	0.009 U	0.009 U	0.0098 U	0.01 U	0.0098 U	0.0093 U
Acetophenone	0.0082 U	0.0075 U	0.0075 U	0.008 U	0.0085 U	0.0084 U	0.0075 U	0.0082 U	0.0076 U	0.0076 U	0.0083 U	0.0085 U	0.0083 U	0.0079 U
Anthracene	0.036 U	0.033 U	0.033 U	0.093 J	0.037 U	0.037 U	0.033 U	0.036 U	0.033 U	0.033 U	0.036 U	0.072 J	0.036 U	0.034 U
Atrazine	0.017 U	0.015 U	0.015 U	0.016 U	0.017 U	0.017 U	0.015 U	0.017 U	0.016 U	0.016 U	0.017 U	0.017 U	0.017 U	0.016 U
Benzaldehyde	0.029 U	0.026 U	0.026 U	0.028 U	0.03 UJ	0.029 U	0.026 U	0.029 U	0.027 U	0.027 U	0.029 U	0.03 U	0.029 U	0.027 U
Benzo(A)Anthracene	0.038	0.029 U	0.029 U	0.34	0.048	0.13	0.029 U	0.069	0.097 J	0.029 UJ	0.13	0.26	0.032 U	0.03 U
Benzo(A)Pyrene	0.046	0.01 U	0.01 U	0.43	0.049	0.17	0.01 U	0.077	0.011 U	0.011 U	0.12	0.33	0.011 U	0.011 U
Benzo(B)Fluoranthene	0.069	0.013 U	0.013 U	0.62	0.073	0.23	0.013 U	0.23	0.35 J	0.014 UJ	0.32	0.55	0.015 U	0.014 U
Benzo(G,H,I)Perylene	0.045 J	0.02 U	0.02 U	0.39	0.04 J	0.13 J	0.02 U	0.086 J	0.02 U	0.02 U	0.11 J	0.33 J	0.022 U	0.021 U
Benzo(K)Fluoranthene	0.023 J	0.015 U	0.015 U	0.22	0.028 J	0.09	0.015 U	0.078	0.075 J	0.015 UJ	0.12	0.19	0.017 U	0.016 U
Benzyl Butyl Phthalate	0.012 U	0.011 U	0.011 U	0.011 U	0.028 J	0.012 U	0.011 U	0.012 U	0.011 U	0.011 U	0.012 U	0.012 U	0.012 U	0.011 U
Biphenyl (Diphenyl)	0.032 U	0.029 U	0.029 U	0.031 U	0.033 U	0.033 U	0.029 U	0.032 U	0.03 U	0.03 U	0.033 U	0.033 U	0.032 U	0.031 U
Bis(2-Chloroethoxy) Methane	0.012 U	0.011 U	0.011 U	0.011 U	0.012 U	0.012 U	0.011 U	0.012 U	0.011 U	0.011 U	0.012 U	0.012 U	0.012 U	0.011 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.0088 U	0.0081 U	0.0081 U	0.0087 U	0.0092 U	0.0091 U	0.0081 U	0.0089 U	0.0082 U	0.0082 U	0.009 U	0.0092 U	0.009 U	0.0085 U
Bis(2-Chloroisopropyl) Ether	0.015 U	0.014 U	0.014 U	0.015 U	0.016 U	0.016 U	0.014 U	0.015 U	0.014 U	0.014 U	0.016 U	0.016 U	0.016 U	0.015 U
Bis(2-Ethylhexyl) Phthalate	0.015 U	0.013 U	0.013 U	0.014 U	0.015 U	0.015 U	0.013 U	0.015 U	0.014 U	0.014 U	0.061 J	0.015 U	0.015 U	0.014 U
Caprolactam	0.027 U	0.025 U	0.025 U	0.026 U	0.028 UJ	0.028 U	0.025 U	0.027 U	0.025 U	0.025 U	0.028 UJ	0.028 U	0.027 U	0.026 U
Carbazole	0.0093 U	0.0086 U	0.0086 U	0.063 J	0.0097 U	0.021 J	0.0086 U	0.0093 U	0.0087 U	0.0086 U	0.016 J	0.058 J	0.0094 U	0.0089 U
Chrysene	0.048 J	0.0094 U	0.0094 U	0.46	0.053 J	0.19 J	0.0094 U	0.14 J	0.19 J	0.0095 UJ	0.18 J	0.41	0.01 U	0.0098 U
Dibenz(A,H)Anthracene	0.019 U	0.018 U	0.018 U	0.1	0.02 U	0.039 J+	0.018 U	0.025 J	0.018 U	0.018 U	0.036 J	0.02 U	0.02 U	0.019 U
Dibenzofuran	0.011 U	0.01 U	0.01 U	0.027 J	0.012 U	0.012 U	0.01 U	0.011 U	0.011 U	0.011 U	0.012 U	0.021 J	0.011 U	0.011 U

Table E-9
Summary of Data Used in Risk Assessment
Central Landfills Area (soil 0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-018	CFMW-018	CFMW-018-DUP	CFMW-019A	CFMW-019A	CFMW-019A-DUP	CFMW-019A	CFMW-022	CFMW-022	CFMW-022-DUP	CFMW-022	CFMW-023A	CFMW-023A	CFMW-023A
Sample Lab IDs	460-114141-35	460-114141-36	460-114141-37	460-114456-49	460-114456-50	460-114456-52	460-114456-51	460-114828-29	460-114828-28	460-114828-30	460-114828-27	460-115731-9	460-115731-10	460-115731-11
Sample Name	CFMW-018-SO-0.5-2.0	CFMW-018-SO-10-12	CFMW-DUP2-SO	CFMW-019a-SO-0-0.5	CFMW-019a-SO-0.5-2	CFMW-DUP5-SO	CFMW-019a-SO-10-12	CFMW-022-SO-0-0.5	CFMW-022-SO-0.5-2	CFMW-DUP12-SO	CFMW-022-SO-10-12	CFMW-023a-SO-0-0.5	CFMW-023a-SO-0.5-2	CFMW-023a-SO-10-12
Sample Depth	0.5-2 ft	10-12 ft	10-12 ft	0-0.5 ft	0.5-2 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft
Chemical	5/19/2016	5/19/2016	5/19/2016	5/25/2016	5/25/2016	5/25/2016	5/25/2016	6/2/2016	6/2/2016	6/2/2016	6/2/2016	6/17/2016	6/17/2016	6/17/2016
Diethyl Phthalate	0.011 U	0.0098 U	0.0098 U	0.01 U	0.011 U	0.011 U	0.0098 U	0.011 U	0.0099 U	0.0099 U	0.011 U	0.011 U	0.011 U	0.01 U
Dimethyl Phthalate	0.011 U	0.01 U	0.01 U	0.011 U	0.011 U	0.011 U	0.01 U	0.011 U	0.01 U	0.01 U	0.011 U	0.011 U	0.011 U	0.01 U
Di-N-Butyl Phthalate	0.011 U	0.01 U	0.01 U	0.011 U	0.012 U	0.012 U	0.01 U	0.011 U	0.01 U	0.01 U	0.011 U	0.052 J	0.038 J	0.011 U
Di-N-Octylphthalate	0.019 U	0.018 U	0.018 U	0.019 U	0.02 U	0.02 U	0.018 U	0.019 U	0.018 U	0.018 U	0.019 U	0.02 U	0.019 U	0.018 U
Fluoranthene	0.047 J	0.01 U	0.01 U	0.66	0.071 J	0.25 J	0.01 U	0.12 J	0.13 J	0.01 UJ	0.23 J	0.52	0.011 U	0.011 U
Fluorene	0.0082 U	0.0075 U	0.0075 U	0.046 J	0.0085 U	0.018 J	0.0075 U	0.0082 U	0.0076 U	0.0076 U	0.0084 J	0.035 J	0.0083 U	0.0079 U
Hexachlorobenzene	0.015 U	0.014 U	0.014 U	0.015 U	0.016 U	0.016 U	0.014 U	0.015 U	0.014 U	0.014 U	0.016 UJ	0.016 U	0.015 U	0.015 U
Hexachlorobutadiene	0.011 U	0.0097 U	0.0097 U	0.01 U	0.011 U	0.011 U	0.0097 U	0.011 U	0.0098 U	0.0098 U	0.011 U	0.011 U	0.011 U	0.01 U
Hexachlorocyclopentadiene	0.023 U	0.022 U	0.022 U	0.023 U	0.024 UJ	0.024 UJ	0.022 U	0.023 U	0.022 U	0.022 U	0.024 U	0.024 U	0.024 U	0.022 U
Hexachloroethane	0.014 U	0.013 U	0.013 U	0.013 U	0.014 U	0.014 U	0.013 U	0.014 U	0.013 U	0.013 U	0.014 U	0.014 U	0.014 U	0.013 U
Indeno(1,2,3-C,D)Pyrene	0.038 J+	0.023 U	0.023 U	0.42	0.045 J+	0.14 J+	0.023 U	0.088	0.023 U	0.023 U	0.12	0.34	0.025 U	0.024 U
Isophorone	0.008 U	0.0074 U	0.0074 U	0.0079 U	0.0084 U	0.0083 U	0.0074 U	0.0081 U	0.0075 U	0.0075 U	0.0082 U	0.0084 U	0.0082 U	0.0077 U
Naphthalene	0.0095 U	0.0088 U	0.0088 U	0.016 J	0.0099 U	0.01 J	0.0088 U	0.0096 U	0.0089 U	0.0089 U	0.0097 U	0.015 J	0.0097 U	0.0092 U
Nitrobenzene	0.012 U	0.011 U	0.011 U	0.012 U	0.012 U	0.012 U	0.011 U	0.012 U	0.011 U	0.011 U	0.012 U	0.012 U	0.012 U	0.011 U
N-Nitrosodi-N-Propylamine	0.013 U	0.012 U	0.012 U	0.012 U	0.013 U	0.013 U	0.012 U	0.013 U	0.012 U	0.012 U	0.013 U	0.013 U	0.013 U	0.012 U
N-Nitrosodiphenylamine	0.034 U	0.031 U	0.031 U	0.033 U	0.035 UJ	0.035 U	0.031 U	0.034 U	0.032 U	0.032 U	0.035 UJ	0.035 UJ	0.034 UJ	0.033 UJ
Pentachlorophenol	0.045 U	0.042 U	0.042 U	0.044 U	0.047 UJ	0.047 U	0.042 UJ	0.046 U	0.042 U	0.042 U	0.046 UJ	0.047 U	0.046 U	0.044 U
Phenanthrene	0.027 J	0.0092 U	0.0092 U	0.46	0.05 J	0.16 J	0.0092 U	0.047 J	0.0093 U	0.0093 U	0.1 J	0.36 J	0.01 U	0.0096 U
Phenol	0.012 U	0.011 U	0.011 U	0.012 U	0.013 U	0.013 U	0.011 U	0.012 U	0.011 U	0.011 U	0.013 U	0.013 U	0.012 U	0.012 U
Pyrene	0.063 J	0.016 U	0.016 U	0.6	0.071 J	0.24 J	0.016 U	0.1 J	0.12 J	0.016 UJ	0.2 J	0.56	0.017 U	0.016 U
VOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,1,1-Trichloroethane	0.00042 U	0.00034 U	0.00037 U	--	0.00036 U	0.00034 U	0.00039 U	--	0.00032 U	0.00034 U	0.00029 U	--	0.0003 U	0.00036 U
1,1,2,2-Tetrachloroethane	0.00019 U	0.00015 U	0.00016 U	--	0.00016 U	0.00015 U	0.00017 U	--	0.00014 U	0.00015 U	0.00013 U	--	0.00014 U	0.00016 U
1,1,2-Trichloro-1,2,2-Trifluoroethane	0.00048 U	0.00039 U	0.00043 U	--	0.00042 U	0.0004 U	0.00045 U	--	0.00037 U	0.00039 U	0.00034 U	--	0.00035 U	0.00041 U
1,1,2-Trichloroethane	0.00031 U	0.00025 U	0.00027 U	--	0.00027 U	0.00025 U	0.00029 U	--	0.00024 U	0.00025 U	0.00021 U	--	0.00022 U	0.00026 U
1,1-Dichloroethane	0.00037 U	0.0003 U	0.00033 U	--	0.00033 U	0.00031 U	0.00035 U	--	0.00029 U	0.0003 U	0.00026 U	--	0.00027 U	0.00032 U
1,1-Dichloroethene	0.00045 U	0.00036 U	0.0004 U	--	0.00039 U	0.00037 U	0.00042 U	--	0.00034 U	0.00036 U	0.00031 U	--	0.00033 U	0.00039 U
1,2,3-Trichlorobenzene	0.00012 U	0.000097 U	0.00011 U	--	0.00011 U	0.000099 U	0.00011 U	--	0.000093 U	0.000097 U	0.000084 UJ	--	0.000088 U	0.0001 U
1,2,4-Trichlorobenzene	0.00035 U	0.00028 U	0.00031 U	--	0.00031 U	0.00029 U	0.00033 U	--	0.00027 U	0.00028 U	0.00025 UJ	--	0.00025 U	0.0003 U
1,2-Dibromo-3-Chloropropane	0.00052 U	0.00041 U	0.00045 U	--	0.00045 U	0.00042 U	0.00048 U	--	0.0004 U	0.00042 U	0.00036 U	--	0.00037 U	0.00044 U
1,2-Dibromoethane (Ethylene Dibromide)	0.00013 U	0.00011 U	0.00012 U	--	0.00011 U	0.00011 U	0.00012 U	--	0.0001 U	0.00011 U	0.000092 U	--	0.000096 U	0.00011 U
1,2-Dichlorobenzene	0.00015 U	0.00012 U	0.00014 U	--	0.00013 U	0.00013 U	0.00014 U	--	0.00012 U	0.00012 U	0.00011 UJ	--	0.00011 U	0.00013 U
1,2-Dichloroethane	0.00012 U	0.000097 U	0.00011 U	--	0.00011 U	0.000099 U	0.00011 U	--	0.000093 U	0.000097 U	0.000084 U	--	0.000088 U	0.0001 U
1,2-Dichloropropane	0.00019 U	0.00015 U	0.00016 U	--	0.00016 U	0.00015 U	0.00017 U	--	0.00014 U	0.00015 U	0.00013 U	--	0.00014 U	0.00016 U
1,3-Dichlorobenzene	0.00013 U	0.00011 U	0.00012 U	--	0.00011 U	0.00011 U	0.00012 U	--	0.0001 U	0.00011 U	0.000092 UJ	--	0.000096 U	0.00011 U
1,4-Dichlorobenzene	0.00014 U	0.00011 U	0.00013 U	--	0.00012 U	0.00012 U	0.00013 U	--	0.00011 U	0.00012 U	0.0001 UJ	--	0.0001 U	0.00012 U
2-Hexanone	0.001 U	0.00083 U	0.00091 U	--	0.0009 U	0.00085 U	0.00097 U	--	0.00079 U	0.00083 U	0.00072 U	--	0.00075 U	0.00088 U
Acetone	0.0088	0.0026 J	0.0059 J	--	0.001 UJ	0.049 J	0.0011 U	--	0.02	0.022	0.00081 U	--	0.024 J+	0.049 J+
Benzene	0.00022 U	0.00025 J	0.00019 U	--	0.00023 J	0.0009 J	0.00021 U	--	0.00017 U	0.00018 U	0.00015 U	--	0.00016 U	0.00019 U
Bromochloromethane	0.00019 U	0.00015 U	0.00016 U	--	0.00016 U	0.00015 U	0.00017 U	--	0.00014 U	0.00015 U	0.00013 U	--	0.00014 U	0.00016 U
Bromodichloromethane	0.00042 U	0.00034 U	0.00037 U	--	0.00036 U	0.00034 U	0.00039 U	--	0.00032 U	0.00034 U	0.00029 U	--	0.0003 U	0.00036 U
Bromoform	0.00014 U	0.00011 U	0.00013 U	--	0.00012 U	0.00012 U	0.00013 U	--	0.00011 U	0.00012 U	0.0001 U	--	0.0001 U	0.00012 U
Bromomethane	0.00035 U	0.00028 U	0.00031 U	--	0.00031 U	0.00029 UJ	0.00033 UJ	--	0.00027 U	0.00028 U	0.00025 U	--	0.00025 U	0.0003 U
Carbon Disulfide	0.00047 U	0.00038 U	0.00042 U	--	0.00041 U	0.00039 U	0.00044 U	--	0.0014 J	0.0024 J	0.00033 U	--	0.00034 U	0.00055 J
Carbon Tetrachloride	0.00047 U	0.00038 U	0.00042 U	--	0.00041 U	0.00039 U	0.00044 U	--	0.00036 U	0.00038 U	0.00033 U	--	0.00034 U	0.0004 U
Chlorobenzene	0.00015 U	0.00012 U	0.00014 U	--	0.00013 U	0.00013 U	0.00014 U	--	0.00012 U	0.00012 U	0.00011 U	--	0.00011 U	0.00013 U
Chloroethane	0.00039 U	0.00031 U	0.00034 U	--	0.00033 U	0.00032 UJ	0.00036 UJ	--	0.00029 U	0.00031 U	0.00027 U	--	0.00028 U	0.00033 U
Chloroform	0.00023 U	0.00019 U	0.0002 U	--	0.0002 U	0.00019 U	0.00022 U	--	0.00018 U	0.00019 U	0.00016 U	--	0.00017 U	0.0002 U
Chloromethane	0.00042 U	0.00034 U	0.00037 U	--	0.00036 U	0.00034 U	0.00039 U	--	0.00032 U	0.00034 U	0.00029 U	--	0.0003 U	0.00036 U
Cis-1,2-Dichloroethylene	0.00024 U	0.00019 U	0.00021 U	--	0.00021 U	0.0002 U	0.00023 U	--	0.00019 U	0.00019 U	0.00017 U	--	0.00018 U	0.00021 U
Cis-1,3-Dichloropropene	0.00017 U	0.00013 U	0.00015 U	--	0.00014 U	0.00014 U	0.00015 U	--	0.00013 U	0.00013 U	0.00011 U	--	0.00012 U	0.00014 U
Cyclohexane	0.00051 U	0.00041 U	0.00045 J	--	0.00044 U	0.00041 U	0.00047 U	--	0.00039 U	0.00041 U	0.00035 U	--	0.00037 U	0.00043 U
Dibromochloromethane	0.00017 U	0.00013 U	0.00015 U	--	0.00014 U	0.00014 U	0.00015 U	--	0.00013 U	0.00013 U	0.00011 U	--	0.00012 U	0.00014 U
Dichlorodifluoromethane	0.00035 U	0.00028 U	0.00031 U	--	0.00031 U	0.00029 U	0.00033 U	--	0.00027 U	0.00028 U	0.00025 U	--	0.00025 U	0.0003 U
Ethylbenzene	0.0002 U	0.00016 U	0.00017 U	--	0.00017 U	0.00016 U	0.00018 U	--	0.00015 U	0.00016 U	0.00014 U	--	0.00014 U	0.00017 U
Isopropylbenzene (Cumene)	0.00019 U	0.00015 U	0.00016 U	--	0.00016 U	0.00015 U	0.00017 U	--	0.00014 U	0.00015 U	0.00013 U	--	0.00014 U	0.00016 U
M,P-Xylene	0.00012 U	0.00054 J	0.00069 J	--	0.00011 U	0.000099 U	0.00011 U	--	0.00012 J	0.0002 J	0.000084 U	--	0.000088 U	0.0001 U

Table E-9
Summary of Data Used in Risk Assessment
Central Landfills Area (soil 0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-018	CFMW-018	CFMW-018-DUP	CFMW-019A	CFMW-019A	CFMW-019A-DUP	CFMW-019A	CFMW-022	CFMW-022	CFMW-022-DUP	CFMW-022	CFMW-023A	CFMW-023A	CFMW-023A
Sample Lab IDs	460-114141-35	460-114141-36	460-114141-37	460-114456-49	460-114456-50	460-114456-52	460-114456-51	460-114828-29	460-114828-28	460-114828-30	460-114828-27	460-115731-9	460-115731-10	460-115731-11
Sample Name	CFMW-018-SO-0.5-2.0	CFMW-018-SO-10-12	CFMW-DUP2-SO	CFMW-019a-SO-0-0.5	CFMW-019a-SO-0.5-2	CFMW-DUP5-SO	CFMW-019a-SO-10-12	CFMW-022-SO-0-0.5	CFMW-022-SO-0.5-2	CFMW-DUP12-SO	CFMW-022-SO-10-12	CFMW-023a-SO-0-0.5	CFMW-023a-SO-0.5-2	CFMW-023a-SO-10-12
Sample Depth	0.5-2 ft	10-12 ft	10-12 ft	0-0.5 ft	0.5-2 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft
Chemical	5/19/2016	5/19/2016	5/19/2016	5/25/2016	5/25/2016	5/25/2016	5/25/2016	6/2/2016	6/2/2016	6/2/2016	6/2/2016	6/17/2016	6/17/2016	6/17/2016
Methyl Acetate	0.00099 U	0.00079 U	0.00087 U	--	0.00086 UJ	0.0058 J	0.00092 U	--	0.00076 U	0.0008 U	0.00069 U	--	0.012	0.00085 U
Methyl Ethyl Ketone (2-Butanone)	0.00085 U	0.00068 U	0.00075 U	--	0.00074 U	0.00069 U	0.00079 U	--	0.00065 U	0.00068 U	0.00059 U	--	0.0018 J	0.0052
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	0.0024 U	0.002 U	0.0021 U	--	0.0021 U	0.002 U	0.0023 U	--	0.0019 U	0.002 U	0.0017 U	--	0.0018 U	0.0021 U
Methylcyclohexane	0.00055 U	0.0008 J	0.00081 J	--	0.00048 U	0.00045 U	0.00051 U	--	0.00042 U	0.00047 J	0.00038 U	--	0.0004 U	0.00047 U
Methylene Chloride	0.00035 U	0.00028 U	0.00031 U	--	0.00031 U	0.00029 U	0.00033 U	--	0.00027 U	0.00028 U	0.00025 U	--	0.00025 U	0.0003 U
O-Xylene (1,2-Dimethylbenzene)	0.00018 U	0.00018 J	0.00021 J	--	0.00015 U	0.00014 U	0.00016 U	--	0.00013 U	0.00014 U	0.00012 U	--	0.00013 U	0.00015 U
Styrene	0.00017 U	0.00013 U	0.00015 U	--	0.00014 U	0.00014 U	0.00015 U	--	0.00013 U	0.00013 U	0.00011 U	--	0.00012 U	0.00014 U
Tert-Butyl Methyl Ether	0.00019 U	0.00015 U	0.00016 U	--	0.00016 U	0.00015 U	0.00017 U	--	0.00014 U	0.00015 U	0.00013 U	--	0.00014 U	0.00016 U
Tetrachloroethylene (PCE)	0.00031 U	0.00025 U	0.00027 U	--	0.00027 U	0.00025 U	0.00029 U	--	0.00024 U	0.00025 U	0.00021 U	--	0.00022 U	0.00026 U
Toluene	0.00022 J	0.0007 J	0.00082 J	--	0.0002 J	0.00027 J	0.0002 U	--	0.00021 J	0.00036 J	0.00022 J	--	0.00016 J	0.00032 J
Trans-1,2-Dichloroethene	0.00043 U	0.00034 U	0.00038 U	--	0.00037 U	0.00035 U	0.0004 U	--	0.00033 U	0.00035 U	0.0003 U	--	0.00031 U	0.00037 U
Trans-1,3-Dichloropropene	0.00011 U	0.000088 U	0.000097 U	--	0.000096 U	0.00009 U	0.0001 U	--	0.000084 U	0.000089 U	0.000077 U	--	0.00008 U	0.000094 U
Trichloroethylene (TCE)	0.00029 U	0.00023 U	0.00025 U	--	0.00025 U	0.00023 U	0.00027 U	--	0.00022 U	0.00023 U	0.0002 U	--	0.00021 U	0.00024 U
Trichlorofluoromethane	0.00037 U	0.0003 U	0.00033 U	--	0.00033 U	0.00031 U	0.00035 U	--	0.00029 U	0.0003 U	0.00026 U	--	0.00027 U	0.00032 U
Vinyl Chloride	0.00043 U	0.00034 U	0.00038 U	--	0.00037 U	0.00035 U	0.0004 U	--	0.00033 U	0.00035 U	0.0003 U	--	0.00031 U	0.00037 U

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-9
Summary of Data Used in Risk Assessment
Central Landfills Area (soil 0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-029	CFMW-029	CFMW-029	CFSB-001	CFSB-001	CFSB-001	CFSB-002	CFSB-002	CFSB-002	CFSB-003	CFSB-003	CFSB-003	CFSB-004	CFSB-004
Sample Lab IDs	460-114141-13	460-114141-14	460-114141-15	460-114529-4	460-114529-5	460-114529-6	460-114529-7	460-114529-8	460-114529-9	460-114529-10	460-114529-11	460-114529-13	460-114529-1	460-114529-2
Sample Name	CFMW-029-SO-0-0.5	CFMW-029-SO-0.5-2.0	CFMW-029-SO-10-12	CFSB-001-SO-0-0.5	CFSB-001-SO-0.5-2	CFSB-001-SO-10-12	CFSB-002-SO-0-0.5	CFSB-002-SO-0.5-2	CFSB-002-SO-10-12	CFSB-003-SO-0-0.5	CFSB-003-SO-0.5-2	CFSB-003-SO-10-12	CFSB-004-SO-0-0.5	CFSB-004-SO-0.5-2
Sample Depth	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft
Chemical	5/18/2016	5/18/2016	5/18/2016	5/25/2016	5/25/2016	5/25/2016	5/25/2016	5/25/2016	5/25/2016	5/25/2016	5/25/2016	5/25/2016	5/25/2016	5/25/2016
GENERAL CHEMISTRY (mg/kg)														
Fluoride	105 J-	50.3 J-	9.6 J-	56.5 J	53.7 J	11.6 J	22.4 J	28 J	4.27 J	26.9 J	16.3 J	0.35 J	34.1 J	39 J
Cyanide	0.21	0.058 J	0.025 J	0.39	0.046 J	0.016 U	0.1 J	0.1 J	0.015 U	0.078 J	0.038 J	0.016 U	0.25	0.6
METALS (mg/kg)														
"Chromium, Hexavalent - Estimated"	0.414842	0.278345	0.176642	0.33455	0.219465	0.256934	0.208759	0.264964	0.270316	0.33455	0.281022	0.26764	0.256934	0.254258
"Chromium, Trivalent - Calculated"	--	--	--	--	--	--	--	--	--	--	--	--	--	--
"Chromium, Trivalent - Estimated"	15.0852	10.1217	6.42336	12.1655	7.98054	9.34307	7.59124	9.63504	9.82968	12.1655	10.219	9.73236	9.34307	9.24574
Aluminum	19500	11900	5980	20400	10100	6850	10500	11600	8420	15900	12100	8230	8890	8960
Antimony	0.33 UJ	0.34 UJ	0.33 UJ	0.44 U	0.37 U	0.32 U	0.37 U	0.4 U	0.34 U	0.4 UJ	0.37 UJ	0.34 UJ	0.34 U	0.36 U
Arsenic	5.4	4.5	4.6	7.3	3.2	4	5.2	5.3	6.9	7.9 J	12 J	3.1 J	4.4	3.7
Barium	81.5	126	42.7	265	75.6	45.1	90.2	62.7	47.3	121	76.5	85.6	77.7	204
Beryllium	0.99	0.48	0.36	0.81	0.4	0.36	0.4	0.54	0.32 J	0.49	0.43	0.35	0.44	0.42
Cadmium	0.27 J	0.26 U	0.25 U	0.33 U	0.28 U	0.24 U	0.28 U	0.31 U	0.26 U	0.3 U	0.28 U	0.25 U	0.26 U	0.78 J
Calcium	25400	21800	27600	6020	6770	60400	10600	24800	63500	7630	38600	35600	39100	14100
Chromium, Total	15.5	10.4	6.6	12.5	8.2	9.6	7.8	9.9	10.1	12.5	10.5	10	9.6	9.5
Cobalt	5.8	5.6	4.5	6	4.1	4	4.3	5.2	4.4	6.7 J-	6.1 J-	5.4 J-	4.1	4.2
Copper	16.4	28.6	13.2	21.8	8.9	6.3	7260	34	16.6	17.7 J+	20.5 J+	11.1 J+	11.8	13.9
Iron	13700	13500	10300	16200	11100	11200	11500	14800	12500	18800	16000	14100	10900	13400
Lead	48	12.1	5.5	18.5	9.1	4.9	10.5	11.1	21.3	12.1 J	13.4 J	5.8 J	18.1	16.6
Magnesium	11500	9500	7860	9090	7940	20000	9420	12700	15500	14100	14200	13300	7820	7930
Manganese	333	429	227	521	331	363	385	436	390	443	397	326	361	886
Mercury	0.019	0.015 J	0.015 J	0.021	0.017 J	0.032	0.026	0.026	0.012 U	0.015 U	0.012 U	0.012 U	0.013 U	0.012 U
Nickel	46.5	13.6	8.6	18.4	10.5	7.6	11.2	12.7	8.9	17	12.3	12.1	10.7	13.8
Potassium	1100	814	507	1310	593	682	828	795	678	1400 J+	1060 J+	665 J+	772	842
Selenium	1 J	0.32 U	0.31 U	0.67 J	0.34 U	0.3 U	0.35 U	0.38 U	0.32 U	0.37 U	0.34 U	0.31 U	0.32 U	0.35 J
Silver	0.6 U	0.63 U	0.6 U	0.8 U	0.67 U	0.59 U	0.68 U	0.74 U	0.63 U	0.73 U	0.67 U	0.61 U	0.62 U	0.65 U
Sodium	209	58.1 J	30.5 U	104 J	38.1 J	31.3 J	34.7 U	37.6 U	32 U	37.2 J	34.3 U	33.2 J	31.7 U	48.2 J
Thallium	0.14 J	0.13 U	0.12 U	0.16 U	0.14 U	0.12 U	0.14 U	0.15 U	0.13 U	0.15 U	0.14 U	0.13 U	0.13 U	0.14 J
Vanadium	22.8	11.1	6.6	15.6	8.3	4.8	9.3	8.1	5.7	11.2	9.2	6.9	8.1	10.5
Zinc	114	61.5	30	66.8	50.4	31.6	40.9	40.9	35.7	58.1	44.3	38.2	63.2	113
METALS|HEXAVALENT CHROMIUM (mg/kg)														
Chromium, Hexavalent	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PESTICIDES (mg/kg)														
Aldrin	0.00087 U	--	--	--	--	--	--	--	--	--	--	--	--	--
Alpha Bhc (Alpha Hexachlorocyclohexane)	0.00065 U	--	--	--	--	--	--	--	--	--	--	--	--	--
Alpha Endosulfan	0.001 U	--	--	--	--	--	--	--	--	--	--	--	--	--
Beta Bhc (Beta Hexachlorocyclohexane)	0.0007 U	--	--	--	--	--	--	--	--	--	--	--	--	--
Beta Endosulfan	0.0011 U	--	--	--	--	--	--	--	--	--	--	--	--	--
cis-Chlordane	0.0012 U	--	--	--	--	--	--	--	--	--	--	--	--	--
Delta BHC (Delta Hexachlorocyclohexane)	0.00078 U	--	--	--	--	--	--	--	--	--	--	--	--	--
Dieldrin	0.00093 U	--	--	--	--	--	--	--	--	--	--	--	--	--
Endosulfan Sulfate	0.00084 U	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin	0.00091 U	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin Aldehyde	0.00089 U	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin Ketone	0.001 U	--	--	--	--	--	--	--	--	--	--	--	--	--
Gamma Bhc (Lindane)	0.00064 U	--	--	--	--	--	--	--	--	--	--	--	--	--
Heptachlor	0.00092 U	--	--	--	--	--	--	--	--	--	--	--	--	--
Heptachlor Epoxide	0.0014 U	--	--	--	--	--	--	--	--	--	--	--	--	--
Methoxychlor	0.0015 U	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDD	0.00094 U	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDE	0.001 U	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDT	0.00074 U	--	--	--	--	--	--	--	--	--	--	--	--	--
Toxaphene	0.021 U	--	--	--	--	--	--	--	--	--	--	--	--	--
trans-Chlordane	0.0016 U	--	--	--	--	--	--	--	--	--	--	--	--	--
POLYCHLORINATED BIPHENYLS (mg/kg)														
PCB-1016 (Aroclor 1016)	0.0095 U	0.0095 U	0.0094 U	0.012 U	0.01 U	0.0095 U	0.01 U	0.011 U	0.0096 U	0.012 U	0.0098 U	0.0094 U	0.01 U	0.0098 U
PCB-1221 (Aroclor 1221)	0.0095 U	0.0095 U	0.0094 U	0.012 U	0.01 U	0.0095 U	0.01 U	0.011 U	0.0096 U	0.012 U	0.0098 U	0.0094 U	0.01 U	0.0098 U

Table E-9
Summary of Data Used in Risk Assessment
Central Landfills Area (soil 0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-029	CFMW-029	CFMW-029	CFSB-001	CFSB-001	CFSB-001	CFSB-002	CFSB-002	CFSB-002	CFSB-003	CFSB-003	CFSB-003	CFSB-004	CFSB-004
Sample Lab IDs	460-114141-13	460-114141-14	460-114141-15	460-114529-4	460-114529-5	460-114529-6	460-114529-7	460-114529-8	460-114529-9	460-114529-10	460-114529-11	460-114529-13	460-114529-1	460-114529-2
Sample Name	CFMW-029-SO-0-0.5	CFMW-029-SO-0.5-2.0	CFMW-029-SO-10-12	CFSB-001-SO-0-0.5	CFSB-001-SO-0.5-2	CFSB-001-SO-10-12	CFSB-002-SO-0-0.5	CFSB-002-SO-0.5-2	CFSB-002-SO-10-12	CFSB-003-SO-0-0.5	CFSB-003-SO-0.5-2	CFSB-003-SO-10-12	CFSB-004-SO-0-0.5	CFSB-004-SO-0.5-2
Sample Depth	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft
Chemical	5/18/2016	5/18/2016	5/18/2016	5/25/2016	5/25/2016	5/25/2016	5/25/2016	5/25/2016	5/25/2016	5/25/2016	5/25/2016	5/25/2016	5/25/2016	5/25/2016
PCB-1232 (Aroclor 1232)	0.0095 U	0.0095 U	0.0094 U	0.012 U	0.01 U	0.0095 U	0.01 U	0.011 U	0.0096 U	0.012 U	0.0098 U	0.0094 U	0.01 U	0.0098 U
PCB-1242 (Aroclor 1242)	0.0095 U	0.0095 U	0.0094 U	0.012 U	0.01 U	0.0095 U	0.01 U	0.011 U	0.0096 U	0.012 U	0.0098 U	0.0094 U	0.01 U	0.0098 U
PCB-1248 (Aroclor 1248)	0.0095 U	0.0095 U	0.0094 U	0.012 U	0.01 U	0.0095 U	0.01 U	0.011 U	0.0096 U	0.012 U	0.0098 U	0.0094 U	0.01 U	0.0098 U
PCB-1254 (Aroclor 1254)	0.0099 U	0.0098 U	0.0097 U	0.013 U	0.01 U	0.0098 U	0.011 U	0.011 U	0.0099 U	0.012 U	0.01 U	0.0097 U	0.01 U	0.01 U
PCB-1260 (Aroclor 1260)	0.0099 U	0.0098 U	0.0097 U	0.013 U	0.01 U	0.0098 U	0.011 U	0.011 U	0.0099 U	0.012 U	0.01 U	0.0097 U	0.01 U	0.01 U
PCB-1262 (Aroclor 1262)	0.0099 U	0.0098 U	0.0097 U	0.013 U	0.01 U	0.0098 U	0.011 U	0.011 U	0.0099 U	0.012 U	0.01 U	0.0097 U	0.01 U	0.01 U
PCB-1268 (Aroclor 1268)	0.0099 U	0.0098 U	0.0097 U	0.013 U	0.01 U	0.0098 U	0.011 U	0.011 U	0.0099 U	0.012 U	0.01 U	0.0097 U	0.01 U	0.01 U
Polychlorinated Biphenyl (PCBs)	0.0099 U	0.0098 U	0.0097 U	0.013 U	0.01 U	0.0098 U	0.011 U	0.011 U	0.0099 U	0.012 U	0.01 U	0.0097 U	0.01 U	0.01 U
SEMIVOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,2,4,5-Tetrachlorobenzene	0.053 U	0.026 U	0.026 U	0.034 U	0.028 U	0.026 U	0.029 U	0.03 U	0.026 U	0.032 U	0.027 U	0.026 U	1.4 U	1.4 U
1,4-Dioxane (P-Dioxane)	0.19 U	0.094 U	0.093 U	0.12 U	0.1 U	0.094 U	0.1 U	0.11 U	0.095 U	0.11 U	0.097 U	0.093 U	4.9 U	4.9 U
2,3,4,6-Tetrachlorophenol	0.067 U	0.033 U	0.033 U	0.042 U	0.035 U	0.033 U	0.036 U	0.038 U	0.033 U	0.04 U	0.034 U	0.033 U	1.7 U	1.7 U
2,4,5-Trichlorophenol	0.071 U	0.035 U	0.035 U	0.045 U	0.037 U	0.035 U	0.039 U	0.04 U	0.035 U	0.043 U	0.036 U	0.035 U	1.8 U	1.8 U
2,4,6-Trichlorophenol	0.02 U	0.01 U	0.0099 U	0.013 U	0.011 U	0.01 U	0.011 U	0.011 U	0.01 U	0.012 U	0.01 U	0.0099 U	0.53 U	0.52 U
2,4-Dichlorophenol	0.017 U	0.0083 U	0.0082 U	0.011 U	0.0088 U	0.0083 U	0.0092 U	0.0095 U	0.0084 U	0.01 U	0.0086 U	0.0082 U	0.44 U	0.43 U
2,4-Dimethylphenol	0.16 U	0.077 U	0.077 U	0.099 U	0.082 U	0.077 U	0.085 U	0.088 U	0.078 U	0.094 U	0.08 U	0.077 U	4.1 U	4 U
2,4-Dinitrophenol	0.54 U	0.27 U	0.26 U	0.34 U	0.28 U	0.27 U	0.29 U	0.3 U	0.27 U	0.32 U	0.27 U	0.26 U	14 U	14 U
2,4-Dinitrotoluene	0.028 U	0.014 U	0.014 U	0.018 U	0.015 U	0.014 U	0.015 U	0.016 U	0.014 U	0.017 U	0.014 U	0.014 U	0.73 U	0.72 U
2,6-Dinitrotoluene	0.038 U	0.019 U	0.019 U	0.024 U	0.02 U	0.019 U	0.021 U	0.021 U	0.019 U	0.023 U	0.019 U	0.019 U	0.99 U	0.97 U
2-Chloronaphthalene	0.016 U	0.008 U	0.0079 U	0.01 U	0.0085 U	0.008 U	0.0088 U	0.0091 U	0.0081 U	0.0097 U	0.0082 U	0.0079 U	0.42 U	0.41 U
2-Chlorophenol	0.018 U	0.0089 U	0.0089 U	0.011 U	0.0095 U	0.0089 U	0.0099 U	0.01 U	0.009 U	0.011 U	0.0092 U	0.0088 U	0.47 U	0.46 U
2-Methylnaphthalene	0.031 J	0.0078 U	0.0077 U	0.073 J	0.011 J	0.0078 U	0.0086 U	0.0089 U	0.0078 U	0.0095 U	0.008 U	0.0077 U	2 J	3.9 J
2-Methylphenol (O-Cresol)	0.031 U	0.015 U	0.015 U	0.02 U	0.016 U	0.015 U	0.017 U	0.017 U	0.015 U	0.019 U	0.016 U	0.015 U	0.81 U	0.79 U
2-Nitroaniline	0.023 U	0.012 U	0.011 U	0.015 U	0.012 U	0.012 U	0.013 U	0.013 U	0.012 U	0.014 U	0.012 U	0.011 U	0.61 U	0.6 U
2-Nitrophenol	0.024 U	0.012 U	0.012 U	0.015 U	0.013 U	0.012 U	0.013 U	0.013 U	0.012 U	0.014 U	0.012 U	0.012 U	0.62 U	0.61 U
3- And 4- Methylphenol (Total)	0.019 U	0.0094 U	0.0093 U	0.012 U	0.01 U	0.0094 U	0.01 U	0.011 U	0.0094 U	0.011 U	0.0097 U	0.0093 U	0.49 U	1 J
3,3'-Dichlorobenzidine	0.079 U	0.039 U	0.039 U	0.05 U	0.042 U	0.039 U	0.043 U	0.045 U	0.04 U	0.048 U	0.041 U	0.039 U	2.1 U	2 U
3-Nitroaniline	0.021 U	0.01 U	0.01 U	0.013 U	0.011 U	0.01 U	0.012 U	0.012 U	0.011 U	0.013 U	0.011 U	0.01 U	0.55 U	0.54 U
4,6-Dinitro-2-Methylphenol	0.19 U	0.094 U	0.093 U	0.12 U	0.1 U	0.094 U	0.1 U	0.11 U	0.095 U	0.11 U	0.097 U	0.093 U	4.9 U	4.9 U
4-Bromophenyl Phenyl Ether	0.022 U	0.011 U	0.011 U	0.014 U	0.012 U	0.011 U	0.012 U	0.013 U	0.011 U	0.013 U	0.011 U	0.011 U	0.58 U	0.57 U
4-Chloro-3-Methylphenol	0.03 U	0.015 U	0.015 U	0.019 U	0.016 U	0.015 U	0.017 U	0.017 U	0.015 U	0.018 U	0.016 U	0.015 U	0.79 U	0.78 U
4-Chloroaniline	0.018 U	0.009 U	0.009 U	0.012 U	0.0096 U	0.009 U	0.01 U	0.01 U	0.0091 U	0.011 U	0.0093 U	0.0089 U	0.48 U	0.47 U
4-Chlorophenyl Phenyl Ether	0.021 U	0.011 U	0.01 U	0.014 U	0.011 U	0.011 U	0.012 U	0.012 U	0.011 U	0.013 U	0.011 U	0.01 U	0.55 U	0.55 U
4-Nitroaniline	0.027 U	0.013 U	0.013 U	0.017 U	0.014 U	0.013 U	0.015 U	0.015 U	0.013 U	0.016 U	0.014 U	0.013 U	0.7 U	0.69 U
4-Nitrophenol	0.34 U	0.17 U	0.17 UJ	0.22 U	0.18 U	0.17 U	0.19 U	0.19 U	0.17 U	0.21 U	0.17 U	0.17 U	8.9 U	8.8 U
Acenaphthene	0.2 J	0.031 J	0.0084 U	0.061 J	0.026 J	0.0085 U	0.018 J	0.012 J	0.0086 U	0.01 U	0.0088 U	0.0084 U	22	28
Acenaphthylene	0.018 U	0.009 U	0.009 U	0.022 J	0.0096 U	0.009 U	0.01 U	0.01 U	0.0091 U	0.011 U	0.0093 U	0.0089 U	0.54 J	1 J
Acetophenone	0.015 U	0.0077 U	0.0076 U	0.0098 U	0.0082 U	0.0077 U	0.0084 U	0.0087 U	0.0077 U	0.0093 U	0.0079 U	0.0076 U	0.4 U	0.4 U
Anthracene	0.34 J	0.065 J	0.033 U	0.16 J	0.045 J	0.033 U	0.037 U	0.038 U	0.034 U	0.041 U	0.034 U	0.033 U	47	48
Atrazine	0.032 U	0.016 U	0.016 U	0.02 U	0.017 U	0.016 U	0.017 U	0.018 U	0.016 U	0.019 U	0.016 U	0.015 U	0.82 U	0.81 U
Benzaldehyde	0.054 U	0.027 U	0.027 U	0.034 U	0.029 U	0.027 U	0.03 U	0.031 U	0.027 U	0.033 U	0.028 U	0.027 U	1.4 U	1.4 U
Benzo(A)Anthracene	2.8	0.26	0.029 U	0.46	0.18	0.029 U	0.19	0.16	0.03 U	0.085	0.03 U	0.029 U	100	89
Benzo(A)Pyrene	3.1	0.32	0.012 J	0.7	0.25	0.011 U	0.24	0.25	0.011 U	0.11	0.027 J	0.011 U	100	75
Benzo(B)Fluoranthene	6.5	0.43	0.016 J	1	0.31	0.014 U	0.36	0.59	0.014 U	0.19	0.046	0.014 U	120	100
Benzo(G,H,I)Perylene	4.1	0.42	0.02 U	0.6	0.37	0.02 U	0.23 J	0.32 J	0.02 U	0.1 J	0.021 J	0.02 U	62	47
Benzo(K)Fluoranthene	2.2	0.17	0.015 U	0.38	0.14	0.015 U	0.15	0.2	0.015 U	0.076	0.018 J	0.015 U	50	38
Benzyl Butyl Phthalate	0.022 U	0.011 U	0.011 U	0.014 U	0.012 U	0.011 U	0.012 U	0.012 U	0.011 U	0.013 U	0.011 U	0.011 U	0.57 U	0.56 U
Biphenyl (Diphenyl)	0.06 U	0.03 U	0.03 U	0.038 U	0.032 U	0.03 U	0.033 U	0.034 U	0.03 U	0.037 U	0.031 U	0.03 U	1.6 U	1.6 U
Bis(2-Chloroethoxy) Methane	0.022 U	0.011 U	0.011 U	0.014 U	0.012 U	0.011 U	0.012 U	0.012 U	0.011 U	0.013 U	0.011 U	0.011 U	0.58 U	0.57 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.017 U	0.0083 U	0.0082 U	0.011 U	0.0088 U	0.0083 U	0.0092 U	0.0095 U	0.0084 U	0.01 U	0.0086 U	0.0082 U	0.44 U	0.43 U
Bis(2-Chloroisopropyl) Ether	0.029 UJ	0.014 UJ	0.014 UJ	0.019 U	0.015 U	0.014 U	0.016 U	0.017 U	0.015 U	0.018 U	0.015 U	0.014 U	0.76 U	0.75 U
Bis(2-Ethylhexyl) Phthalate	0.079 J	0.014 U	0.014 U	0.18 J	0.052 J	0.014 U	0.015 U	0.016 U	0.014 U	0.017 U	0.014 U	0.014 U	0.72 U	0.71 U
Caprolactam	0.051 U	0.025 U	0.025 U	0.032 U	0.027 U	0.025 U	0.028 U	0.029 U	0.026 U	0.031 U	0.026 U	0.025 U	1.3 U	1.3 U
Carbazole	0.29 J	0.046 J	0.0086 U	0.13 J	0.037 J	0.0087 U	0.027 J	0.021 J	0.0088 U	0.011 J	0.009 U	0.0086 U	32	24
Chrysene	4.1	0.36	0.013 J	0.77	0.28 J	0.0096 U	0.28 J	0.29 J	0.0097 U	0.13 J	0.033 J	0.0095 U	110	110
Dibenz(A,H)Anthracene	1.2	0.078	0.018 U	0.13	0.08 J+	0.018 U	0.05	0.074	0.018 U	0.024 J	0.019 U	0.018 U	21	19
Dibenzofuran	0.06 J	0.016 J	0.011 U	0.031 J	0.011 U	0.011 U	0.012 U	0.012 U	0.011 U	0.013 U	0.011 U	0.011 U	10 J	15 J

Table E-9
Summary of Data Used in Risk Assessment
Central Landfills Area (soil 0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-029	CFMW-029	CFMW-029	CFSB-001	CFSB-001	CFSB-001	CFSB-002	CFSB-002	CFSB-002	CFSB-003	CFSB-003	CFSB-003	CFSB-004	CFSB-004
Sample Lab IDs	460-114141-13	460-114141-14	460-114141-15	460-114529-4	460-114529-5	460-114529-6	460-114529-7	460-114529-8	460-114529-9	460-114529-10	460-114529-11	460-114529-13	460-114529-1	460-114529-2
Sample Name	CFMW-029-SO-0-0.5	CFMW-029-SO-0.5-2.0	CFMW-029-SO-10-12	CFSB-001-SO-0-0.5	CFSB-001-SO-0.5-2	CFSB-001-SO-10-12	CFSB-002-SO-0-0.5	CFSB-002-SO-0.5-2	CFSB-002-SO-10-12	CFSB-003-SO-0-0.5	CFSB-003-SO-0.5-2	CFSB-003-SO-10-12	CFSB-004-SO-0-0.5	CFSB-004-SO-0.5-2
Sample Depth	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft
Chemical	5/18/2016	5/18/2016	5/18/2016	5/25/2016	5/25/2016	5/25/2016	5/25/2016	5/25/2016	5/25/2016	5/25/2016	5/25/2016	5/25/2016	5/25/2016	5/25/2016
Diethyl Phthalate	0.02 U	0.01 U	0.0099 U	0.013 U	0.011 U	0.01 U	0.011 U	0.011 U	0.01 U	0.012 U	0.01 U	0.0099 U	0.53 U	0.52 U
Dimethyl Phthalate	0.021 U	0.01 U	0.01 U	0.013 U	0.011 U	0.01 U	0.011 U	0.012 U	0.01 U	0.012 U	0.011 U	0.01 U	0.54 U	0.53 U
Di-N-Butyl Phthalate	0.021 U	0.011 U	0.01 U	0.014 U	0.011 U	0.011 U	0.012 U	0.012 U	0.011 U	0.013 U	0.011 U	0.01 U	0.55 U	0.55 U
Di-N-Octylphthalate	0.036 U	0.018 U	0.018 U	0.023 U	0.019 U	0.018 U	0.02 U	0.02 U	0.018 U	0.022 U	0.018 U	0.018 U	0.94 U	0.93 U
Fluoranthene	4	0.46	0.026 J	1	0.33 J	0.01 U	0.31 J	0.25 J	0.011 J	0.14 J	0.037 J	0.01 U	240	240
Fluorene	0.099 J	0.026 J	0.0076 U	0.044 J	0.018 J	0.0077 U	0.0084 U	0.0087 U	0.0077 U	0.0093 U	0.0079 U	0.0076 U	19	25
Hexachlorobenzene	0.029 U	0.014 U	0.014 U	0.018 U	0.015 U	0.014 U	0.016 U	0.016 U	0.014 U	0.017 U	0.015 U	0.014 U	0.75 U	0.74 U
Hexachlorobutadiene	0.02 U	0.0099 U	0.0098 U	0.013 U	0.011 U	0.0099 U	0.011 U	0.011 U	0.01 U	0.012 U	0.01 U	0.0098 U	0.52 U	0.51 U
Hexachlorocyclopentadiene	0.044 U	0.022 U	0.022 U	0.028 U	0.023 UJ	0.022 U	0.024 U	0.025 U	0.022 U	0.027 U	0.023 U	0.022 U	1.2 U	1.1 U
Hexachloroethane	0.026 U	0.013 U	0.013 U	0.017 U	0.014 U	0.013 U	0.014 U	0.015 U	0.013 U	0.016 U	0.013 U	0.013 U	0.68 U	0.67 U
Indeno(1,2,3-C,D)Pyrene	5.1	0.42	0.023 U	0.54	0.32 J+	0.023 U	0.18	0.25	0.024 U	0.097	0.024 U	0.023 U	76	57
Isophorone	0.015 U	0.0076 U	0.0075 U	0.0097 U	0.008 U	0.0076 U	0.0083 U	0.0086 U	0.0076 U	0.0092 U	0.0078 U	0.0075 U	0.4 U	1.4 J
Naphthalene	0.032 J	0.011 J	0.0089 U	0.044 J	0.011 J	0.0089 U	0.0099 U	0.01 U	0.009 U	0.011 U	0.0092 U	0.0088 U	4.6 J	10 J
Nitrobenzene	0.022 U	0.011 U	0.011 U	0.014 U	0.012 U	0.011 U	0.012 U	0.013 U	0.011 U	0.013 U	0.011 U	0.011 U	0.58 U	0.57 U
N-Nitrosodi-N-Propylamine	0.024 U	0.012 U	0.012 U	0.015 U	0.013 U	0.012 U	0.013 U	0.013 U	0.012 U	0.014 U	0.012 U	0.012 U	0.62 U	0.61 U
N-Nitrosodiphenylamine	0.064 U	0.032 U	0.032 U	0.041 U	0.034 U	0.032 U	0.035 U	0.036 U	0.032 U	0.039 U	0.033 U	0.032 U	1.7 U	1.7 U
Pentachlorophenol	0.086 U	0.043 U	0.042 U	0.055 U	0.045 U	0.043 U	0.047 U	0.049 U	0.043 U	0.052 U	0.044 U	0.042 U	2.2 U	2.2 U
Phenanthrene	1.5	0.29 J	0.021 J	0.5	0.22 J	0.0094 U	0.18 J	0.12 J	0.012 J	0.071 J	0.02 J	0.0093 U	180	240
Phenol	0.023 U	0.011 U	0.011 U	0.015 U	0.012 U	0.011 U	0.013 U	0.013 U	0.012 U	0.014 U	0.012 U	0.011 U	0.6 U	1.2 J
Pyrene	2.9	0.38	0.018 J	0.73	0.31 J	0.016 U	0.35 J	0.26 J	0.016 U	0.15 J	0.038 J	0.016 U	150	130
VOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,1,1-Trichloroethane	--	0.00032 U	0.00035 U	--	0.00041 U	0.00033 U	--	0.00038 U	0.00036 U	--	0.00031 U	0.00034 U	--	0.00043 U
1,1,2,2-Tetrachloroethane	--	0.00014 U	0.00016 U	--	0.00018 U	0.00015 U	--	0.00017 U	0.00016 U	--	0.00014 U	0.00015 U	--	0.00019 U
1,1,2-Trichloro-1,2,2-Trifluoroethane	--	0.00037 U	0.00041 U	--	0.00047 U	0.00038 U	--	0.00044 U	0.00042 U	--	0.00036 U	0.00039 U	--	0.00049 U
1,1,2-Trichloroethane	--	0.00023 U	0.00026 U	--	0.0003 U	0.00024 U	--	0.00028 U	0.00027 U	--	0.00023 U	0.00025 U	--	0.00031 U
1,1-Dichloroethane	--	0.00028 U	0.00032 U	--	0.00036 U	0.00029 U	--	0.00034 U	0.00032 U	--	0.00028 U	0.00031 U	--	0.00038 U
1,1-Dichloroethene	--	0.00034 U	0.00038 U	--	0.00044 U	0.00036 U	--	0.00041 U	0.00039 U	--	0.00034 U	0.00037 U	--	0.00046 U
1,2,3-Trichlorobenzene	--	0.000092 U	0.0001 U	--	0.00012 U	0.000095 U	--	0.00011 U	0.0001 U	--	0.000091 U	0.000099 U	--	0.00012 U
1,2,4-Trichlorobenzene	--	0.00027 U	0.0003 U	--	0.00034 U	0.00028 U	--	0.00032 U	0.0003 U	--	0.00026 U	0.00029 U	--	0.00036 U
1,2-Dibromo-3-Chloropropane	--	0.00039 U	0.00044 U	--	0.0005 U	0.00041 U	--	0.00047 U	0.00045 U	--	0.00039 U	0.00042 U	--	0.00053 U
1,2-Dibromoethane (Ethylene Dibromide)	--	0.0001 U	0.00011 U	--	0.00013 U	0.0001 U	--	0.00012 U	0.00011 U	--	0.000099 U	0.00011 U	--	0.00013 U
1,2-Dichlorobenzene	--	0.00012 U	0.00013 U	--	0.00015 U	0.00012 U	--	0.00014 U	0.00013 U	--	0.00012 U	0.00013 U	--	0.00016 U
1,2-Dichloroethane	--	0.000092 U	0.0001 U	--	0.00012 U	0.000095 U	--	0.00011 U	0.0001 U	--	0.000091 U	0.000099 U	--	0.00012 U
1,2-Dichloropropane	--	0.00014 U	0.00016 U	--	0.00018 U	0.00015 U	--	0.00017 U	0.00016 U	--	0.00014 U	0.00015 U	--	0.00019 U
1,3-Dichlorobenzene	--	0.0001 U	0.00011 U	--	0.00013 U	0.0001 U	--	0.00012 U	0.00011 U	--	0.000099 U	0.00011 U	--	0.00013 U
1,4-Dichlorobenzene	--	0.00011 U	0.00012 U	--	0.00014 U	0.00011 U	--	0.00013 U	0.00012 U	--	0.00011 U	0.00012 U	--	0.00015 U
2-Hexanone	--	0.00079 U	0.00087 U	--	0.001 U	0.00081 U	--	0.00094 U	0.00089 U	--	0.00078 U	0.00084 U	--	0.0011 U
Acetone	--	0.033	0.0092	--	0.029	0.0051	--	0.041	0.009	--	0.041	0.0039 J	--	0.019
Benzene	--	0.00038 J	0.00019 U	--	0.00021 U	0.00017 U	--	0.0002 U	0.00019 U	--	0.0003 J	0.00018 U	--	0.00038 J
Bromochloromethane	--	0.00014 U	0.00016 U	--	0.00018 U	0.00015 U	--	0.00017 U	0.00016 U	--	0.00014 U	0.00015 U	--	0.00019 U
Bromodichloromethane	--	0.00032 U	0.00035 U	--	0.00041 U	0.00033 U	--	0.00038 U	0.00036 U	--	0.00031 U	0.00034 U	--	0.00043 U
Bromoform	--	0.00011 U	0.00012 U	--	0.00014 U	0.00011 U	--	0.00013 U	0.00012 U	--	0.00011 U	0.00012 U	--	0.00015 U
Bromomethane	--	0.00027 U	0.0003 U	--	0.00034 UJ	0.00028 UJ	--	0.00032 UJ	0.0003 UJ	--	0.00026 UJ	0.00029 UJ	--	0.00036 UJ
Carbon Disulfide	--	0.00072 J	0.00071 J	--	0.00046 U	0.00037 U	--	0.00043 U	0.00041 U	--	0.00036 U	0.00039 U	--	0.0022
Carbon Tetrachloride	--	0.00036 U	0.0004 U	--	0.00046 U	0.00037 U	--	0.00043 U	0.00041 U	--	0.00036 U	0.00039 U	--	0.00048 U
Chlorobenzene	--	0.00012 U	0.00013 U	--	0.00015 U	0.00012 U	--	0.00014 U	0.00013 U	--	0.00012 U	0.00013 U	--	0.00016 U
Chloroethane	--	0.00029 U	0.00033 U	--	0.00038 UJ	0.0003 UJ	--	0.00035 UJ	0.00033 UJ	--	0.00029 UJ	0.00031 UJ	--	0.00039 UJ
Chloroform	--	0.00018 U	0.0002 U	--	0.00023 U	0.00018 U	--	0.00021 U	0.0002 U	--	0.00017 U	0.00019 U	--	0.00024 U
Chloromethane	--	0.00032 U	0.00035 U	--	0.00041 U	0.00033 U	--	0.00038 U	0.00036 U	--	0.00031 U	0.00034 U	--	0.00043 U
Cis-1,2-Dichloroethylene	--	0.00018 U	0.0002 U	--	0.00024 U	0.00019 U	--	0.00022 U	0.00021 U	--	0.00018 U	0.0002 U	--	0.00025 U
Cis-1,3-Dichloropropene	--	0.00013 U	0.00014 U	--	0.00016 U	0.00013 U	--	0.00015 U	0.00014 U	--	0.00012 U	0.00013 U	--	0.00017 U
Cyclohexane	--	0.00038 U	0.00043 U	--	0.00049 U	0.0004 U	--	0.00046 U	0.00044 U	--	0.00038 U	0.00041 U	--	0.00052 U
Dibromochloromethane	--	0.00013 U	0.00014 U	--	0.00016 U	0.00013 U	--	0.00015 U	0.00014 U	--	0.00012 U	0.00013 U	--	0.00017 U
Dichlorodifluoromethane	--	0.00027 U	0.0003 U	--	0.00034 U	0.00028 U	--	0.00032 U	0.0003 U	--	0.00026 U	0.00029 U	--	0.00036 U
Ethylbenzene	--	0.00015 U	0.00017 U	--	0.00019 U	0.00016 U	--	0.00018 U	0.00017 U	--	0.00015 U	0.00016 U	--	0.0002 U
Isopropylbenzene (Cumene)	--	0.00014 U	0.00016 U	--	0.00018 U	0.00015 U	--	0.00017 U	0.00016 U	--	0.00014 U	0.00015 U	--	0.00019 U
M,P-Xylene	--	0.000092 U	0.0001 U	--	0.00012 U	0.000095 U	--	0.00011 U	0.00015 J	--	0.000091 U	0.00013 J	--	0.00048 J

Table E-9
Summary of Data Used in Risk Assessment
Central Landfills Area (soil 0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-029	CFMW-029	CFMW-029	CFSB-001	CFSB-001	CFSB-001	CFSB-002	CFSB-002	CFSB-002	CFSB-003	CFSB-003	CFSB-003	CFSB-004	CFSB-004
Sample Lab IDs	460-114141-13	460-114141-14	460-114141-15	460-114529-4	460-114529-5	460-114529-6	460-114529-7	460-114529-8	460-114529-9	460-114529-10	460-114529-11	460-114529-13	460-114529-1	460-114529-2
Sample Name	CFMW-029-SO-0-0.5	CFMW-029-SO-0.5-2.0	CFMW-029-SO-10-12	CFSB-001-SO-0-0.5	CFSB-001-SO-0.5-2	CFSB-001-SO-10-12	CFSB-002-SO-0-0.5	CFSB-002-SO-0.5-2	CFSB-002-SO-10-12	CFSB-003-SO-0-0.5	CFSB-003-SO-0.5-2	CFSB-003-SO-10-12	CFSB-004-SO-0-0.5	CFSB-004-SO-0.5-2
Sample Depth	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft
Chemical	5/18/2016	5/18/2016	5/18/2016	5/25/2016	5/25/2016	5/25/2016	5/25/2016	5/25/2016	5/25/2016	5/25/2016	5/25/2016	5/25/2016	5/25/2016	5/25/2016
Methyl Acetate	--	0.00075 U	0.015	--	0.00096 U	0.00078 U	--	0.0009 U	0.00085 U	--	0.00074 U	0.00081 U	--	0.001 U
Methyl Ethyl Ketone (2-Butanone)	--	0.00064 U	0.00072 U	--	0.00083 U	0.00067 U	--	0.00077 U	0.00073 U	--	0.00064 U	0.00069 U	--	0.00086 U
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	--	0.0019 U	0.0021 U	--	0.0024 U	0.0019 U	--	0.0022 U	0.0021 U	--	0.0018 U	0.002 U	--	0.0025 U
Methylcyclohexane	--	0.00042 J	0.00046 U	--	0.00054 U	0.00043 U	--	0.0005 U	0.00047 U	--	0.00041 U	0.00045 U	--	0.001 J
Methylene Chloride	--	0.00027 U	0.0003 U	--	0.00034 U	0.00028 U	--	0.00032 U	0.0003 U	--	0.00026 U	0.00029 U	--	0.00036 U
O-Xylene (1,2-Dimethylbenzene)	--	0.00013 U	0.00015 U	--	0.00017 U	0.00014 U	--	0.00016 U	0.00015 U	--	0.00013 U	0.00014 U	--	0.00018 U
Styrene	--	0.00013 U	0.00014 U	--	0.00016 U	0.00013 U	--	0.00015 U	0.00014 U	--	0.00012 U	0.00013 U	--	0.00017 U
Tert-Butyl Methyl Ether	--	0.00014 U	0.00016 U	--	0.00018 U	0.00015 U	--	0.00017 U	0.00016 U	--	0.00014 U	0.00015 U	--	0.00019 U
Tetrachloroethylene (PCE)	--	0.00023 U	0.00026 U	--	0.0003 U	0.00024 U	--	0.00028 U	0.00027 U	--	0.00023 U	0.00025 U	--	0.00031 U
Toluene	--	0.00048 J	0.00038 J	--	0.0002 U	0.00016 U	--	0.00019 U	0.00024 J	--	0.00025 J	0.00023 J	--	0.00098 J
Trans-1,2-Dichloroethene	--	0.00033 U	0.00036 U	--	0.00042 U	0.00034 U	--	0.00039 U	0.00037 U	--	0.00032 U	0.00035 U	--	0.00044 U
Trans-1,3-Dichloropropene	--	0.000084 U	0.000093 U	--	0.00011 U	0.000087 U	--	0.0001 U	0.000095 U	--	0.000083 U	0.00009 U	--	0.00011 U
Trichloroethylene (TCE)	--	0.00022 U	0.00024 U	--	0.00028 U	0.00023 U	--	0.00026 U	0.00025 U	--	0.00022 U	0.00023 U	--	0.00029 U
Trichlorofluoromethane	--	0.00028 U	0.00032 U	--	0.00036 U	0.00029 U	--	0.00034 U	0.00032 U	--	0.00028 U	0.00031 U	--	0.00038 U
Vinyl Chloride	--	0.00033 U	0.00036 U	--	0.00042 U	0.00034 U	--	0.00039 U	0.00037 U	--	0.00032 U	0.00035 U	--	0.00044 U

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-9
Summary of Data Used in Risk Assessment
Central Landfills Area (soil 0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-004	CFSB-005	CFSB-005	CFSB-005	CFSB-006	CFSB-006	CFSB-006	CFSB-007	CFSB-007	CFSB-007	CFSB-008	CFSB-008	CFSB-008-DUP	CFSB-008
Sample Lab IDs	460-114529-3	460-114529-15	460-114529-17	460-114529-12	460-114456-18	460-114456-22	460-114456-16	460-114529-14	460-114529-16	460-114529-18	460-114456-20	460-114456-17	460-114456-19	460-114456-21
Sample Name	CFSB-004-SO-10-12	CFSB-005-SO-0-0.5	CFSB-005-SO-0.5-2	CFSB-005-SO-10-12	CFSB-006-SO-0-0.5	CFSB-006-SO-0.5-2	CFSB-006-SO-10-12	CFSB-007-SO-0-0.5	CFSB-007-SO-0.5-2	CFSB-007-SO-10-12	CFSB-008-SO-0-0.5	CFSB-008-SO-0.5-2	CFSB-DUP4-SO	CFSB-008-SO-10-12
Sample Depth	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	0.5-2 ft	10-12 ft
Chemical	5/25/2016	5/25/2016	5/25/2016	5/25/2016	5/23/2016	5/23/2016	5/23/2016	5/25/2016	5/25/2016	5/25/2016	5/23/2016	5/23/2016	5/23/2016	5/23/2016
GENERAL CHEMISTRY (mg/kg)														
Fluoride	10.3 J	11.6 J	20.4 J	4.23 J	14.6 J	5.6 J+	12.5 J	11.8 J	25 J	1.52 J	30.6 J	16.2 J	45.4 J	8.58 J+
Cyanide	0.11	0.21	0.026 J	0.017 U	0.016 U	0.11 J	0.041 J	0.095 J	0.029 J	0.017 U	0.02 J	0.036 J	0.02 J	0.017 U
METALS (mg/kg)														
"Chromium, Hexavalent - Estimated"	0.195377	0.2382	0.353285	0.232847	0.206083	0.192701	0.339903	0.289051	0.232847	0.281022	0.278345	0.232847	0.211436	0.17129
"Chromium, Trivalent - Calculated"	--	--	--	--	--	--	--	--	--	--	--	--	--	--
"Chromium, Trivalent - Estimated"	7.10462	8.6618	12.8467	8.46715	7.49392	7.0073	12.3601	10.5109	8.46715	10.219	10.1217	8.46715	7.68856	6.22871
Aluminum	8160	11300	13200	6930	7200	8230	14300	12600	10200	9810	15100	7990	11800	6980
Antimony	0.33 U	0.38 UJ	0.38 UJ	0.35 UJ	0.32 UJ	0.39 UJ	0.37 UJ	0.38 UJ	0.36 UJ	0.33 UJ	0.39 UJ	0.37 UJ	0.37 UJ	0.33 UJ
Arsenic	3.7	5.6 J	3.7 J	3.4 J	3.6	4	8.4	4.4 J	3.1 J	5.6 J	11.8	7.2	11.8	4.1
Barium	37.2	111	102	69	77.4	112	61.3	109	90.9	54.2	105	41.7	62.1	55.1
Beryllium	0.3 J	0.48	0.47	0.28 J	0.36	0.28 J	0.38	0.51	0.39	0.38	0.65	0.24 J	0.4	0.31 J
Cadmium	0.25 U	0.29 U	0.29 U	0.27 U	0.24 U	0.3 U	0.28 U	0.29 U	0.28 U	0.25 U	0.29 U	0.28 U	0.28 U	0.25 U
Calcium	35000	86800	17000	22600	34300	23400	16600	20500	3990	60200	2090	49600 J	1210 J	52800
Chromium, Total	7.3	8.9	13.2	8.7	7.7	7.2	12.7	10.8	8.7	10.5	10.4	8.7	7.9	6.4
Cobalt	3.6	4.1 J-	11.7 J-	4.3 J-	4.4	8	8	5.6 J-	5.3 J-	7.4 J-	5.5	5	4	4.5
Copper	9.4	12.5 J+	13.7 J+	10.3 J+	9.1	8.9 J+	12.5	15.1 J+	14.2 J+	8.9 J+	10.8	8.2 J	19.6 J	8.6 J+
Iron	10300	12900	25000	10400	12000	10700	17900	14300	12100	16100	17900	10400	12000	9300
Lead	5.6	12.4 J	7.7 J	5.4 J	6.1 J+	7.1	13.3 J+	9.9 J	6.9 J	7.8 J	11.6	19 J	84.2 J	6.4
Magnesium	11500	15600	13400	8570	12000	13300	15800	10100	7430	17600	11000	9670	8450	12500
Manganese	293	446	433	341	313	348	342	437	302	580	419	557 J	147 J	344
Mercury	0.012 J	0.013 U	0.013 U	0.012 U	0.025	0.015 J	0.029	0.017 J	0.013 U	0.013 J+	0.017 J	0.04	0.067	0.012 J
Nickel	7.6	14.6	13.9	9.1	9.3 J	10.5	17.7 J	16.3	10.3	11.7	13.6 J	8.7 J	7.9 J	7.7
Potassium	561	1060 J+	1150 J+	754 J+	541 J	818 J+	684 J	1230 J+	858 J+	945 J+	1340 J	613 J	883 J	596 J+
Selenium	0.31 U	0.36 U	0.35 U	0.33 U	0.3 U	0.37 U	0.35 U	0.36 U	0.34 U	0.31 U	0.36 U	0.34 U	0.35 U	0.31 U
Silver	0.6 U	0.7 U	0.69 U	0.64 U	0.58 U	0.72 U	0.68 U	0.7 U	0.66 U	0.61 U	0.71 U	0.67 U	0.68 U	0.61 U
Sodium	30.8 U	49.5 J	35.2 U	32.9 U	29.7 U	36.8 U	34.9 U	45.5 J	45.2 J	35.4 J	36.2 U	34.3 U	34.6 U	31 U
Thallium	0.12 U	0.14 U	0.14 U	0.13 U	0.12 U	0.15 U	0.14 U	0.14 U	0.14 U	0.13 U	0.15 U	0.14 U	0.14 U	0.13 U
Vanadium	5.2	10.6	20.7	6.2	6.2	6.4	10.4	11.7	10	8.5	15.3	6.9	7.5	5
Zinc	33.6	44.3	63.2	29	33.6	38.2	42.4	46.2	35.7	45	39.6	39.6	27.9	30.1
METALS|HEXAVALENT CHROMIUM (mg/kg)														
Chromium, Hexavalent	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PESTICIDES (mg/kg)														
Aldrin	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Alpha Bhc (Alpha Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Alpha Endosulfan	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Beta Bhc (Beta Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Beta Endosulfan	--	--	--	--	--	--	--	--	--	--	--	--	--	--
cis-Chlordane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Delta BHC (Delta Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dieldrin	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endosulfan Sulfate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin Aldehyde	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin Ketone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Gamma Bhc (Lindane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Heptachlor	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Heptachlor Epoxide	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methoxychlor	--	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDD	--	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDT	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Toxaphene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
trans-Chlordane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
POLYCHLORINATED BIPHENYLS (mg/kg)														
PCB-1016 (Aroclor 1016)	0.0095 U	0.011 U	0.01 U	0.0096 U	0.0096 U	0.011 U	0.0099 U	0.01 U	0.01 U	0.0094 U	0.011 U	0.01 U	0.01 U	0.0093 U
PCB-1221 (Aroclor 1221)	0.0095 U	0.011 U	0.01 U	0.0096 U	0.0096 U	0.011 U	0.0099 U	0.01 U	0.01 U	0.0094 U	0.011 U	0.01 U	0.01 U	0.0093 U

Table E-9
Summary of Data Used in Risk Assessment
Central Landfills Area (soil 0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-004	CFSB-005	CFSB-005	CFSB-005	CFSB-006	CFSB-006	CFSB-006	CFSB-007	CFSB-007	CFSB-007	CFSB-008	CFSB-008	CFSB-008-DUP	CFSB-008
Sample Lab IDs	460-114529-3	460-114529-15	460-114529-17	460-114529-12	460-114456-18	460-114456-22	460-114456-16	460-114529-14	460-114529-16	460-114529-18	460-114456-20	460-114456-17	460-114456-19	460-114456-21
Sample Name	CFSB-004-SO-10-12	CFSB-005-SO-0-0.5	CFSB-005-SO-0.5-2	CFSB-005-SO-10-12	CFSB-006-SO-0-0.5	CFSB-006-SO-0.5-2	CFSB-006-SO-10-12	CFSB-007-SO-0-0.5	CFSB-007-SO-0.5-2	CFSB-007-SO-10-12	CFSB-008-SO-0-0.5	CFSB-008-SO-0.5-2	CFSB-DUP4-SO	CFSB-008-SO-10-12
Sample Depth	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	0.5-2 ft	10-12 ft
Chemical	5/25/2016	5/25/2016	5/25/2016	5/25/2016	5/23/2016	5/23/2016	5/23/2016	5/25/2016	5/25/2016	5/25/2016	5/23/2016	5/23/2016	5/23/2016	5/23/2016
PCB-1232 (Aroclor 1232)	0.0095 U	0.011 U	0.01 U	0.0096 U	0.0096 U	0.011 U	0.0099 U	0.01 U	0.01 U	0.0094 U	0.011 U	0.01 U	0.01 U	0.0093 U
PCB-1242 (Aroclor 1242)	0.0095 U	0.011 U	0.01 U	0.0096 U	0.0096 U	0.011 U	0.0099 U	0.01 U	0.01 U	0.0094 U	0.011 U	0.01 U	0.01 U	0.0093 U
PCB-1248 (Aroclor 1248)	0.0095 U	0.011 U	0.01 U	0.0096 U	0.0096 U	0.011 U	0.0099 U	0.01 U	0.01 U	0.0094 U	0.011 U	0.01 U	0.01 U	0.0093 U
PCB-1254 (Aroclor 1254)	0.0098 U	0.011 U	0.01 U	0.0099 U	0.0099 U	0.012 U	0.01 U	0.01 U	0.01 U	0.0097 U	0.011 U	0.011 U	0.011 U	0.0097 U
PCB-1260 (Aroclor 1260)	0.0098 U	0.011 U	0.01 U	0.0099 U	0.0099 U	0.012 U	0.01 U	0.01 U	0.01 U	0.0097 U	0.011 U	0.011 U	0.011 U	0.0097 U
PCB-1262 (Aroclor 1262)	0.0098 U	0.011 U	0.01 U	0.0099 U	0.0099 U	0.012 U	0.01 U	0.01 U	0.01 U	0.0097 U	0.011 U	0.011 U	0.011 U	0.0097 U
PCB-1268 (Aroclor 1268)	0.0098 U	0.011 U	0.01 U	0.0099 U	0.0099 U	0.012 U	0.01 U	0.01 U	0.01 U	0.0097 U	0.011 U	0.011 U	0.011 U	0.0097 U
Polychlorinated Biphenyl (PCBs)	0.0098 U	0.011 U	0.01 U	0.0099 U	0.0099 U	0.012 U	0.01 U	0.01 U	0.01 U	0.0097 U	0.011 U	0.011 U	0.011 U	0.0097 U
SEMIVOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,2,4,5-Tetrachlorobenzene	0.026 U	0.029 U	0.028 U	0.027 U	0.027 U	0.031 U	0.027 U	0.028 U	0.028 U	0.026 U	0.03 U	0.028 U	0.029 U	0.026 U
1,4-Dioxane (P-Dioxane)	0.094 U	0.11 U	0.1 U	0.095 U	0.096 U	0.11 U	0.099 U	0.1 U	0.1 U	0.093 U	0.11 U	0.1 U	0.1 U	0.093 U
2,3,4,6-Tetrachlorophenol	0.033 U	0.037 U	0.035 U	0.034 U	0.034 U	0.039 U	0.035 U	0.035 U	0.035 U	0.033 U	0.038 U	0.036 U	0.036 U	0.033 U
2,4,5-Trichlorophenol	0.035 U	0.039 U	0.037 U	0.035 U	0.036 U	0.041 U	0.037 U	0.037 U	0.037 U	0.035 U	0.04 U	0.038 U	0.038 U	0.035 U
2,4,6-Trichlorophenol	0.01 U	0.011 U	0.011 U	0.01 U	0.01 U	0.012 U	0.01 U	0.011 U	0.011 U	0.0099 U	0.011 U	0.011 U	0.011 U	0.0099 U
2,4-Dichlorophenol	0.0083 U	0.0093 U	0.0088 U	0.0084 U	0.0084 U	0.0098 U	0.0087 U	0.0089 U	0.0089 U	0.0082 U	0.0095 U	0.009 U	0.009 U	0.0082 U
2,4-Dimethylphenol	0.077 U	0.087 U	0.082 U	0.078 U	0.079 U	0.091 U	0.081 U	0.083 U	0.083 U	0.077 U	0.088 U	0.084 U	0.084 U	0.076 U
2,4-Dinitrophenol	0.27 U	0.3 U	0.28 U	0.27 U	0.27 U	0.31 U	0.28 U	0.28 U	0.28 U	0.26 U	0.3 UJ	0.29 U	0.29 U	0.26 U
2,4-Dinitrotoluene	0.014 U	0.016 U	0.015 U	0.014 U	0.014 U	0.016 U	0.015 U	0.015 U	0.015 U	0.014 U	0.016 U	0.015 U	0.015 U	0.014 U
2,6-Dinitrotoluene	0.019 U	0.021 U	0.02 U	0.019 U	0.019 U	0.022 U	0.02 U	0.02 U	0.02 U	0.019 U	0.021 U	0.02 U	0.02 U	0.018 U
2-Chloronaphthalene	0.008 U	0.009 U	0.0085 U	0.0081 U	0.0081 U	0.0094 U	0.0084 U	0.0085 U	0.0085 U	0.0079 U	0.0091 U	0.0086 U	0.0087 U	0.0079 U
2-Chlorophenol	0.0089 U	0.01 U	0.0095 U	0.0091 U	0.0091 U	0.011 U	0.0094 U	0.0096 U	0.0096 U	0.0089 U	0.01 U	0.0097 U	0.0097 U	0.0088 U
2-Methylnaphthalene	0.0078 U	0.0087 U	0.0082 U	0.0079 U	0.0079 U	0.0092 U	0.0081 U	0.0083 U	0.0083 U	0.0077 U	0.0089 U	0.0084 U	0.0085 U	0.0077 U
2-Methylphenol (O-Cresol)	0.015 U	0.017 U	0.016 U	0.016 U	0.016 U	0.018 U	0.016 U	0.016 U	0.016 U	0.015 U	0.017 U	0.017 U	0.017 U	0.015 U
2-Nitroaniline	0.012 U	0.013 U	0.012 U	0.012 U	0.012 U	0.014 U	0.012 U	0.012 U	0.012 U	0.011 U	0.013 U	0.013 U	0.013 U	0.011 U
2-Nitrophenol	0.012 U	0.013 U	0.013 U	0.012 U	0.012 U	0.014 U	0.012 U	0.013 U	0.013 U	0.012 U	0.013 U	0.013 U	0.013 U	0.012 U
3- And 4- Methylphenol (Total)	0.0094 U	0.011 U	0.0099 U	0.0095 U	0.0095 U	0.011 U	0.0098 U	0.01 U	0.01 U	0.0093 U	0.011 U	0.01 U	0.01 U	0.0092 U
3,3'-Dichlorobenzidine	0.039 U	0.044 U	0.042 U	0.04 U	0.04 U	0.046 U	0.041 U	0.042 U	0.042 U	0.039 U	0.045 U	0.042 U	0.043 U	0.039 U
3-Nitroaniline	0.01 U	0.012 U	0.011 U	0.011 U	0.011 U	0.012 U	0.011 U	0.011 U	0.011 U	0.01 U	0.012 U	0.011 U	0.011 U	0.01 U
4,6-Dinitro-2-Methylphenol	0.094 U	0.11 U	0.099 U	0.095 U	0.095 U	0.11 U	0.098 U	0.1 U	0.1 U	0.093 U	0.11 UJ	0.1 U	0.1 U	0.093 U
4-Bromophenyl Phenyl Ether	0.011 U	0.012 U	0.012 U	0.011 U	0.011 U	0.013 U	0.012 U	0.012 U	0.012 U	0.011 U	0.013 U	0.012 U	0.012 U	0.011 U
4-Chloro-3-Methylphenol	0.015 U	0.017 U	0.016 U	0.015 U	0.015 U	0.018 U	0.016 U	0.016 U	0.016 U	0.015 U	0.017 U	0.016 U	0.016 U	0.015 U
4-Chloroaniline	0.0091 U	0.01 U	0.0096 U	0.0092 U	0.0092 U	0.011 U	0.0095 U	0.0097 U	0.0097 U	0.009 U	0.01 U	0.0098 U	0.0099 U	0.0089 U
4-Chlorophenyl Phenyl Ether	0.011 U	0.012 U	0.011 U	0.011 U	0.011 U	0.012 U	0.011 U	0.011 U	0.011 U	0.01 U	0.012 U	0.011 U	0.011 U	0.01 U
4-Nitroaniline	0.013 U	0.015 U	0.014 U	0.013 U	0.014 U	0.016 U	0.014 U	0.014 U	0.014 U	0.013 U	0.015 U	0.014 U	0.014 U	0.013 U
4-Nitrophenol	0.17 U	0.19 U	0.18 U	0.17 U	0.17 U	0.2 U	0.18 U	0.18 U	0.18 U	0.17 U	0.19 U	0.18 U	0.18 U	0.17 U
Acenaphthene	0.026 J	0.025 J	0.009 U	0.0086 U	0.0086 U	0.01 U	0.0089 U	0.029 J	0.064 J	0.0084 U	0.0097 U	0.0092 U	0.0093 U	0.0084 U
Acenaphthylene	0.0091 U	0.01 U	0.0096 U	0.0092 U	0.0092 U	0.011 U	0.0095 U	0.0097 U	0.0097 U	0.009 U	0.01 U	0.0098 U	0.0099 U	0.0089 U
Acetophenone	0.0077 U	0.0086 U	0.0081 U	0.0078 U	0.0078 U	0.009 U	0.008 U	0.0082 U	0.0082 U	0.0076 U	0.0087 U	0.0083 U	0.0084 U	0.0076 U
Anthracene	0.089 J	0.042 J	0.035 U	0.034 U	0.034 U	0.039 U	0.035 U	0.093 J	0.14 J	0.033 U	0.038 U	0.036 U	0.036 U	0.033 U
Atrazine	0.016 U	0.018 U	0.017 U	0.016 U	0.016 U	0.018 U	0.016 U	0.017 U	0.017 U	0.015 U	0.018 U	0.017 U	0.017 U	0.015 U
Benzaldehyde	0.027 U	0.03 U	0.028 U	0.027 U	0.027 U	0.032 U	0.028 U	0.029 U	0.029 U	0.027 U	0.031 UJ	0.029 U	0.029 U	0.026 U
Benzo(A)Anthracene	0.21	0.19	0.036 J	0.03 U	0.03 U	0.051	0.031 U	0.41	0.27	0.029 U	0.034 U	0.07 J	0.032 UJ	0.029 U
Benzo(A)Pyrene	0.14	0.23	0.04	0.011 U	0.011 U	0.055	0.011 U	0.44	0.27	0.011 U	0.012 U	0.1 J	0.012 UJ	0.01 U
Benzo(B)Fluoranthene	0.26	0.36	0.064	0.019 J	0.015 J	0.1	0.014 U	0.84	0.34	0.014 U	0.016 U	0.15 J	0.015 UJ	0.014 U
Benzo(G,H,I)Perylene	0.13 J	0.21 J	0.033 J	0.02 U	0.021 U	0.058 J	0.021 U	0.48	0.15 J	0.02 U	0.023 U	0.1 J	0.022 UJ	0.02 U
Benzo(K)Fluoranthene	0.12	0.15	0.023 J	0.016 U	0.016 U	0.037 J	0.016 U	0.34	0.16	0.015 U	0.017 U	0.062 J	0.017 UJ	0.015 U
Benzyl Butyl Phthalate	0.011 U	0.012 U	0.011 U	0.011 U	0.011 U	0.013 U	0.011 U	0.012 U	0.012 U	0.011 U	0.012 U	0.012 U	0.012 U	0.011 U
Biphenyl (Diphenyl)	0.03 U	0.034 U	0.032 U	0.03 U	0.03 U	0.035 U	0.031 U	0.032 U	0.032 U	0.03 U	0.034 U	0.032 U	0.033 U	0.03 U
Bis(2-Chloroethoxy) Methane	0.011 U	0.012 U	0.012 U	0.011 U	0.011 U	0.013 U	0.011 U	0.012 U	0.012 U	0.011 U	0.013 U	0.012 U	0.012 U	0.011 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.0083 U	0.0093 U	0.0088 U	0.0084 U	0.0084 U	0.0098 U	0.0087 U	0.0089 U	0.0089 U	0.0082 U	0.0095 U	0.009 U	0.009 U	0.0082 U
Bis(2-Chloroisopropyl) Ether	0.014 U	0.016 U	0.015 U	0.015 U	0.015 U	0.017 U	0.015 U	0.015 U	0.015 U	0.014 U	0.017 U	0.016 U	0.016 U	0.014 U
Bis(2-Ethylhexyl) Phthalate	0.014 U	0.015 U	0.015 U	0.047 J	0.051 J	0.016 U	0.014 U	0.015 U	0.015 U	0.014 U	0.016 U	0.025 J	0.015 U	0.014 U
Caprolactam	0.025 U	0.028 U	0.027 U	0.026 U	0.026 U	0.03 U	0.027 U	0.027 U	0.027 U	0.025 U	0.029 UJ	0.027 U	0.028 U	0.025 U
Carbazole	0.062 J	0.033 J	0.0092 U	0.0088 U	0.0089 U	0.01 U	0.0091 U	0.061 J	0.089 J	0.0086 U	0.01 U	0.0097 J	0.0095 U	0.0086 U
Chrysene	0.24 J	0.26 J	0.05 J	0.013 J	0.011 J	0.069 J	0.01 J	1.3	0.3 J	0.0095 U	0.011 J	0.11 J	0.01 UJ	0.0094 U
Dibenz(A,H)Anthracene	0.037 J+	0.043	0.019 U	0.019 U	0.019 U	0.022 U	0.019 U	0.13	0.05	0.018 U	0.021 U	0.027 J	0.02 U	0.018 U
Dibenzofuran	0.022 J	0.012 U	0.011 U	0.011 U	0.011 U	0.013 U	0.011 U	0.011 U	0.029 J	0.011 U	0.012 U	0.012 U	0.012 U	0.01 U

Table E-9
Summary of Data Used in Risk Assessment
Central Landfills Area (soil 0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-004	CFSB-005	CFSB-005	CFSB-005	CFSB-006	CFSB-006	CFSB-006	CFSB-007	CFSB-007	CFSB-007	CFSB-008	CFSB-008	CFSB-008-DUP	CFSB-008
Sample Lab IDs	460-114529-3	460-114529-15	460-114529-17	460-114529-12	460-114456-18	460-114456-22	460-114456-16	460-114529-14	460-114529-16	460-114529-18	460-114456-20	460-114456-17	460-114456-19	460-114456-21
Sample Name	CFSB-004-SO-10-12	CFSB-005-SO-0-0.5	CFSB-005-SO-0.5-2	CFSB-005-SO-10-12	CFSB-006-SO-0-0.5	CFSB-006-SO-0.5-2	CFSB-006-SO-10-12	CFSB-007-SO-0-0.5	CFSB-007-SO-0.5-2	CFSB-007-SO-10-12	CFSB-008-SO-0-0.5	CFSB-008-SO-0.5-2	CFSB-DUP4-SO	CFSB-008-SO-10-12
Sample Depth	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	0.5-2 ft	10-12 ft
Chemical	5/25/2016	5/25/2016	5/25/2016	5/25/2016	5/23/2016	5/23/2016	5/23/2016	5/25/2016	5/25/2016	5/25/2016	5/23/2016	5/23/2016	5/23/2016	5/23/2016
Diethyl Phthalate	0.01 U	0.011 U	0.011 U	0.01 U	0.01 U	0.012 U	0.01 U	0.011 U	0.011 U	0.0099 U	0.011 U	0.011 U	0.011 U	0.0099 U
Dimethyl Phthalate	0.01 U	0.011 U	0.011 U	0.01 U	0.01 U	0.012 U	0.011 U	0.011 U	0.011 U	0.01 U	0.012 U	0.011 U	0.011 U	0.01 U
Di-N-Butyl Phthalate	0.011 U	0.012 U	0.011 U	0.011 U	0.017 J	0.012 U	0.011 U	0.011 U	0.011 U	0.01 U	0.012 U	0.011 U	0.011 U	0.01 U
Di-N-Octylphthalate	0.018 U	0.02 U	0.019 U	0.018 U	0.018 U	0.021 U	0.019 U	0.019 U	0.019 U	0.018 U	0.02 U	0.019 U	0.019 U	0.018 U
Fluoranthene	0.5	0.34 J	0.055 J	0.014 J	0.014 J	0.081 J	0.011 U	0.75	0.59	0.01 U	0.012 U	0.14 J	0.011 UJ	0.01 U
Fluorene	0.042 J	0.02 J	0.0081 U	0.0078 U	0.0078 U	0.009 U	0.008 U	0.02 J	0.063 J	0.0076 U	0.0087 U	0.0083 U	0.0084 U	0.0076 U
Hexachlorobenzene	0.014 U	0.016 U	0.015 U	0.014 U	0.014 U	0.017 U	0.015 U	0.015 U	0.015 U	0.014 U	0.016 U	0.015 U	0.016 U	0.014 U
Hexachlorobutadiene	0.0099 U	0.011 U	0.01 U	0.01 U	0.01 U	0.012 U	0.01 U	0.011 U	0.011 U	0.0098 U	0.011 U	0.011 U	0.011 U	0.0098 U
Hexachlorocyclopentadiene	0.022 UJ	0.025 U	0.023 U	0.022 U	0.022 UJ	0.026 UJ	0.023 UJ	0.023 U	0.023 U	0.022 U	0.025 UJ	0.024 UJ	0.024 UJ	0.022 UJ
Hexachloroethane	0.013 U	0.014 U	0.014 U	0.013 U	0.013 U	0.015 U	0.013 U	0.014 U	0.014 U	0.013 U	0.015 U	0.014 U	0.014 U	0.013 U
Indeno(1,2,3-C,D)Pyrene	0.15 J+	0.2	0.03 J	0.024 U	0.024 U	0.058 J+	0.025 U	0.42	0.16	0.023 U	0.027 U	0.11 J	0.026 UJ	0.023 U
Isophorone	0.0076 U	0.0085 U	0.008 U	0.0077 U	0.0077 U	0.012 J	0.0079 U	0.25	0.0081 U	0.0075 U	0.0086 U	0.0082 U	0.0082 U	0.0075 U
Naphthalene	0.0089 U	0.01 U	0.0095 U	0.0091 U	0.0091 U	0.011 U	0.0094 U	0.0097 J	0.0096 U	0.0089 U	0.01 U	0.0097 U	0.0097 U	0.0088 U
Nitrobenzene	0.011 U	0.012 U	0.012 U	0.011 U	0.011 U	0.013 U	0.012 U	0.012 U	0.012 U	0.011 U	0.013 U	0.012 U	0.012 U	0.011 U
N-Nitrosodi-N-Propylamine	0.012 U	0.013 U	0.013 U	0.012 U	0.012 U	0.014 U	0.012 U	0.013 U	0.013 U	0.012 U	0.013 U	0.013 U	0.013 U	0.012 U
N-Nitrosodiphenylamine	0.032 U	0.036 U	0.034 U	0.032 U	0.032 U	0.038 U	0.033 U	0.034 U	0.034 U	0.032 U	0.036 U	0.035 U	0.035 U	0.031 U
Pentachlorophenol	0.043 U	0.048 U	0.045 U	0.043 U	0.043 U	0.05 U	0.045 U	0.046 U	0.046 U	0.042 U	0.049 UJ	0.046 U	0.046 U	0.042 U
Phenanthrene	0.49	0.21 J	0.032 J	0.013 J	0.018 J	0.037 J	0.0098 U	0.36 J	0.56	0.0093 U	0.011 U	0.057 J	0.01 UJ	0.0092 U
Phenol	0.012 U	0.013 U	0.012 U	0.012 U	0.012 U	0.014 U	0.012 U	0.012 U	0.012 U	0.011 U	0.013 U	0.012 U	0.013 U	0.011 U
Pyrene	0.44	0.36 J	0.054 J	0.016 U	0.016 U	0.084 J	0.017 U	0.8	0.53	0.016 U	0.018 U	0.12 J	0.017 UJ	0.016 U
VOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,1,1-Trichloroethane	0.00038 U	--	0.00032 U	0.00032 U	--	0.00038 U	0.00036 U	--	0.0003 U	0.00031 U	--	0.0003 U	0.00034 U	0.00046 U
1,1,2,2-Tetrachloroethane	0.00017 U	--	0.00014 U	0.00014 U	--	0.00017 U	0.00016 U	--	0.00014 U	0.00014 U	--	0.00013 U	0.00015 U	0.00021 U
1,1,2-Trichloro-1,2,2-Trifluoroethane	0.00044 U	--	0.00037 U	0.00037 UJ	--	0.00043 U	0.00042 U	--	0.00035 U	0.00036 U	--	0.00035 U	0.0004 U	0.00054 U
1,1,2-Trichloroethane	0.00028 U	--	0.00024 U	0.00024 U	--	0.00028 U	0.00027 U	--	0.00022 U	0.00023 U	--	0.00022 U	0.00025 U	0.00034 U
1,1-Dichloroethane	0.00034 U	--	0.00029 U	0.00029 U	--	0.00034 U	0.00032 U	--	0.00027 U	0.00028 U	--	0.00027 U	0.00031 U	0.00041 U
1,1-Dichloroethene	0.00041 U	--	0.00035 U	0.00035 U	--	0.00041 U	0.00039 U	--	0.00033 U	0.00034 U	--	0.00032 U	0.00037 U	0.0005 U
1,2,3-Trichlorobenzene	0.00011 U	--	0.000093 U	0.000093 U	--	0.00011 U	0.0001 U	--	0.000087 U	0.00009 U	--	0.000087 U	0.000099 U	0.00013 U
1,2,4-Trichlorobenzene	0.00032 U	--	0.00027 U	0.00027 U	--	0.00032 U	0.0003 U	--	0.00025 U	0.00026 U	--	0.00025 U	0.00029 U	0.00039 U
1,2-Dibromo-3-Chloropropane	0.00047 U	--	0.0004 U	0.0004 U	--	0.00046 U	0.00045 U	--	0.00037 U	0.00038 U	--	0.00037 U	0.00042 U	0.00057 U
1,2-Dibromoethane (Ethylene Dibromide)	0.00012 U	--	0.0001 U	0.0001 U	--	0.00012 U	0.00011 U	--	0.000095 U	0.000098 U	--	0.000094 U	0.00011 U	0.00015 U
1,2-Dichlorobenzene	0.00014 U	--	0.00012 U	0.00012 U	--	0.00014 U	0.00013 U	--	0.00011 U	0.00011 U	--	0.00011 U	0.00013 U	0.00017 U
1,2-Dichloroethane	0.00011 U	--	0.000093 U	0.000093 U	--	0.00011 U	0.0001 U	--	0.000087 U	0.00009 U	--	0.000087 U	0.000099 U	0.00013 U
1,2-Dichloropropane	0.00017 U	--	0.00014 U	0.00014 U	--	0.00017 U	0.00016 U	--	0.00014 U	0.00014 U	--	0.00013 U	0.00015 U	0.00021 U
1,3-Dichlorobenzene	0.00012 U	--	0.0001 U	0.0001 U	--	0.00012 U	0.00011 U	--	0.000095 U	0.000098 U	--	0.000094 U	0.00011 U	0.00015 U
1,4-Dichlorobenzene	0.00013 U	--	0.00011 U	0.00011 U	--	0.00013 U	0.00012 U	--	0.0001 U	0.00011 U	--	0.0001 U	0.00012 U	0.00016 U
2-Hexanone	0.00093 U	--	0.00079 U	0.00079 U	--	0.00093 U	0.0009 U	--	0.00075 U	0.00077 U	--	0.00074 U	0.00085 U	0.0011 U
Acetone	0.0058	--	0.033	0.0071	--	0.031	0.019	--	0.042	0.0034 J	--	0.048	0.045	0.014
Benzene	0.0002 U	--	0.00017 U	0.00024 J	--	0.0002 U	0.00019 U	--	0.00044 J	0.00016 U	--	0.00024 J	0.00051 J	0.00024 U
Bromochloromethane	0.00017 U	--	0.00014 U	0.00014 U	--	0.00017 U	0.00016 U	--	0.00014 U	0.00014 U	--	0.00013 U	0.00015 U	0.00021 U
Bromodichloromethane	0.00038 U	--	0.00032 U	0.00032 U	--	0.00038 U	0.00036 U	--	0.0003 U	0.00031 U	--	0.0003 U	0.00034 U	0.00046 U
Bromoform	0.00013 U	--	0.00011 U	0.00011 U	--	0.00013 U	0.00012 U	--	0.0001 U	0.00011 U	--	0.0001 U	0.00012 U	0.00016 U
Bromomethane	0.00032 UJ	--	0.00027 UJ	0.00027 UJ	--	0.00032 U	0.0003 U	--	0.00025 UJ	0.00026 UJ	--	0.00025 U	0.00029 U	0.00039 U
Carbon Disulfide	0.00043 U	--	0.001	0.00036 U	--	0.00042 U	0.00041 U	--	0.00034 U	0.00035 U	--	0.00034 U	0.00039 U	0.00052 U
Carbon Tetrachloride	0.00043 U	--	0.00036 U	0.00036 U	--	0.00042 U	0.00041 U	--	0.00034 U	0.00035 U	--	0.00034 U	0.00039 U	0.00052 U
Chlorobenzene	0.00014 U	--	0.00012 U	0.00012 U	--	0.00014 U	0.00013 U	--	0.00011 U	0.00011 U	--	0.00011 U	0.00013 U	0.00017 U
Chloroethane	0.00035 UJ	--	0.00029 UJ	0.0003 UJ	--	0.00035 U	0.00033 U	--	0.00028 UJ	0.00029 UJ	--	0.00028 U	0.00032 U	0.00043 U
Chloroform	0.00021 U	--	0.00018 U	0.00018 U	--	0.00021 U	0.0002 U	--	0.00017 U	0.00017 U	--	0.00017 U	0.00019 U	0.00026 U
Chloromethane	0.00038 U	--	0.00032 U	0.00032 U	--	0.00038 U	0.00036 U	--	0.0003 U	0.00031 U	--	0.0003 U	0.00034 U	0.00046 U
Cis-1,2-Dichloroethylene	0.00022 U	--	0.00019 U	0.00019 U	--	0.00022 U	0.00021 U	--	0.00017 U	0.00018 U	--	0.00017 U	0.0002 U	0.00027 U
Cis-1,3-Dichloropropene	0.00015 U	--	0.00013 U	0.00013 U	--	0.00015 U	0.00014 U	--	0.00012 U	0.00012 U	--	0.00012 U	0.00014 U	0.00018 U
Cyclohexane	0.00046 U	--	0.00039 U	0.00039 UJ	--	0.00045 U	0.00044 U	--	0.00037 U	0.00038 U	--	0.00036 U	0.00041 U	0.00056 U
Dibromochloromethane	0.00015 U	--	0.00013 U	0.00013 U	--	0.00015 U	0.00014 U	--	0.00012 U	0.00012 U	--	0.00012 U	0.00014 U	0.00018 U
Dichlorodifluoromethane	0.00032 U	--	0.00027 U	0.00027 UJ	--	0.00032 U	0.0003 U	--	0.00025 U	0.00026 U	--	0.00025 U	0.00029 U	0.00039 U
Ethylbenzene	0.00018 U	--	0.00015 U	0.00015 U	--	0.00018 U	0.00017 U	--	0.00014 U	0.00015 U	--	0.00014 U	0.00016 U	0.00022 U
Isopropylbenzene (Cumene)	0.00017 U	--	0.00014 U	0.00014 U	--	0.00017 U	0.00016 U	--	0.00014 U	0.00014 U	--	0.00013 U	0.00015 U	0.00021 U
M,P-Xylene	0.00011 U	--	0.00014 J	0.000093 U	--	0.00023 J	0.00017 J	--	0.000087 U	0.00009 U	--	0.000087 UJ	0.00017 J	0.00013 U

Table E-9
Summary of Data Used in Risk Assessment
Central Landfills Area (soil 0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-004	CFSB-005	CFSB-005	CFSB-005	CFSB-006	CFSB-006	CFSB-006	CFSB-007	CFSB-007	CFSB-007	CFSB-008	CFSB-008	CFSB-008-DUP	CFSB-008
Sample Lab IDs	460-114529-3	460-114529-15	460-114529-17	460-114529-12	460-114456-18	460-114456-22	460-114456-16	460-114529-14	460-114529-16	460-114529-18	460-114456-20	460-114456-17	460-114456-19	460-114456-21
Sample Name	CFSB-004-SO-10-12	CFSB-005-SO-0-0.5	CFSB-005-SO-0.5-2	CFSB-005-SO-10-12	CFSB-006-SO-0-0.5	CFSB-006-SO-0.5-2	CFSB-006-SO-10-12	CFSB-007-SO-0-0.5	CFSB-007-SO-0.5-2	CFSB-007-SO-10-12	CFSB-008-SO-0-0.5	CFSB-008-SO-0.5-2	CFSB-DUP4-SO	CFSB-008-SO-10-12
Sample Depth	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	0.5-2 ft	10-12 ft
Chemical	5/25/2016	5/25/2016	5/25/2016	5/25/2016	5/23/2016	5/23/2016	5/23/2016	5/25/2016	5/25/2016	5/25/2016	5/23/2016	5/23/2016	5/23/2016	5/23/2016
Methyl Acetate	0.00089 U	--	0.00076 U	0.00076 U	--	0.0031 J	0.00086 U	--	0.00071 U	0.00074 U	--	0.0029 J	0.00081 UJ	0.0011 U
Methyl Ethyl Ketone (2-Butanone)	0.00077 U	--	0.00065 U	0.00065 U	--	0.0015 J	0.00073 U	--	0.00061 U	0.00063 U	--	0.0009 J	0.00069 U	0.00094 U
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	0.0022 U	--	0.0019 U	0.0019 U	--	0.0022 U	0.0021 U	--	0.0018 U	0.0018 U	--	0.0017 U	0.002 U	0.0027 U
Methylcyclohexane	0.0005 U	--	0.00042 U	0.00042 UJ	--	0.00049 U	0.00048 U	--	0.0004 U	0.00041 U	--	0.00039 UJ	0.00078 J	0.00061 U
Methylene Chloride	0.00032 U	--	0.00027 U	0.00027 U	--	0.00032 U	0.0003 U	--	0.00025 U	0.00026 U	--	0.00025 U	0.00029 U	0.00054 J
O-Xylene (1,2-Dimethylbenzene)	0.00016 U	--	0.00013 U	0.00014 U	--	0.00016 U	0.00015 U	--	0.00013 U	0.00013 U	--	0.00013 U	0.00014 U	0.00019 U
Styrene	0.00015 U	--	0.00013 U	0.00013 U	--	0.00015 U	0.00014 U	--	0.00012 U	0.00012 U	--	0.00012 U	0.00014 U	0.00018 U
Tert-Butyl Methyl Ether	0.00017 U	--	0.00014 U	0.00014 U	--	0.00017 U	0.00016 U	--	0.00014 U	0.00014 U	--	0.00013 U	0.00015 U	0.00021 U
Tetrachloroethylene (PCE)	0.00028 U	--	0.00024 U	0.00024 U	--	0.00028 U	0.00027 U	--	0.00022 U	0.00023 U	--	0.00022 U	0.00025 U	0.00034 U
Toluene	0.00025 J	--	0.00034 J	0.00025 J	--	0.0004 J	0.00031 J	--	0.00024 J	0.00016 U	--	0.00072 J	0.00061 J	0.00023 U
Trans-1,2-Dichloroethene	0.00039 U	--	0.00033 U	0.00033 U	--	0.00039 U	0.00037 U	--	0.00031 U	0.00032 U	--	0.00031 U	0.00035 U	0.00047 U
Trans-1,3-Dichloropropene	0.000099 U	--	0.000084 U	0.000084 U	--	0.000099 U	0.000095 U	--	0.000079 U	0.000082 U	--	0.000079 U	0.00009 U	0.00012 U
Trichloroethylene (TCE)	0.00026 U	--	0.00022 U	0.00022 U	--	0.00026 U	0.00025 U	--	0.00021 U	0.00021 U	--	0.0002 U	0.00023 U	0.00032 U
Trichlorofluoromethane	0.00034 U	--	0.00029 U	0.00029 UJ	--	0.00034 U	0.00032 U	--	0.00027 U	0.00028 U	--	0.00027 U	0.00031 U	0.00041 U
Vinyl Chloride	0.00039 U	--	0.00033 U	0.00033 U	--	0.00039 U	0.00037 U	--	0.00031 U	0.00032 U	--	0.00031 U	0.00035 U	0.00047 U

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-9
Summary of Data Used in Risk Assessment
Central Landfills Area (soil 0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-009	CFSB-009	CFSB-009	CFSB-009-DUP	CFSB-021	CFSB-021	CFSB-021	CFSB-022	CFSB-022	CFSB-022	CFSB-029	CFSB-029	CFSB-029	CFSB-033
Sample Lab IDs	460-114456-15	460-114456-13	460-114456-14	460-114456-24	460-114456-12	460-114456-9	460-114456-1	460-114456-6	460-114456-7	460-114456-11	460-114456-4	460-114456-3	460-114456-8	460-114456-5
Sample Name	CFSB-009-SO-0-0.5	CFSB-009-SO-0.5-2	CFSB-009-SO-10-12	CFSB-DUP6-SO	CFSB-021-SO-0-0.5	CFSB-021-SO-0.5-2	CFSB-021-SO-10-12	CFSB-022-SO-0-0.5	CFSB-022-SO-0.5-2	CFSB-022-SO-10-12	CFSB-029-SO-0-0.5	CFSB-029-SO-0.5-2	CFSB-029-SO-10-12	CFSB-033-SO-0-0.5
Sample Depth	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft
Chemical	5/23/2016	5/23/2016	5/23/2016	5/24/2016	5/23/2016	5/23/2016	5/23/2016	5/23/2016	5/23/2016	5/23/2016	5/23/2016	5/23/2016	5/23/2016	5/23/2016
GENERAL CHEMISTRY (mg/kg)														
Fluoride	37.6 J	17.9 J	4.63 J	37.9 J+	89.9 J	81.1 J	16.8 J	28.9 J	24.7 J	25.9 J	62 J	21.7 J	57.1 J	95.8 J
Cyanide	0.078 J	0.018 U	0.14	0.33	0.048 J	0.021 J	0.017 U	0.035 J	0.072 J	0.018 U	0.016 J	0.015 U	0.024 J	0.18
METALS (mg/kg)														
"Chromium, Hexavalent - Estimated"	0.326521	0.214112	0.227494	0.481752	0.299757	0.173966	0.208759	0.206083	0.176642	0.321168	0.254258	0.224818	0.26764	0.256934
"Chromium, Trivalent - Calculated"	--	--	--	--	--	--	--	--	--	--	--	--	--	--
"Chromium, Trivalent - Estimated"	11.8735	7.78589	8.27251	17.5182	10.9002	6.32603	7.59124	7.49392	6.42336	11.6788	9.24574	8.17518	9.73236	9.34307
Aluminum	11400	10400	11000	20000	13600	7000	8230	8720	7510	10100	9790	8220	9140	12500
Antimony	0.43 UJ	0.36 UJ	0.41 UJ	0.47 UJ	0.37 UJ	0.32 UJ	0.35 UJ	0.38 UJ	0.37 UJ	0.31 UJ	0.33 UJ	0.32 UJ	0.48 J-	0.38 UJ
Arsenic	7.1	3.7	3.1	5.2	6.7	2.8	4.3	6.7	4.1	4.1	4	3.8	8.2	4.7
Barium	117	75.7	132	319	72.3	99.9	47.3	91	102	46.7	58	40.7	69.1	55.3
Beryllium	0.55	0.47	0.44	0.85	0.45	0.3 J	0.26 J	0.38	0.36	0.29 J	0.39	0.32	0.32 J	0.43
Cadmium	0.32 U	0.27 U	0.31 U	0.36 U	0.28 U	0.24 U	0.27 U	0.29 U	0.28 U	0.24 U	0.25 U	0.24 U	0.28 U	0.29 U
Calcium	19400	5920	11900	7550 J	1770	87500	78200	18000	27800	29400	30500	23300	69600	36900
Chromium, Total	12.2	8	8.5	18	11.2	6.5	7.8	7.7	6.6	12	9.5	8.4	10	9.6
Cobalt	5.4	4.1	3.8	6.3	5	3.5	3.6	3.9	3.5	4.9	4.7	4.5	6.7	4.8
Copper	14.5	10.1	11.4	24.7 J+	11.6	19.1	13.1	8.8	10.3	7.2	12.7	9.9	15.6	13.3
Iron	14300	11300	11100	16400	16800	9060	11100	14700	9860	13500	13800	11500	16100	12700
Lead	11 J+	8.2 J+	6.4 J+	17.1	9.8 J+	8.4 J+	8.4 J+	19.3 J+	7.8 J+	6.1 J+	7.8 J+	8.7 J+	15.4 J+	10.4 J+
Magnesium	10500	7900	8630	12600	12000	11700	11100	11500	8020	14600	10800	8610	9100	12000
Manganese	337	168	281	333	156	320	283	471	478	455	334	218	425	311
Mercury	0.026	0.015 J	0.024	0.045	0.015 U	0.024	0.015 J	0.035	0.042	0.022	0.018 J	0.012 J	0.033	0.023
Nickel	10.6 J	9.4 J	8.1 J	13.2	12.4 J	7.8 J	7.8 J	8.9 J	7.4 J	9.9 J	11.3 J	9.8 J	12.7 J	20.4 J
Potassium	864 J	643 J	643 J	1270 J+	1010 J	561 J	631 J	1020 J	756 J	759 J	810 J	557 J	580 J	758 J
Selenium	0.4 U	0.34 U	0.38 U	1.2 J	0.34 U	0.3 U	0.33 U	0.35 U	0.35 U	0.29 U	0.31 U	0.3 U	0.34 U	0.43 J
Silver	0.78 U	0.66 U	0.74 U	0.86 U	0.67 U	0.58 U	0.64 U	0.69 U	0.68 U	0.57 U	0.6 U	0.59 U	0.67 U	0.69 U
Sodium	57.7 J	37.7 J	135	81.6 J	34.4 U	33 J	32.7 U	35.4 U	34.6 U	29.3 U	30.5 U	30.1 U	34.2 U	57.9 J
Thallium	0.16 U	0.14 U	0.15 U	0.18 U	0.14 U	0.12 U	0.13 U	0.14 U	0.14 U	0.12 U	0.12 U	0.12 U	0.14 U	0.14 U
Vanadium	9.9	8.1	6.4	13	12.4	5	5.8	7.6	5.7	7.3	8.5	6.4	10.1	11.3
Zinc	44.3	37	34.3	58.6	44.3	29.8	31.3	48.6	34.6	41.8	39.6	30.9	50	42.2
METALS|HEXAVALENT CHROMIUM (mg/kg)														
Chromium, Hexavalent	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PESTICIDES (mg/kg)														
Aldrin	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Alpha Bhc (Alpha Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Alpha Endosulfan	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Beta Bhc (Beta Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Beta Endosulfan	--	--	--	--	--	--	--	--	--	--	--	--	--	--
cis-Chlordane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Delta BHC (Delta Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dieldrin	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endosulfan Sulfate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin Aldehyde	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin Ketone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Gamma Bhc (Lindane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Heptachlor	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Heptachlor Epoxide	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methoxychlor	--	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDD	--	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDT	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Toxaphene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
trans-Chlordane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
POLYCHLORINATED BIPHENYLS (mg/kg)														
PCB-1016 (Aroclor 1016)	0.011 U	0.0099 U	0.012 U	0.013 U	0.011 U	0.0095 U	0.0093 U	0.011 U	0.011 U	0.0094 U	0.0097 U	0.0095 U	0.0098 U	0.0099 U
PCB-1221 (Aroclor 1221)	0.011 U	0.0099 U	0.012 U	0.013 U	0.011 U	0.0095 U	0.0093 U	0.011 U	0.011 U	0.0094 U	0.0097 U	0.0095 U	0.0098 U	0.0099 U

Table E-9
Summary of Data Used in Risk Assessment
Central Landfills Area (soil 0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-009	CFSB-009	CFSB-009	CFSB-009-DUP	CFSB-021	CFSB-021	CFSB-021	CFSB-022	CFSB-022	CFSB-022	CFSB-029	CFSB-029	CFSB-029	CFSB-033
Sample Lab IDs	460-114456-15	460-114456-13	460-114456-14	460-114456-24	460-114456-12	460-114456-9	460-114456-1	460-114456-6	460-114456-7	460-114456-11	460-114456-4	460-114456-3	460-114456-8	460-114456-5
Sample Name	CFSB-009-SO-0-0.5	CFSB-009-SO-0.5-2	CFSB-009-SO-10-12	CFSB-DUP6-SO	CFSB-021-SO-0-0.5	CFSB-021-SO-0.5-2	CFSB-021-SO-10-12	CFSB-022-SO-0-0.5	CFSB-022-SO-0.5-2	CFSB-022-SO-10-12	CFSB-029-SO-0-0.5	CFSB-029-SO-0.5-2	CFSB-029-SO-10-12	CFSB-033-SO-0-0.5
Sample Depth	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft
Chemical	5/23/2016	5/23/2016	5/23/2016	5/24/2016	5/23/2016	5/23/2016	5/23/2016	5/23/2016	5/23/2016	5/23/2016	5/23/2016	5/23/2016	5/23/2016	5/23/2016
PCB-1232 (Aroclor 1232)	0.011 U	0.0099 U	0.012 U	0.013 U	0.011 U	0.0095 U	0.0093 U	0.011 U	0.011 U	0.0094 U	0.0097 U	0.0095 U	0.0098 U	0.0099 U
PCB-1242 (Aroclor 1242)	0.011 U	0.0099 U	0.012 U	0.013 U	0.011 U	0.0095 U	0.0093 U	0.011 U	0.011 U	0.0094 U	0.0097 U	0.0095 U	0.0098 U	0.0099 U
PCB-1248 (Aroclor 1248)	0.011 U	0.0099 U	0.012 U	0.013 U	0.011 U	0.0095 U	0.0093 U	0.011 U	0.011 U	0.0094 U	0.0097 U	0.0095 U	0.0098 U	0.0099 U
PCB-1254 (Aroclor 1254)	0.012 U	0.01 U	0.013 U	0.013 U	0.011 U	0.0099 U	0.0096 U	0.011 U	0.011 U	0.0098 U	0.01 U	0.0098 U	0.01 U	0.01 U
PCB-1260 (Aroclor 1260)	0.012 U	0.01 U	0.013 U	0.013 U	0.011 U	0.0099 U	0.0096 U	0.011 U	0.011 U	0.0098 U	0.01 U	0.0098 U	0.01 U	0.01 U
PCB-1262 (Aroclor 1262)	0.012 U	0.01 U	0.013 U	0.013 U	0.011 U	0.0099 U	0.0096 U	0.011 U	0.011 U	0.0098 U	0.01 U	0.0098 U	0.01 U	0.01 U
PCB-1268 (Aroclor 1268)	0.012 U	0.01 U	0.013 U	0.013 U	0.011 U	0.0099 U	0.0096 U	0.011 U	0.011 U	0.0098 U	0.01 U	0.0098 U	0.01 U	0.01 U
Polychlorinated Biphenyl (PCBs)	0.012 U	0.01 U	0.013 U	0.013 U	0.011 U	0.0099 U	0.0096 U	0.011 U	0.011 U	0.0098 U	0.01 U	0.0098 U	0.01 U	0.01 U
SEMIVOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,2,4,5-Tetrachlorobenzene	0.032 U	0.027 U	0.035 U	0.035 U	0.03 U	0.026 U	0.026 U	0.03 U	0.03 U	0.026 U	0.027 U	0.026 U	0.027 U	0.027 U
1,4-Dioxane (P-Dioxane)	0.11 U	0.099 U	0.12 U	0.13 U	0.11 U	0.095 U	0.092 U	0.11 U	0.11 U	0.094 U	0.096 U	0.094 U	0.097 U	0.099 U
2,3,4,6-Tetrachlorophenol	0.04 U	0.035 U	0.044 U	0.044 U	0.038 U	0.033 U	0.032 U	0.037 U	0.038 U	0.033 U	0.034 U	0.033 U	0.034 U	0.035 U
2,4,5-Trichlorophenol	0.042 U	0.037 U	0.046 U	0.047 U	0.04 U	0.035 U	0.034 U	0.04 U	0.04 U	0.035 U	0.036 U	0.035 U	0.036 U	0.037 U
2,4,6-Trichlorophenol	0.012 U	0.01 U	0.013 U	0.013 U	0.012 U	0.01 U	0.0098 U	0.011 U	0.011 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
2,4-Dichlorophenol	0.01 U	0.0087 U	0.011 U	0.011 U	0.0095 U	0.0084 U	0.0081 U	0.0094 U	0.0095 U	0.0083 U	0.0085 U	0.0083 U	0.0086 U	0.0087 U
2,4-Dimethylphenol	0.093 U	0.081 U	0.1 U	0.1 U	0.089 U	0.078 U	0.076 U	0.088 U	0.088 U	0.077 U	0.079 U	0.077 U	0.08 U	0.081 U
2,4-Dinitrophenol	0.32 U	0.28 U	0.35 U	0.35 U	0.31 U	0.27 U	0.26 U	0.3 U	0.3 U	0.26 U	0.27 U	0.27 U	0.28 U	0.28 U
2,4-Dinitrotoluene	0.017 U	0.015 U	0.018 U	0.019 U	0.016 U	0.014 U	0.014 U	0.016 U	0.016 U	0.014 U	0.014 U	0.014 U	0.014 U	0.015 U
2,6-Dinitrotoluene	0.023 U	0.02 U	0.025 U	0.025 U	0.022 U	0.019 U	0.018 U	0.021 U	0.021 U	0.019 U	0.019 U	0.019 U	0.019 U	0.02 U
2-Chloronaphthalene	0.0096 U	0.0084 U	0.011 U	0.011 U	0.0092 U	0.008 U	0.0078 U	0.009 U	0.0091 U	0.0079 U	0.0082 U	0.008 U	0.0083 U	0.0084 U
2-Chlorophenol	0.011 U	0.0094 U	0.012 U	0.012 U	0.01 U	0.009 U	0.0088 U	0.01 U	0.01 U	0.0089 U	0.0091 U	0.0089 U	0.0093 U	0.0094 U
2-Methylnaphthalene	0.0094 U	0.0081 U	0.01 U	0.01 U	0.021 J	0.0078 U	0.0076 U	0.0088 U	0.0089 U	0.0077 U	0.0079 U	0.009 J	0.008 U	0.0082 U
2-Methylphenol (O-Cresol)	0.018 U	0.016 U	0.02 U	0.02 U	0.018 U	0.015 U	0.015 U	0.017 U	0.017 U	0.015 U	0.016 U	0.015 U	0.016 U	0.016 U
2-Nitroaniline	0.014 U	0.012 U	0.015 U	0.015 U	0.013 U	0.012 U	0.011 U	0.013 U	0.013 U	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U
2-Nitrophenol	0.014 U	0.012 U	0.016 U	0.016 U	0.014 U	0.012 U	0.012 U	0.013 U	0.013 U	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U
3- And 4- Methylphenol (Total)	0.026 J	0.0098 U	0.012 U	0.012 U	0.048 J	0.0094 U	0.0092 U	0.011 U	0.011 U	0.0093 U	0.0096 U	0.012 J	0.0097 U	0.0098 U
3,3'-Dichlorobenzidine	0.047 U	0.041 U	0.052 U	0.052 U	0.045 U	0.04 U	0.039 U	0.044 U	0.045 U	0.039 U	0.04 U	0.039 U	0.041 U	0.041 U
3-Nitroaniline	0.013 U	0.011 U	0.014 U	0.014 U	0.012 U	0.01 U	0.01 U	0.012 U	0.012 U	0.01 U	0.011 U	0.01 U	0.011 U	0.011 U
4,6-Dinitro-2-Methylphenol	0.11 U	0.098 U	0.12 U	0.12 U	0.11 U	0.094 U	0.092 U	0.11 U	0.11 U	0.093 U	0.096 U	0.094 U	0.097 U	0.099 U
4-Bromophenyl Phenyl Ether	0.013 U	0.012 U	0.015 U	0.015 U	0.013 U	0.011 U	0.011 U	0.013 U	0.013 U	0.011 U	0.011 U	0.011 U	0.011 U	0.012 U
4-Chloro-3-Methylphenol	0.018 U	0.016 U	0.02 U	0.02 U	0.017 U	0.015 U	0.015 U	0.017 U	0.017 U	0.015 U	0.015 U	0.015 U	0.016 U	0.016 U
4-Chloroaniline	0.011 U	0.0095 U	0.012 U	0.012 U	0.01 U	0.0091 U	0.0089 U	0.01 U	0.01 U	0.009 U	0.0092 U	0.009 U	0.0094 U	0.0095 U
4-Chlorophenyl Phenyl Ether	0.013 U	0.011 U	0.014 U	0.014 U	0.012 U	0.011 U	0.01 U	0.012 U	0.012 U	0.01 U	0.011 U	0.011 U	0.011 U	0.011 U
4-Nitroaniline	0.016 U	0.014 U	0.018 U	0.018 U	0.015 U	0.013 U	0.013 U	0.015 U	0.015 U	0.013 U	0.014 U	0.013 U	0.014 U	0.014 U
4-Nitrophenol	0.2 U	0.18 U	0.22 U	0.23 U	0.19 U	0.17 U	0.17 U	0.19 U	0.19 U	0.17 U	0.17 U	0.17 U	0.18 U	0.18 U
Acenaphthene	0.01 U	0.0089 U	0.011 U	0.012 J	0.11 J	0.0086 U	0.0084 U	0.053 J	0.018 J	0.011 J	0.021 J	0.041 J	0.0088 U	0.051 J
Acenaphthylene	0.011 U	0.0095 U	0.012 U	0.012 U	0.01 U	0.0091 U	0.0089 U	0.01 U	0.01 U	0.009 U	0.0092 U	0.009 U	0.0094 U	0.0095 U
Acetophenone	0.0092 U	0.008 U	0.01 U	0.01 U	0.0088 U	0.0077 U	0.0075 U	0.0087 U	0.0087 U	0.0076 U	0.0078 U	0.0077 U	0.0079 U	0.008 U
Anthracene	0.04 U	0.035 U	0.044 U	0.044 U	0.16 J	0.034 U	0.033 U	0.075 J	0.038 U	0.033 U	0.039 J	0.072 J	0.035 U	0.084 J
Atrazine	0.019 U	0.016 U	0.021 U	0.021 U	0.018 U	0.016 U	0.015 U	0.018 U	0.018 U	0.016 U	0.016 U	0.016 U	0.016 U	0.016 U
Benzaldehyde	0.032 U	0.028 U	0.035 U	0.036 U	0.037 J	0.027 U	0.026 U	0.03 U	0.031 U	0.027 U	0.027 U	0.027 U	0.028 U	0.028 U
Benzo(A)Anthracene	0.077	0.031 U	0.039 U	0.093 J	0.85	0.081	0.029 U	0.61	0.18	0.13	0.31	0.63	0.12	0.6
Benzo(A)Pyrene	0.095	0.017 J	0.014 U	0.12 J	1.1	0.1	0.01 U	0.8	0.2	0.16	0.39	0.82	0.14	0.7
Benzo(B)Fluoranthene	0.19	0.041	0.018 U	0.24 J	1.8	0.18	0.013 U	1.2	0.33	0.23	0.79	1.5	0.3	1.5
Benzo(G,H,I)Perylene	0.095 J	0.021 U	0.027 U	0.14 J	1.1	0.078 J	0.02 U	0.57	0.14 J	0.098 J	0.48	1.1	0.2 J	0.82
Benzo(K)Fluoranthene	0.018 U	0.016 U	0.02 U	0.084 J	0.018 U	0.071	0.015 U	0.017 U	0.14	0.09	0.016 U	0.51	0.016 U	0.016 U
Benzyl Butyl Phthalate	0.013 U	0.011 U	0.014 U	0.014 U	0.012 U	0.011 U	0.011 U	0.012 U	0.012 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U
Biphenyl (Diphenyl)	0.036 U	0.031 U	0.04 U	0.04 U	0.035 U	0.03 U	0.029 U	0.034 U	0.034 U	0.03 U	0.031 U	0.03 U	0.031 U	0.031 U
Bis(2-Chloroethoxy) Methane	0.013 U	0.011 U	0.014 U	0.015 U	0.013 U	0.011 U	0.011 U	0.012 U	0.013 U	0.011 U	0.011 U	0.011 U	0.011 U	0.012 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.01 U	0.0087 U	0.011 U	0.011 U	0.0095 U	0.0084 U	0.0081 U	0.0094 U	0.0095 U	0.0083 U	0.0085 U	0.0083 U	0.0086 U	0.0087 U
Bis(2-Chloroisopropyl) Ether	0.017 U	0.015 U	0.019 U	0.019 U	0.017 U	0.015 U	0.014 U	0.016 U	0.017 U	0.014 U	0.015 U	0.014 U	0.015 U	0.015 U
Bis(2-Ethylhexyl) Phthalate	0.017 U	0.014 U	0.018 U	0.069 J	0.016 U	0.014 U	0.013 U	0.016 U	0.016 U	0.014 U	0.014 U	0.014 U	0.014 U	0.014 U
Caprolactam	0.031 U	0.027 U	0.033 U	0.034 U	0.029 U	0.025 U	0.025 U	0.029 U	0.029 U	0.025 U	0.026 U	0.025 U	0.026 U	0.027 U
Carbazole	0.012 J	0.0091 U	0.012 U	0.027 J	0.16 J	0.011 J	0.0086 U	0.066 J	0.017 J	0.015 J	0.045 J	0.08 J	0.019 J	0.12 J
Chrysene	0.13 J	0.026 J	0.013 U	0.17 J	1.3	0.13 J	0.0094 U	0.77	0.25 J	0.17 J	0.51	0.93	0.2 J	1
Dibenz(A,H)Anthracene	0.023 J	0.019 U	0.024 U	0.04 J	0.3	0.019 J	0.018 U	0.11	0.038 J	0.027 J	0.12	0.26	0.048	0.23
Dibenzofuran	0.013 U	0.011 U	0.014 U	0.014 U	0.053 J	0.011 U	0.01 U	0.012 U	0.012 U	0.011 U	0.012 J	0.014 J	0.011 U	0.02 J

Table E-9
Summary of Data Used in Risk Assessment
Central Landfills Area (soil 0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-009	CFSB-009	CFSB-009	CFSB-009-DUP	CFSB-021	CFSB-021	CFSB-021	CFSB-022	CFSB-022	CFSB-022	CFSB-029	CFSB-029	CFSB-029	CFSB-033
Sample Lab IDs	460-114456-15	460-114456-13	460-114456-14	460-114456-24	460-114456-12	460-114456-9	460-114456-1	460-114456-6	460-114456-7	460-114456-11	460-114456-4	460-114456-3	460-114456-8	460-114456-5
Sample Name	CFSB-009-SO-0-0.5	CFSB-009-SO-0.5-2	CFSB-009-SO-10-12	CFSB-DUP6-SO	CFSB-021-SO-0-0.5	CFSB-021-SO-0.5-2	CFSB-021-SO-10-12	CFSB-022-SO-0-0.5	CFSB-022-SO-0.5-2	CFSB-022-SO-10-12	CFSB-029-SO-0-0.5	CFSB-029-SO-0.5-2	CFSB-029-SO-10-12	CFSB-033-SO-0-0.5
Sample Depth	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft
Chemical	5/23/2016	5/23/2016	5/23/2016	5/24/2016	5/23/2016	5/23/2016	5/23/2016	5/23/2016	5/23/2016	5/23/2016	5/23/2016	5/23/2016	5/23/2016	5/23/2016
Diethyl Phthalate	0.012 U	0.01 U	0.013 U	0.013 U	0.012 U	0.01 U	0.0098 U	0.011 U	0.011 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Dimethyl Phthalate	0.012 U	0.011 U	0.013 U	0.014 U	0.012 U	0.01 U	0.01 U	0.012 U	0.012 U	0.01 U	0.01 U	0.01 U	0.011 U	0.011 U
Di-N-Butyl Phthalate	0.013 U	0.011 U	0.014 U	0.014 U	0.012 U	0.011 U	0.01 U	0.012 U	0.012 U	0.01 U	0.011 U	0.011 U	0.011 U	0.056 J
Di-N-Octylphthalate	0.022 U	0.61	0.024 U	0.024 U	0.021 U	0.018 U	0.018 U	0.02 U	0.02 U	0.018 U	0.018 U	0.018 U	0.019 U	0.019 U
Fluoranthene	0.13 J	0.023 J	0.014 U	0.18 J	1.5	0.14 J	0.01 U	0.98	0.38 J	0.23 J	0.48	0.87	0.18 J	1.1
Fluorene	0.0092 U	0.008 U	0.01 U	0.01 U	0.087 J	0.0077 U	0.0075 U	0.023 J	0.012 J	0.0076 U	0.016 J	0.024 J	0.0079 U	0.031 J
Hexachlorobenzene	0.017 U	0.015 U	0.019 U	0.019 U	0.016 U	0.014 U	0.014 U	0.016 U	0.016 U	0.014 U	0.015 U	0.014 U	0.015 U	0.015 U
Hexachlorobutadiene	0.012 U	0.01 U	0.013 U	0.013 U	0.011 U	0.01 U	0.0097 U	0.011 U	0.011 U	0.0098 U	0.01 U	0.0099 U	0.01 U	0.01 U
Hexachlorocyclopentadiene	0.026 U	0.023 U	0.029 U	0.029 UJ	0.025 U	0.022 U	0.022 U	0.025 U	0.025 U	0.022 U	0.022 U	0.022 U	0.023 U	0.023 U
Hexachloroethane	0.016 U	0.013 U	0.017 U	0.017 U	0.015 U	0.013 U	0.013 U	0.015 U	0.015 U	0.013 U	0.013 U	0.013 U	0.013 U	0.014 U
Indeno(1,2,3-C,D)Pyrene	0.092	0.025 U	0.031 U	0.14 J	1.1	0.078	0.023 U	0.52	0.14	0.093	0.44	0.98	0.18	0.82
Isophorone	0.048 J	0.017 J	0.01 U	0.011 J	0.072 J	0.019 J	0.0074 U	0.0086 U	0.024 J	0.013 J	0.034 J	0.11 J	0.093 J	0.036 J
Naphthalene	0.011 U	0.0094 U	0.012 U	0.012 U	0.051 J	0.009 U	0.0088 U	0.01 U	0.01 U	0.0089 U	0.011 J	0.01 J	0.0093 U	0.011 J
Nitrobenzene	0.013 U	0.012 U	0.015 U	0.015 U	0.013 U	0.011 U	0.011 U	0.013 U	0.013 U	0.011 U	0.011 U	0.011 U	0.011 U	0.012 U
N-Nitrosodi-N-Propylamine	0.014 U	0.012 U	0.016 U	0.016 U	0.014 U	0.012 U	0.012 U	0.013 U	0.013 U	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U
N-Nitrosodiphenylamine	0.038 U	0.033 U	0.042 U	0.042 U	0.037 U	0.032 U	0.031 U	0.036 U	0.036 U	0.032 U	0.033 U	0.032 U	0.033 U	0.034 U
Pentachlorophenol	0.051 U	0.045 U	0.056 U	0.057 U	0.049 U	0.043 U	0.042 U	0.048 U	0.049 U	0.042 U	0.043 U	0.043 U	0.044 U	0.045 U
Phenanthrene	0.068 J	0.013 J	0.012 U	0.12 J	0.89	0.078 J	0.0092 U	0.37 J	0.15 J	0.1 J	0.26 J	0.37	0.11 J	0.48
Phenol	0.014 U	0.012 U	0.015 U	0.015 U	0.013 U	0.012 U	0.011 U	0.013 U	0.013 U	0.011 U	0.012 U	0.011 U	0.012 U	0.012 U
Pyrene	0.15 J	0.027 J	0.021 U	0.17 J	1.7	0.17 J	0.016 U	1.1	0.46	0.26 J	0.59	0.92	0.25 J	1.3
VOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,1,1-Trichloroethane	--	0.00029 U	0.00043 U	--	--	0.00042 U	0.00024 U	--	0.00034 U	0.00024 U	--	0.00031 U	0.00048 U	--
1,1,2,2-Tetrachloroethane	--	0.00013 U	0.00019 U	--	--	0.00019 U	0.00011 U	--	0.00015 U	0.00011 U	--	0.00014 U	0.00022 U	--
1,1,2-Trichloro-1,2,2-Trifluoroethane	--	0.00034 U	0.0005 U	--	--	0.00048 U	0.00027 U	--	0.0004 U	0.00028 U	--	0.00036 U	0.00056 U	--
1,1,2-Trichloroethane	--	0.00022 U	0.00032 U	--	--	0.00031 U	0.00017 U	--	0.00025 U	0.00018 U	--	0.00023 U	0.00036 U	--
1,1-Dichloroethane	--	0.00026 U	0.00038 U	--	--	0.00037 U	0.00021 U	--	0.00031 U	0.00022 U	--	0.00028 U	0.00043 U	--
1,1-Dichloroethene	--	0.00032 U	0.00046 U	--	--	0.00045 U	0.00026 U	--	0.00037 U	0.00026 U	--	0.00033 U	0.00052 U	--
1,2,3-Trichlorobenzene	--	0.000085 U	0.00012 U	--	--	0.00012 U	0.000069 U	--	0.0001 U	0.00007 U	--	0.00009 U	0.00014 U	--
1,2,4-Trichlorobenzene	--	0.00025 U	0.00036 U	--	--	0.00035 U	0.0002 U	--	0.00029 U	0.0002 U	--	0.00026 U	0.00041 U	--
1,2-Dibromo-3-Chloropropane	--	0.00036 U	0.00053 U	--	--	0.00052 U	0.00029 U	--	0.00043 U	0.0003 U	--	0.00038 U	0.0006 U	--
1,2-Dibromoethane (Ethylene Dibromide)	--	0.000093 U	0.00014 U	--	--	0.00013 U	0.000075 U	--	0.00011 U	0.000076 U	--	0.000098 U	0.00015 U	--
1,2-Dichlorobenzene	--	0.00011 U	0.00016 U	--	--	0.00015 U	0.000087 U	--	0.00013 U	0.000089 U	--	0.00011 U	0.00018 U	--
1,2-Dichloroethane	--	0.000085 U	0.00012 U	--	--	0.00012 U	0.000069 U	--	0.0001 U	0.00007 U	--	0.00009 U	0.00014 U	--
1,2-Dichloropropane	--	0.00013 U	0.00019 U	--	--	0.00019 U	0.00011 U	--	0.00015 U	0.00011 U	--	0.00014 U	0.00022 U	--
1,3-Dichlorobenzene	--	0.000093 U	0.00014 U	--	--	0.00013 U	0.000075 U	--	0.00011 U	0.000076 U	--	0.000098 U	0.00015 U	--
1,4-Dichlorobenzene	--	0.0001 U	0.00015 U	--	--	0.00014 U	0.000081 U	--	0.00012 U	0.000083 U	--	0.00011 U	0.00017 U	--
2-Hexanone	--	0.00073 U	0.0011 U	--	--	0.001 U	0.00059 U	--	0.00085 U	0.0006 U	--	0.00077 U	0.0012 U	--
Acetone	--	0.022	0.031	--	--	0.022	0.0065	--	0.023	0.0059	--	0.012	0.028	--
Benzene	--	0.00016 U	0.00047 J	--	--	0.00022 U	0.00012 U	--	0.00018 U	0.00013 U	--	0.00017 J	0.00079 J	--
Bromochloromethane	--	0.00013 U	0.00019 U	--	--	0.00019 U	0.00011 U	--	0.00015 U	0.00011 U	--	0.00014 U	0.00022 U	--
Bromodichloromethane	--	0.00029 U	0.00043 U	--	--	0.00042 U	0.00024 U	--	0.00034 U	0.00024 U	--	0.00031 U	0.00048 U	--
Bromoform	--	0.0001 U	0.00015 U	--	--	0.00014 U	0.000081 U	--	0.00012 U	0.000083 U	--	0.00011 U	0.00017 U	--
Bromomethane	--	0.00025 U	0.00036 U	--	--	0.00035 U	0.0002 U	--	0.00029 U	0.0002 U	--	0.00026 U	0.00041 U	--
Carbon Disulfide	--	0.00033 U	0.00048 U	--	--	0.00047 U	0.00027 U	--	0.00039 U	0.00027 U	--	0.0018	0.00055 U	--
Carbon Tetrachloride	--	0.00033 U	0.00048 U	--	--	0.00047 U	0.00027 U	--	0.00039 U	0.00027 U	--	0.00035 U	0.00055 U	--
Chlorobenzene	--	0.00011 U	0.00016 U	--	--	0.00015 U	0.000087 U	--	0.00013 U	0.000089 U	--	0.00011 U	0.00018 U	--
Chloroethane	--	0.00027 U	0.00039 U	--	--	0.00039 U	0.00022 U	--	0.00032 U	0.00022 U	--	0.00029 U	0.00045 U	--
Chloroform	--	0.00016 U	0.00024 U	--	--	0.00023 U	0.00013 U	--	0.00019 U	0.00013 U	--	0.00017 U	0.00027 U	--
Chloromethane	--	0.00029 U	0.00043 U	--	--	0.00042 U	0.00024 U	--	0.00034 U	0.00024 U	--	0.00031 U	0.00048 U	--
Cis-1,2-Dichloroethylene	--	0.00017 U	0.00025 U	--	--	0.00024 U	0.00014 U	--	0.0002 U	0.00014 U	--	0.00018 U	0.00028 U	--
Cis-1,3-Dichloropropene	--	0.00012 U	0.00017 U	--	--	0.00017 U	0.000093 U	--	0.00014 U	0.000095 U	--	0.00012 U	0.00019 U	--
Cyclohexane	--	0.00036 U	0.00052 U	--	--	0.00051 U	0.00029 U	--	0.00042 U	0.00029 U	--	0.00038 U	0.00059 U	--
Dibromochloromethane	--	0.00012 U	0.00017 U	--	--	0.00017 U	0.000093 U	--	0.00014 U	0.000095 U	--	0.00012 U	0.00019 U	--
Dichlorodifluoromethane	--	0.00025 U	0.00036 U	--	--	0.00035 U	0.0002 U	--	0.00029 U	0.0002 U	--	0.00026 U	0.00041 U	--
Ethylbenzene	--	0.00014 U	0.0002 U	--	--	0.0002 U	0.00011 U	--	0.00016 U	0.00011 U	--	0.00015 U	0.00023 U	--
Isopropylbenzene (Cumene)	--	0.00013 U	0.00019 U	--	--	0.00019 U	0.00011 U	--	0.00015 U	0.00011 U	--	0.00014 U	0.00022 U	--
M,P-Xylene	--	0.000085 U	0.00012 U	--	--	0.00012 U	0.000069 U	--	0.0001 U	0.00007 U	--	0.00033 J	0.00014 U	--

Table E-9
Summary of Data Used in Risk Assessment
Central Landfills Area (soil 0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-009	CFSB-009	CFSB-009	CFSB-009-DUP	CFSB-021	CFSB-021	CFSB-021	CFSB-022	CFSB-022	CFSB-022	CFSB-029	CFSB-029	CFSB-029	CFSB-033
Sample Lab IDs	460-114456-15	460-114456-13	460-114456-14	460-114456-24	460-114456-12	460-114456-9	460-114456-1	460-114456-6	460-114456-7	460-114456-11	460-114456-4	460-114456-3	460-114456-8	460-114456-5
Sample Name	CFSB-009-SO-0-0.5	CFSB-009-SO-0.5-2	CFSB-009-SO-10-12	CFSB-DUP6-SO	CFSB-021-SO-0-0.5	CFSB-021-SO-0.5-2	CFSB-021-SO-10-12	CFSB-022-SO-0-0.5	CFSB-022-SO-0.5-2	CFSB-022-SO-10-12	CFSB-029-SO-0-0.5	CFSB-029-SO-0.5-2	CFSB-029-SO-10-12	CFSB-033-SO-0-0.5
Sample Depth	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft
Chemical	5/23/2016	5/23/2016	5/23/2016	5/24/2016	5/23/2016	5/23/2016	5/23/2016	5/23/2016	5/23/2016	5/23/2016	5/23/2016	5/23/2016	5/23/2016	5/23/2016
Methyl Acetate	--	0.0028 J	0.001 U	--	--	0.00099 U	0.00056 U	--	0.013	0.00057 U	--	0.011	0.0011 U	--
Methyl Ethyl Ketone (2-Butanone)	--	0.0006 U	0.0023 J	--	--	0.00085 U	0.00048 U	--	0.0007 U	0.00049 U	--	0.00063 U	0.00098 U	--
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	--	0.0017 U	0.0025 U	--	--	0.0024 U	0.0014 U	--	0.002 U	0.0014 U	--	0.0018 U	0.0028 U	--
Methylcyclohexane	--	0.00039 U	0.00056 U	--	--	0.00055 U	0.00031 U	--	0.00045 U	0.00032 U	--	0.00041 U	0.00064 U	--
Methylene Chloride	--	0.00025 U	0.00036 U	--	--	0.00035 U	0.0002 U	--	0.00029 U	0.0002 U	--	0.00026 U	0.00041 U	--
O-Xylene (1,2-Dimethylbenzene)	--	0.00012 U	0.00018 U	--	--	0.00018 U	0.0001 U	--	0.00014 U	0.0001 U	--	0.00013 U	0.0002 U	--
Styrene	--	0.00012 U	0.00017 U	--	--	0.00017 U	0.000093 U	--	0.00014 U	0.000095 U	--	0.00012 U	0.00019 U	--
Tert-Butyl Methyl Ether	--	0.00013 U	0.00019 U	--	--	0.00019 U	0.00011 U	--	0.00015 U	0.00011 U	--	0.00014 U	0.00022 U	--
Tetrachloroethylene (PCE)	--	0.00022 U	0.00032 U	--	--	0.00031 U	0.00017 U	--	0.00025 U	0.00018 U	--	0.00023 U	0.00036 U	--
Toluene	--	0.0003 J	0.00031 J	--	--	0.00021 U	0.00012 U	--	0.00017 U	0.00012 U	--	0.00042 J	0.00055 J	--
Trans-1,2-Dichloroethene	--	0.0003 U	0.00044 U	--	--	0.00043 U	0.00024 U	--	0.00035 U	0.00025 U	--	0.00032 U	0.0005 U	--
Trans-1,3-Dichloropropene	--	0.000078 U	0.00011 U	--	--	0.00011 U	0.000062 U	--	0.00009 U	0.000063 U	--	0.000082 U	0.00013 U	--
Trichloroethylene (TCE)	--	0.0002 U	0.00029 U	--	--	0.00029 U	0.00016 U	--	0.00024 U	0.00017 U	--	0.00021 U	0.00033 U	--
Trichlorofluoromethane	--	0.00026 U	0.00038 U	--	--	0.00037 U	0.00021 U	--	0.00031 U	0.00022 U	--	0.00028 U	0.00043 U	--
Vinyl Chloride	--	0.0003 U	0.00044 U	--	--	0.00043 U	0.00024 U	--	0.00035 U	0.00025 U	--	0.00032 U	0.0005 U	--

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-9
Summary of Data Used in Risk Assessment
Central Landfills Area (soil 0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-033	CFSB-033	CFSB-034	CFSB-034	CFSB-034	CFSB-035	CFSB-035	CFSB-035	CFSB-036	CFSB-036	CFSB-036	CFSB-037	CFSB-037	CFSB-037
Sample Lab IDs	460-114456-10	460-114456-2	460-114793-52	460-114793-51	460-114793-55	460-114793-45	460-114793-46	460-114793-57	460-114793-48	460-114793-53	460-114793-50	460-114793-49	460-114793-54	460-114793-47
Sample Name	CFSB-033-SO-0.5-2	CFSB-033-SO-10-12	CFSB-034-SO-0-0.5	CFSB-034-SO-0.5-2	CFSB-034-SO-10-12	CFSB-035-SO-0-0.5	CFSB-035-SO-0.5-2	CFSB-035-SO-10-12	CFSB-036-SO-0-0.5	CFSB-036-SO-0.5-2	CFSB-036-SO-10-12	CFSB-037-SO-0-0.5	CFSB-037-SO-0.5-2	CFSB-037-SO-10-12
Sample Depth	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft
Chemical	5/23/2016	5/23/2016	5/31/2016	5/31/2016	5/31/2016	5/31/2016	5/31/2016	5/31/2016	5/31/2016	5/31/2016	5/31/2016	5/31/2016	5/31/2016	5/31/2016
GENERAL CHEMISTRY (mg/kg)														
Fluoride	75.3 J	12.4 J	210 J-	20.4 J	32.9 J	180 J	116 J	35.2 J	86.8 J	104 J-	28.3 J	19.4 J	15.5 J	5.64 J
Cyanide	0.85	0.045 J	0.097 J	0.02 J	0.049 J	0.2	0.051 J	0.057 J	0.05 J	0.024 J	0.018 U	0.026 J	0.029 J	0.023 J
METALS (mg/kg)														
"Chromium, Hexavalent - Estimated"	0.275669	0.264964	0.251582	0.232847	0.219465	0.36399	0.289051	0.342579	2.26959	0.26764	0.17129	0.264964	0.291727	0.243552
"Chromium, Trivalent - Calculated"	--	--	--	--	--	--	--	--	--	--	--	--	--	--
"Chromium, Trivalent - Estimated"	10.0243	9.63504	9.14842	8.46715	7.98054	13.236	10.5109	12.4574	82.5304	9.73236	6.22871	9.63504	10.6083	8.85645
Aluminum	12100	8210	14800	9920	6860	10800	10900	16000	9820	8750	6870	12100	9600	9700
Antimony	0.37 UJ	0.35 UJ	0.49 UJ	0.46 UJ	0.48 UJ	0.45 U	0.41 UJ	0.44 UJ	0.57 J	0.43 UJ	0.49 UJ	0.43 UJ	0.4 UJ	0.43 UJ
Arsenic	6	5.6	3.7	4.7	5.3	6.2	4.2	4.2	6.2	3.9	4.4	5.5	4.8	4.9
Barium	82.9	48.3	80.8	89.5	55.6	73.4	67.3	107	76.7	48.3	38.9	89.9	69.3	64.4
Beryllium	0.51	0.31 J	0.47 J	0.4 J	0.27 J	0.42 J	0.41	0.5	0.37 J	0.36 J	0.25 J	0.44	0.38 J	0.31 J
Cadmium	0.28 U	0.26 U	0.37 U	0.35 U	0.36 U	0.34 U	0.31 U	0.33 U	0.33 U	0.32 U	0.37 U	0.33 U	0.31 U	0.33 U
Calcium	18200	60100	22000	17600	59800	13000	13300	7930	22200	26600	45400	23800	26200	24200
Chromium, Total	10.3	9.9	9.4	8.7	8.2	13.6	10.8	12.8	84.8	10	6.4	9.9	10.9	9.1
Cobalt	4.3	4.5	5.1	4.6	4.6	5.1	4.7	5.5	6.8	4.8	4.4	5.2	4.7	4.3
Copper	45.7	7.8	13.9 J	13.4 J	14 J	21.9	19.5 J	16 J	60 J	14.6 J	9.5 J	18.8 J	13.7 J	12.8 J
Iron	14100	14000	13800	13800	11000	17800	16900	16200	37100	12800	10600	16000	13400	12500
Lead	13.7 J+	7.1 J+	17 J	8 J	7.2 J	9.5	7.9 J	9.6 J	21.9 J	9.4 J	10.1 J	16.5 J	10 J	8.7 J
Magnesium	10700	13600	11300	12500	11100	9260	9500	9440	8360	9740	8610	12200	10500	10500
Manganese	323	369	367	366	287	760	446	509	548	334	313	487	348	338
Mercury	0.012 J	0.012 U	0.02	0.02 J	0.027	0.021	0.025	0.034	0.025	0.026	0.021	0.022	0.021	0.016 J
Nickel	18.1 J	11.8 J	19.8 J	9.7 J	9.4 J	41.4	21 J	13.5 J	80.5 J	26.7 J	7.2 J	15.1 J	10.4 J	9 J
Potassium	957 J	653 J	730	925	588	546	878	1710	635	621	574	772	676	615
Selenium	0.35 U	0.32 U	0.46 U	0.43 U	0.45 U	1.1 J	0.62 J	0.41 U	1.2 J	0.49 J	0.46 U	0.4 U	0.38 U	0.41 U
Silver	0.68 U	0.63 U	0.9 U	0.84 U	0.88 U	0.82 U	0.75 U	0.81 U	0.8 U	0.78 U	0.9 U	0.79 U	0.74 U	0.79 U
Sodium	88.3 J	32.3 U	92 J	248	44.8 U	340	508	241	63.9 J	137	45.8 U	40.2 U	42.6 J	42.7 J
Thallium	0.14 U	0.13 U	0.18 U	0.17 U	0.18 U	0.17 U	0.15 U	0.17 U	0.17 U	0.16 U	0.18 U	0.16 U	0.15 U	0.16 U
Vanadium	16.4	7.9	13	9.7	5.1	11.8	10	12.4	18.1	10.9	5.7	11.1	8.4	7.1
Zinc	69.4	38.6	51.5	35	28	28.9	33	44.1	52.5	41.2	26.6	42.4	37.8	32.6
METALS|HEXAVALENT CHROMIUM (mg/kg)														
Chromium, Hexavalent	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PESTICIDES (mg/kg)														
Aldrin	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Alpha Bhc (Alpha Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Alpha Endosulfan	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Beta Bhc (Beta Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Beta Endosulfan	--	--	--	--	--	--	--	--	--	--	--	--	--	--
cis-Chlordane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Delta BHC (Delta Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dieldrin	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endosulfan Sulfate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin Aldehyde	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin Ketone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Gamma Bhc (Lindane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Heptachlor	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Heptachlor Epoxide	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methoxychlor	--	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDD	--	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDT	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Toxaphene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
trans-Chlordane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
POLYCHLORINATED BIPHENYLS (mg/kg)														
PCB-1016 (Aroclor 1016)	0.0097 U	0.0093 U	0.011 U	0.011 U	0.01 U	0.0099 U	0.0098 U	0.01 U	0.011 U	0.01 U	0.011 U	0.01 U	0.0098 U	0.011 U
PCB-1221 (Aroclor 1221)	0.0097 U	0.0093 U	0.011 U	0.011 U	0.01 U	0.0099 U	0.0098 U	0.01 U	0.011 U	0.01 U	0.011 U	0.01 U	0.0098 U	0.011 U

Table E-9
Summary of Data Used in Risk Assessment
Central Landfills Area (soil 0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-033	CFSB-033	CFSB-034	CFSB-034	CFSB-034	CFSB-035	CFSB-035	CFSB-035	CFSB-036	CFSB-036	CFSB-036	CFSB-037	CFSB-037	CFSB-037
Sample Lab IDs	460-114456-10	460-114456-2	460-114793-52	460-114793-51	460-114793-55	460-114793-45	460-114793-46	460-114793-57	460-114793-48	460-114793-53	460-114793-50	460-114793-49	460-114793-54	460-114793-47
Sample Name	CFSB-033-SO-0.5-2	CFSB-033-SO-10-12	CFSB-034-SO-0-0.5	CFSB-034-SO-0.5-2	CFSB-034-SO-10-12	CFSB-035-SO-0-0.5	CFSB-035-SO-0.5-2	CFSB-035-SO-10-12	CFSB-036-SO-0-0.5	CFSB-036-SO-0.5-2	CFSB-036-SO-10-12	CFSB-037-SO-0-0.5	CFSB-037-SO-0.5-2	CFSB-037-SO-10-12
Sample Depth	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft
Chemical	5/23/2016	5/23/2016	5/31/2016	5/31/2016	5/31/2016	5/31/2016	5/31/2016	5/31/2016	5/31/2016	5/31/2016	5/31/2016	5/31/2016	5/31/2016	5/31/2016
PCB-1232 (Aroclor 1232)	0.0097 U	0.0093 U	0.011 U	0.011 U	0.01 U	0.0099 U	0.0098 U	0.01 U	0.011 U	0.01 U	0.011 U	0.01 U	0.0098 U	0.011 U
PCB-1242 (Aroclor 1242)	0.0097 U	0.0093 U	0.011 U	0.011 U	0.01 U	0.0099 U	0.0098 U	0.01 U	0.011 U	0.01 U	0.011 U	0.01 U	0.0098 U	0.011 U
PCB-1248 (Aroclor 1248)	0.0097 U	0.0093 U	0.011 U	0.011 U	0.01 U	0.0099 U	0.0098 U	0.01 U	0.011 U	0.01 U	0.011 U	0.01 U	0.0098 U	0.011 U
PCB-1254 (Aroclor 1254)	0.01 U	0.0096 U	0.011 U	0.011 U	0.011 U	0.01 U	0.01 U	0.01 U	0.011 U	0.01 U	0.011 U	0.01 U	0.01 U	0.011 U
PCB-1260 (Aroclor 1260)	0.01 U	0.0096 U	0.011 U	0.011 U	0.011 U	0.01 U	0.01 U	0.01 U	0.011 U	0.01 U	0.011 U	0.01 U	0.01 U	0.011 U
PCB-1262 (Aroclor 1262)	0.01 U	0.0096 U	0.011 U	0.011 U	0.011 U	0.01 U	0.01 U	0.01 U	0.011 U	0.01 U	0.011 U	0.01 U	0.01 U	0.011 U
PCB-1268 (Aroclor 1268)	0.01 U	0.0096 U	0.011 U	0.011 U	0.011 U	0.01 U	0.01 U	0.01 U	0.011 U	0.01 U	0.011 U	0.01 U	0.01 U	0.011 U
Polychlorinated Biphenyl (PCBs)	0.01 U	0.0096 U	0.011 U	0.011 U	0.011 U	0.01 U	0.01 U	0.01 U	0.011 U	0.01 U	0.011 U	0.01 U	0.01 U	0.011 U
SEMIVOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,2,4,5-Tetrachlorobenzene	0.13 U	0.051 U	0.29 UJ	0.03 UJ	0.029 UJ	0.027 U	0.027 U	0.028 UJ	0.029 U	0.028 UJ	0.029 U	0.027 U	0.027 UJ	0.029 U
1,4-Dioxane (P-Dioxane)	0.48 U	0.18 U	1.1 UJ	0.11 UJ	0.1 UJ	0.099 U	0.097 U	0.1 UJ	0.11 U	0.1 UJ	0.11 U	0.099 U	0.097 UJ	0.1 U
2,3,4,6-Tetrachlorophenol	0.17 U	0.065 U	0.37 UJ	0.038 UJ	0.037 UJ	0.035 U	0.034 U	0.035 UJ	0.037 U	0.035 UJ	0.037 U	0.035 U	0.034 UJ	0.037 U
2,4,5-Trichlorophenol	0.18 U	0.069 U	0.39 UJ	0.04 UJ	0.039 UJ	0.037 U	0.036 U	0.037 UJ	0.039 U	0.037 UJ	0.039 U	0.037 U	0.036 UJ	0.039 U
2,4,6-Trichlorophenol	0.051 U	0.02 U	0.11 UJ	0.011 UJ	0.011 UJ	0.01 U	0.01 U	0.011 UJ	0.011 U	0.011 UJ	0.011 U	0.011 U	0.01 UJ	0.011 U
2,4-Dichlorophenol	0.042 U	0.016 U	0.093 UJ	0.0095 UJ	0.0092 UJ	0.0087 U	0.0086 U	0.0088 UJ	0.0093 U	0.0088 UJ	0.0093 U	0.0087 U	0.0086 UJ	0.0093 U
2,4-Dimethylphenol	0.39 U	0.15 U	0.87 UJ	0.088 UJ	0.085 UJ	0.081 U	0.08 U	0.082 UJ	0.087 U	0.082 UJ	0.087 U	0.081 U	0.08 UJ	0.086 U
2,4-Dinitrophenol	1.4 U	0.52 U	3 UJ	0.3 UJ	0.29 UJ	0.28 U	0.27 U	0.28 UJ	0.3 U	0.28 UJ	0.3 U	0.28 U	0.27 UJ	0.3 U
2,4-Dinitrotoluene	0.071 U	0.027 U	0.16 UJ	0.016 UJ	0.015 UJ	0.015 U	0.014 U	0.015 UJ	0.016 U	0.015 UJ	0.016 U	0.015 U	0.014 UJ	0.016 U
2,6-Dinitrotoluene	0.096 U	0.037 U	0.21 UJ	0.021 UJ	0.021 UJ	0.02 U	0.019 U	0.02 UJ	0.021 U	0.02 UJ	0.021 U	0.02 U	0.019 UJ	0.021 U
2-Chloronaphthalene	0.041 U	0.016 U	0.089 UJ	0.0091 UJ	0.0088 UJ	0.0084 U	0.0082 U	0.0085 UJ	0.009 U	0.0085 UJ	0.0089 U	0.0084 U	0.0082 UJ	0.0089 U
2-Chlorophenol	0.046 U	0.018 U	0.1 UJ	0.01 UJ	0.0099 UJ	0.0094 U	0.0092 U	0.0095 UJ	0.01 U	0.0095 UJ	0.01 U	0.0094 U	0.0092 UJ	0.01 U
2-Methylnaphthalene	0.04 U	0.04 J	0.24 J-	0.0089 UJ	0.0086 UJ	0.0081 U	0.008 U	0.0083 UJ	0.018 J	0.0083 UJ	0.0087 U	0.0082 U	0.008 UJ	0.0087 U
2-Methylphenol (O-Cresol)	0.078 U	0.03 U	0.17 UJ	0.018 UJ	0.017 UJ	0.016 U	0.016 U	0.016 UJ	0.017 U	0.016 UJ	0.017 U	0.016 U	0.016 UJ	0.017 U
2-Nitroaniline	0.059 U	0.023 U	0.13 UJ	0.013 UJ	0.013 UJ	0.012 U	0.012 U	0.012 UJ	0.013 U	0.012 UJ	0.013 U	0.012 U	0.012 UJ	0.013 U
2-Nitrophenol	0.06 U	0.023 U	0.13 UJ	0.013 UJ	0.013 UJ	0.012 U	0.012 U	0.013 UJ	0.013 U	0.013 UJ	0.013 U	0.012 U	0.012 UJ	0.013 U
3- And 4- Methylphenol (Total)	0.048 U	0.029 J	0.1 UJ	0.011 UJ	0.01 UJ	0.0098 U	0.0097 U	0.015 J-	0.011 U	0.01 UJ	0.01 U	0.0098 U	0.0097 UJ	0.01 U
3,3'-Dichlorobenzidine	0.2 U	0.077 U	0.44 UJ	0.045 UJ	0.043 UJ	0.041 U	0.041 U	0.042 UJ	0.044 U	0.042 UJ	0.044 U	0.041 U	0.04 UJ	0.044 U
3-Nitroaniline	0.053 U	0.02 U	0.12 UJ	0.012 UJ	0.012 UJ	0.011 U	0.011 U	0.011 UJ	0.012 U	0.011 UJ	0.012 U	0.011 U	0.011 UJ	0.012 U
4,6-Dinitro-2-Methylphenol	0.48 U	0.18 U	1 UJ	0.11 UJ	0.1 UJ	0.098 U	0.097 U	0.1 UJ	0.11 U	0.1 UJ	0.11 U	0.099 U	0.097 UJ	0.1 U
4-Bromophenyl Phenyl Ether	0.056 U	0.022 U	0.12 UJ	0.013 UJ	0.012 UJ	0.012 U	0.011 U	0.012 UJ	0.012 U	0.012 UJ	0.012 U	0.012 U	0.011 UJ	0.012 U
4-Chloro-3-Methylphenol	0.077 U	0.03 U	0.17 UJ	0.017 UJ	0.017 UJ	0.016 U	0.016 U	0.016 UJ	0.017 U	0.016 UJ	0.017 U	0.016 U	0.016 UJ	0.017 U
4-Chloroaniline	0.046 U	0.018 U	0.1 UJ	0.01 UJ	0.01 UJ	0.0095 U	0.0093 U	0.0096 UJ	0.01 U	0.0096 UJ	0.01 U	0.0095 U	0.0093 UJ	0.01 U
4-Chlorophenyl Phenyl Ether	0.054 U	0.021 U	0.12 UJ	0.012 UJ	0.012 UJ	0.011 U	0.011 U	0.011 UJ	0.012 U	0.011 UJ	0.012 U	0.011 U	0.011 UJ	0.012 U
4-Nitroaniline	0.068 U	0.026 U	0.15 UJ	0.015 UJ	0.015 UJ	0.014 U	0.014 U	0.014 UJ	0.015 U	0.014 UJ	0.015 U	0.014 U	0.014 UJ	0.015 U
4-Nitrophenol	0.86 U	0.33 U	1.9 UJ	0.19 UJ	0.19 UJ	0.18 U	0.17 U	0.18 UJ	0.19 U	0.18 UJ	0.19 U	0.18 U	0.17 UJ	0.19 U
Acenaphthene	0.043 U	0.41 J	1.7 J-	0.012 J	0.012 J-	0.022 J	0.0088 U	0.0091 UJ	0.065 J	0.014 J-	0.0095 U	0.013 J	0.0088 UJ	0.0095 U
Acenaphthylene	0.046 U	0.018 U	0.1 UJ	0.01 UJ	0.01 UJ	0.0095 U	0.0093 U	0.0096 UJ	0.01 U	0.0096 UJ	0.01 U	0.0095 U	0.0093 UJ	0.01 U
Acetophenone	0.039 U	0.015 U	0.086 UJ	0.0088 UJ	0.0085 UJ	0.008 U	0.0079 U	0.0082 UJ	0.0091 J	0.0081 UJ	0.0086 U	0.008 U	0.0079 UJ	0.0085 U
Anthracene	0.17 U	0.64 J	3.5 J-	0.038 U	0.037 UJ	0.059 J	0.034 U	0.036 UJ	0.14 J	0.056 J-	0.037 U	0.035 U	0.034 UJ	0.037 U
Atrazine	0.08 U	0.031 U	0.17 UJ	0.018 UJ	0.017 UJ	0.016 U	0.016 U	0.017 UJ	0.018 U	0.017 UJ	0.018 U	0.016 U	0.016 UJ	0.017 U
Benzaldehyde	0.14 U	0.053 U	0.3 UJ	0.031 UJ	0.03 UJ	0.028 U	0.028 U	0.029 UJ	0.03 U	0.029 UJ	0.03 U	0.028 U	0.028 UJ	0.03 U
Benzo(A)Anthracene	0.81	5	19 J-	0.1	0.11 J-	0.8	0.24	0.031 UJ	1	0.49 J-	0.033 U	0.16	0.1 J-	0.033 U
Benzo(A)Pyrene	1.1	5.6	25 J-	0.12	0.099 J-	0.57	0.19	0.014 J-	1	0.42 J-	0.012 U	0.2	0.11 J-	0.014 J
Benzo(B)Fluoranthene	2	9.6	29 J-	0.15	0.26 J-	3.5	1.1	0.12 J-	3.9	1.8 J-	0.015 U	0.31	0.16 J-	0.018 J
Benzo(G,H,I)Perylene	1.6 J	8	22 J-	0.15 J	0.2 J-	0.86	0.29 J	0.041 J-	2	0.97 J-	0.023 U	0.25 J	0.13 J-	0.023 U
Benzo(K)Fluoranthene	0.66	3.9	14 J-	0.057	0.075 J-	0.9	0.31	0.035 J-	1.2	0.57 J-	0.017 U	0.11	0.053 J-	0.017 U
Benzyl Butyl Phthalate	0.055 U	0.021 U	0.12 UJ	0.012 UJ	0.015 J-	0.011 U	0.011 U	0.012 UJ	0.98	0.22 J-	0.012 U	0.057 J	0.034 J-	0.012 U
Biphenyl (Diphenyl)	0.15 U	0.059 U	0.34 UJ	0.034 UJ	0.033 UJ	0.031 U	0.031 U	0.032 UJ	0.034 U	0.032 UJ	0.034 U	0.032 U	0.031 UJ	0.033 U
Bis(2-Chloroethoxy) Methane	0.056 U	0.021 U	0.12 UJ	0.013 UJ	0.012 UJ	0.011 U	0.011 U	0.012 UJ	0.012 U	0.012 UJ	0.012 U	0.012 U	0.011 UJ	0.012 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.042 U	0.016 U	0.093 UJ	0.0095 UJ	0.0092 UJ	0.0087 U	0.0086 U	0.0088 UJ	0.0093 U	0.0088 UJ	0.0093 U	0.0087 U	0.0086 UJ	0.0093 U
Bis(2-Chloroisopropyl) Ether	0.074 U	0.028 U	0.16 UJ	0.017 UJ	0.016 UJ	0.015 U	0.015 U	0.015 UJ	0.016 U	0.015 UJ	0.016 U	0.015 U	0.015 UJ	0.016 U
Bis(2-Ethylhexyl) Phthalate	0.07 U	0.15 J	0.15 UJ	0.016 UJ	0.015 UJ	0.014 U	0.014 U	0.015 UJ	0.067 J+	0.015 UJ	0.015 U	0.087 J+	0.069 J	0.015 U
Caprolactam	0.13 U	0.05 U	0.28 UJ	0.029 UJ	0.028 UJ	0.066 J	0.039 J	0.027 UJ	0.028 U	0.027 UJ	0.028 U	0.027 U	0.026 UJ	0.028 U
Carbazole	0.4 J	0.87	2.8 J-	0.018 J	0.016 J-	0.065 J	0.028 J	0.0093 UJ	0.12 J	0.059 J-	0.0098 U	0.022 J	0.013 J-	0.0097 U
Chrysene	2.3	8.2	24 J-	0.13 J	0.14 J-	1.8	0.57	0.056 J-	2.3	1.1 J-	0.011 U	0.23 J	0.12 J-	0.017 J
Dibenz(A,H)Anthracene	0.43	1.9	5.2 J-	0.021 U	0.057 J-	0.37	0.13	0.019 J-	0.65	0.35 J-	0.02 U	0.05	0.027 J-	0.02 U
Dibenzofuran	0.054 U	0.095 J	0.59 J-	0.012 U	0.012 UJ	0.012 J	0.011 U	0.011 UJ	0.037 J	0.011 UJ	0.012 U	0.011 U	0.011 UJ	0.012 U

Table E-9
Summary of Data Used in Risk Assessment
Central Landfills Area (soil 0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-033	CFSB-033	CFSB-034	CFSB-034	CFSB-034	CFSB-035	CFSB-035	CFSB-035	CFSB-036	CFSB-036	CFSB-036	CFSB-037	CFSB-037	CFSB-037
Sample Lab IDs	460-114456-10	460-114456-2	460-114793-52	460-114793-51	460-114793-55	460-114793-45	460-114793-46	460-114793-57	460-114793-48	460-114793-53	460-114793-50	460-114793-49	460-114793-54	460-114793-47
Sample Name	CFSB-033-SO-0.5-2	CFSB-033-SO-10-12	CFSB-034-SO-0-0.5	CFSB-034-SO-0.5-2	CFSB-034-SO-10-12	CFSB-035-SO-0-0.5	CFSB-035-SO-0.5-2	CFSB-035-SO-10-12	CFSB-036-SO-0-0.5	CFSB-036-SO-0.5-2	CFSB-036-SO-10-12	CFSB-037-SO-0-0.5	CFSB-037-SO-0.5-2	CFSB-037-SO-10-12
Sample Depth	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft
Chemical	5/23/2016	5/23/2016	5/31/2016	5/31/2016	5/31/2016	5/31/2016	5/31/2016	5/31/2016	5/31/2016	5/31/2016	5/31/2016	5/31/2016	5/31/2016	5/31/2016
Diethyl Phthalate	0.051 U	0.02 U	0.11 UJ	0.011 UJ	0.011 UJ	0.01 U	0.01 U	0.011 UJ	0.011 U	0.011 UJ	0.011 U	0.011 U	0.01 UJ	0.011 U
Dimethyl Phthalate	0.052 U	0.02 U	0.11 UJ	0.012 UJ	0.011 UJ	0.011 U	0.011 U	0.011 UJ	0.011 U	0.011 UJ	0.011 U	0.011 U	0.011 UJ	0.011 U
Di-N-Butyl Phthalate	0.054 U	0.021 U	0.12 UJ	0.012 UJ	0.012 UJ	0.011 U	0.011 U	0.011 UJ	0.012 U	0.013 J-	0.012 U	0.011 U	0.011 UJ	0.012 U
Di-N-Octylphthalate	0.091 U	0.035 U	0.2 UJ	0.02 UJ	0.02 UJ	0.019 U	0.018 U	0.019 UJ	0.02 U	0.019 UJ	0.02 U	0.019 U	0.018 UJ	0.02 U
Fluoranthene	2.2	7.3	35 J-	0.18 J	0.14 J-	0.78	0.29 J	0.017 J-	1.6	0.62 J-	0.012 U	0.28 J	0.15 J-	0.015 J
Fluorene	0.039 U	0.19 J	1.1 J-	0.0088 U	0.01 J-	0.014 J	0.0079 U	0.0082 UJ	0.057 J	0.01 J-	0.0086 U	0.01 J	0.0079 UJ	0.0085 U
Hexachlorobenzene	0.073 U	0.028 U	0.16 UJ	0.016 UJ	0.016 UJ	0.015 U	0.015 U	0.015 UJ	0.016 U	0.015 UJ	0.016 U	0.015 U	0.015 UJ	0.016 U
Hexachlorobutadiene	0.05 U	0.019 U	0.11 UJ	0.011 UJ	0.011 UJ	0.01 U	0.01 U	0.011 UJ	0.011 U	0.011 UJ	0.011 U	0.01 U	0.01 UJ	0.011 U
Hexachlorocyclopentadiene	0.11 U	0.043 U	0.25 UJ	0.025 UJ	0.024 UJ	0.023 U	0.023 U	0.023 UJ	0.025 UJ	0.023 UJ	0.025 UJ	0.023 UJ	0.023 UJ	0.024 UJ
Hexachloroethane	0.066 U	0.025 U	0.14 UJ	0.015 UJ	0.014 UJ	0.013 U	0.013 U	0.014 UJ	0.014 U	0.014 UJ	0.014 U	0.014 U	0.013 UJ	0.014 U
Indeno(1,2,3-C,D)Pyrene	1.4	7.7	23 J	0.13	0.2 J	1	0.32	0.045 J	2.2	1.1 J	0.026 U	0.28	0.14 J	0.026 U
Isophorone	0.039 U	0.015 U	0.085 UJ	0.0086 UJ	0.0083 UJ	0.016 J	0.0078 U	0.008 UJ	0.069 J	0.008 UJ	0.0085 U	0.011 J	0.0078 UJ	0.0084 U
Naphthalene	0.046 U	0.06 J	0.45 J-	0.01 U	0.0099 UJ	0.014 J	0.0092 U	0.0095 UJ	0.052 J	0.0095 UJ	0.01 U	0.0094 U	0.0092 UJ	0.01 U
Nitrobenzene	0.056 U	0.022 U	0.12 UJ	0.013 UJ	0.012 UJ	0.012 U	0.011 U	0.012 UJ	0.012 U	0.012 UJ	0.012 U	0.012 U	0.011 UJ	0.012 U
N-Nitrosodi-N-Propylamine	0.06 U	0.023 U	0.13 UJ	0.013 UJ	0.013 UJ	0.012 U	0.012 U	0.013 UJ	0.013 U	0.013 UJ	0.013 U	0.012 U	0.012 UJ	0.013 U
N-Nitrosodiphenylamine	0.16 U	0.063 U	0.36 UJ	0.036 UJ	0.035 UJ	0.033 U	0.033 U	0.034 UJ	0.036 U	0.034 UJ	0.036 U	0.034 U	0.033 UJ	0.036 U
Pentachlorophenol	0.22 U	0.083 U	0.48 UJ	0.049 UJ	0.047 UJ	0.045 U	0.044 U	0.045 UJ	0.048 U	0.045 UJ	0.048 U	0.045 U	0.044 UJ	0.047 U
Phenanthrene	0.66 J	3	18 J-	0.12 J	0.1 J-	0.3 J	0.13 J	0.01 UJ	0.78	0.24 J-	0.01 U	0.14 J	0.094 J-	0.01 U
Phenol	0.059 U	0.023 U	0.13 UJ	0.013 UJ	0.013 UJ	0.012 U	0.012 U	0.012 UJ	0.016 J	0.012 UJ	0.013 U	0.012 U	0.012 UJ	0.013 U
Pyrene	1.7 J	7.8	36 J-	0.25 J	0.17 J-	0.73	0.26 J	0.023 J-	1.6	0.66 J-	0.018 U	0.29 J	0.17 J-	0.018 U
VOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,1,1-Trichloroethane	0.00032 U	0.00034 U	--	0.00036 U	0.0004 U	--	0.00032 U	0.0003 U	--	0.00039 U	0.00035 U	--	0.00028 U	0.00029 U
1,1,2,2-Tetrachloroethane	0.00015 U	0.00015 U	--	0.00016 U	0.00018 U	--	0.00014 U	0.00013 U	--	0.00017 U	0.00016 U	--	0.00013 U	0.00013 U
1,1,2-Trichloro-1,2,2-Trifluoroethane	0.00038 U	0.00039 U	--	0.00042 U	0.00046 U	--	0.00037 U	0.00035 U	--	0.00045 U	0.0004 U	--	0.00033 U	0.00034 U
1,1,2-Trichloroethane	0.00024 U	0.00025 U	--	0.00027 U	0.00029 U	--	0.00024 U	0.00022 U	--	0.00028 U	0.00026 U	--	0.00021 U	0.00021 U
1,1-Dichloroethane	0.00029 U	0.0003 U	--	0.00032 U	0.00035 U	--	0.00029 U	0.00027 U	--	0.00035 U	0.00031 U	--	0.00025 U	0.00026 U
1,1-Dichloroethene	0.00035 U	0.00037 U	--	0.00039 U	0.00043 U	--	0.00035 U	0.00032 U	--	0.00042 U	0.00038 U	--	0.0003 U	0.00031 U
1,2,3-Trichlorobenzene	0.000094 U	0.000099 U	--	0.0001 U	0.00011 U	--	0.000093 U	0.000087 U	--	0.00011 U	0.0001 U	--	0.000082 U	0.000084 U
1,2,4-Trichlorobenzene	0.00027 U	0.00029 U	--	0.0003 U	0.00033 U	--	0.00027 U	0.00025 U	--	0.00032 U	0.00029 U	--	0.00024 U	0.00024 U
1,2-Dibromo-3-Chloropropane	0.0004 U	0.00042 U	--	0.00045 U	0.00049 U	--	0.0004 U	0.00037 U	--	0.00048 U	0.00043 U	--	0.00035 U	0.00036 U
1,2-Dibromoethane (Ethylene Dibromide)	0.0001 U	0.00011 U	--	0.00011 U	0.00013 U	--	0.0001 U	0.000095 U	--	0.00012 U	0.00011 U	--	0.000089 U	0.000091 U
1,2-Dichlorobenzene	0.00012 U	0.00013 U	--	0.00013 U	0.00015 U	--	0.00012 U	0.00011 U	--	0.00014 U	0.00013 U	--	0.0001 U	0.00011 U
1,2-Dichloroethane	0.000094 U	0.000099 U	--	0.0001 U	0.00011 U	--	0.000093 U	0.000087 U	--	0.00011 U	0.0001 U	--	0.000082 U	0.000084 U
1,2-Dichloropropane	0.00015 U	0.00015 U	--	0.00016 U	0.00018 U	--	0.00014 U	0.00013 U	--	0.00017 U	0.00016 U	--	0.00013 U	0.00013 U
1,3-Dichlorobenzene	0.0001 U	0.00011 U	--	0.00011 U	0.00013 U	--	0.0001 U	0.000095 U	--	0.00012 U	0.00011 U	--	0.000089 U	0.000091 U
1,4-Dichlorobenzene	0.00011 U	0.00012 U	--	0.00012 U	0.00014 U	--	0.00011 U	0.0001 U	--	0.00013 U	0.00012 U	--	0.000097 U	0.000099 U
2-Hexanone	0.0008 U	0.00084 U	--	0.00089 U	0.00098 U	--	0.00079 U	0.00075 UJ	--	0.00095 U	0.00086 U	--	0.0007 U	0.00072 U
Acetone	0.02	0.0057	--	0.019	0.0097	--	0.014	0.0059 J	--	0.0011 U	0.00097 U	--	0.0079	0.014
Benzene	0.00026 J	0.00018 U	--	0.00019 U	0.00021 U	--	0.00017 U	0.00032 J	--	0.00026 J	0.00018 U	--	0.00015 U	0.00015 U
Bromochloromethane	0.00015 U	0.00015 U	--	0.00016 U	0.00018 U	--	0.00014 U	0.00013 U	--	0.00017 U	0.00016 U	--	0.00013 U	0.00013 U
Bromodichloromethane	0.00032 U	0.00034 U	--	0.00036 U	0.0004 U	--	0.00032 U	0.0003 U	--	0.00039 U	0.00035 U	--	0.00028 U	0.00029 U
Bromoform	0.00011 U	0.00012 U	--	0.00012 U	0.00014 U	--	0.00011 U	0.0001 U	--	0.00013 U	0.00012 U	--	0.000097 U	0.000099 U
Bromomethane	0.00027 U	0.00029 U	--	0.00045 J	0.00033 U	--	0.00027 U	0.00025 U	--	0.00032 U	0.00029 U	--	0.00024 U	0.00024 U
Carbon Disulfide	0.0033	0.00039 U	--	0.0012	0.00061 J	--	0.0017	0.00034 U	--	0.00044 U	0.0004 U	--	0.00039 J	0.00068 J
Carbon Tetrachloride	0.00037 U	0.00039 U	--	0.00041 U	0.00045 U	--	0.00036 U	0.00034 U	--	0.00044 U	0.0004 U	--	0.00032 U	0.00033 U
Chlorobenzene	0.00012 U	0.00013 U	--	0.00013 U	0.00015 U	--	0.00012 U	0.00011 U	--	0.00014 U	0.00013 U	--	0.0001 U	0.00011 U
Chloroethane	0.0003 U	0.00031 U	--	0.00033 U	0.00036 U	--	0.0003 U	0.00028 U	--	0.00036 U	0.00032 U	--	0.00026 U	0.00027 U
Chloroform	0.00018 U	0.00019 U	--	0.0002 U	0.00022 U	--	0.00018 U	0.00017 U	--	0.00021 U	0.00019 U	--	0.00016 U	0.00016 U
Chloromethane	0.00032 U	0.00034 U	--	0.00036 U	0.0004 U	--	0.00032 U	0.0003 U	--	0.00039 U	0.00035 U	--	0.00028 U	0.00029 U
Cis-1,2-Dichloroethylene	0.00019 U	0.0002 U	--	0.00021 U	0.00023 U	--	0.00019 U	0.00017 U	--	0.00022 U	0.0002 U	--	0.00016 U	0.00017 U
Cis-1,3-Dichloropropene	0.00013 U	0.00013 U	--	0.00014 U	0.00016 U	--	0.00013 U	0.00012 U	--	0.00015 U	0.00014 U	--	0.00011 U	0.00011 U
Cyclohexane	0.00039 U	0.00041 U	--	0.00044 U	0.00048 U	--	0.00039 U	0.00036 U	--	0.00047 U	0.00042 U	--	0.00034 U	0.00035 U
Dibromochloromethane	0.00013 U	0.00013 U	--	0.00014 U	0.00016 U	--	0.00013 U	0.00012 U	--	0.00015 U	0.00014 U	--	0.00011 U	0.00011 U
Dichlorodifluoromethane	0.00027 U	0.00029 U	--	0.0003 U	0.00033 U	--	0.00027 U	0.00025 U	--	0.00032 U	0.00029 U	--	0.00024 U	0.00024 U
Ethylbenzene	0.00015 U	0.00016 U	--	0.00017 U	0.00019 U	--	0.00015 U	0.00014 U	--	0.00018 U	0.00017 U	--	0.00013 U	0.00014 U
Isopropylbenzene (Cumene)	0.00015 U	0.00015 U	--	0.00016 U	0.00018 U	--	0.00014 U	0.00013 U	--	0.00017 U	0.00016 U	--	0.00013 U	0.00013 U
M,P-Xylene	0.00021 J	0.000099 U	--	0.00022 J	0.00021 J	--	0.00016 J	0.000087 U	--	0.00065 J	0.0001 U	--	0.000082 U	0.000084 U

Table E-9
Summary of Data Used in Risk Assessment
Central Landfills Area (soil 0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-033	CFSB-033	CFSB-034	CFSB-034	CFSB-034	CFSB-035	CFSB-035	CFSB-035	CFSB-036	CFSB-036	CFSB-036	CFSB-037	CFSB-037	CFSB-037
Sample Lab IDs	460-114456-10	460-114456-2	460-114793-52	460-114793-51	460-114793-55	460-114793-45	460-114793-46	460-114793-57	460-114793-48	460-114793-53	460-114793-50	460-114793-49	460-114793-54	460-114793-47
Sample Name	CFSB-033-SO-0.5-2	CFSB-033-SO-10-12	CFSB-034-SO-0-0.5	CFSB-034-SO-0.5-2	CFSB-034-SO-10-12	CFSB-035-SO-0-0.5	CFSB-035-SO-0.5-2	CFSB-035-SO-10-12	CFSB-036-SO-0-0.5	CFSB-036-SO-0.5-2	CFSB-036-SO-10-12	CFSB-037-SO-0-0.5	CFSB-037-SO-0.5-2	CFSB-037-SO-10-12
Sample Depth	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft
Chemical	5/23/2016	5/23/2016	5/31/2016	5/31/2016	5/31/2016	5/31/2016	5/31/2016	5/31/2016	5/31/2016	5/31/2016	5/31/2016	5/31/2016	5/31/2016	5/31/2016
Methyl Acetate	0.00077 U	0.00081 U	--	0.00086 U	0.00094 U	--	0.00076 U	0.00071 U	--	0.00091 U	0.00083 U	--	0.00067 U	0.00069 U
Methyl Ethyl Ketone (2-Butanone)	0.00066 U	0.00069 U	--	0.00073 U	0.0008 U	--	0.00065 U	0.00061 UJ	--	0.00078 U	0.00071 U	--	0.00057 U	0.00059 U
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	0.0019 U	0.002 U	--	0.0021 U	0.0023 U	--	0.0019 U	0.0018 UJ	--	0.0023 U	0.002 U	--	0.0017 U	0.0017 U
Methylcyclohexane	0.00043 J	0.00045 U	--	0.00048 U	0.00052 U	--	0.00042 U	0.0004 U	--	0.00086 J	0.00046 U	--	0.00037 U	0.00038 U
Methylene Chloride	0.00056 J	0.00029 U	--	0.0003 U	0.00033 U	--	0.00027 U	0.00025 U	--	0.00032 U	0.00029 U	--	0.00024 U	0.00024 U
O-Xylene (1,2-Dimethylbenzene)	0.00014 U	0.00014 U	--	0.00015 U	0.00017 U	--	0.00014 U	0.00013 U	--	0.00022 J	0.00015 U	--	0.00012 U	0.00012 U
Styrene	0.00013 U	0.00013 U	--	0.00014 U	0.00016 U	--	0.00013 U	0.00012 U	--	0.00015 U	0.00014 U	--	0.00011 U	0.00011 U
Tert-Butyl Methyl Ether	0.00015 U	0.00015 U	--	0.00016 U	0.00018 U	--	0.00014 U	0.00013 U	--	0.00017 U	0.00016 U	--	0.00013 U	0.00013 U
Tetrachloroethylene (PCE)	0.00024 U	0.00025 U	--	0.00027 U	0.00029 U	--	0.00024 U	0.00022 U	--	0.00028 U	0.00026 U	--	0.00021 U	0.00021 U
Toluene	0.0005 J	0.00017 U	--	0.00039 J	0.00033 J	--	0.00025 J	0.00015 U	--	0.00093 J	0.00017 U	--	0.0002 J	0.00019 J
Trans-1,2-Dichloroethene	0.00033 U	0.00035 U	--	0.00037 U	0.00041 U	--	0.00033 U	0.00031 U	--	0.0004 U	0.00036 U	--	0.00029 U	0.0003 U
Trans-1,3-Dichloropropene	0.000085 U	0.00009 U	--	0.000095 U	0.0001 U	--	0.000085 U	0.000079 U	--	0.0001 U	0.000092 U	--	0.000074 U	0.000076 U
Trichloroethylene (TCE)	0.00022 U	0.00023 U	--	0.00025 U	0.00027 U	--	0.00022 U	0.00021 U	--	0.00026 U	0.00024 U	--	0.00019 U	0.0002 U
Trichlorofluoromethane	0.00029 U	0.0003 U	--	0.00032 U	0.00035 U	--	0.00029 U	0.00027 U	--	0.00035 U	0.00031 U	--	0.00025 U	0.00026 U
Vinyl Chloride	0.00033 U	0.00035 U	--	0.00037 U	0.00041 U	--	0.00033 U	0.00031 U	--	0.0004 U	0.00036 U	--	0.00029 U	0.0003 U

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-9
Summary of Data Used in Risk Assessment
Central Landfills Area (soil 0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-177	CFSB-177-DUP	CFSB-177	CFSB-178	CFSB-178	CFSB-179	CFSB-179	CFSB-180	CFSB-180	CFSB-219	CFSB-219	CFSB-220	CFSB-220	CFSB-221
Sample Lab IDs	180-79272-7, 460-159191-7	180-79272-15, 460-159191-15	180-79272-8, 460-159191-8	180-79272-9, 460-159191-9	180-79272-10, 460-159191-10	180-79272-11, 460-159191-11	180-79272-12, 460-159191-12	180-79272-13, 460-159191-13	180-79272-14, 460-159191-14	180-78894-14, 460-158632-14	180-78894-15, 460-158632-15	180-79204-11, 460-159044-17	180-79204-12, 460-159044-18	180-77673-1, 460-155989-21
Sample Name	CFSB-177-SO-0-0.5	CFSB-DUP42-SO	CFSB-177-SO-0.5-2	CFSB-178-SO-0-0.5	CFSB-178-SO-0.5-2	CFSB-179-SO-0-0.5	CFSB-179-SO-0.5-2	CFSB-180-SO-0-0.5	CFSB-180-SO-0.5-2	CFSB-219-SO-0-0.5	CFSB-219-SO-0.5-2	CFSB-220-SO-0-0.5	CFSB-220-SO-0.5-2	CFSB-221-SO-0-0.5
Sample Depth	0-0.5 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft
Chemical	6/25/2018	6/25/2018	6/25/2018	6/25/2018	6/25/2018	6/25/2018	6/25/2018	6/25/2018	6/25/2018	6/16/2018	6/16/2018	6/22/2018	6/22/2018	5/7/2018
GENERAL CHEMISTRY (mg/kg)														
Fluoride	16 J-	17.2 J-	16.9 J-	17 J-	17.6 J-	14.9 J-	16.5 J-	32.6 J-	46 J-	7.47 J+	9.99 J+	7.8 J-	5.2 J-	3.27 J+
Cyanide	0.061 U	0.06 U	0.068 U	0.12 J	0.1 J	0.06 U	0.062 U	0.084 U	0.089 U	0.12 J+	0.083 J+	0.071 U	0.06 U	0.073 U
METALS (mg/kg)														
"Chromium, Hexavalent - Estimated"	0.187348	0.206083	0.152555	0.216788	0.289051	0.323844	0.366667	0.0642336	0.0722628	0.337226	0.347932	0.240876	0.235523	0.289051
"Chromium, Trivalent - Calculated"	--	--	--	--	--	--	--	--	--	--	--	--	--	--
"Chromium, Trivalent - Estimated"	6.81265	7.49392	5.54745	7.88321	10.5109	11.7762	13.3333	2.33577	2.62774	12.2628	12.6521	8.75912	8.56448	10.5109
Aluminum	20700	21200	17200	15600	21100	14100	15900	4710	4500	18600	20600	17100	11000	17000
Antimony	0.26 UJ	0.25 UJ	0.23 UJ	0.26 UJ	0.26 UJ	0.26 UJ	0.24 UJ	0.34 UJ	0.34 UJ	0.31 UJ	0.3 UJ	0.32 U	0.31 U	0.33 UJ
Arsenic	4.1	4.2	3.3	5.1	7.9	9.5	8.2	9.7	10.4	5.5	6	5.6	5.4	6.3
Barium	420	376	317	368	360	140	97.3	415	436	333	253	240	75.4	122
Beryllium	0.91	0.74	0.62	0.48	0.77	0.62	0.74	0.31 J	0.34 J	0.56	0.66	0.6	0.5	0.51
Cadmium	0.3 U	0.29 U	0.27 U	0.3 U	0.3 U	0.3 U	0.27 U	0.39 U	0.39 U	0.36 U	0.34 U	0.36 U	0.36 U	0.38 U
Calcium	1400	1530	1200	2690	2490	1780	1320	279000	313000	2130	1650	2180	921	1680
Chromium, Total	7	7.7	5.7	8.1	10.8	12.1	13.7	2.4	2.7	12.6	13	9	8.8	10.8
Cobalt	6.5	7.2	5.3	5.8	7.2	6.3	6.7	1.5 J	1.8 J	6	6.3	6.2	4.6	5.4
Copper	8.5	7.9	5.9	9.1	12.7	8.6	8.5	25.2	28.4	10.8	10.7	6.7	8.4	9.5
Iron	12600	13300	10700	13200	19300	18900	17800	2940	3580	21000	20000	16200	13500	17500
Lead	13.2	12.4	10.5	12.5	16.9	15.9	10.9	7.1	5.9	13.8	12.9	12	7.9	10.8
Magnesium	7060	8870	5970	6210	9080	11600	18200	2890	3900	11000	10600	8270	7990	9950
Manganese	529	460	484	1140	989	598	503	525	536	1050 J	506 J	958	230	278 J
Mercury	0.01 J	0.013 J	0.01 U	0.018	0.014 J	0.011 J	0.01 U	0.024	0.015 J	0.018 J	0.011 U	0.019	0.0096 U	0.011 U
Nickel	12.1	13.8	10.5	14.2	14.7	15.9	14.6	8.6	4.9	15.2	14	11.5	9.7	13.2
Potassium	1010	1050	914	1340	1680	1060	816	337	332	1440	1380	1100	584	854
Selenium	0.26 U	0.25 U	0.23 U	0.26 U	0.26 U	0.26 U	0.24 U	0.46 J	0.36 J	0.31 U	0.3 U	0.31 U	0.31 U	0.33 U
Silver	0.55 U	0.53 U	0.49 U	0.54 U	0.55 U	0.55 U	0.51 U	0.71 U	0.72 U	0.66 U	0.63 U	0.67 U	0.66 U	0.7 U
Sodium	56.5 J	54.8 J	45.2 J	51.1 J	45 J	27.6 U	25.6 U	67.4 J	76.2 J	40.7 J	46.1 J	33.9 U	33.5 U	35.7 U
Thallium	0.11 U	0.11 U	0.099 U	0.11 U	0.13 J	0.11 U	0.1 U	0.14 U	0.15 U	0.14 J	0.13 J	0.14 U	0.13 U	0.14 U
Vanadium	11.4 J+	11.3 J+	9.5 J+	11.5 J+	15.6 J+	12.2 J+	13.3 J+	4 J+	3 J+	14.6	15.5	14.3	9.4	14.4
Zinc	48.4	54.1	45.3	61.8	71.3	57.2	43.8	29.8	28.7	95.1	74.4	57.8	36.1	44.8
METALS|HEXAVALENT CHROMIUM (mg/kg)														
Chromium, Hexavalent	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PESTICIDES (mg/kg)														
Aldrin	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Alpha Bhc (Alpha Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Alpha Endosulfan	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Beta Bhc (Beta Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Beta Endosulfan	--	--	--	--	--	--	--	--	--	--	--	--	--	--
cis-Chlordane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Delta BHC (Delta Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dieldrin	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endosulfan Sulfate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin Aldehyde	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin Ketone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Gamma Bhc (Lindane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Heptachlor	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Heptachlor Epoxide	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methoxychlor	--	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDD	--	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDT	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Toxaphene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
trans-Chlordane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
POLYCHLORINATED BIPHENYLS (mg/kg)														
PCB-1016 (Aroclor 1016)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1221 (Aroclor 1221)	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Table E-9
Summary of Data Used in Risk Assessment
Central Landfills Area (soil 0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-177	CFSB-177-DUP	CFSB-177	CFSB-178	CFSB-178	CFSB-179	CFSB-179	CFSB-180	CFSB-180	CFSB-219	CFSB-219	CFSB-220	CFSB-220	CFSB-221
Sample Lab IDs	180-79272-7, 460-159191-7	180-79272-15, 460-159191-15	180-79272-8, 460-159191-8	180-79272-9, 460-159191-9	180-79272-10, 460-159191-10	180-79272-11, 460-159191-11	180-79272-12, 460-159191-12	180-79272-13, 460-159191-13	180-79272-14, 460-159191-14	180-78894-14, 460-158632-14	180-78894-15, 460-158632-15	180-79204-11, 460-159044-17	180-79204-12, 460-159044-18	180-77673-1, 460-155989-21
Sample Name	CFSB-177-SO-0-0.5	CFSB-DUP42-SO	CFSB-177-SO-0.5-2	CFSB-178-SO-0-0.5	CFSB-178-SO-0.5-2	CFSB-179-SO-0-0.5	CFSB-179-SO-0.5-2	CFSB-180-SO-0-0.5	CFSB-180-SO-0.5-2	CFSB-219-SO-0-0.5	CFSB-219-SO-0.5-2	CFSB-220-SO-0-0.5	CFSB-220-SO-0.5-2	CFSB-221-SO-0-0.5
Sample Depth	0-0.5 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft
Chemical	6/25/2018	6/25/2018	6/25/2018	6/25/2018	6/25/2018	6/25/2018	6/25/2018	6/25/2018	6/25/2018	6/16/2018	6/16/2018	6/22/2018	6/22/2018	5/7/2018
PCB-1232 (Aroclor 1232)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1242 (Aroclor 1242)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1248 (Aroclor 1248)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1254 (Aroclor 1254)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1260 (Aroclor 1260)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1262 (Aroclor 1262)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1268 (Aroclor 1268)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Polychlorinated Biphenyl (PCBs)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SEMIVOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,2,4,5-Tetrachlorobenzene	0.0015 U	0.0015 U	0.0015 U	0.0048 U	0.0016 U	0.003 U	0.003 U	0.0042 U	0.0041 U	0.0016 UJ	0.0017 UJ	0.0016 U	0.0015 U	0.0016 U
1,4-Dioxane (P-Dioxane)	0.011 U	0.011 U	0.011 U	0.034 U	0.011 U	0.022 U	0.022 U	0.03 U	0.03 U	0.012 U	0.012 U	0.012 U	0.011 U	0.012 U
2,3,4,6-Tetrachlorophenol	0.015 U	0.014 U	0.015 U	0.046 U	0.015 U	0.029 U	0.029 U	0.04 U	0.04 U	0.016 U	0.016 U	0.016 UJ	0.015 UJ	0.016 U
2,4,5-Trichlorophenol	0.0026 U	0.0025 U	0.0026 U	0.0079 U	0.0026 U	0.005 U	0.005 U	0.0069 U	0.0068 U	0.0027 U	0.0028 U	0.0027 U	0.0025 U	0.0027 U
2,4,6-Trichlorophenol	0.002 U	0.0019 U	0.002 U	0.0061 U	0.002 U	0.0038 U	0.0038 U	0.0053 U	0.0052 U	0.0021 U	0.0021 U	0.0021 U	0.0019 U	0.0021 U
2,4-Dichlorophenol	0.0028 U	0.0027 U	0.0028 U	0.0085 U	0.0028 U	0.0054 U	0.0054 U	0.0074 U	0.0073 U	0.0029 U	0.003 U	0.0029 U	0.0027 U	0.0029 U
2,4-Dimethylphenol	0.0022 U	0.0022 U	0.0022 U	0.0069 UJ	0.0022 U	0.0043 U	0.0044 U	0.006 U	0.0059 U	0.0023 U	0.0024 U	0.0023 U	0.0022 U	0.0023 U
2,4-Dinitrophenol	0.096 U	0.093 U	0.096 U	0.3 UR	0.097 U	0.19 U	0.19 U	0.26 U	0.26 U	0.1 U	0.1 U	0.1 UJ	0.094 UJ	0.1 U
2,4-Dinitrotoluene	0.0018 U	0.0017 U	0.0018 U	0.0055 U	0.0018 U	0.0035 U	0.0035 U	0.0048 U	0.0047 U	0.0019 U	0.0019 U	0.0019 U	0.0017 U	0.0019 U
2,6-Dinitrotoluene	0.0022 U	0.0021 U	0.0022 U	0.0068 U	0.0022 U	0.0043 U	0.0043 U	0.006 U	0.0059 U	0.0023 U	0.0024 U	0.0023 U	0.0022 U	0.0023 U
2-Chloronaphthalene	0.0016 U	0.0016 U	0.0016 U	0.0051 U	0.0017 U	0.0032 U	0.0032 U	0.0044 U	0.0044 U	0.0017 U	0.0018 U	0.0017 U	0.0016 U	0.0017 U
2-Chlorophenol	0.0017 U	0.0016 U	0.0017 U	0.0051 U	0.0017 U	0.0032 U	0.0033 U	0.0045 U	0.0044 U	0.0017 U	0.0018 U	0.0017 U	0.0016 U	0.0018 U
2-Methylnaphthalene	0.0017 U	0.0017 U	0.0017 U	0.0053 U	0.0017 U	0.0033 U	0.0034 U	0.0046 U	0.0046 U	0.0018 U	0.0018 U	0.0028 J	0.0018 J	0.0018 U
2-Methylphenol (O-Cresol)	0.01 U	0.01 U	0.01 U	0.032 U	0.01 U	0.02 U	0.02 U	0.028 U	0.027 U	0.011 U	0.011 U	0.011 U	0.01 U	0.011 U
2-Nitroaniline	0.016 U	0.016 U	0.016 U	0.05 U	0.016 U	0.032 U	0.032 U	0.044 U	0.043 U	0.017 U	0.018 U	0.017 U	0.016 U	0.017 U
2-Nitrophenol	0.002 U	0.002 U	0.002 U	0.0063 U	0.0021 U	0.004 U	0.004 U	0.0055 U	0.0054 U	0.0022 U	0.0022 U	0.0021 U	0.002 U	0.0022 U
3- And 4- Methylphenol (Total)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3,3'-Dichlorobenzidine	0.033 U	0.032 U	0.033 U	0.1 UR	0.034 U	0.065 U	0.065 U	0.09 U	0.089 U	0.035 U	0.036 U	0.035 U	0.033 U	0.035 UR
3-Nitroaniline	0.0091 U	0.0088 U	0.0091 U	0.028 U	0.0092 U	0.018 U	0.018 U	0.025 U	0.024 U	0.0096 U	0.0098 U	0.0095 U	0.0089 U	0.0096 UJ
4,6-Dinitro-2-Methylphenol	0.062 U	0.06 U	0.062 U	0.19 U	0.062 U	0.12 U	0.12 U	0.17 U	0.16 U	0.065 U	0.066 U	0.064 U	0.06 U	0.065 U
4-Bromophenyl Phenyl Ether	0.0025 U	0.0024 U	0.0025 U	0.0077 U	0.0025 U	0.0049 U	0.0049 U	0.0067 U	0.0066 U	0.0026 U	0.0027 U	0.0026 U	0.0024 U	0.0026 U
4-Chloro-3-Methylphenol	0.0017 U	0.0016 U	0.0017 U	0.0052 U	0.0017 U	0.0033 U	0.0033 U	0.0045 U	0.0045 U	0.0018 U	0.0018 U	0.0018 U	0.0016 U	0.0018 U
4-Chloroaniline	0.0012 U	0.0012 U	0.0012 U	0.0037 UJ	0.0012 U	0.0023 U	0.0023 U	0.0032 U	0.0032 U	0.0013 U	0.0013 U	0.0012 U	0.0012 U	0.0013 UJ
4-Chlorophenyl Phenyl Ether	0.0022 U	0.0021 U	0.0022 U	0.0067 U	0.0022 U	0.0042 U	0.0042 U	0.0058 U	0.0058 U	0.0023 U	0.0023 U	0.0023 U	0.0021 U	0.0023 U
4-Nitroaniline	0.0017 U	0.0017 U	0.0017 U	0.0054 U	0.0018 U	0.0034 U	0.0034 U	0.0047 U	0.0046 U	0.0018 U	0.0019 U	0.0018 U	0.0017 U	0.0018 UJ
4-Nitrophenol	0.025 U	0.024 U	0.025 U	0.078 U	0.025 U	0.049 U	0.049 U	0.068 U	0.067 U	0.026 U	0.027 U	0.026 UJ	0.025 UJ	0.026 U
Acenaphthene	0.0021 U	0.0025 J	0.0021 U	0.011 J	0.0021 U	0.004 U	0.004 U	0.015 J	0.0094 J	0.0046 J	0.0022 U	0.0066 J	0.0024 J	0.0022 U
Acenaphthylene	0.0016 U	0.0015 U	0.0016 U	0.0048 U	0.0016 U	0.0031 U	0.0031 U	0.0042 U	0.0042 U	0.0016 U	0.0017 U	0.0016 U	0.0015 U	0.0016 U
Acetophenone	0.0019 U	0.0026 J	0.0022 J	0.006 U	0.0023 J	0.0038 U	0.0038 U	0.0052 U	0.0052 U	0.002 U	0.0021 U	0.0037 J	0.0022 J	0.002 U
Anthracene	0.0019 U	0.0025 J	0.0023 J	0.017 J	0.002 J	0.0062 J	0.0036 U	0.026	0.017 J	0.0072 J	0.002 U	0.0089	0.0018 U	0.0077
Atrazine	0.016 UJ	0.015 UJ	0.016 UJ	0.048 UJ	0.016 UJ	0.031 UJ	0.031 UJ	0.042 UJ	0.042 UJ	0.016 UJ	0.017 UJ	0.016 UJ	0.015 UJ	0.016 UJ
Benzaldehyde	0.0049 J	0.0071 J	0.005 J	0.014 UR	0.0058 J	0.0087 UR	0.0087 UR	0.013 J	0.012 U	0.0049 J-	0.0048 UR	0.0071 J	0.0043 UR	0.0047 U
Benzo(A)Anthracene	0.013 J	0.031 J	0.027	0.2	0.023	0.057	0.031	0.15	0.1	0.042	0.0051 J	0.044	0.005 J	0.053
Benzo(A)Pyrene	0.019 J	0.044 J	0.044	0.37	0.037	0.11	0.058	0.22	0.14	0.06	0.0078	0.057	0.0066 J	0.069
Benzo(B)Fluoranthene	0.051 J	0.13 J	0.11	0.94 J-	0.098	0.36	0.2	0.44	0.27	0.11	0.012	0.1	0.011	0.1
Benzo(G,H,I)Perylene	0.027 J	0.075 J	0.056	0.48 J-	0.052	0.17	0.088	0.32	0.19	0.072	0.0073 J	0.066	0.0072	0.077
Benzo(K)Fluoranthene	0.018 J	0.032 J	0.034	0.26	0.032	0.11	0.067	0.13	0.1	0.04	0.0046 J	0.035	0.0034 J	0.04
Benzyl Butyl Phthalate	0.025 U	0.024 U	0.025 U	0.076 U	0.025 U	0.048 U	0.048 U	0.066 U	0.065 U	0.026 U	0.026 U	0.026 U	0.024 U	0.026 U
Biphenyl (Diphenyl)	0.0015 U	0.0015 U	0.0015 U	0.0046 U	0.0015 U	0.0029 U	0.0029 U	0.004 U	0.004 U	0.0016 U	0.0016 U	0.0055 J	0.0035 J	0.0016 U
Bis(2-Chloroethoxy) Methane	0.0017 U	0.0017 U	0.0017 U	0.0053 U	0.0017 U	0.0033 U	0.0033 U	0.0046 U	0.0045 U	0.0018 U	0.0018 U	0.0018 U	0.0017 U	0.0018 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.0013 U	0.0013 U	0.0013 U	0.004 U	0.0013 U	0.0025 U	0.0025 U	0.0035 U	0.0034 U	0.0014 U	0.0014 U	0.0014 U	0.0013 U	0.0014 U
Bis(2-Chloroisopropyl) Ether	0.0026 U	0.0026 U	0.0026 U	0.0082 U	0.0027 U	0.0052 U	0.0052 U	0.0071 U	0.007 U	0.0028 U	0.0029 U	0.0028 U	0.0026 U	0.0028 U
Bis(2-Ethylhexyl) Phthalate	0.038 UJ	0.23 J	0.038 U	0.12 U	0.038 U	0.074 U	0.075 U	0.15 J	0.1 U	0.04 U	0.041 U	0.045 J	0.037 U	0.04 U
Caprolactam	0.023 U	0.023 U	0.023 U	0.072 UJ	0.023 U	0.045 U	0.046 U	0.063 U	0.062 U	0.024 U	0.025 U	0.024 U	0.023 U	0.025 UJ
Carbazole	0.0018 J	0.0051 J	0.0051 J	0.039	0.004 J	0.015	0.0074 J	0.039	0.025	0.016	0.0018 U	0.012	0.0016 U	0.0083
Chrysene	0.029 J	0.073 J	0.061	0.51 J-	0.058	0.2	0.11	0.28	0.18	0.072	0.008	0.075	0.0078	0.079
Dibenz(A,H)Anthracene	0.0054 J	0.012 J	0.011	0.082	0.0074	0.028	0.015	0.068	0.04	0.014	0.0019 J	0.015	0.0017 J	0.016
Dibenzofuran	0.0016 U	0.0026 J	0.0016 U	0.0048 U	0.0019 J	0.0031 U	0.0031 U	0.0084 J	0.0055 J	0.003 J	0.0017 U	0.0054 J	0.0028 J	0.0016 J

Table E-9
Summary of Data Used in Risk Assessment
Central Landfills Area (soil 0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-177	CFSB-177-DUP	CFSB-177	CFSB-178	CFSB-178	CFSB-179	CFSB-179	CFSB-180	CFSB-180	CFSB-219	CFSB-219	CFSB-220	CFSB-220	CFSB-221
Sample Lab IDs	180-79272-7, 460-159191-7	180-79272-15, 460-159191-15	180-79272-8, 460-159191-8	180-79272-9, 460-159191-9	180-79272-10, 460-159191-10	180-79272-11, 460-159191-11	180-79272-12, 460-159191-12	180-79272-13, 460-159191-13	180-79272-14, 460-159191-14	180-78894-14, 460-158632-14	180-78894-15, 460-158632-15	180-79204-11, 460-159044-17	180-79204-12, 460-159044-18	180-77673-1, 460-155989-21
Sample Name	CFSB-177-SO-0-0.5	CFSB-DUP42-SO	CFSB-177-SO-0.5-2	CFSB-178-SO-0-0.5	CFSB-178-SO-0.5-2	CFSB-179-SO-0-0.5	CFSB-179-SO-0.5-2	CFSB-180-SO-0-0.5	CFSB-180-SO-0.5-2	CFSB-219-SO-0-0.5	CFSB-219-SO-0.5-2	CFSB-220-SO-0-0.5	CFSB-220-SO-0.5-2	CFSB-221-SO-0-0.5
Sample Depth	0-0.5 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft
Chemical	6/25/2018	6/25/2018	6/25/2018	6/25/2018	6/25/2018	6/25/2018	6/25/2018	6/25/2018	6/25/2018	6/16/2018	6/16/2018	6/22/2018	6/22/2018	5/7/2018
Diethyl Phthalate	0.011 U	0.012 J	0.011 U	0.033 U	0.011 U	0.021 U	0.021 U	0.029 U	0.028 U	0.011 U	0.012 U	0.011 U	0.01 U	0.011 U
Dimethyl Phthalate	0.0013 U	0.0013 U	0.0013 U	0.004 U	0.0013 U	0.0025 U	0.0025 U	0.0035 U	0.0034 U	0.0014 U	0.0014 U	0.0014 U	0.0013 U	0.0014 U
Di-N-Butyl Phthalate	0.016 U	0.015 U	0.016 U	0.048 U	0.016 U	0.031 U	0.031 U	0.042 U	0.042 U	0.016 U	0.017 U	0.016 U	0.015 U	0.016 U
Di-N-Octylphthalate	0.021 U	0.02 U	0.021 U	0.064 U	0.021 U	0.041 U	0.041 U	0.056 U	0.055 U	0.022 U	0.022 U	0.022 U	0.02 U	0.022 U
Fluoranthene	0.026 J	0.078 J	0.058	0.44 J-	0.05	0.15	0.089	0.29	0.18	0.083	0.011	0.094	0.01	0.11
Fluorene	0.0014 U	0.0021 J	0.0014 J	0.0059 J	0.0017 J	0.0034 J	0.0028 U	0.012 J	0.0074 J	0.005 J	0.0015 U	0.0066 J	0.0025 J	0.0028 J
Hexachlorobenzene	0.0026 U	0.0025 U	0.0026 U	0.0079 U	0.0026 U	0.005 U	0.005 U	0.0069 U	0.0068 U	0.0027 U	0.0028 U	0.0027 U	0.0025 U	0.0027 U
Hexachlorobutadiene	0.0021 UJ	0.002 U	0.0021 UJ	0.0065 UJ	0.0021 UJ	0.0041 UJ	0.0041 UJ	0.0056 U	0.0056 U	0.0022 U	0.0023 U	0.0022 U	0.002 U	0.0022 U
Hexachlorocyclopentadiene	0.0018 UJ	0.0018 U	0.0018 UJ	0.0056 UJ	0.0018 UJ	0.0036 UJ	0.0036 UJ	0.0049 U	0.0048 U	0.0019 U	0.002 U	0.0019 UJ	0.0018 UJ	0.0019 U
Hexachloroethane	0.0018 U	0.0018 U	0.0018 U	0.0057 U	0.0019 U	0.0036 U	0.0036 U	0.005 U	0.0049 U	0.0019 U	0.002 U	0.0019 U	0.0018 U	0.0019 U
Indeno(1,2,3-C,D)Pyrene	0.021 J	0.061 J	0.045	0.37	0.038	0.14	0.08	0.26	0.16	0.062	0.0071 J	0.052	0.0055 J	0.066
Isophorone	0.0018 U	0.0018 U	0.0018 U	0.0056 U	0.0018 U	0.0036 U	0.0036 U	0.0049 U	0.0048 U	0.0019 U	0.002 U	0.0019 U	0.0018 U	0.0019 U
Naphthalene	0.0018 J	0.0014 U	0.0021 J	0.0043 J	0.0026 J	0.003 J	0.0027 U	0.0058 J	0.0037 U	0.0063 J	0.0022 J	0.0045 J	0.002 J	0.0015 U
Nitrobenzene	0.013 U	0.013 U	0.013 U	0.04 U	0.013 U	0.026 U	0.026 U	0.035 U	0.035 U	0.014 U	0.014 U	0.014 U	0.013 U	0.014 U
N-Nitrosodi-N-Propylamine	0.0024 U	0.0024 U	0.0024 U	0.0075 U	0.0024 U	0.0047 U	0.0048 U	0.0065 U	0.0064 U	0.0026 U	0.0026 U	0.0025 U	0.0024 U	0.0026 U
N-Nitrosodiphenylamine	0.012 U	0.012 U	0.012 U	0.037 UJ	0.012 U	0.023 U	0.023 U	0.032 U	0.032 U	0.013 U	0.013 U	0.012 U	0.012 U	0.013 U
Pentachlorophenol	0.057 U	0.056 U	0.057 U	0.18 U	0.058 U	0.11 U	0.11 U	0.15 U	0.15 U	0.06 U	0.062 U	0.06 UJ	0.056 UJ	0.061 U
Phenanthrene	0.01 J	0.024 J	0.019	0.13	0.018	0.048	0.028	0.15	0.089	0.052	0.0095	0.059	0.011	0.043
Phenol	0.011 U	0.011 U	0.011 U	0.033 U	0.011 U	0.021 U	0.021 U	0.029 U	0.029 U	0.011 U	0.012 U	0.011 U	0.011 U	0.011 U
Pyrene	0.028 J	0.078 J	0.058	0.49	0.052	0.16	0.088	0.31	0.2	0.077	0.0093	0.079	0.0083	0.093
VOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,1,1-Trichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,2,2-Tetrachloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,2-Trichloro-1,2,2-Trifluoroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,2-Trichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1-Dichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1-Dichloroethene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,3-Trichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,4-Trichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dibromo-3-Chloropropane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dibromoethane (Ethylene Dibromide)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichloropropane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,3-Dichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,4-Dichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Hexanone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acetone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromochloromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromodichloromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromoform	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromomethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Carbon Disulfide	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Carbon Tetrachloride	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chloroform	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chloromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cis-1,2-Dichloroethylene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cis-1,3-Dichloropropene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cyclohexane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibromochloromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dichlorodifluoromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Ethylbenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Isopropylbenzene (Cumene)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
M,P-Xylene	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Table E-9
Summary of Data Used in Risk Assessment
Central Landfills Area (soil 0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-177	CFSB-177-DUP	CFSB-177	CFSB-178	CFSB-178	CFSB-179	CFSB-179	CFSB-180	CFSB-180	CFSB-219	CFSB-219	CFSB-220	CFSB-220	CFSB-221
Sample Lab IDs	180-79272-7, 460-159191-7	180-79272-15, 460-159191-15	180-79272-8, 460-159191-8	180-79272-9, 460-159191-9	180-79272-10, 460-159191-10	180-79272-11, 460-159191-11	180-79272-12, 460-159191-12	180-79272-13, 460-159191-13	180-79272-14, 460-159191-14	180-78894-14, 460-158632-14	180-78894-15, 460-158632-15	180-79204-11, 460-159044-17	180-79204-12, 460-159044-18	180-77673-1, 460-155989-21
Sample Name	CFSB-177-SO-0-0.5	CFSB-DUP42-SO	CFSB-177-SO-0.5-2	CFSB-178-SO-0-0.5	CFSB-178-SO-0.5-2	CFSB-179-SO-0-0.5	CFSB-179-SO-0.5-2	CFSB-180-SO-0-0.5	CFSB-180-SO-0.5-2	CFSB-219-SO-0-0.5	CFSB-219-SO-0.5-2	CFSB-220-SO-0-0.5	CFSB-220-SO-0.5-2	CFSB-221-SO-0-0.5
Sample Depth	0-0.5 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft
Chemical	6/25/2018	6/25/2018	6/25/2018	6/25/2018	6/25/2018	6/25/2018	6/25/2018	6/25/2018	6/25/2018	6/16/2018	6/16/2018	6/22/2018	6/22/2018	5/7/2018
Methyl Acetate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methyl Ethyl Ketone (2-Butanone)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methylcyclohexane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methylene Chloride	--	--	--	--	--	--	--	--	--	--	--	--	--	--
O-Xylene (1,2-Dimethylbenzene)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Styrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Tert-Butyl Methyl Ether	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Tetrachloroethylene (PCE)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Toluene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Trans-1,2-Dichloroethene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Trans-1,3-Dichloropropene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Trichloroethylene (TCE)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Trichlorofluoromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Vinyl Chloride	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-9
Summary of Data Used in Risk Assessment
Central Landfills Area (soil 0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-221	CFSB-221	CFSB-222	CFSB-222	CFSB-223	CFSB-223	CFSB-224	CFSB-224	CFSB-225	CFSB-225	CFSB-226	CFSB-226	CFSB-227	CFSB-227
Sample Lab IDs	180-77673-2, 460-155989-22	460-159538-1	180-77673-3, 460-155989-23	180-77673-4, 460-155989-24	460-155989-14	460-155989-15	460-155989-12	460-155989-13	460-155989-10	460-155989-11	460-155989-8	460-155989-9	460-155989-6	460-155989-7
Sample Name	CFSB-221-SO-0.5-2	CFSB-221a-SO-2.5-3.5	CFSB-222-SO-0-0.5	CFSB-222-SO-0.5-2	CFSB-223-SO-0-0.5	CFSB-223-SO-0.5-2	CFSB-224-SO-0-0.5	CFSB-224-SO-0.5-2	CFSB-225-SO-0-0.5	CFSB-225-SO-0.5-2	CFSB-226-SO-0-0.5	CFSB-226-SO-0.5-2	CFSB-227-SO-0-0.5	CFSB-227-SO-0.5-2
Sample Depth	0.5-2 ft	2.5-3.5 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft
Chemical	5/7/2018	6/28/2018	5/7/2018	5/7/2018	5/7/2018	5/7/2018	5/7/2018	5/7/2018	5/7/2018	5/7/2018	5/7/2018	5/7/2018	5/7/2018	5/7/2018
GENERAL CHEMISTRY (mg/kg)														
Fluoride	4.79 J+	--	16.1 J+	31 J+	--	--	--	--	--	--	--	--	--	--
Cyanide	0.07 U	--	0.07 U	0.31	--	--	--	--	--	--	--	--	--	--
METALS (mg/kg)														
"Chromium, Hexavalent - Estimated"	0.240876	--	0.2382	0.294404	--	--	--	--	--	--	--	--	--	--
"Chromium, Trivalent - Calculated"	--	--	--	--	--	--	--	--	--	--	--	--	--	--
"Chromium, Trivalent - Estimated"	8.75912	--	8.6618	10.7056	--	--	--	--	--	--	--	--	--	--
Aluminum	12900	--	14900	16600	--	--	--	--	--	--	--	--	--	--
Antimony	0.27 UJ	--	0.28 UJ	0.29 UJ	--	--	--	--	--	--	--	--	--	--
Arsenic	6.2	--	5.2	8.2	--	--	--	--	--	--	--	--	--	--
Barium	60.2	--	133	214	--	--	--	--	--	--	--	--	--	--
Beryllium	0.54	--	0.54	0.7	--	--	--	--	--	--	--	--	--	--
Cadmium	0.31 U	--	0.33 U	0.33 U	--	--	--	--	--	--	--	--	--	--
Calcium	1080	--	1800	2050	--	--	--	--	--	--	--	--	--	--
Chromium, Total	9	--	8.9	11	--	--	--	--	--	--	--	--	--	--
Cobalt	6.3	--	4.8	6.4	--	--	--	--	--	--	--	--	--	--
Copper	16.8	--	9.1	8.1	--	--	--	--	--	--	--	--	--	--
Iron	14200	--	14100	20300	--	--	--	--	--	--	--	--	--	--
Lead	9.5	--	10.2	12.2	--	--	--	--	--	--	--	--	--	--
Magnesium	9860	--	8670	9200	--	--	--	--	--	--	--	--	--	--
Manganese	379 J	--	458 J	842 J	--	--	--	--	--	--	--	--	--	--
Mercury	0.031	--	0.021	0.017 J	--	--	--	--	--	--	--	--	--	--
Nickel	10	--	25.2	20.5	--	--	--	--	--	--	--	--	--	--
Potassium	572	--	918	895	--	--	--	--	--	--	--	--	--	--
Selenium	0.26 U	--	0.28 U	0.29 U	--	--	--	--	--	--	--	--	--	--
Silver	0.56 U	--	0.6 U	0.61 U	--	--	--	--	--	--	--	--	--	--
Sodium	28.4 U	--	30.4 U	40.1 J	--	--	--	--	--	--	--	--	--	--
Thallium	0.11 U	--	0.12 U	0.12 U	--	--	--	--	--	--	--	--	--	--
Vanadium	9.4	--	14.5	21.2	--	--	--	--	--	--	--	--	--	--
Zinc	32.7	--	46.3	46.5	--	--	--	--	--	--	--	--	--	--
METALS|HEXAVALENT CHROMIUM (mg/kg)														
Chromium, Hexavalent	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PESTICIDES (mg/kg)														
Aldrin	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Alpha Bhc (Alpha Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Alpha Endosulfan	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Beta Bhc (Beta Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Beta Endosulfan	--	--	--	--	--	--	--	--	--	--	--	--	--	--
cis-Chlordane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Delta BHC (Delta Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dieldrin	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endosulfan Sulfate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin Aldehyde	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin Ketone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Gamma Bhc (Lindane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Heptachlor	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Heptachlor Epoxide	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methoxychlor	--	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDD	--	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDT	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Toxaphene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
trans-Chlordane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
POLYCHLORINATED BIPHENYLS (mg/kg)														
PCB-1016 (Aroclor 1016)	--	--	--	--	0.0094 U	0.0094 U	0.01 U	0.0097 U	0.0096 U	0.0095 U	0.0093 U	0.0093 U	0.0095 U	0.0094 U
PCB-1221 (Aroclor 1221)	--	--	--	--	0.0094 U	0.0094 U	0.01 U	0.0097 U	0.0096 U	0.0095 U	0.0093 U	0.0093 U	0.0095 U	0.0094 U

Table E-9
Summary of Data Used in Risk Assessment
Central Landfills Area (soil 0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-221	CFSB-221	CFSB-222	CFSB-222	CFSB-223	CFSB-223	CFSB-224	CFSB-224	CFSB-225	CFSB-225	CFSB-226	CFSB-226	CFSB-227	CFSB-227
Sample Lab IDs	180-77673-2, 460-155989-22	460-159538-1	180-77673-3, 460-155989-23	180-77673-4, 460-155989-24	460-155989-14	460-155989-15	460-155989-12	460-155989-13	460-155989-10	460-155989-11	460-155989-8	460-155989-9	460-155989-6	460-155989-7
Sample Name	CFSB-221-SO-0.5-2	CFSB-221a-SO-2.5-3.5	CFSB-222-SO-0-0.5	CFSB-222-SO-0.5-2	CFSB-223-SO-0-0.5	CFSB-223-SO-0.5-2	CFSB-224-SO-0-0.5	CFSB-224-SO-0.5-2	CFSB-225-SO-0-0.5	CFSB-225-SO-0.5-2	CFSB-226-SO-0-0.5	CFSB-226-SO-0.5-2	CFSB-227-SO-0-0.5	CFSB-227-SO-0.5-2
Sample Depth	0.5-2 ft	2.5-3.5 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft
Chemical	5/7/2018	6/28/2018	5/7/2018	5/7/2018	5/7/2018	5/7/2018	5/7/2018	5/7/2018	5/7/2018	5/7/2018	5/7/2018	5/7/2018	5/7/2018	5/7/2018
PCB-1232 (Aroclor 1232)	--	--	--	--	0.0094 U	0.0094 U	0.01 U	0.0097 U	0.0096 U	0.0095 U	0.0093 U	0.0093 U	0.0095 U	0.0094 U
PCB-1242 (Aroclor 1242)	--	--	--	--	0.0094 U	0.0094 U	0.01 U	0.0097 U	0.0096 U	0.0095 U	0.0093 U	0.0093 U	0.0095 U	0.0094 U
PCB-1248 (Aroclor 1248)	--	--	--	--	0.0094 U	0.0094 U	0.01 U	0.0097 U	0.0096 U	0.0095 U	0.0093 U	0.0093 U	0.0095 U	0.0094 U
PCB-1254 (Aroclor 1254)	--	--	--	--	0.062 J	0.08	0.01 U	0.4	0.0099 U	0.0099 U	0.0096 U	0.0096 U	1.2	0.91
PCB-1260 (Aroclor 1260)	--	--	--	--	0.0097 U	0.0097 U	0.01 U	0.01 U	0.0099 U	0.0099 U	0.0096 U	0.0096 U	0.0098 U	0.0097 U
PCB-1262 (Aroclor 1262)	--	--	--	--	0.0097 U	0.0097 U	0.01 U	0.01 U	0.0099 U	0.0099 U	0.0096 U	0.0096 U	0.0098 U	0.0097 U
PCB-1268 (Aroclor 1268)	--	--	--	--	0.0097 U	0.0097 U	0.01 U	0.01 U	0.0099 U	0.0099 U	0.0096 U	0.0096 U	0.0098 U	0.0097 U
Polychlorinated Biphenyl (PCBs)	--	--	--	--	0.062 J	0.08	0.01 U	0.4	0.0099 U	0.0099 U	0.0096 U	0.0096 U	1.2	0.91
SEMIVOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,2,4,5-Tetrachlorobenzene	0.0016 U	--	0.0017 U	0.0018 U	--	--	--	--	--	--	--	--	--	--
1,4-Dioxane (P-Dioxane)	0.012 U	--	0.013 U	0.013 U	--	--	--	--	--	--	--	--	--	--
2,3,4,6-Tetrachlorophenol	0.016 U	--	0.017 U	0.017 U	--	--	--	--	--	--	--	--	--	--
2,4,5-Trichlorophenol	0.0027 U	--	0.0029 U	0.003 U	--	--	--	--	--	--	--	--	--	--
2,4,6-Trichlorophenol	0.0021 U	--	0.0022 U	0.0023 U	--	--	--	--	--	--	--	--	--	--
2,4-Dichlorophenol	0.0029 U	--	0.0031 U	0.0032 U	--	--	--	--	--	--	--	--	--	--
2,4-Dimethylphenol	0.0024 U	--	0.0025 U	0.0026 U	--	--	--	--	--	--	--	--	--	--
2,4-Dinitrophenol	0.1 U	--	0.11 U	0.11 U	--	--	--	--	--	--	--	--	--	--
2,4-Dinitrotoluene	0.0019 U	--	0.002 U	0.0021 U	--	--	--	--	--	--	--	--	--	--
2,6-Dinitrotoluene	0.0024 U	--	0.0025 U	0.0026 U	--	--	--	--	--	--	--	--	--	--
2-Chloronaphthalene	0.0018 U	--	0.0019 U	0.0019 U	--	--	--	--	--	--	--	--	--	--
2-Chlorophenol	0.0018 U	--	0.0019 U	0.0019 U	--	--	--	--	--	--	--	--	--	--
2-Methylnaphthalene	0.0018 U	--	0.0019 U	0.002 U	--	--	--	--	--	--	--	--	--	--
2-Methylphenol (O-Cresol)	0.011 U	--	0.012 U	0.012 U	--	--	--	--	--	--	--	--	--	--
2-Nitroaniline	0.017 U	--	0.018 U	0.019 U	--	--	--	--	--	--	--	--	--	--
2-Nitrophenol	0.0022 U	--	0.0023 U	0.0024 U	--	--	--	--	--	--	--	--	--	--
3- And 4- Methylphenol (Total)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3,3'-Dichlorobenzidine	0.036 U	--	0.038 U	0.039 U	--	--	--	--	--	--	--	--	--	--
3-Nitroaniline	0.0097 U	--	0.01 U	0.011 U	--	--	--	--	--	--	--	--	--	--
4,6-Dinitro-2-Methylphenol	0.066 U	--	0.07 U	0.072 U	--	--	--	--	--	--	--	--	--	--
4-Bromophenyl Phenyl Ether	0.0027 U	--	0.0028 U	0.0029 U	--	--	--	--	--	--	--	--	--	--
4-Chloro-3-Methylphenol	0.0018 U	--	0.0019 U	0.002 U	--	--	--	--	--	--	--	--	--	--
4-Chloroaniline	0.0013 U	--	0.0013 U	0.0014 U	--	--	--	--	--	--	--	--	--	--
4-Chlorophenyl Phenyl Ether	0.0023 U	--	0.0024 U	0.0025 U	--	--	--	--	--	--	--	--	--	--
4-Nitroaniline	0.0019 U	--	0.002 U	0.002 U	--	--	--	--	--	--	--	--	--	--
4-Nitrophenol	0.027 U	--	0.028 U	0.029 U	--	--	--	--	--	--	--	--	--	--
Acenaphthene	0.0022 U	--	0.011	0.012	--	--	--	--	--	--	--	--	--	--
Acenaphthylene	0.0017 U	--	0.0018 U	0.0018 U	--	--	--	--	--	--	--	--	--	--
Acetophenone	0.0021 U	--	0.0022 U	0.0023 U	--	--	--	--	--	--	--	--	--	--
Anthracene	0.002 U	--	0.019	0.022	--	--	--	--	--	--	--	--	--	--
Atrazine	0.017 UJ	--	0.018 UJ	0.018 UJ	--	--	--	--	--	--	--	--	--	--
Benzaldehyde	0.0047 U	--	0.005 U	0.006 J	--	--	--	--	--	--	--	--	--	--
Benzo(A)Anthracene	0.0089	--	0.092	0.097	--	--	--	--	--	--	--	--	--	--
Benzo(A)Pyrene	0.018	--	0.12	0.13	--	--	--	--	--	--	--	--	--	--
Benzo(B)Fluoranthene	0.017	--	0.23	0.32	--	--	--	--	--	--	--	--	--	--
Benzo(G,H,I)Perylene	0.012	--	0.17	0.21	--	--	--	--	--	--	--	--	--	--
Benzo(K)Fluoranthene	0.0044 J	--	0.067	0.072	--	--	--	--	--	--	--	--	--	--
Benzyl Butyl Phthalate	0.026 U	--	0.028 U	0.028 U	--	--	--	--	--	--	--	--	--	--
Biphenyl (Diphenyl)	0.0016 U	--	0.0017 U	0.0017 U	--	--	--	--	--	--	--	--	--	--
Bis(2-Chloroethoxy) Methane	0.0018 U	--	0.0019 U	0.002 U	--	--	--	--	--	--	--	--	--	--
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.0014 U	--	0.0015 U	0.0015 U	--	--	--	--	--	--	--	--	--	--
Bis(2-Chloroisopropyl) Ether	0.0028 U	--	0.003 U	0.0031 U	--	--	--	--	--	--	--	--	--	--
Bis(2-Ethylhexyl) Phthalate	0.041 U	--	0.043 U	0.044 U	--	--	--	--	--	--	--	--	--	--
Caprolactam	0.025 U	--	0.026 U	0.027 U	--	--	--	--	--	--	--	--	--	--
Carbazole	0.002 J	--	0.022	0.026	--	--	--	--	--	--	--	--	--	--
Chrysene	0.013	--	0.15	0.17	--	--	--	--	--	--	--	--	--	--
Dibenz(A,H)Anthracene	0.0017 U	--	0.038	0.041	--	--	--	--	--	--	--	--	--	--
Dibenzofuran	0.0017 U	--	0.0045 J	0.0063 J	--	--	--	--	--	--	--	--	--	--

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Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-221	CFSB-221	CFSB-222	CFSB-222	CFSB-223	CFSB-223	CFSB-224	CFSB-224	CFSB-225	CFSB-225	CFSB-226	CFSB-226	CFSB-227	CFSB-227
Sample Lab IDs	180-77673-2, 460-155989-22	460-159538-1	180-77673-3, 460-155989-23	180-77673-4, 460-155989-24	460-155989-14	460-155989-15	460-155989-12	460-155989-13	460-155989-10	460-155989-11	460-155989-8	460-155989-9	460-155989-6	460-155989-7
Sample Name	CFSB-221-SO-0.5-2	CFSB-221a-SO-2.5-3.5	CFSB-222-SO-0-0.5	CFSB-222-SO-0.5-2	CFSB-223-SO-0-0.5	CFSB-223-SO-0.5-2	CFSB-224-SO-0-0.5	CFSB-224-SO-0.5-2	CFSB-225-SO-0-0.5	CFSB-225-SO-0.5-2	CFSB-226-SO-0-0.5	CFSB-226-SO-0.5-2	CFSB-227-SO-0-0.5	CFSB-227-SO-0.5-2
Sample Depth	0.5-2 ft	2.5-3.5 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft
Chemical	5/7/2018	6/28/2018	5/7/2018	5/7/2018	5/7/2018	5/7/2018	5/7/2018	5/7/2018	5/7/2018	5/7/2018	5/7/2018	5/7/2018	5/7/2018	5/7/2018
Diethyl Phthalate	0.011 U	--	0.012 U	0.012 U	--	--	--	--	--	--	--	--	--	--
Dimethyl Phthalate	0.0014 U	--	0.0015 U	0.0015 U	--	--	--	--	--	--	--	--	--	--
Di-N-Butyl Phthalate	0.017 U	--	0.018 U	0.018 U	--	--	--	--	--	--	--	--	--	--
Di-N-Octylphthalate	0.022 U	--	0.024 U	0.024 U	--	--	--	--	--	--	--	--	--	--
Fluoranthene	0.018	--	0.2	0.21	--	--	--	--	--	--	--	--	--	--
Fluorene	0.0015 U	--	0.008 J	0.01	--	--	--	--	--	--	--	--	--	--
Hexachlorobenzene	0.0027 U	--	0.0029 U	0.003 U	--	--	--	--	--	--	--	--	--	--
Hexachlorobutadiene	0.0022 U	--	0.0024 U	0.0024 U	--	--	--	--	--	--	--	--	--	--
Hexachlorocyclopentadiene	0.0019 U	--	0.0021 U	0.0021 U	--	--	--	--	--	--	--	--	--	--
Hexachloroethane	0.002 U	--	0.0021 U	0.0021 U	--	--	--	--	--	--	--	--	--	--
Indeno(1,2,3-C,D)Pyrene	0.01	--	0.14	0.16	--	--	--	--	--	--	--	--	--	--
Isophorone	0.0019 U	--	0.0021 U	0.0021 U	--	--	--	--	--	--	--	--	--	--
Naphthalene	0.0015 U	--	0.0029 J	0.0037 J	--	--	--	--	--	--	--	--	--	--
Nitrobenzene	0.014 U	--	0.015 U	0.015 U	--	--	--	--	--	--	--	--	--	--
N-Nitrosodi-N-Propylamine	0.0026 U	--	0.0027 U	0.0028 U	--	--	--	--	--	--	--	--	--	--
N-Nitrosodiphenylamine	0.013 U	--	0.013 U	0.014 U	--	--	--	--	--	--	--	--	--	--
Pentachlorophenol	0.061 U	--	0.065 U	0.067 U	--	--	--	--	--	--	--	--	--	--
Phenanthrene	0.011	--	0.094	0.11	--	--	--	--	--	--	--	--	--	--
Phenol	0.012 U	--	0.012 U	0.013 U	--	--	--	--	--	--	--	--	--	--
Pyrene	0.016	--	0.16	0.17	--	--	--	--	--	--	--	--	--	--
VOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,1,1-Trichloroethane	--	0.00023 U	--	--	--	--	--	--	--	--	--	--	--	--
1,1,2,2-Tetrachloroethane	--	0.00021 U	--	--	--	--	--	--	--	--	--	--	--	--
1,1,2-Trichloro-1,2,2-Trifluoroethane	--	0.0003 U	--	--	--	--	--	--	--	--	--	--	--	--
1,1,2-Trichloroethane	--	0.00018 U	--	--	--	--	--	--	--	--	--	--	--	--
1,1-Dichloroethane	--	0.00021 U	--	--	--	--	--	--	--	--	--	--	--	--
1,1-Dichloroethene	--	0.00023 U	--	--	--	--	--	--	--	--	--	--	--	--
1,2,3-Trichlorobenzene	--	0.00018 U	--	--	--	--	--	--	--	--	--	--	--	--
1,2,4-Trichlorobenzene	--	0.000092 U	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dibromo-3-Chloropropane	--	0.00046 U	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dibromoethane (Ethylene Dibromide)	--	0.00018 U	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichlorobenzene	--	0.00014 U	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichloroethane	--	0.0003 U	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichloropropane	--	0.00042 U	--	--	--	--	--	--	--	--	--	--	--	--
1,3-Dichlorobenzene	--	0.00016 U	--	--	--	--	--	--	--	--	--	--	--	--
1,4-Dichlorobenzene	--	0.0001 U	--	--	--	--	--	--	--	--	--	--	--	--
2-Hexanone	--	0.00078 U	--	--	--	--	--	--	--	--	--	--	--	--
Acetone	--	0.15	--	--	--	--	--	--	--	--	--	--	--	--
Benzene	--	0.00026 U	--	--	--	--	--	--	--	--	--	--	--	--
Bromochloromethane	--	0.00028 U	--	--	--	--	--	--	--	--	--	--	--	--
Bromodichloromethane	--	0.00026 U	--	--	--	--	--	--	--	--	--	--	--	--
Bromoform	--	0.00043 U	--	--	--	--	--	--	--	--	--	--	--	--
Bromomethane	--	0.00047 U	--	--	--	--	--	--	--	--	--	--	--	--
Carbon Disulfide	--	0.0003 J	--	--	--	--	--	--	--	--	--	--	--	--
Carbon Tetrachloride	--	0.00018 U	--	--	--	--	--	--	--	--	--	--	--	--
Chlorobenzene	--	0.00018 U	--	--	--	--	--	--	--	--	--	--	--	--
Chloroethane	--	0.00052 U	--	--	--	--	--	--	--	--	--	--	--	--
Chloroform	--	0.00032 U	--	--	--	--	--	--	--	--	--	--	--	--
Chloromethane	--	0.00044 U	--	--	--	--	--	--	--	--	--	--	--	--
Cis-1,2-Dichloroethylene	--	0.00015 U	--	--	--	--	--	--	--	--	--	--	--	--
Cis-1,3-Dichloropropene	--	0.00027 U	--	--	--	--	--	--	--	--	--	--	--	--
Cyclohexane	--	0.00022 U	--	--	--	--	--	--	--	--	--	--	--	--
Dibromochloromethane	--	0.00019 U	--	--	--	--	--	--	--	--	--	--	--	--
Dichlorodifluoromethane	--	0.00034 U	--	--	--	--	--	--	--	--	--	--	--	--
Ethylbenzene	--	0.0002 U	--	--	--	--	--	--	--	--	--	--	--	--
Isopropylbenzene (Cumene)	--	0.00013 U	--	--	--	--	--	--	--	--	--	--	--	--
M,P-Xylene	--	0.00017 U	--	--	--	--	--	--	--	--	--	--	--	--

Table E-9
Summary of Data Used in Risk Assessment
Central Landfills Area (soil 0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-221	CFSB-221	CFSB-222	CFSB-222	CFSB-223	CFSB-223	CFSB-224	CFSB-224	CFSB-225	CFSB-225	CFSB-226	CFSB-226	CFSB-227	CFSB-227
Sample Lab IDs	180-77673-2, 460-155989-22	460-159538-1	180-77673-3, 460-155989-23	180-77673-4, 460-155989-24	460-155989-14	460-155989-15	460-155989-12	460-155989-13	460-155989-10	460-155989-11	460-155989-8	460-155989-9	460-155989-6	460-155989-7
Sample Name	CFSB-221-SO-0.5-2	CFSB-221a-SO-2.5-3.5	CFSB-222-SO-0-0.5	CFSB-222-SO-0.5-2	CFSB-223-SO-0-0.5	CFSB-223-SO-0.5-2	CFSB-224-SO-0-0.5	CFSB-224-SO-0.5-2	CFSB-225-SO-0-0.5	CFSB-225-SO-0.5-2	CFSB-226-SO-0-0.5	CFSB-226-SO-0.5-2	CFSB-227-SO-0-0.5	CFSB-227-SO-0.5-2
Sample Depth	0.5-2 ft	2.5-3.5 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft
Chemical	5/7/2018	6/28/2018	5/7/2018	5/7/2018	5/7/2018	5/7/2018	5/7/2018	5/7/2018	5/7/2018	5/7/2018	5/7/2018	5/7/2018	5/7/2018	5/7/2018
Methyl Acetate	--	0.0043 U	--	--	--	--	--	--	--	--	--	--	--	--
Methyl Ethyl Ketone (2-Butanone)	--	0.0032 J	--	--	--	--	--	--	--	--	--	--	--	--
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	--	0.00066 U	--	--	--	--	--	--	--	--	--	--	--	--
Methylcyclohexane	--	0.00016 U	--	--	--	--	--	--	--	--	--	--	--	--
Methylene Chloride	--	0.00016 U	--	--	--	--	--	--	--	--	--	--	--	--
O-Xylene (1,2-Dimethylbenzene)	--	0.000095 U	--	--	--	--	--	--	--	--	--	--	--	--
Styrene	--	0.0002 J	--	--	--	--	--	--	--	--	--	--	--	--
Tert-Butyl Methyl Ether	--	0.00013 U	--	--	--	--	--	--	--	--	--	--	--	--
Tetrachloroethylene (PCE)	--	0.00014 U	--	--	--	--	--	--	--	--	--	--	--	--
Toluene	--	0.00092 J	--	--	--	--	--	--	--	--	--	--	--	--
Trans-1,2-Dichloroethene	--	0.00025 U	--	--	--	--	--	--	--	--	--	--	--	--
Trans-1,3-Dichloropropene	--	0.00027 U	--	--	--	--	--	--	--	--	--	--	--	--
Trichloroethylene (TCE)	--	0.00014 U	--	--	--	--	--	--	--	--	--	--	--	--
Trichlorofluoromethane	--	0.00041 U	--	--	--	--	--	--	--	--	--	--	--	--
Vinyl Chloride	--	0.00055 U	--	--	--	--	--	--	--	--	--	--	--	--

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-9
Summary of Data Used in Risk Assessment
Central Landfills Area (soil 0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-228	CFSB-228	CFSB-229	CFSB-229	CFSB-230	CFSB-230-DUP	CFSB-230	CFSB-261	CFSB-261	CFSB-261	CFSB-262	CFSB-262	CFSB-262	CFSB-262
Sample Lab IDs	460-155989-16	460-155989-17	460-155989-4	460-155989-5	460-155989-1	460-155989-2	460-155989-3	180-77393-48, 460-155369-4	180-77393-49, 460-155369-5	180-77393-50, 460-155369-6	180-77393-59, 460-155369-15	180-77393-60, 460-155369-16	180-77393-61, 460-155369-17	180-77393-62, 460-155369-18
Sample Name	CFSB-228-SO-0-0.5	CFSB-228-SO-0.5-2	CFSB-229-SO-0-0.5	CFSB-229-SO-0.5-2	CFSB-230-SO-0-0.5	CFSB-DUP34-SO	CFSB-230-SO-0.5-2	CFSB-261-SO-0-0.5	CFSB-261-SO-0.5-2	CFSB-261-SO-10-12	CFSB-262-SO-0-0.5	CFSB-262-SO-0.5-2	CFSB-262-SO-6-8	CFSB-262-SO-10-12
Sample Depth	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	6-8 ft	10-12 ft
Chemical	5/7/2018	5/7/2018	5/7/2018	5/7/2018	5/7/2018	5/7/2018	5/7/2018	5/2/2018	5/2/2018	5/2/2018	5/2/2018	5/2/2018	5/2/2018	5/2/2018
GENERAL CHEMISTRY (mg/kg)														
Fluoride	--	--	--	--	--	--	--	568 J-	349 J-	41.2 J-	23.4 J-	16.7 J-	14.9 J-	5.56 J-
Cyanide	--	--	--	--	--	--	--	9.9	13	0.61	0.49	0.38	0.5	0.066 U
METALS (mg/kg)														
"Chromium, Hexavalent - Estimated"	--	--	--	--	--	--	--	0.393431	0.264964	0.281022	0.259611	0.235523	0.208759	0.305109
"Chromium, Trivalent - Calculated"	--	--	--	--	--	--	--	--	--	--	--	--	--	--
"Chromium, Trivalent - Estimated"	--	--	--	--	--	--	--	14.3066	9.63504	10.219	9.44039	8.56448	7.59124	11.0949
Aluminum	--	--	--	--	--	--	--	30800	15100	6640	12500	10300	7670	8200
Antimony	--	--	--	--	--	--	--	0.26 UJ	0.25 UJ	0.24 UJ	0.25 UJ	0.24 UJ	0.25 UJ	0.23 UJ
Arsenic	--	--	--	--	--	--	--	7.3	4.2	4.8	5	5.9	4.5	3.7
Barium	--	--	--	--	--	--	--	227	115	67.9	122	59.6	56.1	130
Beryllium	--	--	--	--	--	--	--	1.5	0.65	0.28 J	0.55	0.33	0.29 J	0.28 J
Cadmium	--	--	--	--	--	--	--	0.3 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.27 U
Calcium	--	--	--	--	--	--	--	12300	3400	30600	2910	18000	52600	37000
Chromium, Total	--	--	--	--	--	--	--	14.7	9.9	10.5	9.7	8.8	7.8	11.4
Cobalt	--	--	--	--	--	--	--	5.3	5	3.2	5	10.5	4.4	4.7
Copper	--	--	--	--	--	--	--	12.5	13.4	8.1	10.8 J	13.8 J	8.1 J	8 J
Iron	--	--	--	--	--	--	--	20200	13500	9540	15600	14100	12000	12900
Lead	--	--	--	--	--	--	--	14.9	10.9	5	10.3 J	15 J	5.6 J	5.3 J
Magnesium	--	--	--	--	--	--	--	11100	7360	10500	7750 J	8920 J	10100 J	11600 J
Manganese	--	--	--	--	--	--	--	584	509	250	520 J	398 J	497 J	675 J
Mercury	--	--	--	--	--	--	--	0.01 U	0.01 U	0.083	0.014 J	0.053	0.025 J+	0.025 J+
Nickel	--	--	--	--	--	--	--	16.6	11	7.7	13.4	9.6	9.7	10.9
Potassium	--	--	--	--	--	--	--	1500	755	631	972	624	562	716
Selenium	--	--	--	--	--	--	--	0.26 U	0.24 U	0.24 U	0.25 U	0.24 U	0.25 U	0.23 U
Silver	--	--	--	--	--	--	--	0.55 U	0.52 U	0.51 U	0.52 UJ	0.51 UJ	0.52 UJ	0.49 UJ
Sodium	--	--	--	--	--	--	--	4390	1990	292	46.8 J	25.8 U	26.5 U	25 U
Thallium	--	--	--	--	--	--	--	0.14 J	0.1 U	0.1 U	0.11 U	0.1 U	0.11 U	0.1 U
Vanadium	--	--	--	--	--	--	--	24.2	11.5	5.1	13.6	7.7	5.6	5.8
Zinc	--	--	--	--	--	--	--	61.5	37.5	26.1	49.2	39.6	34.1	34.3
METALS|HEXAVALENT CHROMIUM (mg/kg)														
Chromium, Hexavalent	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PESTICIDES (mg/kg)														
Aldrin	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Alpha Bhc (Alpha Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Alpha Endosulfan	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Beta Bhc (Beta Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Beta Endosulfan	--	--	--	--	--	--	--	--	--	--	--	--	--	--
cis-Chlordane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Delta BHC (Delta Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dieldrin	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endosulfan Sulfate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin Aldehyde	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin Ketone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Gamma Bhc (Lindane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Heptachlor	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Heptachlor Epoxide	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methoxychlor	--	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDD	--	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDT	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Toxaphene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
trans-Chlordane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
POLYCHLORINATED BIPHENYLS (mg/kg)														
PCB-1016 (Aroclor 1016)	0.0094 U	0.0097 U	0.0091 U	0.0093 U	0.0093 U	0.0093 U	0.0093 U	--	--	--	--	--	--	--
PCB-1221 (Aroclor 1221)	0.0094 U	0.0097 U	0.0091 U	0.0093 U	0.0093 U	0.0093 U	0.0093 U	--	--	--	--	--	--	--

Table E-9
Summary of Data Used in Risk Assessment
Central Landfills Area (soil 0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-228	CFSB-228	CFSB-229	CFSB-229	CFSB-230	CFSB-230-DUP	CFSB-230	CFSB-261	CFSB-261	CFSB-261	CFSB-262	CFSB-262	CFSB-262	CFSB-262
Sample Lab IDs	460-155989-16	460-155989-17	460-155989-4	460-155989-5	460-155989-1	460-155989-2	460-155989-3	180-77393-48, 460-155369-4	180-77393-49, 460-155369-5	180-77393-50, 460-155369-6	180-77393-59, 460-155369-15	180-77393-60, 460-155369-16	180-77393-61, 460-155369-17	180-77393-62, 460-155369-18
Sample Name	CFSB-228-SO-0-0.5	CFSB-228-SO-0.5-2	CFSB-229-SO-0-0.5	CFSB-229-SO-0.5-2	CFSB-230-SO-0-0.5	CFSB-DUP34-SO	CFSB-230-SO-0.5-2	CFSB-261-SO-0-0.5	CFSB-261-SO-0.5-2	CFSB-261-SO-10-12	CFSB-262-SO-0-0.5	CFSB-262-SO-0.5-2	CFSB-262-SO-6-8	CFSB-262-SO-10-12
Sample Depth	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	6-8 ft	10-12 ft
Chemical	5/7/2018	5/7/2018	5/7/2018	5/7/2018	5/7/2018	5/7/2018	5/7/2018	5/2/2018	5/2/2018	5/2/2018	5/2/2018	5/2/2018	5/2/2018	5/2/2018
PCB-1232 (Aroclor 1232)	0.0094 U	0.0097 U	0.0091 U	0.0093 U	0.0093 U	0.0093 U	0.0093 U	--	--	--	--	--	--	--
PCB-1242 (Aroclor 1242)	0.0094 U	0.0097 U	0.0091 U	0.0093 U	0.0093 U	0.0093 U	0.0093 U	--	--	--	--	--	--	--
PCB-1248 (Aroclor 1248)	0.0094 U	0.0097 U	0.0091 U	0.0093 U	0.0093 U	0.0093 U	0.0093 U	--	--	--	--	--	--	--
PCB-1254 (Aroclor 1254)	0.0097 U	0.01 U	0.0094 U	0.18 J+	0.0097 U	0.0096 U	0.0097 U	--	--	--	--	--	--	--
PCB-1260 (Aroclor 1260)	0.0097 U	0.01 U	0.0094 U	0.0096 U	0.0097 U	0.0096 U	0.0097 U	--	--	--	--	--	--	--
PCB-1262 (Aroclor 1262)	0.0097 U	0.01 U	0.0094 U	0.0096 U	0.0097 U	0.0096 U	0.0097 U	--	--	--	--	--	--	--
PCB-1268 (Aroclor 1268)	0.0097 U	0.01 U	0.0094 U	0.0096 U	0.0097 U	0.0096 U	0.0097 U	--	--	--	--	--	--	--
Polychlorinated Biphenyl (PCBs)	0.0097 U	0.01 U	0.0094 U	0.18 J+	0.0097 U	0.0096 U	0.0097 U	--	--	--	--	--	--	--
SEMIVOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,2,4,5-Tetrachlorobenzene	--	--	--	--	--	--	--	0.0064 U	0.0031 U	0.0015 U	0.0016 U	0.0015 U	0.0015 U	0.0015 U
1,4-Dioxane (P-Dioxane)	--	--	--	--	--	--	--	0.046 U	0.023 U	0.011 U	0.012 U	0.011 U	0.011 U	0.011 U
2,3,4,6-Tetrachlorophenol	--	--	--	--	--	--	--	0.062 U	0.03 U	0.015 U	0.016 U	0.015 U	0.015 U	0.014 U
2,4,5-Trichlorophenol	--	--	--	--	--	--	--	0.011 U	0.0052 U	0.0025 U	0.0027 U	0.0026 U	0.0025 U	0.0024 U
2,4,6-Trichlorophenol	--	--	--	--	--	--	--	0.0082 U	0.004 U	0.0019 U	0.0021 U	0.002 U	0.0019 U	0.0019 U
2,4-Dichlorophenol	--	--	--	--	--	--	--	0.011 U	0.0056 U	0.0027 U	0.0029 U	0.0028 U	0.0027 U	0.0026 U
2,4-Dimethylphenol	--	--	--	--	--	--	--	0.0092 U	0.0045 U	0.0022 U	0.0023 U	0.0022 U	0.0022 U	0.0021 U
2,4-Dinitrophenol	--	--	--	--	--	--	--	0.4 U	0.19 U	0.094 U	0.1 U	0.097 U	0.095 UJ	0.092 UJ
2,4-Dinitrotoluene	--	--	--	--	--	--	--	0.0074 U	0.0036 U	0.0017 U	0.0019 U	0.0018 U	0.0018 U	0.0017 U
2,6-Dinitrotoluene	--	--	--	--	--	--	--	0.0092 U	0.0045 U	0.0022 U	0.0023 U	0.0022 U	0.0022 U	0.0021 U
2-Chloronaphthalene	--	--	--	--	--	--	--	0.0068 U	0.0033 U	0.0016 U	0.0017 U	0.0016 U	0.0016 U	0.0016 U
2-Chlorophenol	--	--	--	--	--	--	--	0.0069 U	0.0034 U	0.0016 U	0.0017 U	0.0017 U	0.0016 U	0.0016 U
2-Methylnaphthalene	--	--	--	--	--	--	--	0.0071 U	0.0035 U	0.0017 U	0.0039 J	0.0017 U	0.0017 U	0.0016 U
2-Methylphenol (O-Cresol)	--	--	--	--	--	--	--	0.043 U	0.021 U	0.01 U	0.011 U	0.01 U	0.01 U	0.0098 U
2-Nitroaniline	--	--	--	--	--	--	--	0.068 U	0.033 U	0.016 U	0.017 U	0.016 U	0.016 U	0.016 U
2-Nitrophenol	--	--	--	--	--	--	--	0.0085 U	0.0041 U	0.002 U	0.0021 U	0.0021 U	0.002 U	0.002 U
3- And 4- Methylphenol (Total)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3,3'-Dichlorobenzidine	--	--	--	--	--	--	--	0.14 U	0.067 U	0.033 U	0.035 U	0.033 U	0.033 U	0.032 U
3-Nitroaniline	--	--	--	--	--	--	--	0.038 U	0.018 U	0.0089 U	0.0095 U	0.0091 U	0.009 U	0.0087 U
4,6-Dinitro-2-Methylphenol	--	--	--	--	--	--	--	0.26 U	0.12 U	0.06 U	0.065 U	0.062 U	0.061 UJ	0.059 UJ
4-Bromophenyl Phenyl Ether	--	--	--	--	--	--	--	0.01 U	0.0051 U	0.0025 U	0.0026 U	0.0025 U	0.0025 U	0.0024 U
4-Chloro-3-Methylphenol	--	--	--	--	--	--	--	0.007 U	0.0034 U	0.0017 U	0.0018 U	0.0017 U	0.0017 U	0.0016 U
4-Chloroaniline	--	--	--	--	--	--	--	0.0049 U	0.0024 U	0.0012 U	0.0012 U	0.0012 U	0.0012 U	0.0011 U
4-Chlorophenyl Phenyl Ether	--	--	--	--	--	--	--	0.009 U	0.0044 U	0.0021 U	0.0023 U	0.0022 U	0.0021 U	0.0021 U
4-Nitroaniline	--	--	--	--	--	--	--	0.0072 U	0.0035 U	0.0017 U	0.0018 U	0.0017 U	0.0017 U	0.0017 U
4-Nitrophenol	--	--	--	--	--	--	--	0.1 U	0.051 U	0.025 U	0.026 U	0.025 U	0.025 U	0.024 U
Acenaphthene	--	--	--	--	--	--	--	0.02 J	0.021	0.002 U	0.038	0.0021 U	0.0044 J	0.002 U
Acenaphthylene	--	--	--	--	--	--	--	0.0065 U	0.0032 U	0.0015 U	0.0016 U	0.0016 U	0.0015 U	0.0015 U
Acetophenone	--	--	--	--	--	--	--	0.0081 U	0.0039 U	0.0019 U	0.002 U	0.0019 U	0.0019 U	0.0019 U
Anthracene	--	--	--	--	--	--	--	0.033	0.036	0.0018 U	0.064	0.0019 U	0.0088	0.0018 U
Atrazine	--	--	--	--	--	--	--	0.065 U	0.032 U	0.015 U	0.016 U	0.016 U	0.015 U	0.015 U
Benzaldehyde	--	--	--	--	--	--	--	0.018 U	0.009 U	0.0044 U	0.0046 U	0.0045 U	0.0044 UR	0.0042 UR
Benzo(A)Anthracene	--	--	--	--	--	--	--	0.18	0.14	0.0091	0.31	0.0056 J	0.068	0.0077
Benzo(A)Pyrene	--	--	--	--	--	--	--	0.17	0.12	0.0081	0.3	0.0057 J	0.082	0.0077
Benzo(B)Fluoranthene	--	--	--	--	--	--	--	0.31	0.21	0.014	0.53	0.0094	0.15	0.019
Benzo(G,H,I)Perylene	--	--	--	--	--	--	--	0.21	0.14	0.011	0.29	0.0051 J	0.072	0.0049 J
Benzo(K)Fluoranthene	--	--	--	--	--	--	--	0.11	0.081	0.0078	0.17	0.0027 J	0.051	0.0076
Benzyl Butyl Phthalate	--	--	--	--	--	--	--	0.1 U	0.05 U	0.024 U	0.026 U	0.025 U	0.024 U	0.023 U
Biphenyl (Diphenyl)	--	--	--	--	--	--	--	0.0062 U	0.003 U	0.0015 U	0.0016 U	0.0015 U	0.0015 U	0.0014 U
Bis(2-Chloroethoxy) Methane	--	--	--	--	--	--	--	0.0071 U	0.0034 U	0.0017 U	0.0018 U	0.0017 U	0.0017 U	0.0016 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	--	--	--	--	--	--	--	0.0054 U	0.0026 U	0.0013 U	0.0014 U	0.0013 U	0.0013 U	0.0012 U
Bis(2-Chloroisopropyl) Ether	--	--	--	--	--	--	--	0.011 U	0.0054 U	0.0026 U	0.0028 U	0.0027 U	0.0026 U	0.0025 U
Bis(2-Ethylhexyl) Phthalate	--	--	--	--	--	--	--	0.16 U	0.077 U	0.037 U	0.04 U	0.038 U	0.038 U	0.036 U
Caprolactam	--	--	--	--	--	--	--	0.097 U	0.047 U	0.023 U	0.024 U	0.023 U	0.023 U	0.022 U
Carbazole	--	--	--	--	--	--	--	0.032	0.028	0.0016 U	0.052	0.0017 U	0.0095	0.0016 U
Chrysene	--	--	--	--	--	--	--	0.27	0.18	0.014	0.43	0.007 J	0.11	0.012
Dibenz(A,H)Anthracene	--	--	--	--	--	--	--	0.047	0.038	0.0016 U	0.083	0.0016 U	0.02	0.0015 J
Dibenzofuran	--	--	--	--	--	--	--	0.0071 J	0.0061 J	0.0015 U	0.015 J	0.0016 U	0.0016 J	0.0015 U

Table E-9
Summary of Data Used in Risk Assessment
Central Landfills Area (soil 0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-228	CFSB-228	CFSB-229	CFSB-229	CFSB-230	CFSB-230-DUP	CFSB-230	CFSB-261	CFSB-261	CFSB-261	CFSB-262	CFSB-262	CFSB-262	CFSB-262
Sample Lab IDs	460-155989-16	460-155989-17	460-155989-4	460-155989-5	460-155989-1	460-155989-2	460-155989-3	180-77393-48, 460-155369-4	180-77393-49, 460-155369-5	180-77393-50, 460-155369-6	180-77393-59, 460-155369-15	180-77393-60, 460-155369-16	180-77393-61, 460-155369-17	180-77393-62, 460-155369-18
Sample Name	CFSB-228-SO-0-0.5	CFSB-228-SO-0.5-2	CFSB-229-SO-0-0.5	CFSB-229-SO-0.5-2	CFSB-230-SO-0-0.5	CFSB-DUP34-SO	CFSB-230-SO-0.5-2	CFSB-261-SO-0-0.5	CFSB-261-SO-0.5-2	CFSB-261-SO-10-12	CFSB-262-SO-0-0.5	CFSB-262-SO-0.5-2	CFSB-262-SO-6-8	CFSB-262-SO-10-12
Sample Depth	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	6-8 ft	10-12 ft
Chemical	5/7/2018	5/7/2018	5/7/2018	5/7/2018	5/7/2018	5/7/2018	5/7/2018	5/2/2018	5/2/2018	5/2/2018	5/2/2018	5/2/2018	5/2/2018	5/2/2018
Diethyl Phthalate	--	--	--	--	--	--	--	0.045 U	0.022 U	0.011 U	0.011 U	0.011 U	0.011 U	0.01 U
Dimethyl Phthalate	--	--	--	--	--	--	--	0.0054 U	0.0026 U	0.0013 U	0.0014 U	0.0013 U	0.0013 U	0.0012 U
Di-N-Butyl Phthalate	--	--	--	--	--	--	--	0.065 U	0.032 U	0.015 U	0.016 U	0.016 U	0.015 U	0.015 U
Di-N-Octylphthalate	--	--	--	--	--	--	--	0.086 U	0.042 U	0.02 U	0.022 U	0.021 U	0.021 U	0.02 U
Fluoranthene	--	--	--	--	--	--	--	0.41	0.32	0.019	0.63	0.01	0.11	0.008
Fluorene	--	--	--	--	--	--	--	0.015 J	0.014 J	0.0014 U	0.028	0.0014 U	0.0031 J	0.0013 U
Hexachlorobenzene	--	--	--	--	--	--	--	0.011 U	0.0052 U	0.0025 U	0.0027 U	0.0026 U	0.0025 U	0.0024 U
Hexachlorobutadiene	--	--	--	--	--	--	--	0.0087 U	0.0042 U	0.0021 U	0.0022 U	0.0021 U	0.0021 U	0.002 U
Hexachlorocyclopentadiene	--	--	--	--	--	--	--	0.0076 U	0.0037 U	0.0018 U	0.0019 U	0.0018 U	0.0018 U	0.0017 U
Hexachloroethane	--	--	--	--	--	--	--	0.0077 U	0.0037 U	0.0018 U	0.0019 U	0.0019 U	0.0018 U	0.0018 U
Indeno(1,2,3-C,D)Pyrene	--	--	--	--	--	--	--	0.16	0.11	0.0089	0.24	0.0031 J	0.061	0.0043 J
Isophorone	--	--	--	--	--	--	--	0.0076 U	0.0037 U	0.0018 U	0.0019 U	0.0018 U	0.0018 U	0.0017 U
Naphthalene	--	--	--	--	--	--	--	0.0058 U	0.0032 J	0.0014 U	0.009	0.0014 U	0.0014 U	0.0013 U
Nitrobenzene	--	--	--	--	--	--	--	0.054 U	0.026 U	0.013 U	0.014 U	0.013 U	0.013 U	0.012 U
N-Nitrosodi-N-Propylamine	--	--	--	--	--	--	--	0.01 U	0.0049 U	0.0024 U	0.0025 U	0.0024 U	0.0024 U	0.0023 U
N-Nitrosodiphenylamine	--	--	--	--	--	--	--	0.049 U	0.024 U	0.012 U	0.012 U	0.012 U	0.012 U	0.011 U
Pentachlorophenol	--	--	--	--	--	--	--	0.24 U	0.12 U	0.056 U	0.06 U	0.058 U	0.057 U	0.055 U
Phenanthrene	--	--	--	--	--	--	--	0.19	0.18	0.0073	0.3	0.0055 J	0.044	0.0044 J
Phenol	--	--	--	--	--	--	--	0.045 U	0.022 U	0.011 U	0.011 U	0.011 U	0.011 U	0.01 U
Pyrene	--	--	--	--	--	--	--	0.32	0.24	0.014	0.54	0.0083	0.11	0.0084
VOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,1,1-Trichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,2,2-Tetrachloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,2-Trichloro-1,2,2-Trifluoroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,2-Trichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1-Dichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1-Dichloroethene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,3-Trichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,4-Trichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dibromo-3-Chloropropane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dibromoethane (Ethylene Dibromide)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichloropropane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,3-Dichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,4-Dichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Hexanone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acetone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromochloromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromodichloromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromoform	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromomethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Carbon Disulfide	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Carbon Tetrachloride	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chloroform	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chloromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cis-1,2-Dichloroethylene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cis-1,3-Dichloropropene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cyclohexane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibromochloromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dichlorodifluoromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Ethylbenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Isopropylbenzene (Cumene)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
M,P-Xylene	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Table E-9
Summary of Data Used in Risk Assessment
Central Landfills Area (soil 0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-228	CFSB-228	CFSB-229	CFSB-229	CFSB-230	CFSB-230-DUP	CFSB-230	CFSB-261	CFSB-261	CFSB-261	CFSB-262	CFSB-262	CFSB-262	CFSB-262
Sample Lab IDs	460-155989-16	460-155989-17	460-155989-4	460-155989-5	460-155989-1	460-155989-2	460-155989-3	180-77393-48, 460-155369-4	180-77393-49, 460-155369-5	180-77393-50, 460-155369-6	180-77393-59, 460-155369-15	180-77393-60, 460-155369-16	180-77393-61, 460-155369-17	180-77393-62, 460-155369-18
Sample Name	CFSB-228-SO-0-0.5	CFSB-228-SO-0.5-2	CFSB-229-SO-0-0.5	CFSB-229-SO-0.5-2	CFSB-230-SO-0-0.5	CFSB-DUP34-SO	CFSB-230-SO-0.5-2	CFSB-261-SO-0-0.5	CFSB-261-SO-0.5-2	CFSB-261-SO-10-12	CFSB-262-SO-0-0.5	CFSB-262-SO-0.5-2	CFSB-262-SO-6-8	CFSB-262-SO-10-12
Sample Depth	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	6-8 ft	10-12 ft
Chemical	5/7/2018	5/7/2018	5/7/2018	5/7/2018	5/7/2018	5/7/2018	5/7/2018	5/2/2018	5/2/2018	5/2/2018	5/2/2018	5/2/2018	5/2/2018	5/2/2018
Methyl Acetate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methyl Ethyl Ketone (2-Butanone)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methylcyclohexane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methylene Chloride	--	--	--	--	--	--	--	--	--	--	--	--	--	--
O-Xylene (1,2-Dimethylbenzene)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Styrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Tert-Butyl Methyl Ether	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Tetrachloroethylene (PCE)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Toluene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Trans-1,2-Dichloroethene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Trans-1,3-Dichloropropene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Trichloroethylene (TCE)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Trichlorofluoromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Vinyl Chloride	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-9
Summary of Data Used in Risk Assessment
Central Landfills Area (soil 0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-263	CFSB-263	CFSB-263	CFSB-263	CFSB-264	CFSB-264	CFSB-264	CFSB-264	CFSB-265	CFSB-265	CFSB-265	CFSB-265	CFSB-270	CFSB-270
Sample Lab IDs	180-77393-63, 460-155369-21	180-77393-64, 460-155369-22	180-77393-65, 460-155369-23	180-77393-66, 460-155369-24	180-77393-72, 460-155369-30	180-77393-73, 460-155369-31	180-77393-74, 460-155369-32	180-77393-75, 460-155369-33	180-77393-76, 460-155369-34	180-77393-77, 460-155369-35	180-77393-78, 460-155369-36	180-77393-79, 460-155369-37	180-77393-55, 460-155369-11	180-77393-56, 460-155369-12
Sample Name	CFSB-263-SO-0-0.5	CFSB-263-SO-0.5-2	CFSB-263-SO-6-8	CFSB-263-SO-10-12	CFSB-264-SO-0-0.5	CFSB-264-SO-0.5-2	CFSB-264-SO-6-8	CFSB-264-SO-10-12	CFSB-265-SO-0-0.5	CFSB-265-SO-0.5-2	CFSB-265-SO-6-8	CFSB-265-SO-10-12	CFSB-270-SO-0-0.5	CFSB-270-SO-0.5-2
Sample Depth	0-0.5 ft	0.5-2 ft	6-8 ft	10-12 ft	0-0.5 ft	0.5-2 ft	6-8 ft	10-12 ft	0-0.5 ft	0.5-2 ft	6-8 ft	10-12 ft	0-0.5 ft	0.5-2 ft
Chemical	5/2/2018	5/2/2018	5/2/2018	5/2/2018	5/3/2018	5/3/2018	5/3/2018	5/3/2018	5/3/2018	5/3/2018	5/3/2018	5/3/2018	5/2/2018	5/2/2018
GENERAL CHEMISTRY (mg/kg)														
Fluoride	10.8 J-	4.12 J-	13 J-	15.9 J-	9.41 J-	7.05 J-	13.4 J-	10.8 J-	5.89 J-	5.17 J-	2.85 J-	4.33 J-	796 J-	538 J-
Cyanide	0.14 J	0.19 J	0.11 J	0.064 U	0.061 U	0.065 U	0.066 U	0.065 U	0.065 J	0.065 U	0.064 U	0.061 U	2 J	4.3
METALS (mg/kg)														
"Chromium, Hexavalent - Estimated"	0.259611	0.208759	0.275669	0.262287	0.232847	0.248905	0.281022	0.315815	0.246229	0.291727	0.256934	0.329197	0.372019	0.366667
"Chromium, Trivalent - Calculated"	--	--	--	--	--	--	--	--	--	--	--	--	--	--
"Chromium, Trivalent - Estimated"	9.44039	7.59124	10.0243	9.53771	8.46715	9.05109	10.219	11.4842	8.95377	10.6083	9.34307	11.9708	13.528	13.3333
Aluminum	13200	8780	7710	10500	7890	8610	8870	9030	8860	9090	8270	8730	22600	20000
Antimony	0.24 UJ	0.3 UJ	0.32 UJ	0.32 UJ	0.3 UJ	0.29 UJ	0.31 UJ	0.3 UJ	0.32 UJ	0.29 UJ	0.3 UJ	0.29 UJ	0.25 UJ	0.25 UJ
Arsenic	4.4	3.4	3.5	3.9	3.6	4	3.7	4	4.1	8.8	4.3	4.8	7.2	9
Barium	178	115	113	112	99.7	71.3	72.5	79.4	77.5	99.5	70.5	63.3	196	137
Beryllium	0.53	0.17 U	0.18 U	0.17 U	0.42	0.16 U	0.17 U	0.47	0.35 J	0.4	0.39 J	0.33 J	0.96	0.97
Cadmium	0.28 U	0.35 U	0.37 U	0.36 U	0.34 U	0.33 U	0.35 U	0.34 U	0.36 U	0.33 U	0.35 U	0.33 U	0.28 U	0.29 U
Calcium	7740	16800	21200	12700	30800	23000	36100	33800	32500	39700	32000	39800	2960	3170
Chromium, Total	9.7	7.8	10.3	9.8	8.7	9.3	10.5	11.8	9.2	10.9	9.6	12.3	13.9	13.7
Cobalt	5.8	4.7	4.4	5	4.9	5.1	5.8	5.5	5.1	6	5.7	5.6	6.3	6.9
Copper	15.9 J	16.8 J	12.6 J	18.4 J	10.9 J	18 J	11.7 J	240 J	12.9 J	20.6 J	13.4 J	13.4 J	13.3 J	13.5 J
Iron	14500	11800	11400	12800	12000	13400	14500	13100	12200	16000	14200	14000	20700	21000
Lead	11.2 J	6 J+	6.3 J+	11.4 J+	6.7 J+	6.5 J+	8 J+	9.7 J+	7.3 J+	11 J+	6.2 J+	6.8 J+	26.3 J	14.7 J
Magnesium	7000 J	8460	7770	8350	10700	10800	11700	11100	10000	12100	12000	13800	9220 J	10900 J
Manganese	546 J	327 J	328 J	397 J	335 J	316 J	280 J	344 J	340 J	425 J	358 J	373 J	548 J	1050 J
Mercury	0.025 J+	0.029 J+	0.013 J+	0.026 J+	0.012 J+	0.017 J+	0.014 J+	0.013 J+	0.018 J+	0.016 J+	0.013 J+	0.011 J+	0.01 U	0.021
Nickel	14.5	10.1	11.1	10.5	10.8	10.5	11.8	11.4	15.4	14.7	11.9	12.2	20	15.4
Potassium	843	639	535	684	615	636	734	728	541	671	688	677	1310	1390
Selenium	0.24 U	0.3 U	0.32 U	0.31 U	0.29 U	0.29 U	0.3 U	0.29 U	0.31 U	0.29 U	0.3 U	0.29 U	0.24 U	0.25 U
Silver	0.51 UJ	0.64 UJ	0.68 UJ	0.66 UJ	0.62 UJ	0.61 UJ	0.64 UJ	0.62 UJ	0.67 UJ	0.61 UJ	0.64 UJ	0.61 UJ	0.52 UJ	0.54 UJ
Sodium	45.9 J	49.5 J	48.8 J	60.1 J	43.9 J	45.1 J	48.2 J	47.2 J	33.8 U	40.1 J	32.5 U	61.7 J	3120	2530
Thallium	0.1 U	0.13 U	0.14 U	0.13 U	0.13 U	0.12 U	0.13 U	0.13 U	0.14 U	0.12 U	0.13 U	0.12 U	0.13 J	0.13 J
Vanadium	11.7	6.2	8.2	7.9	6.9	8	8.6	7.9	8.1	8.4	6.6	6.4	23.5	21.6
Zinc	52	36.4	29	37.1	33.9	35.1	40	36.7	33.3	38	40.2	39.4	63.3	51.8
METALS|HEXAVALENT CHROMIUM (mg/kg)														
Chromium, Hexavalent	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PESTICIDES (mg/kg)														
Aldrin	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Alpha Bhc (Alpha Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Alpha Endosulfan	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Beta Bhc (Beta Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Beta Endosulfan	--	--	--	--	--	--	--	--	--	--	--	--	--	--
cis-Chlordane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Delta BHC (Delta Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dieldrin	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endosulfan Sulfate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin Aldehyde	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin Ketone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Gamma Bhc (Lindane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Heptachlor	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Heptachlor Epoxide	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methoxychlor	--	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDD	--	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDT	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Toxaphene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
trans-Chlordane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
POLYCHLORINATED BIPHENYLS (mg/kg)														
PCB-1016 (Aroclor 1016)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1221 (Aroclor 1221)	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Table E-9
Summary of Data Used in Risk Assessment
Central Landfills Area (soil 0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-263	CFSB-263	CFSB-263	CFSB-263	CFSB-264	CFSB-264	CFSB-264	CFSB-264	CFSB-265	CFSB-265	CFSB-265	CFSB-265	CFSB-270	CFSB-270
Sample Lab IDs	180-77393-63, 460-155369-21	180-77393-64, 460-155369-22	180-77393-65, 460-155369-23	180-77393-66, 460-155369-24	180-77393-72, 460-155369-30	180-77393-73, 460-155369-31	180-77393-74, 460-155369-32	180-77393-75, 460-155369-33	180-77393-76, 460-155369-34	180-77393-77, 460-155369-35	180-77393-78, 460-155369-36	180-77393-79, 460-155369-37	180-77393-55, 460-155369-11	180-77393-56, 460-155369-12
Sample Name	CFSB-263-SO-0-0.5	CFSB-263-SO-0.5-2	CFSB-263-SO-6-8	CFSB-263-SO-10-12	CFSB-264-SO-0-0.5	CFSB-264-SO-0.5-2	CFSB-264-SO-6-8	CFSB-264-SO-10-12	CFSB-265-SO-0-0.5	CFSB-265-SO-0.5-2	CFSB-265-SO-6-8	CFSB-265-SO-10-12	CFSB-270-SO-0-0.5	CFSB-270-SO-0.5-2
Sample Depth	0-0.5 ft	0.5-2 ft	6-8 ft	10-12 ft	0-0.5 ft	0.5-2 ft	6-8 ft	10-12 ft	0-0.5 ft	0.5-2 ft	6-8 ft	10-12 ft	0-0.5 ft	0.5-2 ft
Chemical	5/2/2018	5/2/2018	5/2/2018	5/2/2018	5/3/2018	5/3/2018	5/3/2018	5/3/2018	5/3/2018	5/3/2018	5/3/2018	5/3/2018	5/2/2018	5/2/2018
PCB-1232 (Aroclor 1232)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1242 (Aroclor 1242)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1248 (Aroclor 1248)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1254 (Aroclor 1254)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1260 (Aroclor 1260)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1262 (Aroclor 1262)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1268 (Aroclor 1268)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Polychlorinated Biphenyl (PCBs)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SEMIVOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,2,4,5-Tetrachlorobenzene	0.0032 U	0.0015 U	0.0015 U	0.0016 U	0.003 U	0.0015 U	0.0015 U	0.0015 U	0.0015 U	0.0015 U	0.0015 U	0.0015 U	0.0016 U	0.0016 U
1,4-Dioxane (P-Dioxane)	0.023 U	0.011 U	0.011 U	0.011 U	0.022 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.012 U
2,3,4,6-Tetrachlorophenol	0.031 U	0.015 U	0.015 U	0.015 U	0.029 U	0.015 U	0.015 U	0.015 U	0.014 U	0.015 U	0.015 U	0.015 U	0.015 U	0.016 U
2,4,5-Trichlorophenol	0.0053 U	0.0025 U	0.0026 U	0.0026 U	0.005 U	0.0025 U	0.0025 U	0.0025 U	0.0025 U	0.0025 U	0.0025 U	0.0025 U	0.0026 U	0.0027 U
2,4,6-Trichlorophenol	0.0041 U	0.0019 U	0.002 U	0.002 U	0.0038 U	0.0019 U	0.0019 U	0.0019 U	0.0019 U	0.002 U	0.0019 U	0.0019 U	0.002 U	0.002 U
2,4-Dichlorophenol	0.0057 U	0.0027 U	0.0028 U	0.0028 U	0.0054 U	0.0027 U	0.0027 U	0.0027 U	0.0027 U	0.0027 U	0.0027 U	0.0027 U	0.0028 U	0.0029 U
2,4-Dimethylphenol	0.0046 U	0.0022 U	0.0022 U	0.0022 U	0.0043 U	0.0022 U	0.0022 U	0.0022 U	0.0022 U	0.0022 U	0.0022 U	0.0022 U	0.0023 U	0.0023 U
2,4-Dinitrophenol	0.2 UJ	0.095 UJ	0.096 UJ	0.097 UJ	0.19 UJ	0.095 UJ	0.094 UJ	0.094 UJ	0.093 UJ	0.096 UJ	0.094 UJ	0.094 UJ	0.099 U	0.1 U
2,4-Dinitrotoluene	0.0037 U	0.0018 U	0.0018 U	0.0018 U	0.0035 U	0.0018 U	0.0017 U	0.0017 U	0.0017 U	0.0018 U	0.0017 U	0.0017 U	0.0018 U	0.0019 U
2,6-Dinitrotoluene	0.0046 U	0.0022 U	0.0022 U	0.0022 U	0.0043 U	0.0022 U	0.0022 U	0.0022 U	0.0021 U	0.0022 U	0.0022 U	0.0022 U	0.0023 U	0.0023 U
2-Chloronaphthalene	0.0034 U	0.0016 U	0.0016 U	0.0016 U	0.0032 U	0.0016 U	0.0016 U	0.0016 U	0.0016 U	0.0016 U	0.0016 U	0.0016 U	0.0017 U	0.0017 U
2-Chlorophenol	0.0035 U	0.0016 U	0.0017 U	0.0017 U	0.0033 U	0.0016 U	0.0016 U	0.0016 U	0.0016 U	0.0017 U	0.0016 U	0.0016 U	0.0017 U	0.0017 U
2-Methylnaphthalene	0.0036 U	0.0017 U	0.0017 U	0.0017 U	0.0034 U	0.0017 U	0.0017 U	0.0018 J	0.0017 U	0.0017 U	0.0017 U	0.0017 U	0.0018 U	0.0018 U
2-Methylphenol (O-Cresol)	0.021 U	0.01 U	0.01 U	0.01 U	0.02 U	0.01 U	0.01 U	0.01 U	0.0099 U	0.01 U	0.01 U	0.01 U	0.011 U	0.011 U
2-Nitroaniline	0.034 U	0.016 U	0.016 U	0.016 U	0.032 U	0.016 U	0.016 U	0.016 U	0.016 U	0.016 U	0.016 U	0.016 U	0.017 U	0.017 U
2-Nitrophenol	0.0043 U	0.002 U	0.0021 U	0.0021 U	0.004 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.0021 U	0.0021 U
3- And 4- Methylphenol (Total)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3,3'-Dichlorobenzidine	0.069 U	0.033 U	0.033 U	0.034 U	0.065 U	0.033 U	0.032 U	0.033 U	0.032 U	0.033 U	0.032 U	0.033 U	0.034 U	0.035 U
3-Nitroaniline	0.019 U	0.009 U	0.0091 U	0.0091 U	0.018 U	0.009 U	0.0089 U	0.0089 U	0.0088 U	0.009 U	0.0089 U	0.0089 U	0.0093 U	0.0095 U
4,6-Dinitro-2-Methylphenol	0.13 UJ	0.061 UJ	0.062 UJ	0.062 UJ	0.12 UJ	0.061 UJ	0.06 UJ	0.06 UJ	0.06 UJ	0.061 UJ	0.06 UJ	0.06 UJ	0.063 U	0.064 U
4-Bromophenyl Phenyl Ether	0.0052 U	0.0025 U	0.0025 U	0.0025 U	0.0049 U	0.0025 U	0.0024 U	0.0025 U	0.0024 U	0.0025 U	0.0024 U	0.0024 U	0.0026 U	0.0026 U
4-Chloro-3-Methylphenol	0.0035 U	0.0017 U	0.0017 U	0.0017 U	0.0033 U	0.0017 U	0.0016 U	0.0017 U	0.0016 U	0.0017 U	0.0016 U	0.0016 U	0.0017 U	0.0018 U
4-Chloroaniline	0.0025 U	0.0012 U	0.0012 U	0.0012 U	0.0023 U	0.0012 U	0.0012 U	0.0012 U	0.0012 U	0.0012 U	0.0012 U	0.0012 U	0.0012 U	0.0012 U
4-Chlorophenyl Phenyl Ether	0.0045 U	0.0021 U	0.0022 U	0.0022 U	0.0042 U	0.0021 U	0.0021 U	0.0021 U	0.0021 U	0.0022 U	0.0021 U	0.0021 U	0.0022 U	0.0023 U
4-Nitroaniline	0.0036 U	0.0017 U	0.0017 U	0.0017 U	0.0034 U	0.0017 U	0.0017 U	0.0017 U	0.0017 U	0.0017 U	0.0017 U	0.0017 U	0.0018 U	0.0018 U
4-Nitrophenol	0.052 U	0.025 U	0.025 U	0.025 U	0.049 U	0.025 U	0.024 U	0.025 U	0.024 U	0.025 U	0.024 U	0.025 U	0.026 U	0.026 U
Acenaphthene	0.0043 U	0.002 U	0.0037 J	0.0023 J	0.0075 J	0.002 U	0.0087	0.023	0.0042 J	0.0022 J	0.002 U	0.002 U	0.0042 J	0.0045 J
Acenaphthylene	0.0033 U	0.0015 U	0.0016 U	0.0016 U	0.0031 U	0.0015 U	0.0021 J	0.0015 U	0.0015 U	0.0016 U	0.0015 U	0.0015 U	0.0016 U	0.0016 U
Acetophenone	0.004 U	0.0019 U	0.0019 U	0.002 U	0.0038 U	0.0019 U	0.0019 U	0.0019 U	0.0019 U	0.0019 U	0.0019 U	0.0019 U	0.002 U	0.002 U
Anthracene	0.0092 J	0.0018 U	0.0043 J	0.0039 J	0.015	0.0018 U	0.015	0.04	0.0091	0.0048 J	0.0018 U	0.0018 U	0.0085	0.0079
Atrazine	0.033 U	0.015 U	0.016 U	0.016 U	0.031 U	0.015 U	0.015 U	0.015 U	0.015 U	0.016 U	0.015 U	0.015 U	0.016 U	0.016 U
Benzaldehyde	0.0092 UR	0.0044 UR	0.0045 UR	0.0045 UR	0.0087 UR	0.0044 UR	0.0043 UR	0.0044 UR	0.0043 UR	0.0044 UR	0.0043 UR	0.0043 UR	0.0046 U	0.0046 U
Benzo(A)Anthracene	0.073	0.0079	0.024	0.031	0.084	0.0058 J	0.084	0.072	0.11	0.051	0.014	0.0086	0.045	0.035
Benzo(A)Pyrene	0.084	0.0086	0.026	0.035	0.092	0.0062 J	0.095	0.073	0.15	0.069	0.017	0.011	0.045	0.031
Benzo(B)Fluoranthene	0.17	0.014	0.04	0.062	0.12	0.0093	0.12	0.082	0.26	0.12	0.026	0.019	0.093	0.06
Benzo(G,H,I)Perylene	0.099	0.011	0.029	0.04	0.099	0.0059 J	0.11	0.055	0.16	0.076	0.018	0.012	0.059	0.039
Benzo(K)Fluoranthene	0.041	0.0082	0.018	0.023	0.053	0.0035 J	0.059	0.04	0.057	0.044	0.01	0.0052 J	0.032	0.023
Benzyl Butyl Phthalate	0.051 U	0.024 U	0.025 U	0.025 U	0.048 U	0.024 U	0.024 U	0.024 U	0.024 U	0.024 U	0.024 U	0.024 U	0.025 U	0.026 U
Biphenyl (Diphenyl)	0.0031 U	0.0015 U	0.0015 U	0.0015 U	0.0029 U	0.0015 U	0.0015 U	0.0015 U	0.0015 U	0.0015 U	0.0015 U	0.0015 U	0.0015 U	0.0016 U
Bis(2-Chloroethoxy) Methane	0.0035 U	0.0017 U	0.0017 U	0.0017 U	0.0033 U	0.0017 U	0.0017 U	0.0017 U	0.0017 U	0.0017 U	0.0017 U	0.0017 U	0.0018 U	0.0018 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.0027 U	0.0013 U	0.0013 U	0.0013 U	0.0025 U	0.0013 U	0.0013 U	0.0013 U	0.0013 U	0.0013 U	0.0013 U	0.0013 U	0.0013 U	0.0014 U
Bis(2-Chloroisopropyl) Ether	0.0055 U	0.0026 U	0.0027 U	0.0027 U	0.0052 U	0.0026 U	0.0026 U	0.0026 U	0.0026 U	0.0026 U	0.0026 U	0.0026 U	0.0027 U	0.0028 U
Bis(2-Ethylhexyl) Phthalate	0.079 U	0.038 U	0.038 U	0.038 U	2.5	0.037 U	0.12 J	0.061 J	0.037 U	0.038 U	0.037 U	0.037 U	0.039 U	0.04 U
Caprolactam	0.048 U	0.023 U	0.023 U	0.023 U	0.046 U	0.023 U	0.023 U	0.023 U	0.023 U	0.023 U	0.023 U	0.023 U	0.024 U	0.024 U
Carbazole	0.014 J	0.0017 J	0.0045 J	0.0066 J	0.014	0.0016 U	0.014	0.026	0.016	0.012	0.0022 J	0.0016 U	0.0098	0.0062 J
Chrysene	0.14	0.017	0.039	0.061	0.092	0.0075	0.11	0.082	0.2	0.097	0.026	0.014	0.082	0.05
Dibenz(A,H)Anthracene	0.021	0.0021 J	0.006 J	0.0098	0.023	0.0016 J	0.023	0.012	0.037	0.016	0.0036 J	0.0028 J	0.0016 U	0.0096
Dibenzofuran	0.0033 U	0.0015 U	0.0016 U	0.0016 U	0.0031 U	0.0015 U	0.0021 J	0.0076 J	0.0015 U	0.0016 U	0.0015 U	0.0015 U	0.0026 J	0.0016 U

Table E-9
Summary of Data Used in Risk Assessment
Central Landfills Area (soil 0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-263	CFSB-263	CFSB-263	CFSB-263	CFSB-264	CFSB-264	CFSB-264	CFSB-264	CFSB-265	CFSB-265	CFSB-265	CFSB-265	CFSB-270	CFSB-270
Sample Lab IDs	180-77393-63, 460-155369-21	180-77393-64, 460-155369-22	180-77393-65, 460-155369-23	180-77393-66, 460-155369-24	180-77393-72, 460-155369-30	180-77393-73, 460-155369-31	180-77393-74, 460-155369-32	180-77393-75, 460-155369-33	180-77393-76, 460-155369-34	180-77393-77, 460-155369-35	180-77393-78, 460-155369-36	180-77393-79, 460-155369-37	180-77393-55, 460-155369-11	180-77393-56, 460-155369-12
Sample Name	CFSB-263-SO-0-0.5	CFSB-263-SO-0.5-2	CFSB-263-SO-6-8	CFSB-263-SO-10-12	CFSB-264-SO-0-0.5	CFSB-264-SO-0.5-2	CFSB-264-SO-6-8	CFSB-264-SO-10-12	CFSB-265-SO-0-0.5	CFSB-265-SO-0.5-2	CFSB-265-SO-6-8	CFSB-265-SO-10-12	CFSB-270-SO-0-0.5	CFSB-270-SO-0.5-2
Sample Depth	0-0.5 ft	0.5-2 ft	6-8 ft	10-12 ft	0-0.5 ft	0.5-2 ft	6-8 ft	10-12 ft	0-0.5 ft	0.5-2 ft	6-8 ft	10-12 ft	0-0.5 ft	0.5-2 ft
Chemical	5/2/2018	5/2/2018	5/2/2018	5/2/2018	5/3/2018	5/3/2018	5/3/2018	5/3/2018	5/3/2018	5/3/2018	5/3/2018	5/3/2018	5/2/2018	5/2/2018
Diethyl Phthalate	0.022 U	0.011 U	0.011 U	0.011 U	0.021 U	0.011 U	0.01 U	0.011 U	0.01 U	0.011 U	0.01 U	0.01 U	0.011 U	0.011 U
Dimethyl Phthalate	0.0027 U	0.0013 U	0.0013 U	0.0013 U	0.0025 U	0.0013 U	0.0013 U	0.0013 U	0.0013 U	0.0013 U	0.0013 U	0.0013 U	0.0013 U	0.0014 U
Di-N-Butyl Phthalate	0.033 U	0.015 U	0.016 U	0.016 U	0.031 U	0.015 U	0.015 U	0.015 U	0.015 U	0.016 U	0.015 U	0.015 U	0.016 U	0.016 U
Di-N-Octylphthalate	0.043 U	0.021 U	0.021 U	0.021 U	0.041 U	0.02 U	0.02 U	0.02 U	0.02 U	0.021 U	0.02 U	0.02 U	0.021 U	0.022 U
Fluoranthene	0.13	0.017	0.043	0.06	0.15	0.011	0.18	0.18	0.2	0.12	0.025	0.016	0.11	0.072
Fluorene	0.0029 U	0.0014 U	0.0023 J	0.0015 J	0.0045 J	0.0014 U	0.0049 J	0.017	0.0025 J	0.0014 J	0.0014 U	0.0014 U	0.0038 J	0.0032 J
Hexachlorobenzene	0.0053 U	0.0025 U	0.0026 U	0.0026 U	0.005 U	0.0025 U	0.0025 U	0.0025 U	0.0025 U	0.0025 U	0.0025 U	0.0025 U	0.0026 U	0.0027 U
Hexachlorobutadiene	0.0043 U	0.0021 U	0.0021 U	0.0021 U	0.0041 U	0.0021 U	0.002 U	0.0021 U	0.002 U	0.0021 U	0.002 U	0.002 U	0.0021 U	0.0022 U
Hexachlorocyclopentadiene	0.0038 U	0.0018 U	0.0018 U	0.0018 U	0.0036 U	0.0018 U	0.0018 U	0.0018 U	0.0018 U	0.0018 U	0.0018 U	0.0018 U	0.0019 U	0.0019 U
Hexachloroethane	0.0038 U	0.0018 U	0.0019 U	0.0019 U	0.0036 U	0.0018 U	0.0018 U	0.0018 U	0.0018 U	0.0018 U	0.0018 U	0.0018 U	0.0019 U	0.0019 U
Indeno(1,2,3-C,D)Pyrene	0.083	0.0088	0.023	0.034	0.076	0.005 J	0.086	0.047	0.12	0.062	0.015	0.0095	0.045	0.033
Isophorone	0.0038 U	0.0018 U	0.0018 U	0.0018 U	0.0036 U	0.0018 U	0.0018 U	0.0018 U	0.0018 U	0.0018 U	0.0018 U	0.0018 U	0.0019 U	0.0019 U
Naphthalene	0.0029 U	0.0014 U	0.0014 U	0.0014 U	0.0027 U	0.0014 U	0.0014 U	0.0034 J	0.0014 U	0.0014 U	0.0014 U	0.0014 U	0.0014 U	0.0015 U
Nitrobenzene	0.027 U	0.013 U	0.013 U	0.013 U	0.026 U	0.013 U	0.013 U	0.013 U	0.013 U	0.013 U	0.013 U	0.013 U	0.013 U	0.014 U
N-Nitrosodi-N-Propylamine	0.005 U	0.0024 U	0.0024 U	0.0024 U	0.0047 U	0.0024 U	0.0024 U	0.0024 U	0.0024 U	0.0024 U	0.0024 U	0.0024 U	0.0025 U	0.0025 U
N-Nitrosodiphenylamine	0.025 U	0.012 U	0.012 U	0.012 U	0.023 U	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U
Pentachlorophenol	0.12 U	0.057 U	0.058 U	0.058 U	0.11 UJ	0.057 U	0.056 UJ	0.056 UJ	0.056 UJ	0.057 UJ	0.056 UJ	0.056 UJ	0.059 U	0.06 U
Phenanthrene	0.044	0.0052 J	0.021	0.022	0.074	0.0054 J	0.078	0.14	0.057	0.034	0.0078	0.0049 J	0.04	0.036
Phenol	0.023 U	0.011 U	0.011 U	0.011 U	0.021 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U
Pyrene	0.13	0.015	0.04	0.059	0.15	0.01	0.17	0.16	0.2	0.1	0.026	0.014	0.087	0.061
VOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,1,1-Trichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,2,2-Tetrachloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,2-Trichloro-1,2,2-Trifluoroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,2-Trichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1-Dichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1-Dichloroethene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,3-Trichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,4-Trichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dibromo-3-Chloropropane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dibromoethane (Ethylene Dibromide)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichloropropane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,3-Dichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,4-Dichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Hexanone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acetone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromochloromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromodichloromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromoform	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromomethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Carbon Disulfide	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Carbon Tetrachloride	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chloroform	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chloromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cis-1,2-Dichloroethylene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cis-1,3-Dichloropropene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cyclohexane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibromochloromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dichlorodifluoromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Ethylbenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Isopropylbenzene (Cumene)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
M,P-Xylene	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Table E-9
Summary of Data Used in Risk Assessment
Central Landfills Area (soil 0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-263	CFSB-263	CFSB-263	CFSB-263	CFSB-264	CFSB-264	CFSB-264	CFSB-264	CFSB-265	CFSB-265	CFSB-265	CFSB-265	CFSB-270	CFSB-270
Sample Lab IDs	180-77393-63, 460-155369-21	180-77393-64, 460-155369-22	180-77393-65, 460-155369-23	180-77393-66, 460-155369-24	180-77393-72, 460-155369-30	180-77393-73, 460-155369-31	180-77393-74, 460-155369-32	180-77393-75, 460-155369-33	180-77393-76, 460-155369-34	180-77393-77, 460-155369-35	180-77393-78, 460-155369-36	180-77393-79, 460-155369-37	180-77393-55, 460-155369-11	180-77393-56, 460-155369-12
Sample Name	CFSB-263-SO-0-0.5	CFSB-263-SO-0.5-2	CFSB-263-SO-6-8	CFSB-263-SO-10-12	CFSB-264-SO-0-0.5	CFSB-264-SO-0.5-2	CFSB-264-SO-6-8	CFSB-264-SO-10-12	CFSB-265-SO-0-0.5	CFSB-265-SO-0.5-2	CFSB-265-SO-6-8	CFSB-265-SO-10-12	CFSB-270-SO-0-0.5	CFSB-270-SO-0.5-2
Sample Depth	0-0.5 ft	0.5-2 ft	6-8 ft	10-12 ft	0-0.5 ft	0.5-2 ft	6-8 ft	10-12 ft	0-0.5 ft	0.5-2 ft	6-8 ft	10-12 ft	0-0.5 ft	0.5-2 ft
Chemical	5/2/2018	5/2/2018	5/2/2018	5/2/2018	5/3/2018	5/3/2018	5/3/2018	5/3/2018	5/3/2018	5/3/2018	5/3/2018	5/3/2018	5/2/2018	5/2/2018
Methyl Acetate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methyl Ethyl Ketone (2-Butanone)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methylcyclohexane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methylene Chloride	--	--	--	--	--	--	--	--	--	--	--	--	--	--
O-Xylene (1,2-Dimethylbenzene)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Styrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Tert-Butyl Methyl Ether	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Tetrachloroethylene (PCE)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Toluene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Trans-1,2-Dichloroethene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Trans-1,3-Dichloropropene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Trichloroethylene (TCE)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Trichlorofluoromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Vinyl Chloride	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-9
Summary of Data Used in Risk Assessment
Central Landfills Area (soil 0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-270	CFSB-270	CFSB-271	CFSB-271	CFSB-271	CFSB-277	CFSB-277	CFSB-277	CFSB-277	CFSB-283	CFSB-284	CFSB-290	CFSB-290	CFSB-290
Sample Lab IDs	180-77393-57, 460-155369-13	180-77393-58, 460-155369-14	180-77393-45, 460-155369-1	180-77393-46, 460-155369-2	180-77393-47, 460-155369-3	180-77393-80, 460-155369-38	180-77393-81, 460-155369-39	180-77393-82, 460-155369-40	180-77393-83, 460-155369-41	180-78894-10, 460-158632-10	180-78894-11, 460-158632-11	460-159538-2	460-159538-3	320-43709-6
Sample Name	CFSB-270-SO-6-8	CFSB-270-SO-10-12	CFSB-271-SO-0-0.5	CFSB-271-SO-0.5-2	CFSB-271-SO-10-12	CFSB-277-SO-0-0.5	CFSB-277-SO-0.5-2	CFSB-277-SO-6-8	CFSB-277-SO-10-12	CFSB-283-SO-0-0.5	CFSB-284-SO-0-0.5	CFSB-290-SO-0-0.5	CFSB-290-SO-0.5-2	CFSB-290-SO-0-0.5
Sample Depth	6-8 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	6-8 ft	10-12 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft
Chemical	5/2/2018	5/2/2018	5/2/2018	5/2/2018	5/2/2018	5/3/2018	5/3/2018	5/3/2018	5/3/2018	6/16/2018	6/16/2018	6/28/2018	6/28/2018	9/27/2018
GENERAL CHEMISTRY (mg/kg)														
Fluoride	19.7 J-	263 J-	40 J-	36.3 J-	12.1 J-	17.3 J-	11.4 J-	32.5 J-	3.5 J-	1.69 J+	1.51 J+	--	--	--
Cyanide	0.58	1.1	1.1	0.35	0.071 J	0.063 U	0.066 U	0.1 J	0.06 U	0.37 J+	0.12 J+	--	--	--
METALS (mg/kg)														
"Chromium, Hexavalent - Estimated"	0.305109	0.291727	0.305109	0.313139	0.350608	0.36399	0.278345	0.374696	0.206083	0.377372	0.29708	--	--	--
"Chromium, Trivalent - Calculated"	--	--	--	--	--	--	--	--	--	--	--	0.215 U	8.725	--
"Chromium, Trivalent - Estimated"	11.0949	10.6083	11.0949	11.3869	12.7494	13.236	10.1217	13.6253	7.49392	13.7226	10.8029	--	--	--
Aluminum	9490	11000	23300	16500	9390	8550	8490	13200	7340	20000	14900	--	--	--
Antimony	0.23 UJ	0.25 UJ	0.27 UJ	0.27 UJ	0.24 UJ	0.3 UJ	0.3 UJ	0.3 UJ	0.31 UJ	0.48 UJ	0.5 UJ	--	--	--
Arsenic	4.5	6.4	7	6.5	4.5	5.5	4.6	7.5	4.6	7.8	6	--	--	--
Barium	69.7	81.6	264	126	62.5	68.7	70.8	90.1	41.1	260	148	--	--	--
Beryllium	0.35	0.48	0.86	0.56	0.33	0.27 J	0.42	0.53	0.31 J	0.84	0.59 J	--	--	--
Cadmium	0.26 U	0.29 U	0.31 U	0.31 U	0.27 U	0.34 U	0.35 U	0.35 U	0.35 U	0.55 U	0.57 U	--	--	--
Calcium	45700	41900	3110	2570	51900	50700	46500	38000	64500	10300	8370	--	--	--
Chromium, Total	11.4	10.9	11.4	11.7	13.1	13.6	10.4	14	7.7	14.1	11.1	0.58 U	8.8	--
Cobalt	5.5	4.9	6.7	7.3	5.5	9.5	5	6.9	4.1	9	7.2	--	--	--
Copper	16.2 J	11.9 J	13.1	10.5	9.8	16.8 J	14.1 J	19.3 J	10.6 J	25.3	20	--	--	--
Iron	15000	13500	20400	17400	15400	12600	13700	17000	11300	20000	16400	--	--	--
Lead	6.7 J	11.5 J	13.4	9.3	7	8.8 J+	7.6 J+	14.2 J+	6.7 J+	16.8	13.4	--	--	--
Magnesium	11200 J	11800 J	9820	11100	20500	12800	12100	14600	13400	10400	8110	--	--	--
Manganese	430 J	350 J	760	501	434	439 J	326 J	478 J	311 J	1570 J	729 J	--	--	--
Mercury	0.018	0.022	0.011 U	0.02	0.036	0.021 J+	0.014 J+	0.013 J	0.025	0.032	0.028	--	--	--
Nickel	13.9	12.7	13.8	12.8	10.2	17.5	12.8	39.8	8.5	33.6	26.1	--	--	--
Potassium	716	1100	1200	822	905	680	691	991	659	1340	872	--	--	--
Selenium	0.23 U	0.25 U	0.26 U	0.27 U	0.23 U	0.29 U	0.3 U	0.3 U	0.31 U	0.56 J	0.5 U	--	--	--
Silver	0.49 UJ	0.53 UJ	0.56 U	0.58 U	0.5 U	0.63 UJ	0.64 UJ	0.64 UJ	0.65 UJ	1 U	1.1 U	--	--	--
Sodium	519	1420	86.2 J	44.8 J	43.2 J	43.1 J	44.4 J	84.5 J	33 U	50.8 U	53.5 U	--	--	--
Thallium	0.098 U	0.11 U	0.11 J	0.12 U	0.1 U	0.13 U	0.13 U	0.13 U	0.13 U	0.2 U	0.21 U	--	--	--
Vanadium	10.4	8.9	20.6	13.5	10.3	9.4	9.5	17	5.3	16	11.4	--	--	--
Zinc	39.5	37.6	61.8	48.4	39.5	36.6	36.5	51.9	29.8	108	61.1	--	--	--
METALS|HEXAVALENT CHROMIUM (mg/kg)														
Chromium, Hexavalent	--	--	--	--	--	--	--	--	--	--	--	0.15 UJ	0.15 UJ	--
PESTICIDES (mg/kg)														
Aldrin	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Alpha Bhc (Alpha Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Alpha Endosulfan	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Beta Bhc (Beta Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Beta Endosulfan	--	--	--	--	--	--	--	--	--	--	--	--	--	--
cis-Chlordane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Delta BHC (Delta Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dieldrin	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endosulfan Sulfate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin Aldehyde	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin Ketone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Gamma Bhc (Lindane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Heptachlor	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Heptachlor Epoxide	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methoxychlor	--	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDD	--	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDT	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Toxaphene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
trans-Chlordane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
POLYCHLORINATED BIPHENYLS (mg/kg)														
PCB-1016 (Aroclor 1016)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1221 (Aroclor 1221)	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Table E-9
Summary of Data Used in Risk Assessment
Central Landfills Area (soil 0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-270	CFSB-270	CFSB-271	CFSB-271	CFSB-271	CFSB-277	CFSB-277	CFSB-277	CFSB-277	CFSB-283	CFSB-284	CFSB-290	CFSB-290	CFSB-290
Sample Lab IDs	180-77393-57, 460-155369-13	180-77393-58, 460-155369-14	180-77393-45, 460-155369-1	180-77393-46, 460-155369-2	180-77393-47, 460-155369-3	180-77393-80, 460-155369-38	180-77393-81, 460-155369-39	180-77393-82, 460-155369-40	180-77393-83, 460-155369-41	180-78894-10, 460-158632-10	180-78894-11, 460-158632-11	460-159538-2	460-159538-3	320-43709-6
Sample Name	CFSB-270-SO-6-8	CFSB-270-SO-10-12	CFSB-271-SO-0-0.5	CFSB-271-SO-0.5-2	CFSB-271-SO-10-12	CFSB-277-SO-0-0.5	CFSB-277-SO-0.5-2	CFSB-277-SO-6-8	CFSB-277-SO-10-12	CFSB-283-SO-0-0.5	CFSB-284-SO-0-0.5	CFSB-290-SO-0-0.5	CFSB-290-SO-0.5-2	CFSB-290-SO-0-0.5
Sample Depth	6-8 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	6-8 ft	10-12 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft
Chemical	5/2/2018	5/2/2018	5/2/2018	5/2/2018	5/2/2018	5/3/2018	5/3/2018	5/3/2018	5/3/2018	6/16/2018	6/16/2018	6/28/2018	6/28/2018	9/27/2018
PCB-1232 (Aroclor 1232)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1242 (Aroclor 1242)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1248 (Aroclor 1248)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1254 (Aroclor 1254)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1260 (Aroclor 1260)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1262 (Aroclor 1262)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1268 (Aroclor 1268)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Polychlorinated Biphenyl (PCBs)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SEMIVOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,2,4,5-Tetrachlorobenzene	0.0015 U	0.0015 U	0.0017 U	0.0016 U	0.0015 U	0.006 U	0.003 U	0.0076 U	0.0015 U	0.0062 UJ	0.0085 UJ	--	--	--
1,4-Dioxane (P-Dioxane)	0.011 U	0.011 U	0.012 U	0.012 U	0.011 U	0.043 U	0.022 U	0.055 U	0.011 U	0.045 U	0.061 U	--	--	--
2,3,4,6-Tetrachlorophenol	0.015 U	0.014 U	0.017 U	0.016 U	0.014 U	0.057 U	0.029 U	0.073 U	0.015 U	0.06 U	0.082 U	--	--	--
2,4,5-Trichlorophenol	0.0025 U	0.0025 U	0.0028 U	0.0027 U	0.0025 U	0.0098 U	0.0049 U	0.012 U	0.0025 U	0.01 U	0.014 U	--	--	--
2,4,6-Trichlorophenol	0.0019 U	0.0019 U	0.0022 U	0.0021 U	0.0019 U	0.0076 U	0.0038 U	0.0096 U	0.0019 U	0.0079 U	0.011 U	--	--	--
2,4-Dichlorophenol	0.0027 U	0.0027 U	0.0031 U	0.0029 U	0.0027 U	0.011 U	0.0053 U	0.013 U	0.0027 U	0.011 U	0.015 U	--	--	--
2,4-Dimethylphenol	0.0022 U	0.0021 U	0.0025 U	0.0023 U	0.0021 U	0.0086 U	0.0043 U	0.011 U	0.0022 U	0.0089 U	0.012 U	--	--	--
2,4-Dinitrophenol	0.094 U	0.093 U	0.11 U	0.1 U	0.093 U	0.37 UJ	0.19 UJ	0.47 UJ	0.094 UJ	0.39 U	0.53 U	--	--	--
2,4-Dinitrotoluene	0.0017 U	0.0017 U	0.002 U	0.0019 U	0.0017 U	0.0069 U	0.0034 U	0.0087 U	0.0017 U	0.0071 U	0.0097 U	--	--	--
2,6-Dinitrotoluene	0.0022 U	0.0021 U	0.0024 U	0.0023 U	0.0021 U	0.0085 U	0.0043 U	0.011 U	0.0022 U	0.0089 U	0.012 U	--	--	--
2-Chloronaphthalene	0.0016 U	0.0016 U	0.0018 U	0.0017 U	0.0016 U	0.0063 U	0.0032 U	0.008 U	0.0016 U	0.0066 U	0.009 U	--	--	--
2-Chlorophenol	0.0016 U	0.0016 U	0.0018 U	0.0018 U	0.0016 U	0.0064 U	0.0032 U	0.0081 U	0.0016 U	0.0067 U	0.0091 U	--	--	--
2-Methylnaphthalene	0.0017 U	0.0017 U	0.0019 U	0.0018 U	0.0017 U	0.0066 U	0.0033 U	0.0084 U	0.0017 U	0.0088 J	0.015 J	--	--	--
2-Methylphenol (O-Cresol)	0.01 U	0.0099 U	0.011 U	0.011 U	0.0099 U	0.04 U	0.02 U	0.05 U	0.01 U	0.041 U	0.056 U	--	--	--
2-Nitroaniline	0.016 U	0.016 U	0.018 U	0.017 U	0.016 U	0.063 U	0.031 U	0.08 U	0.016 U	0.065 U	0.089 U	--	--	--
2-Nitrophenol	0.002 U	0.002 U	0.0023 U	0.0022 U	0.002 U	0.0079 U	0.004 U	0.01 U	0.002 U	0.0082 U	0.011 U	--	--	--
3- And 4- Methylphenol (Total)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3,3'-Dichlorobenzidine	0.033 U	0.032 U	0.037 U	0.035 U	0.032 U	0.13 U	0.064 U	0.16 U	0.033 U	0.13 U	0.18 U	--	--	--
3-Nitroaniline	0.0089 U	0.0088 U	0.01 U	0.0096 U	0.0088 U	0.035 U	0.018 U	0.045 U	0.0089 U	0.036 U	0.05 U	--	--	--
4,6-Dinitro-2-Methylphenol	0.06 U	0.06 U	0.068 U	0.065 U	0.06 U	0.24 UJ	0.12 UJ	0.3 UJ	0.06 UJ	0.25 U	0.34 U	--	--	--
4-Bromophenyl Phenyl Ether	0.0024 U	0.0024 U	0.0028 U	0.0026 U	0.0024 U	0.0096 U	0.0048 U	0.012 U	0.0024 U	0.01 U	0.014 U	--	--	--
4-Chloro-3-Methylphenol	0.0016 U	0.0016 U	0.0019 U	0.0018 U	0.0016 U	0.0065 U	0.0033 U	0.0082 U	0.0016 U	0.0067 U	0.0092 U	--	--	--
4-Chloroaniline	0.0012 U	0.0012 U	0.0013 U	0.0013 U	0.0012 U	0.0046 U	0.0023 U	0.0058 U	0.0012 U	0.0048 U	0.0065 U	--	--	--
4-Chlorophenyl Phenyl Ether	0.0021 U	0.0021 U	0.0024 U	0.0023 U	0.0021 U	0.0083 U	0.0042 U	0.011 U	0.0021 U	0.0087 U	0.012 U	--	--	--
4-Nitroaniline	0.0017 U	0.0017 U	0.0019 U	0.0018 U	0.0017 U	0.0067 U	0.0034 U	0.0085 U	0.0017 U	0.007 U	0.0095 U	--	--	--
4-Nitrophenol	0.024 U	0.024 U	0.028 U	0.026 U	0.024 U	0.097 U	0.048 U	0.12 U	0.025 U	0.1 U	0.14 U	--	--	--
Acenaphthene	0.002 U	0.002 U	0.0092	0.0022 U	0.002 U	0.04	0.0094 J	0.053	0.002 U	0.072	0.061	--	--	--
Acenaphthylene	0.0015 U	0.0015 U	0.0017 U	0.0016 U	0.0015 U	0.006 U	0.003 U	0.0077 U	0.0015 U	0.0063 U	0.0086 U	--	--	--
Acetophenone	0.0019 U	0.0019 U	0.0022 U	0.002 U	0.0019 U	0.0075 U	0.0037 U	0.0095 U	0.0019 U	0.0078 U	0.011 U	--	--	--
Anthracene	0.0018 U	0.0018 U	0.018	0.0025 J	0.0018 U	0.072	0.019	0.091	0.0018 U	0.14	0.12	--	--	--
Atrazine	0.015 U	0.015 U	0.017 U	0.016 U	0.015 U	0.06 U	0.03 U	0.077 U	0.015 U	0.063 UJ	0.086 UJ	--	--	--
Benzaldehyde	0.0043 U	0.0043 U	0.0049 U	0.0047 U	0.0043 U	0.017 UR	0.0086 UR	0.022 UR	0.0043 UR	0.018 UR	0.024 UR	--	--	--
Benzo(A)Anthracene	0.0029 J	0.0061 J	0.07	0.015	0.0066 J	0.39	0.11	0.6	0.0021 J	1	0.6	--	--	--
Benzo(A)Pyrene	0.0031 J	0.0065 J	0.067	0.014	0.0073	0.49	0.14	0.71	0.0019 J	1.4	0.77	--	--	--
Benzo(B)Fluoranthene	0.0045 J	0.013	0.13	0.03	0.017	0.76	0.2	1.1	0.0033 J	1.7	1.3	--	--	--
Benzo(G,H,I)Perylene	0.0035 J	0.0065 J	0.083	0.02	0.0097	0.63	0.18	0.96	0.0029 J	1.3	0.85	--	--	--
Benzo(K)Fluoranthene	0.0021 U	0.0031 J	0.044	0.011	0.0053 J	0.3	0.087	0.44	0.0021 U	0.75	0.43	--	--	--
Benzyl Butyl Phthalate	0.024 U	0.024 U	0.027 U	0.026 U	0.024 U	0.095 U	0.047 U	0.12 U	0.024 U	0.098 U	0.13 U	--	--	--
Biphenyl (Diphenyl)	0.0015 U	0.0015 U	0.0017 U	0.0016 U	0.0015 U	0.0058 U	0.0029 U	0.0073 U	0.0015 U	0.006 U	0.0082 U	--	--	--
Bis(2-Chloroethoxy) Methane	0.0017 U	0.0017 U	0.0019 U	0.0018 U	0.0017 U	0.0066 U	0.0033 U	0.0083 U	0.0017 U	0.0068 U	0.0093 U	--	--	--
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.0013 U	0.0013 U	0.0014 U	0.0014 U	0.0013 U	0.005 U	0.0025 U	0.0064 U	0.0013 U	0.0052 U	0.0071 U	--	--	--
Bis(2-Chloroisopropyl) Ether	0.0026 U	0.0026 U	0.0029 U	0.0028 U	0.0026 U	0.01 U	0.0051 U	0.013 U	0.0026 U	0.011 U	0.015 U	--	--	--
Bis(2-Ethylhexyl) Phthalate	0.037 U	0.044 J	0.042 U	0.04 U	0.037 U	0.15 U	0.073 U	0.19 U	0.037 U	0.15 U	0.21 U	--	--	--
Caprolactam	0.023 U	0.023 U	0.026 U	0.025 U	0.023 U	0.09 U	0.045 U	0.11 U	0.023 U	0.093 U	0.13 U	--	--	--
Carbazole	0.0016 U	0.0016 U	0.014	0.0029 J	0.0016 U	0.074	0.022	0.12	0.0016 U	0.18	0.14	--	--	--
Chrysene	0.0041 J	0.01	0.11	0.024	0.014	0.58	0.17	0.95	0.0028 J	1.4	1.1	--	--	--
Dibenz(A,H)Anthracene	0.0016 U	0.0015 U	0.021	0.0053 J	0.0028 J	0.15	0.036	0.21	0.0016 U	0.24	0.22	--	--	--
Dibenzofuran	0.0015 U	0.0015 U	0.0027 J	0.0016 U	0.0015 U	0.013 J	0.0031 J	0.013 J	0.0015 U	0.022 J	0.029 J	--	--	--

Table E-9
Summary of Data Used in Risk Assessment
Central Landfills Area (soil 0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-270	CFSB-270	CFSB-271	CFSB-271	CFSB-271	CFSB-277	CFSB-277	CFSB-277	CFSB-277	CFSB-283	CFSB-284	CFSB-290	CFSB-290	CFSB-290
Sample Lab IDs	180-77393-57, 460-155369-13	180-77393-58, 460-155369-14	180-77393-45, 460-155369-1	180-77393-46, 460-155369-2	180-77393-47, 460-155369-3	180-77393-80, 460-155369-38	180-77393-81, 460-155369-39	180-77393-82, 460-155369-40	180-77393-83, 460-155369-41	180-78894-10, 460-158632-10	180-78894-11, 460-158632-11	460-159538-2	460-159538-3	320-43709-6
Sample Name	CFSB-270-SO-6-8	CFSB-270-SO-10-12	CFSB-271-SO-0-0.5	CFSB-271-SO-0.5-2	CFSB-271-SO-10-12	CFSB-277-SO-0-0.5	CFSB-277-SO-0.5-2	CFSB-277-SO-6-8	CFSB-277-SO-10-12	CFSB-283-SO-0-0.5	CFSB-284-SO-0-0.5	CFSB-290-SO-0-0.5	CFSB-290-SO-0.5-2	CFSB-290-SO-0-0.5
Sample Depth	6-8 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	6-8 ft	10-12 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft
Chemical	5/2/2018	5/2/2018	5/2/2018	5/2/2018	5/2/2018	5/3/2018	5/3/2018	5/3/2018	5/3/2018	6/16/2018	6/16/2018	6/28/2018	6/28/2018	9/27/2018
Diethyl Phthalate	0.01 U	0.01 U	0.012 U	0.011 U	0.01 U	0.041 U	0.021 U	0.052 U	0.01 U	0.043 U	0.059 U	--	--	--
Dimethyl Phthalate	0.0013 U	0.0013 U	0.0014 U	0.0014 U	0.0013 U	0.005 U	0.0025 U	0.0064 U	0.0013 U	0.0052 U	0.0071 U	--	--	--
Di-N-Butyl Phthalate	0.015 U	0.015 U	0.017 U	0.016 U	0.015 U	0.06 U	0.03 U	0.077 U	0.015 U	0.063 U	0.086 U	--	--	--
Di-N-Octylphthalate	0.02 U	0.02 U	0.023 U	0.022 U	0.027 J	0.08 U	0.04 U	0.1 U	0.02 U	0.083 U	0.11 U	--	--	--
Fluoranthene	0.0053 J	0.014	0.15	0.033	0.013	0.75	0.21	1.2	0.0032 J	1.8	1.2	--	--	--
Fluorene	0.0014 U	0.0014 U	0.007 J	0.0015 U	0.0014 U	0.027 J	0.0049 J	0.03 J	0.0014 U	0.042	0.037 J	--	--	--
Hexachlorobenzene	0.0025 U	0.0025 U	0.0028 U	0.0027 U	0.0025 U	0.0099 U	0.0049 U	0.013 U	0.0025 U	0.01 U	0.014 U	--	--	--
Hexachlorobutadiene	0.002 U	0.002 U	0.0023 U	0.0022 U	0.002 U	0.0081 U	0.004 U	0.01 U	0.002 U	0.0084 U	0.011 U	--	--	--
Hexachlorocyclopentadiene	0.0018 U	0.0018 U	0.002 U	0.0019 U	0.0018 U	0.007 U	0.0035 U	0.0089 U	0.0018 U	0.0073 U	0.01 U	--	--	--
Hexachloroethane	0.0018 U	0.0018 U	0.002 U	0.0019 U	0.0018 U	0.0071 U	0.0036 U	0.009 U	0.0018 U	0.0074 U	0.01 U	--	--	--
Indeno(1,2,3-C,D)Pyrene	0.0031 J	0.0058 J	0.062	0.015	0.0081	0.48	0.14	0.75	0.0022 J	0.99	0.66	--	--	--
Isophorone	0.0018 U	0.0018 U	0.002 U	0.0019 U	0.0018 U	0.007 U	0.0035 U	0.0089 U	0.0018 U	0.0073 U	0.01 U	--	--	--
Naphthalene	0.0014 U	0.0014 U	0.0015 U	0.0015 U	0.0014 U	0.011 J	0.0027 U	0.0094 J	0.0014 U	0.024 J	0.045	--	--	--
Nitrobenzene	0.013 U	0.013 U	0.014 U	0.014 U	0.013 U	0.05 U	0.025 U	0.064 U	0.013 U	0.052 U	0.072 U	--	--	--
N-Nitrosodi-N-Propylamine	0.0024 U	0.0023 U	0.0027 U	0.0026 U	0.0023 U	0.0093 U	0.0047 U	0.012 U	0.0024 U	0.0097 U	0.013 U	--	--	--
N-Nitrosodiphenylamine	0.012 U	0.012 U	0.013 U	0.013 U	0.012 U	0.046 U	0.023 U	0.058 U	0.012 U	0.048 U	0.065 U	--	--	--
Pentachlorophenol	0.056 U	0.056 U	0.064 U	0.061 U	0.056 U	0.22 U	0.11 U	0.28 U	0.056 U	0.23 U	0.31 U	--	--	--
Phenanthrene	0.0027 J	0.0063 J	0.07	0.012	0.0059 J	0.35	0.092	0.51	0.0019 U	0.81	0.64	--	--	--
Phenol	0.011 U	0.01 U	0.012 U	0.011 U	0.01 U	0.042 U	0.021 U	0.053 U	0.011 U	0.043 U	0.059 U	--	--	--
Pyrene	0.0046 J	0.012	0.12	0.025	0.011	0.77	0.22	1.2	0.0033 J	1.5	1.1	--	--	--
VOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,1,1-Trichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,2,2-Tetrachloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,2-Trichloro-1,2,2-Trifluoroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,2-Trichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1-Dichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1-Dichloroethene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,3-Trichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,4-Trichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dibromo-3-Chloropropane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dibromoethane (Ethylene Dibromide)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichloropropane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,3-Dichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,4-Dichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Hexanone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acetone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromochloromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromodichloromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromoform	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromomethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Carbon Disulfide	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Carbon Tetrachloride	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chloroform	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chloromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cis-1,2-Dichloroethylene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cis-1,3-Dichloropropene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cyclohexane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibromochloromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dichlorodifluoromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Ethylbenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Isopropylbenzene (Cumene)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
M,P-Xylene	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Table E-9
Summary of Data Used in Risk Assessment
Central Landfills Area (soil 0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-270	CFSB-270	CFSB-271	CFSB-271	CFSB-271	CFSB-277	CFSB-277	CFSB-277	CFSB-277	CFSB-283	CFSB-284	CFSB-290	CFSB-290	CFSB-290
Sample Lab IDs	180-77393-57, 460-155369-13	180-77393-58, 460-155369-14	180-77393-45, 460-155369-1	180-77393-46, 460-155369-2	180-77393-47, 460-155369-3	180-77393-80, 460-155369-38	180-77393-81, 460-155369-39	180-77393-82, 460-155369-40	180-77393-83, 460-155369-41	180-78894-10, 460-158632-10	180-78894-11, 460-158632-11	460-159538-2	460-159538-3	320-43709-6
Sample Name	CFSB-270-SO-6-8	CFSB-270-SO-10-12	CFSB-271-SO-0-0.5	CFSB-271-SO-0.5-2	CFSB-271-SO-10-12	CFSB-277-SO-0-0.5	CFSB-277-SO-0.5-2	CFSB-277-SO-6-8	CFSB-277-SO-10-12	CFSB-283-SO-0-0.5	CFSB-284-SO-0-0.5	CFSB-290-SO-0-0.5	CFSB-290-SO-0.5-2	CFSB-290-SO-0-0.5
Sample Depth	6-8 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	6-8 ft	10-12 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft
Chemical	5/2/2018	5/2/2018	5/2/2018	5/2/2018	5/2/2018	5/3/2018	5/3/2018	5/3/2018	5/3/2018	6/16/2018	6/16/2018	6/28/2018	6/28/2018	9/27/2018
Methyl Acetate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methyl Ethyl Ketone (2-Butanone)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methylcyclohexane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methylene Chloride	--	--	--	--	--	--	--	--	--	--	--	--	--	--
O-Xylene (1,2-Dimethylbenzene)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Styrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Tert-Butyl Methyl Ether	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Tetrachloroethylene (PCE)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Toluene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Trans-1,2-Dichloroethene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Trans-1,3-Dichloropropene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Trichloroethylene (TCE)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Trichlorofluoromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Vinyl Chloride	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-9
Summary of Data Used in Risk Assessment
Central Landfills Area (soil 0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-290	CFSB-291	CFSB-291	CFSB-292	CFSB-292
Sample Lab IDs	320-43709-7	460-159044-11	460-159044-12	460-159044-25	460-159044-26
Sample Name	CFSB-290-SO-0.5-2	CFSB-291-SO-0-0.5	CFSB-291-SO-0.5-2	CFSB-292-SO-0-0.5	CFSB-292-SO-0.5-2
Sample Depth	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft
Chemical	9/27/2018	6/22/2018	6/22/2018	6/22/2018	6/22/2018
GENERAL CHEMISTRY (mg/kg)					
Fluoride	--	--	--	--	--
Cyanide	--	--	--	--	--
METALS (mg/kg)					
"Chromium, Hexavalent - Estimated"	--	--	--	--	--
"Chromium, Trivalent - Calculated"	--	11.02	9.92	8.42	9.8735
"Chromium, Trivalent - Estimated"	--	--	--	--	--
Aluminum	--	--	--	--	--
Antimony	--	--	--	--	--
Arsenic	--	--	--	--	--
Barium	--	--	--	--	--
Beryllium	--	--	--	--	--
Cadmium	--	--	--	--	--
Calcium	--	--	--	--	--
Chromium, Total	--	11.1	10	8.5	9.9
Cobalt	--	--	--	--	--
Copper	--	--	--	--	--
Iron	--	--	--	--	--
Lead	--	--	--	--	--
Magnesium	--	--	--	--	--
Manganese	--	--	--	--	--
Mercury	--	--	--	--	--
Nickel	--	--	--	--	--
Potassium	--	--	--	--	--
Selenium	--	--	--	--	--
Silver	--	--	--	--	--
Sodium	--	--	--	--	--
Thallium	--	--	--	--	--
Vanadium	--	--	--	--	--
Zinc	--	--	--	--	--
METALS|HEXAVALENT CHROMIUM (mg/kg)					
Chromium, Hexavalent	--	0.16 UJ	0.16 UJ	0.16 UJ	0.053 U
PESTICIDES (mg/kg)					
Aldrin	--	--	--	--	--
Alpha Bhc (Alpha Hexachlorocyclohexane)	--	--	--	--	--
Alpha Endosulfan	--	--	--	--	--
Beta Bhc (Beta Hexachlorocyclohexane)	--	--	--	--	--
Beta Endosulfan	--	--	--	--	--
cis-Chlordane	--	--	--	--	--
Delta BHC (Delta Hexachlorocyclohexane)	--	--	--	--	--
Dieldrin	--	--	--	--	--
Endosulfan Sulfate	--	--	--	--	--
Endrin	--	--	--	--	--
Endrin Aldehyde	--	--	--	--	--
Endrin Ketone	--	--	--	--	--
Gamma Bhc (Lindane)	--	--	--	--	--
Heptachlor	--	--	--	--	--
Heptachlor Epoxide	--	--	--	--	--
Methoxychlor	--	--	--	--	--
P,P'-DDD	--	--	--	--	--
P,P'-DDE	--	--	--	--	--
P,P'-DDT	--	--	--	--	--
Toxaphene	--	--	--	--	--
trans-Chlordane	--	--	--	--	--
POLYCHLORINATED BIPHENYLS (mg/kg)					
PCB-1016 (Aroclor 1016)	--	--	--	--	--
PCB-1221 (Aroclor 1221)	--	--	--	--	--

Table E-9
Summary of Data Used in Risk Assessment
Central Landfills Area (soil 0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-290	CFSB-291	CFSB-291	CFSB-292	CFSB-292
Sample Lab IDs	320-43709-7	460-159044-11	460-159044-12	460-159044-25	460-159044-26
Sample Name	CFSB-290-SO-0.5-2	CFSB-291-SO-0-0.5	CFSB-291-SO-0.5-2	CFSB-292-SO-0-0.5	CFSB-292-SO-0.5-2
Sample Depth	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft
Chemical	9/27/2018	6/22/2018	6/22/2018	6/22/2018	6/22/2018
PCB-1232 (Aroclor 1232)	--	--	--	--	--
PCB-1242 (Aroclor 1242)	--	--	--	--	--
PCB-1248 (Aroclor 1248)	--	--	--	--	--
PCB-1254 (Aroclor 1254)	--	--	--	--	--
PCB-1260 (Aroclor 1260)	--	--	--	--	--
PCB-1262 (Aroclor 1262)	--	--	--	--	--
PCB-1268 (Aroclor 1268)	--	--	--	--	--
Polychlorinated Biphenyl (PCBs)	--	--	--	--	--
SEMIVOLATILE ORGANIC COMPOUNDS (mg/kg)					
1,2,4,5-Tetrachlorobenzene	--	--	--	--	--
1,4-Dioxane (P-Dioxane)	--	--	--	--	--
2,3,4,6-Tetrachlorophenol	--	--	--	--	--
2,4,5-Trichlorophenol	--	--	--	--	--
2,4,6-Trichlorophenol	--	--	--	--	--
2,4-Dichlorophenol	--	--	--	--	--
2,4-Dimethylphenol	--	--	--	--	--
2,4-Dinitrophenol	--	--	--	--	--
2,4-Dinitrotoluene	--	--	--	--	--
2,6-Dinitrotoluene	--	--	--	--	--
2-Chloronaphthalene	--	--	--	--	--
2-Chlorophenol	--	--	--	--	--
2-Methylnaphthalene	--	--	--	--	--
2-Methylphenol (O-Cresol)	--	--	--	--	--
2-Nitroaniline	--	--	--	--	--
2-Nitrophenol	--	--	--	--	--
3- And 4- Methylphenol (Total)	--	--	--	--	--
3,3'-Dichlorobenzidine	--	--	--	--	--
3-Nitroaniline	--	--	--	--	--
4,6-Dinitro-2-Methylphenol	--	--	--	--	--
4-Bromophenyl Phenyl Ether	--	--	--	--	--
4-Chloro-3-Methylphenol	--	--	--	--	--
4-Chloroaniline	--	--	--	--	--
4-Chlorophenyl Phenyl Ether	--	--	--	--	--
4-Nitroaniline	--	--	--	--	--
4-Nitrophenol	--	--	--	--	--
Acenaphthene	--	--	--	--	--
Acenaphthylene	--	--	--	--	--
Acetophenone	--	--	--	--	--
Anthracene	--	--	--	--	--
Atrazine	--	--	--	--	--
Benzaldehyde	--	--	--	--	--
Benzo(A)Anthracene	--	--	--	--	--
Benzo(A)Pyrene	--	--	--	--	--
Benzo(B)Fluoranthene	--	--	--	--	--
Benzo(G,H,I)Perylene	--	--	--	--	--
Benzo(K)Fluoranthene	--	--	--	--	--
Benzyl Butyl Phthalate	--	--	--	--	--
Biphenyl (Diphenyl)	--	--	--	--	--
Bis(2-Chloroethoxy) Methane	--	--	--	--	--
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	--	--	--	--	--
Bis(2-Chloroisopropyl) Ether	--	--	--	--	--
Bis(2-Ethylhexyl) Phthalate	--	--	--	--	--
Caprolactam	--	--	--	--	--
Carbazole	--	--	--	--	--
Chrysene	--	--	--	--	--
Dibenz(A,H)Anthracene	--	--	--	--	--
Dibenzofuran	--	--	--	--	--

Table E-9
Summary of Data Used in Risk Assessment
Central Landfills Area (soil 0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-290	CFSB-291	CFSB-291	CFSB-292	CFSB-292
Sample Lab IDs	320-43709-7	460-159044-11	460-159044-12	460-159044-25	460-159044-26
Sample Name	CFSB-290-SO-0.5-2	CFSB-291-SO-0-0.5	CFSB-291-SO-0.5-2	CFSB-292-SO-0-0.5	CFSB-292-SO-0.5-2
Sample Depth	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft
Chemical	9/27/2018	6/22/2018	6/22/2018	6/22/2018	6/22/2018
Diethyl Phthalate	--	--	--	--	--
Dimethyl Phthalate	--	--	--	--	--
Di-N-Butyl Phthalate	--	--	--	--	--
Di-N-Octylphthalate	--	--	--	--	--
Fluoranthene	--	--	--	--	--
Fluorene	--	--	--	--	--
Hexachlorobenzene	--	--	--	--	--
Hexachlorobutadiene	--	--	--	--	--
Hexachlorocyclopentadiene	--	--	--	--	--
Hexachloroethane	--	--	--	--	--
Indeno(1,2,3-C,D)Pyrene	--	--	--	--	--
Isophorone	--	--	--	--	--
Naphthalene	--	--	--	--	--
Nitrobenzene	--	--	--	--	--
N-Nitrosodi-N-Propylamine	--	--	--	--	--
N-Nitrosodiphenylamine	--	--	--	--	--
Pentachlorophenol	--	--	--	--	--
Phenanthrene	--	--	--	--	--
Phenol	--	--	--	--	--
Pyrene	--	--	--	--	--
VOLATILE ORGANIC COMPOUNDS (mg/kg)					
1,1,1-Trichloroethane	--	--	--	--	--
1,1,2,2-Tetrachloroethane	--	--	--	--	--
1,1,2-Trichloro-1,2,2-Trifluoroethane	--	--	--	--	--
1,1,2-Trichloroethane	--	--	--	--	--
1,1-Dichloroethane	--	--	--	--	--
1,1-Dichloroethene	--	--	--	--	--
1,2,3-Trichlorobenzene	--	--	--	--	--
1,2,4-Trichlorobenzene	--	--	--	--	--
1,2-Dibromo-3-Chloropropane	--	--	--	--	--
1,2-Dibromoethane (Ethylene Dibromide)	--	--	--	--	--
1,2-Dichlorobenzene	--	--	--	--	--
1,2-Dichloroethane	--	--	--	--	--
1,2-Dichloropropane	--	--	--	--	--
1,3-Dichlorobenzene	--	--	--	--	--
1,4-Dichlorobenzene	--	--	--	--	--
2-Hexanone	--	--	--	--	--
Acetone	--	--	--	--	--
Benzene	--	--	--	--	--
Bromochloromethane	--	--	--	--	--
Bromodichloromethane	--	--	--	--	--
Bromoform	--	--	--	--	--
Bromomethane	--	--	--	--	--
Carbon Disulfide	--	--	--	--	--
Carbon Tetrachloride	--	--	--	--	--
Chlorobenzene	--	--	--	--	--
Chloroethane	--	--	--	--	--
Chloroform	--	--	--	--	--
Chloromethane	--	--	--	--	--
Cis-1,2-Dichloroethylene	--	--	--	--	--
Cis-1,3-Dichloropropene	--	--	--	--	--
Cyclohexane	--	--	--	--	--
Dibromochloromethane	--	--	--	--	--
Dichlorodifluoromethane	--	--	--	--	--
Ethylbenzene	--	--	--	--	--
Isopropylbenzene (Cumene)	--	--	--	--	--
M,P-Xylene	--	--	--	--	--

Table E-9
Summary of Data Used in Risk Assessment
Central Landfills Area (soil 0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-290	CFSB-291	CFSB-291	CFSB-292	CFSB-292
Sample Lab IDs	320-43709-7	460-159044-11	460-159044-12	460-159044-25	460-159044-26
Sample Name	CFSB-290-SO-0.5-2	CFSB-291-SO-0-0.5	CFSB-291-SO-0.5-2	CFSB-292-SO-0-0.5	CFSB-292-SO-0.5-2
Sample Depth	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft
Chemical	9/27/2018	6/22/2018	6/22/2018	6/22/2018	6/22/2018
Methyl Acetate	--	--	--	--	--
Methyl Ethyl Ketone (2-Butanone)	--	--	--	--	--
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	--	--	--	--	--
Methylcyclohexane	--	--	--	--	--
Methylene Chloride	--	--	--	--	--
O-Xylene (1,2-Dimethylbenzene)	--	--	--	--	--
Styrene	--	--	--	--	--
Tert-Butyl Methyl Ether	--	--	--	--	--
Tetrachloroethylene (PCE)	--	--	--	--	--
Toluene	--	--	--	--	--
Trans-1,2-Dichloroethene	--	--	--	--	--
Trans-1,3-Dichloropropene	--	--	--	--	--
Trichloroethylene (TCE)	--	--	--	--	--
Trichlorofluoromethane	--	--	--	--	--
Vinyl Chloride	--	--	--	--	--

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-10
Summary of Data Used in Risk Assessment
Central Landfills Area (surface water) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Chemical	CFSWP-010 460-114997-2 CFSWP-010-SW 6/7/2016	CFSWP-010 460-129899-2 CFSWP-010-SW 3/15/2017	CFSWP-010 460-135182-2 CFSWP-010-SW 6/12/2017	CFSWP-010 460-158366-2 CFSWP-010-SW 6/14/2018	CFSWP-011 460-114997-3 CFSWP-011-SW 6/7/2016	CFSWP-011 460-130874-6 CFSWP-011-SW 4/3/2017	CFSWP-011 460-135182-3 CFSWP-011-SW 6/12/2017	CFSWP-011 460-158366-3 CFSWP-011-SW 6/14/2018	CFSWP-012 460-114997-4 CFSWP-012-SW 6/7/2016	CFSWP-012 460-130874-7 CFSWP-012-SW 4/3/2017	CFSWP-012-DUP 460-130874-8 CFSWP-DUP5-SW 4/3/2017	CFSWP-012 460-135182-4 CFSWP-012-SW 6/12/2017	CFSWP-012 460-158366-4 CFSWP-012-SW 6/14/2018	CFSWP-041 460-158366-6 CFSWP-041-SW 6/14/2018	CFSWP-041-DUP 460-158366-9 CFSWP-DUP11-SW 6/14/2018
GENERAL CHEMISTRY (µg/L)															
Fluoride	--	--	177 J+	--	--	--	128 J+	--	--	--	--	129 J+	--	--	--
Cyanide	--	--	2 U	--	--	--	2 U	--	--	--	--	2 U	--	--	--
Cyanide	4 U	2 U	2 U	2 U	4 U	2 U	2 U	2 U	4 U	2 U	2 U	2 U	2 U	2 U	2 U
Cyanide (Free)	--	--	--	1.5 U	--	--	--	1.5 U	--	--	--	--	1.5 U	1.5 U	1.5 U
METALS (µg/L)															
Aluminum	--	--	18.2 U	15 U	--	--	18.2 U	15 U	--	--	--	18.2 U	36.1 J	15 U	15 U
Antimony	--	--	0.62 U	0.62 U	--	--	0.62 U	0.62 U	--	--	--	0.62 U	0.62 U	0.62 U	0.62 U
Arsenic	--	--	0.64 U	0.77 U	--	--	0.64 U	0.77 U	--	--	--	0.64 U	0.77 U	0.77 U	0.77 U
Barium	--	--	85.2	79.6	--	--	86.6	76.2	--	--	--	85	79.6	76.2	76.9
Beryllium	--	--	0.24 U	0.26 U	--	--	0.24 U	0.26 U	--	--	--	0.24 U	0.26 U	0.26 U	0.26 U
Cadmium	--	--	0.71 U	0.61 U	--	--	0.71 U	0.61 U	--	--	--	0.71 U	0.61 U	0.61 U	0.61 U
Calcium	--	--	48600	46800	--	--	48700	45200	--	--	--	48700	46000	47900	48400
Chromium, Total	--	--	1.3 U	1.3 U	--	--	1.3 U	1.3 U	--	--	--	1.3 U	1.3 U	1.3 U	1.3 U
Cobalt	--	--	1.3 U	1.3 U	--	--	1.3 U	1.3 U	--	--	--	1.3 U	1.3 U	1.3 U	1.3 U
Copper	--	--	1.4 U	1.9 U	--	--	1.4 U	1.9 U	--	--	--	1.4 U	1.9 U	1.9 U	1.9 U
Iron	--	--	42.4 U	45.7 U	--	--	42.4 U	45.7 U	--	--	--	42.4 U	45.7 U	45.7 U	45.7 U
Lead	--	--	0.38 U	0.37 U	--	--	0.38 U	0.37 U	--	--	--	0.38 U	0.37 U	0.37 U	0.37 U
Magnesium	--	--	10900	10100	--	--	11100	9750	--	--	--	11100	10100	10700	10700
Manganese	--	--	2.5 U	2.7 U	--	--	2.5 U	2.7 U	--	--	--	2.5 U	3.4 J	2.7 U	2.7 U
Mercury	--	--	0.17 U	0.12 U	--	--	0.17 U	0.12 U	--	--	--	0.17 U	0.12 U	0.12 U	0.12 U
Nickel	--	--	1.4 U	1.3 U	--	--	1.4 U	1.3 U	--	--	--	1.4 U	1.3 U	1.3 U	1.3 U
Potassium	--	--	417	426	--	--	419	417	--	--	--	410	433	453	466
Selenium	--	--	0.73 U	0.69 U	--	--	0.73 U	0.69 U	--	--	--	0.73 U	0.69 U	0.69 U	0.69 U
Silver	--	--	1.3 U	1.4 U	--	--	1.3 U	1.4 U	--	--	--	1.3 U	1.4 U	1.4 U	1.4 U
Sodium	--	--	2060	1800	--	--	2010	1760	--	--	--	2020	1810	1910	1910
Thallium	--	--	0.26 U	0.24 U	--	--	0.26 U	0.24 U	--	--	--	0.26 U	0.24 U	0.24 U	0.24 U
Vanadium	--	--	1.9 U	1.2 U	--	--	1.9 U	1.2 U	--	--	--	1.9 U	1.2 U	1.2 U	1.2 U
Zinc	--	--	7 U	5.4 U	--	--	7 U	5.4 U	--	--	--	7 U	5.4 U	5.4 U	5.4 U
Aluminum	44.6	507	18.2 U	50.6	28.2 J	37.9 J	18.2 U	17.1 J	35.9 J	27.4 J	37.7 J	18.2 U	23 J	16.7 J	16.5 J
Antimony	0.76 U	0.62 U	0.62 U	2.2	0.76 U	0.62 U	0.62 U	0.62 U	0.76 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U
Arsenic	0.71 U	0.64 U	0.64 U	0.77 U	0.71 U	0.64 U	0.64 U	0.77 U	0.8 J	0.64 U	0.64 U	0.64 U	0.77 U	0.77 U	0.77 U
Barium	79.6	63.4	88	79.7	78.6	70.8	87.3	80.4	79	70.5	75.8	88.8	79.2	79.7	80.6
Beryllium	0.29 U	0.24 U	0.24 U	0.26 U	0.29 U	0.24 U	0.24 U	0.26 U	0.29 U	0.24 U	0.24 U	0.24 U	0.26 U	0.26 U	0.26 U
Cadmium	0.72 U	0.71 U	0.71 U	0.61 U	0.72 U	0.71 U	0.71 U	0.61 U	0.72 U	0.71 U	0.71 U	0.71 U	0.61 U	0.61 U	0.61 U
Calcium	47000	38300	50700	46100	47000	46600	50600	44300	46800	45600	45300	50000	43900	44500	43400
Chromium, Total	1.5 U	1.3 U	1.3 U	1.3 U	1.5 U	1.3 U	1.3 U	1.3 U	1.5 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
Cobalt	1.5 U	1.3 U	1.3 U	1.3 U	1.5 U	1.3 U	1.3 U	1.3 U	1.5 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
Copper	1.6 U	1.5 J	1.4 U	1.9 U	2.1 J	1.4 U	1.4 U	1.9 U	4.1	1.4 U	1.4 U	1.4 U	1.9 U	1.9 U	1.9 U
Iron	49.3 J	392	42.4 U	57.4 J	49.1 U	42.4 U	42.4 U	45.7 U	72.8 J	42.4 U	54.6 J	42.4 U	45.7 U	45.7 U	45.7 U
Lead	0.44 U	0.54 J	0.38 U	0.37 U	0.44 U	0.38 U	0.38 U	0.37 U	0.44 U	0.38 U	0.38 U	0.38 U	0.37 U	0.37 U	0.37 U
Magnesium	10900	6510	12100	10600	10800	10400	12100	10800	10900	10300	10900	12000	10700	10800	10700
Manganese	7.8 J	19.6	3.1 J	5.3 J	6.3 J	7.5 J	3.8 J	3.9 J	8.6	6.8 J	7.9 J	4.4 J	5.7 J	3.7 J	3.9 J
Mercury	0.14 U	0.17 U	0.17 U	0.12 U	0.14 U	0.17 U	0.17 U	0.12 U	0.14 U	0.17 U	0.17 U	0.17 U	0.12 U	0.12 U	0.12 U
Nickel	1.6 U	1.4 U	1.4 U	1.3 U	1.6 U	1.4 U	1.4 U	1.3 U	1.6 U	1.4 U	1.4 U	1.4 U	1.3 U	1.3 U	1.3 U
Potassium	535	1100	473	427	540	454	472	392	537	433	451	474	379	382	363
Selenium	0.79 U	0.73 U	0.73 U	0.69 U	0.79 U	0.73 U	0.73 U	0.69 U	0.79 U	0.73 U	0.73 U	0.73 U	0.69 U	0.69 U	0.69 U
Silver	1.5 U	1.3 U	1.3 U	1.4 U	1.5 U	1.3 U	1.3 U	1.4 U	1.5 U	1.3 U	1.3 U	1.3 U	1.4 U	1.4 U	1.4 U
Sodium	2080	2180	2220	4830	2120	2370	2210	2240	2080	2310	2360	2190	2230	2120	2160
Thallium	0.31 U	0.26 U	0.26 U	0.24 U	0.31 U	0.26 U	0.26 U	0.24 U	0.31 U	0.26 U	0.26 U	0.26 U	0.24 U	0.24 U	0.24 U

Table E-10
Summary of Data Used in Risk Assessment
Central Landfills Area (surface water) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Chemical	CFSWP-010 460-114997-2 CFSWP-010-SW 6/7/2016	CFSWP-010 460-129899-2 CFSWP-010-SW 3/15/2017	CFSWP-010 460-135182-2 CFSWP-010-SW 6/12/2017	CFSWP-010 460-158366-2 CFSWP-010-SW 6/14/2018	CFSWP-011 460-114997-3 CFSWP-011-SW 6/7/2016	CFSWP-011 460-130874-6 CFSWP-011-SW 4/3/2017	CFSWP-011 460-135182-3 CFSWP-011-SW 6/12/2017	CFSWP-011 460-158366-3 CFSWP-011-SW 6/14/2018	CFSWP-012 460-114997-4 CFSWP-012-SW 6/7/2016	CFSWP-012 460-130874-7 CFSWP-012-SW 4/3/2017	CFSWP-012-DUP 460-130874-8 CFSWP-DUP5-SW 4/3/2017	CFSWP-012 460-135182-4 CFSWP-012-SW 6/12/2017	CFSWP-012 460-158366-4 CFSWP-012-SW 6/14/2018	CFSWP-041 460-158366-6 CFSWP-041-SW 6/14/2018	CFSWP-041-DUP 460-158366-9 CFSWP-DUP11- SW 6/14/2018
Vanadium	2.1 J	1.9 U	1.9 U	1.2 U	2.1 J	1.9 U	1.9 U	1.2 U	2.1 J	1.9 U	1.9 U	1.9 U	1.2 U	1.2 U	1.2 U
Zinc	6.5 U	7 U	7 U	7.1 J	6.5 U	7 U	7 U	5.4 U	6.5 U	7 U	7 U	7 U	5.4 U	5.4 U	5.4 U

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-11
Summary of Data Used in Risk Assessment
Central Landfills Area (sediment) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Chemical	CFSDP-010 200-35201-5, 460-119741-2 CFSDP-010-SO 9/6/2016	CFSDP-011 200-35201-6, 460-119741-3 CFSDP-011-SO 9/6/2016	CFSDP-012 200-35201-7, 460-119741-4 CFSDP-012-SO 9/6/2016	CFSDP-012-DUP 460-119741-6 CFSDP-DUP1-SO 9/6/2016
GENERAL CHEMISTRY (mg/kg)				
Fluoride	4.27	1.62	1.3	1.57
Cyanide	0.85	0.3	0.56	0.57
METALS (mg/kg)				
Aluminum	22700	14700	20700	21400
Antimony	0.37 UJ	0.32 UJ	0.34 UJ	0.34 UJ
Arsenic	4.3	5.2	5.5	5.8
Barium	257	180	251	255
Beryllium	0.98	0.64	0.8	0.85
Cadmium	0.39 U	0.33 U	0.36 U	0.36 U
Calcium	30100	23500	21700	20600
Chromium, Total	14.9	11.8	14.1	15.2
Cobalt	8.3	7.5	8.4	8.6
Copper	23.3	20.1	20.8	22.3
Iron	18800	16800	19500	20200
Lead	18.2	13	18.5	18.1
Magnesium	11500	12200	10400	10600
Manganese	640	1070	1250	1280
Mercury	0.045	0.029	0.045	0.043
Nickel	43.8 J+	23.7 J+	28.9 J+	30 J+
Potassium	1330	922	1290	1290
Selenium	0.46 J	0.29 U	0.34 J	0.35 J
Silver	0.73 U	0.62 U	0.67 U	0.67 U
Sodium	104 J	60 J	71.5 J	72.4 J
Thallium	0.15 U	0.13 U	0.14 U	0.14 U
Vanadium	18	11.5	14	14.5
Zinc	129	128	81.1	82.3

Table E-11
Summary of Data Used in Risk Assessment
Central Landfills Area (sediment) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Chemical	CFSDP-010 200-35201-5, 460-119741-2 CFSDP-010-SO 9/6/2016	CFSDP-011 200-35201-6, 460-119741-3 CFSDP-011-SO 9/6/2016	CFSDP-012 200-35201-7, 460-119741-4 CFSDP-012-SO 9/6/2016	CFSDP-012-DUP 460-119741-6 CFSDP-DUP1-SO 9/6/2016
PESTICIDES (mg/kg)				
Aldrin	0.0011 U	0.00099 U	0.0011 U	0.001 U
Alpha Bhc (Alpha Hexachlorocyclohexane)	0.00084 U	0.00074 U	0.00079 U	0.00079 U
Alpha Endosulfan	0.0013 U	0.0011 U	0.0012 U	0.0012 U
Beta Bhc (Beta Hexachlorocyclohexane)	0.0009 U	0.00079 U	0.00085 U	0.00084 U
Beta Endosulfan	0.0015 U	0.0013 U	0.0014 U	0.0014 U
cis-Chlordane	0.0015 U	0.0013 U	0.0014 U	0.0014 U
Delta BHC (Delta Hexachlorocyclohexane)	0.001 U	0.00089 U	0.00095 U	0.00094 U
Dieldrin	0.0012 U	0.0011 U	0.0011 U	0.0011 U
Endosulfan Sulfate	0.0011 U	0.00095 U	0.001 U	0.001 U
Endrin	0.0012 U	0.001 U	0.0011 U	0.0011 U
Endrin Aldehyde	0.0011 U	0.001 U	0.0011 U	0.0011 U
Endrin Ketone	0.0013 U	0.0011 U	0.0012 U	0.0012 U
Gamma Bhc (Lindane)	0.00083 U	0.00073 U	0.00078 U	0.00077 U
Heptachlor	0.0012 U	0.001 U	0.0011 U	0.0011 U
Heptachlor Epoxide	0.0018 U	0.0016 U	0.0017 U	0.0017 U
Methoxychlor	0.002 U	0.0017 U	0.0018 U	0.0018 U
P,P'-DDD	0.0012 U	0.0011 U	0.0011 U	0.0011 U
P,P'-DDE	0.0013 U	0.0012 U	0.0013 U	0.0013 U
P,P'-DDT	0.00096 U	0.00084 U	0.0009 U	0.00089 U
Toxaphene	0.027 U	0.024 U	0.025 U	0.025 U
trans-Chlordane	0.002 U	0.0018 U	0.0019 U	0.0019 U
POLYCHLORINATED BIPHENYLS (mg/kg)				
PCB-1016 (Aroclor 1016)	0.012 U	0.011 U	0.012 U	0.011 U
PCB-1221 (Aroclor 1221)	0.012 U	0.011 U	0.012 U	0.011 U
PCB-1232 (Aroclor 1232)	0.012 U	0.011 U	0.012 U	0.011 U
PCB-1242 (Aroclor 1242)	0.012 U	0.011 U	0.012 U	0.011 U
PCB-1248 (Aroclor 1248)	0.012 U	0.011 U	0.012 U	0.011 U
PCB-1254 (Aroclor 1254)	0.013 U	0.011 U	0.012 U	0.012 U
PCB-1260 (Aroclor 1260)	0.013 U	0.011 U	0.012 U	0.012 U

Table E-11
Summary of Data Used in Risk Assessment
Central Landfills Area (sediment) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Chemical	CFSDP-010 200-35201-5, 460-119741-2 CFSDP-010-SO 9/6/2016	CFSDP-011 200-35201-6, 460-119741-3 CFSDP-011-SO 9/6/2016	CFSDP-012 200-35201-7, 460-119741-4 CFSDP-012-SO 9/6/2016	CFSDP-012-DUP 460-119741-6 CFSDP-DUP1-SO 9/6/2016
PCB-1262 (Aroclor 1262)	0.013 U	0.011 U	0.012 U	0.012 U
PCB-1268 (Aroclor 1268)	0.013 U	0.011 U	0.012 U	0.012 U
Polychlorinated Biphenyl (PCBs)	0.013 U	0.011 U	0.012 U	0.012 U
SEMIVOLATILE ORGANIC COMPOUNDS (mg/kg)				
1,2,4,5-Tetrachlorobenzene	0.034 U	0.03 U	0.032 U	0.032 U
1,4-Dioxane (P-Dioxane)	0.12 U	0.11 U	0.11 U	0.11 U
2,3,4,6-Tetrachlorophenol	0.043 U	0.038 U	0.04 U	0.04 U
2,4,5-Trichlorophenol	0.046 U	0.04 U	0.043 U	0.042 U
2,4,6-Trichlorophenol	0.013 U	0.011 U	0.012 U	0.012 U
2,4-Dichlorophenol	0.011 U	0.0095 U	0.01 U	0.01 U
2,4-Dimethylphenol	0.1 U	0.089 U	0.095 U	0.094 U
2,4-Dinitrophenol	0.35 U	0.31 U	0.33 U	0.32 U
2,4-Dinitrotoluene	0.018 U	0.016 U	0.017 U	0.017 U
2,6-Dinitrotoluene	0.024 U	0.021 U	0.023 U	0.023 U
2-Chloronaphthalene	0.01 U	0.0092 U	0.0098 U	0.0097 U
2-Chlorophenol	0.012 U	0.01 U	0.011 U	0.011 U
2-Methylnaphthalene	0.01 U	0.012 J	0.0095 U	0.0094 U
2-Methylphenol (O-Cresol)	0.02 U	0.018 U	0.019 U	0.019 U
2-Nitroaniline	0.015 U	0.013 U	0.014 U	0.014 U
2-Nitrophenol	0.015 U	0.014 U	0.014 U	0.014 U
3- And 4- Methylphenol (Total)	0.012 U	0.011 U	0.011 U	0.011 U
3,3'-Dichlorobenzidine	0.051 U	0.045 U	0.048 U	0.048 U
3-Nitroaniline	0.014 U	0.012 U	0.013 U	0.013 U
4,6-Dinitro-2-Methylphenol	0.12 U	0.11 U	0.11 U	0.11 U
4-Bromophenyl Phenyl Ether	0.014 U	0.013 U	0.014 U	0.013 U
4-Chloro-3-Methylphenol	0.02 U	0.017 U	0.018 U	0.018 U
4-Chloroaniline	0.012 U	0.01 U	0.011 U	0.011 U
4-Chlorophenyl Phenyl Ether	0.014 U	0.012 U	0.013 U	0.013 U
4-Nitroaniline	0.017 U	0.015 U	0.016 U	0.016 U
4-Nitrophenol	0.22 U	0.19 U	0.21 U	0.2 U

Table E-11
Summary of Data Used in Risk Assessment
Central Landfills Area (sediment) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Chemical	CFSDP-010 200-35201-5, 460-119741-2 CFSDP-010-SO 9/6/2016	CFSDP-011 200-35201-6, 460-119741-3 CFSDP-011-SO 9/6/2016	CFSDP-012 200-35201-7, 460-119741-4 CFSDP-012-SO 9/6/2016	CFSDP-012-DUP 460-119741-6 CFSDP-DUP1-SO 9/6/2016
Acenaphthene	0.043 J	0.075 J	0.046 J	0.037 J
Acenaphthylene	0.012 U	0.01 U	0.011 U	0.011 U
Acetophenone	0.011 J	0.0088 U	0.0094 U	0.0093 U
Anthracene	0.082 J	0.14 J	0.096 J	0.083 J
Atrazine	0.02 U	0.018 U	0.019 U	0.019 U
Benzaldehyde	0.069 J	0.031 U	0.033 U	0.032 U
Benzo(A)Anthracene	0.82	0.74	0.64	0.55
Benzo(A)Pyrene	1.1	0.94	0.83	0.74
Benzo(B)Fluoranthene	1.8	1.3	1.2	1.1
Benzo(G,H,I)Perylene	1.3	0.84	0.77	0.69
Benzo(K)Fluoranthene	0.47	0.49	0.45	0.45
Benzyl Butyl Phthalate	0.014 U	0.012 U	0.031 J	0.027 J
Biphenyl (Diphenyl)	0.039 U	0.034 U	0.037 U	0.036 U
Bis(2-Chloroethoxy) Methane	0.014 U	0.013 U	0.013 U	0.013 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.011 U	0.0095 U	0.01 U	0.01 U
Bis(2-Chloroisopropyl) Ether	0.019 U	0.017 U	0.018 U	0.018 U
Bis(2-Ethylhexyl) Phthalate	0.018 U	0.016 U	0.045 J	0.031 J
Caprolactam	0.033 U	0.029 U	0.031 U	0.031 U
Carbazole	0.1 J	0.1 J	0.1 J	0.091 J
Chrysene	1.1	0.93	0.89	0.82
Dibenz(A,H)Anthracene	0.28	0.16	0.2	0.15
Dibenzofuran	0.014 U	0.024 J	0.015 J	0.014 J
Diethyl Phthalate	0.013 U	0.011 U	0.012 U	0.012 U
Dimethyl Phthalate	0.013 U	0.012 U	0.012 U	0.012 U
Di-N-Butyl Phthalate	0.014 U	0.012 U	0.039 J	0.018 J
Di-N-Octylphthalate	0.023 U	0.02 U	0.022 U	0.022 U
Fluoranthene	1.1	1.1	1	0.92
Fluorene	0.028 J	0.053 J	0.03 J	0.024 J
Hexachlorobenzene	0.019 U	0.016 U	0.017 U	0.017 U
Hexachlorobutadiene	0.013 U	0.011 U	0.012 U	0.012 U

Table E-11
Summary of Data Used in Risk Assessment
Central Landfills Area (sediment) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Chemical	CFSDP-010 200-35201-5, 460-119741-2 CFSDP-010-SO 9/6/2016	CFSDP-011 200-35201-6, 460-119741-3 CFSDP-011-SO 9/6/2016	CFSDP-012 200-35201-7, 460-119741-4 CFSDP-012-SO 9/6/2016	CFSDP-012-DUP 460-119741-6 CFSDP-DUP1-SO 9/6/2016
Hexachlorocyclopentadiene	0.029 U	0.025 U	0.027 U	0.027 U
Hexachloroethane	0.017 U	0.015 U	0.016 U	0.016 U
Indeno(1,2,3-C,D)Pyrene	1.3	0.95	0.87	0.76
Isophorone	0.014 J	0.012 J	0.014 J	0.011 J
Naphthalene	0.013 J	0.02 J	0.013 J	0.011 J
Nitrobenzene	0.014 U	0.013 U	0.014 U	0.013 U
N-Nitrosodi-N-Propylamine	0.015 U	0.014 U	0.014 U	0.014 U
N-Nitrosodiphenylamine	0.042 U	0.037 U	0.039 U	0.039 U
Pentachlorophenol	0.055 U	0.049 U	0.052 U	0.052 U
Phenanthrene	0.53	0.69	0.55	0.49
Phenol	0.015 U	0.013 U	0.014 U	0.014 U
Pyrene	1.5	1.4	1.1	1

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-12
Summary of Data Used in Risk Assessment
Industrial Landfill Area Soil (0-0.5 ft-bgs) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFLP-001	CFLP-002	CFLP-002-DUP	CFLP-003	CFLP-003-DUP	CFLP-004	CFLP-005	CFLP-005-DUP	CFLP-006	CFMW-003A	CFMW-066	CFSB-191	CFSB-192	CFSB-194
Sample Lab IDs	180-77488-33, 200-43353-7, 460-155568-11	180-77488-35, 200-43353-9, 460-155568-13	180-77488-41, 460-155568-19	180-77488-37, 200-43353-11, 460-155568-15	180-77488-42, 460-155568-20	180-77488-29, 200-43353-3, 460-155568-7	180-77488-39, 200-43353-13, 460-155568-17	180-77488-43, 460-155568-21	180-77488-31, 200-43353-5, 460-155568-9	460-114793-37	180-77393-1, 460-155265-1	180-79204-23, 460-159044-29	180-79204-21, 460-159044-27	180-79434-23, 460-159377-22
Sample Name	CFLP-001-SO-0-0.5	CFLP-002-SO-0-0.5	CFLP-DUP30-SO	CFLP-003-SO-0-0.5	CFLP-DUP31-SO	CFLP-004-SO-0-0.5	CFLP-005-SO-0-0.5	CFLP-DUP32-SO	CFLP-006-SO-0-0.5	CFMW-003a-SO-0-0.5	CFMW-066-SO-0-0.5	CFSB-191-SO-0-0.5	CFSB-192-SO-0-0.5	CFSB-194-SO-0-0.5
Sample Depth	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft
Chemical	5/5/2018	5/5/2018	5/5/2018	5/5/2018	5/5/2018	5/5/2018	5/5/2018	5/5/2018	5/5/2018	5/31/2016	4/30/2018	6/22/2018	6/22/2018	6/27/2018
GENERAL CHEMISTRY (mg/kg)														
Fluoride	12.1 J+	7.75 J	14.9 J	26.1 J	277 J	4.23 J+	398 J+	579 J+	26 J+	4.17 J	3.69 J+	2.24 J-	5.17 J-	3.8
Cyanide	0.068 U	0.075 U	0.074 U	0.061 U	0.063 U	0.067 U	0.066 U	0.063 U	0.19 J+	0.066 J-	0.075 U	0.094 J+	0.094 J	0.21 J+
METALS (mg/kg)														
"Chromium, Hexavalent - Estimated"	0.305109	0.345255	0.289051	0.224818	0.179319	0.259611	1.04915	0.575426	0.388078	0.173966	0.256934	0.232847	0.26764	0.299757
"Chromium, Trivalent - Estimated"	11.0949	12.5547	10.5109	8.17518	6.52068	9.44039	38.1509	20.9246	14.1119	6.32603	9.34307	8.46715	9.73236	10.9002
Aluminum	15100	27800	31300	9660	12200	11000	38900	36100	19800	6230	13800	10400	19500	16700
Antimony	0.3 UJ	0.35 UJ	0.35 UJ	0.3 UJ	0.31 UJ	0.34 J-	2.8 J	1.4 J	0.32 J-	0.5 U	0.34 UJ	0.27 U	0.31 U	0.3 UJ
Arsenic	5.6	5.9	6.1	4.5	3.2	7.1	23.5	14.2	7.2	4.1	6.3	4.5	5.4	6.1
Barium	80.2	226	275	64.2	43.9	66.3	227	207	73.9 J	94.1	234	85.7	194	229
Beryllium	0.3 J	0.82	0.92	0.3 J	0.63 J	0.43	7.2 J	4.1 J	0.52	0.29 J	0.49	0.15 U	0.72	0.46
Cadmium	0.35 U	0.4 U	0.4 U	0.34 U	0.35 U	0.35 U	0.94 J	0.39 J	0.36 J	0.38 U	0.39 U	0.32 U	0.36 U	0.35 U
Calcium	40100	3160 J	6650 J	43400 J	50000 J	36500 J	46700 J	45400 J	19800	75000	2890	20500	1440	3170
Chromium, Total	11.4 J	12.9	10.8	8.4	6.7	9.7	39.2 J	21.5 J	14.5	6.5	9.6	8.7	10	11.2
Cobalt	5.2	7.4	7	5.1	3.5	5.5	16	11.2	5.2	3.6	5.1	3.8	5.5	5.2
Copper	15	17.8 J	21 J	11.3 J	8.3 J	22.9 J	54.6 J	27.2 J	19.3	10.8	12.3	10.7	9.9	13.3 J+
Iron	15400 J	20600	20500	12100	9230	15500	17000	17100	14500	9890	15600	12700	17100	16500
Lead	11.3	13.6 J+	14 J+	7.6 J+	5.5 J+	11.7 J+	19.4 J+	17.2 J+	16.3 J	8.1	13.2	9.5	11.6	13.3
Magnesium	12300	7260	6520	11800	8920	13400	13400	15900	7640	11800	8300	9980	7920	10200
Manganese	341	481	478	400 J	188 J	363	303	340	323	284	721	375	351	1050 J
Mercury	0.019	0.014 J	0.013 J	0.012 J	0.011 U	0.02	0.014 J	0.012 J	0.016 J	0.055	0.023	0.016 J	0.01 J	0.027
Nickel	18.5	13.6 J	13.3 J	12.4 J	11 J	24.9 J	463 J	217 J	60	7.8	17.1	11.8	14.2	11.8
Potassium	888	1170	1220	658	665	764	6760	6690	741 J	464	1090	710	1230	783
Selenium	0.3 U	0.34 U	0.34 U	0.29 U	0.31 U	0.38 J	0.75 J	0.33 J	0.37 J	0.47 U	0.34 U	0.27 U	0.31 U	0.3 U
Silver	0.64 U	0.73 U	0.73 U	0.62 U	0.65 U	0.64 U	0.64 U	0.63 U	0.65 U	0.91 U	0.73 U	0.58 U	0.66 U	0.64 U
Sodium	71.4 J	166	195	38.3 J	405 J	45.6 J	49200 J	26600 J	116	80.6 J	42.6 J	29.4 U	37.3 J	47.7 J
Thallium	0.13 U	0.17 J	0.17 J	0.13 U	0.13 U	0.13 U	0.14 J	0.17 J	0.13 U	0.19 U	0.15 U	0.12 U	0.13 U	0.13 U
Vanadium	11	26.2	26.9	7.4	8.6	10.8	169 J	84.5 J	19.5	4.6	13.1	7.3	15.4	13.1
Zinc	43.8	67	69.7	36.9	27.7	66.6	62.1	61.2	51	41.3	71.2	40.7	60.9	62.8
PESTICIDES (mg/kg)														
Aldrin	--	--	--	--	--	--	--	--	--	0.00099 UJ	--	--	--	--
Alpha Bhc (Alpha Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	0.00074 UJ	--	--	--	--
Alpha Endosulfan	--	--	--	--	--	--	--	--	--	0.0011 UJ	--	--	--	--
Beta Bhc (Beta Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	0.00079 UJ	--	--	--	--
Beta Endosulfan	--	--	--	--	--	--	--	--	--	0.0013 UJ	--	--	--	--
cis-Chlordane	--	--	--	--	--	--	--	--	--	0.0013 UJ	--	--	--	--
Delta BHC (Delta Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	0.00089 UJ	--	--	--	--
Dieldrin	--	--	--	--	--	--	--	--	--	0.0011 UJ	--	--	--	--
Endosulfan Sulfate	--	--	--	--	--	--	--	--	--	0.00095 UJ	--	--	--	--
Endrin	--	--	--	--	--	--	--	--	--	0.001 UJ	--	--	--	--
Endrin Aldehyde	--	--	--	--	--	--	--	--	--	0.001 UJ	--	--	--	--
Endrin Ketone	--	--	--	--	--	--	--	--	--	0.0011 UJ	--	--	--	--
Gamma Bhc (Lindane)	--	--	--	--	--	--	--	--	--	0.00073 UJ	--	--	--	--
Heptachlor	--	--	--	--	--	--	--	--	--	0.001 UJ	--	--	--	--
Heptachlor Epoxide	--	--	--	--	--	--	--	--	--	0.0016 UJ	--	--	--	--
Methoxychlor	--	--	--	--	--	--	--	--	--	0.0017 UJ	--	--	--	--
P,P'-DDD	--	--	--	--	--	--	--	--	--	0.0011 UJ	--	--	--	--
P,P'-DDE	--	--	--	--	--	--	--	--	--	0.0012 UJ	--	--	--	--
P,P'-DDT	--	--	--	--	--	--	--	--	--	0.00084 UJ	--	--	--	--
Toxaphene	--	--	--	--	--	--	--	--	--	0.024 UJ	--	--	--	--
trans-Chlordane	--	--	--	--	--	--	--	--	--	0.0018 UJ	--	--	--	--
POLYCHLORINATED BIPHENYLS (mg/kg)														
PCB-1016 (Aroclor 1016)	--	--	--	--	--	--	--	--	--	0.011 U	--	--	--	--
PCB-1221 (Aroclor 1221)	--	--	--	--	--	--	--	--	--	0.011 U	--	--	--	--
PCB-1232 (Aroclor 1232)	--	--	--	--	--	--	--	--	--	0.011 U	--	--	--	--
PCB-1242 (Aroclor 1242)	--	--	--	--	--	--	--	--	--	0.011 U	--	--	--	--
PCB-1248 (Aroclor 1248)	--	--	--	--	--	--	--	--	--	0.011 U	--	--	--	--

Table E-12
Summary of Data Used in Risk Assessment
Industrial Landfill Area Soil (0-0.5 ft-bgs) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFLP-001	CFLP-002	CFLP-002-DUP	CFLP-003	CFLP-003-DUP	CFLP-004	CFLP-005	CFLP-005-DUP	CFLP-006	CFMW-003A	CFMW-066	CFSB-191	CFSB-192	CFSB-194
Sample Lab IDs	180-77488-33, 200-43353-7, 460-155568-11	180-77488-35, 200-43353-9, 460-155568-13	180-77488-41, 460-155568-19	180-77488-37, 200-43353-11, 460-155568-15	180-77488-42, 460-155568-20	180-77488-29, 200-43353-3, 460-155568-7	180-77488-39, 200-43353-13, 460-155568-17	180-77488-43, 460-155568-21	180-77488-31, 200-43353-5, 460-155568-9	460-114793-37	180-77393-1, 460-155265-1	180-79204-23, 460-159044-29	180-79204-21, 460-159044-27	180-79434-23, 460-159377-22
Sample Name	CFLP-001-SO-0-0.5	CFLP-002-SO-0-0.5	CFLP-DUP30-SO	CFLP-003-SO-0-0.5	CFLP-DUP31-SO	CFLP-004-SO-0-0.5	CFLP-005-SO-0-0.5	CFLP-DUP32-SO	CFLP-006-SO-0-0.5	CFMW-003a-SO-0-0.5	CFMW-066-SO-0-0.5	CFSB-191-SO-0-0.5	CFSB-192-SO-0-0.5	CFSB-194-SO-0-0.5
Sample Depth	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft
Chemical	5/5/2018	5/5/2018	5/5/2018	5/5/2018	5/5/2018	5/5/2018	5/5/2018	5/5/2018	5/5/2018	5/31/2016	4/30/2018	6/22/2018	6/22/2018	6/27/2018
PCB-1254 (Aroclor 1254)	--	--	--	--	--	--	--	--	--	0.011 U	--	--	--	--
PCB-1260 (Aroclor 1260)	--	--	--	--	--	--	--	--	--	0.011 U	--	--	--	--
PCB-1262 (Aroclor 1262)	--	--	--	--	--	--	--	--	--	0.011 U	--	--	--	--
PCB-1268 (Aroclor 1268)	--	--	--	--	--	--	--	--	--	0.011 U	--	--	--	--
Polychlorinated Biphenyl (PCBs)	--	--	--	--	--	--	--	--	--	0.011 U	--	--	--	--
SEMIVOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,2,4,5-Tetrachlorobenzene	0.0077 U	0.0069 U	0.0086 U	0.0015 U	0.0015 U	0.003 U	0.064 U	0.15 U	0.076 U	0.03 UJ	0.0016 U	0.003 U	0.0016 U	0.0016 U
1,4-Dioxane (P-Dioxane)	0.056 U	0.05 U	0.062 U	0.011 U	0.011 U	0.022 U	0.46 U	1.1 U	0.55 U	0.11 UJ	0.011 U	0.022 U	0.012 U	0.012 U
2,3,4,6-Tetrachlorophenol	0.075 U	0.066 U	0.083 U	0.015 U	0.015 U	0.029 U	0.61 U	1.5 U	0.74 U	0.038 UJ	0.015 U	0.029 U	0.015 U	0.016 U
2,4,5-Trichlorophenol	0.013 U	0.011 U	0.014 U	0.0025 U	0.0025 U	0.005 U	0.1 U	0.25 U	0.13 U	0.04 UJ	0.0026 U	0.005 U	0.0027 U	0.0027 U
2,4,6-Trichlorophenol	0.0098 U	0.0087 U	0.011 U	0.0019 U	0.002 U	0.0038 U	0.081 U	0.2 U	0.097 U	0.011 UJ	0.002 U	0.0039 U	0.002 U	0.0021 U
2,4-Dichlorophenol	0.014 U	0.012 U	0.015 U	0.0027 U	0.0028 U	0.0054 U	0.11 U	0.27 U	0.14 U	0.0095 UJ	0.0028 U	0.0054 U	0.0029 U	0.0029 U
2,4-Dimethylphenol	0.011 U	0.0099 U	0.012 U	0.0022 U	0.0022 U	0.0043 U	0.091 U	0.22 U	0.11 U	0.088 UJ	0.0023 U	0.0044 U	0.0023 U	0.0023 U
2,4-Dinitrophenol	0.48 UJ	0.43 UJ	0.53 UJ	0.094 UJ	0.096 UJ	0.19 UJ	4 UJ	9.6 UJ	4.8 U	0.3 UJ	0.098 U	0.19 U	0.1 U	0.1 U
2,4-Dinitrotoluene	0.0089 U	0.0079 U	0.0099 U	0.0017 U	0.0018 U	0.0035 U	0.073 U	0.18 U	0.088 U	0.016 UJ	0.0018 U	0.0035 U	0.0019 U	0.0019 U
2,6-Dinitrotoluene	0.011 U	0.0098 U	0.012 U	0.0022 U	0.0022 U	0.0043 U	0.091 U	0.22 U	0.11 U	0.021 UJ	0.0023 U	0.0043 U	0.0023 U	0.0023 U
2-Chloronaphthalene	0.0082 U	0.0073 U	0.0091 U	0.0016 U	0.0016 U	0.0032 U	0.067 U	0.16 U	0.081 U	0.0091 UJ	0.0017 U	0.0032 U	0.0017 U	0.0017 U
2-Chlorophenol	0.0083 U	0.0074 U	0.0092 U	0.0016 U	0.0017 U	0.0032 U	0.068 U	0.17 U	0.082 U	0.01 UJ	0.0017 U	0.0033 U	0.0017 U	0.0018 U
2-Methylnaphthalene	0.013 J	0.0076 U	0.0095 U	0.0017 UJ	0.0076 J	0.0055 J	0.11 J	0.23 J	0.41	0.0089 UJ	0.0018 U	0.0034 U	0.0018 U	0.0018 U
2-Methylphenol (O-Cresol)	0.051 U	0.046 U	0.057 U	0.01 U	0.01 U	0.02 U	0.42 U	1 U	0.51 U	0.018 UJ	0.01 U	0.02 U	0.011 U	0.011 U
2-Nitroaniline	0.081 U	0.073 U	0.09 U	0.016 U	0.016 U	0.032 U	0.67 U	1.6 U	0.81 U	0.013 UJ	0.017 U	0.032 U	0.017 U	0.017 U
2-Nitrophenol	0.01 U	0.0091 U	0.011 U	0.002 U	0.002 U	0.004 U	0.084 U	0.2 U	0.1 U	0.014 UJ	0.0021 U	0.004 U	0.0021 U	0.0022 U
3- And 4- Methylphenol (Total)	--	--	--	--	--	--	--	--	--	0.011 UJ	--	--	--	--
3,3'-Dichlorobenzidine	0.17 U	0.15 U	0.18 U	0.033 U	0.033 U	0.065 U	1.4 U	3.3 U	1.6 U	0.045 UJ	0.034 U	0.066 U	0.035 U	0.035 U
3-Nitroaniline	0.045 U	0.04 U	0.05 U	0.0089 U	0.0091 U	0.018 U	0.37 U	0.9 U	0.45 U	0.012 UJ	0.0093 U	0.018 U	0.0095 U	0.0096 U
4,6-Dinitro-2-Methylphenol	0.31 U	0.27 U	0.34 UJ	0.06 U	0.062 U	0.12 UJ	2.5 U	6.1 U	3 U	0.11 UJ	0.063 U	0.12 U	0.064 U	0.065 U
4-Bromophenyl Phenyl Ether	0.012 U	0.011 U	0.014 U	0.0024 U	0.0025 U	0.0049 U	0.1 U	0.25 U	0.12 U	0.013 UJ	0.0026 U	0.0049 U	0.0026 U	0.0026 U
4-Chloro-3-Methylphenol	0.0084 U	0.0075 U	0.0093 U	0.0016 U	0.0017 U	0.0033 U	0.069 U	0.17 U	0.083 U	0.017 UJ	0.0017 U	0.0033 U	0.0017 U	0.0018 U
4-Chloroaniline	0.006 U	0.0053 U	0.0066 U	0.0012 U	0.0012 U	0.0023 UJ	0.049 U	0.12 U	0.059 U	0.01 UJ	0.0012 U	0.0023 U	0.0012 U	0.0013 U
4-Chlorophenyl Phenyl Ether	0.011 U	0.0096 U	0.012 U	0.0021 U	0.0022 U	0.0042 U	0.089 U	0.22 U	0.11 U	0.012 UJ	0.0022 U	0.0043 U	0.0023 U	0.0023 U
4-Nitroaniline	0.0087 U	0.0077 U	0.0096 U	0.0017 U	0.0017 U	0.0034 U	0.071 U	0.17 U	0.086 U	0.015 UJ	0.0018 U	0.0034 U	0.0018 U	0.0018 U
4-Nitrophenol	0.13 U	0.11 U	0.14 U	0.024 U	0.025 U	0.049 U	1 U	2.5 U	1.2 U	0.19 UJ	0.026 U	0.049 U	0.026 U	0.027 U
Acenaphthene	0.053	0.061	0.048	0.0093 J	0.037 J	0.044	2.2 J	5.5 J	3.4	0.0097 UJ	0.0044 J	0.0063 J	0.0032 J	0.0022 U
Acenaphthylene	0.0078 U	0.007 U	0.0087 U	0.0015 U	0.0018 J	0.0031 U	0.064 U	0.16 U	0.077 U	0.01 UJ	0.0016 U	0.0031 U	0.0016 U	0.0017 U
Acetophenone	0.0097 U	0.0086 U	0.011 U	0.0019 U	0.002 J	0.0038 U	0.08 U	0.19 U	0.096 U	0.0088 UJ	0.002 U	0.0038 U	0.002 U	0.0021 U
Anthracene	0.1	0.18	0.12	0.018 J	0.036 J	0.086	2 J	4.5 J	6.4	0.038 UJ	0.0082	0.012 J	0.0047 J	0.002 U
Atrazine	0.078 U	0.07 U	0.087 U	0.015 U	0.016 U	0.031 U	0.64 U	1.6 U	0.77 U	0.018 UJ	0.016 U	0.031 UJ	0.016 UJ	0.017 UJ
Benzaldehyde	0.022 UR	0.02 UR	0.025 UR	0.0043 UR	0.0044 UR	0.0087 UR	0.18 UR	0.44 UR	0.22 UR	0.031 UJ	0.0045 UR	0.0087 UR	0.0046 UR	0.0047 U
Benzo(A)Anthracene	0.95	1.3	0.82	0.15 J	0.41 J	0.51 J	19 J	42 J	43	0.034 UJ	0.061	0.1	0.024	0.0069 J
Benzo(A)Pyrene	1.2	1.6	1	0.17 J	0.5 J	0.69 J	23 J	48 J	53	0.032 J-	0.085	0.15	0.032	0.0065 J
Benzo(B)Fluoranthene	1.3	1.7	1.1	0.27 J	0.75 J	0.83 J	24 J	53 J	60	0.044 J-	0.13	0.22	0.043	0.014
Benzo(G,H,I)Perylene	1.7	1.4	0.91	0.22 J	0.56 J	0.61 J	22 J	52 J	43	0.033 J-	0.084	0.15	0.03	0.0091
Benzo(K)Fluoranthene	0.47	0.76	0.52	0.11 J	0.34 J	0.37 J	12 J	21 J	24	0.018 UJ	0.035	0.082	0.018	0.005 J
Benzyl Butyl Phthalate	0.12 U	0.11 U	0.14 U	0.024 U	0.025 U	0.048 U	1 U	2.4 U	1.2 U	0.012 UJ	0.025 U	0.048 U	0.026 U	0.026 U
Biphenyl (Diphenyl)	0.0075 U	0.0067 U	0.0083 U	0.0015 UJ	0.003 J	0.0029 U	0.062 U	0.15 U	0.11 J	0.034 UJ	0.0015 U	0.0029 U	0.0016 U	0.0016 U
Bis(2-Chloroethoxy) Methane	0.0085 U	0.0076 U	0.0095 U	0.0017 U	0.0017 U	0.0033 U	0.07 U	0.17 U	0.084 U	0.013 UJ	0.0017 U	0.0033 U	0.0018 U	0.0018 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.0065 U	0.0058 U	0.0072 U	0.0013 U	0.0013 U	0.0025 U	0.053 U	0.13 U	0.064 U	0.0095 UJ	0.0013 U	0.0025 U	0.0013 U	0.0014 U
Bis(2-Chloroisopropyl) Ether	0.013 U	0.012 U	0.015 U	0.0026 U	0.0026 U	0.0052 U	0.11 U	0.26 U	0.13 U	0.017 UJ	0.0027 U	0.0052 U	0.0028 U	0.0028 U
Bis(2-Ethylhexyl) Phthalate	0.19 U	0.17 U	0.21 U	0.037 U	0.038 U	0.074 U	1.6 U	3.8 U	1.9 U	0.064 J	0.039 U	0.075 U	0.04 U	0.04 U
Caprolactam	0.12 U	0.1 U	0.13 U	0.023 U	0.023 U	0.045 UJ	0.96 U	2.3 U	1.2 U	0.029 UJ	0.024 U	0.046 U	0.024 U	0.025 U
Carbazole	0.11	0.14	0.099	0.014 J	0.041 J	0.078	1.7 J	4 J	7.1	0.01 UJ	0.012	0.015	0.0044 J	0.0018 U
Chrysene	1.3	1.5	0.92	0.19 J	0.55 J	0.63 J	21 J	48 J	51	0.035 J-	0.088	0.14	0.035	0.009
Dibenz(A,H)Anthracene	0.31	0.3	0.23	0.049 J	0.15 J	0.15 J+	4.6 J	10 J	11	0.021 UJ	0.018	0.031	0.0078	0.0017 U
Dibenzofuran	0.019 J	0.013 J	0.016 J	0.0019 J	0.011 J	0.02 J	0.26 J	0.6 J	1.3 J	0.012 UJ	0.0016 J	0.0031 U	0.0016 U	0.0017 U
Diethyl Phthalate	0.054 U	0.048 U	0.059 U	0.01 U	0.011 U	0.021 U	0.44 U	1.1 U	0.53 U	0.011 UJ	0.011 U	0.021 U	0.011 U	0.011 U
Dimethyl Phthalate	0.0065 U	0.0058 U	0.0072 U	0.0013 U	0.0013 U	0.0025 U	0.053 U	0.13 U	0.064 U	0.012 UJ	0.0013 U	0.0025 U	0.0013 U	0.0014 U
Di-N-Butyl Phthalate	0.078 U	0.07 U	0.087 U	0.015 U	0.016 U	0.031 U	0.64 U	1.6 U	0.77 U	0.012 UJ	0.016 U	0.031 U	0.016 U	0.017 U
Di-N-Octylphthalate	0.1 U	0.093 U	0.12 U	0.02 U	0.021 U	0.041 U	0.86 U	2.1 U	1 U	0.02 UJ	0.021 U	0.041 U	0.022 U	0.022 U

Table E-12
Summary of Data Used in Risk Assessment
Industrial Landfill Area Soil (0-0.5 ft-bgs) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFLP-001	CFLP-002	CFLP-002-DUP	CFLP-003	CFLP-003-DUP	CFLP-004	CFLP-005	CFLP-005-DUP	CFLP-006	CFMW-003A	CFMW-066	CFSB-191	CFSB-192	CFSB-194
Sample Lab IDs	180-77488-33, 200-43353-7, 460-155568-11	180-77488-35, 200-43353-9, 460-155568-13	180-77488-41, 460-155568-19	180-77488-37, 200-43353-11, 460-155568-15	180-77488-42, 460-155568-20	180-77488-29, 200-43353-3, 460-155568-7	180-77488-39, 200-43353-13, 460-155568-17	180-77488-43, 460-155568-21	180-77488-31, 200-43353-5, 460-155568-9	460-114793-37	180-77393-1, 460-155265-1	180-79204-23, 460-159044-29	180-79204-21, 460-159044-27	180-79434-23, 460-159377-22
Sample Name	CFLP-001-SO-0-0.5	CFLP-002-SO-0-0.5	CFLP-DUP30-SO	CFLP-003-SO-0-0.5	CFLP-DUP31-SO	CFLP-004-SO-0-0.5	CFLP-005-SO-0-0.5	CFLP-DUP32-SO	CFLP-006-SO-0-0.5	CFMW-003a-SO-0-0.5	CFMW-066-SO-0-0.5	CFSB-191-SO-0-0.5	CFSB-192-SO-0-0.5	CFSB-194-SO-0-0.5
Sample Depth	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft
Chemical	5/5/2018	5/5/2018	5/5/2018	5/5/2018	5/5/2018	5/5/2018	5/5/2018	5/5/2018	5/5/2018	5/31/2016	4/30/2018	6/22/2018	6/22/2018	6/27/2018
Fluoranthene	1.1	1.9	1.3	0.19 J	0.69 J	0.92 J	26 J	61 J	71	0.033 J-	0.11	0.18	0.045	0.012
Fluorene	0.029 J	0.03 J	0.032 J	0.0034 J	0.01 J	0.031	0.55 J	1.4 J	2.7	0.0088 UJ	0.0032 J	0.0035 J	0.0018 J	0.0015 U
Hexachlorobenzene	0.013 U	0.011 U	0.014 U	0.0025 U	0.0026 U	0.005 U	0.11 U	0.25 U	0.13 U	0.016 UJ	0.0026 U	0.005 U	0.0027 U	0.0027 U
Hexachlorobutadiene	0.01 U	0.0093 U	0.012 U	0.002 U	0.0021 U	0.0041 U	0.086 U	0.21 U	0.1 U	0.011 UJ	0.0021 U	0.0041 UJ	0.0022 UJ	0.0022 U
Hexachlorocyclopentadiene	0.0091 U	0.0081 U	0.01 U	0.0018 U	0.0018 U	0.0036 U	0.075 U	0.18 U	0.09 U	0.025 UJ	0.0019 U	0.0036 UJ	0.0019 UJ	0.0019 U
Hexachloroethane	0.0092 U	0.0082 U	0.01 U	0.0018 U	0.0018 U	0.0036 U	0.076 U	0.18 U	0.091 U	0.015 UJ	0.0019 U	0.0036 U	0.0019 U	0.002 U
Indeno(1,2,3-C,D)Pyrene	0.84	1.1	0.77	0.16 J	0.43 J	0.49 J	16 J	40 J	36	0.027 UJ	0.066	0.12	0.023	0.007 J
Isophorone	0.0091 U	0.0081 U	0.01 U	0.0018 U	0.0021 J	0.0036 U	0.075 U	0.18 U	0.09 U	0.0086 UJ	0.0019 U	0.0036 U	0.0019 U	0.0019 U
Naphthalene	0.026 J	0.0077 J	0.017 J	0.0014 UJ	0.0059 J	0.031	0.11 J	0.26 J	1.8	0.01 UJ	0.0015 J	0.0032 J	0.002 J	0.0015 U
Nitrobenzene	0.065 U	0.058 U	0.073 U	0.013 U	0.013 U	0.026 U	0.54 U	1.3 U	0.65 U	0.013 UJ	0.013 U	0.026 U	0.014 U	0.014 U
N-Nitrosodi-N-Propylamine	0.012 U	0.011 U	0.013 U	0.0024 U	0.0024 U	0.0047 U	0.1 U	0.24 U	0.12 U	0.014 UJ	0.0025 U	0.0048 U	0.0025 U	0.0026 U
N-Nitrosodiphenylamine	0.06 U	0.053 U	0.066 U	0.012 U	0.012 U	0.023 U	0.49 U	1.2 U	0.59 U	0.037 UJ	0.012 U	0.023 U	0.012 U	0.013 U
Pentachlorophenol	0.29 U	0.26 U	0.32 U	0.056 U	0.057 U	0.11 U	2.4 U	5.7 U	2.8 U	0.049 UJ	0.059 U	0.11 U	0.06 U	0.061 U
Phenanthrene	0.56	0.69	0.52	0.067 J	0.22 J	0.43 J	8.1 J	19 J	40	0.018 J-	0.05	0.072	0.024	0.0056 J
Phenol	0.054 U	0.048 U	0.06 U	0.011 U	0.011 U	0.021 U	0.45 U	1.1 U	0.54 U	0.013 UJ	0.011 U	0.021 U	0.011 U	0.011 U
Pyrene	1.3	1.9	1.2	0.19 J	0.57 J	0.83 J+	25 J	50 J	67	0.042 J-	0.11	0.16	0.039	0.011

J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-12
Summary of Data Used in Risk Assessment
Industrial Landfill Area Soil (0-0.5 ft-bgs) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-195	CFSB-250	CFSB-252	CFSB-253
Sample Lab IDs	180-79434-8, 460-159377-8	180-77393-35, 460-155265-37	180-77393-26, 460-155265-28	180-77393-29, 460-155265-31
Sample Name	CFSB-195-SO-0-0.5	CFSB-250-SO-0-0.5	CFSB-252-SO-0-0.5	CFSB-253-SO-0-0.5
Sample Depth	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft
Chemical	6/27/2018	5/1/2018	5/1/2018	5/1/2018
GENERAL CHEMISTRY (mg/kg)				
Fluoride	6.48 J-	8.3 J-	2.86	10.9
Cyanide	0.42 J+	0.072 U	0.075 U	0.069 U
METALS (mg/kg)				
"Chromium, Hexavalent - Estimated"	0.278345	0.246229	0.321168	0.302433
"Chromium, Trivalent - Estimated"	10.1217	8.95377	11.6788	10.9976
Aluminum	13000	11200	15800 J	16500 J
Antimony	0.3 UJ	0.26 U	0.34 UJ	0.35 UJ
Arsenic	6.2	4.6	5.5 J	8 J
Barium	436	93.9	148	197
Beryllium	0.49	0.32 J	0.55	0.53
Cadmium	0.39 J	0.3 U	0.39 U	0.4 U
Calcium	5070	1120	3080 J+	2730 J+
Chromium, Total	10.4	9.2	12	11.3
Cobalt	5.9	5.5	5.5	6
Copper	7.5	9.5	12.2 J	13.2 J
Iron	16500	14600	18000	18000
Lead	14.8	12.9	12.1 J+	13.8 J+
Magnesium	9620	8810	10400 J	11400 J
Manganese	2620	400	464 J	705 J
Mercury	0.042 J-	0.011 U	0.02	0.024
Nickel	17.7	12.2	13.2	15.2
Potassium	970	791	1200 J+	993 J+
Selenium	0.29 U	0.26 U	0.34 U	0.34 U
Silver	0.62 U	0.55 U	0.72 U	0.73 U
Sodium	36.8 J	28 U	36.3 U	37.1 U
Thallium	0.13 U	0.11 U	0.14 U	0.15 U
Vanadium	12.2	9.5	12.9 J+	14.4 J+
Zinc	89.1	46	53.5	55.7
PESTICIDES (mg/kg)				
Aldrin	--	--	--	--
Alpha Bhc (Alpha Hexachlorocyclohexane)	--	--	--	--
Alpha Endosulfan	--	--	--	--
Beta Bhc (Beta Hexachlorocyclohexane)	--	--	--	--
Beta Endosulfan	--	--	--	--
cis-Chlordane	--	--	--	--
Delta BHC (Delta Hexachlorocyclohexane)	--	--	--	--
Dieldrin	--	--	--	--
Endosulfan Sulfate	--	--	--	--
Endrin	--	--	--	--
Endrin Aldehyde	--	--	--	--
Endrin Ketone	--	--	--	--
Gamma Bhc (Lindane)	--	--	--	--
Heptachlor	--	--	--	--
Heptachlor Epoxide	--	--	--	--
Methoxychlor	--	--	--	--
P,P'-DDD	--	--	--	--
P,P'-DDE	--	--	--	--
P,P'-DDT	--	--	--	--
Toxaphene	--	--	--	--
trans-Chlordane	--	--	--	--
POLYCHLORINATED BIPHENYLS (mg/kg)				
PCB-1016 (Aroclor 1016)	--	--	--	--
PCB-1221 (Aroclor 1221)	--	--	--	--
PCB-1232 (Aroclor 1232)	--	--	--	--
PCB-1242 (Aroclor 1242)	--	--	--	--
PCB-1248 (Aroclor 1248)	--	--	--	--

Table E-12
Summary of Data Used in Risk Assessment
Industrial Landfill Area Soil (0-0.5 ft-bgs) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-195	CFSB-250	CFSB-252	CFSB-253
Sample Lab IDs	180-79434-8, 460-159377-8	180-77393-35, 460-155265-37	180-77393-26, 460-155265-28	180-77393-29, 460-155265-31
Sample Name	CFSB-195-SO-0-0.5	CFSB-250-SO-0-0.5	CFSB-252-SO-0-0.5	CFSB-253-SO-0-0.5
Sample Depth	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft
Chemical	6/27/2018	5/1/2018	5/1/2018	5/1/2018
PCB-1254 (Aroclor 1254)	--	--	--	--
PCB-1260 (Aroclor 1260)	--	--	--	--
PCB-1262 (Aroclor 1262)	--	--	--	--
PCB-1268 (Aroclor 1268)	--	--	--	--
Polychlorinated Biphenyl (PCBs)	--	--	--	--
SEMIVOLATILE ORGANIC COMPOUNDS (mg/kg)				
1,2,4,5-Tetrachlorobenzene	0.0035 U	0.005 U	0.0016 U	0.0017 U
1,4-Dioxane (P-Dioxane)	0.025 U	0.036 U	0.012 U	0.012 U
2,3,4,6-Tetrachlorophenol	0.034 U	0.048 U	0.016 U	0.016 U
2,4,5-Trichlorophenol	0.0057 U	0.0083 U	0.0027 U	0.0028 U
2,4,6-Trichlorophenol	0.0044 U	0.0064 U	0.002 U	0.0021 U
2,4-Dichlorophenol	0.0062 U	0.0089 U	0.0029 U	0.003 U
2,4-Dimethylphenol	0.005 U	0.0072 U	0.0023 U	0.0024 U
2,4-Dinitrophenol	0.22 U	0.31 UJ	0.1 UJ	0.1 UJ
2,4-Dinitrotoluene	0.004 U	0.0058 U	0.0019 U	0.0019 U
2,6-Dinitrotoluene	0.005 U	0.0072 U	0.0023 U	0.0024 U
2-Chloronaphthalene	0.0037 U	0.0053 U	0.0017 U	0.0018 U
2-Chlorophenol	0.0037 U	0.0054 U	0.0017 U	0.0018 U
2-Methylnaphthalene	0.0039 U	0.0056 U	0.0018 U	0.0019 U
2-Methylphenol (O-Cresol)	0.023 U	0.033 U	0.011 U	0.011 U
2-Nitroaniline	0.037 U	0.053 U	0.017 U	0.018 U
2-Nitrophenol	0.0046 U	0.0066 U	0.0021 U	0.0022 U
3- And 4- Methylphenol (Total)	--	--	--	--
3,3'-Dichlorobenzidine	0.075 U	0.11 U	0.035 UJ	0.036 U
3-Nitroaniline	0.02 U	0.029 U	0.0095 U	0.0099 U
4,6-Dinitro-2-Methylphenol	0.14 U	0.2 UJ	0.064 UJ	0.067 UJ
4-Bromophenyl Phenyl Ether	0.0056 U	0.0081 U	0.0026 U	0.0027 U
4-Chloro-3-Methylphenol	0.0038 U	0.0055 U	0.0018 U	0.0018 U
4-Chloroaniline	0.0027 U	0.0039 U	0.0012 U	0.0013 U
4-Chlorophenyl Phenyl Ether	0.0049 U	0.007 U	0.0023 U	0.0023 U
4-Nitroaniline	0.0039 U	0.0056 U	0.0018 U	0.0019 U
4-Nitrophenol	0.056 U	0.081 U	0.026 U	0.027 U
Acenaphthene	0.015 J	0.024	0.0022 J	0.0031 J
Acenaphthylene	0.0035 U	0.0051 U	0.0016 U	0.0017 U
Acetophenone	0.0057 J	0.0063 U	0.0022 J	0.0021 U
Anthracene	0.03	0.046	0.0041 J	0.0051 J
Atrazine	0.035 U	0.051 U	0.016 U	0.017 U
Benzaldehyde	0.014 J	0.015 J-	0.0052 J-	0.0048 UR
Benzo(A)Anthracene	0.17	0.4	0.035	0.036
Benzo(A)Pyrene	0.24	0.47	0.045	0.046
Benzo(B)Fluoranthene	0.36	0.9	0.061	0.076
Benzo(G,H,I)Perylene	0.22	0.53	0.046	0.046
Benzo(K)Fluoranthene	0.09	0.22	0.03	0.017
Benzyl Butyl Phthalate	0.055 U	0.08 U	0.026 U	0.027 U
Biphenyl (Diphenyl)	0.0034 U	0.0049 U	0.0016 U	0.0016 U
Bis(2-Chloroethoxy) Methane	0.0038 U	0.0055 U	0.0018 U	0.0018 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.0029 U	0.0042 U	0.0014 U	0.0014 U
Bis(2-Chloroisopropyl) Ether	0.006 U	0.0086 U	0.0028 U	0.0029 U
Bis(2-Ethylhexyl) Phthalate	0.086 U	0.12 U	0.093 J+	0.06 J+
Caprolactam	0.052 U	0.075 U	0.024 U	0.025 U
Carbazole	0.033	0.048	0.0056 J	0.0058 J
Chrysene	0.29	0.59	0.06	0.053
Dibenz(A,H)Anthracene	0.052	0.12	0.012	0.012
Dibenzofuran	0.011 J	0.0073 J	0.0016 U	0.0017 U
Diethyl Phthalate	0.024 U	0.035 U	0.011 U	0.012 U
Dimethyl Phthalate	0.0029 U	0.0042 U	0.0014 U	0.0014 U
Di-N-Butyl Phthalate	0.035 U	0.051 U	0.016 U	0.017 U
Di-N-Octylphthalate	0.047 U	0.067 U	0.022 U	0.023 U

Table E-12
Summary of Data Used in Risk Assessment
Industrial Landfill Area Soil (0-0.5 ft-bgs) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-195	CFSB-250	CFSB-252	CFSB-253
Sample Lab IDs	180-79434-8, 460-159377-8	180-77393-35, 460-155265-37	180-77393-26, 460-155265-28	180-77393-29, 460-155265-31
Sample Name	CFSB-195-SO-0-0.5	CFSB-250-SO-0-0.5	CFSB-252-SO-0-0.5	CFSB-253-SO-0-0.5
Sample Depth	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft
Chemical	6/27/2018	5/1/2018	5/1/2018	5/1/2018
Fluoranthene	0.3	0.55	0.065	0.062
Fluorene	0.015 J	0.016 J	0.0018 J	0.0019 J
Hexachlorobenzene	0.0058 U	0.0083 U	0.0027 U	0.0028 U
Hexachlorobutadiene	0.0047 U	0.0068 U	0.0022 U	0.0023 U
Hexachlorocyclopentadiene	0.0041 U	0.0059 U	0.0019 U	0.002 U
Hexachloroethane	0.0042 U	0.006 U	0.0019 U	0.002 U
Indeno(1,2,3-C,D)Pyrene	0.18	0.4	0.036	0.036
Isophorone	0.0041 U	0.0059 U	0.0019 U	0.002 U
Naphthalene	0.0068 J	0.012 J	0.0015 U	0.0015 U
Nitrobenzene	0.029 U	0.042 U	0.014 U	0.014 U
N-Nitrosodi-N-Propylamine	0.0055 U	0.0079 U	0.0025 U	0.0026 U
N-Nitrosodiphenylamine	0.027 U	0.039 U	0.012 U	0.013 U
Pentachlorophenol	0.13 U	0.19 U	0.06 U	0.062 U
Phenanthrene	0.17	0.21	0.025	0.028
Phenol	0.024 U	0.035 U	0.011 U	0.012 U
Pyrene	0.29	0.51	0.065	0.063

J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-13
Summary of Data Used in Risk Assessment
Industrial Landfill Area Soil (0-2 ft-bgs) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFLP-001	CFLP-001	CFLP-002	CFLP-002-DUP	CFLP-002	CFLP-003	CFLP-003-DUP	CFLP-003	CFLP-004	CFLP-004	CFLP-005	CFLP-005-DUP	CFLP-005	CFLP-006
Sample Lab IDs	180-77488-33, 200-43353-7, 460-155568-11	180-77488-34, 200-43353-8, 460-155568-12	180-77488-35, 200-43353-9, 460-155568-13	180-77488-41, 460-155568-19	180-77488-36, 200-43353-10, 460-155568-14	180-77488-37, 200-43353-11, 460-155568-15	180-77488-42, 460-155568-20	180-77488-38, 200-43353-12, 460-155568-16	180-77488-29, 200-43353-3, 460-155568-7	180-77488-30, 200-43353-4, 460-155568-8	180-77488-39, 200-43353-13, 460-155568-17	180-77488-43, 460-155568-21	180-77488-40, 200-43353-14, 460-155568-18	180-77488-31, 200-43353-5, 460-155568-9
Sample Name	CFLP-001-SO-0-0.5	CFLP-001-SO-0.5-2	CFLP-002-SO-0-0.5	CFLP-DUP30-SO	CFLP-002-SO-0.5-2	CFLP-003-SO-0-0.5	CFLP-DUP31-SO	CFLP-003-SO-0.5-2	CFLP-004-SO-0-0.5	CFLP-004-SO-0.5-2	CFLP-005-SO-0-0.5	CFLP-DUP32-SO	CFLP-005-SO-0.5-2	CFLP-006-SO-0-0.5
Sample Depth	0-0.5 ft	0.5-2 ft	0-0.5 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft
Chemical	5/5/2018	5/5/2018	5/5/2018	5/5/2018	5/5/2018	5/5/2018	5/5/2018	5/5/2018	5/5/2018	5/5/2018	5/5/2018	5/5/2018	5/5/2018	5/5/2018
GENERAL CHEMISTRY (mg/kg)														
Fluoride	12.1 J+	42.6 J+	7.75 J	14.9 J	2.71 J+	26.1 J	277 J	810 J+	4.23 J+	1.37 J+	398 J+	579 J+	442 J+	26 J+
Cyanide	0.068 U	0.14 J+	0.075 U	0.074 U	0.069 U	0.061 U	0.063 U	0.22 J+	0.067 U	0.062 U	0.066 U	0.063 U	0.067 U	0.19 J+
METALS (mg/kg)														
"Chromium, Hexavalent - Estimated"	0.305109	0.355961	0.345255	0.289051	0.337226	0.224818	0.179319	0.259611	0.259611	0.243552	1.04915	0.575426	0.562044	0.388078
"Chromium, Trivalent - Estimated"	11.0949	12.944	12.5547	10.5109	12.2628	8.17518	6.52068	9.44039	9.44039	8.85645	38.1509	20.9246	20.438	14.1119
Aluminum	15100	16400	27800	31300	19400	9660	12200	117000	11000	9030	38900	36100	48200	19800
Antimony	0.3 UJ	0.3 UJ	0.35 UJ	0.35 UJ	0.31 UJ	0.3 UJ	0.31 UJ	0.65 J-	0.34 J-	0.29 UJ	2.8 J	1.4 J	2.9 J-	0.32 J-
Arsenic	5.6	6.5	5.9	6.1	4	4.5	3.2	4.3	7.1	6.2	23.5	14.2	23.2	7.2
Barium	80.2	114	226	275	184	64.2	43.9	49.7	66.3	52.8	227	207	234	73.9 J
Beryllium	0.3 J	0.48	0.82	0.92	0.57	0.3 J	0.63 J	2.2	0.43	0.3 J	7.2 J	4.1 J	7.7	0.52
Cadmium	0.35 U	0.35 U	0.4 U	0.4 U	0.36 U	0.34 U	0.35 U	1.5	0.35 U	0.33 U	0.94 J	0.39 J	0.72 J	0.36 J
Calcium	40100	47500 J	3160 J	6650 J	2880 J	43400 J	50000 J	19200 J	36500 J	52500 J	46700 J	45400 J	31900 J	19800
Chromium, Total	11.4 J	13.3	12.9	10.8	12.6	8.4	6.7	9.7	9.7	9.1	39.2 J	21.5 J	21	14.5
Cobalt	5.2	6.1	7.4	7	7.6	5.1	3.5	3.4	5.5	6.4	16	11.2	15.6	5.2
Copper	15	19.3 J	17.8 J	21 J	11.8 J	11.3 J	8.3 J	16.2 J	22.9 J	15.1 J	54.6 J	27.2 J	776 J	19.3
Iron	15400 J	19300	20600	20500	19400	12100	9230	6400	15500	15200	17000	17100	11700	14500
Lead	11.3	14.1 J+	13.6 J+	14 J+	11.4 J+	7.6 J+	5.5 J+	11.4 J+	11.7 J+	9.3 J+	19.4 J+	17.2 J+	18.8 J+	16.3 J
Magnesium	12300	14100	7260	6520	8510	11800	8920	4950	13400	14100	13400	15900	9980	7640
Manganese	341	505	481	478	606	400 J	188 J	137	363	343	303	340	404	323
Mercury	0.019	0.018	0.014 J	0.013 J	0.011 U	0.012 J	0.011 U	0.012 U	0.02	0.022	0.014 J	0.012 J	0.01 U	0.016 J
Nickel	18.5	23.4 J	13.6 J	13.3 J	12.8 J	12.4 J	11 J	84.1 J	24.9 J	11.7 J	463 J	217 J	513 J	60
Potassium	888	1030	1170	1220	1040	658	665	492	764	621	6760	6690	6690	741 J
Selenium	0.3 U	0.3 U	0.34 U	0.34 U	0.31 U	0.29 U	0.31 U	0.35 U	0.38 J	0.29 U	0.75 J	0.33 J	0.39 J	0.37 J
Silver	0.64 U	0.63 U	0.73 U	0.73 U	0.66 U	0.62 U	0.65 U	0.75 U	0.64 U	0.61 U	0.64 U	0.63 U	0.66 U	0.65 U
Sodium	71.4 J	80.9 J	166	195	112	38.3 J	405 J	10200	45.6 J	31 U	49200 J	26600 J	61300	116
Thallium	0.13 U	0.13 U	0.17 J	0.17 J	0.19 J	0.13 U	0.13 U	0.15 U	0.13 U	0.12 U	0.14 J	0.17 J	0.13 J	0.13 U
Vanadium	11	13.9	26.2	26.9	21.6	7.4	8.6	47.6	10.8	7	169 J	84.5 J	163	19.5
Zinc	43.8	56.7	67	69.7	53.9	36.9	27.7	40.2	66.6	39.5	62.1	61.2	56.9	51
PESTICIDES (mg/kg)														
Aldrin	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Alpha Bhc (Alpha Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Alpha Endosulfan	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Beta Bhc (Beta Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Beta Endosulfan	--	--	--	--	--	--	--	--	--	--	--	--	--	--
cis-Chlordane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Delta BHC (Delta Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dieldrin	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endosulfan Sulfate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin Aldehyde	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin Ketone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Gamma Bhc (Lindane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Heptachlor	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Heptachlor Epoxide	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methoxychlor	--	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDD	--	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDT	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Toxaphene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
trans-Chlordane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
POLYCHLORINATED BIPHENYLS (mg/kg)														
PCB-1016 (Aroclor 1016)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1221 (Aroclor 1221)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1232 (Aroclor 1232)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1242 (Aroclor 1242)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1248 (Aroclor 1248)	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Table E-13
Summary of Data Used in Risk Assessment
Industrial Landfill Area Soil (0-2 ft-bgs) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFLP-001	CFLP-001	CFLP-002	CFLP-002-DUP	CFLP-002	CFLP-003	CFLP-003-DUP	CFLP-003	CFLP-004	CFLP-004	CFLP-005	CFLP-005-DUP	CFLP-005	CFLP-006
Sample Lab IDs	180-77488-33, 200-43353-7, 460-155568-11	180-77488-34, 200-43353-8, 460-155568-12	180-77488-35, 200-43353-9, 460-155568-13	180-77488-41, 460-155568-19	180-77488-36, 200-43353-10, 460-155568-14	180-77488-37, 200-43353-11, 460-155568-15	180-77488-42, 460-155568-20	180-77488-38, 200-43353-12, 460-155568-16	180-77488-29, 200-43353-3, 460-155568-7	180-77488-30, 200-43353-4, 460-155568-8	180-77488-39, 200-43353-13, 460-155568-17	180-77488-43, 460-155568-21	180-77488-40, 200-43353-14, 460-155568-18	180-77488-31, 200-43353-5, 460-155568-9
Sample Name	CFLP-001-SO-0-0.5	CFLP-001-SO-0.5-2	CFLP-002-SO-0-0.5	CFLP-DUP30-SO	CFLP-002-SO-0.5-2	CFLP-003-SO-0-0.5	CFLP-DUP31-SO	CFLP-003-SO-0.5-2	CFLP-004-SO-0-0.5	CFLP-004-SO-0.5-2	CFLP-005-SO-0-0.5	CFLP-DUP32-SO	CFLP-005-SO-0.5-2	CFLP-006-SO-0-0.5
Sample Depth	0-0.5 ft	0.5-2 ft	0-0.5 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft
Chemical	5/5/2018	5/5/2018	5/5/2018	5/5/2018	5/5/2018	5/5/2018	5/5/2018	5/5/2018	5/5/2018	5/5/2018	5/5/2018	5/5/2018	5/5/2018	5/5/2018
PCB-1254 (Aroclor 1254)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1260 (Aroclor 1260)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1262 (Aroclor 1262)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1268 (Aroclor 1268)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Polychlorinated Biphenyl (PCBs)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SEMIVOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,2,4,5-Tetrachlorobenzene	0.0077 U	0.015 U	0.0069 U	0.0086 U	0.0016 U	0.0015 U	0.0015 U	0.044 U	0.003 U	0.0015 U	0.064 U	0.15 U	0.032 U	0.076 U
1,4-Dioxane (P-Dioxane)	0.056 U	0.11 U	0.05 U	0.062 U	0.012 U	0.011 U	0.011 U	0.32 U	0.022 U	0.011 U	0.46 U	1.1 U	0.23 U	0.55 U
2,3,4,6-Tetrachlorophenol	0.075 U	0.15 U	0.066 U	0.083 U	0.016 U	0.015 U	0.015 U	0.43 U	0.029 U	0.014 U	0.61 U	1.5 U	0.31 U	0.74 U
2,4,5-Trichlorophenol	0.013 U	0.025 U	0.011 U	0.014 U	0.0027 U	0.0025 U	0.0025 U	0.073 U	0.005 U	0.0025 U	0.1 U	0.25 U	0.052 U	0.13 U
2,4,6-Trichlorophenol	0.0098 U	0.02 U	0.0087 U	0.011 U	0.0021 U	0.0019 U	0.002 U	0.056 U	0.0038 U	0.0019 U	0.081 U	0.2 U	0.04 U	0.097 U
2,4-Dichlorophenol	0.014 U	0.027 U	0.012 U	0.015 U	0.0029 U	0.0027 U	0.0028 U	0.079 U	0.0054 U	0.0027 U	0.11 U	0.27 U	0.057 U	0.14 U
2,4-Dimethylphenol	0.011 U	0.022 U	0.0099 U	0.012 U	0.0023 U	0.0022 U	0.0022 U	0.064 U	0.0043 U	0.0021 U	0.091 U	0.22 U	0.046 U	0.11 U
2,4-Dinitrophenol	0.48 UJ	0.96 UJ	0.43 UJ	0.53 UJ	0.1 UJ	0.094 UJ	0.096 UJ	2.8 UJ	0.19 UJ	0.093 UJ	4 UJ	9.6 UJ	2 UJ	4.8 U
2,4-Dinitrotoluene	0.0089 U	0.018 U	0.0079 U	0.0099 U	0.0019 U	0.0017 U	0.0018 U	0.051 U	0.0035 U	0.0017 U	0.073 U	0.18 U	0.037 U	0.088 U
2,6-Dinitrotoluene	0.011 U	0.022 U	0.0098 U	0.012 U	0.0023 U	0.0022 U	0.0022 U	0.063 U	0.0043 U	0.0021 U	0.091 U	0.22 U	0.045 U	0.11 U
2-Chloronaphthalene	0.0082 U	0.016 U	0.0073 U	0.0091 U	0.0017 U	0.0016 U	0.0016 U	0.047 U	0.0032 U	0.0016 U	0.067 U	0.16 U	0.034 U	0.081 U
2-Chlorophenol	0.0083 U	0.017 U	0.0074 U	0.0092 U	0.0017 U	0.0016 U	0.0017 U	0.048 U	0.0032 U	0.0016 U	0.068 U	0.17 U	0.034 U	0.082 U
2-Methylnaphthalene	0.013 J	0.05 J	0.0076 U	0.0095 U	0.0018 U	0.0017 UJ	0.0076 J	0.087 J	0.0055 J	0.0017 U	0.11 J	0.23 J	0.054 J	0.41
2-Methylphenol (O-Cresol)	0.051 U	0.1 U	0.046 U	0.057 U	0.011 U	0.01 U	0.01 U	0.29 U	0.02 U	0.0099 U	0.42 U	1 U	0.21 U	0.51 U
2-Nitroaniline	0.081 U	0.16 U	0.073 U	0.09 U	0.017 U	0.016 U	0.016 U	0.47 U	0.032 U	0.016 U	0.67 U	1.6 U	0.33 U	0.81 U
2-Nitrophenol	0.01 U	0.02 U	0.0091 U	0.011 U	0.0021 U	0.002 U	0.002 U	0.059 U	0.004 U	0.002 U	0.084 U	0.2 U	0.042 U	0.1 U
3- And 4- Methylphenol (Total)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3,3'-Dichlorobenzidine	0.17 U	0.33 U	0.15 U	0.18 U	0.035 U	0.033 U	0.033 U	0.96 U	0.065 U	0.032 U	1.4 U	3.3 U	0.68 U	1.6 U
3-Nitroaniline	0.045 U	0.09 U	0.04 U	0.05 U	0.0095 U	0.0089 U	0.0091 U	0.26 U	0.018 U	0.0087 U	0.37 U	0.9 U	0.19 U	0.45 U
4,6-Dinitro-2-Methylphenol	0.31 U	0.61 U	0.27 U	0.34 UJ	0.064 U	0.06 U	0.062 U	1.8 U	0.12 UJ	0.059 U	2.5 U	6.1 U	1.3 U	3 U
4-Bromophenyl Phenyl Ether	0.012 U	0.025 U	0.011 U	0.014 U	0.0026 U	0.0024 U	0.0025 U	0.072 U	0.0049 U	0.0024 U	0.1 U	0.25 U	0.051 U	0.12 U
4-Chloro-3-Methylphenol	0.0084 U	0.017 U	0.0075 U	0.0093 U	0.0018 U	0.0016 U	0.0017 U	0.048 U	0.0033 U	0.0016 U	0.069 U	0.17 U	0.035 U	0.083 U
4-Chloroaniline	0.006 U	0.012 U	0.0053 U	0.0066 U	0.0012 U	0.0012 U	0.0012 U	0.034 U	0.0023 UJ	0.0011 U	0.049 U	0.12 U	0.024 U	0.059 U
4-Chlorophenyl Phenyl Ether	0.011 U	0.022 U	0.0096 U	0.012 U	0.0023 U	0.0021 U	0.0022 U	0.062 U	0.0042 U	0.0021 U	0.089 U	0.22 U	0.044 U	0.11 U
4-Nitroaniline	0.0087 U	0.017 U	0.0077 U	0.0096 U	0.0018 U	0.0017 U	0.0017 U	0.05 U	0.0034 U	0.0017 U	0.071 U	0.17 U	0.036 U	0.086 U
4-Nitrophenol	0.13 U	0.25 U	0.11 U	0.14 U	0.026 U	0.024 U	0.025 U	0.72 U	0.049 U	0.024 U	1 U	2.5 U	0.52 U	1.2 U
Acenaphthene	0.053	0.15	0.061	0.048	0.0092	0.0093 J	0.037 J	0.77	0.044	0.0028 J	2.2 J	5.5 J	1.2	3.4
Acenaphthylene	0.0078 U	0.016 U	0.007 U	0.0087 U	0.0016 U	0.0015 U	0.0018 J	0.045 U	0.0031 U	0.0015 U	0.064 U	0.16 U	0.032 U	0.077 U
Acetophenone	0.0097 U	0.019 U	0.0086 U	0.011 U	0.002 U	0.0019 U	0.002 J	0.056 U	0.0038 U	0.0019 U	0.08 U	0.19 U	0.04 U	0.096 U
Anthracene	0.1	0.31	0.18	0.12	0.028	0.018 J	0.036 J	1.1	0.086	0.0057 J	2 J	4.5 J	1	6.4
Atrazine	0.078 U	0.16 U	0.07 U	0.087 U	0.016 U	0.015 U	0.016 U	0.45 U	0.031 U	0.015 U	0.64 U	1.6 U	0.32 U	0.77 U
Benzaldehyde	0.022 UR	0.044 UR	0.02 UR	0.025 UR	0.0046 UR	0.0043 UR	0.0044 UR	0.13 UR	0.0087 UR	0.0043 UR	0.18 UR	0.44 UR	0.091 UR	0.22 UR
Benzo(A)Anthracene	0.95	2	1.3	0.82	0.19	0.15 J	0.41 J	9.8	0.51 J	0.054	19 J	42 J	9.9	43
Benzo(A)Pyrene	1.2	2.3	1.6	1	0.2	0.17 J	0.5 J	12	0.69 J	0.067	23 J	48 J	13	53
Benzo(B)Fluoranthene	1.3	2.6	1.7	1.1	0.22	0.27 J	0.75 J	15	0.83 J	0.077	24 J	53 J	14	60
Benzo(G,H,I)Perylene	1.7	2.5	1.4	0.91	0.2	0.22 J	0.56 J	17	0.61 J	0.064	22 J	52 J	12	43
Benzo(K)Fluoranthene	0.47	0.98	0.76	0.52	0.11	0.11 J	0.34 J	6.9	0.37 J	0.036	12 J	21 J	6.4	24
Benzyl Butyl Phthalate	0.12 U	0.24 U	0.11 U	0.14 U	0.026 U	0.024 U	0.025 U	0.7 U	0.048 U	0.024 U	1 U	2.4 U	0.5 U	1.2 U
Biphenyl (Diphenyl)	0.0075 U	0.015 U	0.0067 U	0.0083 U	0.0016 U	0.0015 UJ	0.003 J	0.043 U	0.0029 U	0.0014 U	0.062 U	0.15 U	0.031 U	0.11 J
Bis(2-Chloroethoxy) Methane	0.0085 U	0.017 U	0.0076 U	0.0095 U	0.0018 U	0.0017 U	0.0017 U	0.049 U	0.0033 U	0.0016 U	0.07 U	0.17 U	0.035 U	0.084 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.0065 U	0.013 U	0.0058 U	0.0072 U	0.0014 U	0.0013 U	0.0013 U	0.037 U	0.0025 U	0.0012 U	0.053 U	0.13 U	0.027 U	0.064 U
Bis(2-Chloroisopropyl) Ether	0.013 U	0.026 U	0.012 U	0.015 U	0.0028 U	0.0026 U	0.0026 U	0.076 U	0.0052 U	0.0025 U	0.11 U	0.26 U	0.054 U	0.13 U
Bis(2-Ethylhexyl) Phthalate	0.19 U	0.38 U	0.17 U	0.21 U	0.04 U	0.037 U	0.038 U	1.1 U	0.074 U	0.037 U	1.6 U	3.8 U	0.78 U	1.9 U
Caprolactam	0.12 U	0.23 U	0.1 U	0.13 U	0.024 U	0.023 U	0.023 U	0.67 U	0.045 UJ	0.022 U	0.96 U	2.3 U	0.48 U	1.2 U
Carbazole	0.11	0.32	0.14	0.099	0.019	0.014 J	0.041 J	1	0.078	0.0095	1.7 J	4 J	0.84	7.1
Chrysene	1.3	2.3	1.5	0.92	0.2	0.19 J	0.55 J	11	0.63 J	0.067	21 J	48 J	11	51
Dibenz(A,H)Anthracene	0.31	0.5	0.3	0.23	0.045	0.049 J	0.15 J	3.2	0.15 J+	0.013	4.6 J	10 J	2.5	11
Dibenzofuran	0.019 J	0.051 J	0.013 J	0.016 J	0.0025 J	0.0019 J	0.011 J	0.16 J	0.02 J	0.0015 U	0.26 J	0.6 J	0.12 J	1.3 J
Diethyl Phthalate	0.054 U	0.11 U	0.048 U	0.059 U	0.011 U	0.01 U	0.011 U	0.31 U	0.021 U	0.01 U	0.44 U	1.1 U	0.22 U	0.53 U
Dimethyl Phthalate	0.0065 U	0.013 U	0.0058 U	0.0072 U	0.0014 U	0.0013 U	0.0013 U	0.037 U	0.0025 U	0.0012 U	0.053 U	0.13 U	0.027 U	0.064 U
Di-N-Butyl Phthalate	0.078 U	0.16 U	0.07 U	0.087 U	0.016 U	0.015 U	0.016 U	0.45 U	0.031 U	0.015 U	0.64 U	1.6 U	0.32 U	0.77 U
Di-N-Octylphthalate	0.1 U	0.21 U	0.093 U	0.12 U	0.022 U	0.02 U	0.021 U	0.6 U	0.041 U	0.02 U	0.86 U	2.1 U	0.43 U	1 U

Table E-13
Summary of Data Used in Risk Assessment
Industrial Landfill Area Soil (0-2 ft-bgs) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFLP-001	CFLP-001	CFLP-002	CFLP-002-DUP	CFLP-002	CFLP-003	CFLP-003-DUP	CFLP-003	CFLP-004	CFLP-004	CFLP-005	CFLP-005-DUP	CFLP-005	CFLP-006
Sample Lab IDs	180-77488-33, 200-43353-7, 460-155568-11	180-77488-34, 200-43353-8, 460-155568-12	180-77488-35, 200-43353-9, 460-155568-13	180-77488-41, 460-155568-19	180-77488-36, 200-43353-10, 460-155568-14	180-77488-37, 200-43353-11, 460-155568-15	180-77488-42, 460-155568-20	180-77488-38, 200-43353-12, 460-155568-16	180-77488-29, 200-43353-3, 460-155568-7	180-77488-30, 200-43353-4, 460-155568-8	180-77488-39, 200-43353-13, 460-155568-17	180-77488-43, 460-155568-21	180-77488-40, 200-43353-14, 460-155568-18	180-77488-31, 200-43353-5, 460-155568-9
Sample Name	CFLP-001-SO-0-0.5	CFLP-001-SO-0.5-2	CFLP-002-SO-0-0.5	CFLP-DUP30-SO	CFLP-002-SO-0.5-2	CFLP-003-SO-0-0.5	CFLP-DUP31-SO	CFLP-003-SO-0.5-2	CFLP-004-SO-0-0.5	CFLP-004-SO-0.5-2	CFLP-005-SO-0-0.5	CFLP-DUP32-SO	CFLP-005-SO-0.5-2	CFLP-006-SO-0-0.5
Sample Depth	0-0.5 ft	0.5-2 ft	0-0.5 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft
Chemical	5/5/2018	5/5/2018	5/5/2018	5/5/2018	5/5/2018	5/5/2018	5/5/2018	5/5/2018	5/5/2018	5/5/2018	5/5/2018	5/5/2018	5/5/2018	5/5/2018
Fluoranthene	1.1	3.2	1.9	1.3	0.28	0.19 J	0.69 J	12	0.92 J	0.096	26 J	61 J	13	71
Fluorene	0.029 J	0.076	0.03 J	0.032 J	0.0067 J	0.0034 J	0.01 J	0.35	0.031	0.0018 J	0.55 J	1.4 J	0.31	2.7
Hexachlorobenzene	0.013 U	0.025 U	0.011 U	0.014 U	0.0027 U	0.0025 U	0.0026 U	0.073 U	0.005 U	0.0025 U	0.11 U	0.25 U	0.053 U	0.13 U
Hexachlorobutadiene	0.01 U	0.021 U	0.0093 U	0.012 U	0.0022 U	0.002 U	0.0021 U	0.06 U	0.0041 U	0.002 U	0.086 U	0.21 U	0.043 U	0.1 U
Hexachlorocyclopentadiene	0.0091 U	0.018 U	0.0081 U	0.01 U	0.0019 U	0.0018 U	0.0018 U	0.052 U	0.0036 U	0.0018 U	0.075 U	0.18 U	0.037 U	0.09 U
Hexachloroethane	0.0092 U	0.018 U	0.0082 U	0.01 U	0.0019 U	0.0018 U	0.0018 U	0.053 U	0.0036 U	0.0018 U	0.076 U	0.18 U	0.038 U	0.091 U
Indeno(1,2,3-C,D)Pyrene	0.84	1.8	1.1	0.77	0.17	0.16 J	0.43 J	12	0.49 J	0.05	16 J	40 J	9.4	36
Isophorone	0.0091 U	0.018 U	0.0081 U	0.01 U	0.0019 U	0.0018 U	0.0021 J	0.052 U	0.0036 U	0.0018 U	0.075 U	0.18 U	0.037 U	0.09 U
Naphthalene	0.026 J	0.07 J	0.0077 J	0.017 J	0.0015 U	0.0014 UJ	0.0059 J	0.09 J	0.031	0.0013 U	0.11 J	0.26 J	0.055 J	1.8
Nitrobenzene	0.065 U	0.13 U	0.058 U	0.073 U	0.014 U	0.013 U	0.013 U	0.38 U	0.026 U	0.013 U	0.54 U	1.3 U	0.27 U	0.65 U
N-Nitrosodi-N-Propylamine	0.012 U	0.024 U	0.011 U	0.013 U	0.0025 U	0.0024 U	0.0024 U	0.069 U	0.0047 U	0.0023 U	0.1 U	0.24 U	0.05 U	0.12 U
N-Nitrosodiphenylamine	0.06 U	0.12 U	0.053 U	0.066 U	0.012 U	0.012 U	0.012 U	0.34 U	0.023 U	0.011 U	0.49 U	1.2 U	0.24 U	0.59 U
Pentachlorophenol	0.29 U	0.57 U	0.26 U	0.32 U	0.06 U	0.056 U	0.057 U	1.6 U	0.11 U	0.055 U	2.4 U	5.7 U	1.2 U	2.8 U
Phenanthrene	0.56	1.7	0.69	0.52	0.12	0.067 J	0.22 J	5.4	0.43 J	0.044	8.1 J	19 J	4.2	40
Phenol	0.054 U	0.11 U	0.048 U	0.06 U	0.011 U	0.011 U	0.011 U	0.31 U	0.021 U	0.01 U	0.45 U	1.1 U	0.22 U	0.54 U
Pyrene	1.3	3.3	1.9	1.2	0.27	0.19 J	0.57 J	13	0.83 J+	0.1	25 J	50 J	13	67
VOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,1,1-Trichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,2,2-Tetrachloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,2-Trichloro-1,2,2-Trifluoroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,2-Trichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1-Dichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1-Dichloroethene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,3-Trichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,4-Trichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dibromo-3-Chloropropane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dibromoethane (Ethylene Dibromide)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichloropropane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,3-Dichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,4-Dichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Hexanone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acetone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromochloromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromodichloromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromoform	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromomethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Carbon Disulfide	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Carbon Tetrachloride	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chloroform	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chloromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cis-1,2-Dichloroethylene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cis-1,3-Dichloropropene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cyclohexane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibromochloromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dichlorodifluoromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Ethylbenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Isopropylbenzene (Cumene)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
M,P-Xylene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methyl Acetate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methyl Ethyl Ketone (2-Butanone)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methylcyclohexane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methylene Chloride	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Table E-13
Summary of Data Used in Risk Assessment
Industrial Landfill Area Soil (0-2 ft-bgs) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFLP-001	CFLP-001	CFLP-002	CFLP-002-DUP	CFLP-002	CFLP-003	CFLP-003-DUP	CFLP-003	CFLP-004	CFLP-004	CFLP-005	CFLP-005-DUP	CFLP-005	CFLP-006
Sample Lab IDs	180-77488-33, 200-43353-7, 460-155568-11	180-77488-34, 200-43353-8, 460-155568-12	180-77488-35, 200-43353-9, 460-155568-13	180-77488-41, 460-155568-19	180-77488-36, 200-43353-10, 460-155568-14	180-77488-37, 200-43353-11, 460-155568-15	180-77488-42, 460-155568-20	180-77488-38, 200-43353-12, 460-155568-16	180-77488-29, 200-43353-3, 460-155568-7	180-77488-30, 200-43353-4, 460-155568-8	180-77488-39, 200-43353-13, 460-155568-17	180-77488-43, 460-155568-21	180-77488-40, 200-43353-14, 460-155568-18	180-77488-31, 200-43353-5, 460-155568-9
Sample Name	CFLP-001-SO-0-0.5	CFLP-001-SO-0.5-2	CFLP-002-SO-0-0.5	CFLP-DUP30-SO	CFLP-002-SO-0.5-2	CFLP-003-SO-0-0.5	CFLP-DUP31-SO	CFLP-003-SO-0.5-2	CFLP-004-SO-0-0.5	CFLP-004-SO-0.5-2	CFLP-005-SO-0-0.5	CFLP-DUP32-SO	CFLP-005-SO-0.5-2	CFLP-006-SO-0-0.5
Sample Depth	0-0.5 ft	0.5-2 ft	0-0.5 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft
Chemical	5/5/2018	5/5/2018	5/5/2018	5/5/2018	5/5/2018	5/5/2018	5/5/2018	5/5/2018	5/5/2018	5/5/2018	5/5/2018	5/5/2018	5/5/2018	5/5/2018
O-Xylene (1,2-Dimethylbenzene)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Styrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Tert-Butyl Methyl Ether	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Tetrachloroethylene (PCE)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Toluene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Trans-1,2-Dichloroethene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Trans-1,3-Dichloropropene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Trichloroethylene (TCE)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Trichlorofluoromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Vinyl Chloride	--	--	--	--	--	--	--	--	--	--	--	--	--	--

J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-13
Summary of Data Used in Risk Assessment
Industrial Landfill Area Soil (0-2 ft-bgs) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFLP-006	CFMW-003A	CFMW-003A	CFMW-066	CFMW-066	CFSB-191	CFSB-191	CFSB-192	CFSB-192	CFSB-194	CFSB-194	CFSB-194-DUP	CFSB-195	CFSB-195
Sample Lab IDs	180-77488-32, 200-43353-6, 460-155568-10	460-114793-37	460-114793-39	180-77393-1, 460-155265-1	180-77393-2, 460-155265-2	180-79204-23, 460-159044-29	180-79204-24, 460-159044-30	180-79204-21, 460-159044-27	180-79204-22, 460-159044-28	180-79434-23, 460-159377-22	180-79434-24, 460-159377-24	180-79434-33, 460-159377-33	180-79434-8, 460-159377-8	180-79434-9, 460-159377-9
Sample Name	CFLP-006-SO-0.5-2	CFMW-003a-SO-0-0.5	CFMW-003a-SO-0.5-2	CFMW-066-SO-0-0.5	CFMW-066-SO-0.5-2	CFSB-191-SO-0-0.5	CFSB-191-SO-0.5-2	CFSB-192-SO-0-0.5	CFSB-192-SO-0.5-2	CFSB-194-SO-0-0.5	CFSB-194-SO-0.5-2	CFSB-DUP44-SO	CFSB-195-SO-0-0.5	CFSB-195-SO-0.5-2
Sample Depth	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft
Chemical	5/5/2018	5/31/2016	5/31/2016	4/30/2018	4/30/2018	6/22/2018	6/22/2018	6/22/2018	6/22/2018	6/27/2018	6/27/2018	6/27/2018	6/27/2018	6/27/2018
GENERAL CHEMISTRY (mg/kg)														
Fluoride	16.8 J+	4.17 J	37.8 J-	3.69 J+	8.01 J+	2.24 J-	6.15 J-	5.17 J-	5.53 J-	3.8	7.11	4.57	6.48 J-	8.17 J-
Cyanide	0.065 U	0.066 J-	0.053 J-	0.075 U	0.066 U	0.094 J+	0.082 J+	0.094 J	0.059 U	0.21 J+	0.066 U	0.07 J+	0.42 J+	0.077 J+
METALS (mg/kg)														
"Chromium, Hexavalent - Estimated"	0.299757	0.173966	0.278345	0.256934	0.270316	0.232847	0.214112	0.26764	0.313139	0.299757	0.305109	0.347932	0.278345	0.286375
"Chromium, Trivalent - Estimated"	10.9002	6.32603	10.1217	9.34307	9.82968	8.46715	7.78589	9.73236	11.3869	10.9002	11.0949	12.6521	10.1217	10.4136
Aluminum	14400	6230	12700	13800	11600	10400	9960	19500	18400	16700	16400	17800	13000	15300
Antimony	0.3 UJ	0.5 U	0.33 UJ	0.34 UJ	0.31 UJ	0.27 U	0.28 U	0.31 U	0.32 U	0.3 UJ	0.3 UJ	0.33 U	0.3 UJ	0.27 UJ
Arsenic	4.3	4.1	4.4	6.3	4.4	4.5	4.2	5.4	6.1	6.1	6.5	6.7	6.2	6.1
Barium	92.5	94.1	74.4	234	88.6	85.7	88.3	194	152	229	85	94.6	436	205
Beryllium	0.47	0.29 J	0.4	0.49	0.43	0.15 U	0.15 U	0.72	0.56	0.46	0.61	0.61	0.49	0.5
Cadmium	0.35 U	0.38 U	0.25 U	0.39 U	0.36 U	0.32 U	0.32 U	0.36 U	0.37 U	0.35 U	0.34 U	0.38 U	0.39 J	0.31 U
Calcium	23500 J	75000	28000	2890	1130	20500	8710	1440	1430	3170	1680	2110	5070	2670
Chromium, Total	11.2	6.5	10.4	9.6	10.1	8.7	8	10	11.7	11.2	11.4	13	10.4	10.7
Cobalt	5.3	3.6	5.5	5.1	4.8	3.8	3.8	5.5	5.2	5.2	4.6	5.1	5.9	6.7
Copper	16.8 J	10.8	15.6	12.3	8.6	10.7	9.8	9.9	9.4	13.3 J+	15.1 J+	17.3	7.5	11.6
Iron	13700	9890	15400	15600	14200	12700	12100	17100	18100	16500	18100	19500	16500	16400
Lead	13.5 J+	8.1	8.4	13.2	8	9.5	9.6	11.6	11.6	13.3	13.3	14.8	14.8	12.1
Magnesium	9400	11800	14100	8300	9260	9980	9070	7920	8990	10200	14100	14100	9620	11000
Manganese	336	284	416	721	196	375	387	351	323	1050 J	175 J	199	2620	393
Mercury	0.017	0.055	0.023	0.023	0.01 U	0.016 J	0.028	0.01 J	0.011 U	0.027	0.023	0.017 J-	0.042 J-	0.011 UJ
Nickel	27.6 J	7.8	12.4	17.1	10.6	11.8	9.8	14.2	12.5	11.8	11.9	13.4	17.7	13
Potassium	707	464	976	1090	789	710	581	1230	1190	783	591	650	970	942
Selenium	0.3 U	0.47 U	0.31 U	0.34 U	0.31 U	0.27 U	0.28 U	0.31 U	0.32 U	0.3 U	0.29 U	0.33 U	0.29 U	0.26 U
Silver	0.64 U	0.91 U	0.61 U	0.73 U	0.66 U	0.58 U	0.59 U	0.66 U	0.67 U	0.64 U	0.63 U	0.7 U	0.62 U	0.56 U
Sodium	81.4 J	80.6 J	36.1 J	42.6 J	33.6 U	29.4 U	29.7 U	37.3 J	34.2 U	47.7 J	34.3 J	35.2 U	36.8 J	40.2 J
Thallium	0.13 U	0.19 U	0.13 U	0.15 U	0.13 U	0.12 U	0.12 U	0.13 U	0.14 U	0.13 U	0.13 U	0.14 U	0.13 U	0.11 J
Vanadium	14.6	4.6	8.8	13.1	9.3	7.3	7	15.4	17.5	13.1	10.7	11	12.2	12
Zinc	48.5	41.3	45.4	71.2	40.4	40.7	41.8	60.9	52.8	62.8	47.9	51.5	89.1	53.8
PESTICIDES (mg/kg)														
Aldrin	--	0.00099 UJ	--	--	--	--	--	--	--	--	--	--	--	--
Alpha Bhc (Alpha Hexachlorocyclohexane)	--	0.00074 UJ	--	--	--	--	--	--	--	--	--	--	--	--
Alpha Endosulfan	--	0.0011 UJ	--	--	--	--	--	--	--	--	--	--	--	--
Beta Bhc (Beta Hexachlorocyclohexane)	--	0.00079 UJ	--	--	--	--	--	--	--	--	--	--	--	--
Beta Endosulfan	--	0.0013 UJ	--	--	--	--	--	--	--	--	--	--	--	--
cis-Chlordane	--	0.0013 UJ	--	--	--	--	--	--	--	--	--	--	--	--
Delta BHC (Delta Hexachlorocyclohexane)	--	0.00089 UJ	--	--	--	--	--	--	--	--	--	--	--	--
Dieldrin	--	0.0011 UJ	--	--	--	--	--	--	--	--	--	--	--	--
Endosulfan Sulfate	--	0.00095 UJ	--	--	--	--	--	--	--	--	--	--	--	--
Endrin	--	0.001 UJ	--	--	--	--	--	--	--	--	--	--	--	--
Endrin Aldehyde	--	0.001 UJ	--	--	--	--	--	--	--	--	--	--	--	--
Endrin Ketone	--	0.0011 UJ	--	--	--	--	--	--	--	--	--	--	--	--
Gamma Bhc (Lindane)	--	0.00073 UJ	--	--	--	--	--	--	--	--	--	--	--	--
Heptachlor	--	0.001 UJ	--	--	--	--	--	--	--	--	--	--	--	--
Heptachlor Epoxide	--	0.0016 UJ	--	--	--	--	--	--	--	--	--	--	--	--
Methoxychlor	--	0.0017 UJ	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDD	--	0.0011 UJ	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDE	--	0.0012 UJ	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDT	--	0.00084 UJ	--	--	--	--	--	--	--	--	--	--	--	--
Toxaphene	--	0.024 UJ	--	--	--	--	--	--	--	--	--	--	--	--
trans-Chlordane	--	0.0018 UJ	--	--	--	--	--	--	--	--	--	--	--	--
POLYCHLORINATED BIPHENYLS (mg/kg)														
PCB-1016 (Aroclor 1016)	--	0.011 U	0.01 U	--	--	--	--	--	--	--	--	--	--	--
PCB-1221 (Aroclor 1221)	--	0.011 U	0.01 U	--	--	--	--	--	--	--	--	--	--	--
PCB-1232 (Aroclor 1232)	--	0.011 U	0.01 U	--	--	--	--	--	--	--	--	--	--	--
PCB-1242 (Aroclor 1242)	--	0.011 U	0.01 U	--	--	--	--	--	--	--	--	--	--	--
PCB-1248 (Aroclor 1248)	--	0.011 U	0.01 U	--	--	--	--	--	--	--	--	--	--	--

Table E-13
Summary of Data Used in Risk Assessment
Industrial Landfill Area Soil (0-2 ft-bgs) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFLP-006	CFMW-003A	CFMW-003A	CFMW-066	CFMW-066	CFSB-191	CFSB-191	CFSB-192	CFSB-192	CFSB-194	CFSB-194	CFSB-194-DUP	CFSB-195	CFSB-195
Sample Lab IDs	180-77488-32, 200-43353-6, 460-155568-10	460-114793-37	460-114793-39	180-77393-1, 460-155265-1	180-77393-2, 460-155265-2	180-79204-23, 460-159044-29	180-79204-24, 460-159044-30	180-79204-21, 460-159044-27	180-79204-22, 460-159044-28	180-79434-23, 460-159377-22	180-79434-24, 460-159377-24	180-79434-33, 460-159377-33	180-79434-8, 460-159377-8	180-79434-9, 460-159377-9
Sample Name	CFLP-006-SO-0.5-2	CFMW-003a-SO-0-0.5	CFMW-003a-SO-0.5-2	CFMW-066-SO-0-0.5	CFMW-066-SO-0.5-2	CFSB-191-SO-0-0.5	CFSB-191-SO-0.5-2	CFSB-192-SO-0-0.5	CFSB-192-SO-0.5-2	CFSB-194-SO-0-0.5	CFSB-194-SO-0.5-2	CFSB-DUP44-SO	CFSB-195-SO-0-0.5	CFSB-195-SO-0.5-2
Sample Depth	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft
Chemical	5/5/2018	5/31/2016	5/31/2016	4/30/2018	4/30/2018	6/22/2018	6/22/2018	6/22/2018	6/22/2018	6/27/2018	6/27/2018	6/27/2018	6/27/2018	6/27/2018
PCB-1254 (Aroclor 1254)	--	0.011 U	0.01 U	--	--	--	--	--	--	--	--	--	--	--
PCB-1260 (Aroclor 1260)	--	0.011 U	0.01 U	--	--	--	--	--	--	--	--	--	--	--
PCB-1262 (Aroclor 1262)	--	0.011 U	0.01 U	--	--	--	--	--	--	--	--	--	--	--
PCB-1268 (Aroclor 1268)	--	0.011 U	0.01 U	--	--	--	--	--	--	--	--	--	--	--
Polychlorinated Biphenyl (PCBs)	--	0.011 U	0.01 U	--	--	--	--	--	--	--	--	--	--	--
SEMIVOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,2,4,5-Tetrachlorobenzene	0.038 U	0.03 UJ	0.028 U	0.0016 U	0.0016 U	0.003 U	0.0015 U	0.0016 U	0.0016 U	0.0016 U	0.0017 U	0.0016 U	0.0035 U	0.0017 U
1,4-Dioxane (P-Dioxane)	0.28 U	0.11 UJ	0.099 U	0.011 U	0.011 U	0.022 U	0.011 U	0.012 U	0.011 U	0.012 U	0.012 U	0.012 U	0.025 U	0.012 U
2,3,4,6-Tetrachlorophenol	0.37 U	0.038 UJ	0.035 U	0.015 U	0.015 U	0.029 U	0.015 U	0.015 U	0.015 U	0.016 U	0.017 U	0.016 U	0.034 U	0.016 U
2,4,5-Trichlorophenol	0.064 U	0.04 UJ	0.037 U	0.0026 U	0.0026 U	0.005 U	0.0025 U	0.0027 U	0.0026 U	0.0027 U	0.0029 U	0.0027 U	0.0057 U	0.0028 U
2,4,6-Trichlorophenol	0.049 U	0.011 UJ	0.011 U	0.002 U	0.002 U	0.0039 U	0.0019 U	0.002 U	0.002 U	0.0021 U	0.0022 U	0.002 U	0.0044 U	0.0021 U
2,4-Dichlorophenol	0.069 U	0.0095 UJ	0.0088 U	0.0028 U	0.0028 U	0.0054 U	0.0027 U	0.0029 U	0.0028 U	0.0029 U	0.0031 U	0.0029 U	0.0062 U	0.003 U
2,4-Dimethylphenol	0.055 U	0.088 UJ	0.082 U	0.0023 U	0.0023 U	0.0044 U	0.0022 U	0.0023 U	0.0023 U	0.0023 U	0.0025 U	0.0023 U	0.005 U	0.0024 U
2,4-Dinitrophenol	2.4 UJ	0.3 UJ	0.28 U	0.098 U	0.098 U	0.19 U	0.094 U	0.1 U	0.098 U	0.1 U	0.11 U	0.1 U	0.22 U	0.1 U
2,4-Dinitrotoluene	0.044 U	0.016 UJ	0.015 U	0.0018 U	0.0018 U	0.0035 U	0.0017 U	0.0019 U	0.0018 U	0.0019 U	0.002 U	0.0019 U	0.004 U	0.0019 U
2,6-Dinitrotoluene	0.055 U	0.021 UJ	0.02 U	0.0023 U	0.0022 U	0.0043 U	0.0022 U	0.0023 U	0.0023 U	0.0023 U	0.0025 U	0.0023 U	0.005 U	0.0024 U
2-Chloronaphthalene	0.041 U	0.0091 UJ	0.0084 U	0.0017 U	0.0017 U	0.0032 U	0.0016 U	0.0017 U	0.0017 U	0.0017 U	0.0018 U	0.0017 U	0.0037 U	0.0018 U
2-Chlorophenol	0.041 U	0.01 UJ	0.0095 U	0.0017 U	0.0017 U	0.0033 U	0.0016 U	0.0017 U	0.0017 U	0.0018 U	0.0019 U	0.0017 U	0.0037 U	0.0018 U
2-Methylnaphthalene	0.048 J	0.0089 UJ	0.0082 U	0.0018 U	0.0017 U	0.0034 U	0.0017 U	0.0018 U	0.0017 U	0.0018 U	0.0019 U	0.0018 U	0.0039 U	0.0019 U
2-Methylphenol (O-Cresol)	0.26 U	0.018 UJ	0.016 U	0.01 U	0.01 U	0.02 U	0.01 U	0.011 U	0.01 U	0.011 U	0.011 U	0.011 U	0.023 U	0.011 U
2-Nitroaniline	0.41 U	0.013 UJ	0.012 U	0.017 U	0.017 U	0.032 U	0.016 U	0.017 U	0.017 U	0.017 U	0.018 U	0.017 U	0.037 U	0.018 U
2-Nitrophenol	0.051 U	0.014 UJ	0.012 U	0.0021 U	0.0021 U	0.004 U	0.002 U	0.0021 U	0.0021 U	0.0022 U	0.0023 U	0.0021 U	0.0046 U	0.0022 U
3- And 4- Methylphenol (Total)	--	0.011 UJ	0.0099 U	--	--	--	--	--	--	--	--	--	--	--
3,3'-Dichlorobenzidine	0.83 U	0.045 UJ	0.042 U	0.034 U	0.034 U	0.066 U	0.033 U	0.035 U	0.034 U	0.035 U	0.037 U	0.035 U	0.075 U	0.036 U
3-Nitroaniline	0.23 U	0.012 UJ	0.011 U	0.0093 U	0.0092 U	0.018 U	0.0089 U	0.0095 U	0.0093 U	0.0096 U	0.01 U	0.0095 U	0.02 U	0.0098 U
4,6-Dinitro-2-Methylphenol	1.5 U	0.11 UJ	0.099 U	0.063 U	0.063 U	0.12 U	0.06 U	0.064 U	0.063 U	0.065 U	0.069 U	0.064 U	0.14 U	0.067 U
4-Bromophenyl Phenyl Ether	0.062 U	0.013 UJ	0.012 U	0.0026 U	0.0025 U	0.0049 U	0.0024 U	0.0026 U	0.0025 U	0.0026 U	0.0028 U	0.0026 U	0.0056 U	0.0027 U
4-Chloro-3-Methylphenol	0.042 U	0.017 UJ	0.016 U	0.0017 U	0.0017 U	0.0033 U	0.0016 U	0.0017 U	0.0017 U	0.0018 U	0.0019 U	0.0018 U	0.0038 U	0.0018 U
4-Chloroaniline	0.03 U	0.01 UJ	0.0096 U	0.0012 U	0.0012 U	0.0023 U	0.0012 U	0.0012 U	0.0012 U	0.0013 U	0.0013 U	0.0012 U	0.0027 U	0.0013 U
4-Chlorophenyl Phenyl Ether	0.054 U	0.012 UJ	0.011 U	0.0022 U	0.0022 U	0.0043 U	0.0021 U	0.0023 U	0.0022 U	0.0023 U	0.0024 U	0.0023 U	0.0049 U	0.0023 U
4-Nitroaniline	0.043 U	0.015 UJ	0.014 U	0.0018 U	0.0018 U	0.0034 U	0.0017 U	0.0018 U	0.0018 U	0.0018 U	0.0019 U	0.0018 U	0.0039 U	0.0019 U
4-Nitrophenol	0.63 U	0.19 UJ	0.18 U	0.026 U	0.026 U	0.049 U	0.024 U	0.026 U	0.026 U	0.027 U	0.028 U	0.026 U	0.056 U	0.027 U
Acenaphthene	0.36	0.0097 UJ	0.009 U	0.0044 J	0.0021 U	0.0063 J	0.0027 J	0.0032 J	0.0021 U	0.0022 U	0.0023 U	0.0021 U	0.015 J	0.0022 U
Acenaphthylene	0.039 U	0.01 UJ	0.0096 U	0.0016 U	0.0016 U	0.0031 U	0.0015 U	0.0016 U	0.0016 U	0.0017 U	0.0018 U	0.0016 U	0.0035 U	0.0017 U
Acetophenone	0.048 U	0.0088 UJ	0.0081 U	0.002 U	0.002 U	0.0038 U	0.0019 J	0.002 U	0.002 U	0.0021 U	0.0022 U	0.002 U	0.0057 J	0.0021 U
Anthracene	0.67	0.038 UJ	0.035 U	0.0082	0.0029 J	0.012 J	0.0039 J	0.0047 J	0.0019 U	0.002 U	0.0021 U	0.0019 U	0.03	0.0039 J
Atrazine	0.39 U	0.018 UJ	0.017 U	0.016 U	0.016 U	0.031 UJ	0.015 UJ	0.016 UJ	0.016 UJ	0.017 UJ	0.018 UJ	0.016 UJ	0.035 U	0.017 U
Benzaldehyde	0.11 UR	0.031 UJ	0.028 U	0.0045 UR	0.0045 UR	0.0087 UR	0.0058 J	0.0046 UR	0.0045 UR	0.0047 U	0.005 U	0.0046 U	0.014 J	0.0048 U
Benzo(A)Anthracene	4.6	0.034 UJ	0.031 U	0.061	0.018	0.1	0.031	0.024	0.01	0.0069 J	0.0015 U	0.0014 U	0.17	0.021
Benzo(A)Pyrene	6.2	0.032 J-	0.011 U	0.085	0.023	0.15	0.046	0.032	0.014	0.0065 J	0.0017 U	0.0016 U	0.24	0.028
Benzo(B)Fluoranthene	6.3	0.044 J-	0.015 J	0.13	0.035	0.22	0.07	0.043	0.02	0.014	0.002 U	0.0018 U	0.36	0.042
Benzo(G,H,I)Perylene	6.2	0.033 J-	0.021 U	0.084	0.023	0.15	0.043	0.03	0.013	0.0091	0.0017 U	0.0016 U	0.22	0.025
Benzo(K)Fluoranthene	3.6	0.018 UJ	0.016 U	0.035	0.0092	0.082	0.021	0.018	0.0091	0.005 J	0.0024 U	0.0022 U	0.09	0.013
Benzyl Butyl Phthalate	0.61 U	0.012 UJ	0.011 U	0.025 U	0.025 U	0.048 U	0.024 U	0.026 U	0.025 U	0.026 U	0.027 U	0.026 U	0.055 U	0.026 U
Biphenyl (Diphenyl)	0.037 U	0.034 UJ	0.032 U	0.0015 U	0.0015 U	0.0029 U	0.0015 U	0.0016 U	0.0015 U	0.0016 U	0.0017 U	0.0016 U	0.0034 U	0.0016 U
Bis(2-Chloroethoxy) Methane	0.043 U	0.013 UJ	0.012 U	0.0017 U	0.0017 U	0.0033 U	0.0017 U	0.0018 U	0.0017 U	0.0018 U	0.0019 U	0.0018 U	0.0038 U	0.0018 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.032 U	0.0095 UJ	0.0088 U	0.0013 U	0.0013 U	0.0025 U	0.0013 U	0.0013 U	0.0013 U	0.0014 U	0.0015 U	0.0014 U	0.0029 U	0.0014 U
Bis(2-Chloroisopropyl) Ether	0.066 U	0.017 UJ	0.015 U	0.0027 U	0.0027 U	0.0052 U	0.0026 U	0.0028 U	0.0027 U	0.0028 U	0.003 U	0.0028 U	0.006 U	0.0029 U
Bis(2-Ethylhexyl) Phthalate	0.95 U	0.064 J	0.043 J+	0.039 U	0.039 U	0.075 U	0.037 U	0.04 U	0.039 U	0.04 U	0.043 U	0.04 U	0.086 U	0.041 U
Caprolactam	0.58 U	0.029 UJ	0.027 U	0.024 U	0.024 U	0.046 U	0.023 U	0.024 U	0.024 U	0.025 U	0.026 U	0.024 U	0.052 U	0.025 U
Carbazole	0.63	0.01 UJ	0.0092 U	0.012	0.0041 J	0.015	0.0053 J	0.0044 J	0.0017 U	0.0018 U	0.0019 U	0.0017 U	0.033	0.0046 J
Chrysene	5.5	0.035 J-	0.01 U	0.088	0.026	0.14	0.044	0.035	0.014	0.009	0.0016 U	0.0015 U	0.29	0.034
Dibenz(A,H)Anthracene	1.3	0.021 UJ	0.019 U	0.018	0.0045 J	0.031	0.0092	0.0078	0.003 J	0.0017 U	0.0018 U	0.0017 U	0.052	0.0081
Dibenzofuran	0.15 J	0.012 UJ	0.011 U	0.0016 J	0.0016 U	0.0031 U	0.0016 J	0.0016 U	0.0016 U	0.0017 U	0.0018 U	0.0016 U	0.011 J	0.0026 J
Diethyl Phthalate	0.27 U	0.011 UJ	0.011 U	0.011 U	0.011 U	0.021 U	0.01 U	0.011 U	0.011 U	0.011 U	0.012 U	0.011 U	0.024 U	0.012 U
Dimethyl Phthalate	0.032 U	0.012 UJ	0.011 U	0.0013 U	0.0013 U	0.0025 U	0.0013 U	0.0013 U	0.0013 U	0.0014 U	0.0015 U	0.0014 U	0.0029 U	0.0014 U
Di-N-Butyl Phthalate	0.39 U	0.012 UJ	0.011 U	0.016 U	0.016 U	0.031 U	0.015 U	0.016 U	0.016 U	0.017 U	0.018 U	0.016 U	0.035 U	0.017 U
Di-N-Octylphthalate	0.52 U	0.02 UJ	0.019 U	0.021 U	0.021 U	0.041 U	0.02 U	0.022 U	0.021 U	0.022 U	0.023 U	0.022 U	0.047 U	0.022 U

Table E-13
Summary of Data Used in Risk Assessment
Industrial Landfill Area Soil (0-2 ft-bgs) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFLP-006	CFMW-003A	CFMW-003A	CFMW-066	CFMW-066	CFSB-191	CFSB-191	CFSB-192	CFSB-192	CFSB-194	CFSB-194	CFSB-194-DUP	CFSB-195	CFSB-195
Sample Lab IDs	180-77488-32, 200-43353-6, 460-155568-10	460-114793-37	460-114793-39	180-77393-1, 460-155265-1	180-77393-2, 460-155265-2	180-79204-23, 460-159044-29	180-79204-24, 460-159044-30	180-79204-21, 460-159044-27	180-79204-22, 460-159044-28	180-79434-23, 460-159377-22	180-79434-24, 460-159377-24	180-79434-33, 460-159377-33	180-79434-8, 460-159377-8	180-79434-9, 460-159377-9
Sample Name	CFLP-006-SO-0.5-2	CFMW-003a-SO-0-0.5	CFMW-003a-SO-0.5-2	CFMW-066-SO-0-0.5	CFMW-066-SO-0.5-2	CFSB-191-SO-0-0.5	CFSB-191-SO-0.5-2	CFSB-192-SO-0-0.5	CFSB-192-SO-0.5-2	CFSB-194-SO-0-0.5	CFSB-194-SO-0.5-2	CFSB-DUP44-SO	CFSB-195-SO-0-0.5	CFSB-195-SO-0.5-2
Sample Depth	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft
Chemical	5/5/2018	5/31/2016	5/31/2016	4/30/2018	4/30/2018	6/22/2018	6/22/2018	6/22/2018	6/22/2018	6/27/2018	6/27/2018	6/27/2018	6/27/2018	6/27/2018
Fluoranthene	7.2	0.033 J-	0.011 U	0.11	0.032	0.18	0.057	0.045	0.017	0.012	0.0021 U	0.002 U	0.3	0.042
Fluorene	0.25	0.0088 UJ	0.0081 U	0.0032 J	0.0014 U	0.0035 J	0.0021 J	0.0018 J	0.0014 U	0.0015 U	0.0016 U	0.0015 U	0.015 J	0.0023 J
Hexachlorobenzene	0.064 U	0.016 UJ	0.015 U	0.0026 U	0.0026 U	0.005 U	0.0025 U	0.0027 U	0.0026 U	0.0027 U	0.0029 U	0.0027 U	0.0058 U	0.0028 U
Hexachlorobutadiene	0.052 U	0.011 UJ	0.01 U	0.0021 U	0.0021 U	0.0041 UJ	0.002 UJ	0.0022 UJ	0.0021 UJ	0.0022 U	0.0023 U	0.0022 U	0.0047 U	0.0023 U
Hexachlorocyclopentadiene	0.045 U	0.025 UJ	0.023 UJ	0.0019 U	0.0019 U	0.0036 UJ	0.0018 UJ	0.0019 UJ	0.0019 UJ	0.0019 U	0.002 U	0.0019 U	0.0041 U	0.002 U
Hexachloroethane	0.046 U	0.015 UJ	0.014 U	0.0019 U	0.0019 U	0.0036 U	0.0018 U	0.0019 U	0.0019 U	0.002 U	0.0021 U	0.0019 U	0.0042 U	0.002 U
Indeno(1,2,3-C,D)Pyrene	4.9	0.027 UJ	0.025 U	0.066	0.019	0.12	0.036	0.023	0.01	0.007 J	0.0016 U	0.0015 U	0.18	0.029
Isophorone	0.045 U	0.0086 UJ	0.008 U	0.0019 U	0.0019 U	0.0036 U	0.0018 U	0.0019 U	0.0019 U	0.0019 U	0.002 U	0.0019 U	0.0041 U	0.002 U
Naphthalene	0.14 J	0.01 UJ	0.0095 U	0.0015 J	0.0014 U	0.0032 J	0.0018 J	0.002 J	0.0014 U	0.0015 U	0.0016 U	0.0015 U	0.0068 J	0.0015 U
Nitrobenzene	0.33 U	0.013 UJ	0.012 U	0.013 U	0.013 U	0.026 U	0.013 U	0.014 U	0.013 U	0.014 U	0.015 U	0.014 U	0.029 U	0.014 U
N-Nitrosodi-N-Propylamine	0.06 U	0.014 UJ	0.012 U	0.0025 U	0.0025 U	0.0048 U	0.0024 U	0.0025 U	0.0025 U	0.0026 U	0.0027 U	0.0025 U	0.0055 U	0.0026 U
N-Nitrosodiphenylamine	0.3 U	0.037 UJ	0.034 U	0.012 U	0.012 U	0.023 U	0.012 U	0.012 U	0.012 U	0.013 U	0.013 U	0.012 U	0.027 U	0.013 U
Pentachlorophenol	1.4 U	0.049 UJ	0.045 U	0.059 U	0.058 U	0.11 U	0.056 U	0.06 U	0.059 U	0.061 U	0.064 U	0.06 U	0.13 U	0.062 U
Phenanthrene	3.6	0.018 J-	0.0099 U	0.05	0.016	0.072	0.025	0.024	0.0097	0.0056 J	0.0021 U	0.0021 J	0.17	0.025
Phenol	0.27 U	0.013 UJ	0.012 U	0.011 U	0.011 U	0.021 U	0.011 U	0.011 U	0.011 U	0.011 U	0.012 U	0.011 U	0.024 U	0.012 U
Pyrene	7.6	0.042 J-	0.017 U	0.11	0.035	0.16	0.05	0.039	0.016	0.011	0.0019 U	0.0018 U	0.29	0.038
VOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,1,1-Trichloroethane	--	--	0.00029 U	--	--	--	--	--	--	--	--	--	--	--
1,1,2,2-Tetrachloroethane	--	--	0.00013 U	--	--	--	--	--	--	--	--	--	--	--
1,1,2-Trichloro-1,2,2-Trifluoroethane	--	--	0.00034 U	--	--	--	--	--	--	--	--	--	--	--
1,1,2-Trichloroethane	--	--	0.00022 U	--	--	--	--	--	--	--	--	--	--	--
1,1-Dichloroethane	--	--	0.00026 U	--	--	--	--	--	--	--	--	--	--	--
1,1-Dichloroethene	--	--	0.00032 U	--	--	--	--	--	--	--	--	--	--	--
1,2,3-Trichlorobenzene	--	--	0.000085 U	--	--	--	--	--	--	--	--	--	--	--
1,2,4-Trichlorobenzene	--	--	0.00025 U	--	--	--	--	--	--	--	--	--	--	--
1,2-Dibromo-3-Chloropropane	--	--	0.00036 U	--	--	--	--	--	--	--	--	--	--	--
1,2-Dibromoethane (Ethylene Dibromide)	--	--	0.000093 U	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichlorobenzene	--	--	0.00011 U	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichloroethane	--	--	0.000085 U	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichloropropane	--	--	0.00013 U	--	--	--	--	--	--	--	--	--	--	--
1,3-Dichlorobenzene	--	--	0.000093 U	--	--	--	--	--	--	--	--	--	--	--
1,4-Dichlorobenzene	--	--	0.0001 U	--	--	--	--	--	--	--	--	--	--	--
2-Hexanone	--	--	0.00073 U	--	--	--	--	--	--	--	--	--	--	--
Acetone	--	--	0.0091	--	--	--	--	--	--	--	--	--	--	--
Benzene	--	--	0.00015 U	--	--	--	--	--	--	--	--	--	--	--
Bromochloromethane	--	--	0.00013 U	--	--	--	--	--	--	--	--	--	--	--
Bromodichloromethane	--	--	0.00029 U	--	--	--	--	--	--	--	--	--	--	--
Bromoform	--	--	0.0001 U	--	--	--	--	--	--	--	--	--	--	--
Bromomethane	--	--	0.00025 U	--	--	--	--	--	--	--	--	--	--	--
Carbon Disulfide	--	--	0.00035 J	--	--	--	--	--	--	--	--	--	--	--
Carbon Tetrachloride	--	--	0.00033 U	--	--	--	--	--	--	--	--	--	--	--
Chlorobenzene	--	--	0.00011 U	--	--	--	--	--	--	--	--	--	--	--
Chloroethane	--	--	0.00027 U	--	--	--	--	--	--	--	--	--	--	--
Chloroform	--	--	0.00016 U	--	--	--	--	--	--	--	--	--	--	--
Chloromethane	--	--	0.00029 U	--	--	--	--	--	--	--	--	--	--	--
Cis-1,2-Dichloroethylene	--	--	0.00017 U	--	--	--	--	--	--	--	--	--	--	--
Cis-1,3-Dichloropropene	--	--	0.00012 U	--	--	--	--	--	--	--	--	--	--	--
Cyclohexane	--	--	0.00035 U	--	--	--	--	--	--	--	--	--	--	--
Dibromochloromethane	--	--	0.00012 U	--	--	--	--	--	--	--	--	--	--	--
Dichlorodifluoromethane	--	--	0.00025 U	--	--	--	--	--	--	--	--	--	--	--
Ethylbenzene	--	--	0.00014 U	--	--	--	--	--	--	--	--	--	--	--
Isopropylbenzene (Cumene)	--	--	0.00013 U	--	--	--	--	--	--	--	--	--	--	--
M,P-Xylene	--	--	0.000085 U	--	--	--	--	--	--	--	--	--	--	--
Methyl Acetate	--	--	0.00069 U	--	--	--	--	--	--	--	--	--	--	--
Methyl Ethyl Ketone (2-Butanone)	--	--	0.00059 U	--	--	--	--	--	--	--	--	--	--	--
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	--	--	0.0017 U	--	--	--	--	--	--	--	--	--	--	--
Methylcyclohexane	--	--	0.00039 U	--	--	--	--	--	--	--	--	--	--	--
Methylene Chloride	--	--	0.00025 U	--	--	--	--	--	--	--	--	--	--	--

Table E-13
Summary of Data Used in Risk Assessment
Industrial Landfill Area Soil (0-2 ft-bgs) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFLP-006	CFMW-003A	CFMW-003A	CFMW-066	CFMW-066	CFSB-191	CFSB-191	CFSB-192	CFSB-192	CFSB-194	CFSB-194	CFSB-194-DUP	CFSB-195	CFSB-195
Sample Lab IDs	180-77488-32, 200-43353-6, 460-155568-10	460-114793-37	460-114793-39	180-77393-1, 460-155265-1	180-77393-2, 460-155265-2	180-79204-23, 460-159044-29	180-79204-24, 460-159044-30	180-79204-21, 460-159044-27	180-79204-22, 460-159044-28	180-79434-23, 460-159377-22	180-79434-24, 460-159377-24	180-79434-33, 460-159377-33	180-79434-8, 460-159377-8	180-79434-9, 460-159377-9
Sample Name	CFLP-006-SO-0.5-2	CFMW-003a-SO-0-0.5	CFMW-003a-SO-0.5-2	CFMW-066-SO-0-0.5	CFMW-066-SO-0.5-2	CFSB-191-SO-0-0.5	CFSB-191-SO-0.5-2	CFSB-192-SO-0-0.5	CFSB-192-SO-0.5-2	CFSB-194-SO-0-0.5	CFSB-194-SO-0.5-2	CFSB-DUP44-SO	CFSB-195-SO-0-0.5	CFSB-195-SO-0.5-2
Sample Depth	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft
Chemical	5/5/2018	5/31/2016	5/31/2016	4/30/2018	4/30/2018	6/22/2018	6/22/2018	6/22/2018	6/22/2018	6/27/2018	6/27/2018	6/27/2018	6/27/2018	6/27/2018
O-Xylene (1,2-Dimethylbenzene)	--	--	0.00012 U	--	--	--	--	--	--	--	--	--	--	--
Styrene	--	--	0.00012 U	--	--	--	--	--	--	--	--	--	--	--
Tert-Butyl Methyl Ether	--	--	0.00013 U	--	--	--	--	--	--	--	--	--	--	--
Tetrachloroethylene (PCE)	--	--	0.00022 U	--	--	--	--	--	--	--	--	--	--	--
Toluene	--	--	0.00015 U	--	--	--	--	--	--	--	--	--	--	--
Trans-1,2-Dichloroethene	--	--	0.0003 U	--	--	--	--	--	--	--	--	--	--	--
Trans-1,3-Dichloropropene	--	--	0.000077 U	--	--	--	--	--	--	--	--	--	--	--
Trichloroethylene (TCE)	--	--	0.0002 U	--	--	--	--	--	--	--	--	--	--	--
Trichlorofluoromethane	--	--	0.00026 U	--	--	--	--	--	--	--	--	--	--	--
Vinyl Chloride	--	--	0.0003 U	--	--	--	--	--	--	--	--	--	--	--

J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-13
Summary of Data Used in Risk Assessment
Industrial Landfill Area Soil (0-2 ft-bgs) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-250	CFSB-250	CFSB-252	CFSB-252	CFSB-253	CFSB-253
Sample Lab IDs	180-77393-35, 460-155265-37	180-77393-36, 460-155265-38	180-77393-26, 460-155265-28	180-77393-27, 460-155265-29	180-77393-29, 460-155265-31	180-77393-30, 460 155265-32
Sample Name	CFSB-250-SO-0-0.5	CFSB-250-SO-0.5-2	CFSB-252-SO-0-0.5	CFSB-252-SO-0.5-2	CFSB-253-SO-0-0.5	CFSB-253-SO-0.5-2
Sample Depth	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft
Chemical	5/1/2018	5/1/2018	5/1/2018	5/1/2018	5/1/2018	5/1/2018
GENERAL CHEMISTRY (mg/kg)						
Fluoride	8.3 J-	5.83 J-	2.86	7.98	10.9	16.9
Cyanide	0.072 U	0.064 U	0.075 U	0.069 U	0.069 U	0.067 U
METALS (mg/kg)						
"Chromium, Hexavalent - Estimated"	0.246229	0.216788	0.321168	0.305109	0.302433	0.299757
"Chromium, Trivalent - Estimated"	8.95377	7.88321	11.6788	11.0949	10.9976	10.9002
Aluminum	11200	11000	15800 J	14900 J	16500 J	15400 J
Antimony	0.26 U	0.26 U	0.34 UJ	0.33 UJ	0.35 UJ	0.34 UJ
Arsenic	4.6	9.4	5.5 J	6.9 J	8 J	6.5 J
Barium	93.9	67.9	148	103	197	116
Beryllium	0.32 J	0.41	0.55	0.51	0.53	0.56
Cadmium	0.3 U	0.3 U	0.39 U	0.38 U	0.4 U	0.39 U
Calcium	1120	1900	3080 J+	4960 J+	2730 J+	16100 J+
Chromium, Total	9.2	8.1	12	11.4	11.3	11.2
Cobalt	5.5	5	5.5	5.2	6	5
Copper	9.5	14.1	12.2 J	21 J	13.2 J	15.4 J
Iron	14600	16000	18000	16400	18000	18500
Lead	12.9	11.1	12.1 J+	11.2 J+	13.8 J+	9.4 J+
Magnesium	8810	8420	10400 J	12200 J	11400 J	14800 J
Manganese	400	447	464 J	382 J	705 J	574 J
Mercury	0.011 U	0.02	0.02	0.034	0.024	0.03
Nickel	12.2	11.8	13.2	11.9	15.2	12.1
Potassium	791	616	1200 J+	1020 J+	993 J+	806 J+
Selenium	0.26 U	0.26 U	0.34 U	0.33 U	0.34 U	0.34 U
Silver	0.55 U	0.56 U	0.72 U	0.7 U	0.73 U	0.71 U
Sodium	28 U	28.1 U	36.3 U	35.4 U	37.1 U	36.2 U
Thallium	0.11 U	0.11 U	0.14 U	0.14 U	0.15 U	0.14 U
Vanadium	9.5	8	12.9 J+	9.1 J+	14.4 J+	9.7 J+
Zinc	46	37.5	53.5	42.2	55.7	44.4
PESTICIDES (mg/kg)						
Aldrin	--	--	--	--	--	--
Alpha Bhc (Alpha Hexachlorocyclohexane)	--	--	--	--	--	--
Alpha Endosulfan	--	--	--	--	--	--
Beta Bhc (Beta Hexachlorocyclohexane)	--	--	--	--	--	--
Beta Endosulfan	--	--	--	--	--	--
cis-Chlordane	--	--	--	--	--	--
Delta BHC (Delta Hexachlorocyclohexane)	--	--	--	--	--	--
Dieldrin	--	--	--	--	--	--
Endosulfan Sulfate	--	--	--	--	--	--
Endrin	--	--	--	--	--	--
Endrin Aldehyde	--	--	--	--	--	--
Endrin Ketone	--	--	--	--	--	--
Gamma Bhc (Lindane)	--	--	--	--	--	--
Heptachlor	--	--	--	--	--	--
Heptachlor Epoxide	--	--	--	--	--	--
Methoxychlor	--	--	--	--	--	--
P,P'-DDD	--	--	--	--	--	--
P,P'-DDE	--	--	--	--	--	--
P,P'-DDT	--	--	--	--	--	--
Toxaphene	--	--	--	--	--	--
trans-Chlordane	--	--	--	--	--	--
POLYCHLORINATED BIPHENYLS (mg/kg)						
PCB-1016 (Aroclor 1016)	--	--	--	--	--	--
PCB-1221 (Aroclor 1221)	--	--	--	--	--	--
PCB-1232 (Aroclor 1232)	--	--	--	--	--	--
PCB-1242 (Aroclor 1242)	--	--	--	--	--	--
PCB-1248 (Aroclor 1248)	--	--	--	--	--	--

Table E-13
Summary of Data Used in Risk Assessment
Industrial Landfill Area Soil (0-2 ft-bgs) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-250	CFSB-250	CFSB-252	CFSB-252	CFSB-253	CFSB-253
Sample Lab IDs	180-77393-35, 460-155265-37	180-77393-36, 460-155265-38	180-77393-26, 460-155265-28	180-77393-27, 460-155265-29	180-77393-29, 460-155265-31	180-77393-30, 460 155265-32
Sample Name	CFSB-250-SO-0-0.5	CFSB-250-SO-0.5-2	CFSB-252-SO-0-0.5	CFSB-252-SO-0.5-2	CFSB-253-SO-0-0.5	CFSB-253-SO-0.5-2
Sample Depth	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft
Chemical	5/1/2018	5/1/2018	5/1/2018	5/1/2018	5/1/2018	5/1/2018
PCB-1254 (Aroclor 1254)	--	--	--	--	--	--
PCB-1260 (Aroclor 1260)	--	--	--	--	--	--
PCB-1262 (Aroclor 1262)	--	--	--	--	--	--
PCB-1268 (Aroclor 1268)	--	--	--	--	--	--
Polychlorinated Biphenyl (PCBs)	--	--	--	--	--	--
SEMIVOLATILE ORGANIC COMPOUNDS (mg/kg)						
1,2,4,5-Tetrachlorobenzene	0.005 U	0.0016 U	0.0016 U	0.0016 U	0.0017 U	0.0016 U
1,4-Dioxane (P-Dioxane)	0.036 U	0.012 U	0.012 U	0.011 U	0.012 U	0.011 U
2,3,4,6-Tetrachlorophenol	0.048 U	0.016 U	0.016 U	0.015 U	0.016 U	0.015 U
2,4,5-Trichlorophenol	0.0083 U	0.0027 U	0.0027 U	0.0026 U	0.0028 U	0.0026 U
2,4,6-Trichlorophenol	0.0064 U	0.0021 U	0.002 U	0.002 U	0.0021 U	0.002 U
2,4-Dichlorophenol	0.0089 U	0.0029 U	0.0029 U	0.0028 U	0.003 U	0.0028 U
2,4-Dimethylphenol	0.0072 U	0.0023 U	0.0023 U	0.0023 U	0.0024 U	0.0023 U
2,4-Dinitrophenol	0.31 UJ	0.1 UJ	0.1 UJ	0.098 UJ	0.1 UJ	0.098 UJ
2,4-Dinitrotoluene	0.0058 U	0.0019 U	0.0019 U	0.0018 U	0.0019 U	0.0018 U
2,6-Dinitrotoluene	0.0072 U	0.0023 U	0.0023 U	0.0022 U	0.0024 U	0.0023 U
2-Chloronaphthalene	0.0053 U	0.0017 U	0.0017 U	0.0017 U	0.0018 U	0.0017 U
2-Chlorophenol	0.0054 U	0.0017 U	0.0017 U	0.0017 U	0.0018 U	0.0017 U
2-Methylnaphthalene	0.0056 U	0.0018 U	0.0018 U	0.0017 U	0.0019 U	0.0018 U
2-Methylphenol (O-Cresol)	0.033 U	0.011 U	0.011 U	0.01 U	0.011 U	0.01 U
2-Nitroaniline	0.053 U	0.017 U	0.017 U	0.017 U	0.018 U	0.017 U
2-Nitrophenol	0.0066 U	0.0022 U	0.0021 U	0.0021 U	0.0022 U	0.0021 U
3- And 4- Methylphenol (Total)	--	--	--	--	--	--
3,3'-Dichlorobenzidine	0.11 U	0.035 U	0.035 UJ	0.034 U	0.036 U	0.034 U
3-Nitroaniline	0.029 U	0.0096 U	0.0095 U	0.0092 U	0.0099 U	0.0093 U
4,6-Dinitro-2-Methylphenol	0.2 UJ	0.065 UJ	0.064 UJ	0.063 UJ	0.067 UJ	0.063 UJ
4-Bromophenyl Phenyl Ether	0.0081 U	0.0026 U	0.0026 U	0.0025 U	0.0027 U	0.0026 U
4-Chloro-3-Methylphenol	0.0055 U	0.0018 U	0.0018 U	0.0017 U	0.0018 U	0.0017 U
4-Chloroaniline	0.0039 U	0.0013 U	0.0012 U	0.0012 U	0.0013 U	0.0012 U
4-Chlorophenyl Phenyl Ether	0.007 U	0.0023 U	0.0023 U	0.0022 U	0.0023 U	0.0022 U
4-Nitroaniline	0.0056 U	0.0018 U	0.0018 U	0.0018 U	0.0019 U	0.0018 U
4-Nitrophenol	0.081 U	0.026 U	0.026 U	0.025 U	0.027 U	0.026 U
Acenaphthene	0.024	0.0022 U	0.0022 J	0.0021 U	0.0031 J	0.0021 U
Acenaphthylene	0.0051 U	0.0016 U	0.0016 U	0.0016 U	0.0017 U	0.0016 U
Acetophenone	0.0063 U	0.002 U	0.0022 J	0.002 U	0.0021 U	0.002 U
Anthracene	0.046	0.002 U	0.0041 J	0.0019 U	0.0051 J	0.0019 U
Atrazine	0.051 U	0.016 U	0.016 U	0.016 U	0.017 U	0.016 U
Benzaldehyde	0.015 J-	0.0047 UR	0.0052 J-	0.0045 UR	0.0048 UR	0.0045 UR
Benzo(A)Anthracene	0.4	0.0014 U	0.035	0.005 J	0.036	0.0016 J
Benzo(A)Pyrene	0.47	0.0016 U	0.045	0.0056 J	0.046	0.0016 U
Benzo(B)Fluoranthene	0.9	0.0019 U	0.061	0.0051 J	0.076	0.0018 J
Benzo(G,H,I)Perylene	0.53	0.0016 U	0.046	0.005 J	0.046	0.0016 U
Benzo(K)Fluoranthene	0.22	0.0023 U	0.03	0.0037 J	0.017	0.0022 U
Benzyl Butyl Phthalate	0.08 U	0.044 J+	0.026 U	0.028 J+	0.027 U	0.025 U
Biphenyl (Diphenyl)	0.0049 U	0.0016 U	0.0016 U	0.0015 U	0.0016 U	0.0015 U
Bis(2-Chloroethoxy) Methane	0.0055 U	0.0018 U	0.0018 U	0.0017 U	0.0018 U	0.0017 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.0042 U	0.0014 U	0.0014 U	0.0013 U	0.0014 U	0.0013 U
Bis(2-Chloroisopropyl) Ether	0.0086 U	0.0028 U	0.0028 U	0.0027 U	0.0029 U	0.0027 U
Bis(2-Ethylhexyl) Phthalate	0.12 U	0.063 J+	0.093 J+	0.058 J+	0.06 J+	0.039 U
Caprolactam	0.075 U	0.024 U	0.024 U	0.024 U	0.025 U	0.024 U
Carbazole	0.048	0.0018 U	0.0056 J	0.0017 U	0.0058 J	0.0017 U
Chrysene	0.59	0.0015 U	0.06	0.005 J	0.053	0.0017 J
Dibenz(A,H)Anthracene	0.12	0.0017 U	0.012	0.0016 U	0.012	0.0016 U
Dibenzofuran	0.0073 J	0.0016 U	0.0016 U	0.0016 U	0.0017 U	0.0016 U
Diethyl Phthalate	0.035 U	0.011 U	0.011 U	0.011 U	0.012 U	0.011 U
Dimethyl Phthalate	0.0042 U	0.0014 U	0.0014 U	0.0013 U	0.0014 U	0.0013 U
Di-N-Butyl Phthalate	0.051 U	0.016 U	0.016 U	0.016 U	0.017 U	0.016 U
Di-N-Octylphthalate	0.067 U	0.022 U	0.022 U	0.021 U	0.023 U	0.021 U

Table E-13
Summary of Data Used in Risk Assessment
Industrial Landfill Area Soil (0-2 ft-bgs) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-250	CFSB-250	CFSB-252	CFSB-252	CFSB-253	CFSB-253
Sample Lab IDs	180-77393-35, 460-155265-37	180-77393-36, 460-155265-38	180-77393-26, 460-155265-28	180-77393-27, 460-155265-29	180-77393-29, 460-155265-31	180-77393-30, 460 155265-32
Sample Name	CFSB-250-SO-0-0.5	CFSB-250-SO-0.5-2	CFSB-252-SO-0-0.5	CFSB-252-SO-0.5-2	CFSB-253-SO-0-0.5	CFSB-253-SO-0.5-2
Sample Depth	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft
Chemical	5/1/2018	5/1/2018	5/1/2018	5/1/2018	5/1/2018	5/1/2018
Fluoranthene	0.55	0.002 U	0.065	0.0071 J	0.062	0.0021 J
Fluorene	0.016 J	0.0015 U	0.0018 J	0.0014 U	0.0019 J	0.0014 U
Hexachlorobenzene	0.0083 U	0.0027 U	0.0027 U	0.0026 U	0.0028 U	0.0026 U
Hexachlorobutadiene	0.0068 U	0.0022 U	0.0022 U	0.0021 U	0.0023 U	0.0021 U
Hexachlorocyclopentadiene	0.0059 U	0.0019 U	0.0019 U	0.0018 U	0.002 U	0.0019 U
Hexachloroethane	0.006 U	0.0019 U	0.0019 U	0.0019 U	0.002 U	0.0019 U
Indeno(1,2,3-C,D)Pyrene	0.4	0.0015 U	0.036	0.0038 J	0.036	0.0015 U
Isophorone	0.0059 U	0.0019 U	0.0019 U	0.0018 U	0.002 U	0.0019 U
Naphthalene	0.012 J	0.0015 U	0.0015 U	0.0014 U	0.0015 U	0.0014 U
Nitrobenzene	0.042 U	0.014 U	0.014 U	0.013 U	0.014 U	0.013 U
N-Nitrosodi-N-Propylamine	0.0079 U	0.0026 U	0.0025 U	0.0025 U	0.0026 U	0.0025 U
N-Nitrosodiphenylamine	0.039 U	0.013 U	0.012 U	0.012 U	0.013 U	0.012 U
Pentachlorophenol	0.19 U	0.061 U	0.06 U	0.058 U	0.062 U	0.059 U
Phenanthrene	0.21	0.0025 J	0.025	0.0054 J	0.028	0.002 U
Phenol	0.035 U	0.011 U	0.011 U	0.011 U	0.012 U	0.011 U
Pyrene	0.51	0.0018 U	0.065	0.0057 J	0.063	0.0017 J
VOLATILE ORGANIC COMPOUNDS (mg/kg)						
1,1,1-Trichloroethane	--	--	--	--	--	--
1,1,2,2-Tetrachloroethane	--	--	--	--	--	--
1,1,2-Trichloro-1,2,2-Trifluoroethane	--	--	--	--	--	--
1,1,2-Trichloroethane	--	--	--	--	--	--
1,1-Dichloroethane	--	--	--	--	--	--
1,1-Dichloroethene	--	--	--	--	--	--
1,2,3-Trichlorobenzene	--	--	--	--	--	--
1,2,4-Trichlorobenzene	--	--	--	--	--	--
1,2-Dibromo-3-Chloropropane	--	--	--	--	--	--
1,2-Dibromoethane (Ethylene Dibromide)	--	--	--	--	--	--
1,2-Dichlorobenzene	--	--	--	--	--	--
1,2-Dichloroethane	--	--	--	--	--	--
1,2-Dichloropropane	--	--	--	--	--	--
1,3-Dichlorobenzene	--	--	--	--	--	--
1,4-Dichlorobenzene	--	--	--	--	--	--
2-Hexanone	--	--	--	--	--	--
Acetone	--	--	--	--	--	--
Benzene	--	--	--	--	--	--
Bromochloromethane	--	--	--	--	--	--
Bromodichloromethane	--	--	--	--	--	--
Bromoform	--	--	--	--	--	--
Bromomethane	--	--	--	--	--	--
Carbon Disulfide	--	--	--	--	--	--
Carbon Tetrachloride	--	--	--	--	--	--
Chlorobenzene	--	--	--	--	--	--
Chloroethane	--	--	--	--	--	--
Chloroform	--	--	--	--	--	--
Chloromethane	--	--	--	--	--	--
Cis-1,2-Dichloroethylene	--	--	--	--	--	--
Cis-1,3-Dichloropropene	--	--	--	--	--	--
Cyclohexane	--	--	--	--	--	--
Dibromochloromethane	--	--	--	--	--	--
Dichlorodifluoromethane	--	--	--	--	--	--
Ethylbenzene	--	--	--	--	--	--
Isopropylbenzene (Cumene)	--	--	--	--	--	--
M,P-Xylene	--	--	--	--	--	--
Methyl Acetate	--	--	--	--	--	--
Methyl Ethyl Ketone (2-Butanone)	--	--	--	--	--	--
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	--	--	--	--	--	--
Methylcyclohexane	--	--	--	--	--	--
Methylene Chloride	--	--	--	--	--	--

Table E-13
Summary of Data Used in Risk Assessment
Industrial Landfill Area Soil (0-2 ft-bgs) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-250	CFSB-250	CFSB-252	CFSB-252	CFSB-253	CFSB-253
Sample Lab IDs	180-77393-35, 460-155265-37	180-77393-36, 460-155265-38	180-77393-26, 460-155265-28	180-77393-27, 460-155265-29	180-77393-29, 460-155265-31	180-77393-30, 460 155265-32
Sample Name	CFSB-250-SO-0-0.5	CFSB-250-SO-0.5-2	CFSB-252-SO-0-0.5	CFSB-252-SO-0.5-2	CFSB-253-SO-0-0.5	CFSB-253-SO-0.5-2
Sample Depth	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft
Chemical	5/1/2018	5/1/2018	5/1/2018	5/1/2018	5/1/2018	5/1/2018
O-Xylene (1,2-Dimethylbenzene)	--	--	--	--	--	--
Styrene	--	--	--	--	--	--
Tert-Butyl Methyl Ether	--	--	--	--	--	--
Tetrachloroethylene (PCE)	--	--	--	--	--	--
Toluene	--	--	--	--	--	--
Trans-1,2-Dichloroethene	--	--	--	--	--	--
Trans-1,3-Dichloropropene	--	--	--	--	--	--
Trichloroethylene (TCE)	--	--	--	--	--	--
Trichlorofluoromethane	--	--	--	--	--	--
Vinyl Chloride	--	--	--	--	--	--

J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-14
Summary of Data Used in Risk Assessment
Eastern Undeveloped Area Soil (0-0.5 ft-bgs) - Current
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-181	CFSB-182	CFSB-183	CFSB-184	CFSB-185	CFSB-186	CFSB-187	CFSB-188	CFSB-209	CFSB-210	CFSB-211	CFSB-212	CFSB-267	CFSB-268
Sample Lab IDs	180-79272-34, 460-159263-19	180-79272-25, 460-159263-9	180-79272-36, 460-159263-21	180-79272-27, 460-159263-11	180-79272-23, 460-159263-7	180-79272-21, 460-159263-5	180-79434-27, 460-159377-27	180-79272-17, 460-159263-1	180-79272-32, 460-159263-16	180-79272-30, 460-159263-13	180-79272-38, 460-159263-23	180-79272-19, 460-159263-3	180-77673-36, 460-155989-58	180-77673-33, 460-155989-55
Sample Name	CFSB-181-SO-0-0.5	CFSB-182-SO-0-0.5	CFSB-183-SO-0-0.5	CFSB-184-SO-0-0.5	CFSB-185-SO-0-0.5	CFSB-186-SO-0-0.5	CFSB-187-SO-0-0.5	CFSB-188-SO-0-0.5	CFSB-209-SO-0-0.5	CFSB-210-SO-0-0.5	CFSB-211-SO-0-0.5	CFSB-212-SO-0-0.5	CFSB-267-SO-0-0.5	CFSB-268-SO-0-0.5
Sample Depth	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft
Chemical	6/26/2018	6/26/2018	6/26/2018	6/26/2018	6/26/2018	6/26/2018	6/27/2018	6/26/2018	6/26/2018	6/26/2018	6/26/2018	6/26/2018	5/10/2018	5/10/2018
GENERAL CHEMISTRY (mg/kg)														
Fluoride	16.9 J-	25.9 J-	16 J-	17.7 J-	13.1 J-	12.9 J-	27.8	0.84 J-	5.16 J-	1 J-	32.9 J+	1.55 J-	2.23 J	1.2 J
Cyanide	0.56	0.17 J	0.12 J	0.46	0.18 J	0.26 J	0.42 J+	0.067 U	0.073 U	0.065 U	0.64	0.11 U	0.12 J	0.062 U
METALS (mg/kg)														
"Chromium, Hexavalent - Estimated"	0.181995	0.198054	0.203406	0.203406	0.211436	0.179319	0.251582	0.176642	0.243552	0.208759	0.17129	0.206083	0.299757	0.227494
"Chromium, Trivalent - Estimated"	6.618	7.20195	7.39659	7.39659	7.68856	6.52068	9.14842	6.42336	8.85645	7.59124	6.22871	7.49392	10.9002	8.27251
Aluminum	24200	21800	30300	18400	13600	15600	22600	6720	22800	11800	23500	14800	8200	6600
Antimony	0.3 UJ	0.26 UJ	0.28 UJ	0.3 UJ	0.28 UJ	0.44 UJ	0.34 UJ	0.25 UJ	0.34 UJ	0.25 UJ	0.47 UJ	0.43 UJ	0.25 UJ	0.23 UJ
Arsenic	4.6 J+	4.4 J+	5.2 J+	6.1	4.4	4.5	6.6	2.8	7.9 J+	10.6 J+	5.5 J+	4.2	12.4	6.3
Barium	750	572	868	764	669	1060	765	45.3	248	103	975	287	238	102
Beryllium	0.58	0.62	0.85	0.87	0.58	0.76	0.85	0.32 J	0.54	0.39	0.62 J	0.47 J	0.38	0.35
Cadmium	0.65 J	0.3 U	0.54 J	0.66 J	0.38 J	0.64 J	0.39 U	0.29 U	0.39 U	0.29 U	0.7 J	0.5 U	0.28 U	0.27 U
Calcium	11500 J	4500 J	6030 J	6000	7050	11800	4150	15500	4140 J	8490 J	10200 J	9600	44100 J	32900 J
Chromium, Total	6.8	7.4	7.6	7.6	7.9	6.7	9.4	6.6	9.1	7.8	6.4	7.7	11.2	8.5
Cobalt	4.7	4.4	4.8	5.4	7.3	5.5	5.6	3.9	4.9	4.4	6.9	4.3	4.5	4.6
Copper	14	11.1	16.5	11.5	9.9	16.5	12.9 J+	5.9	14.2	10.9	10.4	17	13.6 J	13.2 J
Iron	8790	11400	12500	10700	12800	9560	16000	8490	15400	13600	9110	10400	12600	10400
Lead	23.9 J+	16.6 J+	25.3 J+	24.9	22.1	36.2	17.8	4.5	13.5 J+	13.3 J+	26.3 J+	12.4	12.3 J	11.7 J
Magnesium	4530	6190	4380	3660	8140	4600	5120	9120	11000	10900	2700	5120	15500 J	10200 J
Manganese	1440	924	1730	1560	2160	2710	1240 J	210	344	457	3950	287	489	469
Mercury	0.042	0.041	0.041	0.04	0.046	0.12	0.036	0.028	0.017 J	0.032	0.048	0.026 J	0.024	0.015 J
Nickel	68.9	22.5	39.6	56.7	24.4	53.9	17	8.6	21.2	11.6	54.1	19	11.1	10
Potassium	1430	1120	1680	2070	1250	1490	1590	327	1560	609	1230	788	689 J+	560 J+
Selenium	0.29 U	0.26 U	0.28 U	0.29 U	0.27 U	0.44 U	0.33 U	0.25 U	0.34 U	0.25 U	0.46 U	0.64 J	0.25 U	0.23 U
Silver	0.63 U	0.55 U	0.59 U	0.63 U	0.58 U	0.93 U	0.71 U	0.54 U	0.72 U	0.53 U	0.98 U	0.92 U	0.52 U	0.5 U
Sodium	84.2 J	92	130	80.6 J	40.9 J	76.8 J	104 J	27.1 U	141	27.1 U	123 J	189	26.5 U	25.1 U
Thallium	0.13 J	0.11 J	0.14 J	0.15 J	0.12 U	0.19 U	0.14 U	0.11 U	0.15 U	0.11 U	0.2 U	0.19 U	0.11 U	0.1 U
Vanadium	25.7	14.2	20.5	24.2	12.6	22.6	15.9	4.9	13.9	8.7	24.4	10.6	8.5	6.7
Zinc	64.3	60.1	85.9	140	79.6	85.8	105	33.1	48.3	87.4	150	33.3	45.1	34.9
SEMIVOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,2,4,5-Tetrachlorobenzene	0.0051 U	0.016 U	0.0054 U	0.0089 U	0.077 U	0.07 U	0.0035 U	0.003 U	0.0017 U	0.0016 U	0.0094 U	0.0047 U	0.0081 U	0.0015 U
1,4-Dioxane (P-Dioxane)	0.037 U	0.12 U	0.039 U	0.064 U	0.56 U	0.51 U	0.025 U	0.022 U	0.012 U	0.012 U	0.068 U	0.034 U	0.058 U	0.011 U
2,3,4,6-Tetrachlorophenol	0.049 U	0.16 U	0.052 U	0.086 U	0.74 U	0.68 U	0.034 U	0.029 U	0.016 U	0.016 U	0.091 U	0.046 U	0.078 U	0.015 U
2,4,5-Trichlorophenol	0.0084 U	0.027 U	0.009 U	0.015 U	0.13 U	0.12 U	0.0058 U	0.005 U	0.0028 U	0.0027 U	0.016 U	0.0078 U	0.013 U	0.0025 U
2,4,6-Trichlorophenol	0.0064 U	0.021 U	0.0069 U	0.011 U	0.098 U	0.089 U	0.0045 U	0.0039 U	0.0021 U	0.0021 U	0.012 U	0.006 U	0.01 U	0.0019 U
2,4-Dichlorophenol	0.009 U	0.029 U	0.0097 U	0.016 U	0.14 U	0.12 U	0.0063 U	0.0054 U	0.003 U	0.0029 U	0.017 U	0.0084 U	0.014 U	0.0027 U
2,4-Dimethylphenol	0.0073 U	0.023 U	0.0078 U	0.013 U	0.11 U	0.1 U	0.005 U	0.0044 U	0.0024 U	0.0023 U	0.013 U	0.0068 U	0.012 U	0.0022 U
2,4-Dinitrophenol	0.32 U	1 U	0.34 U	0.55 U	4.8 U	4.4 U	0.22 U	0.19 U	0.1 U	0.1 U	0.58 U	0.29 U	0.5 U	0.095 U
2,4-Dinitrotoluene	0.0058 U	0.019 U	0.0063 U	0.01 U	0.089 U	0.081 U	0.004 U	0.0035 U	0.0019 U	0.0019 U	0.011 U	0.0054 U	0.0093 U	0.0018 U
2,6-Dinitrotoluene	0.0073 U	0.023 U	0.0078 U	0.013 U	0.11 U	0.1 U	0.005 U	0.0044 U	0.0024 U	0.0023 U	0.013 U	0.0068 U	0.012 U	0.0022 U
2-Chloronaphthalene	0.0054 U	0.017 U	0.0058 U	0.0094 U	0.082 U	0.074 U	0.0037 U	0.0032 U	0.0018 U	0.0017 U	0.01 U	0.005 U	0.0086 U	0.0016 U
2-Chlorophenol	0.0055 U	0.017 U	0.0058 U	0.0096 U	0.083 U	0.075 U	0.0038 U	0.0033 U	0.0018 U	0.0017 U	0.01 U	0.0051 U	0.0087 U	0.0016 U
2-Methylnaphthalene	0.0056 J	0.018 U	0.006 U	0.0099 U	0.085 U	0.078 U	0.0051 J	0.012 J	0.0019 U	0.0018 U	0.01 U	0.0052 U	0.009 U	0.0017 U
2-Methylphenol (O-Cresol)	0.034 U	0.11 U	0.036 U	0.059 U	0.51 U	0.46 U	0.023 U	0.02 U	0.011 U	0.011 U	0.062 U	0.031 U	0.054 U	0.01 U
2-Nitroaniline	0.053 U	0.17 U	0.057 U	0.094 U	0.81 U	0.74 U	0.037 U	0.032 U	0.018 U	0.017 U	0.099 U	0.05 U	0.085 U	0.016 U
2-Nitrophenol	0.0067 U	0.021 U	0.0072 U	0.012 U	0.1 U	0.093 U	0.0046 U	0.004 U	0.0022 U	0.0021 U	0.012 U	0.0063 U	0.011 U	0.002 U
3,3'-Dichlorobenzidine	0.11 U	0.35 U	0.12 U	0.19 U	1.7 U	1.5 U	0.076 U	0.066 U	0.036 U	0.035 U	0.2 U	0.1 U	0.17 U	0.033 U
3-Nitroaniline	0.03 U	0.095 U	0.032 U	0.052 U	0.45 U	0.41 U	0.021 U	0.018 U	0.0098 U	0.0095 U	0.055 U	0.028 U	0.048 U	0.009 U
4,6-Dinitro-2-Methylphenol	0.2 U	0.64 U	0.22 U	0.35 U	3.1 U	2.8 U	0.14 U	0.12 U	0.067 U	0.064 U	0.37 U	0.19 U	0.32 U	0.061 U
4-Bromophenyl Phenyl Ether	0.0082 U	0.026 U	0.0088 U	0.014 U	0.12 U	0.11 U	0.0057 U	0.0049 U	0.0027 U	0.0026 U	0.015 U	0.0076 U	0.013 U	0.0025 U
4-Chloro-3-Methylphenol	0.0055 U	0.018 U	0.0059 U	0.0097 U	0.084 U	0.076 U	0.0038 U	0.0033 U	0.0018 U	0.0018 U	0.01 U	0.0051 U	0.0088 U	0.0017 U
4-Chloroaniline	0.0039 U	0.012 U	0.0042 U	0.0068 U	0.059 U	0.054 U	0.0027 U	0.0023 U	0.0013 U	0.0012 U	0.0072 U	0.0036 U	0.0062 U	0.0012 U
4-Chlorophenyl Phenyl Ether	0.0071 U	0.023 U	0.0076 U	0.012 U	0.11 U	0.098 U	0.0049 U	0.0043 U	0.0023 U	0.0023 U	0.013 U	0.0066 U	0.011 U	0.0021 U
4-Nitroaniline	0.0057 U	0.018 U	0.0061 U	0.01 U	0.086 U	0.079 U	0.0039 U	0.0034 U	0.0019 U	0.0018 U	0.011 U	0.0053 U	0.0091 U	0.0017 U
4-Nitrophenol	0.082 U	0.26 U	0.088 U	0.14 U	1.2 U	1.1 U	0.057 U	0.05 U	0.027 U	0.026 U	0.15 U	0.077 U	0.13 U	0.025 U
Acenaphthene	0.033	0.024 J	0.012 J	0.015 J	0.11 J	0.093 U	0.013 J	0.0081 J	0.014	0.0039 J	0.023 J	0.021 J	0.011 U	0.002 U
Acenaphthylene	0.0073 J	0.016 U	0.0055 U	0.009 U	0.078 U	0.071 U	0.0036 U	0.0031 U	0.0017 U	0.0016 U	0.0095 U	0.0048 U	0.021 J	0.0016 U
Acetophenone	0.0064 U	0.02 U	0.0068 U	0.011 U	0.097 U	0.088 U	0.0044 U	0.0052 J	0.0026 J	0.002 U	0.012 U	0.0059 U	0.01 U	0.0019 U
Anthracene	0.06	0.044 J	0.019 J	0.031 J	0.21 J	0.15 J	0.029	0.013 J	0.073	0.0069 J	0.052	0.039	0.04	0.0018 U

Table E-14
Summary of Data Used in Risk Assessment
Eastern Undeveloped Area Soil (0-0.5 ft-bgs) - Current
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-181	CFSB-182	CFSB-183	CFSB-184	CFSB-185	CFSB-186	CFSB-187	CFSB-188	CFSB-209	CFSB-210	CFSB-211	CFSB-212	CFSB-267	CFSB-268
Sample Lab IDs	180-79272-34, 460-159263-19	180-79272-25, 460-159263-9	180-79272-36, 460-159263-21	180-79272-27, 460-159263-11	180-79272-23, 460-159263-7	180-79272-21, 460-159263-5	180-79434-27, 460-159377-27	180-79272-17, 460-159263-1	180-79272-32, 460-159263-16	180-79272-30, 460-159263-13	180-79272-38, 460-159263-23	180-79272-19, 460-159263-3	180-77673-36, 460-155989-58	180-77673-33, 460-155989-55
Sample Name	CFSB-181-SO-0-0.5	CFSB-182-SO-0-0.5	CFSB-183-SO-0-0.5	CFSB-184-SO-0-0.5	CFSB-185-SO-0-0.5	CFSB-186-SO-0-0.5	CFSB-187-SO-0-0.5	CFSB-188-SO-0-0.5	CFSB-209-SO-0-0.5	CFSB-210-SO-0-0.5	CFSB-211-SO-0-0.5	CFSB-212-SO-0-0.5	CFSB-267-SO-0-0.5	CFSB-268-SO-0-0.5
Sample Depth	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft
Chemical	6/26/2018	6/26/2018	6/26/2018	6/26/2018	6/26/2018	6/26/2018	6/27/2018	6/26/2018	6/26/2018	6/26/2018	6/26/2018	6/26/2018	5/10/2018	5/10/2018
Atrazine	0.051 U	0.16 UJ	0.055 U	0.09 UJ	0.78 UJ	0.71 UJ	0.036 UJ	0.031 UJ	0.017 UJ	0.016 UJ	0.095 U	0.048 UJ	0.082 UJ	0.016 UJ
Benzaldehyde	0.015 J	0.046 U	0.016 U	0.026 U	0.22 U	0.2 U	0.01 U	0.016 J	0.007 J	0.0046 U	0.027 U	0.014 J	0.023 U	0.0044 U
Benzo(A)Anthracene	0.51	0.46	0.19	0.2	1.5	0.81	0.15	0.11	0.18	0.047	0.27	0.25	0.069	0.011
Benzo(A)Pyrene	0.86	0.75	0.32	0.29	1.9	1.3	0.22	0.14	0.13	0.054	0.43	0.29	0.11	0.017
Benzo(B)Fluoranthene	1.6	1.8	0.84	0.67	4.5	3.5	0.57	0.24	0.22	0.09	0.85	0.41	0.18	0.028
Benzo(G,H,I)Perylene	1.2	1.2	0.32	0.44	3.1	1.8	0.35	0.18	0.15	0.078	0.49	0.34	0.25	0.026
Benzo(K)Fluoranthene	0.66	0.64	0.26	0.17	1.6	0.88	0.15	0.086	0.07	0.028	0.27	0.15	0.062	0.0092
Benzyl Butyl Phthalate	0.081 U	0.26 U	0.086 U	0.14 U	1.2 U	1.1 U	0.056 U	0.048 U	0.027 U	0.026 U	0.15 U	0.075 U	0.13 U	0.024 U
Biphenyl (Diphenyl)	0.0049 U	0.016 U	0.0053 U	0.0086 U	0.075 U	0.068 U	0.0034 U	0.0041 J	0.0016 U	0.0016 U	0.0091 U	0.0046 U	0.0079 U	0.0015 U
Bis(2-Chloroethoxy) Methane	0.0056 U	0.018 U	0.006 U	0.0098 U	0.085 U	0.077 U	0.0039 U	0.0034 U	0.0018 U	0.0018 U	0.01 U	0.0052 U	0.0089 U	0.0017 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.0043 U	0.014 U	0.0046 U	0.0075 U	0.065 U	0.059 U	0.0029 U	0.0026 U	0.0014 U	0.0014 U	0.0079 U	0.004 U	0.0068 U	0.0013 U
Bis(2-Chloroisopropyl) Ether	0.0087 U	0.028 U	0.0093 U	0.015 U	0.13 U	0.12 U	0.006 U	0.0052 U	0.0029 U	0.0028 U	0.016 U	0.0081 U	0.014 U	0.0026 U
Bis(2-Ethylhexyl) Phthalate	0.12 U	0.4 U	0.15 J	0.22 U	1.9 U	1.7 U	0.086 U	0.12 J	0.041 U	0.04 U	0.23 U	0.12 U	0.2 U	0.038 U
Caprolactam	0.076 U	0.24 U	0.082 U	0.13 U	1.2 U	1.1 U	0.053 U	0.046 U	0.025 U	0.024 U	0.14 U	0.071 U	0.12 U	0.023 U
Carbazole	0.1	0.082	0.038	0.054	0.37	0.26 J	0.047	0.019	0.043	0.0095	0.072	0.051	0.023 J	0.0017 U
Chrysene	1	1	0.49	0.42	2.8	1.9	0.33	0.16	0.19	0.065	0.53	0.33	0.1	0.018
Dibenz(A,H)Anthracene	0.23	0.24	0.059	0.088	0.62	0.37	0.069	0.036	0.038	0.017	0.13	0.066	0.042	0.0016 U
Dibenzofuran	0.016 J	0.016 U	0.0088 J	0.009 U	0.078 U	0.071 U	0.0075 J	0.0055 J	0.0074 J	0.0022 J	0.028 J	0.0093 J	0.0082 U	0.0016 U
Diethyl Phthalate	0.044 J	0.11 U	0.038 U	0.062 U	0.53 U	0.49 U	0.024 U	0.021 U	0.012 J	0.011 U	0.065 U	0.033 U	0.056 U	0.011 U
Dimethyl Phthalate	0.0043 U	0.014 U	0.0046 U	0.0075 U	0.065 U	0.059 U	0.0029 U	0.0026 U	0.0014 U	0.0014 U	0.0079 U	0.004 U	0.0068 U	0.0013 U
Di-N-Butyl Phthalate	0.051 U	0.16 U	0.055 U	0.09 U	0.78 U	0.71 U	0.036 U	0.031 U	0.017 U	0.016 U	0.095 U	0.048 U	0.082 U	0.016 U
Di-N-Octylphthalate	0.068 U	0.22 U	0.073 U	0.12 U	1 U	0.94 U	0.047 U	0.041 U	0.022 U	0.022 U	0.13 U	0.064 U	0.11 U	0.021 U
Fluoranthene	1.1	0.96	0.46	0.41	2.8	1.8	0.34	0.19	0.31	0.074	0.55	0.43	0.089	0.019
Fluorene	0.022 J	0.015 U	0.0079 J	0.012 J	0.07 U	0.064 U	0.012 J	0.0055 J	0.018	0.0031 J	0.026 J	0.015 J	0.0074 U	0.0014 U
Hexachlorobenzene	0.0084 U	0.027 U	0.009 U	0.015 U	0.13 U	0.12 U	0.0058 U	0.0051 U	0.0028 U	0.0027 U	0.016 U	0.0078 U	0.013 U	0.0025 U
Hexachlorobutadiene	0.0069 U	0.022 U	0.0074 U	0.012 U	0.1 U	0.095 U	0.0047 U	0.0041 U	0.0023 U	0.0022 U	0.013 U	0.0064 U	0.011 U	0.0021 U
Hexachlorocyclopentadiene	0.006 U	0.019 U	0.0064 U	0.01 U	0.091 U	0.083 U	0.0041 U	0.0036 U	0.002 U	0.0019 U	0.011 U	0.0056 U	0.0095 U	0.0018 U
Hexachloroethane	0.0061 U	0.019 U	0.0065 U	0.011 U	0.092 U	0.084 U	0.0042 U	0.0036 U	0.002 U	0.0019 U	0.011 U	0.0056 U	0.0097 U	0.0018 U
Indeno(1,2,3-C,D)Pyrene	0.99	0.97	0.28	0.34	2.5	1.5	0.28	0.14	0.12	0.06	0.48	0.26	0.18	0.02
Isophorone	0.006 U	0.019 U	0.0064 U	0.01 U	0.091 U	0.083 U	0.0041 U	0.0036 U	0.002 U	0.0019 U	0.011 U	0.0056 U	0.0095 U	0.0018 U
Naphthalene	0.0096 J	0.015 U	0.0049 U	0.008 U	0.069 U	0.063 U	0.0063 J	0.0064 J	0.0019 J	0.0015 U	0.0085 U	0.0075 J	0.0082 J	0.0014 U
Nitrobenzene	0.043 U	0.14 U	0.046 U	0.075 U	0.65 U	0.59 U	0.03 U	0.026 U	0.014 U	0.014 U	0.08 U	0.04 U	0.068 U	0.013 U
N-Nitrosodi-N-Propylamine	0.008 U	0.025 U	0.0085 U	0.014 U	0.12 U	0.11 U	0.0055 U	0.0048 U	0.0026 U	0.0025 U	0.015 U	0.0074 U	0.013 U	0.0024 U
N-Nitrosodiphenylamine	0.039 U	0.12 U	0.042 U	0.068 U	0.59 U	0.54 U	0.027 U	0.023 U	0.013 U	0.012 U	0.072 U	0.036 U	0.062 U	0.012 U
Pentachlorophenol	0.19 U	0.6 U	0.2 U	0.33 U	2.9 U	2.6 U	0.13 U	0.11 U	0.062 U	0.06 U	0.35 U	0.18 U	0.3 U	0.057 U
Phenanthrene	0.37	0.26	0.14	0.17	1.1	0.71	0.16	0.086	0.22	0.039	0.27	0.21	0.044	0.007 J
Phenol	0.036 U	0.11 U	0.038 U	0.062 U	0.54 U	0.49 U	0.025 U	0.021 U	0.012 U	0.011 U	0.066 U	0.033 U	0.057 U	0.011 U
Pyrene	0.99	1.1	0.45	0.44	2.9	1.9	0.32	0.21	0.32	0.089	0.49	0.45	0.12	0.026

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-14
Summary of Data Used in Risk Assessment
Eastern Undeveloped Area Soil (0-0.5 ft-bgs) - Current
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-269	CFSB-282
Sample Lab IDs	180-77673-30, 460-155989-52	180-78894-9, 460-158632-9
Sample Name	CFSB-269-SO-0-0.5	CFSB-282-SO-0-0.5
Sample Depth	0-0.5 ft	0-0.5 ft
Chemical	5/9/2018	6/16/2018
GENERAL CHEMISTRY (mg/kg)		
Fluoride	0.75 J	1.8 J+
Cyanide	0.067 J	0.18 J+
METALS (mg/kg)		
"Chromium, Hexavalent - Estimated"	0.206083	0.310462
"Chromium, Trivalent - Estimated"	7.49392	11.2895
Aluminum	5350	14800
Antimony	0.24 UJ	0.56 UJ
Arsenic	4.2	7.5
Barium	71.8	237
Beryllium	0.28 J	0.46 J
Cadmium	0.28 U	0.65 U
Calcium	36400 J	18300
Chromium, Total	7.7	11.6
Cobalt	3.9	6.9
Copper	9.4 J	18.6
Iron	8940	16600
Lead	5.6 J	13.3
Magnesium	10400 J	12000
Manganese	260	1640 J
Mercury	0.011 J	0.028 J
Nickel	7.9	18.7
Potassium	523 J+	1290
Selenium	0.24 U	0.57 J
Silver	0.51 U	1.2 U
Sodium	25.8 U	60.1 U
Thallium	0.1 U	0.24 U
Vanadium	5.5	11.1
Zinc	25.3	76.9
SEMIVOLATILE ORGANIC COMPOUNDS (mg/kg)		
1,2,4,5-Tetrachlorobenzene	0.0015 U	0.012 UJ
1,4-Dioxane (P-Dioxane)	0.011 U	0.087 U
2,3,4,6-Tetrachlorophenol	0.015 U	0.12 U
2,4,5-Trichlorophenol	0.0025 U	0.02 U
2,4,6-Trichlorophenol	0.0019 U	0.015 U
2,4-Dichlorophenol	0.0027 U	0.021 U
2,4-Dimethylphenol	0.0022 U	0.017 U
2,4-Dinitrophenol	0.094 U	0.75 U
2,4-Dinitrotoluene	0.0017 U	0.014 U
2,6-Dinitrotoluene	0.0022 U	0.017 U
2-Chloronaphthalene	0.0016 U	0.013 U
2-Chlorophenol	0.0016 U	0.013 U
2-Methylnaphthalene	0.0017 U	0.013 U
2-Methylphenol (O-Cresol)	0.01 U	0.08 U
2-Nitroaniline	0.016 U	0.13 U
2-Nitrophenol	0.002 U	0.016 U
3,3'-Dichlorobenzidine	0.033 U	0.26 U
3-Nitroaniline	0.0089 U	0.071 U
4,6-Dinitro-2-Methylphenol	0.06 U	0.48 U
4-Bromophenyl Phenyl Ether	0.0024 U	0.019 U
4-Chloro-3-Methylphenol	0.0016 U	0.013 U
4-Chloroaniline	0.0012 U	0.0092 U
4-Chlorophenyl Phenyl Ether	0.0021 U	0.017 U
4-Nitroaniline	0.0017 U	0.013 U
4-Nitrophenol	0.025 U	0.19 U
Acenaphthene	0.002 U	0.034 J
Acenaphthylene	0.0015 U	0.012 U
Acetophenone	0.0019 U	0.015 U
Anthracene	0.0018 U	0.066

Table E-14
Summary of Data Used in Risk Assessment
Eastern Undeveloped Area Soil (0-0.5 ft-bgs) - Current
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Sample Depth Chemical	CFSB-269 180-77673-30, 460-155989-52 CFSB-269-SO-0-0.5 0-0.5 ft 5/9/2018	CFSB-282 180-78894-9, 460-158632-9 CFSB-282-SO-0-0.5 0-0.5 ft 6/16/2018
Atrazine	0.015 U	0.12 UJ
Benzaldehyde	0.0043 U	0.056 J
Benzo(A)Anthracene	0.0068 J	0.52
Benzo(A)Pyrene	0.0097	0.71
Benzo(B)Fluoranthene	0.015	0.9
Benzo(G,H,I)Perylene	0.01	0.66
Benzo(K)Fluoranthene	0.005 J	0.36
Benzyl Butyl Phthalate	0.024 U	0.19 U
Biphenyl (Diphenyl)	0.0015 U	0.012 U
Bis(2-Chloroethoxy) Methane	0.0017 U	0.013 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.0013 U	0.01 U
Bis(2-Chloroisopropyl) Ether	0.0026 U	0.021 U
Bis(2-Ethylhexyl) Phthalate	0.037 U	0.3 U
Caprolactam	0.023 U	0.18 U
Carbazole	0.0016 U	0.11
Chrysene	0.011	0.8
Dibenz(A,H)Anthracene	0.0016 U	0.14
Dibenzofuran	0.0015 U	0.014 J
Diethyl Phthalate	0.01 U	0.083 U
Dimethyl Phthalate	0.0013 U	0.01 U
Di-N-Butyl Phthalate	0.015 U	0.12 U
Di-N-Octylphthalate	0.027 J	0.16 U
Fluoranthene	0.014	0.96
Fluorene	0.0014 U	0.022 J
Hexachlorobenzene	0.0025 U	0.02 U
Hexachlorobutadiene	0.002 U	0.016 U
Hexachlorocyclopentadiene	0.0018 U	0.014 U
Hexachloroethane	0.0018 U	0.014 U
Indeno(1,2,3-C,D)Pyrene	0.0077	0.49
Isophorone	0.0018 U	0.014 U
Naphthalene	0.0014 U	0.021 J
Nitrobenzene	0.013 U	0.1 U
N-Nitrosodi-N-Propylamine	0.0024 U	0.019 U
N-Nitrosodiphenylamine	0.012 U	0.092 U
Pentachlorophenol	0.056 U	0.45 U
Phenanthrene	0.0045 J	0.45
Phenol	0.011 U	0.084 U
Pyrene	0.012	0.87

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-15
Summary of Data Used in Risk Assessment
Eastern Undeveloped Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-181	CFSB-181	CFSB-182	CFSB-182	CFSB-183	CFSB-183	CFSB-184	CFSB-184	CFSB-185	CFSB-185	CFSB-186	CFSB-186	CFSB-187	CFSB-187
Sample Lab IDs	180-79272-34, 460-159263-19	180-79272-35, 460-159263-20	180-79272-25, 460-159263-9	180-79272-26, 460-159263-10	180-79272-36, 460-159263-21	180-79272-37, 460-159263-22	180-79272-27, 460-159263-11	180-79272-28, 460-159263-12	180-79272-23, 460-159263-7	180-79272-24, 460-159263-8	180-79272-21, 460-159263-5	180-79272-22, 460-159263-6	180-79434-27, 460-159377-27	180-79434-28, 460-159377-28
Sample Name	CFSB-181-SO-0-0.5	CFSB-181-SO-0.5-2	CFSB-182-SO-0-0.5	CFSB-182-SO-0.5-2	CFSB-183-SO-0-0.5	CFSB-183-SO-0.5-2	CFSB-184-SO-0-0.5	CFSB-184-SO-0.5-2	CFSB-185-SO-0-0.5	CFSB-185-SO-0.5-2	CFSB-186-SO-0-0.5	CFSB-186-SO-0.5-2	CFSB-187-SO-0-0.5	CFSB-187-SO-0.5-2
Sample Depth	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft
Chemical	6/26/2018	6/26/2018	6/26/2018	6/26/2018	6/26/2018	6/26/2018	6/26/2018	6/26/2018	6/26/2018	6/26/2018	6/26/2018	6/26/2018	6/27/2018	6/27/2018
GENERAL CHEMISTRY (mg/kg)														
Fluoride	16.9 J-	24.8 J-	25.9 J-	41.3 J-	16 J-	21 J+	17.7 J-	26.8 J-	13.1 J-	22.2 J-	12.9 J-	13.2 J-	27.8	19.6
Cyanide	0.56	0.064 U	0.17 J	0.058 U	0.12 J	0.15 J	0.46	0.22 J	0.18 J	0.07 U	0.26 J	0.067 U	0.42 J+	0.13 J+
METALS (mg/kg)														
"Chromium, Hexavalent - Estimated"	0.181995	0.246229	0.198054	0.214112	0.203406	0.173966	0.203406	0.149878	0.211436	0.160584	0.179319	0.160584	0.251582	0.246229
"Chromium, Trivalent - Estimated"	6.618	8.95377	7.20195	7.78589	7.39659	6.32603	7.39659	5.45012	7.68856	5.83942	6.52068	5.83942	9.14842	8.95377
Aluminum	24200	28000	21800	28500	30300	19900	18400	15600	13600	9920	15600	12000	22600	24400
Antimony	0.3 UJ	0.27 UJ	0.26 UJ	0.27 UJ	0.28 UJ	0.29 UJ	0.3 UJ	0.26 UJ	0.28 UJ	0.26 UJ	0.44 UJ	0.25 UJ	0.34 UJ	0.3 UJ
Arsenic	4.6 J+	6.7 J+	4.4 J+	4.6 J+	5.2 J+	2.8 J+	6.1	4.3 J+	4.4	2.2	4.5	2	6.6	4.6
Barium	750	712	572	541	868	353	764	344	669	173	1060	229	765	461
Beryllium	0.58	0.72	0.62	0.87	0.85	0.5	0.87	0.44	0.58	0.29 J	0.76	0.33 J	0.85	0.75
Cadmium	0.65 J	0.31 U	0.3 U	0.31 U	0.54 J	0.33 U	0.66 J	0.3 U	0.38 J	0.3 U	0.64 J	0.29 U	0.39 U	0.34 U
Calcium	11500 J	3250 J	4500 J	4030 J	6030 J	1900 J	6000	2200 J	7050	1640	11800	1620	4150	2250
Chromium, Total	6.8	9.2	7.4	8	7.6	6.5	7.6	5.6	7.9	6	6.7	6	9.4	9.2
Cobalt	4.7	5.5	4.4	5.2	4.8	5.4	5.4	3.9	7.3	3.5	5.5	3	5.6	5.3
Copper	14	12.9	11.1	17.1	16.5	8.7	11.5	6.9	9.9	4.7	16.5	5.6	12.9 J+	12.6 J+
Iron	8790	15900	11400	14200	12500	11600	10700	9310	12800	9390	9560	9120	16000	14800
Lead	23.9 J+	14.5 J+	16.6 J+	11 J+	25.3 J+	10.1 J+	24.9	7.1 J+	22.1	7.7	36.2	7.9	17.8	11
Magnesium	4530	7210	6190	7270	4380	6430	3660	3880	8140	6740	4600	5230	5120	5330
Manganese	1440	590	924	547	1730	535	1560	702	2160	313	2710	169	1240 J	551 J
Mercury	0.042	0.014 J	0.041	0.025	0.041	0.02	0.04	0.016 J	0.046	0.012 U	0.12	0.012 J	0.036	0.011 J
Nickel	68.9	13	22.5	11.2	39.6	10.6	56.7	9.4	24.4	7.4	53.9	8	17	12.1
Potassium	1430	1750	1120	1340	1680	876	2070	1030	1250	888	1490	864	1590	1690
Selenium	0.29 U	0.27 U	0.26 U	0.27 U	0.28 U	0.28 U	0.29 U	0.26 U	0.27 U	0.26 U	0.44 U	0.25 U	0.33 U	0.29 U
Silver	0.63 U	0.57 U	0.55 U	0.57 U	0.59 U	0.61 U	0.63 U	0.55 U	0.58 U	0.56 U	0.93 U	0.53 U	0.71 U	0.63 U
Sodium	84.2 J	118	92	132	130	78.7 J	80.6 J	60.4 J	40.9 J	38.2 J	76.8 J	45.9 J	104 J	113
Thallium	0.13 J	0.13 J	0.11 J	0.11 J	0.14 J	0.12 U	0.15 J	0.11 U	0.12 U	0.11 U	0.19 U	0.11 U	0.14 U	0.13 U
Vanadium	25.7	14.7	14.2	12.4	20.5	8.5	24.2	9.5	12.6	5.5	22.6	7.4	15.9	15.6
Zinc	64.3	57.3	60.1	49.8	85.9	37.3	140	53.8	79.6	29.7	85.8	33.6	105	66.4
SEMIVOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,2,4,5-Tetrachlorobenzene	0.0051 U	0.0018 U	0.016 U	0.0016 U	0.0054 U	0.0017 U	0.0089 U	0.0032 U	0.077 U	0.0015 U	0.07 U	0.0016 U	0.0035 U	0.0016 U
1,4-Dioxane (P-Dioxane)	0.037 U	0.013 U	0.12 U	0.011 U	0.039 U	0.012 U	0.064 U	0.023 U	0.56 U	0.011 U	0.51 U	0.011 U	0.025 U	0.012 U
2,3,4,6-Tetrachlorophenol	0.049 U	0.017 U	0.16 U	0.015 U	0.052 U	0.016 U	0.086 U	0.031 U	0.74 U	0.015 U	0.68 U	0.015 U	0.034 U	0.016 U
2,4,5-Trichlorophenol	0.0084 U	0.0029 U	0.027 U	0.0026 U	0.009 U	0.0028 U	0.015 U	0.0052 U	0.13 U	0.0025 U	0.12 U	0.0026 U	0.0058 U	0.0027 U
2,4,6-Trichlorophenol	0.0064 U	0.0022 U	0.021 U	0.002 U	0.0069 U	0.0022 U	0.011 U	0.004 U	0.098 U	0.0019 U	0.089 U	0.002 U	0.0045 U	0.0021 U
2,4-Dichlorophenol	0.009 U	0.0032 U	0.029 U	0.0028 U	0.0097 U	0.003 U	0.016 U	0.0056 U	0.14 U	0.0027 U	0.12 U	0.0028 U	0.0063 U	0.0029 U
2,4-Dimethylphenol	0.0073 U	0.0025 U	0.023 U	0.0023 U	0.0078 U	0.0024 U	0.013 U	0.0045 U	0.11 U	0.0022 U	0.1 U	0.0022 U	0.005 U	0.0023 U
2,4-Dinitrophenol	0.32 U	0.11 U	1 U	0.098 U	0.34 U	0.11 U	0.55 U	0.2 U	4.8 U	0.095 U	4.4 U	0.097 U	0.22 U	0.1 U
2,4-Dinitrotoluene	0.0058 U	0.002 U	0.019 U	0.0018 U	0.0063 U	0.002 U	0.01 U	0.0036 U	0.089 U	0.0018 U	0.081 U	0.0018 U	0.004 U	0.0019 U
2,6-Dinitrotoluene	0.0073 U	0.0025 U	0.023 U	0.0022 U	0.0078 U	0.0024 U	0.013 U	0.0045 U	0.11 U	0.0022 U	0.1 U	0.0022 U	0.005 U	0.0023 U
2-Chloronaphthalene	0.0054 U	0.0019 U	0.017 U	0.0017 U	0.0058 U	0.0018 U	0.0094 U	0.0034 U	0.082 U	0.0016 U	0.074 U	0.0016 U	0.0037 U	0.0017 U
2-Chlorophenol	0.0055 U	0.0019 U	0.017 U	0.0017 U	0.0058 U	0.0018 U	0.0096 U	0.0034 U	0.083 U	0.0016 U	0.075 U	0.0017 U	0.0038 U	0.0017 U
2-Methylnaphthalene	0.0056 J	0.002 U	0.018 U	0.0017 U	0.006 U	0.0019 U	0.0099 U	0.0035 U	0.085 U	0.0017 U	0.078 U	0.0017 U	0.0051 J	0.0018 U
2-Methylphenol (O-Cresol)	0.034 U	0.012 U	0.11 U	0.01 U	0.036 U	0.011 U	0.059 U	0.021 U	0.51 U	0.01 U	0.46 U	0.01 U	0.023 U	0.011 U
2-Nitroaniline	0.053 U	0.019 U	0.17 U	0.017 U	0.057 U	0.018 U	0.094 U	0.033 U	0.81 U	0.016 U	0.74 U	0.016 U	0.037 U	0.017 U
2-Nitrophenol	0.0067 U	0.0023 U	0.021 U	0.0021 U	0.0072 U	0.0022 U	0.012 U	0.0042 U	0.1 U	0.002 U	0.093 U	0.0021 U	0.0046 U	0.0021 U
3,3'-Dichlorobenzidine	0.11 U	0.038 U	0.35 U	0.034 U	0.12 U	0.037 U	0.19 U	0.068 U	1.7 U	0.033 U	1.5 U	0.033 U	0.076 U	0.035 U
3-Nitroaniline	0.03 U	0.01 U	0.095 U	0.0092 U	0.032 U	0.01 U	0.052 U	0.019 U	0.45 U	0.009 U	0.41 U	0.0091 U	0.021 U	0.0095 U
4,6-Dinitro-2-Methylphenol	0.2 U	0.071 U	0.64 U	0.063 U	0.22 U	0.068 U	0.35 U	0.13 U	3.1 U	0.061 U	2.8 U	0.062 U	0.14 U	0.064 U
4-Bromophenyl Phenyl Ether	0.0082 U	0.0029 U	0.026 U	0.0025 U	0.0088 U	0.0027 U	0.014 U	0.0051 U	0.12 U	0.0025 U	0.11 U	0.0025 U	0.0057 U	0.0026 U
4-Chloro-3-Methylphenol	0.0055 U	0.0019 U	0.018 U	0.0017 U	0.0059 U	0.0018 U	0.0097 U	0.0034 U	0.084 U	0.0017 U	0.076 U	0.0017 U	0.0038 U	0.0018 U
4-Chloroaniline	0.0039 U	0.0014 U	0.012 U	0.0012 U	0.0042 U	0.0013 U	0.0068 U	0.0024 U	0.059 U	0.0012 U	0.054 U	0.0012 U	0.0027 U	0.0012 U
4-Chlorophenyl Phenyl Ether	0.0071 U	0.0025 U	0.023 U	0.0022 U	0.0076 U	0.0024 U	0.012 U	0.0044 U	0.11 U	0.0021 U	0.098 U	0.0022 U	0.0049 U	0.0023 U
4-Nitroaniline	0.0057 U	0.002 U	0.018 U	0.0018 U	0.0061 U	0.0019 U	0.01 U	0.0036 U	0.086 U	0.0017 U	0.079 U	0.0017 U	0.0039 U	0.0018 U
4-Nitrophenol	0.082 U	0.029 U	0.26 U	0.025 U	0.088 U	0.028 U	0.14 U	0.051 U	1.2 U	0.025 U	1.1 U	0.025 U	0.057 U	0.026 U
Acenaphthene	0.033	0.0024 U	0.024 J	0.0021 U	0.012 J	0.0031 J	0.015 J	0.011 J	0.11 J	0.0024 J	0.093 U	0.0036 J	0.013 J	0.0022 U
Acenaphthylene	0.0073 J	0.0018 U	0.016 U	0.0016 U	0.0055 U	0.0017 U	0.009 U	0.0032 U	0.078 U	0.0015 U	0.071 U	0.0016 U	0.0036 U	0.0016 U

Table E-15
Summary of Data Used in Risk Assessment
Eastern Undeveloped Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Sample Depth Chemical	CFSB-181 180-79272-34, 460-159263-19 CFSB-181-SO-0-0.5 0-0.5 ft 6/26/2018	CFSB-181 180-79272-35, 460-159263-20 CFSB-181-SO-0.5-2 0.5-2 ft 6/26/2018	CFSB-182 180-79272-25, 460-159263-9 CFSB-182-SO-0-0.5 0-0.5 ft 6/26/2018	CFSB-182 180-79272-26, 460-159263-10 CFSB-182-SO-0.5-2 0.5-2 ft 6/26/2018	CFSB-183 180-79272-36, 460-159263-21 CFSB-183-SO-0-0.5 0-0.5 ft 6/26/2018	CFSB-183 180-79272-37, 460-159263-22 CFSB-183-SO-0.5-2 0.5-2 ft 6/26/2018	CFSB-184 180-79272-27, 460-159263-11 CFSB-184-SO-0-0.5 0-0.5 ft 6/26/2018	CFSB-184 180-79272-28, 460-159263-12 CFSB-184-SO-0.5-2 0.5-2 ft 6/26/2018	CFSB-185 180-79272-23, 460-159263-7 CFSB-185-SO-0-0.5 0-0.5 ft 6/26/2018	CFSB-185 180-79272-24, 460-159263-8 CFSB-185-SO-0.5-2 0.5-2 ft 6/26/2018	CFSB-186 180-79272-21, 460-159263-5 CFSB-186-SO-0-0.5 0-0.5 ft 6/26/2018	CFSB-186 180-79272-22, 460-159263-6 CFSB-186-SO-0.5-2 0.5-2 ft 6/26/2018	CFSB-187 180-79434-27, 460-159377-27 CFSB-187-SO-0-0.5 0-0.5 ft 6/27/2018	CFSB-187 180-79434-28, 460-159377-28 CFSB-187-SO-0.5-2 0.5-2 ft 6/27/2018
Acetophenone	0.0064 U	0.0022 U	0.02 U	0.0028 J	0.0068 U	0.0031 J	0.011 U	0.0044 J	0.097 U	0.0029 J	0.088 U	0.0022 J	0.0044 U	0.002 U
Anthracene	0.06	0.0021 U	0.044 J	0.0019 J	0.019 J	0.0037 J	0.031 J	0.019	0.21 J	0.0028 J	0.15 J	0.0061 J	0.029	0.002 J
Atrazine	0.051 U	0.018 U	0.16 UJ	0.016 UJ	0.055 U	0.017 U	0.09 UJ	0.032 UJ	0.78 UJ	0.015 UJ	0.71 UJ	0.016 UJ	0.036 UJ	0.016 UJ
Benzaldehyde	0.015 J	0.0057 J	0.046 U	0.0075 J	0.016 U	0.0064 J	0.026 U	0.015 J	0.22 U	0.0054 J	0.2 U	0.0048 J	0.01 U	0.0046 U
Benzo(A)Anthracene	0.51	0.018	0.46	0.018	0.19	0.036	0.2	0.12	1.5	0.013	0.81	0.032	0.15	0.011
Benzo(A)Pyrene	0.86	0.028	0.75	0.028	0.32	0.063	0.29	0.18	1.9	0.02	1.3	0.049	0.22	0.015
Benzo(B)Fluoranthene	1.6	0.051	1.8	0.08	0.84	0.16	0.67	0.48	4.5	0.047	3.5	0.12	0.57	0.04
Benzo(G,H,I)Perylene	1.2	0.028	1.2	0.053	0.32	0.094	0.44	0.33	3.1	0.032	1.8	0.074	0.35	0.024
Benzo(K)Fluoranthene	0.66	0.02	0.64	0.018	0.26	0.066	0.17	0.15	1.6	0.012	0.88	0.032	0.15	0.0077
Benzyl Butyl Phthalate	0.081 U	0.028 U	0.26 U	0.025 U	0.086 U	0.027 U	0.14 U	0.05 U	1.2 U	0.024 U	1.1 U	0.025 U	0.056 U	0.026 U
Biphenyl (Diphenyl)	0.0049 U	0.0017 U	0.016 U	0.0015 U	0.0053 U	0.0016 U	0.0086 U	0.0031 U	0.075 U	0.0015 U	0.068 U	0.0015 U	0.0034 U	0.0016 U
Bis(2-Chloroethoxy) Methane	0.0056 U	0.002 U	0.018 U	0.0017 U	0.006 U	0.0019 U	0.0098 U	0.0035 U	0.085 U	0.0017 U	0.077 U	0.0017 U	0.0039 U	0.0018 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.0043 U	0.0015 U	0.014 U	0.0013 U	0.0046 U	0.0014 U	0.0075 U	0.0027 U	0.065 U	0.0013 U	0.059 U	0.0013 U	0.0029 U	0.0014 U
Bis(2-Chloroisopropyl) Ether	0.0087 U	0.003 U	0.028 U	0.0027 U	0.0093 U	0.0029 U	0.015 U	0.0054 U	0.13 U	0.0026 U	0.12 U	0.0027 U	0.006 U	0.0028 U
Bis(2-Ethylhexyl) Phthalate	0.12 U	0.044 U	0.4 U	0.039 U	0.15 J	0.047 J	0.22 U	0.14 J	1.9 U	0.038 U	1.7 U	0.062 J	0.086 U	0.12 J
Caprolactam	0.076 U	0.027 U	0.24 U	0.024 U	0.082 U	0.026 U	0.13 U	0.048 U	1.2 U	0.023 U	1.1 U	0.023 U	0.053 U	0.024 U
Carbazole	0.1	0.0035 J	0.082	0.0031 J	0.038	0.0081	0.054	0.034	0.37	0.004 J	0.26 J	0.0094	0.047	0.0031 J
Chrysene	1	0.038	1	0.041	0.49	0.099	0.42	0.29	2.8	0.027	1.9	0.075	0.33	0.021
Dibenz(A,H)Anthracene	0.23	0.0068 J	0.24	0.011	0.059	0.019	0.088	0.065	0.62	0.0062 J	0.37	0.016	0.069	0.0049 J
Dibenzofuran	0.016 J	0.0023 J	0.016 U	0.0026 J	0.0088 J	0.004 J	0.009 U	0.0066 J	0.078 U	0.0025 J	0.071 U	0.0032 J	0.0075 J	0.0016 U
Diethyl Phthalate	0.044 J	0.012 U	0.11 U	0.011 U	0.038 U	0.012 U	0.062 U	0.022 U	0.53 U	0.011 U	0.49 U	0.011 U	0.024 U	0.011 U
Dimethyl Phthalate	0.0043 U	0.0015 U	0.014 U	0.0013 U	0.0046 U	0.0014 U	0.0075 U	0.0027 U	0.065 U	0.0013 U	0.059 U	0.0013 U	0.0029 U	0.0014 U
Di-N-Butyl Phthalate	0.051 U	0.018 U	0.16 U	0.016 U	0.055 U	0.017 U	0.09 U	0.032 U	0.78 U	0.015 U	0.71 U	0.016 U	0.036 U	0.016 U
Di-N-Octylphthalate	0.068 U	0.024 U	0.22 U	0.021 U	0.073 U	0.023 U	0.12 U	0.043 U	1 U	0.021 U	0.94 U	0.021 U	0.047 U	0.022 U
Fluoranthene	1.1	0.04	0.96	0.038	0.46	0.095	0.41	0.24	2.8	0.027	1.8	0.069	0.34	0.019
Fluorene	0.022 J	0.0019 J	0.015 U	0.0018 J	0.0079 J	0.0034 J	0.012 J	0.0086 J	0.07 U	0.0022 J	0.064 U	0.0034 J	0.012 J	0.0015 U
Hexachlorobenzene	0.0084 U	0.0029 U	0.027 U	0.0026 U	0.009 U	0.0028 U	0.015 U	0.0053 U	0.13 U	0.0025 U	0.12 U	0.0026 U	0.0058 U	0.0027 U
Hexachlorobutadiene	0.0069 U	0.0024 U	0.022 U	0.0021 U	0.0074 U	0.0023 U	0.012 U	0.0043 U	0.1 U	0.0021 U	0.095 U	0.0021 U	0.0047 U	0.0022 U
Hexachlorocyclopentadiene	0.006 U	0.0021 U	0.019 U	0.0019 U	0.0064 U	0.002 U	0.01 U	0.0037 U	0.091 U	0.0018 U	0.083 U	0.0018 U	0.0041 U	0.0019 U
Hexachloroethane	0.0061 U	0.0021 U	0.019 U	0.0019 U	0.0065 U	0.002 U	0.011 U	0.0038 U	0.092 U	0.0018 U	0.084 U	0.0019 U	0.0042 U	0.0019 U
Indeno(1,2,3-C,D)Pyrene	0.99	0.025	0.97	0.038	0.28	0.081	0.34	0.26	2.5	0.024	1.5	0.06	0.28	0.02
Isophorone	0.006 U	0.0021 U	0.019 U	0.0019 U	0.0064 U	0.002 U	0.01 U	0.0037 U	0.091 U	0.0018 U	0.083 U	0.0018 U	0.0041 U	0.0019 U
Naphthalene	0.0096 J	0.0016 U	0.015 U	0.0016 J	0.0049 U	0.0015 U	0.008 U	0.0058 J	0.069 U	0.0018 J	0.063 U	0.0023 J	0.0063 J	0.0015 U
Nitrobenzene	0.043 U	0.015 U	0.14 U	0.013 U	0.046 U	0.014 U	0.075 U	0.027 U	0.65 U	0.013 U	0.59 U	0.013 U	0.03 U	0.014 U
N-Nitrosodi-N-Propylamine	0.008 U	0.0028 U	0.025 U	0.0025 U	0.0085 U	0.0027 U	0.014 U	0.005 U	0.12 U	0.0024 U	0.11 U	0.0024 U	0.0055 U	0.0025 U
N-Nitrosodiphenylamine	0.039 U	0.014 U	0.12 U	0.012 U	0.042 U	0.013 U	0.068 U	0.024 U	0.59 U	0.012 U	0.54 U	0.012 U	0.027 U	0.012 U
Pentachlorophenol	0.19 U	0.066 U	0.6 U	0.058 U	0.2 U	0.063 U	0.33 U	0.12 U	2.9 U	0.057 U	2.6 U	0.058 U	0.13 U	0.06 U
Phenanthrene	0.37	0.017	0.26	0.015	0.14	0.031	0.17	0.1	1.1	0.018	0.71	0.034	0.16	0.0095
Phenol	0.036 U	0.012 U	0.11 U	0.011 U	0.038 U	0.012 U	0.062 U	0.022 U	0.54 U	0.011 U	0.49 U	0.011 U	0.025 U	0.011 U
Pyrene	0.99	0.04	1.1	0.044	0.45	0.087	0.44	0.27	2.9	0.028	1.9	0.072	0.32	0.021

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-15
Summary of Data Used in Risk Assessment
Eastern Undeveloped Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-188	CFSB-188	CFSB-209	CFSB-209	CFSB-210	CFSB-210	CFSB-211	CFSB-211	CFSB-212	CFSB-212	CFSB-212-DUP	CFSB-267	CFSB-267	CFSB-267
Sample Lab IDs	180-79272-17, 460-159263-1	180-79272-18, 460-159263-2	180-79272-32, 460-159263-16	180-79272-31, 460-159263-15	180-79272-30, 460-159263-13	180-79272-29, 460-159263-14	180-79272-38, 460-159263-23	180-79272-39, 460-159263-24	180-79272-19, 460-159263-3	180-79272-20, 460-159263-4	180-79272-33, 460-159263-17	180-77673-36, 460-155989-58	180-77673-37, 460-155989-59	180-77673-38, 460-155989-60
Sample Name	CFSB-188-SO-0-0.5	CFSB-188-SO-0.5-2	CFSB-209-SO-0-0.5	CFSB-209-SO-0.5-2	CFSB-210-SO-0-0.5	CFSB-210-SO-0.5-2	CFSB-211-SO-0-0.5	CFSB-211-SO-0.5-2	CFSB-212-SO-0-0.5	CFSB-212-SO-0.5-2	CFSB-DUP43-SO	CFSB-267-SO-0-0.5	CFSB-267-SO-0.5-2	CFSB-267-SO-10-12
Sample Depth	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	10-12 ft
Chemical	6/26/2018	6/26/2018	6/26/2018	6/26/2018	6/26/2018	6/26/2018	6/26/2018	6/26/2018	6/26/2018	6/26/2018	6/26/2018	5/10/2018	5/10/2018	5/10/2018
GENERAL CHEMISTRY (mg/kg)														
Fluoride	0.84 J-	1.45 J-	5.16 J-	18.4 J-	1 J-	5.12 J-	32.9 J+	20.7 J+	1.55 J-	1.65 J	3.53 J	2.23 J	1.37 J	1.93 J
Cyanide	0.067 U	0.056 U	0.073 U	0.075 U	0.065 U	0.076 U	0.64	0.07 U	0.11 U	0.1 UJ	1.2 J	0.12 J	0.082 J	0.13 J
METALS (mg/kg)														
"Chromium, Hexavalent - Estimated"	0.176642	0.179319	0.243552	0.222141	0.208759	0.192701	0.17129	0.256934	0.206083	0.206083	0.184672	0.299757	0.224818	0.187348
"Chromium, Trivalent - Estimated"	6.42336	6.52068	8.85645	8.07786	7.59124	7.0073	6.22871	9.34307	7.49392	7.49392	6.71533	10.9002	8.17518	6.81265
Aluminum	6720	6220	22800	18100	11800	23900	23500	19700	14800	13400	13300	8200	6670	6370
Antimony	0.25 UJ	0.23 UJ	0.34 UJ	0.29 UJ	0.25 UJ	0.29 UJ	0.47 UJ	0.29 UJ	0.43 UJ	0.4 UJ	0.36 UJ	0.25 UJ	0.24 UJ	0.24 UJ
Arsenic	2.8	7.5	7.9 J+	7.5 J+	10.6 J+	6.2 J+	5.5 J+	5.8 J+	4.2	4.8	3.9 J+	12.4	6.5	3.5
Barium	45.3	123	248	262	103	449	975	476	287	324	383	238	113	222
Beryllium	0.32 J	0.4	0.54	0.46	0.39	0.61	0.62 J	0.57	0.47 J	0.38 J	0.42 J	0.38	0.23 J	0.21 J
Cadmium	0.29 U	0.26 U	0.39 U	0.33 U	0.29 U	0.33 U	0.7 J	0.33 U	0.5 U	0.46 U	0.41 U	0.28 U	0.28 U	0.27 U
Calcium	15500	36700	4140 J	2820 J	8490 J	4040 J	10200 J	3370 J	9600	11600	19400 J	44100 J	33200 J	30900 J
Chromium, Total	6.6	6.7	9.1	8.3	7.8	7.2	6.4	9.6	7.7	7.7	6.9	11.2	8.4	7
Cobalt	3.9	4.3	4.9	4.3	4.4	5.3	6.9	4.3	4.3	4.3	3.7	4.5	4.5	3.5
Copper	5.9	10.3	14.2	11.4	10.9	10.1	10.4	7.6	17	12.3	11.2	13.6 J	14.9 J	9.3 J
Iron	8490	10200	15400	13300	13600	13500	9110	15600	10400	11400	10800	12600	9520	10800
Lead	4.5	10.7	13.5 J+	10.5 J+	13.3 J+	11.6 J+	26.3 J+	11.9 J+	12.4	10.1	7.7 J+	12.3 J	12.7 J	5.3 J
Magnesium	9120	11300	11000	9040	10900	5990	2700	8780	5120	5530	4600	15500 J	10800 J	9200 J
Manganese	210	354	344	522	457	892	3950	1290	287	285	223	489	320	254
Mercury	0.028	0.014 J	0.017 J	0.022	0.032	0.011 J	0.048	0.015 J	0.026 J	0.015 U	0.02 J	0.024	0.021	0.017 J
Nickel	8.6	9.4	21.2	10.6	11.6	10.1	54.1	13.8	19	11.9	7.7	11.1	11.5	7.9
Potassium	327	691	1560	864	609	847	1230	1220	788	725	814	689 J+	488 J+	568 J+
Selenium	0.25 U	0.23 U	0.34 U	0.28 U	0.25 U	0.29 U	0.46 U	0.28 U	0.64 J	0.52 J	0.52 J	0.25 U	0.24 U	0.24 U
Silver	0.54 U	0.48 U	0.72 U	0.6 U	0.53 U	0.61 U	0.98 U	0.61 U	0.92 U	0.85 U	0.76 U	0.52 U	0.51 U	0.5 U
Sodium	27.1 U	24.5 U	141	89.9 J	27.1 U	134	123 J	79.7 J	189	174	205	26.5 U	25.9 U	25.5 U
Thallium	0.11 U	0.098 U	0.15 U	0.12 U	0.11 U	0.12 U	0.2 U	0.12 J	0.19 U	0.17 U	0.15 U	0.11 U	0.1 U	0.1 U
Vanadium	4.9	8	13.9	9.7	8.7	12.8	24.4	10.5	10.6	9.8	9.6	8.5	7.7	5.4
Zinc	33.1	63.8	48.3	54.5	87.4	46	150	93.3	33.3	28.8	24.2	45.1	40.7	26.9
SEMIVOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,2,4,5-Tetrachlorobenzene	0.003 U	0.003 U	0.0017 U	0.0017 U	0.0016 U	0.0018 U	0.0094 U	0.0017 U	0.0047 U	0.0024 U	0.0026 U	0.0081 U	0.0015 U	0.0015 U
1,4-Dioxane (P-Dioxane)	0.022 U	0.022 U	0.012 U	0.013 U	0.012 U	0.013 U	0.068 U	0.013 U	0.034 U	0.018 U	0.019 U	0.058 U	0.011 U	0.011 U
2,3,4,6-Tetrachlorophenol	0.029 U	0.029 U	0.016 U	0.017 U	0.016 U	0.017 U	0.091 U	0.017 U	0.046 U	0.023 U	0.025 U	0.078 U	0.015 U	0.015 U
2,4,5-Trichlorophenol	0.005 U	0.005 U	0.0028 U	0.0029 U	0.0027 U	0.003 U	0.016 U	0.0029 U	0.0078 U	0.004 U	0.0043 U	0.013 U	0.0025 U	0.0025 U
2,4,6-Trichlorophenol	0.0039 U	0.0038 U	0.0021 U	0.0022 U	0.0021 U	0.0023 U	0.012 U	0.0022 U	0.006 U	0.0031 U	0.0033 U	0.01 U	0.0019 U	0.0019 U
2,4-Dichlorophenol	0.0054 U	0.0054 U	0.003 U	0.0031 U	0.0029 U	0.0032 U	0.017 U	0.0031 U	0.0084 U	0.0043 U	0.0046 U	0.014 U	0.0027 U	0.0027 U
2,4-Dimethylphenol	0.0044 U	0.0043 U	0.0024 U	0.0025 U	0.0023 U	0.0026 U	0.013 U	0.0025 U	0.0068 U	0.0035 U	0.0037 U	0.012 U	0.0022 U	0.0022 U
2,4-Dinitrophenol	0.19 U	0.19 U	0.1 U	0.11 U	0.1 U	0.11 U	0.58 U	0.11 U	0.29 U	0.15 U	0.16 U	0.5 U	0.095 U	0.094 U
2,4-Dinitrotoluene	0.0035 U	0.0035 U	0.0019 U	0.002 U	0.0019 U	0.0021 U	0.011 U	0.002 U	0.0054 U	0.0028 U	0.003 U	0.0093 U	0.0018 U	0.0017 U
2,6-Dinitrotoluene	0.0044 U	0.0043 U	0.0024 U	0.0025 U	0.0023 U	0.0026 U	0.013 U	0.0025 U	0.0068 U	0.0035 U	0.0037 U	0.012 U	0.0022 U	0.0022 U
2-Chloronaphthalene	0.0032 U	0.0032 U	0.0018 U	0.0018 U	0.0017 U	0.0019 U	0.01 U	0.0019 U	0.005 U	0.0026 U	0.0027 U	0.0086 U	0.0016 U	0.0016 U
2-Chlorophenol	0.0033 U	0.0033 U	0.0018 U	0.0019 U	0.0017 U	0.0019 U	0.01 U	0.0019 U	0.0051 U	0.0026 U	0.0028 U	0.0087 U	0.0016 U	0.0016 U
2-Methylnaphthalene	0.012 J	0.011 J	0.0019 U	0.0019 U	0.0018 U	0.002 U	0.01 U	0.0019 U	0.0052 U	0.0027 U	0.0029 U	0.009 U	0.0031 J	0.0017 U
2-Methylphenol (O-Cresol)	0.02 U	0.02 U	0.011 U	0.012 U	0.011 U	0.012 U	0.062 U	0.012 U	0.031 U	0.016 U	0.017 U	0.054 U	0.01 U	0.01 U
2-Nitroaniline	0.032 U	0.032 U	0.018 U	0.018 U	0.017 U	0.019 U	0.099 U	0.018 U	0.05 U	0.026 U	0.027 U	0.085 U	0.016 U	0.016 U
2-Nitrophenol	0.004 U	0.004 U	0.0022 U	0.0023 U	0.0021 U	0.0024 U	0.012 U	0.0023 U	0.0063 U	0.0032 U	0.0034 U	0.011 U	0.002 U	0.002 U
3,3'-Dichlorobenzidine	0.066 U	0.065 U	0.036 U	0.038 U	0.035 U	0.039 U	0.2 U	0.038 U	0.1 U	0.052 U	0.056 U	0.17 U	0.033 U	0.033 U
3-Nitroaniline	0.018 U	0.018 U	0.0098 U	0.01 U	0.0095 U	0.011 U	0.055 U	0.01 U	0.028 U	0.014 U	0.015 U	0.048 U	0.009 U	0.0089 U
4,6-Dinitro-2-Methylphenol	0.12 U	0.12 U	0.067 U	0.069 U	0.064 U	0.071 U	0.37 U	0.07 U	0.19 U	0.097 U	0.1 U	0.32 U	0.061 U	0.06 U
4-Bromophenyl Phenyl Ether	0.0049 U	0.0049 U	0.0027 U	0.0028 U	0.0026 U	0.0029 U	0.015 U	0.0028 U	0.0076 U	0.0039 U	0.0042 U	0.013 U	0.0025 U	0.0024 U
4-Chloro-3-Methylphenol	0.0033 U	0.0033 U	0.0018 U	0.0019 U	0.0018 U	0.002 U	0.01 U	0.0019 U	0.0051 U	0.0026 U	0.0028 U	0.0088 U	0.0017 U	0.0017 U
4-Chloroaniline	0.0023 U	0.0023 U	0.0013 U	0.0013 U	0.0012 U	0.0014 U	0.0072 U	0.0013 U	0.0036 U	0.0019 U	0.002 U	0.0062 U	0.0012 U	0.0012 U
4-Chlorophenyl Phenyl Ether	0.0043 U	0.0042 U	0.0023 U	0.0024 U	0.0023 U	0.0025 U	0.013 U	0.0024 U	0.0066 U	0.0034 U	0.0036 U	0.011 U	0.0021 U	0.0021 U
4-Nitroaniline	0.0034 U	0.0034 U	0.0019 U	0.002 U	0.0018 U	0.002 U	0.011 U	0.002 U	0.0053 U	0.0027 U	0.0029 U	0.0091 U	0.0017 U	0.0017 U
4-Nitrophenol	0.05 U	0.049 U	0.027 U	0.028 U	0.026 U	0.029 U	0.15 U	0.028 U	0.077 U	0.039 U	0.042 U	0.13 U	0.025 U	0.025 U
Acenaphthene	0.0081 J	0.0044 J	0.014	0.0056 J	0.0039 J	0.0024 U	0.023 J	0.0038 J	0.021 J	0.01 J	0.0046 J	0.011 U	0.0037 J	0.002 U
Acenaphthylene	0.0031 U	0.0031 U	0.0017 U	0.0018 U	0.0016 U	0.0018 U	0.0095 U	0.0018 U	0.0048 U	0.0025 U	0.0026 U	0.021 J	0.0069 J	0.0015 U

Table E-15
Summary of Data Used in Risk Assessment
Eastern Undeveloped Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Sample Depth Chemical	CFSB-188 180-79272-17, 460-159263-1 CFSB-188-SO-0-0.5 0-0.5 ft 6/26/2018	CFSB-188 180-79272-18, 460-159263-2 CFSB-188-SO-0.5-2 0.5-2 ft 6/26/2018	CFSB-209 180-79272-32, 460-159263-16 CFSB-209-SO-0-0.5 0-0.5 ft 6/26/2018	CFSB-209 180-79272-31, 460-159263-15 CFSB-209-SO-0.5-2 0.5-2 ft 6/26/2018	CFSB-210 180-79272-30, 460-159263-13 CFSB-210-SO-0-0.5 0-0.5 ft 6/26/2018	CFSB-210 180-79272-29, 460-159263-14 CFSB-210-SO-0.5-2 0.5-2 ft 6/26/2018	CFSB-211 180-79272-38, 460-159263-23 CFSB-211-SO-0-0.5 0-0.5 ft 6/26/2018	CFSB-211 180-79272-39, 460-159263-24 CFSB-211-SO-0.5-2 0.5-2 ft 6/26/2018	CFSB-212 180-79272-19, 460-159263-3 CFSB-212-SO-0-0.5 0-0.5 ft 6/26/2018	CFSB-212 180-79272-20, 460-159263-4 CFSB-212-SO-0.5-2 0.5-2 ft 6/26/2018	CFSB-212-DUP 180-79272-33, 460-159263-17 CFSB-DUP43-SO 0.5-2 ft 6/26/2018	CFSB-267 180-77673-36, 460-155989-58 CFSB-267-SO-0-0.5 0-0.5 ft 5/10/2018	CFSB-267 180-77673-37, 460-155989-59 CFSB-267-SO-0.5-2 0.5-2 ft 5/10/2018	CFSB-267 180-77673-38, 460-155989-60 CFSB-267-SO-10-12 10-12 ft 5/10/2018
Acetophenone	0.0052 J	0.004 J	0.0026 J	0.003 J	0.002 U	0.0022 U	0.012 U	0.0028 J	0.0059 U	0.0031 J	0.0032 U	0.01 U	0.0019 U	0.0019 U
Anthracene	0.013 J	0.0058 J	0.073	0.0077 J	0.0069 J	0.0022 U	0.052	0.0053 J	0.039	0.016 J	0.0061 J	0.04	0.015	0.0018 U
Atrazine	0.031 UJ	0.031 UJ	0.017 UJ	0.018 UJ	0.016 UJ	0.018 UJ	0.095 U	0.018 U	0.048 UJ	0.025 UJ	0.026 U	0.082 UJ	0.016 UJ	0.015 UJ
Benzaldehyde	0.016 J	0.0087 U	0.007 J	0.0073 J	0.0046 U	0.0051 U	0.027 U	0.0063 J	0.014 J	0.01 J	0.0076 J	0.023 U	0.0044 U	0.0044 U
Benzo(A)Anthracene	0.11	0.039	0.18	0.039	0.047	0.013	0.27	0.037	0.25	0.11 J	0.035 J	0.069	0.038	0.0013 U
Benzo(A)Pyrene	0.14	0.043	0.13	0.042	0.054	0.0097	0.43	0.054	0.29	0.13 J	0.04 J	0.11	0.055	0.0015 U
Benzo(B)Fluoranthene	0.24	0.078	0.22	0.082	0.09	0.017	0.85	0.11	0.41	0.17 J	0.061 J	0.18	0.086	0.0017 U
Benzo(G,H,I)Perylene	0.18	0.061	0.15	0.066	0.078	0.017	0.49	0.063	0.34	0.15 J	0.051 J	0.25	0.11	0.0015 U
Benzo(K)Fluoranthene	0.086	0.025	0.07	0.021	0.028	0.0047 J	0.27	0.026	0.15	0.07 J	0.017 J	0.062	0.027	0.0021 U
Benzyl Butyl Phthalate	0.048 U	0.048 U	0.027 U	0.028 U	0.026 U	0.028 U	0.15 U	0.028 U	0.075 U	0.039 U	0.041 U	0.13 U	0.024 U	0.024 U
Biphenyl (Diphenyl)	0.0041 J	0.0036 J	0.0016 U	0.0017 U	0.0016 U	0.0017 U	0.0091 U	0.0017 U	0.0046 U	0.0024 U	0.0025 U	0.0079 U	0.0015 U	0.0015 U
Bis(2-Chloroethoxy) Methane	0.0034 U	0.0033 U	0.0018 U	0.0019 U	0.0018 U	0.002 U	0.01 U	0.0019 U	0.0052 U	0.0027 U	0.0028 U	0.0089 U	0.0017 U	0.0017 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.0026 U	0.0025 U	0.0014 U	0.0015 U	0.0014 U	0.0015 U	0.0079 U	0.0015 U	0.004 U	0.002 U	0.0022 U	0.0068 U	0.0013 U	0.0013 U
Bis(2-Chloroisopropyl) Ether	0.0052 U	0.0052 U	0.0029 U	0.003 U	0.0028 U	0.0031 U	0.016 U	0.003 U	0.0081 U	0.0042 U	0.0044 U	0.014 U	0.0026 U	0.0026 U
Bis(2-Ethylhexyl) Phthalate	0.12 J	0.075 U	0.041 U	0.043 U	0.04 U	0.044 U	0.23 U	0.043 U	0.12 U	0.071 J	0.064 U	0.2 U	0.038 U	0.037 U
Caprolactam	0.046 U	0.046 U	0.025 U	0.026 U	0.024 U	0.027 U	0.14 U	0.026 U	0.071 U	0.037 U	0.039 J	0.12 U	0.023 U	0.023 U
Carbazole	0.019	0.0084 J	0.043	0.0094	0.0095	0.0027 J	0.072	0.0082	0.051	0.024 J	0.0085 J	0.023 J	0.01	0.0016 U
Chrysene	0.16	0.054	0.19	0.061	0.065	0.015	0.53	0.067	0.33	0.15 J	0.048 J	0.1	0.057	0.0014 U
Dibenz(A,H)Anthracene	0.036	0.012 J	0.038	0.015	0.017	0.0019 U	0.13	0.014	0.066	0.034 J	0.012 J	0.042	0.018	0.0016 U
Dibenzofuran	0.0055 J	0.0043 J	0.0074 J	0.0043 J	0.0022 J	0.002 J	0.028 J	0.0035 J	0.0093 J	0.0051 J	0.0039 J	0.0082 U	0.0029 J	0.0015 U
Diethyl Phthalate	0.021 U	0.021 U	0.012 J	0.012 U	0.011 U	0.012 U	0.065 U	0.012 U	0.033 U	0.017 U	0.018 U	0.056 U	0.011 U	0.011 U
Dimethyl Phthalate	0.0026 U	0.0025 U	0.0014 U	0.0015 U	0.0014 U	0.0015 U	0.0079 U	0.0015 U	0.004 U	0.002 U	0.0022 U	0.0068 U	0.0013 U	0.0013 U
Di-N-Butyl Phthalate	0.031 U	0.031 U	0.017 U	0.018 U	0.016 U	0.018 U	0.095 U	0.018 U	0.048 U	0.025 U	0.026 U	0.082 U	0.016 U	0.015 U
Di-N-Octylphthalate	0.041 U	0.041 U	0.022 U	0.023 U	0.022 U	0.024 U	0.13 U	0.023 U	0.064 U	0.033 U	0.035 U	0.11 U	0.021 U	0.02 U
Fluoranthene	0.19	0.065	0.31	0.068	0.074	0.012	0.55	0.074	0.43	0.19 J	0.056 J	0.089	0.058	0.0019 U
Fluorene	0.0055 J	0.0039 J	0.018	0.0051 J	0.0031 J	0.0016 U	0.026 J	0.0039 J	0.015 J	0.008 J	0.0038 J	0.0074 U	0.0026 J	0.0014 U
Hexachlorobenzene	0.0051 U	0.005 U	0.0028 U	0.0029 U	0.0027 U	0.003 U	0.016 U	0.0029 U	0.0078 U	0.004 U	0.0043 U	0.013 U	0.0025 U	0.0025 U
Hexachlorobutadiene	0.0041 U	0.0041 U	0.0023 U	0.0024 U	0.0022 U	0.0024 U	0.013 U	0.0024 U	0.0064 U	0.0033 U	0.0035 U	0.011 U	0.0021 U	0.0021 U
Hexachlorocyclopentadiene	0.0036 U	0.0036 U	0.002 U	0.0021 U	0.0019 U	0.0021 U	0.011 U	0.0021 U	0.0056 U	0.0029 U	0.003 U	0.0095 U	0.0018 U	0.0018 U
Hexachloroethane	0.0036 U	0.0036 U	0.002 U	0.0021 U	0.0019 U	0.0021 U	0.011 U	0.0021 U	0.0056 U	0.0029 U	0.0031 U	0.0097 U	0.0018 U	0.0018 U
Indeno(1,2,3-C,D)Pyrene	0.14	0.048	0.12	0.05	0.06	0.013	0.48	0.054	0.26	0.11 J	0.037 J	0.18	0.08	0.0014 U
Isophorone	0.0036 U	0.0036 U	0.002 U	0.0021 U	0.0019 U	0.0021 U	0.011 U	0.0021 U	0.0056 U	0.0029 U	0.003 U	0.0095 U	0.0018 U	0.0018 U
Naphthalene	0.0064 J	0.0054 J	0.0019 J	0.0027 J	0.0015 U	0.0016 U	0.0085 U	0.0023 J	0.0075 J	0.0038 J	0.0023 U	0.0082 J	0.0048 J	0.0014 U
Nitrobenzene	0.026 U	0.026 U	0.014 U	0.015 U	0.014 U	0.015 U	0.08 U	0.015 U	0.04 U	0.021 U	0.022 U	0.068 U	0.013 U	0.013 U
N-Nitrosodi-N-Propylamine	0.0048 U	0.0047 U	0.0026 U	0.0027 U	0.0025 U	0.0028 U	0.015 U	0.0027 U	0.0074 U	0.0038 U	0.004 U	0.013 U	0.0024 U	0.0024 U
N-Nitrosodiphenylamine	0.023 U	0.023 U	0.013 U	0.013 U	0.012 U	0.014 U	0.072 U	0.013 U	0.036 U	0.019 U	0.02 U	0.062 U	0.012 U	0.012 U
Pentachlorophenol	0.11 U	0.11 U	0.062 U	0.065 U	0.06 U	0.067 U	0.35 U	0.065 U	0.18 U	0.09 U	0.096 U	0.3 U	0.057 U	0.056 U
Phenanthrene	0.086	0.038	0.22	0.044	0.039	0.011	0.27	0.037	0.21	0.098 J	0.039 J	0.044	0.03	0.0019 U
Phenol	0.021 U	0.021 U	0.012 U	0.012 U	0.011 U	0.013 U	0.066 U	0.012 U	0.033 U	0.017 U	0.018 U	0.057 U	0.011 U	0.011 U
Pyrene	0.21	0.068	0.32	0.074	0.089	0.012	0.49	0.078	0.45	0.19 J	0.062 J	0.12	0.081	0.0017 U

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-15
Summary of Data Used in Risk Assessment
Eastern Undeveloped Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-268	CFSB-268	CFSB-268	CFSB-269	CFSB-269	CFSB-269	CFSB-282
Sample Lab IDs	180-77673-33, 460-155989-55	180-77673-34, 460-155989-56	180-77673-35, 460-155989-57	180-77673-30, 460-155989-52	180-77673-31, 460-155989-53	180-77673-32, 460-155989-54	180-78894-9, 460-158632-9
Sample Name	CFSB-268-SO-0-0.5	CFSB-268-SO-0.5-2	CFSB-268-SO-10-12	CFSB-269-SO-0-0.5	CFSB-269-SO-0.5-2	CFSB-269-SO-10-12	CFSB-282-SO-0-0.5
Sample Depth	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft
Chemical	5/10/2018	5/10/2018	5/10/2018	5/9/2018	5/9/2018	5/9/2018	6/16/2018
GENERAL CHEMISTRY (mg/kg)							
Fluoride	1.2 J	1.35 J	1.15 J	0.75 J	0.69 J	0.75 J	1.8 J+
Cyanide	0.062 U	0.11 J	0.09 J	0.067 J	0.064 U	0.079 J	0.18 J+
METALS (mg/kg)							
"Chromium, Hexavalent - Estimated"	0.227494	0.195377	0.305109	0.206083	0.190024	0.216788	0.310462
"Chromium, Trivalent - Estimated"	8.27251	7.10462	11.0949	7.49392	6.90998	7.88321	11.2895
Aluminum	6600	6200	6970	5350	6690	5990	14800
Antimony	0.23 UJ	0.23 UJ	0.25 UJ	0.24 UJ	0.24 UJ	0.25 UJ	0.56 UJ
Arsenic	6.3	6.4	7.1	4.2	5.1	4.9	7.5
Barium	102	110	229	71.8	62.6	98.2	237
Beryllium	0.35	0.27 J	0.31 J	0.28 J	0.33	0.38	0.46 J
Cadmium	0.27 U	0.27 U	0.29 U	0.28 U	0.28 U	0.28 U	0.65 U
Calcium	32900 J	26800 J	40300 J	36400 J	54100 J	50700 J	18300
Chromium, Total	8.5	7.3	11.4	7.7	7.1	8.1	11.6
Cobalt	4.6	4.2	4.4	3.9	4.2	4.7	6.9
Copper	13.2 J	10 J	15 J	9.4 J	10.4 J	8.9 J	18.6
Iron	10400	9130	10900	8940	10400	9960	16600
Lead	11.7 J	8.8 J	9.1 J	5.6 J	6 J	6.7 J	13.3
Magnesium	10200 J	10200 J	10500 J	10400 J	12600 J	13600 J	12000
Manganese	469	292	323	260	276	323	1640 J
Mercury	0.015 J	0.015 J	0.014 J	0.011 J	0.024	0.02	0.028 J
Nickel	10	8.6	8.9	7.9	8.4	8.1	18.7
Potassium	560 J+	637 J+	670 J+	523 J+	528 J+	579 J+	1290
Selenium	0.23 U	0.23 U	0.25 U	0.24 U	0.24 U	0.24 U	0.57 J
Silver	0.5 U	0.49 U	0.53 U	0.51 U	0.51 U	0.52 U	1.2 U
Sodium	25.1 U	25.1 U	26.7 U	25.8 U	25.9 U	26.3 U	60.1 U
Thallium	0.1 U	0.1 U	0.11 U	0.1 U	0.1 U	0.11 U	0.24 U
Vanadium	6.7	5.4	6	5.5	6.1	5.8	11.1
Zinc	34.9	29	30.1	25.3	29.6	26.7	76.9
SEMIVOLATILE ORGANIC COMPOUNDS (mg/kg)							
1,2,4,5-Tetrachlorobenzene	0.0015 U	0.0015 U	0.0015 U	0.0015 U	0.0015 U	0.0015 U	0.012 UJ
1,4-Dioxane (P-Dioxane)	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.087 U
2,3,4,6-Tetrachlorophenol	0.015 U	0.014 U	0.014 U	0.015 U	0.015 U	0.015 U	0.12 U
2,4,5-Trichlorophenol	0.0025 U	0.0024 U	0.0025 U	0.0025 U	0.0025 U	0.0025 U	0.02 U
2,4,6-Trichlorophenol	0.0019 U	0.0019 U	0.0019 U	0.0019 U	0.0019 U	0.0019 U	0.015 U
2,4-Dichlorophenol	0.0027 U	0.0026 U	0.0026 U	0.0027 U	0.0027 U	0.0027 U	0.021 U
2,4-Dimethylphenol	0.0022 U	0.0021 U	0.0021 U	0.0022 U	0.0022 U	0.0022 U	0.017 U
2,4-Dinitrophenol	0.095 U	0.091 U	0.092 U	0.094 U	0.094 U	0.094 U	0.75 U
2,4-Dinitrotoluene	0.0018 U	0.0017 U	0.0017 U	0.0017 U	0.0017 U	0.0017 U	0.014 U
2,6-Dinitrotoluene	0.0022 U	0.0021 U	0.0021 U	0.0022 U	0.0022 U	0.0022 U	0.017 U
2-Chloronaphthalene	0.0016 U	0.0016 U	0.0016 U	0.0016 U	0.0016 U	0.0016 U	0.013 U
2-Chlorophenol	0.0016 U	0.0016 U	0.0016 U	0.0016 U	0.0016 U	0.0016 U	0.013 U
2-Methylnaphthalene	0.0017 U	0.0016 U	0.0016 U	0.0017 U	0.0017 U	0.0017 U	0.013 U
2-Methylphenol (O-Cresol)	0.01 U	0.0097 U	0.0098 U	0.01 U	0.01 U	0.01 U	0.08 U
2-Nitroaniline	0.016 U	0.015 U	0.016 U	0.016 U	0.016 U	0.016 U	0.13 U
2-Nitrophenol	0.002 U	0.0019 U	0.002 U	0.002 U	0.002 U	0.002 U	0.016 U
3,3'-Dichlorobenzidine	0.033 U	0.032 U	0.032 U	0.033 U	0.033 U	0.033 U	0.26 U
3-Nitroaniline	0.009 U	0.0086 U	0.0087 U	0.0089 U	0.0089 U	0.0089 U	0.071 U
4,6-Dinitro-2-Methylphenol	0.061 U	0.058 U	0.059 U	0.06 U	0.06 U	0.06 U	0.48 U
4-Bromophenyl Phenyl Ether	0.0025 U	0.0024 U	0.0024 U	0.0024 U	0.0024 U	0.0024 U	0.019 U
4-Chloro-3-Methylphenol	0.0017 U	0.0016 U	0.0016 U	0.0016 U	0.0016 U	0.0016 U	0.013 U
4-Chloroaniline	0.0012 U	0.0011 U	0.0011 U	0.0012 U	0.0012 U	0.0012 U	0.0092 U
4-Chlorophenyl Phenyl Ether	0.0021 U	0.0021 U	0.0021 U	0.0021 U	0.0021 U	0.0021 U	0.017 U
4-Nitroaniline	0.0017 U	0.0016 U	0.0017 U	0.0017 U	0.0017 U	0.0017 U	0.013 U
4-Nitrophenol	0.025 U	0.024 U	0.024 U	0.025 U	0.025 U	0.025 U	0.19 U
Acenaphthene	0.002 U	0.0019 U	0.002 U	0.002 U	0.002 U	0.002 U	0.034 J
Acenaphthylene	0.0016 U	0.0015 U	0.0015 U	0.0015 U	0.0015 U	0.0015 U	0.012 U

Table E-15
Summary of Data Used in Risk Assessment
Eastern Undeveloped Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-268	CFSB-268	CFSB-268	CFSB-269	CFSB-269	CFSB-269	CFSB-282
Sample Lab IDs	180-77673-33, 460-155989-55	180-77673-34, 460-155989-56	180-77673-35, 460-155989-57	180-77673-30, 460-155989-52	180-77673-31, 460-155989-53	180-77673-32, 460-155989-54	180-78894-9, 460-158632-9
Sample Name	CFSB-268-SO-0-0.5	CFSB-268-SO-0.5-2	CFSB-268-SO-10-12	CFSB-269-SO-0-0.5	CFSB-269-SO-0.5-2	CFSB-269-SO-10-12	CFSB-282-SO-0-0.5
Sample Depth	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft
Chemical	5/10/2018	5/10/2018	5/10/2018	5/9/2018	5/9/2018	5/9/2018	6/16/2018
Acetophenone	0.0019 U	0.0018 U	0.0019 U	0.0019 U	0.0019 U	0.0019 U	0.015 U
Anthracene	0.0018 U	0.0018 U	0.0018 U	0.0018 U	0.0018 U	0.0018 U	0.066
Atrazine	0.016 UJ	0.015 UJ	0.015 U	0.015 U	0.015 UJ	0.015 UJ	0.12 UJ
Benzaldehyde	0.0044 U	0.0042 U	0.0043 U	0.0043 U	0.0043 U	0.0043 U	0.056 J
Benzo(A)Anthracene	0.011	0.014	0.0013 U	0.0068 J	0.0023 J	0.0033 J	0.52
Benzo(A)Pyrene	0.017	0.019	0.0015 U	0.0097	0.0026 J	0.0044 J	0.71
Benzo(B)Fluoranthene	0.028	0.03	0.002 J	0.015	0.0041 J	0.0064 J	0.9
Benzo(G,H,I)Perylene	0.026	0.028	0.0018 J	0.01	0.0035 J	0.0054 J	0.66
Benzo(K)Fluoranthene	0.0092	0.01	0.0021 U	0.005 J	0.0021 U	0.0026 J	0.36
Benzyl Butyl Phthalate	0.024 U	0.023 U	0.024 U	0.024 U	0.024 U	0.024 U	0.19 U
Biphenyl (Diphenyl)	0.0015 U	0.0014 U	0.0014 U	0.0015 U	0.0015 U	0.0015 U	0.012 U
Bis(2-Chloroethoxy) Methane	0.0017 U	0.0016 U	0.0016 U	0.0017 U	0.0017 U	0.0017 U	0.013 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.0013 U	0.0012 U	0.0012 U	0.0013 U	0.0013 U	0.0013 U	0.01 U
Bis(2-Chloroisopropyl) Ether	0.0026 U	0.0025 U	0.0025 U	0.0026 U	0.0026 U	0.0026 U	0.021 U
Bis(2-Ethylhexyl) Phthalate	0.038 U	0.036 U	0.037 U	0.037 U	0.037 U	0.037 U	0.3 U
Caprolactam	0.023 U	0.022 U	0.022 U	0.023 U	0.023 U	0.023 U	0.18 U
Carbazole	0.0017 U	0.0016 U	0.0016 U	0.0016 U	0.0016 U	0.0016 U	0.11
Chrysene	0.018	0.02	0.0016 J	0.011	0.0028 J	0.0048 J	0.8
Dibenz(A,H)Anthracene	0.0016 U	0.0015 U	0.0015 U	0.0016 U	0.0016 U	0.0016 U	0.14
Dibenzofuran	0.0016 U	0.0015 U	0.0015 U	0.0015 U	0.0015 U	0.0015 U	0.014 J
Diethyl Phthalate	0.011 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.083 U
Dimethyl Phthalate	0.0013 U	0.0012 U	0.0012 U	0.0013 U	0.0013 U	0.0013 U	0.01 U
Di-N-Butyl Phthalate	0.016 U	0.015 U	0.015 U	0.015 U	0.015 U	0.015 U	0.12 U
Di-N-Octylphthalate	0.021 U	0.02 U	0.02 U	0.027 J	0.02 U	0.02 U	0.16 U
Fluoranthene	0.019	0.02	0.0018 J	0.014	0.0035 J	0.0054 J	0.96
Fluorene	0.0014 U	0.0013 U	0.0013 U	0.0014 U	0.0014 U	0.0014 U	0.022 J
Hexachlorobenzene	0.0025 U	0.0024 U	0.0025 U	0.0025 U	0.0025 U	0.0025 U	0.02 U
Hexachlorobutadiene	0.0021 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.016 U
Hexachlorocyclopentadiene	0.0018 U	0.0017 U	0.0018 U	0.0018 U	0.0018 U	0.0018 U	0.014 U
Hexachloroethane	0.0018 U	0.0017 U	0.0018 U	0.0018 U	0.0018 U	0.0018 U	0.014 U
Indeno(1,2,3-C,D)Pyrene	0.02	0.02	0.0014 U	0.0077	0.0026 J	0.0039 J	0.49
Isophorone	0.0018 U	0.0017 U	0.0018 U	0.0018 U	0.0018 U	0.0018 U	0.014 U
Naphthalene	0.0014 U	0.0013 U	0.0013 U	0.0014 U	0.0014 U	0.0014 U	0.021 J
Nitrobenzene	0.013 U	0.012 U	0.013 U	0.013 U	0.013 U	0.013 U	0.1 U
N-Nitrosodi-N-Propylamine	0.0024 U	0.0023 U	0.0023 U	0.0024 U	0.0024 U	0.0024 U	0.019 U
N-Nitrosodiphenylamine	0.012 U	0.011 U	0.011 U	0.012 U	0.012 U	0.012 U	0.092 U
Pentachlorophenol	0.057 U	0.054 U	0.055 U	0.056 U	0.056 U	0.056 U	0.45 U
Phenanthrene	0.007 J	0.0074	0.0018 U	0.0045 J	0.0019 U	0.0023 J	0.45
Phenol	0.011 U	0.01 U	0.01 U	0.011 U	0.011 U	0.011 U	0.084 U
Pyrene	0.026	0.03	0.0016 U	0.012	0.0047 J	0.0075	0.87

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-16
Summary of Data Used in Risk Assessment
Eastern Undeveloped Area (surface water) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Chemical	CFSWP-009 460-114997-1 CFSWP-009-SW 6/7/2016	CFSWP-009 460-130874-5 CFSWP-009-SW 4/3/2017	CFSWP-009 460-135182-1 CFSWP-009-SW 6/12/2017	CFSWP-009 460-158366-1 CFSWP-009-SW 6/14/2018	CFSWP-039 460-158494-1 CFSWP-039-SW 6/15/2018	CFSWP-039 460-166739-1 CFSWP-039-SW 10/11/2018	CFSWP-040 460-158494-2 CFSWP-040-SW 6/15/2018
GENERAL CHEMISTRY (µg/L)							
Fluoride	80.3	105	188	102 J-	99.6	322	90.6
Cyanide	4 U	2 U	2 U	2 U	2 U	2 U	2 U
Cyanide (Free)	--	--	--	1.5 U	5.8	1.5 U	2.5 J
METALS (µg/L)							
Aluminum	16.8 J	34.8 J	64.4	18.7 J	22 J	15 U	24.5 J
Antimony	0.76 U	0.62 U	0.62 U	2	0.62 U	0.62 U	0.62 U
Arsenic	0.95 J	0.64 U	0.64 U	0.77 U	0.77 U	0.79 J	0.77 U
Barium	104	77.1	116	83.7	90.5	209	88.5
Beryllium	0.29 U	0.24 U	0.24 U	0.26 U	0.26 U	0.26 U	0.26 U
Cadmium	0.72 U	0.71 U	0.71 U	0.61 U	0.61 U	0.61 U	0.61 U
Calcium	50100	46800	53000	45100	50600	59000	49700
Chromium, Total	1.5 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
Cobalt	1.5 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
Copper	1.6 U	1.4 U	1.4 U	1.9 U	2.8 J	7.2	3.1 J
Iron	49.1 U	42.4 U	42.4 U	45.7 U	45.7 U	45.7 U	45.7 U
Lead	0.44 U	0.38 U	0.38 U	0.37 U	0.37 U	0.37 U	0.37 U
Magnesium	12600	10600	13200	11100	12000	18500	11700
Manganese	3 U	3 J	3.4 J	3.3 J	3.6 J	3.8 J	3.8 J
Mercury	0.14 U	0.17 U	0.17 U	0.12 U	0.12 U	0.12 U	0.12 U
Nickel	1.6 U	1.4 U	1.4 U	1.3 U	1.3 U	1.3 U	1.3 U
Potassium	560	460	551	411	423	655	418
Selenium	0.79 U	0.73 U	0.73 U	0.69 U	0.69 U	0.69 U	0.69 U
Silver	1.5 U	1.3 U	1.3 U	1.4 U	1.4 U	1.4 U	1.4 U
Sodium	2340	2360	2380	2380	2440	3430	2360
Thallium	0.31 U	0.26 U	0.26 U	0.24 U	0.24 U	0.24 U	0.24 U
Vanadium	2.2 J	1.9 U	1.9 U	1.2 U	1.2 U	1.2 U	1.2 U
Zinc	6.5 U	7 U	7 U	5.4 U	5.4 U	5.4 U	5.4 U

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-17
Summary of Data Used in Risk Assessment
Eastern Undeveloped Area (sediment) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Sample Depth Chemical	CFSDP-009 200-35201-4, 460-119741-1 CFSDP-009-SO 0-0.5 ft 9/6/2016
GENERAL CHEMISTRY|ANIONS (mg/kg)	
Fluoride	1.62
Cyanide	0.34
METALS (mg/kg)	
Aluminum	17400
Antimony	0.32 UJ
Arsenic	6.8
Barium	295
Beryllium	0.66
Cadmium	0.34 U
Calcium	11500
Chromium, Total	11.8
Cobalt	5.8
Copper	19.8
Iron	14100
Lead	13
Magnesium	8750
Manganese	517
Mercury	0.038
Nickel	16 J+
Potassium	978
Selenium	0.54 J
Silver	0.62 U
Sodium	171
Thallium	0.13 U
Vanadium	12.1
Zinc	59
PESTICIDES (mg/kg)	
Aldrin	0.00097 U
Alpha Bhc (Alpha Hexachlorocyclohexane)	0.00073 U
Alpha Endosulfan	0.0011 U
Beta Bhc (Beta Hexachlorocyclohexane)	0.00078 U
Beta Endosulfan	0.0013 U
cis-Chlordane	0.0013 U
Delta BHC (Delta Hexachlorocyclohexane)	0.00087 U
Dieldrin	0.001 U
Endosulfan Sulfate	0.00093 U
Endrin	0.001 U
Endrin Aldehyde	0.00099 U
Endrin Ketone	0.0011 U
Gamma Bhc (Lindane)	0.00072 U
Heptachlor	0.001 U
Heptachlor Epoxide	0.0016 U
Methoxychlor	0.0017 U

Table E-17
Summary of Data Used in Risk Assessment
Eastern Undeveloped Area (sediment) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Sample Depth Chemical	CFSDP-009 200-35201-4, 460-119741-1 CFSDP-009-SO 0-0.5 ft 9/6/2016
P,P'-DDD	0.0011 U
P,P'-DDE	0.0012 U
P,P'-DDT	0.00083 U
Toxaphene	0.023 U
trans-Chlordane	0.0017 U
POLYCHLORINATED BIPHENYLS (mg/kg)	
PCB-1016 (Aroclor 1016)	0.011 U
PCB-1221 (Aroclor 1221)	0.011 U
PCB-1232 (Aroclor 1232)	0.011 U
PCB-1242 (Aroclor 1242)	0.011 U
PCB-1248 (Aroclor 1248)	0.011 U
PCB-1254 (Aroclor 1254)	0.011 U
PCB-1260 (Aroclor 1260)	0.011 U
PCB-1262 (Aroclor 1262)	0.011 U
PCB-1268 (Aroclor 1268)	0.011 U
Polychlorinated Biphenyl (PCBs)	0.011 U
SEMIVOLATILE ORGANIC COMPOUNDS (mg/kg)	
1,2,4,5-Tetrachlorobenzene	0.029 U
1,4-Dioxane (P-Dioxane)	0.11 U
2,3,4,6-Tetrachlorophenol	0.037 U
2,4,5-Trichlorophenol	0.039 U
2,4,6-Trichlorophenol	0.011 U
2,4-Dichlorophenol	0.0093 U
2,4-Dimethylphenol	0.087 U
2,4-Dinitrophenol	0.3 UJ
2,4-Dinitrotoluene	0.016 U
2,6-Dinitrotoluene	0.021 U
2-Chloronaphthalene	0.009 U
2-Chlorophenol	0.01 U
2-Methylnaphthalene	0.0087 U
2-Methylphenol (O-Cresol)	0.017 U
2-Nitroaniline	0.013 U
2-Nitrophenol	0.013 U
3- And 4- Methylphenol (Total)	0.011 U
3,3'-Dichlorobenzidine	0.044 U
3-Nitroaniline	0.012 U
4,6-Dinitro-2-Methylphenol	0.11 U
4-Bromophenyl Phenyl Ether	0.012 U
4-Chloro-3-Methylphenol	0.017 U
4-Chloroaniline	0.01 U
4-Chlorophenyl Phenyl Ether	0.012 U
4-Nitroaniline	0.015 U
4-Nitrophenol	0.19 UJ
Acenaphthene	0.0096 U

Table E-17
Summary of Data Used in Risk Assessment
Eastern Undeveloped Area (sediment) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Sample Depth Chemical	CFSDP-009 200-35201-4, 460-119741-1 CFSDP-009-SO 0-0.5 ft 9/6/2016
Acenaphthylene	0.01 U
Acetophenone	0.0086 U
Anthracene	0.038 U
Atrazine	0.018 U
Benzaldehyde	0.03 U
Benzo(A)Anthracene	0.1
Benzo(A)Pyrene	0.12
Benzo(B)Fluoranthene	0.21
Benzo(G,H,I)Perylene	0.11 J
Benzo(K)Fluoranthene	0.069
Benzyl Butyl Phthalate	0.012 U
Biphenyl (Diphenyl)	0.034 U
Bis(2-Chloroethoxy) Methane	0.012 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.0093 U
Bis(2-Chloroisopropyl) Ether	0.016 U
Bis(2-Ethylhexyl) Phthalate	0.015 U
Caprolactam	0.028 UJ
Carbazole	0.011 J
Chrysene	0.14 J
Dibenz(A,H)Anthracene	0.021 U
Dibenzofuran	0.012 U
Diethyl Phthalate	0.011 U
Dimethyl Phthalate	0.011 U
Di-N-Butyl Phthalate	0.012 U
Di-N-Octylphthalate	0.02 U
Fluoranthene	0.13 J
Fluorene	0.0086 U
Hexachlorobenzene	0.016 U
Hexachlorobutadiene	0.011 U
Hexachlorocyclopentadiene	0.025 U
Hexachloroethane	0.014 U
Indeno(1,2,3-C,D)Pyrene	0.12
Isophorone	0.0085 U
Naphthalene	0.01 U
Nitrobenzene	0.012 U
N-Nitrosodi-N-Propylamine	0.013 U
N-Nitrosodiphenylamine	0.036 U
Pentachlorophenol	0.048 U
Phenanthrene	0.065 J

Table E-17
Summary of Data Used in Risk Assessment
Eastern Undeveloped Area (sediment) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSDP-009
Sample Lab IDs	200-35201-4, 460-119741-1
Sample Name	CFSDP-009-SO
Sample Depth	0-0.5 ft
Chemical	9/6/2016
Phenol	0.013 U
Pyrene	0.19 J

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-18
Summary of Data Used in Risk Assessment
North-Central Undeveloped Area Soil (0-0.5 ft-bgs) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-011A	CFMW-067	CFSB-011	CFSB-013	CFSB-122	CFSB-173	CFSB-174	CFSB-175	CFSB-176	CFSB-193	CFSB-197	CFSB-198	CFSB-200	CFSB-200-DUP
Sample Lab IDs	460-116119-10	180-77393-22, 460-155265-24	460-114141-41	460-114141-38	460-114141-28	180-79272-1, 460-159191-1	180-79272-3, 460-159191-3	180-79272-5, 460-159191-5	180-78894-12, 460-158632-12	180-79434-6, 460-159377-6	180-79108-7, 460-158919-7	180-79108-5, 460-158919-5	180-79434-37, 460-159538-7	180-79434-39, 460-159538-9
Sample Name	CFMW-011a-SO-0-0.5	CFMW-067-SO-0-0.5	CFSB-011-SO-0-0.5	CFSB-013-SO-0-0.5	CFSB-122-SO-0-0.5	CFSB-173-SO-0-0.5	CFSB-174-0-0.5	CFSB-175-SO-0-0.5	CFSB-176-SO-0-0.5	CFSB-193-SO-0-0.5	CFSB-197-SO-0-0.5	CFSB-198-SO-0-0.5	CFSB-200-SO-0-0.5	CFSB-DUP48-SO
Sample Depth	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft
Chemical	6/25/2016	5/1/2018	5/19/2016	5/19/2016	5/19/2016	6/25/2018	6/25/2018	6/25/2018	6/16/2018	6/27/2018	6/21/2018	6/21/2018	6/28/2018	6/28/2018
GENERAL CHEMISTRY (mg/kg)														
Fluoride	27.6 J+	3.86	8.33 J-	15.8 J-	12.2 J-	4.27 J-	13.4 J-	15.5 J-	11.8 J+	4.93 J-	7.15	4.59	7.17	7.14
Cyanide	0.042 J	0.072 U	0.12 J	0.23	0.026 U	0.13 J	0.12 J	0.064 U	0.16 J+	0.19 J+	0.3 J+	0.28	0.25 J	0.15 J
METALS (mg/kg)														
"Chromium, Hexavalent - Estimated"	0.23017	0.299757	0.291727	0.2382	0.144526	0.147202	0.176642	0.275669	0.192701	0.248905	0.278345	0.355961	0.195377	0.195377
"Chromium, Trivalent - Estimated"	8.36983	10.9002	10.6083	8.6618	5.25547	5.3528	6.42336	10.0243	7.0073	9.05109	10.1217	12.944	7.10462	7.10462
Aluminum	15800	15700 J	16400	16900 J	20200 J	15600	19300	23000	21500	15200	21100	26600	11000	11000
Antimony	0.49 U	0.35 UJ	0.48 UJ	0.39 UJ	0.5 UJ	0.25 UJ	0.28 UJ	0.26 UJ	0.38 UJ	0.25 UJ	0.26 U	0.29 U	0.36 UJ	0.32 UJ
Arsenic	4.9	5.5 J	5.2	5.3 J	2.8 J	3.1	3.6	8.5	5.1	5.4	7.2	8.1	3.4	4
Barium	158	370	253 J+	267	289	275	362	310	482	253	354	419	282	347
Beryllium	0.55	0.51	0.58	0.59	0.63	0.57	0.57	0.69	0.48 J	0.45	0.85	0.91	0.43 J	0.45
Cadmium	0.37 U	0.4 U	0.37 U	0.29 U	0.38 U	0.29 U	0.32 U	0.3 U	0.44 U	0.3 J	0.3 U	0.33 U	0.41 U	0.37 U
Calcium	6600	2260 J+	3070	4240	3300	2050	1750	1900	4570	3150	4950	5100	3030	3840
Chromium, Total	8.6	11.2	10.9	8.9	5.4	5.5	6.6	10.3	7.2	9.3	10.4	13.3	7.3	7.3
Cobalt	6.2	4.9	6.6	5.6	2.9	6.4	6.8	5.9	5	4.9	5.8	8.2	4.8	4.7
Copper	13.4	8 J	13.1	12.5 J	9.1 J	4	6.9	17.3	15.4	8.7	18.1	20.8	8.9	9.2
Iron	14900	17700	17000	14000	8140	11000	12500	18800	12000	14700	15200	23400	11100	11300
Lead	11.2	10.6 J+	10.4	10.2	6.4	9.8	12	14.8	16.7	12.9	14.3	14.1	11.4	12.7
Magnesium	7170	7530 J	7080	5750	2940	3580	4330	7860	4020	8100	6510	9250	5200	4420
Manganese	446	1940 J	457	518 J	49.4 J	513	710	233	1130 J	855	550	735	719	758
Mercury	0.015 U	0.038	0.02	0.032	0.019 U	0.02	0.013 J	0.011 J	0.018 J	0.02 J-	0.033	0.031	0.026	0.021
Nickel	12.2	10.9	12.2	10.1	6.4	13.5	12.6	12.2	35.7	16.8	11	15.2	10.9	11.1
Potassium	978	768 J+	1120	1020	519	939	1030	970	1400	1020	1180	1620	1340 J+	1450 J+
Selenium	0.46 U	0.34 U	0.5 J	0.41 J	0.46 U	0.25 U	0.28 U	0.26 U	0.38 U	0.25 U	0.34 J	0.38 J	0.35 U	0.32 U
Silver	0.9 U	0.73 U	0.88 U	0.71 U	0.91 U	0.54 U	0.59 U	0.56 U	0.8 U	0.53 U	0.55 U	0.61 U	0.75 U	0.68 U
Sodium	168	49.3 J	64.6 J	39.5 J	552	39.6 J	65.4 J	86.9 J	87.8 J	43.6 J	58.7 J	56.5 J	51.4 J	51.1 J
Thallium	0.19 U	0.15 U	0.18 U	0.15 U	0.19 U	0.11 U	0.12 U	0.11 U	0.16 U	0.11 U	0.11 U	0.12 U	0.15 U	0.14 U
Vanadium	12.8	13 J+	11	11	7.7	9 J+	12.7 J+	15.2 J+	20.4	12.7	12.7	14.5	10.2	10.5
Zinc	40	81.6	70.8	61.3	13.6	64.5	62	52	84.6	64.5	82.1	112	53.1	52.5
PESTICIDES (mg/kg)														
Aldrin	0.001 U	--	--	--	0.0013 U	--	--	--	--	--	--	--	--	--
Alpha Bhc (Alpha Hexachlorocyclohexane)	0.00076 U	--	--	--	0.00097 U	--	--	--	--	--	--	--	--	--
Alpha Endosulfan	0.0012 U	--	--	--	0.0015 U	--	--	--	--	--	--	--	--	--
Beta Bhc (Beta Hexachlorocyclohexane)	0.00081 U	--	--	--	0.001 U	--	--	--	--	--	--	--	--	--
Beta Endosulfan	0.0013 U	--	--	--	0.0017 U	--	--	--	--	--	--	--	--	--
cis-Chlordane	0.0014 U	--	--	--	0.0017 U	--	--	--	--	--	--	--	--	--
Delta BHC (Delta Hexachlorocyclohexane)	0.00091 U	--	--	--	0.0012 U	--	--	--	--	--	--	--	--	--
Dieldrin	0.0011 U	--	--	--	0.0014 U	--	--	--	--	--	--	--	--	--
Endosulfan Sulfate	0.00097 U	--	--	--	0.0012 U	--	--	--	--	--	--	--	--	--
Endrin	0.0011 U	--	--	--	0.0014 U	--	--	--	--	--	--	--	--	--
Endrin Aldehyde	0.001 U	--	--	--	0.0013 U	--	--	--	--	--	--	--	--	--
Endrin Ketone	0.0012 U	--	--	--	0.0015 U	--	--	--	--	--	--	--	--	--
Gamma Bhc (Lindane)	0.00075 U	--	--	--	0.00095 U	--	--	--	--	--	--	--	--	--
Heptachlor	0.0011 U	--	--	--	0.0014 U	--	--	--	--	--	--	--	--	--
Heptachlor Epoxide	0.0016 U	--	--	--	0.0021 U	--	--	--	--	--	--	--	--	--
Methoxychlor	0.0018 U	--	--	--	0.0023 U	--	--	--	--	--	--	--	--	--
P,P'-DDD	0.0011 U	--	--	--	0.0014 U	--	--	--	--	--	--	--	--	--
P,P'-DDE	0.0012 U	--	--	--	0.0015 U	--	--	--	--	--	--	--	--	--
P,P'-DDT	0.00086 U	--	--	--	0.0011 U	--	--	--	--	--	--	--	--	--
Toxaphene	0.024 U	--	--	--	0.031 U	--	--	--	--	--	--	--	--	--
trans-Chlordane	0.0018 U	--	--	--	0.0023 U	--	--	--	--	--	--	--	--	--
POLYCHLORINATED BIPHENYLS (mg/kg)														
PCB-1016 (Aroclor 1016)	0.011 U	--	0.011 U	0.011 U	0.014 U	--	--	--	--	--	--	--	--	--
PCB-1221 (Aroclor 1221)	0.011 U	--	0.011 U	0.011 U	0.014 U	--	--	--	--	--	--	--	--	--
PCB-1232 (Aroclor 1232)	0.011 U	--	0.011 U	0.011 U	0.014 U	--	--	--	--	--	--	--	--	--
PCB-1242 (Aroclor 1242)	0.011 U	--	0.011 U	0.011 U	0.014 U	--	--	--	--	--	--	--	--	--
PCB-1248 (Aroclor 1248)	0.011 U	--	0.011 U	0.011 U	0.014 U	--	--	--	--	--	--	--	--	--
PCB-1254 (Aroclor 1254)	0.011 U	--	0.011 U	0.012 U	0.015 U	--	--	--	--	--	--	--	--	--
PCB-1260 (Aroclor 1260)	0.011 U	--	0.011 U	0.012 U	0.015 U	--	--	--	--	--	--	--	--	--

Table E-18
Summary of Data Used in Risk Assessment
North-Central Undeveloped Area Soil (0-0.5 ft-bgs) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-011A	CFMW-067	CFSB-011	CFSB-013	CFSB-122	CFSB-173	CFSB-174	CFSB-175	CFSB-176	CFSB-193	CFSB-197	CFSB-198	CFSB-200	CFSB-200-DUP
Sample Lab IDs	460-116119-10	180-77393-22, 460-155265-24	460-114141-41	460-114141-38	460-114141-28	180-79272-1, 460-159191-1	180-79272-3, 460-159191-3	180-79272-5, 460-159191-5	180-78894-12, 460-158632-12	180-79434-6, 460-159377-6	180-79108-7, 460-158919-7	180-79108-5, 460-158919-5	180-79434-37, 460-159538-7	180-79434-39, 460-159538-9
Sample Name	CFMW-011a-SO-0-0.5	CFMW-067-SO-0-0.5	CFSB-011-SO-0-0.5	CFSB-013-SO-0-0.5	CFSB-122-SO-0-0.5	CFSB-173-SO-0-0.5	CFSB-174-0-0.5	CFSB-175-SO-0-0.5	CFSB-176-SO-0-0.5	CFSB-193-SO-0-0.5	CFSB-197-SO-0-0.5	CFSB-198-SO-0-0.5	CFSB-200-SO-0-0.5	CFSB-DUP48-SO
Sample Depth	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft
Chemical	6/25/2016	5/1/2018	5/19/2016	5/19/2016	5/19/2016	6/25/2018	6/25/2018	6/25/2018	6/16/2018	6/27/2018	6/21/2018	6/21/2018	6/28/2018	6/28/2018
PCB-1262 (Aroclor 1262)	0.011 U	--	0.011 U	0.012 U	0.015 U	--	--	--	--	--	--	--	--	--
PCB-1268 (Aroclor 1268)	0.011 U	--	0.011 U	0.012 U	0.015 U	--	--	--	--	--	--	--	--	--
Polychlorinated Biphenyl (PCBs)	0.011 U	--	0.011 U	0.012 U	0.015 U	--	--	--	--	--	--	--	--	--
SEMIVOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,2,4,5-Tetrachlorobenzene	0.031 U	0.0017 U	0.029 U	0.032 U	0.039 U	0.0031 U	0.0016 U	0.0016 U	0.0037 UJ	0.0015 U	0.0017 UJ	0.0034 UJ	0.0053 U	0.0018 U
1,4-Dioxane (P-Dioxane)	0.11 U	0.012 U	0.11 U	0.11 U	0.14 U	0.023 U	0.011 U	0.011 U	0.027 U	0.011 U	0.012 U	0.025 U	0.038 U	0.013 U
2,3,4,6-Tetrachlorophenol	0.039 U	0.016 U	0.037 U	0.04 U	0.049 U	0.03 U	0.015 U	0.015 U	0.035 U	0.015 U	0.016 UJ	0.033 UJ	0.051 U	0.017 U
2,4,5-Trichlorophenol	0.041 U	0.0028 U	0.039 U	0.042 U	0.052 U	0.0051 U	0.0026 U	0.0026 U	0.0061 U	0.0025 U	0.0028 U	0.0057 U	0.0088 U	0.003 U
2,4,6-Trichlorophenol	0.012 U	0.0022 U	0.011 U	0.012 U	0.015 U	0.004 U	0.002 U	0.002 U	0.0047 U	0.002 U	0.0022 U	0.0044 U	0.0067 U	0.0023 U
2,4-Dichlorophenol	0.0097 U	0.003 U	0.0093 U	0.01 U	0.012 U	0.0056 U	0.0028 U	0.0028 U	0.0066 U	0.0027 U	0.003 U	0.0062 U	0.0095 U	0.0032 U
2,4-Dimethylphenol	0.091 U	0.0024 U	0.087 U	0.093 U	0.12 U	0.0045 U	0.0022 U	0.0022 U	0.0053 U	0.0022 U	0.0025 U	0.005 U	0.0076 UJ	0.0026 U
2,4-Dinitrophenol	0.31 U	0.11 UJ	0.3 U	0.32 U	0.4 U	0.19 U	0.097 U	0.097 U	0.23 U	0.096 U	0.11 UJ	0.21 UJ	0.33 U	0.11 U
2,4-Dinitrotoluene	0.016 U	0.002 U	0.016 U	0.017 U	0.021 U	0.0036 U	0.0018 U	0.0018 U	0.0042 U	0.0018 U	0.002 U	0.004 U	0.0061 U	0.0021 U
2,6-Dinitrotoluene	0.022 U	0.0024 U	0.021 U	0.023 U	0.028 U	0.0045 U	0.0022 U	0.0022 U	0.0053 U	0.0022 U	0.0024 U	0.0049 U	0.0076 U	0.0026 U
2-Chloronaphthalene	0.0094 U	0.0018 U	0.009 U	0.0096 U	0.012 U	0.0033 U	0.0017 U	0.0017 U	0.0039 U	0.0016 U	0.0018 U	0.0037 U	0.0056 U	0.0019 U
2-Chlorophenol	0.01 U	0.0018 U	0.01 U	0.011 U	0.013 U	0.0034 U	0.0017 U	0.0017 U	0.004 U	0.0017 U	0.0018 U	0.0037 U	0.0057 U	0.0019 U
2-Methylnaphthalene	0.0091 U	0.0019 U	0.0087 U	0.0094 U	0.012 U	0.0035 U	0.0017 U	0.0017 U	0.0064 J	0.0018 J	0.0034 J	0.005 J	0.0059 U	0.002 U
2-Methylphenol (O-Cresol)	0.018 U	0.011 U	0.017 U	0.018 U	0.023 U	0.021 U	0.01 U	0.01 U	0.024 U	0.01 U	0.011 U	0.023 U	0.035 U	0.012 U
2-Nitroaniline	0.014 U	0.018 U	0.013 U	0.014 U	0.017 U	0.033 U	0.016 U	0.016 U	0.039 U	0.016 U	0.018 U	0.036 U	0.056 U	0.019 U
2-Nitrophenol	0.014 U	0.0023 U	0.013 U	0.014 U	0.018 U	0.0041 U	0.0021 U	0.0021 U	0.0049 U	0.002 U	0.0023 U	0.0046 U	0.007 U	0.0024 U
3- And 4- Methylphenol (Total)	0.011 U	--	0.011 U	0.011 U	0.014 U	--	--	--	--	--	--	--	--	--
3,3'-Dichlorobenzidine	0.046 U	0.037 U	0.044 U	0.047 U	0.059 U	0.067 U	0.034 U	0.034 U	0.079 U	0.033 U	0.037 U	0.074 U	0.11 UR	0.039 U
3-Nitroaniline	0.012 U	0.01 U	0.012 U	0.013 U	0.016 U	0.018 U	0.0092 U	0.0092 U	0.022 U	0.0091 U	0.01 U	0.02 U	0.031 U	0.011 U
4,6-Dinitro-2-Methylphenol	0.11 U	0.068 UJ	0.11 U	0.11 U	0.14 U	0.12 U	0.062 U	0.062 U	0.15 U	0.061 U	0.068 U	0.14 U	0.21 U	0.072 U
4-Bromophenyl Phenyl Ether	0.013 U	0.0028 U	0.012 U	0.013 U	0.017 U	0.005 U	0.0025 U	0.0025 U	0.0059 U	0.0025 U	0.0028 U	0.0056 U	0.0086 U	0.0029 U
4-Chloro-3-Methylphenol	0.018 U	0.0019 U	0.017 U	0.018 U	0.023 U	0.0034 U	0.0017 U	0.0017 U	0.004 U	0.0017 U	0.0019 U	0.0038 U	0.0058 U	0.002 U
4-Chloroaniline	0.011 U	0.0013 U	0.01 U	0.011 U	0.014 U	0.0024 U	0.0012 U	0.0012 U	0.0028 U	0.0012 U	0.0013 U	0.0027 U	0.0041 UJ	0.0014 U
4-Chlorophenyl Phenyl Ether	0.012 U	0.0024 U	0.012 U	0.013 U	0.016 U	0.0044 U	0.0022 U	0.0022 U	0.0052 U	0.0022 U	0.0024 U	0.0048 U	0.0074 U	0.0025 U
4-Nitroaniline	0.016 U	0.0019 U	0.015 U	0.016 U	0.02 U	0.0035 U	0.0018 U	0.0018 U	0.0041 U	0.0017 U	0.0019 U	0.0039 U	0.006 U	0.002 U
4-Nitrophenol	0.2 U	0.028 U	0.19 U	0.2 U	0.25 U	0.051 U	0.025 U	0.025 U	0.06 U	0.025 U	0.028 UJ	0.056 UJ	0.086 U	0.029 U
Acenaphthene	0.01 U	0.0023 U	0.0096 U	0.01 U	0.013 U	0.0042 U	0.0029 J	0.0021 U	0.018	0.0021 U	0.0049 J	0.0081 J	0.016 J	0.0024 UJ
Acenaphthylene	0.011 U	0.0017 U	0.01 U	0.011 U	0.014 U	0.0032 U	0.0016 U	0.0016 U	0.0037 U	0.0016 U	0.0017 U	0.0035 U	0.0054 U	0.0018 U
Acetophenone	0.009 U	0.0021 U	0.0086 U	0.0092 U	0.011 U	0.0066 J	0.0025 J	0.0031 J	0.0046 U	0.0031 J	0.0034 J	0.0043 U	0.0067 U	0.0023 U
Anthracene	0.039 U	0.0037 J	0.038 U	0.04 U	0.05 U	0.0037 U	0.0035 J	0.0019 U	0.021	0.013	0.0064 J	0.0085 J	0.022 J	0.0034 J
Atrazine	0.018 U	0.017 U	0.018 U	0.019 U	0.023 U	0.032 UJ	0.016 UJ	0.016 UJ	0.037 UJ	0.016 U	0.017 UJ	0.035 UJ	0.054 UJ	0.018 U
Benzaldehyde	0.031 U	0.0049 UR	0.03 U	0.032 U	0.04 U	0.018 J	0.0088 J	0.0065 J	0.011 UR	0.0077 J	0.012 J	0.011 J	0.015 U	0.0052 U
Benzo(A)Anthracene	0.034 U	0.034	0.041	0.14	0.044 U	0.033	0.028	0.004 J	0.13	0.089	0.037	0.038	0.098 J	0.016 J
Benzo(A)Pyrene	0.03 J	0.04	0.045	0.16	0.016 U	0.056	0.041	0.005 J	0.22	0.11	0.047	0.05	0.097 J	0.018 J
Benzo(B)Fluoranthene	0.053	0.069	0.11	0.41	0.021 U	0.11	0.086	0.01	0.51	0.17	0.09	0.08	0.16 J	0.03 J
Benzo(G,H,I)Perylene	0.031 J	0.046	0.051 J	0.19 J	0.03 U	0.073	0.049	0.0055 J	0.29	0.16	0.052	0.049	0.13 J	0.017 J
Benzo(K)Fluoranthene	0.023 J	0.026	0.033 J	0.13	0.023 U	0.041	0.033	0.0029 J	0.16	0.07	0.023	0.031	0.056 J	0.0094 J
Benzyl Butyl Phthalate	0.013 U	0.027 U	0.012 U	0.013 U	0.016 U	0.05 U	0.025 U	0.025 U	0.058 U	0.047	0.027 U	0.055 U	0.084 U	0.029 U
Biphenyl (Diphenyl)	0.035 U	0.0017 U	0.034 U	0.036 U	0.045 U	0.003 U	0.0015 U	0.0015 U	0.0037 J	0.0015 U	0.0034 J	0.0034 U	0.0052 U	0.0018 U
Bis(2-Chloroethoxy) Methane	0.013 U	0.0019 U	0.012 U	0.013 U	0.016 U	0.0034 U	0.0017 U	0.0017 U	0.0041 U	0.0017 U	0.0019 U	0.0038 U	0.0059 U	0.002 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.0097 U	0.0014 U	0.0093 U	0.01 U	0.012 U	0.0026 U	0.0013 U	0.0013 U	0.0031 U	0.0013 U	0.0014 U	0.0029 U	0.0045 U	0.0015 U
Bis(2-Chloroisopropyl) Ether	0.017 U	0.0029 U	0.016 U	0.017 U	0.022 U	0.0053 U	0.0027 U	0.0027 U	0.0063 U	0.0026 U	0.0029 U	0.0059 U	0.0091 U	0.0031 U
Bis(2-Ethylhexyl) Phthalate	0.016 U	0.042 U	0.085 J	0.017 U	0.021 U	0.077 U	0.038 U	0.039 U	0.091 U	0.17 J	0.15 J	0.26 J	0.13 U	0.045 U
Caprolactam	0.03 UJ	0.026 U	0.028 U	0.031 U	0.038 U	0.047 U	0.024 U	0.024 U	0.055 U	0.023 U	0.026 U	0.052 U	0.08 UJ	0.027 U
Carbazole	0.01 U	0.006 J	0.0098 U	0.017 J	0.013 U	0.0065 J	0.0053 J	0.0017 U	0.035	0.014	0.0085	0.0097 J	0.023 J	0.0036 J
Chrysene	0.043 J	0.051	0.084 J	0.25 J	0.014 U	0.07	0.06	0.007 J	0.32	0.14	0.063	0.064	0.13 J	0.027 J
Dibenz(A,H)Anthracene	0.021 U	0.012	0.021 U	0.056 J+	0.027 U	0.013 J	0.012	0.0016 U	0.062	0.025	0.01	0.013 J	0.034 J	0.0039 J
Dibenzofuran	0.012 U	0.0017 U	0.012 U	0.013 U	0.016 U	0.0032 U	0.0021 J	0.0016 U	0.013 J	0.0045 J	0.0042 J	0.0054 J	0.0082 J	0.0018 UJ
Diethyl Phthalate	0.012 U	0.012 U	0.011 U	0.012 U	0.015 U	0.022 U	0.011 U	0.011 U	0.026 U	0.011 U	0.012 U	0.024 U	0.037 U	0.013 U
Dimethyl Phthalate	0.012 U	0.0014 U	0.011 U	0.012 U	0.015 U	0.0026 U	0.0013 U	0.0013 U	0.0031 U	0.0013 U	0.0014 U	0.0029 U	0.0045 U	0.0015 U
Di-N-Butyl Phthalate	0.012 U	0.017 U	0.012 U	0.013 U	0.016 U	0.032 U	0.016 U	0.016 U	0.037 U	0.016 U	0.017 U	0.035 U	0.054 U	0.018 U
Di-N-Octylphthalate	0.021 U	0.023 U	0.02 U	0.022 U	0.027 U	0.042 U	0.021 U	0.021 U	0.05 U	0.021 U	0.023 U	0.046 U	0.071 U	0.024 U
Fluoranthene	0.038 J	0.056	0.059 J	0.21 J	0.016 U	0.072	0.058	0.0068 J	0.29	0.17	0.07	0.073	0.17 J	0.033 J
Fluorene	0.009 U	0.0016 U	0.0086 U	0.0092 U	0.011 U	0.0028 U	0.0023 J	0.0014 U	0.01 J	0.0064 J	0.0046 J	0.0069 J	0.012 J	0.0022 J
Hexachlorobenzene	0.017 U	0.0028 U	0.016 U	0.017 U	0.021 U	0.0052 U	0.0026 U	0.0026 U	0.0061 U	0.0026 U	0.0028 U	0.0057 U	0.0088 U	0.003 U

Table E-18
Summary of Data Used in Risk Assessment
North-Central Undeveloped Area Soil (0-0.5 ft-bgs) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-011A	CFMW-067	CFSB-011	CFSB-013	CFSB-122	CFSB-173	CFSB-174	CFSB-175	CFSB-176	CFSB-193	CFSB-197	CFSB-198	CFSB-200	CFSB-200-DUP
Sample Lab IDs	460-116119-10	180-77393-22, 460-155265-24	460-114141-41	460-114141-38	460-114141-28	180-79272-1, 460-159191-1	180-79272-3, 460-159191-3	180-79272-5, 460-159191-5	180-78894-12, 460-158632-12	180-79434-6, 460-159377-6	180-79108-7, 460-158919-7	180-79108-5, 460-158919-5	180-79434-37, 460-159538-7	180-79434-39, 460-159538-9
Sample Name	CFMW-011a-SO-0-0.5	CFMW-067-SO-0-0.5	CFSB-011-SO-0-0.5	CFSB-013-SO-0-0.5	CFSB-122-SO-0-0.5	CFSB-173-SO-0-0.5	CFSB-174-0-0.5	CFSB-175-SO-0-0.5	CFSB-176-SO-0-0.5	CFSB-193-SO-0-0.5	CFSB-197-SO-0-0.5	CFSB-198-SO-0-0.5	CFSB-200-SO-0-0.5	CFSB-DUP48-SO
Sample Depth	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft
Chemical	6/25/2016	5/1/2018	5/19/2016	5/19/2016	5/19/2016	6/25/2018	6/25/2018	6/25/2018	6/16/2018	6/27/2018	6/21/2018	6/21/2018	6/28/2018	6/28/2018
Hexachlorobutadiene	0.012 U	0.0023 U	0.011 U	0.012 U	0.015 U	0.0042 UJ	0.0021 UJ	0.0021 UJ	0.005 U	0.0021 U	0.0023 U	0.0047 U	0.0072 U	0.0025 U
Hexachlorocyclopentadiene	0.026 U	0.002 U	0.025 U	0.026 U	0.033 U	0.0037 UJ	0.0018 UJ	0.0018 UJ	0.0043 U	0.0018 U	0.002 UJ	0.0041 UJ	0.0063 U	0.0021 U
Hexachloroethane	0.015 U	0.002 U	0.014 U	0.016 U	0.019 U	0.0037 U	0.0019 U	0.0019 U	0.0044 U	0.0018 U	0.002 U	0.0041 U	0.0063 U	0.0022 U
Indeno(1,2,3-C,D)Pyrene	0.027 U	0.037	0.056 J+	0.2 J+	0.035 U	0.053	0.042	0.0042 J	0.24	0.1	0.042	0.042	0.096 J	0.014 J
Isophorone	0.0089 U	0.002 U	0.0089 J	0.013 J	0.011 U	0.0037 U	0.0018 U	0.0018 U	0.0043 U	0.0018 U	0.002 U	0.0041 U	0.0063 U	0.0021 U
Naphthalene	0.01 U	0.0015 U	0.01 U	0.011 U	0.013 U	0.0037 J	0.0033 J	0.0027 J	0.049	0.0034 J	0.0065 J	0.0089 J	0.007 J	0.0016 UJ
Nitrobenzene	0.013 U	0.014 U	0.012 U	0.013 U	0.017 U	0.026 U	0.013 U	0.013 U	0.031 U	0.013 U	0.014 U	0.029 U	0.045 U	0.015 U
N-Nitrosodi-N-Propylamine	0.014 U	0.0027 U	0.013 U	0.014 U	0.018 U	0.0049 U	0.0025 U	0.0025 U	0.0058 U	0.0024 U	0.0027 U	0.0054 U	0.0083 U	0.0028 U
N-Nitrosodiphenylamine	0.037 U	0.013 U	0.036 U	0.038 U	0.048 U	0.024 U	0.012 U	0.012 U	0.028 U	0.012 U	0.013 U	0.027 U	0.041 U	0.014 U
Pentachlorophenol	0.05 U	0.063 U	0.048 U	0.051 U	0.064 U	0.12 U	0.058 U	0.058 U	0.14 U	0.057 U	0.063 UJ	0.13 UJ	0.2 U	0.067 U
Phenanthrene	0.018 J	0.024	0.036 J	0.098 J	0.014 U	0.028	0.028	0.0062 J	0.13	0.088	0.041	0.048	0.12 J	0.019 J
Phenol	0.013 U	0.012 U	0.013 U	0.014 U	0.017 U	0.022 U	0.011 U	0.011 U	0.026 U	0.011 U	0.012 U	0.024 U	0.037 U	0.013 U
Pyrene	0.043 J	0.057	0.063 J	0.22 J	0.024 U	0.065	0.06	0.0063 J	0.27	0.16	0.066	0.07	0.18 J	0.027 J

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-18
Summary of Data Used in Risk Assessment
North-Central Undeveloped Area Soil (0-0.5 ft-bgs) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-241	CFSB-248	CFSB-251	CFSB-254	CFSB-255	CFSB-256	CFSB-257	CFSB-258	CFSB-259	CFSB-260
Sample Lab IDs	180-77488-23, 460-155568-1	180-77393-38, 460-155265-42	180-77393-41, 460-155265-45	180-77393-10, 460-155265-12	180-77393-4, 460-155265-4	180-77393-7, 460-155265-7	180-77393-13, 460-155265-15	180-77393-16, 460-155265-18	180-77393-19, 460-155265-21	180-77488-26, 460-155568-4
Sample Name	CFSB-241-SO-0-0.5	CFSB-248-SO-0-0.5	CFSB-251-SO-0-0.5	CFSB-254-SO-0-0.5	CFSB-255-SO-0-0.5	CFSB-256-SO-0-0.5	CFSB-257-SO-0-0.5	CFSB-258-SO-0-0.5	CFSB-259-SO-0-0.5	CFSB-260-SO-0-0.5
Sample Depth	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft
Chemical	5/5/2018	5/1/2018	5/1/2018	4/30/2018	4/30/2018	4/30/2018	4/30/2018	4/30/2018	4/30/2018	5/5/2018
GENERAL CHEMISTRY (mg/kg)										
Fluoride	8.29 J+	2.22 J-	12.5 J-	6.31 J+	7.27 J+	9.48 J+	5.22 J+	3.89	16	2.34 J+
Cyanide	0.071 U	0.08 U	0.13 J	0.086 U	0.086 U	0.098 U	0.079 U	0.15 J+	0.086 U	0.062 U
METALS (mg/kg)										
"Chromium, Hexavalent - Estimated"	0.281022	0.414842	0.165937	0.117762	0.128467	0.208759	0.262287	0.251582	0.248905	0.243552
"Chromium, Trivalent - Estimated"	10.219	15.0852	6.03406	4.28224	4.67153	7.59124	9.53771	9.14842	9.05109	8.85645
Aluminum	15200	19800	16300	8830	7750	26100	14300	14700 J	27400 J	10000
Antimony	0.33 UJ	0.29 U	0.33 UJ	0.41 UJ	0.41 UJ	0.45 UJ	0.37 UJ	0.36 UJ	0.4 UJ	0.32 UJ
Arsenic	4.3	3.4	4.7	7.7	10.7	15.8	6.1	8 J	8.1 J	5.2
Barium	139	338	293	376	340	486	197	168	454	103
Beryllium	0.58	0.88	0.52	0.47 J	0.39 J	0.87	0.41 J	0.64	0.81	0.46
Cadmium	0.38 U	0.33 U	0.38 U	0.47 U	0.47 U	0.78 J	0.43 U	0.42 U	0.46 U	0.36 U
Calcium	2350 J	3650	2420	170000	177000	11600	2640	2840 J+	3000 J+	24300 J
Chromium, Total	10.5	15.5	6.2	4.4	4.8	7.8	9.8	9.4	9.3	9.1
Cobalt	6.2	5.1	3.8	2.7 J	2.2 J	5.4	4.8	4.2	6.3	6.1
Copper	10.8 J	20.3	10.7 J	19.4	20.3	26.2	13.1	11.1 J	14.3 J	15.4 J
Iron	16400	15300	11900	6880	6490	14600	16000	17100	16900	15300
Lead	11.1 J+	15.2	9.7 J	7	9.7	14.4	12.8	13.3 J+	16 J+	9.6 J+
Magnesium	7450	9790	4170 J	3280	3730	5040	9550	9330 J	6460 J	9600
Manganese	363	95.3	648 J	558	609	511	553	620 J	881 J	466
Mercury	0.011 U	0.013 J	0.024	0.034	0.031	0.039	0.053	0.031	0.022 J	0.016 J
Nickel	12.6 J	12.1	8.9	5.1	4.2	9.7	12.2	13.4	14.7	10.3 J
Potassium	1090	1080	996	400	337	841	939	886 J+	1390 J+	960
Selenium	0.33 U	0.28 U	0.33 U	0.41 U	0.41 U	0.46 J	0.37 U	0.36 U	0.39 U	0.31 U
Silver	0.71 U	0.61 U	0.7 UJ	0.87 U	0.87 U	0.94 U	0.79 U	0.77 U	0.84 U	0.67 U
Sodium	62.1 J	122	156	62.9 J	59.1 J	243	39.9 U	38.9 U	131 J	46.3 J
Thallium	0.14 U	0.12 U	0.14 U	0.18 U	0.18 U	0.19 U	0.16 U	0.19 J	0.17 U	0.14 U
Vanadium	17.2	11.4	10.3	4.8	4.3	13	13.3	11.8 J+	17.2 J+	9.7
Zinc	46.6	46.9	54.7	40.5	39.3	49.1	54.4	71.2	71	39.1
PESTICIDES (mg/kg)										
Aldrin	--	--	--	--	--	--	--	--	--	--
Alpha Bhc (Alpha Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--
Alpha Endosulfan	--	--	--	--	--	--	--	--	--	--
Beta Bhc (Beta Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--
Beta Endosulfan	--	--	--	--	--	--	--	--	--	--
cis-Chlordane	--	--	--	--	--	--	--	--	--	--
Delta BHC (Delta Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--
Dieldrin	--	--	--	--	--	--	--	--	--	--
Endosulfan Sulfate	--	--	--	--	--	--	--	--	--	--
Endrin	--	--	--	--	--	--	--	--	--	--
Endrin Aldehyde	--	--	--	--	--	--	--	--	--	--
Endrin Ketone	--	--	--	--	--	--	--	--	--	--
Gamma Bhc (Lindane)	--	--	--	--	--	--	--	--	--	--
Heptachlor	--	--	--	--	--	--	--	--	--	--
Heptachlor Epoxide	--	--	--	--	--	--	--	--	--	--
Methoxychlor	--	--	--	--	--	--	--	--	--	--
P,P'-DDD	--	--	--	--	--	--	--	--	--	--
P,P'-DDE	--	--	--	--	--	--	--	--	--	--
P,P'-DDT	--	--	--	--	--	--	--	--	--	--
Toxaphene	--	--	--	--	--	--	--	--	--	--
trans-Chlordane	--	--	--	--	--	--	--	--	--	--
POLYCHLORINATED BIPHENYLS (mg/kg)										
PCB-1016 (Aroclor 1016)	--	--	--	--	--	--	--	--	--	--
PCB-1221 (Aroclor 1221)	--	--	--	--	--	--	--	--	--	--
PCB-1232 (Aroclor 1232)	--	--	--	--	--	--	--	--	--	--
PCB-1242 (Aroclor 1242)	--	--	--	--	--	--	--	--	--	--
PCB-1248 (Aroclor 1248)	--	--	--	--	--	--	--	--	--	--
PCB-1254 (Aroclor 1254)	--	--	--	--	--	--	--	--	--	--
PCB-1260 (Aroclor 1260)	--	--	--	--	--	--	--	--	--	--

Table E-18
Summary of Data Used in Risk Assessment
North-Central Undeveloped Area Soil (0-0.5 ft-bgs) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-241	CFSB-248	CFSB-251	CFSB-254	CFSB-255	CFSB-256	CFSB-257	CFSB-258	CFSB-259	CFSB-260
Sample Lab IDs	180-77488-23, 460-155568-1	180-77393-38, 460-155265-42	180-77393-41, 460-155265-45	180-77393-10, 460-155265-12	180-77393-4, 460-155265-4	180-77393-7, 460-155265-7	180-77393-13, 460-155265-15	180-77393-16, 460-155265-18	180-77393-19, 460-155265-21	180-77488-26, 460-155568-4
Sample Name	CFSB-241-SO-0-0.5	CFSB-248-SO-0-0.5	CFSB-251-SO-0-0.5	CFSB-254-SO-0-0.5	CFSB-255-SO-0-0.5	CFSB-256-SO-0-0.5	CFSB-257-SO-0-0.5	CFSB-258-SO-0-0.5	CFSB-259-SO-0-0.5	CFSB-260-SO-0-0.5
Sample Depth	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft
Chemical	5/5/2018	5/1/2018	5/1/2018	4/30/2018	4/30/2018	4/30/2018	4/30/2018	4/30/2018	4/30/2018	5/5/2018
PCB-1262 (Aroclor 1262)	--	--	--	--	--	--	--	--	--	--
PCB-1268 (Aroclor 1268)	--	--	--	--	--	--	--	--	--	--
Polychlorinated Biphenyl (PCBs)	--	--	--	--	--	--	--	--	--	--
SEMIVOLATILE ORGANIC COMPOUNDS (mg/kg)										
1,2,4,5-Tetrachlorobenzene	0.0016 U	0.0019 U	0.0021 U	0.002 U	0.0021 U	0.0017 U	0.0019 U	0.0019 U	0.0038 U	0.0015 U
1,4-Dioxane (P-Dioxane)	0.012 U	0.014 U	0.015 U	0.014 U	0.015 U	0.012 U	0.013 U	0.013 U	0.028 U	0.011 U
2,3,4,6-Tetrachlorophenol	0.016 U	0.018 U	0.021 U	0.019 U	0.02 U	0.016 U	0.018 U	0.018 U	0.037 U	0.015 U
2,4,5-Trichlorophenol	0.0027 U	0.0031 U	0.0035 U	0.0033 U	0.0034 U	0.0028 U	0.0031 U	0.0031 U	0.0063 U	0.0025 U
2,4,6-Trichlorophenol	0.0021 U	0.0024 U	0.0027 U	0.0025 U	0.0026 U	0.0022 U	0.0024 U	0.0024 U	0.0049 U	0.002 U
2,4-Dichlorophenol	0.0029 U	0.0033 U	0.0038 U	0.0036 U	0.0037 U	0.003 U	0.0033 U	0.0033 U	0.0068 U	0.0027 U
2,4-Dimethylphenol	0.0024 U	0.0027 U	0.0031 U	0.0029 U	0.003 U	0.0024 U	0.0027 U	0.0027 U	0.0055 U	0.0022 U
2,4-Dinitrophenol	0.1 U	0.12 UJ	0.13 UJ	0.12 U	0.13 UJ	0.11 UJ	0.12 U	0.12 U	0.24 UJ	0.096 U
2,4-Dinitrotoluene	0.0019 U	0.0022 U	0.0025 U	0.0023 U	0.0024 U	0.002 U	0.0021 U	0.0021 U	0.0044 U	0.0018 U
2,6-Dinitrotoluene	0.0024 U	0.0027 U	0.0031 U	0.0029 U	0.003 U	0.0024 U	0.0027 U	0.0027 U	0.0055 U	0.0022 U
2-Chloronaphthalene	0.0018 U	0.002 U	0.0023 U	0.0021 U	0.0022 U	0.0018 U	0.002 U	0.002 U	0.0041 U	0.0016 U
2-Chlorophenol	0.0018 U	0.002 U	0.0023 U	0.0021 U	0.0022 U	0.0018 U	0.002 U	0.002 U	0.0041 U	0.0017 U
2-Methylnaphthalene	0.0018 U	0.0021 U	0.0024 U	0.0022 U	0.0023 U	0.0019 U	0.0021 U	0.0021 U	0.0043 U	0.0017 U
2-Methylphenol (O-Cresol)	0.011 U	0.012 U	0.014 U	0.013 U	0.014 U	0.011 U	0.012 U	0.012 U	0.025 U	0.01 U
2-Nitroaniline	0.017 U	0.02 U	0.023 U	0.021 U	0.022 U	0.018 U	0.02 U	0.02 U	0.04 U	0.016 U
2-Nitrophenol	0.0022 U	0.0025 U	0.0028 U	0.0026 U	0.0027 U	0.0022 U	0.0025 U	0.0025 U	0.0051 U	0.002 U
3- And 4- Methylphenol (Total)	--	--	--	--	--	--	--	--	--	--
3,3'-Dichlorobenzidine	0.036 U	0.041 U	0.046 U	0.043 U	0.045 U	0.037 U	0.04 U	0.04 U	0.083 U	0.033 U
3-Nitroaniline	0.0097 U	0.011 U	0.013 U	0.012 U	0.012 U	0.01 U	0.011 U	0.011 U	0.023 U	0.0091 U
4,6-Dinitro-2-Methylphenol	0.066 U	0.075 UJ	0.085 UJ	0.08 U	0.082 U	0.068 U	0.074 U	0.074 U	0.15 UJ	0.061 U
4-Bromophenyl Phenyl Ether	0.0027 U	0.003 U	0.0035 U	0.0032 U	0.0033 U	0.0027 U	0.003 U	0.003 U	0.0062 U	0.0025 U
4-Chloro-3-Methylphenol	0.0018 U	0.002 U	0.0023 U	0.0022 U	0.0022 U	0.0018 U	0.002 U	0.002 U	0.0042 U	0.0017 U
4-Chloroaniline	0.0013 U	0.0014 U	0.0016 U	0.0015 U	0.0016 U	0.0013 U	0.0014 U	0.0014 U	0.003 U	0.0012 U
4-Chlorophenyl Phenyl Ether	0.0023 U	0.0026 U	0.003 U	0.0028 U	0.0029 U	0.0024 U	0.0026 U	0.0026 U	0.0054 U	0.0022 U
4-Nitroaniline	0.0019 U	0.0021 U	0.0024 U	0.0022 U	0.0023 U	0.0019 U	0.0021 U	0.0021 U	0.0043 U	0.0017 U
4-Nitrophenol	0.027 U	0.031 U	0.035 U	0.032 U	0.034 U	0.028 U	0.03 U	0.03 U	0.062 U	0.025 U
Acenaphthene	0.0034 J	0.0025 U	0.0042 J	0.0027 U	0.0028 U	0.0023 U	0.0035 J	0.0041 J	0.0088 J	0.002 U
Acenaphthylene	0.0017 U	0.0019 U	0.0022 U	0.002 U	0.0021 U	0.0017 U	0.0019 U	0.0019 U	0.0039 U	0.0016 U
Acetophenone	0.0021 U	0.0024 U	0.0027 U	0.0025 U	0.0026 U	0.0045 J	0.0023 U	0.0023 U	0.0048 U	0.0019 U
Anthracene	0.0052 J	0.0023 U	0.0072 J	0.0024 U	0.0025 U	0.0022 J	0.0064 J	0.0076 J	0.015 J	0.0018 U
Atrazine	0.017 U	0.019 U	0.022 U	0.02 U	0.021 U	0.017 U	0.019 U	0.019 U	0.039 U	0.016 U
Benzaldehyde	0.0047 UR	0.0054 UR	0.0061 UR	0.0057 UR	0.0059 UR	0.0063 J-	0.0053 UR	0.0056 J-	0.011 UR	0.0044 UR
Benzo(A)Anthracene	0.045	0.01	0.051	0.014	0.0034 J	0.0079	0.045	0.054	0.12	0.0091
Benzo(A)Pyrene	0.058	0.012	0.065	0.019	0.0042 J	0.0055 J	0.065	0.074	0.16	0.012
Benzo(B)Fluoranthene	0.083	0.015	0.1	0.025	0.0048 J	0.013	0.11	0.13	0.26	0.017
Benzo(G,H,I)Perylene	0.06	0.012	0.066	0.02	0.004 J	0.009	0.076	0.086	0.17	0.013
Benzo(K)Fluoranthene	0.025	0.0096	0.03	0.0089 J	0.0029 J	0.0064 J	0.037	0.043	0.091	0.0088
Benzyl Butyl Phthalate	0.026 U	0.03 U	0.034 U	0.032 U	0.033 U	0.027 U	0.03 U	0.03 U	0.061 U	0.024 U
Biphenyl (Diphenyl)	0.0016 U	0.0018 U	0.0021 U	0.0019 U	0.002 U	0.0016 U	0.0018 U	0.0018 U	0.0037 U	0.0015 U
Bis(2-Chloroethoxy) Methane	0.0018 U	0.0021 U	0.0024 U	0.0022 U	0.0023 U	0.0019 U	0.0021 U	0.0021 U	0.0042 U	0.0017 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.0014 U	0.0016 U	0.0018 U	0.0017 U	0.0017 U	0.0014 U	0.0016 U	0.0016 U	0.0032 U	0.0013 U
Bis(2-Chloroisopropyl) Ether	0.0028 U	0.0032 U	0.0037 U	0.0034 U	0.0035 U	0.0029 U	0.0032 U	0.0032 U	0.0066 U	0.0026 U
Bis(2-Ethylhexyl) Phthalate	0.041 U	0.046 U	0.053 U	0.27 J	0.14 J	0.35 J	0.51	0.11 J	0.11 J+	0.038 U
Caprolactam	0.025 U	0.028 U	0.032 U	0.03 U	0.031 U	0.026 U	0.028 U	0.028 U	0.058 U	0.023 U
Carbazole	0.006 J	0.002 J	0.0094 J	0.0029 J	0.0022 U	0.0024 J	0.0094	0.012	0.02	0.0018 J
Chrysene	0.064	0.014	0.076	0.02	0.0047 J	0.012	0.082	0.1	0.2	0.018
Dibenz(A,H)Anthracene	0.014	0.0023 J	0.013	0.0028 J	0.0021 U	0.0018 U	0.015	0.017	0.032	0.0028 J
Dibenzofuran	0.0017 U	0.0019 U	0.0022 U	0.002 U	0.0021 U	0.0017 U	0.0019 U	0.0019 U	0.0039 U	0.0016 U
Diethyl Phthalate	0.011 U	0.013 U	0.015 U	0.014 U	0.014 U	0.012 U	0.013 U	0.013 U	0.027 U	0.011 U
Dimethyl Phthalate	0.0014 U	0.0016 U	0.0018 U	0.0017 U	0.0017 U	0.0014 U	0.0016 U	0.0016 U	0.0032 U	0.0013 U
Di-N-Butyl Phthalate	0.017 U	0.019 U	0.022 U	0.02 U	0.021 U	0.017 U	0.019 U	0.019 U	0.039 U	0.016 U
Di-N-Octylphthalate	0.022 U	0.025 U	0.029 U	0.027 U	0.028 U	0.023 U	0.025 U	0.025 U	0.052 U	0.021 U
Fluoranthene	0.071	0.018	0.097	0.022	0.0059 J	0.019	0.085	0.11	0.22	0.02
Fluorene	0.0021 J	0.0017 U	0.0026 J	0.0018 U	0.0019 U	0.0015 U	0.0024 J	0.0017 U	0.0067 J	0.0014 U
Hexachlorobenzene	0.0027 U	0.0031 U	0.0035 U	0.0033 U	0.0034 U	0.0028 U	0.0031 U	0.0031 U	0.0064 U	0.0026 U

Table E-18
Summary of Data Used in Risk Assessment
North-Central Undeveloped Area Soil (0-0.5 ft-bgs) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-241	CFSB-248	CFSB-251	CFSB-254	CFSB-255	CFSB-256	CFSB-257	CFSB-258	CFSB-259	CFSB-260
Sample Lab IDs	180-77488-23, 460-155568-1	180-77393-38, 460-155265-42	180-77393-41, 460-155265-45	180-77393-10, 460-155265-12	180-77393-4, 460-155265-4	180-77393-7, 460-155265-7	180-77393-13, 460-155265-15	180-77393-16, 460-155265-18	180-77393-19, 460-155265-21	180-77488-26, 460-155568-4
Sample Name	CFSB-241-SO-0-0.5	CFSB-248-SO-0-0.5	CFSB-251-SO-0-0.5	CFSB-254-SO-0-0.5	CFSB-255-SO-0-0.5	CFSB-256-SO-0-0.5	CFSB-257-SO-0-0.5	CFSB-258-SO-0-0.5	CFSB-259-SO-0-0.5	CFSB-260-SO-0-0.5
Sample Depth	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft
Chemical	5/5/2018	5/1/2018	5/1/2018	4/30/2018	4/30/2018	4/30/2018	4/30/2018	4/30/2018	4/30/2018	5/5/2018
Hexachlorobutadiene	0.0022 U	0.0025 U	0.0029 U	0.0027 U	0.0028 U	0.0023 U	0.0025 U	0.0025 U	0.0052 U	0.0021 U
Hexachlorocyclopentadiene	0.0019 U	0.0022 U	0.0025 U	0.0024 U	0.0024 U	0.002 U	0.0022 U	0.0022 U	0.0045 U	0.0018 U
Hexachloroethane	0.002 U	0.0022 U	0.0026 U	0.0024 U	0.0025 U	0.002 U	0.0022 U	0.0022 U	0.0046 U	0.0018 U
Indeno(1,2,3-C,D)Pyrene	0.047	0.01	0.051	0.015	0.0031 J	0.0073 J	0.061	0.066	0.14	0.0097
Isophorone	0.0019 U	0.0022 U	0.0025 U	0.0024 U	0.0024 U	0.002 U	0.0022 U	0.0022 U	0.0045 U	0.0018 U
Naphthalene	0.0015 U	0.0017 U	0.0019 U	0.0018 U	0.0019 U	0.0015 U	0.0022 J	0.0019 J	0.0035 U	0.0014 U
Nitrobenzene	0.014 U	0.016 U	0.018 U	0.017 U	0.017 U	0.014 U	0.016 U	0.016 U	0.032 U	0.013 U
N-Nitrosodi-N-Propylamine	0.0026 U	0.0029 U	0.0034 U	0.0031 U	0.0032 U	0.0027 U	0.0029 U	0.0029 U	0.006 U	0.0024 U
N-Nitrosodiphenylamine	0.013 U	0.014 U	0.016 U	0.015 U	0.016 U	0.013 U	0.014 U	0.014 U	0.03 U	0.012 U
Pentachlorophenol	0.061 U	0.07 UJ	0.08 UJ	0.074 U	0.077 UJ	0.063 UJ	0.069 U	0.069 U	0.14 U	0.057 U
Phenanthrene	0.028	0.01	0.046	0.012	0.0035 J	0.011	0.04	0.045	0.093	0.007 J
Phenol	0.012 U	0.013 U	0.015 U	0.014 U	0.014 U	0.012 U	0.013 U	0.013 U	0.027 U	0.011 U
Pyrene	0.076	0.018	0.097	0.024	0.0059 J	0.012	0.083	0.11	0.23	0.018

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-19
Summary of Data Used in Risk Assessment
North-Central Undeveloped Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-011A	CFMW-011A	CFMW-011A-DUP	CFMW-011A	CFMW-067	CFMW-067	CFMW-067	CFMW-067-DUP	CFSB-011	CFSB-011	CFSB-011	CFSB-013	CFSB-013	CFSB-013
Sample Lab IDs	460-116119-10	460-116119-11	460-116119-13	460-116119-12	180-77393-22, 460-155265-24	180-77393-23, 460-155265-25	180-77393-24, 460-155265-26	180-77393-25, 460-155265-27	460-114141-41	460-114141-42	460-114141-43	460-114141-38	460-114141-39	460-114141-40
Sample Name	CFMW-011a-SO-0-0.5	CFMW-011a-SO-0.5-2	CFMW-Dup18-SO	CFMW-011a-SO-10-12	CFMW-067-SO-0-0.5	CFMW-067-SO-0.5-2	CFMW-067-SO-10-12	CFMW-DUP26-SO	CFSB-011-SO-0-0.5	CFSB-011-SO-0.5-2.0	CFSB-011-SO-10-12	CFSB-013-SO-0-0.5	CFSB-013-SO-0.5-2.0	CFSB-013-SO-10-12
Sample Depth	0-0.5 ft	0.5-2 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft
Chemical	6/25/2016	6/25/2016	6/25/2016	6/25/2016	5/1/2018	5/1/2018	5/1/2018	5/1/2018	5/19/2016	5/19/2016	5/19/2016	5/19/2016	5/19/2016	5/19/2016
GENERAL CHEMISTRY (mg/kg)														
Fluoride	27.6 J+	12 J+	10.1 J+	5.08 J+	3.86	0.17 U	1.29	1.79	8.33 J-	11.2 J-	7.87 J-	15.8 J-	8 J-	1.57 J-
Cyanide	0.042 J	0.051 J	0.034 J	0.027 J	0.072 U	0.071 U	0.063 U	0.062 U	0.12 J	0.044 J	0.022 J	0.23	0.17	0.018 U
METALS (mg/kg)														
"Chromium, Hexavalent - Estimated"	0.23017	0.262287	0.259611	0.302433	0.299757	0.256934	0.243552	0.243552	0.291727	0.361314	0.256934	0.2382	0.246229	0.259611
"Chromium, Trivalent - Estimated"	8.36983	9.53771	9.44039	10.9976	10.9002	9.34307	8.85645	8.85645	10.6083	13.1387	9.34307	8.6618	8.95377	9.44039
Aluminum	15800	10000	10400	11000	15700 J	14400 J	9370 J	10600 J	16400	14400 J	7460	16900 J	13900 J	6240 J
Antimony	0.49 U	0.47 U	0.47 U	0.33 UJ	0.35 UJ	0.33 UJ	0.3 UJ	0.31 UJ	0.48 UJ	0.36 U	0.4 UJ	0.39 UJ	0.4 UJ	0.32 UJ
Arsenic	4.9	4.6	4.5	4.7	5.5 J	4.2 J	4.8 J	4.7 J	5.2	6.1 J	3.3	5.3 J	5.8 J	2.8 J
Barium	158	61.8	63.3	139	370	90.9	80.6	86.1	253 J+	195	102 J+	267	222	68.9
Beryllium	0.55	0.57	0.58	0.4	0.51	0.44 J	0.32 J	0.33 J	0.58	0.53	0.3 J	0.59	0.52	0.33
Cadmium	0.37 U	0.36 U	0.36 U	0.25 U	0.4 U	0.38 U	0.35 U	0.36 U	0.37 U	0.27 U	0.31 U	0.29 U	0.3 U	0.25 U
Calcium	6600	1660	1560	45500	2260 J+	1600 J+	31400 J+	29200 J+	3070	3300	4290	4240	3790	7110
Chromium, Total	8.6	9.8	9.7	11.3 J-	11.2	9.6	9.1	9.1	10.9	13.5	9.6	8.9	9.2	9.7
Cobalt	6.2	8.1	8.5	5.5 J-	4.9	4.5	4.6	4.2	6.6	6	3.9	5.6	4.8	6.3
Copper	13.4	12.2	11.3	11.1 J-	8 J	26.7 J	16 J	12.5 J	13.1	20.6 J	10	12.5 J	12.1 J	9.4 J
Iron	14900	14500	14300	16300	17700	16100	13700	14100	17000	17100	9590	14000	13300	12900
Lead	11.2	12.9	12.8	7.7 J-	10.6 J+	8.5 J+	8.7 J+	8.3 J+	10.4	11.1	5.9	10.2	9	5.4
Magnesium	7170	6160	6120	17100	7530 J	9050 J	9470 J	10000 J	7080	8700	6000	5750	5980	7520
Manganese	446	475	490	486	1940 J	226 J	510 J	541 J	457	453 J	359	518 J	554 J	855 J
Mercury	0.015 U	0.014 U	0.013 U	0.016	0.038	0.02	0.025	0.029	0.02	0.014 J	0.018	0.032	0.025	0.012 U
Nickel	12.2	11.2	10.8	12.2 J-	10.9	11.6	10.1	9.6	12.2	11.2	8	10.1	9.1	9.4
Potassium	978	1040	1060	1360	768 J+	486 J+	570 J+	614 J+	1120	1140	536	1020	903	619
Selenium	0.46 U	0.44 U	0.44 U	0.31 U	0.34 U	0.33 U	0.3 U	0.31 U	0.5 J	0.42 J	0.38 U	0.41 J	0.43 J	0.3 U
Silver	0.9 U	0.87 U	0.86 U	0.61 U	0.73 U	0.69 U	0.64 U	0.66 U	0.88 U	0.66 U	0.74 U	0.71 U	0.73 U	0.59 U
Sodium	168	44.2 U	44.1 U	31 U	49.3 J	35.2 U	32.4 U	33.3 U	64.6 J	45.5 J	46.2 J	39.5 J	37 U	30.3 U
Thallium	0.19 U	0.18 U	0.18 U	0.13 U	0.15 U	0.14 U	0.13 U	0.13 U	0.18 U	0.14 U	0.15 U	0.15 U	0.15 U	0.12 U
Vanadium	12.8	12.5	13.2	7.9	13 J+	7.6 J+	6.1 J+	7.3 J+	11	12.6	6	11	9.8	7.1
Zinc	40	30.5	30	39.8	81.6	42.2	41	37.7	70.8	57.3	31.5	61.3	51.7	33
PESTICIDES (mg/kg)														
Aldrin	0.001 U	--	--	--	--	--	--	--	--	--	--	--	--	--
Alpha Bhc (Alpha Hexachlorocyclohexane)	0.00076 U	--	--	--	--	--	--	--	--	--	--	--	--	--
Alpha Endosulfan	0.0012 U	--	--	--	--	--	--	--	--	--	--	--	--	--
Beta Bhc (Beta Hexachlorocyclohexane)	0.00081 U	--	--	--	--	--	--	--	--	--	--	--	--	--
Beta Endosulfan	0.0013 U	--	--	--	--	--	--	--	--	--	--	--	--	--
cis-Chlordane	0.0014 U	--	--	--	--	--	--	--	--	--	--	--	--	--
Delta BHC (Delta Hexachlorocyclohexane)	0.00091 U	--	--	--	--	--	--	--	--	--	--	--	--	--
Dieldrin	0.0011 U	--	--	--	--	--	--	--	--	--	--	--	--	--
Endosulfan Sulfate	0.00097 U	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin	0.0011 U	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin Aldehyde	0.001 U	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin Ketone	0.0012 U	--	--	--	--	--	--	--	--	--	--	--	--	--
Gamma Bhc (Lindane)	0.00075 U	--	--	--	--	--	--	--	--	--	--	--	--	--
Heptachlor	0.0011 U	--	--	--	--	--	--	--	--	--	--	--	--	--
Heptachlor Epoxide	0.0016 U	--	--	--	--	--	--	--	--	--	--	--	--	--
Methoxychlor	0.0018 U	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDD	0.0011 U	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDE	0.0012 U	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDT	0.00086 U	--	--	--	--	--	--	--	--	--	--	--	--	--
Toxaphene	0.024 U	--	--	--	--	--	--	--	--	--	--	--	--	--
trans-Chlordane	0.0018 U	--	--	--	--	--	--	--	--	--	--	--	--	--
POLYCHLORINATED BIPHENYLS (mg/kg)														
PCB-1016 (Aroclor 1016)	0.011 U	0.011 U	0.011 U	0.0091 U	--	--	--	--	0.011 U	0.0099 U	0.0099 U	0.011 U	0.01 U	0.0093 U
PCB-1221 (Aroclor 1221)	0.011 U	0.011 U	0.011 U	0.0091 U	--	--	--	--	0.011 U	0.0099 U	0.0099 U	0.011 U	0.01 U	0.0093 U
PCB-1232 (Aroclor 1232)	0.011 U	0.011 U	0.011 U	0.0091 U	--	--	--	--	0.011 U	0.0099 U	0.0099 U	0.011 U	0.01 U	0.0093 U
PCB-1242 (Aroclor 1242)	0.011 U	0.011 U	0.011 U	0.0091 U	--	--	--	--	0.011 U	0.0099 U	0.0099 U	0.011 U	0.01 U	0.0093 U
PCB-1248 (Aroclor 1248)	0.011 U	0.011 U	0.011 U	0.0091 U	--	--	--	--	0.011 U	0.0099 U	0.0099 U	0.011 U	0.01 U	0.0093 U
PCB-1254 (Aroclor 1254)	0.011 U	0.011 U	0.011 U	0.0094 U	--	--	--	--	0.011 U	0.01 U	0.01 U	0.012 U	0.011 U	0.0097 U

Table E-19
Summary of Data Used in Risk Assessment
North-Central Undeveloped Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Sample Depth Chemical	CFMW-011A 460-116119-10 CFMW-011a-SO-0-0.5 0-0.5 ft 6/25/2016	CFMW-011A 460-116119-11 CFMW-011a-SO-0.5-2 0.5-2 ft 6/25/2016	CFMW-011A-DUP 460-116119-13 CFMW-Dup18-SO 0.5-2 ft 6/25/2016	CFMW-011A 460-116119-12 CFMW-011a-SO-10-12 10-12 ft 6/25/2016	CFMW-067 180-77393-22, 460-155265-24 CFMW-067-SO-0-0.5 0-0.5 ft 5/1/2018	CFMW-067 180-77393-23, 460-155265-25 CFMW-067-SO-0.5-2 0.5-2 ft 5/1/2018	CFMW-067 180-77393-24, 460-155265-26 CFMW-067-SO-10-12 10-12 ft 5/1/2018	CFMW-067-DUP 180-77393-25, 460-155265-27 CFMW-DUP26-SO 10-12 ft 5/1/2018	CFSB-011 460-114141-41 CFSB-011-SO-0-0.5 0-0.5 ft 5/19/2016	CFSB-011 460-114141-42 CFSB-011-SO-0.5-2.0 0.5-2 ft 5/19/2016	CFSB-011 460-114141-43 CFSB-011-SO-10-12 10-12 ft 5/19/2016	CFSB-013 460-114141-38 CFSB-013-SO-0-0.5 0-0.5 ft 5/19/2016	CFSB-013 460-114141-39 CFSB-013-SO-0.5-2.0 0.5-2 ft 5/19/2016	CFSB-013 460-114141-40 CFSB-013-SO-10-12 10-12 ft 5/19/2016
PCB-1260 (Aroclor 1260)	0.011 U	0.011 U	0.011 U	0.0094 U	--	--	--	--	0.011 U	0.01 U	0.01 U	0.012 U	0.011 U	0.0097 U
PCB-1262 (Aroclor 1262)	0.011 U	0.011 U	0.011 U	0.0094 U	--	--	--	--	0.011 U	0.01 U	0.01 U	0.012 U	0.011 U	0.0097 U
PCB-1268 (Aroclor 1268)	0.011 U	0.011 U	0.011 U	0.0094 U	--	--	--	--	0.011 U	0.01 U	0.01 U	0.012 U	0.011 U	0.0097 U
Polychlorinated Biphenyl (PCBs)	0.011 U	0.011 U	0.011 U	0.0094 U	--	--	--	--	0.011 U	0.01 U	0.01 U	0.012 U	0.011 U	0.0097 U
SEMIVOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,2,4,5-Tetrachlorobenzene	0.031 U	0.029 U	0.029 U	0.025 U	0.0017 U	0.0015 U	0.0015 U	0.0016 U	0.029 U	0.027 U	0.027 U	0.032 U	0.028 U	0.026 U
1,4-Dioxane (P-Dioxane)	0.11 U	0.11 U	0.11 U	0.091 U	0.012 U	0.011 UJ	0.011 U	0.011 U	0.11 U	0.098 U	0.098 U	0.11 U	0.1 U	0.093 U
2,3,4,6-Tetrachlorophenol	0.039 U	0.037 U	0.037 U	0.032 UJ	0.016 U	0.015 U	0.015 U	0.015 U	0.037 U	0.034 UJ	0.034 U	0.04 U	0.036 U	0.033 U
2,4,5-Trichlorophenol	0.041 U	0.039 U	0.039 U	0.034 UJ	0.0028 U	0.0025 U	0.0025 U	0.0026 U	0.039 U	0.036 UJ	0.036 U	0.042 U	0.038 U	0.035 U
2,4,6-Trichlorophenol	0.012 U	0.011 U	0.011 U	0.0096 U	0.0022 U	0.0019 U	0.0019 U	0.002 U	0.011 U	0.01 UJ	0.01 U	0.012 U	0.011 U	0.0099 U
2,4-Dichlorophenol	0.0097 U	0.0093 U	0.0093 U	0.008 U	0.003 U	0.0027 U	0.0027 U	0.0028 U	0.0093 U	0.0086 UJ	0.0086 U	0.01 U	0.009 U	0.0082 U
2,4-Dimethylphenol	0.091 U	0.087 U	0.087 U	0.074 U	0.0024 U	0.0022 U	0.0022 U	0.0022 U	0.087 U	0.081 UJ	0.08 U	0.093 U	0.084 U	0.076 U
2,4-Dinitrophenol	0.31 U	0.3 U	0.3 U	0.26 UR	0.11 UJ	0.095 UJ	0.095 UJ	0.097 UJ	0.3 U	0.28 UJ	0.28 U	0.32 U	0.29 U	0.26 U
2,4-Dinitrotoluene	0.016 U	0.016 U	0.016 U	0.013 U	0.002 U	0.0018 U	0.0018 U	0.0018 U	0.016 U	0.015 U	0.014 U	0.017 U	0.015 U	0.014 U
2,6-Dinitrotoluene	0.022 U	0.021 U	0.021 U	0.018 U	0.0024 U	0.0022 U	0.0022 U	0.0022 U	0.021 U	0.019 U	0.019 U	0.023 U	0.02 U	0.018 U
2-Chloronaphthalene	0.0094 U	0.009 U	0.0089 U	0.0077 U	0.0018 U	0.0016 U	0.0016 U	0.0016 U	0.009 U	0.0083 U	0.0083 U	0.0096 U	0.0087 U	0.0079 U
2-Chlorophenol	0.01 U	0.01 U	0.01 U	0.0086 U	0.0018 U	0.0016 U	0.0016 U	0.0017 U	0.01 U	0.0093 UJ	0.0093 U	0.011 U	0.0097 U	0.0088 U
2-Methylnaphthalene	0.0091 U	0.0087 U	0.0087 U	0.0075 U	0.0019 U	0.0017 U	0.0017 U	0.0017 U	0.0087 U	0.0081 UJ	0.0081 U	0.0094 U	0.0084 U	0.0077 U
2-Methylphenol (O-Cresol)	0.018 U	0.017 U	0.017 U	0.015 U	0.011 U	0.01 U	0.01 U	0.01 U	0.017 U	0.016 UJ	0.016 U	0.018 U	0.017 U	0.015 U
2-Nitroaniline	0.014 U	0.013 U	0.013 U	0.011 U	0.018 U	0.016 U	0.016 U	0.016 U	0.013 U	0.012 U	0.012 U	0.014 U	0.013 U	0.011 U
2-Nitrophenol	0.014 U	0.013 U	0.013 U	0.011 UJ	0.0023 U	0.002 U	0.002 U	0.0021 U	0.013 U	0.012 UJ	0.012 U	0.014 U	0.013 U	0.012 U
3- And 4- Methylphenol (Total)	0.011 U	0.011 U	0.01 U	0.009 U	--	--	--	--	0.011 U	0.0097 U	0.0097 U	0.011 U	0.01 U	0.0092 U
3,3'-Dichlorobenzidine	0.046 U	0.044 U	0.044 U	0.038 U	0.037 U	0.033 U	0.033 U	0.033 U	0.044 U	0.041 U	0.041 U	0.047 U	0.043 U	0.039 U
3-Nitroaniline	0.012 U	0.012 U	0.012 U	0.01 U	0.01 U	0.009 U	0.009 U	0.0091 U	0.012 U	0.011 U	0.011 U	0.013 U	0.011 U	0.01 U
4,6-Dinitro-2-Methylphenol	0.11 U	0.11 U	0.11 U	0.09 UJ	0.068 UJ	0.061 UJ	0.061 UJ	0.062 UJ	0.11 U	0.098 UJ	0.098 U	0.11 U	0.1 U	0.093 U
4-Bromophenyl Phenyl Ether	0.013 U	0.012 U	0.012 U	0.011 U	0.0028 U	0.0025 U	0.0025 U	0.0025 U	0.012 U	0.012 U	0.012 U	0.013 U	0.012 U	0.011 U
4-Chloro-3-Methylphenol	0.018 U	0.017 U	0.017 U	0.015 U	0.0019 U	0.0017 U	0.0017 U	0.0017 U	0.017 U	0.016 UJ	0.016 U	0.018 U	0.016 U	0.015 U
4-Chloroaniline	0.011 U	0.01 U	0.01 U	0.0087 U	0.0013 U	0.0012 UJ	0.0012 U	0.0012 U	0.01 U	0.0094 U	0.0094 U	0.011 U	0.0098 U	0.0089 U
4-Chlorophenyl Phenyl Ether	0.012 U	0.012 U	0.012 U	0.01 U	0.0024 U	0.0021 U	0.0021 U	0.0022 U	0.012 U	0.011 U	0.011 U	0.013 U	0.011 U	0.01 U
4-Nitroaniline	0.016 U	0.015 U	0.015 U	0.013 U	0.0019 U	0.0017 U	0.0017 U	0.0017 U	0.015 U	0.014 UJ	0.014 U	0.016 U	0.014 U	0.013 U
4-Nitrophenol	0.2 U	0.19 U	0.19 U	0.16 U	0.028 U	0.025 U	0.025 U	0.025 U	0.19 U	0.18 U	0.18 U	0.2 U	0.18 U	0.17 U
Acenaphthene	0.01 U	0.0096 U	0.0095 U	0.0082 U	0.0023 U	0.002 U	0.002 U	0.0021 U	0.0096 U	0.0089 U	0.0089 U	0.01 U	0.0092 U	0.0084 U
Acenaphthylene	0.011 U	0.01 U	0.01 U	0.0087 U	0.0017 U	0.0015 U	0.0016 U	0.0016 U	0.01 U	0.0094 U	0.0094 U	0.011 U	0.0098 U	0.0089 U
Acetophenone	0.009 U	0.0086 U	0.0086 U	0.0074 U	0.0021 U	0.0019 U	0.0019 U	0.0019 U	0.0086 U	0.008 U	0.008 U	0.0092 U	0.0083 U	0.0076 U
Anthracene	0.039 U	0.038 U	0.037 U	0.032 U	0.0037 J	0.0018 U	0.0018 U	0.0019 U	0.038 U	0.035 UJ	0.035 U	0.04 U	0.036 U	0.033 U
Atrazine	0.018 U	0.018 U	0.018 U	0.015 U	0.017 U	0.015 U	0.016 U	0.016 U	0.018 U	0.016 U	0.016 U	0.019 U	0.017 U	0.015 U
Benzaldehyde	0.031 U	0.03 U	0.03 U	0.026 U	0.0049 UR	0.0044 UR	0.0044 UR	0.0045 UR	0.03 U	0.028 UJ	0.028 U	0.032 U	0.029 U	0.026 U
Benzo(A)Anthracene	0.034 U	0.033 U	0.033 U	0.028 U	0.034	0.0013 U	0.0013 UJ	0.003 J	0.041	0.031 U	0.031 U	0.14	0.033 J	0.029 U
Benzo(A)Pyrene	0.03 J	0.012 U	0.012 U	0.01 U	0.04	0.0015 U	0.0015 UJ	0.0029 J	0.045	0.02 J	0.011 U	0.16	0.036 J	0.01 U
Benzo(B)Fluoranthene	0.053	0.015 U	0.015 U	0.013 U	0.069	0.0017 U	0.0017 UJ	0.0058 J	0.11	0.049	0.016 J	0.41	0.11	0.014 U
Benzo(G,H,I)Perylene	0.031 J	0.023 U	0.023 U	0.019 U	0.046	0.0015 U	0.0015 UJ	0.004 J	0.051 J	0.023 J+	0.021 U	0.19 J	0.05 J	0.02 U
Benzo(K)Fluoranthene	0.023 J	0.017 U	0.017 U	0.015 U	0.026	0.0021 U	0.0021 U	0.0023 J	0.033 J	0.016 U	0.016 U	0.13	0.032 J	0.015 U
Benzyl Butyl Phthalate	0.013 U	0.012 U	0.012 U	0.01 U	0.027 U	0.024 U	0.024 U	0.025 U	0.012 U	0.011 U	0.011 U	0.013 U	0.012 U	0.011 U
Biphenyl (Diphenyl)	0.035 U	0.034 U	0.034 U	0.029 U	0.0017 U	0.0015 U	0.0015 U	0.0015 U	0.034 U	0.031 U	0.031 U	0.036 U	0.033 U	0.03 U
Bis(2-Chloroethoxy) Methane	0.013 U	0.012 U	0.012 U	0.011 U	0.0019 U	0.0017 U	0.0017 U	0.0017 U	0.012 U	0.011 U	0.011 U	0.013 U	0.012 U	0.011 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.0097 U	0.0093 U	0.0093 U	0.008 U	0.0014 U	0.0013 U	0.0013 U	0.0013 U	0.0093 U	0.0086 U	0.0086 U	0.01 U	0.009 U	0.0082 U
Bis(2-Chloroisopropyl) Ether	0.017 U	0.016 U	0.016 U	0.014 U	0.0029 U	0.0026 U	0.0026 U	0.0027 U	0.016 U	0.015 U	0.015 U	0.017 U	0.016 U	0.014 U
Bis(2-Ethylhexyl) Phthalate	0.016 U	0.015 U	0.015 U	0.013 U	0.042 U	0.038 U	0.038 U	0.038 U	0.085 J	0.014 U	0.014 U	0.017 U	0.015 U	0.014 U
Caprolactam	0.03 UJ	0.028 UJ	0.028 UJ	0.024 UJ	0.026 U	0.023 U	0.023 U	0.023 U	0.028 U	0.026 UJ	0.026 U	0.031 U	0.028 U	0.025 U
Carbazole	0.01 U	0.0098 U	0.0098 U	0.0084 U	0.006 J	0.0017 U	0.0017 U	0.0017 U	0.0098 U	0.0091 UJ	0.0091 U	0.017 J	0.0095 U	0.0086 U
Chrysene	0.043 J	0.011 U	0.011 U	0.0092 U	0.051	0.0014 U	0.0014 UJ	0.005 J	0.084 J	0.041 J	0.01 U	0.25 J	0.086 J	0.0094 U
Dibenz(A,H)Anthracene	0.021 U	0.021 U	0.02 U	0.018 U	0.012	0.0016 U	0.0016 U	0.0016 U	0.021 U	0.019 U	0.019 U	0.056 J+	0.02 U	0.018 U
Dibenzofuran	0.012 U	0.012 U	0.012 U	0.01 U	0.0017 U	0.0015 U	0.0016 U	0.0016 U	0.012 U	0.011 U	0.011 U	0.013 U	0.012 U	0.01 U
Diethyl Phthalate	0.012 U	0.011 U	0.011 U	0.0096 U	0.012 U	0.011 U	0.011 U	0.011 U	0.011 U	0.01 U	0.01 U	0.012 U	0.011 U	0.0099 U
Dimethyl Phthalate	0.012 U	0.011 U	0.011 U	0.0098 U	0.0014 U	0.0013 U	0.0013 U	0.0013 U	0.011 U	0.011 U	0.011 U	0.012 U	0.011 U	0.01 U
Di-N-Butyl Phthalate	0.012 U	0.012 U	0.012 U	0.01 U	0.017 U	0.015 U	0.016 U	0.016 U	0.012 U	0.011 U	0.011 U	0.013 U	0.011 U	0.01 U
Di-N-Octylphthalate	0.021 U	0.02 U	0.02 U	0.017 U	0.023 U	0.021 U	0.021 U	0.021 U	0.02 U	0.019 U	0.019 U	0.022 U	0.019 U	0.018 U
Fluoranthene	0.038 J	0.012 U	0.012 U	0.01 U	0.056	0.0019 U	0.0019 UJ	0.0048 J	0.059 J	0.028 J-	0.011 U	0.21 J	0.048 J	0.01 U

Table E-19
Summary of Data Used in Risk Assessment
North-Central Undeveloped Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Sample Depth Chemical	CFMW-011A 460-116119-10 CFMW-011a-SO-0-0.5 0-0.5 ft 6/25/2016	CFMW-011A 460-116119-11 CFMW-011a-SO-0.5-2 0.5-2 ft 6/25/2016	CFMW-011A-DUP 460-116119-13 CFMW-Dup18-SO 0.5-2 ft 6/25/2016	CFMW-011A 460-116119-12 CFMW-011a-SO-10-12 10-12 ft 6/25/2016	CFMW-067 180-77393-22, 460-155265-24 CFMW-067-SO-0-0.5 0-0.5 ft 5/1/2018	CFMW-067 180-77393-23, 460-155265-25 CFMW-067-SO-0.5-2 0.5-2 ft 5/1/2018	CFMW-067 180-77393-24, 460-155265-26 CFMW-067-SO-10-12 10-12 ft 5/1/2018	CFMW-067-DUP 180-77393-25, 460-155265-27 CFMW-DUP26-SO 10-12 ft 5/1/2018	CFSB-011 460-114141-41 CFSB-011-SO-0-0.5 0-0.5 ft 5/19/2016	CFSB-011 460-114141-42 CFSB-011-SO-0.5-2.0 0.5-2 ft 5/19/2016	CFSB-011 460-114141-43 CFSB-011-SO-10-12 10-12 ft 5/19/2016	CFSB-013 460-114141-38 CFSB-013-SO-0-0.5 0-0.5 ft 5/19/2016	CFSB-013 460-114141-39 CFSB-013-SO-0.5-2.0 0.5-2 ft 5/19/2016	CFSB-013 460-114141-40 CFSB-013-SO-10-12 10-12 ft 5/19/2016
Fluorene	0.009 U	0.0086 U	0.0086 U	0.0074 U	0.0016 U	0.0014 U	0.0014 U	0.0014 U	0.0086 U	0.008 UJ	0.008 U	0.0092 U	0.0083 U	0.0076 U
Hexachlorobenzene	0.017 U	0.016 U	0.016 U	0.014 U	0.0028 U	0.0025 U	0.0025 U	0.0026 U	0.016 U	0.015 U	0.015 U	0.017 U	0.015 U	0.014 U
Hexachlorobutadiene	0.012 U	0.011 U	0.011 U	0.0095 U	0.0023 U	0.0021 U	0.0021 U	0.0021 U	0.011 U	0.01 U	0.01 U	0.012 U	0.011 U	0.0098 U
Hexachlorocyclopentadiene	0.026 U	0.025 U	0.025 U	0.021 U	0.002 U	0.0018 U	0.0018 U	0.0018 U	0.025 U	0.023 U	0.023 U	0.026 U	0.024 U	0.022 U
Hexachloroethane	0.015 U	0.014 U	0.014 U	0.012 U	0.002 U	0.0018 U	0.0018 U	0.0019 U	0.014 U	0.013 U	0.013 U	0.016 U	0.014 U	0.013 U
Indeno(1,2,3-C,D)Pyrene	0.027 U	0.026 U	0.026 U	0.023 U	0.037	0.0014 U	0.0014 UJ	0.0034 J	0.056 J+	0.024 J	0.024 U	0.2 J+	0.049 J+	0.023 U
Isophorone	0.0089 U	0.0085 U	0.0085 U	0.0073 U	0.002 U	0.0018 U	0.0018 U	0.0018 U	0.0089 J	0.0079 U	0.0079 U	0.013 J	0.0082 U	0.0074 U
Naphthalene	0.01 U	0.01 U	0.01 U	0.0086 U	0.0015 U	0.0014 U	0.0014 U	0.0014 U	0.01 U	0.0093 UJ	0.0093 U	0.011 U	0.0097 U	0.0088 U
Nitrobenzene	0.013 U	0.012 U	0.012 U	0.011 U	0.014 U	0.013 U	0.013 U	0.013 U	0.012 U	0.012 U	0.012 U	0.013 U	0.012 U	0.011 U
N-Nitrosodi-N-Propylamine	0.014 U	0.013 U	0.013 U	0.011 U	0.0027 U	0.0024 U	0.0024 U	0.0024 U	0.013 U	0.012 U	0.012 U	0.014 U	0.013 U	0.012 U
N-Nitrosodiphenylamine	0.037 U	0.036 U	0.036 U	0.031 U	0.013 U	0.012 U	0.012 U	0.012 U	0.036 U	0.033 UJ	0.033 U	0.038 U	0.035 U	0.031 U
Pentachlorophenol	0.05 U	0.048 U	0.048 U	0.041 UJ	0.063 U	0.057 U	0.057 UJ	0.058 U	0.048 U	0.044 UJ	0.044 U	0.051 U	0.046 U	0.042 U
Phenanthrene	0.018 J	0.011 U	0.01 U	0.009 U	0.024	0.0019 U	0.0019 UJ	0.0027 J	0.036 J	0.018 J-	0.0097 U	0.098 J	0.031 J	0.0092 U
Phenol	0.013 U	0.013 U	0.013 U	0.011 U	0.012 U	0.011 U	0.011 U	0.011 U	0.013 U	0.012 UJ	0.012 U	0.014 U	0.012 U	0.011 U
Pyrene	0.043 J	0.018 U	0.018 U	0.015 U	0.057	0.0017 U	0.0017 UJ	0.0044 J	0.063 J	0.029 J	0.017 U	0.22 J	0.058 J	0.016 U
VOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,1,1-Trichloroethane	--	0.00033 U	0.00032 U	0.00034 U	--	--	--	--	--	0.00055 UJ	0.00033 U	--	0.00046 U	0.00033 U
1,1,2,2-Tetrachloroethane	--	0.00015 U	0.00014 U	0.00015 U	--	--	--	--	--	0.00024 UJ	0.00015 U	--	0.0002 U	0.00015 U
1,1,2-Trichloro-1,2,2-Trifluoroethane	--	0.00038 U	0.00037 U	0.0004 U	--	--	--	--	--	0.00063 UJ	0.00038 U	--	0.00053 U	0.00038 U
1,1,2-Trichloroethane	--	0.00024 U	0.00024 U	0.00025 U	--	--	--	--	--	0.0004 UJ	0.00024 U	--	0.00034 U	0.00024 U
1,1-Dichloroethane	--	0.0003 U	0.00029 U	0.00031 U	--	--	--	--	--	0.00049 UJ	0.0003 U	--	0.00041 U	0.0003 U
1,1-Dichloroethene	--	0.00036 U	0.00035 U	0.00037 U	--	--	--	--	--	0.00059 UJ	0.00036 U	--	0.00049 U	0.00036 U
1,2,3-Trichlorobenzene	--	0.000096 U	0.000093 U	0.000099 UJ	--	--	--	--	--	0.00016 UJ	0.000096 U	--	0.00013 U	0.000096 U
1,2,4-Trichlorobenzene	--	0.00028 U	0.00027 U	0.00029 UJ	--	--	--	--	--	0.00046 UJ	0.00028 U	--	0.00038 U	0.00028 U
1,2-Dibromo-3-Chloropropane	--	0.00041 U	0.0004 U	0.00042 U	--	--	--	--	--	0.00067 UJ	0.00041 U	--	0.00056 U	0.00041 U
1,2-Dibromoethane (Ethylene Dibromide)	--	0.0001 U	0.0001 U	0.00011 U	--	--	--	--	--	0.00017 UJ	0.0001 U	--	0.00014 U	0.0001 U
1,2-Dichlorobenzene	--	0.00012 U	0.00012 U	0.00013 UJ	--	--	--	--	--	0.0002 UJ	0.00012 U	--	0.00017 U	0.00012 U
1,2-Dichloroethane	--	0.000096 U	0.000093 U	0.000099 U	--	--	--	--	--	0.00016 U	0.000096 U	--	0.00013 U	0.000096 U
1,2-Dichloropropane	--	0.00015 U	0.00014 U	0.00015 U	--	--	--	--	--	0.00024 UJ	0.00015 U	--	0.0002 U	0.00015 U
1,3-Dichlorobenzene	--	0.0001 U	0.0001 U	0.00011 UJ	--	--	--	--	--	0.00017 UJ	0.0001 U	--	0.00014 U	0.0001 U
1,4-Dichlorobenzene	--	0.00011 U	0.00011 U	0.00012 UJ	--	--	--	--	--	0.00019 UJ	0.00011 U	--	0.00016 U	0.00011 U
2-Hexanone	--	0.00082 U	0.00079 U	0.00084 U	--	--	--	--	--	0.0013 U	0.00082 U	--	0.0011 U	0.00082 U
Acetone	--	0.038	0.045	0.0047 J-	--	--	--	--	--	0.042 J	0.019	--	0.071	0.0086
Benzene	--	0.00017 UJ	0.0003 J	0.00018 U	--	--	--	--	--	0.00041 J-	0.00044 J	--	0.00024 U	0.00031 J
Bromochloromethane	--	0.00015 U	0.00014 U	0.00015 U	--	--	--	--	--	0.00024 U	0.00015 U	--	0.0002 U	0.00015 U
Bromodichloromethane	--	0.00033 U	0.00032 U	0.00034 U	--	--	--	--	--	0.00055 UJ	0.00033 U	--	0.00046 U	0.00033 U
Bromoform	--	0.00011 U	0.00011 U	0.00012 U	--	--	--	--	--	0.00019 U	0.00011 U	--	0.00016 U	0.00011 U
Bromomethane	--	0.00028 U	0.00027 U	0.00029 U	--	--	--	--	--	0.00046 UJ	0.00028 U	--	0.00038 U	0.00028 U
Carbon Disulfide	--	0.00038 U	0.00036 U	0.00039 U	--	--	--	--	--	0.00062 UJ	0.00037 U	--	0.00052 U	0.00058 J
Carbon Tetrachloride	--	0.00038 U	0.00036 U	0.00039 U	--	--	--	--	--	0.00062 UJ	0.00037 U	--	0.00052 U	0.00037 U
Chlorobenzene	--	0.00012 U	0.00012 U	0.00013 U	--	--	--	--	--	0.0002 UJ	0.00012 U	--	0.00017 U	0.00012 U
Chloroethane	--	0.00031 U	0.0003 U	0.00031 U	--	--	--	--	--	0.0005 U	0.0003 U	--	0.00042 U	0.0003 U
Chloroform	--	0.00018 U	0.00018 U	0.00019 U	--	--	--	--	--	0.0003 UJ	0.00018 U	--	0.00025 U	0.00018 U
Chloromethane	--	0.00033 U	0.00032 U	0.00034 U	--	--	--	--	--	0.00055 UJ	0.00033 U	--	0.00046 U	0.00033 U
Cis-1,2-Dichloroethylene	--	0.00019 U	0.00019 U	0.0002 U	--	--	--	--	--	0.00032 UJ	0.00019 U	--	0.00026 U	0.00019 U
Cis-1,3-Dichloropropene	--	0.00013 U	0.00013 U	0.00013 U	--	--	--	--	--	0.00022 UJ	0.00013 U	--	0.00018 U	0.00013 U
Cyclohexane	--	0.0004 U	0.00039 U	0.00041 U	--	--	--	--	--	0.00066 UJ	0.0004 U	--	0.00055 U	0.0004 U
Dibromochloromethane	--	0.00013 U	0.00013 U	0.00013 U	--	--	--	--	--	0.00022 UJ	0.00013 U	--	0.00018 U	0.00013 U
Dichlorodifluoromethane	--	0.00028 U	0.00027 U	0.00029 U	--	--	--	--	--	0.00046 UJ	0.00028 U	--	0.00038 U	0.00028 U
Ethylbenzene	--	0.00016 U	0.00015 U	0.00016 U	--	--	--	--	--	0.00026 UJ	0.00016 U	--	0.00022 U	0.00016 U
Isopropylbenzene (Cumene)	--	0.00015 U	0.00014 U	0.00015 U	--	--	--	--	--	0.00024 UJ	0.00015 U	--	0.0002 U	0.00015 U
M,P-Xylene	--	0.000096 U	0.000093 U	0.000099 U	--	--	--	--	--	0.00016 UJ	0.00012 J	--	0.00013 U	0.0002 J
Methyl Acetate	--	0.0019 J	0.00076 UJ	0.00081 U	--	--	--	--	--	0.27 J	0.0038 J	--	0.0058 J	0.00078 U
Methyl Ethyl Ketone (2-Butanone)	--	0.0018 J	0.0021 J	0.00069 U	--	--	--	--	--	0.0011 U	0.00067 U	--	0.0034 J	0.00067 U
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	--	0.0019 U	0.0019 U	0.002 U	--	--	--	--	--	0.0032 UJ	0.0019 U	--	0.0027 U	0.0019 U
Methylcyclohexane	--	0.00044 U	0.00042 U	0.00045 U	--	--	--	--	--	0.00072 UJ	0.0007 J	--	0.0006 U	0.00043 U
Methylene Chloride	--	0.00028 U	0.00027 U	0.00029 U	--	--	--	--	--	0.00046 UJ	0.00028 U	--	0.00038 U	0.00028 U
O-Xylene (1,2-Dimethylbenzene)	--	0.00014 U	0.00014 U	0.00014 U	--	--	--	--	--	0.00023 UJ	0.00014 U	--	0.00019 U	0.00014 U

Table E-19
Summary of Data Used in Risk Assessment
North-Central Undeveloped Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-011A	CFMW-011A	CFMW-011A-DUP	CFMW-011A	CFMW-067	CFMW-067	CFMW-067	CFMW-067-DUP	CFSB-011	CFSB-011	CFSB-011	CFSB-013	CFSB-013	CFSB-013
Sample Lab IDs	460-116119-10	460-116119-11	460-116119-13	460-116119-12	180-77393-22, 460-155265-24	180-77393-23, 460-155265-25	180-77393-24, 460-155265-26	180-77393-25, 460-155265-27	460-114141-41	460-114141-42	460-114141-43	460-114141-38	460-114141-39	460-114141-40
Sample Name	CFMW-011a-SO-0-0.5	CFMW-011a-SO-0.5-2	CFMW-Dup18-SO	CFMW-011a-SO-10-12	CFMW-067-SO-0-0.5	CFMW-067-SO-0.5-2	CFMW-067-SO-10-12	CFMW-DUP26-SO	CFSB-011-SO-0-0.5	CFSB-011-SO-0.5-2.0	CFSB-011-SO-10-12	CFSB-013-SO-0-0.5	CFSB-013-SO-0.5-2.0	CFSB-013-SO-10-12
Sample Depth	0-0.5 ft	0.5-2 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft
Chemical	6/25/2016	6/25/2016	6/25/2016	6/25/2016	5/1/2018	5/1/2018	5/1/2018	5/1/2018	5/19/2016	5/19/2016	5/19/2016	5/19/2016	5/19/2016	5/19/2016
Styrene	--	0.00013 U	0.00013 U	0.00013 U	--	--	--	--	--	0.00022 UJ	0.00013 U	--	0.00018 U	0.00013 U
Tert-Butyl Methyl Ether	--	0.00015 U	0.00014 U	0.00015 U	--	--	--	--	--	0.00024 U	0.00015 U	--	0.0002 U	0.00015 U
Tetrachloroethylene (PCE)	--	0.00024 U	0.00024 U	0.00025 U	--	--	--	--	--	0.0004 UJ	0.00024 U	--	0.00034 U	0.00024 U
Toluene	--	0.00064 J	0.00024 J	0.00017 U	--	--	--	--	--	0.00027 UJ	0.00044 J	--	0.00023 U	0.00039 J
Trans-1,2-Dichloroethene	--	0.00034 U	0.00033 U	0.00035 U	--	--	--	--	--	0.00056 UJ	0.00034 U	--	0.00047 U	0.00034 U
Trans-1,3-Dichloropropene	--	0.000087 U	0.000084 U	0.00009 U	--	--	--	--	--	0.00014 UJ	0.000087 U	--	0.00012 U	0.000087 U
Trichloroethylene (TCE)	--	0.00023 U	0.00022 U	0.00023 U	--	--	--	--	--	0.00037 UJ	0.00023 U	--	0.00031 U	0.00023 U
Trichlorofluoromethane	--	0.0003 U	0.00029 U	0.00031 U	--	--	--	--	--	0.00049 UJ	0.0003 U	--	0.00041 U	0.0003 U
Vinyl Chloride	--	0.00034 U	0.00033 U	0.00035 U	--	--	--	--	--	0.00056 UJ	0.00034 U	--	0.00047 U	0.00034 U

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-19
Summary of Data Used in Risk Assessment
North-Central Undeveloped Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-122	CFSB-122	CFSB-122	CFSB-173	CFSB-173	CFSB-174	CFSB-174	CFSB-175	CFSB-175	CFSB-176	CFSB-176	CFSB-193	CFSB-193	CFSB-197
Sample Lab IDs	460-114141-28	460-114141-29	460-114141-30	180-79272-1, 460-159191-1	180-79272-2, 460-159191-2	180-79272-3, 460-159191-3	180-79272-4, 460-159191-4	180-79272-5, 460-159191-5	180-79272-6, 460-159191-6	180-78894-12, 460-158632-12	180-78894-13, 460-158632-13	180-79434-6, 460-159377-6	180-79434-7, 460-159377-7	180-79108-7, 460-158919-7
Sample Name	CFSB-122-SO-0-0.5	CFSB-122-SO-0.5-2.0	CFSB-122-SO-10-12	CFSB-173-SO-0-0.5	CFSB-173-SO-0.5-2	CFSB-174-0-0.5	CFSB-174-0.5-2	CFSB-175-SO-0-0.5	CFSB-175-SO-0.5-2	CFSB-176-SO-0-0.5	CFSB-176-SO-0.5-2	CFSB-193-SO-0-0.5	CFSB-193-SO-0.5-2	CFSB-197-SO-0-0.5
Sample Depth	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft
Chemical	5/19/2016	5/19/2016	5/19/2016	6/25/2018	6/25/2018	6/25/2018	6/25/2018	6/25/2018	6/25/2018	6/16/2018	6/16/2018	6/27/2018	6/27/2018	6/21/2018
GENERAL CHEMISTRY (mg/kg)														
Fluoride	12.2 J-	5.57 J-	0.57 J-	4.27 J-	7.77 J-	13.4 J-	8.89 J-	15.5 J-	11.9 J-	11.8 J+	11.3 J+	4.93 J-	8.47 J-	7.15
Cyanide	0.026 U	0.024 U	0.017 U	0.13 J	0.064 U	0.12 J	0.063 U	0.064 U	0.058 U	0.16 J+	0.098 J+	0.19 J+	0.11 J+	0.3 J+
METALS (mg/kg)														
"Chromium, Hexavalent - Estimated"	0.144526	0.131144	0.168613	0.147202	0.123114	0.176642	0.181995	0.275669	0.251582	0.192701	0.2382	0.248905	0.240876	0.278345
"Chromium, Trivalent - Estimated"	5.25547	4.76886	6.13139	5.3528	4.47689	6.42336	6.618	10.0243	9.14842	7.0073	8.6618	9.05109	8.75912	10.1217
Aluminum	20200 J	15800 J	4740 J	15600	12700	19300	9630	23000	15600	21500	26100	15200	14400	21100
Antimony	0.5 UJ	0.51 UJ	0.34 UJ	0.25 UJ	0.25 UJ	0.28 UJ	0.26 UJ	0.26 UJ	0.25 UJ	0.38 UJ	0.36 UJ	0.25 UJ	0.24 UJ	0.26 U
Arsenic	2.8 J	2.2 J	3.5 J	3.1	2.4	3.6	3.5	8.5	9	5.1	5.7	5.4	6.3	7.2
Barium	289	288	43	275	204	362	161	310	159	482	469	253	195	354
Beryllium	0.63	0.47 J	0.24 J	0.57	0.56	0.57	0.59	0.69	0.69	0.48 J	0.97	0.45	0.5	0.85
Cadmium	0.38 U	0.39 U	0.26 U	0.29 U	0.28 U	0.32 U	0.3 U	0.3 U	0.28 U	0.44 U	0.42 U	0.3 J	0.28 U	0.3 U
Calcium	3300	3150	29200	2050	1530	1750	1140	1900	1620	4570	2480	3150	1810	4950
Chromium, Total	5.4	4.9	6.3	5.5	4.6	6.6	6.8	10.3	9.4	7.2	8.9	9.3	9	10.4
Cobalt	2.9	2.8	3.7	6.4	6.1	6.8	5.3	5.9	5.8	5	6	4.9	4.2	5.8
Copper	9.1 J	10.2 J	10.6 J	4	3.5	6.9	6.2	17.3	15.5	15.4	18.5	8.7	6.5	18.1
Iron	8140	7710	9580	11000	8920	12500	10500	18800	17300	12000	16600	14700	16800	15200
Lead	6.4	5.1	6.1	9.8	8.2	12	8	14.8	13.1	16.7	14.2	12.9	11.9	14.3
Magnesium	2940	2950	6060	3580	3730	4330	5030	7860	8130	4020	6570	8100	8130	6510
Manganese	49.4 J	44.4 J	224 J	513	454	710	347	233	282	1130 J	742 J	855	405	550
Mercury	0.019 U	0.017 U	0.012 J	0.02	0.0098 J	0.013 J	0.012 U	0.011 J	0.01 U	0.018 J	0.016 J	0.02 J-	0.01 UJ	0.033
Nickel	6.4	5.8	6.9	13.5	12.4	12.6	8.8	12.2	11.3	35.7	15.4	16.8	9.9	11
Potassium	519	551	427	939	758	1030	612	970	679	1400	1520	1020	686	1180
Selenium	0.46 U	0.48 U	0.32 U	0.25 U	0.24 U	0.28 U	0.26 U	0.26 U	0.24 U	0.38 U	0.36 U	0.25 U	0.24 U	0.34 J
Silver	0.91 U	0.93 U	0.62 U	0.54 U	0.52 U	0.59 U	0.55 U	0.56 U	0.52 U	0.8 U	0.77 U	0.53 U	0.51 U	0.55 U
Sodium	552	555	31.8 U	39.6 J	34.6 J	65.4 J	38.4 J	86.9 J	54.2 J	87.8 J	106 J	43.6 J	39.7 J	58.7 J
Thallium	0.19 U	0.19 U	0.13 U	0.11 U	0.11 U	0.12 U	0.11 U	0.11 U	0.11 U	0.16 U	0.16 U	0.11 U	0.1 U	0.11 U
Vanadium	7.7	7.4	6.4	9 J+	7.1 J+	12.7 J+	9 J+	15.2 J+	12.5 J+	20.4	18.3	12.7	15.1	12.7
Zinc	13.6	12.6	23.1	64.5	48.9	62	35.5	52	44.9	84.6	69.8	64.5	41.4	82.1
PESTICIDES (mg/kg)														
Aldrin	0.0013 U	--	--	--	--	--	--	--	--	--	--	--	--	--
Alpha Bhc (Alpha Hexachlorocyclohexane)	0.00097 U	--	--	--	--	--	--	--	--	--	--	--	--	--
Alpha Endosulfan	0.0015 U	--	--	--	--	--	--	--	--	--	--	--	--	--
Beta Bhc (Beta Hexachlorocyclohexane)	0.001 U	--	--	--	--	--	--	--	--	--	--	--	--	--
Beta Endosulfan	0.0017 U	--	--	--	--	--	--	--	--	--	--	--	--	--
cis-Chlordane	0.0017 U	--	--	--	--	--	--	--	--	--	--	--	--	--
Delta BHC (Delta Hexachlorocyclohexane)	0.0012 U	--	--	--	--	--	--	--	--	--	--	--	--	--
Dieldrin	0.0014 U	--	--	--	--	--	--	--	--	--	--	--	--	--
Endosulfan Sulfate	0.0012 U	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin	0.0014 U	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin Aldehyde	0.0013 U	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin Ketone	0.0015 U	--	--	--	--	--	--	--	--	--	--	--	--	--
Gamma Bhc (Lindane)	0.00095 U	--	--	--	--	--	--	--	--	--	--	--	--	--
Heptachlor	0.0014 U	--	--	--	--	--	--	--	--	--	--	--	--	--
Heptachlor Epoxide	0.0021 U	--	--	--	--	--	--	--	--	--	--	--	--	--
Methoxychlor	0.0023 U	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDD	0.0014 U	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDE	0.0015 U	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDT	0.0011 U	--	--	--	--	--	--	--	--	--	--	--	--	--
Toxaphene	0.031 U	--	--	--	--	--	--	--	--	--	--	--	--	--
trans-Chlordane	0.0023 U	--	--	--	--	--	--	--	--	--	--	--	--	--
POLYCHLORINATED BIPHENYLS (mg/kg)														
PCB-1016 (Aroclor 1016)	0.014 U	0.013 U	0.0099 U	--	--	--	--	--	--	--	--	--	--	--
PCB-1221 (Aroclor 1221)	0.014 U	0.013 U	0.0099 U	--	--	--	--	--	--	--	--	--	--	--
PCB-1232 (Aroclor 1232)	0.014 U	0.013 U	0.0099 U	--	--	--	--	--	--	--	--	--	--	--
PCB-1242 (Aroclor 1242)	0.014 U	0.013 U	0.0099 U	--	--	--	--	--	--	--	--	--	--	--
PCB-1248 (Aroclor 1248)	0.014 U	0.013 U	0.0099 U	--	--	--	--	--	--	--	--	--	--	--
PCB-1254 (Aroclor 1254)	0.015 U	0.014 U	0.01 U	--	--	--	--	--	--	--	--	--	--	--

Table E-19
Summary of Data Used in Risk Assessment
North-Central Undeveloped Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-122	CFSB-122	CFSB-122	CFSB-173	CFSB-173	CFSB-174	CFSB-174	CFSB-175	CFSB-175	CFSB-176	CFSB-176	CFSB-193	CFSB-193	CFSB-197
Sample Lab IDs	460-114141-28	460-114141-29	460-114141-30	180-79272-1, 460-159191-1	180-79272-2, 460-159191-2	180-79272-3, 460-159191-3	180-79272-4, 460-159191-4	180-79272-5, 460-159191-5	180-79272-6, 460-159191-6	180-78894-12, 460-158632-12	180-78894-13, 460-158632-13	180-79434-6, 460-159377-6	180-79434-7, 460-159377-7	180-79108-7, 460-158919-7
Sample Name	CFSB-122-SO-0-0.5	CFSB-122-SO-0.5-2.0	CFSB-122-SO-10-12	CFSB-173-SO-0-0.5	CFSB-173-SO-0.5-2	CFSB-174-0-0.5	CFSB-174-0.5-2	CFSB-175-SO-0-0.5	CFSB-175-SO-0.5-2	CFSB-176-SO-0-0.5	CFSB-176-SO-0.5-2	CFSB-193-SO-0-0.5	CFSB-193-SO-0.5-2	CFSB-197-SO-0-0.5
Sample Depth	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft
Chemical	5/19/2016	5/19/2016	5/19/2016	6/25/2018	6/25/2018	6/25/2018	6/25/2018	6/25/2018	6/25/2018	6/16/2018	6/16/2018	6/27/2018	6/27/2018	6/21/2018
PCB-1260 (Aroclor 1260)	0.015 U	0.014 U	0.01 U	--	--	--	--	--	--	--	--	--	--	--
PCB-1262 (Aroclor 1262)	0.015 U	0.014 U	0.01 U	--	--	--	--	--	--	--	--	--	--	--
PCB-1268 (Aroclor 1268)	0.015 U	0.014 U	0.01 U	--	--	--	--	--	--	--	--	--	--	--
Polychlorinated Biphenyl (PCBs)	0.015 U	0.014 U	0.01 U	--	--	--	--	--	--	--	--	--	--	--
SEMIVOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,2,4,5-Tetrachlorobenzene	0.039 U	0.037 U	0.027 U	0.0031 U	0.0015 U	0.0016 U	0.0015 U	0.0016 U	0.0016 U	0.0037 UJ	0.0035 UJ	0.0015 U	0.0016 U	0.0017 UJ
1,4-Dioxane (P-Dioxane)	0.14 U	0.13 U	0.098 U	0.023 U	0.011 U	0.011 U	0.011 U	0.011 U	0.012 U	0.027 U	0.025 U	0.011 U	0.011 U	0.012 U
2,3,4,6-Tetrachlorophenol	0.049 U	0.047 U	0.034 U	0.03 U	0.015 U	0.015 U	0.015 U	0.015 U	0.015 U	0.035 U	0.033 U	0.015 U	0.015 U	0.016 UJ
2,4,5-Trichlorophenol	0.052 U	0.05 U	0.036 U	0.0051 U	0.0025 U	0.0026 U	0.0025 U	0.0026 U	0.0027 U	0.0061 U	0.0057 U	0.0025 U	0.0026 U	0.0028 U
2,4,6-Trichlorophenol	0.015 U	0.014 U	0.01 U	0.004 U	0.0019 U	0.002 U	0.002 U	0.002 U	0.002 U	0.0047 U	0.0044 U	0.002 U	0.002 U	0.0022 U
2,4-Dichlorophenol	0.012 U	0.012 U	0.0086 U	0.0056 U	0.0027 U	0.0028 U	0.0027 U	0.0028 U	0.0029 U	0.0066 U	0.0062 U	0.0027 U	0.0028 U	0.003 U
2,4-Dimethylphenol	0.12 U	0.11 U	0.08 U	0.0045 U	0.0022 U	0.0022 U	0.0022 U	0.0022 U	0.0023 U	0.0053 U	0.005 U	0.0022 U	0.0022 U	0.0025 U
2,4-Dinitrophenol	0.4 U	0.38 U	0.28 U	0.19 U	0.095 U	0.097 U	0.096 U	0.097 U	0.1 U	0.23 U	0.22 U	0.096 U	0.097 U	0.11 UJ
2,4-Dinitrotoluene	0.021 U	0.02 U	0.014 U	0.0036 U	0.0018 U	0.0018 U	0.0018 U	0.0018 U	0.0018 U	0.0042 U	0.004 U	0.0018 U	0.0018 U	0.002 U
2,6-Dinitrotoluene	0.028 U	0.027 U	0.019 U	0.0045 U	0.0022 U	0.0022 U	0.0022 U	0.0022 U	0.0023 U	0.0053 U	0.005 U	0.0022 U	0.0022 U	0.0024 U
2-Chloronaphthalene	0.012 U	0.011 U	0.0083 U	0.0033 U	0.0016 U	0.0017 U	0.0016 U	0.0017 U	0.0017 U	0.0039 U	0.0037 U	0.0016 U	0.0017 U	0.0018 U
2-Chlorophenol	0.013 U	0.013 U	0.0093 U	0.0034 U	0.0016 U	0.0017 U	0.0017 U	0.0017 U	0.0017 U	0.004 U	0.0037 U	0.0017 U	0.0017 U	0.0018 U
2-Methylnaphthalene	0.012 U	0.011 U	0.0081 U	0.0035 U	0.0017 U	0.0017 U	0.0017 U	0.0017 U	0.0018 U	0.0064 J	0.0038 J	0.0018 J	0.0017 U	0.0034 J
2-Methylphenol (O-Cresol)	0.023 U	0.022 U	0.016 U	0.021 U	0.01 U	0.01 U	0.01 U	0.01 U	0.011 U	0.024 U	0.023 U	0.01 U	0.01 U	0.011 U
2-Nitroaniline	0.017 U	0.016 U	0.012 U	0.033 U	0.016 U	0.016 U	0.016 U	0.016 U	0.017 U	0.039 U	0.037 U	0.016 U	0.016 U	0.018 U
2-Nitrophenol	0.018 U	0.017 U	0.012 U	0.0041 U	0.002 U	0.0021 U	0.002 U	0.0021 U	0.0021 U	0.0049 U	0.0046 U	0.002 U	0.0021 U	0.0023 U
3- And 4- Methylphenol (Total)	0.014 U	0.013 U	0.0097 U	--	--	--	--	--	--	--	--	--	--	--
3,3'-Dichlorobenzidine	0.059 U	0.056 U	0.041 U	0.067 U	0.033 U	0.034 U	0.033 U	0.034 U	0.035 U	0.079 U	0.075 U	0.033 U	0.034 U	0.037 U
3-Nitroaniline	0.016 U	0.015 U	0.011 U	0.018 U	0.009 U	0.0092 U	0.0091 U	0.0092 U	0.0094 U	0.022 U	0.02 U	0.0091 U	0.0092 U	0.01 U
4,6-Dinitro-2-Methylphenol	0.14 U	0.13 U	0.098 U	0.12 U	0.061 U	0.062 U	0.061 U	0.062 U	0.064 U	0.15 U	0.14 U	0.061 U	0.062 U	0.068 U
4-Bromophenyl Phenyl Ether	0.017 U	0.016 U	0.012 U	0.005 U	0.0025 U	0.0025 U	0.0025 U	0.0025 U	0.0026 U	0.0059 U	0.0056 U	0.0025 U	0.0025 U	0.0028 U
4-Chloro-3-Methylphenol	0.023 U	0.021 U	0.016 U	0.0034 U	0.0017 U	0.0017 U	0.0017 U	0.0017 U	0.0017 U	0.004 U	0.0038 U	0.0017 U	0.0017 U	0.0019 U
4-Chloroaniline	0.014 U	0.013 U	0.0094 U	0.0024 U	0.0012 U	0.0012 U	0.0012 U	0.0012 U	0.0012 U	0.0028 U	0.0027 U	0.0012 U	0.0012 U	0.0013 U
4-Chlorophenyl Phenyl Ether	0.016 U	0.015 U	0.011 U	0.0044 U	0.0021 U	0.0022 U	0.0022 U	0.0022 U	0.0023 U	0.0052 U	0.0049 U	0.0022 U	0.0022 U	0.0024 U
4-Nitroaniline	0.02 U	0.019 U	0.014 U	0.0035 U	0.0017 U	0.0018 U	0.0017 U	0.0018 U	0.0018 U	0.0041 U	0.0039 U	0.0017 U	0.0018 U	0.0019 U
4-Nitrophenol	0.25 U	0.24 U	0.18 U	0.051 U	0.025 U	0.025 U	0.025 U	0.025 U	0.026 U	0.06 U	0.056 U	0.025 U	0.025 U	0.028 UJ
Acenaphthene	0.013 U	0.012 U	0.0089 U	0.0042 U	0.002 U	0.0029 J	0.0021 U	0.0021 U	0.0021 U	0.018	0.0066 J	0.0021 U	0.0042 J	0.0049 J
Acenaphthylene	0.014 U	0.013 U	0.0094 U	0.0032 U	0.0015 U	0.0016 U	0.0016 U	0.0016 U	0.0016 U	0.0037 U	0.0035 U	0.0016 U	0.0016 U	0.0017 U
Acetophenone	0.011 U	0.011 U	0.008 U	0.0066 J	0.0043 J	0.0025 J	0.0025 J	0.0031 J	0.002 U	0.0046 U	0.0057 J	0.0031 J	0.0023 J	0.0034 J
Anthracene	0.05 U	0.047 U	0.035 U	0.0037 U	0.0021 J	0.0035 J	0.0018 U	0.0019 U	0.0019 U	0.021	0.007 J	0.013	0.0056 J	0.0064 J
Atrazine	0.023 U	0.022 U	0.016 U	0.032 UJ	0.015 UJ	0.016 UJ	0.016 UJ	0.016 UJ	0.016 UJ	0.037 UJ	0.035 UJ	0.016 U	0.016 U	0.017 UJ
Benzaldehyde	0.04 U	0.038 U	0.028 U	0.018 J	0.013 J	0.0088 J	0.0044 UR	0.0065 J	0.0046 UR	0.011 UR	0.01 UR	0.0077 J	0.0052 J	0.012 J
Benzo(A)Anthracene	0.044 U	0.042 U	0.031 U	0.033	0.024	0.028	0.003 J	0.004 J	0.0015 J	0.13	0.042	0.089	0.042	0.037
Benzo(A)Pyrene	0.016 U	0.015 U	0.011 U	0.056	0.038	0.041	0.0042 J	0.005 J	0.0023 J	0.22	0.066	0.11	0.05	0.047
Benzo(B)Fluoranthene	0.021 U	0.019 U	0.014 U	0.11	0.081	0.086	0.0071 J	0.01	0.0034 J	0.51	0.14	0.17	0.058	0.09
Benzo(G,H,I)Perylene	0.03 U	0.029 U	0.021 U	0.073	0.048	0.049	0.0045 J	0.0055 J	0.0023 J	0.29	0.088	0.16	0.051	0.052
Benzo(K)Fluoranthene	0.023 U	0.022 U	0.016 U	0.041	0.031	0.033	0.0042 J	0.0029 J	0.0022 U	0.16	0.043	0.07	0.021	0.023
Benzyl Butyl Phthalate	0.016 U	0.015 U	0.011 U	0.05 U	0.024 U	0.025 U	0.024 U	0.025 U	0.026 U	0.058 U	0.055 U	0.047	0.025 U	0.027 U
Biphenyl (Diphenyl)	0.045 U	0.046 J	0.031 U	0.003 U	0.0015 U	0.0015 U	0.0015 U	0.0015 U	0.0016 U	0.0037 J	0.0041 J	0.0015 U	0.0015 U	0.0034 J
Bis(2-Chloroethoxy) Methane	0.016 U	0.016 U	0.011 U	0.0034 U	0.0017 U	0.0017 U	0.0017 U	0.0017 U	0.0018 U	0.0041 U	0.0038 U	0.0017 U	0.0017 U	0.0019 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.012 U	0.012 U	0.0086 U	0.0026 U	0.0013 U	0.0013 U	0.0013 U	0.0013 U	0.0013 U	0.0031 U	0.0029 U	0.0013 U	0.0013 U	0.0014 U
Bis(2-Chloroisopropyl) Ether	0.022 U	0.021 U	0.015 U	0.0053 U	0.0026 U	0.0027 U	0.0026 U	0.0027 U	0.0028 U	0.0063 U	0.0059 U	0.0026 U	0.0027 U	0.0029 U
Bis(2-Ethylhexyl) Phthalate	0.021 U	0.019 U	0.014 U	0.077 U	0.038 U	0.038 U	0.038 U	0.039 U	0.059 J+	0.091 U	0.085 U	0.17 J	0.038 U	0.15 J
Caprolactam	0.038 U	0.036 U	0.026 U	0.047 U	0.023 U	0.024 U	0.023 U	0.024 U	0.024 U	0.055 U	0.052 U	0.023 U	0.024 U	0.026 U
Carbazole	0.013 U	0.012 U	0.0091 U	0.0065 J	0.0037 J	0.0053 J	0.0017 U	0.0017 U	0.0017 U	0.035	0.01 J	0.014	0.0068 J	0.0085
Chrysene	0.014 U	0.014 U	0.01 U	0.07	0.051	0.06	0.0055 J	0.007 J	0.0032 J	0.32	0.091	0.14	0.065	0.063
Dibenz(A,H)Anthracene	0.027 U	0.026 U	0.019 U	0.013 J	0.0084	0.012	0.0016 U	0.0016 U	0.0017 U	0.062	0.018	0.025	0.013	0.01
Dibenzofuran	0.016 U	0.015 U	0.011 U	0.0032 U	0.0016 J	0.0021 J	0.0016 U	0.0016 U	0.0016 U	0.013 J	0.0061 J	0.0045 J	0.0028 J	0.0042 J
Diethyl Phthalate	0.015 U	0.032 J	0.01 U	0.022 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.026 U	0.024 U	0.011 U	0.011 U	0.012 U
Dimethyl Phthalate	0.015 U	0.015 U	0.011 U	0.0026 U	0.0013 U	0.0013 U	0.0013 U	0.0013 U	0.0013 U	0.0031 U	0.0029 U	0.0013 U	0.0013 U	0.0014 U
Di-N-Butyl Phthalate	0.016 U	0.48 J	0.011 U	0.032 U	0.015 U	0.016 U	0.016 U	0.016 U	0.016 U	0.037 U	0.035 U	0.016 U	0.016 U	0.017 U
Di-N-Octylphthalate	0.027 U	0.025 U	0.019 U	0.042 U	0.021 U	0.021 U	0.021 U	0.021 U	0.022 U	0.05 U	0.047 U	0.021 U	0.021 U	0.023 U
Fluoranthene	0.016 U	0.015 U	0.011 U	0.072	0.046	0.058	0.0067 J	0.0068 J	0.0026 J	0.29	0.094	0.17	0.075	0.07

Table E-19
Summary of Data Used in Risk Assessment
North-Central Undeveloped Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-122	CFSB-122	CFSB-122	CFSB-173	CFSB-173	CFSB-174	CFSB-174	CFSB-175	CFSB-175	CFSB-176	CFSB-176	CFSB-193	CFSB-193	CFSB-197
Sample Lab IDs	460-114141-28	460-114141-29	460-114141-30	180-79272-1, 460-159191-1	180-79272-2, 460-159191-2	180-79272-3, 460-159191-3	180-79272-4, 460-159191-4	180-79272-5, 460-159191-5	180-79272-6, 460-159191-6	180-78894-12, 460-158632-12	180-78894-13, 460-158632-13	180-79434-6, 460-159377-6	180-79434-7, 460-159377-7	180-79108-7, 460-158919-7
Sample Name	CFSB-122-SO-0-0.5	CFSB-122-SO-0.5-2.0	CFSB-122-SO-10-12	CFSB-173-SO-0-0.5	CFSB-173-SO-0.5-2	CFSB-174-0-0.5	CFSB-174-0.5-2	CFSB-175-SO-0-0.5	CFSB-175-SO-0.5-2	CFSB-176-SO-0-0.5	CFSB-176-SO-0.5-2	CFSB-193-SO-0-0.5	CFSB-193-SO-0.5-2	CFSB-197-SO-0-0.5
Sample Depth	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft
Chemical	5/19/2016	5/19/2016	5/19/2016	6/25/2018	6/25/2018	6/25/2018	6/25/2018	6/25/2018	6/25/2018	6/16/2018	6/16/2018	6/27/2018	6/27/2018	6/21/2018
Fluorene	0.011 U	0.011 U	0.008 U	0.0028 U	0.0018 J	0.0023 J	0.0014 U	0.0014 U	0.0015 U	0.01 J	0.0048 J	0.0064 J	0.0027 J	0.0046 J
Hexachlorobenzene	0.021 U	0.02 U	0.015 U	0.0052 U	0.0025 U	0.0026 U	0.0026 U	0.0026 U	0.0027 U	0.0061 U	0.0057 U	0.0026 U	0.0026 U	0.0028 U
Hexachlorobutadiene	0.015 U	0.014 U	0.01 U	0.0042 UJ	0.0021 UJ	0.0021 UJ	0.0021 UJ	0.0021 UJ	0.0022 UJ	0.005 U	0.0047 U	0.0021 U	0.0021 U	0.0023 U
Hexachlorocyclopentadiene	0.033 U	0.031 U	0.023 U	0.0037 UJ	0.0018 UJ	0.0018 UJ	0.0018 UJ	0.0018 UJ	0.0019 UJ	0.0043 U	0.0041 U	0.0018 U	0.0018 U	0.002 UJ
Hexachloroethane	0.019 U	0.018 U	0.013 U	0.0037 U	0.0018 U	0.0019 U	0.0018 U	0.0019 U	0.0019 U	0.0044 U	0.0041 U	0.0018 U	0.0019 U	0.002 U
Indeno(1,2,3-C,D)Pyrene	0.035 U	0.033 U	0.024 U	0.053	0.039	0.042	0.0041 J	0.0042 J	0.0016 J	0.24	0.067	0.1	0.044	0.042
Isophorone	0.011 U	0.011 U	0.0079 U	0.0037 U	0.0018 U	0.0018 U	0.0018 U	0.0018 U	0.0019 U	0.0043 U	0.0041 U	0.0018 U	0.0018 U	0.002 U
Naphthalene	0.013 U	0.013 U	0.0093 U	0.0037 J	0.0029 J	0.0033 J	0.0014 U	0.0027 J	0.0014 U	0.049	0.023	0.0034 J	0.0016 J	0.0065 J
Nitrobenzene	0.017 U	0.016 U	0.012 U	0.026 U	0.013 U	0.013 U	0.013 U	0.013 U	0.014 U	0.031 U	0.029 U	0.013 U	0.013 U	0.014 U
N-Nitrosodi-N-Propylamine	0.018 U	0.017 U	0.012 U	0.0049 U	0.0024 U	0.0025 U	0.0024 U	0.0025 U	0.0025 U	0.0058 U	0.0054 U	0.0024 U	0.0024 U	0.0027 U
N-Nitrosodiphenylamine	0.048 U	0.045 U	0.033 U	0.024 U	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U	0.028 U	0.027 U	0.012 U	0.012 U	0.013 U
Pentachlorophenol	0.064 U	0.06 U	0.044 U	0.12 U	0.057 U	0.058 U	0.057 U	0.058 U	0.06 U	0.14 U	0.13 U	0.057 U	0.058 U	0.063 UJ
Phenanthrene	0.014 U	0.013 U	0.0097 U	0.028	0.019	0.028	0.0067 J	0.0062 J	0.0043 J	0.13	0.058	0.088	0.034	0.041
Phenol	0.017 U	0.016 U	0.012 U	0.022 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.026 U	0.024 U	0.011 U	0.011 U	0.012 U
Pyrene	0.024 U	0.023 U	0.017 U	0.065	0.05	0.06	0.006 J	0.0063 J	0.0022 J	0.27	0.08	0.16	0.068	0.066
VOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,1,1-Trichloroethane	--	0.00055 U	0.00035 U	--	--	--	--	--	--	--	--	--	--	--
1,1,2,2-Tetrachloroethane	--	0.00024 U	0.00016 U	--	--	--	--	--	--	--	--	--	--	--
1,1,2-Trichloro-1,2,2-Trifluoroethane	--	0.00063 U	0.00041 U	--	--	--	--	--	--	--	--	--	--	--
1,1,2-Trichloroethane	--	0.0004 U	0.00026 U	--	--	--	--	--	--	--	--	--	--	--
1,1-Dichloroethane	--	0.00049 U	0.00031 U	--	--	--	--	--	--	--	--	--	--	--
1,1-Dichloroethene	--	0.00059 U	0.00038 U	--	--	--	--	--	--	--	--	--	--	--
1,2,3-Trichlorobenzene	--	0.00016 U	0.0001 U	--	--	--	--	--	--	--	--	--	--	--
1,2,4-Trichlorobenzene	--	0.00046 U	0.0003 U	--	--	--	--	--	--	--	--	--	--	--
1,2-Dibromo-3-Chloropropane	--	0.00068 U	0.00043 U	--	--	--	--	--	--	--	--	--	--	--
1,2-Dibromoethane (Ethylene Dibromide)	--	0.00017 U	0.00011 U	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichlorobenzene	--	0.0002 U	0.00013 U	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichloroethane	--	0.00016 U	0.0001 U	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichloropropane	--	0.00024 U	0.00016 U	--	--	--	--	--	--	--	--	--	--	--
1,3-Dichlorobenzene	--	0.00017 U	0.00011 U	--	--	--	--	--	--	--	--	--	--	--
1,4-Dichlorobenzene	--	0.00019 U	0.00012 U	--	--	--	--	--	--	--	--	--	--	--
2-Hexanone	--	0.0014 U	0.00087 U	--	--	--	--	--	--	--	--	--	--	--
Acetone	--	0.012	0.0057	--	--	--	--	--	--	--	--	--	--	--
Benzene	--	0.00029 U	0.00022 J	--	--	--	--	--	--	--	--	--	--	--
Bromochloromethane	--	0.00024 U	0.00016 U	--	--	--	--	--	--	--	--	--	--	--
Bromodichloromethane	--	0.00055 U	0.00035 U	--	--	--	--	--	--	--	--	--	--	--
Bromoform	--	0.00019 U	0.00012 U	--	--	--	--	--	--	--	--	--	--	--
Bromomethane	--	0.00046 U	0.0003 U	--	--	--	--	--	--	--	--	--	--	--
Carbon Disulfide	--	0.00062 U	0.0004 U	--	--	--	--	--	--	--	--	--	--	--
Carbon Tetrachloride	--	0.00062 U	0.0004 U	--	--	--	--	--	--	--	--	--	--	--
Chlorobenzene	--	0.0002 U	0.00013 U	--	--	--	--	--	--	--	--	--	--	--
Chloroethane	--	0.0005 U	0.00032 U	--	--	--	--	--	--	--	--	--	--	--
Chloroform	--	0.0003 U	0.00019 U	--	--	--	--	--	--	--	--	--	--	--
Chloromethane	--	0.00055 U	0.00035 U	--	--	--	--	--	--	--	--	--	--	--
Cis-1,2-Dichloroethylene	--	0.00032 U	0.0002 U	--	--	--	--	--	--	--	--	--	--	--
Cis-1,3-Dichloropropene	--	0.00022 U	0.00014 U	--	--	--	--	--	--	--	--	--	--	--
Cyclohexane	--	0.00066 U	0.00093	--	--	--	--	--	--	--	--	--	--	--
Dibromochloromethane	--	0.00022 U	0.00014 U	--	--	--	--	--	--	--	--	--	--	--
Dichlorodifluoromethane	--	0.00046 U	0.0003 U	--	--	--	--	--	--	--	--	--	--	--
Ethylbenzene	--	0.00026 U	0.00025 J	--	--	--	--	--	--	--	--	--	--	--
Isopropylbenzene (Cumene)	--	0.00024 U	0.00016 U	--	--	--	--	--	--	--	--	--	--	--
M,P-Xylene	--	0.00016 U	0.0008 J	--	--	--	--	--	--	--	--	--	--	--
Methyl Acetate	--	0.0013 U	0.00083 U	--	--	--	--	--	--	--	--	--	--	--
Methyl Ethyl Ketone (2-Butanone)	--	0.0011 U	0.00071 U	--	--	--	--	--	--	--	--	--	--	--
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	--	0.0032 U	0.0021 U	--	--	--	--	--	--	--	--	--	--	--
Methylcyclohexane	--	0.00072 U	0.0011	--	--	--	--	--	--	--	--	--	--	--
Methylene Chloride	--	0.00046 U	0.0003 U	--	--	--	--	--	--	--	--	--	--	--
O-Xylene (1,2-Dimethylbenzene)	--	0.00023 U	0.00025 J	--	--	--	--	--	--	--	--	--	--	--

Table E-19
Summary of Data Used in Risk Assessment
North-Central Undeveloped Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-122	CFSB-122	CFSB-122	CFSB-173	CFSB-173	CFSB-174	CFSB-174	CFSB-175	CFSB-175	CFSB-176	CFSB-176	CFSB-193	CFSB-193	CFSB-197
Sample Lab IDs	460-114141-28	460-114141-29	460-114141-30	180-79272-1, 460-159191-1	180-79272-2, 460-159191-2	180-79272-3, 460-159191-3	180-79272-4, 460-159191-4	180-79272-5, 460-159191-5	180-79272-6, 460-159191-6	180-78894-12, 460-158632-12	180-78894-13, 460-158632-13	180-79434-6, 460-159377-6	180-79434-7, 460-159377-7	180-79108-7, 460-158919-7
Sample Name	CFSB-122-SO-0-0.5	CFSB-122-SO-0.5-2.0	CFSB-122-SO-10-12	CFSB-173-SO-0-0.5	CFSB-173-SO-0.5-2	CFSB-174-0-0.5	CFSB-174-0.5-2	CFSB-175-SO-0-0.5	CFSB-175-SO-0.5-2	CFSB-176-SO-0-0.5	CFSB-176-SO-0.5-2	CFSB-193-SO-0-0.5	CFSB-193-SO-0.5-2	CFSB-197-SO-0-0.5
Sample Depth	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft
Chemical	5/19/2016	5/19/2016	5/19/2016	6/25/2018	6/25/2018	6/25/2018	6/25/2018	6/25/2018	6/25/2018	6/16/2018	6/16/2018	6/27/2018	6/27/2018	6/21/2018
Styrene	--	0.00022 U	0.00014 U	--	--	--	--	--	--	--	--	--	--	--
Tert-Butyl Methyl Ether	--	0.00024 U	0.00016 U	--	--	--	--	--	--	--	--	--	--	--
Tetrachloroethylene (PCE)	--	0.0004 U	0.00026 U	--	--	--	--	--	--	--	--	--	--	--
Toluene	--	0.00027 U	0.001	--	--	--	--	--	--	--	--	--	--	--
Trans-1,2-Dichloroethene	--	0.00056 U	0.00036 U	--	--	--	--	--	--	--	--	--	--	--
Trans-1,3-Dichloropropene	--	0.00014 U	0.000092 U	--	--	--	--	--	--	--	--	--	--	--
Trichloroethylene (TCE)	--	0.00037 U	0.00024 U	--	--	--	--	--	--	--	--	--	--	--
Trichlorofluoromethane	--	0.00049 U	0.00031 U	--	--	--	--	--	--	--	--	--	--	--
Vinyl Chloride	--	0.00056 U	0.00036 U	--	--	--	--	--	--	--	--	--	--	--

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-19
Summary of Data Used in Risk Assessment
North-Central Undeveloped Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Sample Depth Chemical	CFSB-197 180-79108-8, 460-158919-8 CFSB-197-SO-0.5-2 0.5-2 ft 6/21/2018	CFSB-198 180-79108-5, 460-158919-5 CFSB-198-SO-0-0.5 0-0.5 ft 6/21/2018	CFSB-198 180-79108-6, 460-158919-6 CFSB-198-SO-0.5-2 0.5-2 ft 6/21/2018	CFSB-200 180-79434-37, 460-159538-7 CFSB-200-SO-0-0.5 0-0.5 ft 6/28/2018	CFSB-200-DUP 180-79434-39, 460-159538-9 CFSB-DUP48-SO 0-0.5 ft 6/28/2018	CFSB-200 180-79434-38, 460-159538-8 CFSB-200-SO-0.5-2 0.5-2 ft 6/28/2018	CFSB-200-DUP 180-79434-40, 460-159538-10 CFSB-DUP49-SO 0.5-2 ft 6/28/2018	CFSB-241 180-77488-23, 460-155568-1 CFSB-241-SO-0-0.5 0-0.5 ft 5/5/2018	CFSB-241 180-77488-24, 460-155568-2 CFSB-241-SO-0.5-2 0.5-2 ft 5/5/2018	CFSB-241 180-77488-25, 460-155568-3 CFSB-241-SO-10-12 10-12 ft 5/5/2018	CFSB-248 180-77393-38, 460-155265-42 CFSB-248-SO-0-0.5 0-0.5 ft 5/1/2018	CFSB-248 180-77393-39, 460-155265-43 CFSB-248-SO-0.5-2 0.5-2 ft 5/1/2018	CFSB-248 180-77393-40, 460-155265-44 CFSB-248-SO-10-12 10-12 ft 5/1/2018	CFSB-251 180-77393-41, 460-155265-45 CFSB-251-SO-0-0.5 0-0.5 ft 5/1/2018
GENERAL CHEMISTRY (mg/kg)														
Fluoride	7.27	4.59	6.72	7.17	7.14	7.95	5.96	8.29 J+	5.19 J+	2.34 J+	2.22 J-	3.62 J-	1.52 J-	12.5 J-
Cyanide	0.15 J+	0.28	0.28 J	0.25 J	0.15 J	0.063 UJ	0.073 J+	0.071 U	0.068 U	0.068 U	0.08 U	0.088 U	0.069 U	0.13 J
METALS (mg/kg)														
"Chromium, Hexavalent - Estimated"	0.321168	0.355961	0.353285	0.195377	0.195377	0.198054	0.203406	0.281022	0.291727	0.388078	0.414842	0.107056	0.248905	0.165937
"Chromium, Trivalent - Estimated"	11.6788	12.944	12.8467	7.10462	7.10462	7.20195	7.39659	10.219	10.6083	14.1119	15.0852	3.89294	9.05109	6.03406
Aluminum	19800	26600	29400	11000	11000	10700	9140	15200	13500	11700	19800	12600	7090	16300
Antimony	0.26 U	0.29 U	0.27 U	0.36 UJ	0.32 UJ	0.31 UJ	0.27 UJ	0.33 UJ	0.34 UJ	0.3 UJ	0.29 U	0.3 UJ	0.26 UJ	0.33 UJ
Arsenic	8.4	8.1	7.9	3.4	4	3.6	3.5	4.3	8	4.9	3.4	2	4.9	4.7
Barium	321	419	477	282	347	146 J	68.4 J	139	89.8	103	338	232	66.6	293
Beryllium	0.81	0.91	0.91	0.43 J	0.45	0.48	0.38	0.58	0.63	0.47	0.88	0.48	0.3 J	0.52
Cadmium	0.3 U	0.33 U	0.31 U	0.41 U	0.37 U	0.35 U	0.31 U	0.38 U	0.39 U	0.35 U	0.33 U	0.48 J	0.3 U	0.38 U
Calcium	3960	5100	4890	3030	3840	1580 J	826 J	2350 J	2050 J	29000 J	3650	2390	9880	2420
Chromium, Total	12	13.3	13.2	7.3	7.3	7.4	7.6	10.5	10.9	14.5	15.5	4	9.3	6.2
Cobalt	7.4	8.2	8.6	4.8	4.7	5.3	4.5	6.2	7.1	6	5.1	2.2	5.5	3.8
Copper	15.3	20.8	21.8	8.9	9.2	9	8.2	10.8 J	13.6 J	11.5 J	20.3	8.6 J	13.9 J	10.7 J
Iron	15900	23400	21700	11100	11300	11500	11600	16400	17800	15800	15300	5720	11800	11900
Lead	13.3	14.1	14.5	11.4	12.7	8.2	7.7	11.1 J+	11.4 J+	8.7 J+	15.2	4.3 J	5.9 J	9.7 J
Magnesium	7060	9250	8660	5200	4420	4720	5450	7450	10600	13500	9790	2110 J	8060 J	4170 J
Manganese	803	735	842	719	758	331 J	116 J	363	465	394	95.3	36.1 J	353 J	648 J
Mercury	0.027	0.031	0.022	0.026	0.021	0.011 U	0.011 U	0.011 U	0.014 J	0.018	0.013 J	0.014 U	0.028	0.024
Nickel	11.1	15.2	13.5	10.9	11.1	8.6	9	12.6 J	12.9 J	12.9 J	12.1	5	9.8	8.9
Potassium	1010	1620	1440	1340 J+	1450 J+	1430 J+	1170 J+	1090	968	1050	1080	409	563	996
Selenium	0.26 J	0.38 J	0.31 J	0.35 U	0.32 U	0.3 U	0.26 U	0.33 U	0.34 U	0.3 U	0.28 U	0.36 J	0.26 U	0.33 U
Silver	0.56 U	0.61 U	0.58 U	0.75 U	0.68 U	0.65 U	0.56 U	0.71 U	0.71 U	0.64 U	0.61 U	0.64 UJ	0.55 UJ	0.7 UJ
Sodium	51 J	56.5 J	61.1 J	51.4 J	51.1 J	49.6 J	51.9 J	62.1 J	40.9 J	49.7 J	122	430	31.3 J	156
Thallium	0.11 U	0.12 U	0.13 J	0.15 U	0.14 U	0.13 U	0.11 U	0.14 U	0.14 U	0.13 U	0.12 U	0.41	0.11 U	0.14 U
Vanadium	12.9	14.5	17.4	10.2	10.5	11.1	10.4	17.2	13	8.9	11.4	5	8.3	10.3
Zinc	69.1	112	116	53.1	52.5	35.6	33.7	46.6	44.1	44.5	46.9	10.1	29.3	54.7
PESTICIDES (mg/kg)														
Aldrin	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Alpha Bhc (Alpha Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Alpha Endosulfan	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Beta Bhc (Beta Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Beta Endosulfan	--	--	--	--	--	--	--	--	--	--	--	--	--	--
cis-Chlordane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Delta BHC (Delta Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dieldrin	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endosulfan Sulfate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin Aldehyde	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin Ketone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Gamma Bhc (Lindane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Heptachlor	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Heptachlor Epoxide	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methoxychlor	--	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDD	--	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDT	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Toxaphene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
trans-Chlordane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
POLYCHLORINATED BIPHENYLS (mg/kg)														
PCB-1016 (Aroclor 1016)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1221 (Aroclor 1221)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1232 (Aroclor 1232)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1242 (Aroclor 1242)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1248 (Aroclor 1248)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1254 (Aroclor 1254)	--	--	--	--	--	--	--	--	--	--	--	--	--	--

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Columbia Falls Aluminum Facility
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Sample Location ID Sample Lab IDs Sample Name Sample Depth Chemical	CFSB-197 180-79108-8, 460-158919-8 CFSB-197-SO-0.5-2 0.5-2 ft 6/21/2018	CFSB-198 180-79108-5, 460-158919-5 CFSB-198-SO-0-0.5 0-0.5 ft 6/21/2018	CFSB-198 180-79108-6, 460-158919-6 CFSB-198-SO-0.5-2 0.5-2 ft 6/21/2018	CFSB-200 180-79434-37, 460-159538-7 CFSB-200-SO-0-0.5 0-0.5 ft 6/28/2018	CFSB-200-DUP 180-79434-39, 460-159538-9 CFSB-DUP48-SO 0-0.5 ft 6/28/2018	CFSB-200 180-79434-38, 460-159538-8 CFSB-200-SO-0.5-2 0.5-2 ft 6/28/2018	CFSB-200-DUP 180-79434-40, 460-159538-10 CFSB-DUP49-SO 0.5-2 ft 6/28/2018	CFSB-241 180-77488-23, 460-155568-1 CFSB-241-SO-0-0.5 0-0.5 ft 5/5/2018	CFSB-241 180-77488-24, 460-155568-2 CFSB-241-SO-0.5-2 0.5-2 ft 5/5/2018	CFSB-241 180-77488-25, 460-155568-3 CFSB-241-SO-10-12 10-12 ft 5/5/2018	CFSB-248 180-77393-38, 460-155265-42 CFSB-248-SO-0-0.5 0-0.5 ft 5/1/2018	CFSB-248 180-77393-39, 460-155265-43 CFSB-248-SO-0.5-2 0.5-2 ft 5/1/2018	CFSB-248 180-77393-40, 460-155265-44 CFSB-248-SO-10-12 10-12 ft 5/1/2018	CFSB-251 180-77393-41, 460-155265-45 CFSB-251-SO-0-0.5 0-0.5 ft 5/1/2018
PCB-1260 (Aroclor 1260)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1262 (Aroclor 1262)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1268 (Aroclor 1268)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Polychlorinated Biphenyl (PCBs)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SEMIVOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,2,4,5-Tetrachlorobenzene	0.0016 UJ	0.0034 UJ	0.0035 UJ	0.0053 U	0.0018 U	0.0016 U	0.0015 U	0.0016 U	0.0016 U	0.0015 U	0.0019 U	0.0024 U	0.0017 U	0.0021 U
1,4-Dioxane (P-Dioxane)	0.012 U	0.025 U	0.025 U	0.038 U	0.013 U	0.012 U	0.011 U	0.012 U	0.012 U	0.011 U	0.014 U	0.017 U	0.012 U	0.015 U
2,3,4,6-Tetrachlorophenol	0.015 UJ	0.033 UJ	0.034 UJ	0.051 U	0.017 U	0.016 U	0.015 U	0.016 U	0.016 U	0.015 U	0.018 U	0.023 U	0.016 U	0.021 U
2,4,5-Trichlorophenol	0.0026 U	0.0057 U	0.0058 U	0.0088 U	0.003 U	0.0027 U	0.0025 U	0.0027 U	0.0027 U	0.0026 U	0.0031 U	0.0039 U	0.0028 U	0.0035 U
2,4,6-Trichlorophenol	0.002 U	0.0044 U	0.0044 U	0.0067 U	0.0023 U	0.0021 U	0.0019 U	0.0021 U	0.0021 U	0.002 U	0.0024 U	0.003 U	0.0022 U	0.0027 U
2,4-Dichlorophenol	0.0029 U	0.0062 U	0.0062 U	0.0095 U	0.0032 U	0.0029 U	0.0027 U	0.0029 U	0.0029 U	0.0028 U	0.0033 U	0.0042 U	0.003 U	0.0038 U
2,4-Dimethylphenol	0.0023 U	0.005 U	0.005 U	0.0076 UJ	0.0026 U	0.0024 U	0.0022 U	0.0024 U	0.0023 U	0.0022 U	0.0027 U	0.0034 U	0.0024 U	0.0031 U
2,4-Dinitrophenol	0.1 UJ	0.21 UJ	0.22 UJ	0.33 U	0.11 U	0.1 UJ	0.095 U	0.1 U	0.1 U	0.096 U	0.12 UJ	0.15 UJ	0.11 UJ	0.13 UJ
2,4-Dinitrotoluene	0.0018 U	0.004 U	0.004 U	0.0061 U	0.0021 U	0.0019 U	0.0018 U	0.0019 U	0.0019 U	0.0018 U	0.0022 U	0.0027 U	0.002 U	0.0025 U
2,6-Dinitrotoluene	0.0023 U	0.0049 U	0.005 U	0.0076 U	0.0026 U	0.0024 U	0.0022 U	0.0024 U	0.0023 U	0.0022 U	0.0027 U	0.0034 U	0.0024 U	0.0031 U
2-Chloronaphthalene	0.0017 U	0.0037 U	0.0037 U	0.0056 U	0.0019 U	0.0018 U	0.0016 U	0.0018 U	0.0017 U	0.0016 U	0.002 U	0.0025 U	0.0018 U	0.0023 U
2-Chlorophenol	0.0017 U	0.0037 U	0.0038 U	0.0057 U	0.0019 U	0.0018 U	0.0016 U	0.0018 U	0.0018 U	0.0017 U	0.002 U	0.0025 U	0.0018 U	0.0023 U
2-Methylnaphthalene	0.0035 J	0.005 J	0.0061 J	0.0059 U	0.002 U	0.0018 U	0.0017 U	0.0018 U	0.0018 U	0.0017 U	0.0021 U	0.0026 U	0.0019 U	0.0024 U
2-Methylphenol (O-Cresol)	0.011 U	0.023 U	0.023 U	0.035 U	0.012 U	0.011 U	0.01 U	0.011 U	0.011 U	0.01 U	0.012 U	0.016 U	0.011 U	0.014 U
2-Nitroaniline	0.017 U	0.036 U	0.037 U	0.056 U	0.019 U	0.017 U	0.016 U	0.017 U	0.017 U	0.016 U	0.02 U	0.025 U	0.018 U	0.023 U
2-Nitrophenol	0.0021 U	0.0046 U	0.0046 U	0.007 U	0.0024 U	0.0022 U	0.002 U	0.0022 U	0.0022 U	0.0021 U	0.0025 U	0.0031 U	0.0023 U	0.0028 U
3- And 4- Methylphenol (Total)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3,3'-Dichlorobenzidine	0.035 U	0.074 U	0.075 U	0.11 UR	0.039 U	0.036 UJ	0.033 U	0.036 U	0.035 U	0.033 U	0.041 U	0.051 U	0.037 U	0.046 U
3-Nitroaniline	0.0094 U	0.02 U	0.021 U	0.031 U	0.011 U	0.0097 UJ	0.009 U	0.0097 U	0.0096 U	0.0091 U	0.011 U	0.014 U	0.01 U	0.013 U
4,6-Dinitro-2-Methylphenol	0.064 U	0.14 U	0.14 U	0.21 U	0.072 U	0.066 U	0.061 U	0.066 U	0.065 U	0.062 U	0.075 UJ	0.094 UJ	0.068 UJ	0.085 UJ
4-Bromophenyl Phenyl Ether	0.0026 U	0.0056 U	0.0056 U	0.0086 U	0.0029 U	0.0027 U	0.0025 U	0.0027 U	0.0026 U	0.0025 U	0.003 U	0.0038 U	0.0027 U	0.0035 U
4-Chloro-3-Methylphenol	0.0017 U	0.0038 U	0.0038 U	0.0058 U	0.002 U	0.0018 U	0.0017 U	0.0018 U	0.0018 U	0.0017 U	0.002 U	0.0026 U	0.0019 U	0.0023 U
4-Chloroaniline	0.0012 U	0.0027 U	0.0027 U	0.0041 UJ	0.0014 U	0.0013 UJ	0.0012 U	0.0013 U	0.0013 U	0.0012 U	0.0014 U	0.0018 U	0.0013 U	0.0016 U
4-Chlorophenyl Phenyl Ether	0.0022 U	0.0048 U	0.0049 U	0.0074 U	0.0025 U	0.0023 U	0.0021 U	0.0023 U	0.0023 U	0.0022 U	0.0026 U	0.0033 U	0.0024 U	0.003 U
4-Nitroaniline	0.0018 U	0.0039 U	0.0039 U	0.006 U	0.002 U	0.0019 UJ	0.0017 U	0.0019 U	0.0018 U	0.0017 U	0.0021 U	0.0027 U	0.0019 U	0.0024 U
4-Nitrophenol	0.026 UJ	0.056 UJ	0.057 UJ	0.086 U	0.029 U	0.027 U	0.025 U	0.027 U	0.026 U	0.025 U	0.031 U	0.038 U	0.028 U	0.035 U
Acenaphthene	0.0039 J	0.0081 J	0.01 J	0.016 J	0.0024 UJ	0.0022 U	0.002 U	0.0034 J	0.0022 U	0.0035 J	0.0025 U	0.0031 U	0.0023 U	0.0042 J
Acenaphthylene	0.0016 U	0.0035 U	0.0035 U	0.0054 U	0.0018 U	0.0017 U	0.0016 U	0.0017 U	0.0017 U	0.0016 U	0.0019 U	0.0024 U	0.0017 U	0.0022 U
Acetophenone	0.0025 J	0.0043 U	0.0044 U	0.0067 U	0.0023 U	0.0021 U	0.0019 U	0.0021 U	0.002 U	0.0019 U	0.0024 U	0.003 U	0.0021 U	0.0027 U
Anthracene	0.0034 J	0.0085 J	0.007 J	0.022 J	0.0034 J	0.002 U	0.0018 U	0.0052 J	0.002 U	0.0061 J	0.0023 U	0.0028 U	0.002 U	0.0072 J
Atrazine	0.016 UJ	0.035 UJ	0.035 UJ	0.054 UJ	0.018 U	0.017 U	0.016 U	0.017 U	0.017 U	0.016 U	0.019 U	0.024 U	0.017 U	0.022 U
Benzaldehyde	0.0074 J	0.011 J	0.014 J	0.015 U	0.0052 U	0.0047 U	0.0044 U	0.0047 UR	0.0047 UR	0.0044 UR	0.0054 UR	0.0068 UR	0.0049 UR	0.0061 UR
Benzo(A)Anthracene	0.017	0.038	0.032	0.098 J	0.016 J	0.003 J	0.0013 UJ	0.045	0.013	0.06	0.01	0.0021 U	0.0015 U	0.051
Benzo(A)Pyrene	0.025	0.05	0.044	0.097 J	0.018 J	0.0028 J	0.0015 UJ	0.058	0.016	0.076	0.012	0.0024 U	0.0017 U	0.065
Benzo(B)Fluoranthene	0.042	0.08	0.071	0.16 J	0.03 J	0.0052 J	0.0017 UJ	0.083	0.02	0.098	0.015	0.0027 U	0.0019 U	0.1
Benzo(G,H,I)Perylene	0.026	0.049	0.044	0.13 J	0.017 J	0.003 J	0.0015 UJ	0.06	0.015	0.075	0.012	0.0024 U	0.0017 U	0.066
Benzo(K)Fluoranthene	0.016	0.031	0.024	0.056 J	0.0094 J	0.0023 U	0.0021 U	0.025	0.0087	0.033	0.0096	0.0033 U	0.0024 U	0.03
Benzyl Butyl Phthalate	0.025 U	0.055 U	0.056 U	0.084 U	0.029 U	0.026 U	0.024 U	0.026 U	0.026 U	0.025 U	0.03 U	0.038 U	0.027 U	0.034 U
Biphenyl (Diphenyl)	0.0033 J	0.0034 U	0.0053 J	0.0052 U	0.0018 U	0.0016 U	0.0015 U	0.0016 U	0.0016 U	0.0015 U	0.0018 U	0.0023 U	0.0017 U	0.0021 U
Bis(2-Chloroethoxy) Methane	0.0018 U	0.0038 U	0.0039 U	0.0059 U	0.002 U	0.0018 U	0.0017 U	0.0018 U	0.0018 U	0.0017 U	0.0021 U	0.0026 U	0.0019 U	0.0024 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.0013 U	0.0029 U	0.0029 U	0.0045 U	0.0015 U	0.0014 U	0.0013 U	0.0014 U	0.0014 U	0.0013 U	0.0016 U	0.002 U	0.0014 U	0.0018 U
Bis(2-Chloroisopropyl) Ether	0.0027 U	0.0059 U	0.006 U	0.0091 U	0.0031 U	0.0028 U	0.0026 U	0.0028 U	0.0028 U	0.0027 U	0.0032 U	0.0041 U	0.0029 U	0.0037 U
Bis(2-Ethylhexyl) Phthalate	0.66	0.26 J	0.14 J	0.13 U	0.045 U	0.041 U	0.038 U	0.041 U	0.04 U	0.038 U	0.046 U	0.058 U	0.042 U	0.053 U
Caprolactam	0.024 U	0.052 U	0.053 U	0.08 UJ	0.027 U	0.025 U	0.023 U	0.025 U	0.025 U	0.023 U	0.028 U	0.036 U	0.026 U	0.032 U
Carbazole	0.0046 J	0.0097 J	0.009 J	0.023 J	0.0036 J	0.0018 U	0.0017 U	0.006 J	0.0021 J	0.006 J	0.002 J	0.0026 U	0.0018 U	0.0094 J
Chrysene	0.032	0.064	0.052	0.13 J	0.027 J	0.0048 J	0.0014 UJ	0.064	0.019	0.082	0.014	0.0021 U	0.0015 U	0.076
Dibenz(A,H)Anthracene	0.0056 J	0.013 J	0.011 J	0.034 J	0.0039 J	0.0017 U	0.0016 U	0.014	0.0039 J	0.016	0.0023 J	0.0024 U	0.0018 U	0.013
Dibenzofuran	0.004 J	0.0054 J	0.0075 J	0.0082 J	0.0018 UJ	0.0017 U	0.0016 U	0.0017 U	0.0017 U	0.0016 U	0.0019 U	0.0024 U	0.0017 U	0.0022 U
Diethyl Phthalate	0.011 U	0.024 U	0.024 U	0.037 U	0.013 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.013 U	0.016 U	0.012 U	0.015 U
Dimethyl Phthalate	0.0013 U	0.0029 U	0.0029 U	0.0045 U	0.0015 U	0.0014 U	0.0013 U	0.0014 U	0.0014 U	0.0013 U	0.0016 U	0.002 U	0.0014 U	0.0018 U
Di-N-Butyl Phthalate	0.016 U	0.035 U	0.035 U	0.054 U	0.018 U	0.017 U	0.016 U	0.017 U	0.017 U	0.016 U	0.019 U	0.024 U	0.017 U	0.022 U
Di-N-Octylphthalate	0.022 U	0.046 U	0.047 U	0.071 U	0.024 U	0.022 U	0.021 U	0.022 U	0.022 U	0.021 U	0.025 U	0.032 U	0.023 U	0.029 U
Fluoranthene	0.034	0.073	0.058	0.17 J	0.033 J	0.0047 J	0.0019 UJ	0.071	0.025	0.091	0.018	0.0029 U	0.0021 U	0.097

Table E-19
Summary of Data Used in Risk Assessment
North-Central Undeveloped Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Sample Depth Chemical	CFSB-197 180-79108-8, 460-158919-8 CFSB-197-SO-0.5-2 0.5-2 ft 6/21/2018	CFSB-198 180-79108-5, 460-158919-5 CFSB-198-SO-0-0.5 0-0.5 ft 6/21/2018	CFSB-198 180-79108-6, 460-158919-6 CFSB-198-SO-0.5-2 0.5-2 ft 6/21/2018	CFSB-200 180-79434-37, 460-159538-7 CFSB-200-SO-0-0.5 0-0.5 ft 6/28/2018	CFSB-200-DUP 180-79434-39, 460-159538-9 CFSB-DUP48-SO 0-0.5 ft 6/28/2018	CFSB-200 180-79434-38, 460-159538-8 CFSB-200-SO-0.5-2 0.5-2 ft 6/28/2018	CFSB-200-DUP 180-79434-40, 460-159538-10 CFSB-DUP49-SO 0.5-2 ft 6/28/2018	CFSB-241 180-77488-23, 460-155568-1 CFSB-241-SO-0-0.5 0-0.5 ft 5/5/2018	CFSB-241 180-77488-24, 460-155568-2 CFSB-241-SO-0.5-2 0.5-2 ft 5/5/2018	CFSB-241 180-77488-25, 460-155568-3 CFSB-241-SO-10-12 10-12 ft 5/5/2018	CFSB-248 180-77393-38, 460-155265-42 CFSB-248-SO-0-0.5 0-0.5 ft 5/1/2018	CFSB-248 180-77393-39, 460-155265-43 CFSB-248-SO-0.5-2 0.5-2 ft 5/1/2018	CFSB-248 180-77393-40, 460-155265-44 CFSB-248-SO-10-12 10-12 ft 5/1/2018	CFSB-251 180-77393-41, 460-155265-45 CFSB-251-SO-0-0.5 0-0.5 ft 5/1/2018
Fluorene	0.0032 J	0.0069 J	0.0068 J	0.012 J	0.0022 J	0.0015 U	0.0014 U	0.0021 J	0.0015 U	0.0019 J	0.0017 U	0.0021 U	0.0015 U	0.0026 J
Hexachlorobenzene	0.0027 U	0.0057 U	0.0058 U	0.0088 U	0.003 U	0.0027 U	0.0025 U	0.0027 U	0.0027 U	0.0026 U	0.0031 U	0.0039 U	0.0028 U	0.0035 U
Hexachlorobutadiene	0.0022 U	0.0047 U	0.0047 U	0.0072 U	0.0025 U	0.0022 U	0.0021 U	0.0022 U	0.0022 U	0.0021 U	0.0025 U	0.0032 U	0.0023 U	0.0029 U
Hexachlorocyclopentadiene	0.0019 UJ	0.0041 UJ	0.0041 UJ	0.0063 U	0.0021 U	0.0019 U	0.0018 U	0.0019 U	0.0019 U	0.0018 U	0.0022 U	0.0028 U	0.002 U	0.0025 U
Hexachloroethane	0.0019 U	0.0041 U	0.0042 U	0.0063 U	0.0022 U	0.002 U	0.0018 U	0.002 U	0.0019 U	0.0018 U	0.0022 U	0.0028 U	0.002 U	0.0026 U
Indeno(1,2,3-C,D)Pyrene	0.021	0.042	0.036	0.096 J	0.014 J	0.0027 J	0.0014 UJ	0.047	0.012	0.061	0.01	0.0022 U	0.0016 U	0.051
Isophorone	0.0019 U	0.0041 U	0.0041 U	0.0063 U	0.0021 U	0.0019 U	0.0018 U	0.0019 U	0.002 J	0.0018 U	0.0022 U	0.0028 U	0.002 U	0.0025 U
Naphthalene	0.006 J	0.0089 J	0.012 J	0.007 J	0.0016 UJ	0.0015 U	0.0014 U	0.0015 U	0.0015 U	0.0014 U	0.0017 U	0.0021 U	0.0015 U	0.0019 U
Nitrobenzene	0.014 U	0.029 U	0.03 U	0.045 U	0.015 U	0.014 U	0.013 U	0.014 U	0.014 U	0.013 U	0.016 U	0.02 U	0.014 U	0.018 U
N-Nitrosodi-N-Propylamine	0.0025 U	0.0054 U	0.0055 U	0.0083 U	0.0028 U	0.0026 U	0.0024 U	0.0026 U	0.0026 U	0.0024 U	0.0029 U	0.0037 U	0.0027 U	0.0034 U
N-Nitrosodiphenylamine	0.012 U	0.027 U	0.027 U	0.041 U	0.014 U	0.013 U	0.012 U	0.013 U	0.013 U	0.012 U	0.014 U	0.018 U	0.013 U	0.016 U
Pentachlorophenol	0.06 UJ	0.13 UJ	0.13 UJ	0.2 U	0.067 U	0.061 U	0.057 U	0.061 U	0.061 U	0.058 U	0.07 UJ	0.088 UJ	0.063 UJ	0.08 UJ
Phenanthrene	0.025	0.048	0.044	0.12 J	0.019 J	0.0038 J	0.003 J	0.028	0.0083	0.029	0.01	0.0029 U	0.0021 U	0.046
Phenol	0.011 U	0.024 U	0.024 U	0.037 U	0.013 U	0.012 U	0.011 U	0.012 U	0.011 U	0.011 U	0.013 U	0.017 U	0.012 U	0.015 U
Pyrene	0.034	0.07	0.058	0.18 J	0.027 J	0.0059 J	0.0017 UJ	0.076	0.022	0.091	0.018	0.0026 U	0.0019 U	0.097
VOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,1,1-Trichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,2,2-Tetrachloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,2-Trichloro-1,2,2-Trifluoroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,2-Trichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1-Dichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1-Dichloroethene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,3-Trichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,4-Trichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dibromo-3-Chloropropane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dibromoethane (Ethylene Dibromide)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichloropropane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,3-Dichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,4-Dichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Hexanone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acetone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromochloromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromodichloromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromoform	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromomethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Carbon Disulfide	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Carbon Tetrachloride	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chloroform	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chloromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cis-1,2-Dichloroethylene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cis-1,3-Dichloropropene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cyclohexane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibromochloromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dichlorodifluoromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Ethylbenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Isopropylbenzene (Cumene)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
M,P-Xylene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methyl Acetate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methyl Ethyl Ketone (2-Butanone)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methylcyclohexane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methylene Chloride	--	--	--	--	--	--	--	--	--	--	--	--	--	--
O-Xylene (1,2-Dimethylbenzene)	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Table E-19
Summary of Data Used in Risk Assessment
North-Central Undeveloped Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Sample Depth Chemical	CFSB-197 180-79108-8, 460-158919-8 CFSB-197-SO-0.5-2 0.5-2 ft 6/21/2018	CFSB-198 180-79108-5, 460-158919-5 CFSB-198-SO-0-0.5 0-0.5 ft 6/21/2018	CFSB-198 180-79108-6, 460-158919-6 CFSB-198-SO-0.5-2 0.5-2 ft 6/21/2018	CFSB-200 180-79434-37, 460-159538-7 CFSB-200-SO-0-0.5 0-0.5 ft 6/28/2018	CFSB-200-DUP 180-79434-39, 460-159538-9 CFSB-DUP48-SO 0-0.5 ft 6/28/2018	CFSB-200 180-79434-38, 460-159538-8 CFSB-200-SO-0.5-2 0.5-2 ft 6/28/2018	CFSB-200-DUP 180-79434-40, 460-159538-10 CFSB-DUP49-SO 0.5-2 ft 6/28/2018	CFSB-241 180-77488-23, 460-155568-1 CFSB-241-SO-0-0.5 0-0.5 ft 5/5/2018	CFSB-241 180-77488-24, 460-155568-2 CFSB-241-SO-0.5-2 0.5-2 ft 5/5/2018	CFSB-241 180-77488-25, 460-155568-3 CFSB-241-SO-10-12 10-12 ft 5/5/2018	CFSB-248 180-77393-38, 460-155265-42 CFSB-248-SO-0-0.5 0-0.5 ft 5/1/2018	CFSB-248 180-77393-39, 460-155265-43 CFSB-248-SO-0.5-2 0.5-2 ft 5/1/2018	CFSB-248 180-77393-40, 460-155265-44 CFSB-248-SO-10-12 10-12 ft 5/1/2018	CFSB-251 180-77393-41, 460-155265-45 CFSB-251-SO-0-0.5 0-0.5 ft 5/1/2018
Styrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Tert-Butyl Methyl Ether	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Tetrachloroethylene (PCE)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Toluene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Trans-1,2-Dichloroethene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Trans-1,3-Dichloropropene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Trichloroethylene (TCE)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Trichlorofluoromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Vinyl Chloride	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-19
Summary of Data Used in Risk Assessment
North-Central Undeveloped Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-251	CFSB-251	CFSB-254	CFSB-254	CFSB-254	CFSB-255	CFSB-255	CFSB-255	CFSB-256	CFSB-256	CFSB-256	CFSB-257	CFSB-257	CFSB-257
Sample Lab IDs	180-77393-42, 460-155265-46	180-77393-43, 460-155265-47	180-77393-10, 460-155265-12	180-77393-11, 460-155265-13	180-77393-12, 460-155265-14	180-77393-4, 460-155265-4	180-77393-5, 460-155265-5	180-77393-6, 460-155265-6	180-77393-7, 460-155265-7	180-77393-8, 460-155265-8	180-77393-9, 460-155265-9	180-77393-13, 460-155265-15	180-77393-14, 460-155265-16	180-77393-15, 460-155265-17
Sample Name	CFSB-251-SO-0.5-2	CFSB-251-SO-10-12	CFSB-254-SO-0-0.5	CFSB-254-SO-0.5-2	CFSB-254-SO-10-12	CFSB-255-SO-0-0.5	CFSB-255-SO-0.5-2	CFSB-255-SO-10-12	CFSB-256-SO-0-0.5	CFSB-256-SO-0.5-2	CFSB-256-SO-10-12	CFSB-257-SO-0-0.5	CFSB-257-SO-0.5-2	CFSB-257-SO-10-12
Sample Depth	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft
Chemical	5/1/2018	5/1/2018	4/30/2018	4/30/2018	4/30/2018	4/30/2018	4/30/2018	4/30/2018	4/30/2018	4/30/2018	4/30/2018	4/30/2018	4/30/2018	4/30/2018
GENERAL CHEMISTRY (mg/kg)														
Fluoride	3.74 J-	0.54 J-	6.31 J+	3.51 J+	0.9 J+	7.27 J+	0.79 J+	0.95 J+	9.48 J+	2.68 J+	0.78 J+	5.22 J+	8.3 J+	0.67 J
Cyanide	0.15 J	0.077 U	0.086 U	0.079 U	0.067 U	0.086 U	0.068 U	0.063 U	0.098 U	0.078 U	0.066 U	0.079 U	0.064 U	0.064 U
METALS (mg/kg)														
"Chromium, Hexavalent - Estimated"	0.147202	0.29708	0.117762	0.208759	0.248905	0.128467	0.128467	0.326521	0.208759	0.281022	0.206083	0.262287	0.305109	0.232847
"Chromium, Trivalent - Estimated"	5.3528	10.8029	4.28224	7.59124	9.05109	4.67153	4.67153	11.8735	7.59124	10.219	7.49392	9.53771	11.0949	8.46715
Aluminum	9710	12900	8830	10700	7280	7750	6280	7140	26100	16600	6230	14300	13800	7730 J
Antimony	0.33 UJ	0.28 UJ	0.41 UJ	0.34 UJ	0.31 UJ	0.41 UJ	0.33 UJ	0.31 UJ	0.45 UJ	0.37 UJ	0.33 UJ	0.37 UJ	0.32 UJ	0.33 UJ
Arsenic	2.3	7.7	7.7	15.3	11.4	10.7	14.9	15.6	15.8	13.7	10.7	6.1	5.3	4.8 J
Barium	88.8	97.3	376	200	72.2	340	179	117	486	213	51	197	158	92.2
Beryllium	0.27 J	0.56	0.47 J	0.45 J	0.3 J	0.39 J	0.21 J	0.23 J	0.87	0.54	0.3 J	0.41 J	0.65	0.39 J
Cadmium	0.38 U	0.32 U	0.47 U	0.39 U	0.35 U	0.47 U	0.37 U	0.36 U	0.78 J	0.42 U	0.38 U	0.43 U	0.37 U	0.38 U
Calcium	1040	34300	170000	87600	39600	177000	143000	103000	11600	12900	26500	2640	4120	34000 J+
Chromium, Total	5.5	11.1	4.4	7.8	9.3	4.8	4.8	12.2	7.8	10.5	7.7	9.8	11.4	8.7
Cobalt	3.1	8.1	2.7 J	4.3	5.5	2.2 J	3.5	4.7	5.4	6.7	5.1	4.8	5.2	5.6
Copper	6.6 J	17.5 J	19.4	13.2	15	20.3	8.5	13.2	26.2	18.3	11.1	13.1	10.4	15.1 J
Iron	10700	19100	6880	13100	12000	6490	8460	12100	14600	17200	11200	16000	15800	13300
Lead	6 J	18.6 J	7	9.4	6.7	9.7	9.4	8.9	14.4	17.2	6.7	12.8	13	9.6 J+
Magnesium	5650 J	9210 J	3280	7490	11800	3730	7110	9830	5040	12700	10100	9550	12800	7750 J
Manganese	206 J	688 J	558	431	345	609	287	406	511	418	275	553	886	379 J
Mercury	0.016 J	0.014 J	0.034	0.029	0.017 J	0.031	0.014 J	0.024	0.039	0.027	0.017 J	0.053	0.023	0.024
Nickel	6.7	13.7	5.1	8.9	10.4	4.2	6	9.6	9.7	12.7	9.1	12.2	11.2	10.3
Potassium	488	1550	400	577	626	337	335	687	841	854	719	939	594	973 J+
Selenium	0.32 U	0.27 U	0.41 U	0.34 U	0.31 U	0.41 U	0.32 U	0.31 U	0.46 J	0.37 U	0.33 U	0.37 U	0.32 U	0.33 U
Silver	0.69 UJ	0.58 UJ	0.87 U	0.73 U	0.65 U	0.87 U	0.69 U	0.65 U	0.94 U	0.78 U	0.7 U	0.79 U	0.68 U	0.69 U
Sodium	35 U	34.2 J	62.9 J	63 J	33.1 U	59.1 J	66 J	95.5 J	243	66.4 J	35.5 U	39.9 U	34.4 U	35.1 U
Thallium	0.14 U	0.12 U	0.18 U	0.15 U	0.13 U	0.18 U	0.14 U	0.13 U	0.19 U	0.16 U	0.14 U	0.16 U	0.14 U	0.14 U
Vanadium	6.9	9.8	4.8	8	5.9	4.3	4	6.1	13	10.9	6	13.3	10.4	7.1 J+
Zinc	27.4	54	40.5	40.6	34.2	39.3	27.6	38.2	49.1	46.8	29.4	54.4	36.7	38.6
PESTICIDES (mg/kg)														
Aldrin	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Alpha Bhc (Alpha Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Alpha Endosulfan	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Beta Bhc (Beta Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Beta Endosulfan	--	--	--	--	--	--	--	--	--	--	--	--	--	--
cis-Chlordane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Delta BHC (Delta Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dieldrin	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endosulfan Sulfate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin Aldehyde	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin Ketone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Gamma Bhc (Lindane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Heptachlor	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Heptachlor Epoxide	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methoxychlor	--	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDD	--	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDT	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Toxaphene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
trans-Chlordane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
POLYCHLORINATED BIPHENYLS (mg/kg)														
PCB-1016 (Aroclor 1016)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1221 (Aroclor 1221)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1232 (Aroclor 1232)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1242 (Aroclor 1242)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1248 (Aroclor 1248)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1254 (Aroclor 1254)	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Table E-19
Summary of Data Used in Risk Assessment
North-Central Undeveloped Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Sample Depth Chemical	CFSB-251 180-77393-42, 460-155265-46 CFSB-251-SO-0.5-2 0.5-2 ft 5/1/2018	CFSB-251 180-77393-43, 460-155265-47 CFSB-251-SO-10-12 10-12 ft 5/1/2018	CFSB-254 180-77393-10, 460-155265-12 CFSB-254-SO-0-0.5 0-0.5 ft 4/30/2018	CFSB-254 180-77393-11, 460-155265-13 CFSB-254-SO-0.5-2 0.5-2 ft 4/30/2018	CFSB-254 180-77393-12, 460-155265-14 CFSB-254-SO-10-12 10-12 ft 4/30/2018	CFSB-255 180-77393-4, 460-155265-4 CFSB-255-SO-0-0.5 0-0.5 ft 4/30/2018	CFSB-255 180-77393-5, 460-155265-5 CFSB-255-SO-0.5-2 0.5-2 ft 4/30/2018	CFSB-255 180-77393-6, 460-155265-6 CFSB-255-SO-10-12 10-12 ft 4/30/2018	CFSB-256 180-77393-7, 460-155265-7 CFSB-256-SO-0-0.5 0-0.5 ft 4/30/2018	CFSB-256 180-77393-8, 460-155265-8 CFSB-256-SO-0.5-2 0.5-2 ft 4/30/2018	CFSB-256 180-77393-9, 460-155265-9 CFSB-256-SO-10-12 10-12 ft 4/30/2018	CFSB-257 180-77393-13, 460-155265-15 CFSB-257-SO-0-0.5 0-0.5 ft 4/30/2018	CFSB-257 180-77393-14, 460-155265-16 CFSB-257-SO-0.5-2 0.5-2 ft 4/30/2018	CFSB-257 180-77393-15, 460-155265-17 CFSB-257-SO-10-12 10-12 ft 4/30/2018
PCB-1260 (Aroclor 1260)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1262 (Aroclor 1262)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1268 (Aroclor 1268)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Polychlorinated Biphenyl (PCBs)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SEMIVOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,2,4,5-Tetrachlorobenzene	0.0018 U	0.0018 U	0.002 U	0.0018 U	0.0017 U	0.0021 U	0.0017 U	0.0016 U	0.0017 U	0.0017 U	0.0016 U	0.0019 U	0.0016 U	0.0016 U
1,4-Dioxane (P-Dioxane)	0.013 U	0.013 U	0.014 U	0.013 U	0.012 U	0.015 U	0.012 U	0.011 U	0.012 U	0.012 U	0.011 U	0.013 U	0.012 U	0.011 U
2,3,4,6-Tetrachlorophenol	0.018 U	0.018 U	0.019 U	0.017 U	0.016 U	0.02 U	0.016 U	0.015 U	0.016 U	0.016 U	0.015 U	0.018 U	0.015 U	0.015 U
2,4,5-Trichlorophenol	0.003 U	0.0031 U	0.0033 U	0.0029 U	0.0027 U	0.0034 U	0.0028 U	0.0026 U	0.0028 U	0.0028 U	0.0026 U	0.0031 U	0.0026 U	0.0026 U
2,4,6-Trichlorophenol	0.0023 U	0.0023 U	0.0025 U	0.0022 U	0.0021 U	0.0026 U	0.0022 U	0.002 U	0.0022 U	0.0021 U	0.002 U	0.0024 U	0.002 U	0.002 U
2,4-Dichlorophenol	0.0033 U	0.0033 U	0.0036 U	0.0032 U	0.003 U	0.0037 U	0.003 U	0.0028 U	0.003 U	0.003 U	0.0028 U	0.0033 U	0.0029 U	0.0028 U
2,4-Dimethylphenol	0.0026 U	0.0027 U	0.0029 U	0.0025 U	0.0024 U	0.003 U	0.0024 U	0.0023 U	0.0024 U	0.0024 U	0.0022 U	0.0027 U	0.0023 U	0.0023 U
2,4-Dinitrophenol	0.11 UJ	0.12 UJ	0.12 U	0.11 U	0.1 U	0.13 UJ	0.11 UJ	0.098 UJ	0.11 UJ	0.1 U	0.097 U	0.12 U	0.1 U	0.098 U
2,4-Dinitrotoluene	0.0021 U	0.0021 U	0.0023 U	0.002 U	0.0019 U	0.0024 U	0.002 U	0.0018 U	0.002 U	0.0019 U	0.0018 U	0.0021 U	0.0018 U	0.0018 U
2,6-Dinitrotoluene	0.0026 U	0.0026 U	0.0029 U	0.0025 U	0.0024 U	0.003 U	0.0024 U	0.0023 U	0.0024 U	0.0024 U	0.0022 U	0.0027 U	0.0023 U	0.0022 U
2-Chloronaphthalene	0.002 U	0.002 U	0.0021 U	0.0019 U	0.0018 U	0.0022 U	0.0018 U	0.0017 U	0.0018 U	0.0018 U	0.0017 U	0.002 U	0.0017 U	0.0017 U
2-Chlorophenol	0.002 U	0.002 U	0.0021 U	0.0019 U	0.0018 U	0.0022 U	0.0018 U	0.0017 U	0.0018 U	0.0018 U	0.0017 U	0.002 U	0.0017 U	0.0017 U
2-Methylnaphthalene	0.002 U	0.0021 U	0.0022 U	0.002 U	0.0018 U	0.0023 U	0.0019 U	0.0018 U	0.0019 U	0.0019 U	0.0017 U	0.0021 U	0.0018 U	0.0017 U
2-Methylphenol (O-Cresol)	0.012 U	0.012 U	0.013 U	0.012 U	0.011 U	0.014 U	0.011 U	0.01 U	0.011 U	0.011 U	0.01 U	0.012 U	0.011 U	0.01 U
2-Nitroaniline	0.019 U	0.019 U	0.021 U	0.019 U	0.017 U	0.022 U	0.018 U	0.017 U	0.018 U	0.018 U	0.016 U	0.02 U	0.017 U	0.017 U
2-Nitrophenol	0.0024 U	0.0024 U	0.0026 U	0.0023 U	0.0022 U	0.0027 U	0.0023 U	0.0021 U	0.0022 U	0.0022 U	0.0021 U	0.0025 U	0.0021 U	0.0021 U
3- And 4- Methylphenol (Total)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3,3'-Dichlorobenzidine	0.04 U	0.04 U	0.043 U	0.038 U	0.036 U	0.045 U	0.037 U	0.034 U	0.037 U	0.036 U	0.034 U	0.04 U	0.035 U	0.034 U
3-Nitroaniline	0.011 U	0.011 U	0.012 U	0.01 U	0.0097 U	0.012 U	0.01 U	0.0093 U	0.01 U	0.0098 U	0.0092 U	0.011 U	0.0094 U	0.0093 U
4,6-Dinitro-2-Methylphenol	0.073 UJ	0.074 UJ	0.08 U	0.071 U	0.066 U	0.082 U	0.068 U	0.063 U	0.068 U	0.067 U	0.062 U	0.074 U	0.064 U	0.063 U
4-Bromophenyl Phenyl Ether	0.003 U	0.003 U	0.0032 U	0.0029 U	0.0027 U	0.0033 U	0.0027 U	0.0025 U	0.0027 U	0.0027 U	0.0025 U	0.003 U	0.0026 U	0.0025 U
4-Chloro-3-Methylphenol	0.002 U	0.002 U	0.0022 U	0.0019 U	0.0018 U	0.0022 U	0.0019 U	0.0017 U	0.0018 U	0.0018 U	0.0017 U	0.002 U	0.0017 U	0.0017 U
4-Chloroaniline	0.0014 U	0.0014 U	0.0015 U	0.0014 U	0.0013 U	0.0016 U	0.0013 U	0.0012 U	0.0013 U	0.0013 U	0.0012 U	0.0014 U	0.0012 U	0.0012 U
4-Chlorophenyl Phenyl Ether	0.0026 U	0.0026 U	0.0028 U	0.0025 U	0.0023 U	0.0029 U	0.0024 U	0.0022 U	0.0024 U	0.0023 U	0.0022 U	0.0026 U	0.0022 U	0.0022 U
4-Nitroaniline	0.0021 U	0.0021 U	0.0022 U	0.002 U	0.0019 U	0.0023 U	0.0019 U	0.0018 U	0.0019 U	0.0019 U	0.0018 U	0.0021 U	0.0018 U	0.0018 U
4-Nitrophenol	0.03 U	0.03 U	0.032 U	0.029 U	0.027 U	0.034 U	0.028 U	0.026 U	0.028 U	0.027 U	0.025 U	0.03 U	0.026 U	0.026 U
Acenaphthene	0.0024 U	0.0025 U	0.0027 U	0.0024 U	0.0022 U	0.0028 U	0.0023 U	0.0021 U	0.0023 U	0.0022 U	0.0021 U	0.0035 J	0.0021 U	0.0021 U
Acenaphthylene	0.0019 U	0.0019 U	0.002 U	0.0018 U	0.0017 U	0.0021 U	0.0017 U	0.0016 U	0.0017 U	0.0017 U	0.0016 U	0.0019 U	0.0016 U	0.0016 U
Acetophenone	0.0023 U	0.0023 U	0.0025 U	0.0022 U	0.0021 U	0.0026 U	0.0021 U	0.002 U	0.0045 J	0.0024 J	0.002 U	0.0023 U	0.002 U	0.002 U
Anthracene	0.0022 U	0.0022 U	0.0024 U	0.0021 U	0.002 U	0.0025 U	0.002 U	0.0019 U	0.0022 J	0.002 U	0.0019 U	0.0064 J	0.0019 U	0.0019 U
Atrazine	0.019 U	0.019 U	0.02 U	0.018 U	0.017 U	0.021 U	0.017 U	0.016 U	0.017 U	0.017 U	0.016 U	0.019 U	0.016 U	0.016 U
Benzaldehyde	0.0053 UR	0.0053 UR	0.0057 UR	0.0051 UR	0.0048 UR	0.0059 UR	0.0049 UR	0.0045 UR	0.0063 J-	0.0052 J-	0.0045 UR	0.0053 UR	0.0046 UR	0.0045 UR
Benzo(A)Anthracene	0.0016 U	0.0016 U	0.014	0.0015 U	0.0014 U	0.0034 J	0.0015 U	0.002 J	0.0079	0.0015 U	0.0014 U	0.045	0.0042 J	0.0014 U
Benzo(A)Pyrene	0.0018 U	0.0019 U	0.019	0.0018 U	0.0017 U	0.0042 J	0.0017 U	0.0021 J	0.0055 J	0.0017 U	0.0016 U	0.065	0.0056 J	0.0016 U
Benzo(B)Fluoranthene	0.0021 U	0.0021 U	0.025	0.002 U	0.0019 U	0.0048 J	0.0019 U	0.0025 J	0.013	0.0019 U	0.0018 U	0.11	0.01	0.0018 U
Benzo(G,H,I)Perylene	0.0018 U	0.0018 U	0.02	0.0018 U	0.0017 U	0.004 J	0.0017 U	0.0023 J	0.009	0.0017 U	0.0016 U	0.076	0.0075	0.0016 U
Benzo(K)Fluoranthene	0.0025 U	0.0026 U	0.0089 J	0.0025 U	0.0023 U	0.0029 J	0.0024 U	0.0022 U	0.0064 J	0.0023 U	0.0022 U	0.037	0.0036 J	0.0022 U
Benzyl Butyl Phthalate	0.029 U	0.029 U	0.032 U	0.028 U	0.026 U	0.033 U	0.027 U	0.025 U	0.027 U	0.027 U	0.025 U	0.03 U	0.025 U	0.025 U
Biphenyl (Diphenyl)	0.0018 U	0.0018 U	0.0019 U	0.0017 U	0.0016 U	0.002 U	0.0017 U	0.0015 U	0.0016 U	0.0023 J	0.0015 U	0.0018 U	0.0016 U	0.0015 U
Bis(2-Chloroethoxy) Methane	0.002 U	0.002 U	0.0022 U	0.002 U	0.0018 U	0.0023 U	0.0019 U	0.0017 U	0.0019 U	0.0018 U	0.0017 U	0.0021 U	0.0018 U	0.0017 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.0015 U	0.0016 U	0.0017 U	0.0015 U	0.0014 U	0.0017 U	0.0014 U	0.0013 U	0.0014 U	0.0014 U	0.0013 U	0.0016 U	0.0013 U	0.0013 U
Bis(2-Chloroisopropyl) Ether	0.0031 U	0.0032 U	0.0034 U	0.003 U	0.0028 U	0.0035 U	0.0029 U	0.0027 U	0.0029 U	0.0029 U	0.0027 U	0.0032 U	0.0027 U	0.0027 U
Bis(2-Ethylhexyl) Phthalate	0.045 U	0.046 U	0.27 J	0.097 J	0.12 J	0.14 J	0.094 J	0.38	0.35 J	0.21 J	0.071 J	0.51	0.22 J	0.039 U
Caprolactam	0.028 U	0.028 U	0.03 U	0.027 U	0.025 U	0.031 U	0.026 U	0.024 U	0.026 U	0.025 U	0.024 U	0.028 U	0.024 U	0.024 U
Carbazole	0.002 U	0.002 U	0.0029 J	0.0019 U	0.0018 U	0.0022 U	0.0018 U	0.0017 U	0.0024 J	0.0018 U	0.0017 U	0.0094	0.0017 U	0.0017 U
Chrysene	0.0017 U	0.0017 U	0.02	0.0016 U	0.0015 U	0.0047 J	0.0015 U	0.0028 J	0.012	0.0015 U	0.0014 U	0.082	0.0074	0.0014 U
Dibenz(A,H)Anthracene	0.0019 U	0.0019 U	0.0028 J	0.0018 U	0.0017 U	0.0021 U	0.0018 U	0.0016 U	0.0018 U	0.0017 U	0.0016 U	0.015	0.0017 U	0.0016 U
Dibenzofuran	0.0019 U	0.0019 U	0.002 U	0.0018 U	0.0017 U	0.0021 U	0.0017 U	0.0016 U	0.0017 U	0.0017 U	0.0016 U	0.0019 U	0.0016 U	0.0016 U
Diethyl Phthalate	0.013 U	0.013 U	0.014 U	0.012 U	0.011 U	0.014 U	0.012 U	0.011 U	0.012 U	0.012 U	0.011 U	0.013 U	0.011 U	0.011 U
Dimethyl Phthalate	0.0015 U	0.0016 U	0.0017 U	0.0015 U	0.0014 U	0.0017 U	0.0014 U	0.0013 U	0.0014 U	0.0014 U	0.0013 U	0.0016 U	0.0013 U	0.0013 U
Di-N-Butyl Phthalate	0.019 U	0.019 U	0.02 U	0.018 U	0.017 U	0.021 U	0.017 U	0.016 U	0.017 U	0.017 U	0.016 U	0.019 U	0.016 U	0.016 U
Di-N-Octylphthalate	0.025 U	0.025 U	0.027 U	0.024 U	0.022 U	0.028 U	0.023 U	0.021 U	0.023 U	0.022 U	0.021 U	0.025 U	0.022 U	0.021 U
Fluoranthene	0.0022 U	0.0023 U	0.022	0.0022 U	0.002 U	0.0059 J	0.0021 U	0.0033 J	0.019	0.0022 J	0.0019 U	0.085	0.0073 J	0.0019 U

Table E-19
Summary of Data Used in Risk Assessment
North-Central Undeveloped Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Sample Depth Chemical	CFSB-251 180-77393-42, 460-155265-46 CFSB-251-SO-0.5-2 0.5-2 ft 5/1/2018	CFSB-251 180-77393-43, 460-155265-47 CFSB-251-SO-10-12 10-12 ft 5/1/2018	CFSB-254 180-77393-10, 460-155265-12 CFSB-254-SO-0-0.5 0-0.5 ft 4/30/2018	CFSB-254 180-77393-11, 460-155265-13 CFSB-254-SO-0.5-2 0.5-2 ft 4/30/2018	CFSB-254 180-77393-12, 460-155265-14 CFSB-254-SO-10-12 10-12 ft 4/30/2018	CFSB-255 180-77393-4, 460-155265-4 CFSB-255-SO-0-0.5 0-0.5 ft 4/30/2018	CFSB-255 180-77393-5, 460-155265-5 CFSB-255-SO-0.5-2 0.5-2 ft 4/30/2018	CFSB-255 180-77393-6, 460-155265-6 CFSB-255-SO-10-12 10-12 ft 4/30/2018	CFSB-256 180-77393-7, 460-155265-7 CFSB-256-SO-0-0.5 0-0.5 ft 4/30/2018	CFSB-256 180-77393-8, 460-155265-8 CFSB-256-SO-0.5-2 0.5-2 ft 4/30/2018	CFSB-256 180-77393-9, 460-155265-9 CFSB-256-SO-10-12 10-12 ft 4/30/2018	CFSB-257 180-77393-13, 460-155265-15 CFSB-257-SO-0-0.5 0-0.5 ft 4/30/2018	CFSB-257 180-77393-14, 460-155265-16 CFSB-257-SO-0.5-2 0.5-2 ft 4/30/2018	CFSB-257 180-77393-15, 460-155265-17 CFSB-257-SO-10-12 10-12 ft 4/30/2018
Fluorene	0.0017 U	0.0017 U	0.0018 U	0.0016 U	0.0015 U	0.0019 U	0.0015 U	0.0014 U	0.0015 U	0.0015 U	0.0014 U	0.0024 J	0.0015 U	0.0014 U
Hexachlorobenzene	0.003 U	0.0031 U	0.0033 U	0.0029 U	0.0027 U	0.0034 U	0.0028 U	0.0026 U	0.0028 U	0.0028 U	0.0026 U	0.0031 U	0.0027 U	0.0026 U
Hexachlorobutadiene	0.0025 U	0.0025 U	0.0027 U	0.0024 U	0.0022 U	0.0028 U	0.0023 U	0.0021 U	0.0023 U	0.0023 U	0.0021 U	0.0025 U	0.0022 U	0.0021 U
Hexachlorocyclopentadiene	0.0022 U	0.0022 U	0.0024 U	0.0021 U	0.002 U	0.0024 U	0.002 U	0.0019 U	0.002 U	0.002 U	0.0018 U	0.0022 U	0.0019 U	0.0019 U
Hexachloroethane	0.0022 U	0.0022 U	0.0024 U	0.0021 U	0.002 U	0.0025 U	0.002 U	0.0019 U	0.002 U	0.002 U	0.0019 U	0.0022 U	0.0019 U	0.0019 U
Indeno(1,2,3-C,D)Pyrene	0.0017 U	0.0017 U	0.015	0.0017 U	0.0016 U	0.0031 J	0.0016 U	0.0017 J	0.0073 J	0.0016 U	0.0015 U	0.061	0.0063 J	0.0015 U
Isophorone	0.0022 U	0.0022 U	0.0024 U	0.0021 U	0.002 U	0.0024 U	0.002 U	0.0019 U	0.002 U	0.002 U	0.0018 U	0.0022 U	0.0019 U	0.0019 U
Naphthalene	0.0017 U	0.0017 U	0.0018 U	0.0016 U	0.0015 U	0.0019 U	0.0015 U	0.0014 U	0.0015 U	0.0015 U	0.0014 U	0.0022 J	0.0014 U	0.0014 U
Nitrobenzene	0.016 U	0.016 U	0.017 U	0.015 U	0.014 U	0.017 U	0.014 U	0.013 U	0.014 U	0.014 U	0.013 U	0.016 U	0.014 U	0.013 U
N-Nitrosodi-N-Propylamine	0.0029 U	0.0029 U	0.0031 U	0.0028 U	0.0026 U	0.0032 U	0.0027 U	0.0025 U	0.0027 U	0.0026 U	0.0025 U	0.0029 U	0.0025 U	0.0025 U
N-Nitrosodiphenylamine	0.014 U	0.014 U	0.015 U	0.014 U	0.013 U	0.016 U	0.013 U	0.012 U	0.013 U	0.013 U	0.012 U	0.014 U	0.012 U	0.012 U
Pentachlorophenol	0.068 UJ	0.069 UJ	0.074 U	0.066 U	0.062 U	0.077 UJ	0.063 UJ	0.059 UJ	0.063 UJ	0.062 U	0.058 U	0.069 U	0.06 U	0.059 U
Phenanthrene	0.0023 U	0.0023 U	0.012	0.0022 U	0.0021 U	0.0035 J	0.0021 U	0.0025 J	0.011	0.0021 U	0.0019 U	0.04	0.004 J	0.002 U
Phenol	0.013 U	0.013 U	0.014 U	0.012 U	0.012 U	0.014 U	0.012 U	0.011 U	0.012 U	0.012 U	0.011 U	0.013 U	0.011 U	0.011 U
Pyrene	0.002 U	0.002 U	0.024	0.0019 U	0.0018 U	0.0059 J	0.0019 U	0.0031 J	0.012	0.0018 U	0.0017 U	0.083	0.0079	0.0017 U
VOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,1,1-Trichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,2,2-Tetrachloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,2-Trichloro-1,2,2-Trifluoroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,2-Trichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1-Dichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1-Dichloroethene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,3-Trichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,4-Trichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dibromo-3-Chloropropane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dibromoethane (Ethylene Dibromide)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichloropropane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,3-Dichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,4-Dichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Hexanone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acetone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromochloromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromodichloromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromoform	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromomethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Carbon Disulfide	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Carbon Tetrachloride	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chloroform	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chloromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cis-1,2-Dichloroethylene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cis-1,3-Dichloropropene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cyclohexane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibromochloromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dichlorodifluoromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Ethylbenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Isopropylbenzene (Cumene)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
M,P-Xylene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methyl Acetate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methyl Ethyl Ketone (2-Butanone)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methylcyclohexane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methylene Chloride	--	--	--	--	--	--	--	--	--	--	--	--	--	--
O-Xylene (1,2-Dimethylbenzene)	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Table E-19
Summary of Data Used in Risk Assessment
North-Central Undeveloped Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Sample Depth Chemical	CFSB-251 180-77393-42, 460-155265-46 CFSB-251-SO-0.5-2 0.5-2 ft 5/1/2018	CFSB-251 180-77393-43, 460-155265-47 CFSB-251-SO-10-12 10-12 ft 5/1/2018	CFSB-254 180-77393-10, 460-155265-12 CFSB-254-SO-0-0.5 0-0.5 ft 4/30/2018	CFSB-254 180-77393-11, 460-155265-13 CFSB-254-SO-0.5-2 0.5-2 ft 4/30/2018	CFSB-254 180-77393-12, 460-155265-14 CFSB-254-SO-10-12 10-12 ft 4/30/2018	CFSB-255 180-77393-4, 460-155265-4 CFSB-255-SO-0-0.5 0-0.5 ft 4/30/2018	CFSB-255 180-77393-5, 460-155265-5 CFSB-255-SO-0.5-2 0.5-2 ft 4/30/2018	CFSB-255 180-77393-6, 460-155265-6 CFSB-255-SO-10-12 10-12 ft 4/30/2018	CFSB-256 180-77393-7, 460-155265-7 CFSB-256-SO-0-0.5 0-0.5 ft 4/30/2018	CFSB-256 180-77393-8, 460-155265-8 CFSB-256-SO-0.5-2 0.5-2 ft 4/30/2018	CFSB-256 180-77393-9, 460-155265-9 CFSB-256-SO-10-12 10-12 ft 4/30/2018	CFSB-257 180-77393-13, 460-155265-15 CFSB-257-SO-0-0.5 0-0.5 ft 4/30/2018	CFSB-257 180-77393-14, 460-155265-16 CFSB-257-SO-0.5-2 0.5-2 ft 4/30/2018	CFSB-257 180-77393-15, 460-155265-17 CFSB-257-SO-10-12 10-12 ft 4/30/2018
Styrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Tert-Butyl Methyl Ether	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Tetrachloroethylene (PCE)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Toluene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Trans-1,2-Dichloroethene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Trans-1,3-Dichloropropene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Trichloroethylene (TCE)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Trichlorofluoromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Vinyl Chloride	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

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Sample Location ID Sample Lab IDs Sample Name Sample Depth Chemical	CFSB-258 180-77393-16, 460-155265-18 CFSB-258-SO-0-0.5 0-0.5 ft 4/30/2018	CFSB-258 180-77393-17, 460-155265-19 CFSB-258-SO-0.5-2 0.5-2 ft 4/30/2018	CFSB-258 180-77393-18, 460-155265-20 CFSB-258-SO-10-12 10-12 ft 4/30/2018	CFSB-259 180-77393-19, 460-155265-21 CFSB-259-SO-0-0.5 0-0.5 ft 4/30/2018	CFSB-259 180-77393-20, 460-155265-22 CFSB-259-SO-0.5-2 0.5-2 ft 4/30/2018	CFSB-259 180-77393-21, 460-155265-23 CFSB-259-SO-10-12 10-12 ft 4/30/2018	CFSB-260 180-77488-26, 460-155568-4 CFSB-260-SO-0-0.5 0-0.5 ft 5/5/2018	CFSB-260 180-77488-27, 460-155568-5 CFSB-260-SO-0.5-2 0.5-2 ft 5/5/2018	CFSB-260 180-77488-28, 460-155568-6 CFSB-260-SO-10-12 10-12 ft 5/5/2018
GENERAL CHEMISTRY (mg/kg)									
Fluoride	3.89	4.12	1.7	16	2.26	0.61 J	2.34 J+	1.12 J+	0.9 J+
Cyanide	0.15 J+	0.065 U	0.063 U	0.086 U	0.071 U	0.075 U	0.062 U	0.061 U	0.066 U
METALS (mg/kg)									
"Chromium, Hexavalent - Estimated"	0.251582	0.254258	0.302433	0.248905	0.286375	0.216788	0.243552	0.240876	0.240876
"Chromium, Trivalent - Estimated"	9.14842	9.24574	10.9976	9.05109	10.4136	7.88321	8.85645	8.75912	8.75912
Aluminum	14700 J	11100 J	10600 J	27400 J	13500 J	8400 J	10000	7380	6640
Antimony	0.36 UJ	0.32 UJ	0.31 UJ	0.4 UJ	0.31 UJ	0.36 UJ	0.32 UJ	0.32 UJ	0.32 UJ
Arsenic	8 J	7.3 J	6.3 J	8.1 J	6.6 J	7.4 J	5.2	5.6	4.1
Barium	168	57.9	75.6	454	73.2	58.1	103	77.2	51.4
Beryllium	0.64	0.4 J	0.37 J	0.81	0.45	0.3 J	0.46	0.26 J	0.21 J
Cadmium	0.42 U	0.36 U	0.35 U	0.46 U	0.36 U	0.41 U	0.36 U	0.36 U	0.37 U
Calcium	2840 J+	16500 J+	51900 J+	3000 J+	27000 J+	57100 J+	24300 J	51100 J	95300 J
Chromium, Total	9.4	9.5	11.3	9.3	10.7	8.1	9.1	9	9
Cobalt	4.2	3.9	4.3	6.3	7.3	5.6	6.1	4.2	3.8
Copper	11.1 J	10.5 J	12.2 J	14.3 J	14.5 J	12.3 J	15.4 J	15.6 J	10.2 J
Iron	17100	14700	14900	16900	17000	13700	15300	13100	11000
Lead	13.3 J+	8.8 J+	7.4 J+	16 J+	21.8 J+	11.5 J+	9.6 J+	7.1 J+	7.9 J+
Magnesium	9330 J	11600 J	13900 J	6460 J	14000 J	13100 J	9600	12000	28700
Manganese	620 J	337 J	454 J	881 J	610 J	413 J	466	482	280
Mercury	0.031	0.047	0.037	0.022 J	0.038	0.018 J	0.016 J	0.017 J	0.019
Nickel	13.4	9	9.9	14.7	10	9.8	10.3 J	8.5 J	8.2 J
Potassium	886 J+	817 J+	1020 J+	1390 J+	648 J+	604 J+	960	782	731
Selenium	0.36 U	0.31 U	0.3 U	0.39 U	0.31 U	0.35 U	0.31 U	0.31 U	0.32 U
Silver	0.77 U	0.67 U	0.65 U	0.84 U	0.66 U	0.75 U	0.67 U	0.67 U	0.68 U
Sodium	38.9 U	33.7 U	32.9 U	131 J	33.4 U	38.1 U	46.3 J	39.5 J	73.4 J
Thallium	0.19 J	0.13 U	0.13 U	0.17 U	0.13 U	0.15 U	0.14 U	0.13 U	0.14 U
Vanadium	11.8 J+	8 J+	7.3 J+	17.2 J+	9.8 J+	7 J+	9.7	6.6	5.8
Zinc	71.2	35.8	37.9	71	33.8	39	39.1	49.5	30
PESTICIDES (mg/kg)									
Aldrin	--	--	--	--	--	--	--	--	--
Alpha Bhc (Alpha Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--
Alpha Endosulfan	--	--	--	--	--	--	--	--	--
Beta Bhc (Beta Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--
Beta Endosulfan	--	--	--	--	--	--	--	--	--
cis-Chlordane	--	--	--	--	--	--	--	--	--
Delta BHC (Delta Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--
Dieldrin	--	--	--	--	--	--	--	--	--
Endosulfan Sulfate	--	--	--	--	--	--	--	--	--
Endrin	--	--	--	--	--	--	--	--	--
Endrin Aldehyde	--	--	--	--	--	--	--	--	--
Endrin Ketone	--	--	--	--	--	--	--	--	--
Gamma Bhc (Lindane)	--	--	--	--	--	--	--	--	--
Heptachlor	--	--	--	--	--	--	--	--	--
Heptachlor Epoxide	--	--	--	--	--	--	--	--	--
Methoxychlor	--	--	--	--	--	--	--	--	--
P,P'-DDD	--	--	--	--	--	--	--	--	--
P,P'-DDE	--	--	--	--	--	--	--	--	--
P,P'-DDT	--	--	--	--	--	--	--	--	--
Toxaphene	--	--	--	--	--	--	--	--	--
trans-Chlordane	--	--	--	--	--	--	--	--	--
POLYCHLORINATED BIPHENYLS (mg/kg)									
PCB-1016 (Aroclor 1016)	--	--	--	--	--	--	--	--	--
PCB-1221 (Aroclor 1221)	--	--	--	--	--	--	--	--	--
PCB-1232 (Aroclor 1232)	--	--	--	--	--	--	--	--	--
PCB-1242 (Aroclor 1242)	--	--	--	--	--	--	--	--	--
PCB-1248 (Aroclor 1248)	--	--	--	--	--	--	--	--	--
PCB-1254 (Aroclor 1254)	--	--	--	--	--	--	--	--	--

Table E-19
Summary of Data Used in Risk Assessment
North-Central Undeveloped Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Sample Depth Chemical	CFSB-258 180-77393-16, 460-155265-18 CFSB-258-SO-0-0.5 0-0.5 ft 4/30/2018	CFSB-258 180-77393-17, 460-155265-19 CFSB-258-SO-0.5-2 0.5-2 ft 4/30/2018	CFSB-258 180-77393-18, 460-155265-20 CFSB-258-SO-10-12 10-12 ft 4/30/2018	CFSB-259 180-77393-19, 460-155265-21 CFSB-259-SO-0-0.5 0-0.5 ft 4/30/2018	CFSB-259 180-77393-20, 460-155265-22 CFSB-259-SO-0.5-2 0.5-2 ft 4/30/2018	CFSB-259 180-77393-21, 460-155265-23 CFSB-259-SO-10-12 10-12 ft 4/30/2018	CFSB-260 180-77488-26, 460-155568-4 CFSB-260-SO-0-0.5 0-0.5 ft 5/5/2018	CFSB-260 180-77488-27, 460-155568-5 CFSB-260-SO-0.5-2 0.5-2 ft 5/5/2018	CFSB-260 180-77488-28, 460-155568-6 CFSB-260-SO-10-12 10-12 ft 5/5/2018
PCB-1260 (Aroclor 1260)	--	--	--	--	--	--	--	--	--
PCB-1262 (Aroclor 1262)	--	--	--	--	--	--	--	--	--
PCB-1268 (Aroclor 1268)	--	--	--	--	--	--	--	--	--
Polychlorinated Biphenyl (PCBs)	--	--	--	--	--	--	--	--	--
SEMIVOLATILE ORGANIC COMPOUNDS (mg/kg)									
1,2,4,5-Tetrachlorobenzene	0.0019 U	0.0016 U	0.0015 U	0.0038 U	0.0016 U	0.0019 U	0.0015 U	0.0016 U	0.0016 U
1,4-Dioxane (P-Dioxane)	0.013 U	0.012 U	0.011 U	0.028 U	0.012 U	0.014 U	0.011 U	0.011 U	0.011 U
2,3,4,6-Tetrachlorophenol	0.018 U	0.016 U	0.014 U	0.037 U	0.015 U	0.018 U	0.015 U	0.015 U	0.015 U
2,4,5-Trichlorophenol	0.0031 U	0.0027 U	0.0025 U	0.0063 U	0.0026 U	0.0032 U	0.0025 U	0.0026 U	0.0026 U
2,4,6-Trichlorophenol	0.0024 U	0.0021 U	0.0019 U	0.0049 U	0.002 U	0.0024 U	0.002 U	0.002 U	0.002 U
2,4-Dichlorophenol	0.0033 U	0.0029 U	0.0027 U	0.0068 U	0.0029 U	0.0034 U	0.0027 U	0.0028 U	0.0028 U
2,4-Dimethylphenol	0.0027 U	0.0023 U	0.0022 U	0.0055 U	0.0023 U	0.0027 U	0.0022 U	0.0022 U	0.0023 U
2,4-Dinitrophenol	0.12 U	0.1 U	0.093 U	0.24 UJ	0.1 UJ	0.12 UJ	0.096 U	0.097 UJ	0.098 UJ
2,4-Dinitrotoluene	0.0021 U	0.0019 U	0.0017 U	0.0044 U	0.0018 U	0.0022 U	0.0018 U	0.0018 U	0.0018 U
2,6-Dinitrotoluene	0.0027 U	0.0023 U	0.0021 U	0.0055 U	0.0023 U	0.0027 U	0.0022 U	0.0022 U	0.0022 U
2-Chloronaphthalene	0.002 U	0.0017 U	0.0016 U	0.0041 U	0.0017 U	0.002 U	0.0016 U	0.0017 U	0.0017 U
2-Chlorophenol	0.002 U	0.0017 U	0.0016 U	0.0041 U	0.0017 U	0.0021 U	0.0017 U	0.0017 U	0.0017 U
2-Methylnaphthalene	0.0021 U	0.0018 U	0.0017 U	0.0043 U	0.0018 U	0.0021 U	0.0017 U	0.0017 U	0.0017 U
2-Methylphenol (O-Cresol)	0.012 U	0.011 U	0.0099 U	0.025 U	0.011 U	0.013 U	0.01 U	0.01 U	0.01 U
2-Nitroaniline	0.02 U	0.017 U	0.016 U	0.04 U	0.017 U	0.02 U	0.016 U	0.016 U	0.017 U
2-Nitrophenol	0.0025 U	0.0021 U	0.002 U	0.0051 U	0.0021 U	0.0025 U	0.002 U	0.0021 U	0.0021 U
3- And 4- Methylphenol (Total)	--	--	--	--	--	--	--	--	--
3,3'-Dichlorobenzidine	0.04 U	0.035 U	0.032 U	0.083 U	0.035 U	0.041 U	0.033 U	0.034 U	0.034 U
3-Nitroaniline	0.011 U	0.0095 U	0.0088 U	0.023 U	0.0094 U	0.011 U	0.0091 U	0.0092 U	0.0092 U
4,6-Dinitro-2-Methylphenol	0.074 U	0.064 U	0.06 U	0.15 UJ	0.064 UJ	0.076 UJ	0.061 U	0.062 U	0.063 U
4-Bromophenyl Phenyl Ether	0.003 U	0.0026 U	0.0024 U	0.0062 U	0.0026 U	0.0031 U	0.0025 U	0.0025 U	0.0025 U
4-Chloro-3-Methylphenol	0.002 U	0.0018 U	0.0016 U	0.0042 U	0.0017 U	0.0021 U	0.0017 U	0.0017 U	0.0017 U
4-Chloroaniline	0.0014 U	0.0012 U	0.0012 U	0.003 U	0.0012 U	0.0015 U	0.0012 U	0.0012 U	0.0012 U
4-Chlorophenyl Phenyl Ether	0.0026 U	0.0023 U	0.0021 U	0.0054 U	0.0022 U	0.0027 U	0.0022 U	0.0022 U	0.0022 U
4-Nitroaniline	0.0021 U	0.0018 U	0.0017 U	0.0043 U	0.0018 U	0.0022 U	0.0017 U	0.0017 U	0.0018 U
4-Nitrophenol	0.03 U	0.026 U	0.024 U	0.062 U	0.026 U	0.031 U	0.025 U	0.025 U	0.025 U
Acenaphthene	0.0041 J	0.0022 U	0.002 U	0.0088 J	0.0021 U	0.0025 U	0.002 U	0.0021 U	0.0021 U
Acenaphthylene	0.0019 U	0.0016 U	0.0015 U	0.0039 U	0.0016 U	0.0019 U	0.0016 U	0.0016 U	0.0016 U
Acetophenone	0.0023 U	0.002 U	0.0019 U	0.0048 U	0.002 U	0.0024 U	0.0019 U	0.002 U	0.002 U
Anthracene	0.0076 J	0.0019 U	0.0018 U	0.015 J	0.0019 U	0.0023 U	0.0018 U	0.0019 U	0.0019 U
Atrazine	0.019 U	0.016 U	0.015 U	0.039 U	0.016 U	0.019 U	0.016 U	0.016 U	0.016 U
Benzaldehyde	0.0056 J-	0.0046 UR	0.0043 UR	0.011 UR	0.0046 UR	0.0055 UR	0.0044 UR	0.0045 UR	0.0051 J
Benzo(A)Anthracene	0.054	0.0024 J	0.0013 U	0.12	0.0074 J	0.0017 U	0.0091	0.0022 J	0.0068 J
Benzo(A)Pyrene	0.074	0.0021 J	0.0015 U	0.16	0.0094	0.0019 U	0.012	0.0026 J	0.0093
Benzo(B)Fluoranthene	0.13	0.0034 J	0.0017 U	0.26	0.014	0.0022 U	0.017	0.0033 J	0.012
Benzo(G,H,I)Perylene	0.086	0.0025 J	0.0015 U	0.17	0.0092	0.0019 U	0.013	0.0024 J	0.0082
Benzo(K)Fluoranthene	0.043	0.0022 U	0.0021 U	0.091	0.0045 J	0.0027 U	0.0088	0.0022 U	0.0041 J
Benzyl Butyl Phthalate	0.03 U	0.026 U	0.024 U	0.061 U	0.025 U	0.03 U	0.024 U	0.025 U	0.025 U
Biphenyl (Diphenyl)	0.0018 U	0.0016 U	0.0015 U	0.0037 U	0.0016 U	0.0019 U	0.0015 U	0.0015 U	0.0015 U
Bis(2-Chloroethoxy) Methane	0.0021 U	0.0018 U	0.0017 U	0.0042 U	0.0018 U	0.0021 U	0.0017 U	0.0017 U	0.0017 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.0016 U	0.0014 U	0.0013 U	0.0032 U	0.0013 U	0.0016 U	0.0013 U	0.0013 U	0.0013 U
Bis(2-Chloroisopropyl) Ether	0.0032 U	0.0028 U	0.0026 U	0.0066 U	0.0027 U	0.0033 U	0.0026 U	0.0027 U	0.0027 U
Bis(2-Ethylhexyl) Phthalate	0.11 J	0.075 J	0.12 J	0.11 J+	0.044 J+	0.047 U	0.038 U	0.038 U	0.039 U
Caprolactam	0.028 U	0.024 U	0.023 U	0.058 U	0.024 U	0.029 U	0.023 U	0.023 U	0.024 U
Carbazole	0.012	0.0017 U	0.0016 U	0.02	0.0017 U	0.0021 U	0.0018 J	0.0017 U	0.0017 U
Chrysene	0.1	0.0029 J	0.0014 J	0.2	0.011	0.0017 U	0.018	0.0026 J	0.011
Dibenz(A,H)Anthracene	0.017	0.0017 U	0.0015 U	0.032	0.0017 U	0.002 U	0.0028 J	0.0016 U	0.0022 J
Dibenzofuran	0.0019 U	0.0016 U	0.0015 U	0.0039 U	0.0016 U	0.0019 U	0.0016 U	0.0016 U	0.0016 U
Diethyl Phthalate	0.013 U	0.011 U	0.01 U	0.027 U	0.011 U	0.013 U	0.011 U	0.011 U	0.011 U
Dimethyl Phthalate	0.0016 U	0.0014 U	0.0013 U	0.0032 U	0.0013 U	0.0016 U	0.0013 U	0.0013 U	0.0013 U
Di-N-Butyl Phthalate	0.019 U	0.016 U	0.015 U	0.039 U	0.016 U	0.019 U	0.016 U	0.016 U	0.016 U
Di-N-Octylphthalate	0.025 U	0.022 U	0.02 U	0.052 U	0.022 U	0.026 U	0.021 U	0.021 U	0.021 U
Fluoranthene	0.11	0.0027 J	0.0018 U	0.22	0.012	0.0023 U	0.02	0.0035 J	0.011

Table E-19
Summary of Data Used in Risk Assessment
North-Central Undeveloped Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Sample Depth Chemical	CFSB-258 180-77393-16, 460-155265-18 CFSB-258-SO-0-0.5 0-0.5 ft 4/30/2018	CFSB-258 180-77393-17, 460-155265-19 CFSB-258-SO-0.5-2 0.5-2 ft 4/30/2018	CFSB-258 180-77393-18, 460-155265-20 CFSB-258-SO-10-12 10-12 ft 4/30/2018	CFSB-259 180-77393-19, 460-155265-21 CFSB-259-SO-0-0.5 0-0.5 ft 4/30/2018	CFSB-259 180-77393-20, 460-155265-22 CFSB-259-SO-0.5-2 0.5-2 ft 4/30/2018	CFSB-259 180-77393-21, 460-155265-23 CFSB-259-SO-10-12 10-12 ft 4/30/2018	CFSB-260 180-77488-26, 460-155568-4 CFSB-260-SO-0-0.5 0-0.5 ft 5/5/2018	CFSB-260 180-77488-27, 460-155568-5 CFSB-260-SO-0.5-2 0.5-2 ft 5/5/2018	CFSB-260 180-77488-28, 460-155568-6 CFSB-260-SO-10-12 10-12 ft 5/5/2018
Fluorene	0.0017 U	0.0015 U	0.0014 U	0.0067 J	0.0015 U	0.0017 U	0.0014 U	0.0014 U	0.0014 U
Hexachlorobenzene	0.0031 U	0.0027 U	0.0025 U	0.0064 U	0.0027 U	0.0032 U	0.0026 U	0.0026 U	0.0026 U
Hexachlorobutadiene	0.0025 U	0.0022 U	0.002 U	0.0052 U	0.0022 U	0.0026 U	0.0021 U	0.0021 U	0.0021 U
Hexachlorocyclopentadiene	0.0022 U	0.0019 U	0.0018 U	0.0045 U	0.0019 U	0.0023 U	0.0018 U	0.0018 U	0.0018 U
Hexachloroethane	0.0022 U	0.0019 U	0.0018 U	0.0046 U	0.0019 U	0.0023 U	0.0018 U	0.0019 U	0.0019 U
Indeno(1,2,3-C,D)Pyrene	0.066	0.0019 J	0.0014 U	0.14	0.0076	0.0018 U	0.0097	0.0016 J	0.0065 J
Isophorone	0.0022 U	0.0019 U	0.0018 U	0.0045 U	0.0019 U	0.0023 U	0.0018 U	0.0018 U	0.0018 U
Naphthalene	0.0019 J	0.0015 U	0.0014 U	0.0035 U	0.0014 U	0.0017 U	0.0014 U	0.0014 U	0.0014 U
Nitrobenzene	0.016 U	0.014 U	0.013 U	0.032 U	0.014 U	0.016 U	0.013 U	0.013 U	0.013 U
N-Nitrosodi-N-Propylamine	0.0029 U	0.0025 U	0.0024 U	0.006 U	0.0025 U	0.003 U	0.0024 U	0.0024 U	0.0025 U
N-Nitrosodiphenylamine	0.014 U	0.012 U	0.012 U	0.03 U	0.012 U	0.015 U	0.012 U	0.012 U	0.012 U
Pentachlorophenol	0.069 U	0.06 U	0.056 U	0.14 U	0.06 U	0.071 UJ	0.057 U	0.058 U	0.058 U
Phenanthrene	0.045	0.002 U	0.0019 U	0.093	0.0055 J	0.0024 U	0.007 J	0.0019 U	0.0041 J
Phenol	0.013 U	0.011 U	0.011 U	0.027 U	0.011 U	0.013 U	0.011 U	0.011 U	0.011 U
Pyrene	0.11	0.0029 J	0.0016 U	0.23	0.012	0.0021 U	0.018	0.0036 J	0.012
VOLATILE ORGANIC COMPOUNDS (mg/kg)									
1,1,1-Trichloroethane	--	--	--	--	--	--	--	--	--
1,1,2,2-Tetrachloroethane	--	--	--	--	--	--	--	--	--
1,1,2-Trichloro-1,2,2-Trifluoroethane	--	--	--	--	--	--	--	--	--
1,1,2-Trichloroethane	--	--	--	--	--	--	--	--	--
1,1-Dichloroethane	--	--	--	--	--	--	--	--	--
1,1-Dichloroethene	--	--	--	--	--	--	--	--	--
1,2,3-Trichlorobenzene	--	--	--	--	--	--	--	--	--
1,2,4-Trichlorobenzene	--	--	--	--	--	--	--	--	--
1,2-Dibromo-3-Chloropropane	--	--	--	--	--	--	--	--	--
1,2-Dibromoethane (Ethylene Dibromide)	--	--	--	--	--	--	--	--	--
1,2-Dichlorobenzene	--	--	--	--	--	--	--	--	--
1,2-Dichloroethane	--	--	--	--	--	--	--	--	--
1,2-Dichloropropane	--	--	--	--	--	--	--	--	--
1,3-Dichlorobenzene	--	--	--	--	--	--	--	--	--
1,4-Dichlorobenzene	--	--	--	--	--	--	--	--	--
2-Hexanone	--	--	--	--	--	--	--	--	--
Acetone	--	--	--	--	--	--	--	--	--
Benzene	--	--	--	--	--	--	--	--	--
Bromochloromethane	--	--	--	--	--	--	--	--	--
Bromodichloromethane	--	--	--	--	--	--	--	--	--
Bromoform	--	--	--	--	--	--	--	--	--
Bromomethane	--	--	--	--	--	--	--	--	--
Carbon Disulfide	--	--	--	--	--	--	--	--	--
Carbon Tetrachloride	--	--	--	--	--	--	--	--	--
Chlorobenzene	--	--	--	--	--	--	--	--	--
Chloroethane	--	--	--	--	--	--	--	--	--
Chloroform	--	--	--	--	--	--	--	--	--
Chloromethane	--	--	--	--	--	--	--	--	--
Cis-1,2-Dichloroethylene	--	--	--	--	--	--	--	--	--
Cis-1,3-Dichloropropene	--	--	--	--	--	--	--	--	--
Cyclohexane	--	--	--	--	--	--	--	--	--
Dibromochloromethane	--	--	--	--	--	--	--	--	--
Dichlorodifluoromethane	--	--	--	--	--	--	--	--	--
Ethylbenzene	--	--	--	--	--	--	--	--	--
Isopropylbenzene (Cumene)	--	--	--	--	--	--	--	--	--
M,P-Xylene	--	--	--	--	--	--	--	--	--
Methyl Acetate	--	--	--	--	--	--	--	--	--
Methyl Ethyl Ketone (2-Butanone)	--	--	--	--	--	--	--	--	--
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	--	--	--	--	--	--	--	--	--
Methylcyclohexane	--	--	--	--	--	--	--	--	--
Methylene Chloride	--	--	--	--	--	--	--	--	--
O-Xylene (1,2-Dimethylbenzene)	--	--	--	--	--	--	--	--	--

Table E-19
Summary of Data Used in Risk Assessment
North-Central Undeveloped Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Sample Depth Chemical	CFSB-258 180-77393-16, 460-155265-18 CFSB-258-SO-0-0.5 0-0.5 ft 4/30/2018	CFSB-258 180-77393-17, 460-155265-19 CFSB-258-SO-0.5-2 0.5-2 ft 4/30/2018	CFSB-258 180-77393-18, 460-155265-20 CFSB-258-SO-10-12 10-12 ft 4/30/2018	CFSB-259 180-77393-19, 460-155265-21 CFSB-259-SO-0-0.5 0-0.5 ft 4/30/2018	CFSB-259 180-77393-20, 460-155265-22 CFSB-259-SO-0.5-2 0.5-2 ft 4/30/2018	CFSB-259 180-77393-21, 460-155265-23 CFSB-259-SO-10-12 10-12 ft 4/30/2018	CFSB-260 180-77488-26, 460-155568-4 CFSB-260-SO-0-0.5 0-0.5 ft 5/5/2018	CFSB-260 180-77488-27, 460-155568-5 CFSB-260-SO-0.5-2 0.5-2 ft 5/5/2018	CFSB-260 180-77488-28, 460-155568-6 CFSB-260-SO-10-12 10-12 ft 5/5/2018
Styrene	--	--	--	--	--	--	--	--	--
Tert-Butyl Methyl Ether	--	--	--	--	--	--	--	--	--
Tetrachloroethylene (PCE)	--	--	--	--	--	--	--	--	--
Toluene	--	--	--	--	--	--	--	--	--
Trans-1,2-Dichloroethene	--	--	--	--	--	--	--	--	--
Trans-1,3-Dichloropropene	--	--	--	--	--	--	--	--	--
Trichloroethylene (TCE)	--	--	--	--	--	--	--	--	--
Trichlorofluoromethane	--	--	--	--	--	--	--	--	--
Vinyl Chloride	--	--	--	--	--	--	--	--	--

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-20
Summary of Data Used in Risk Assessment
North-Central Undeveloped Area (surface water) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Chemical	CFSWP-013 460-114997-5 CFSWP-013-SW 6/7/2016	CFSWP-013-DUP 460-114997-6 CFSWP-DUP1-SW 6/7/2016	CFSWP-013 460-124553-1 CFSWP-013-SW 11/30/2016	CFSWP-013 460-129899-3 CFSWP-013-SW 3/15/2017	CFSWP-013 460-135182-5 CFSWP-013-SW 6/12/2017	CFSWP-013 460-158366-5 CFSWP-013-SW 6/14/2018	CFSWP-021 460-114944-4 CFSWP-021-SW 6/6/2016	CFSWP-021 460-124553-7 CFSWP-021-SW 11/30/2016	CFSWP-021 460-129899-1 CFSWP-021-SW 3/15/2017	CFSWP-021 460-135444-4 CFSWP-021-SW 6/15/2017	CFSWP-021 460-158717-1 CFSWP-021-SW 6/19/2018	CFSWP-022 460-114944-5 CFSWP-022-SW 6/6/2016	CFSWP-022 460-130874-2 CFSWP-022-SW 4/3/2017	CFSWP-022 460-158804-2 CFSWP-022-SW 6/20/2018
GENERAL CHEMISTRY (µg/L)														
Fluoride	--	--	--	--	126 J+	--	--	--	--	188	--	--	--	--
Fluoride	39.2 J	38.3 J	473 J-	308	131	90.2 J-	166	189 J-	231	243	209 J-	177	223	214 J-
Cyanide	--	--	--	--	2 U	--	--	--	--	2 U	--	--	--	--
Cyanide	4 U	4 U	2 U	2 U	2 U	2 U	4 U	2 U	2 U	2 U	2 U	4 U	2 U	2 U
Cyanide (Free)	--	--	--	--	--	1.6 J	--	--	--	--	4.1 J	--	--	1.5 U
METALS (µg/L)														
Aluminum	--	--	--	--	18.2 U	15 U	--	--	--	18.2 U	15 U	--	--	15 U
Antimony	--	--	--	--	0.62 U	0.62 U	--	--	--	0.62 U	0.62 U	--	--	0.62 U
Arsenic	--	--	--	--	0.64 U	0.77 U	--	--	--	0.93 J	0.77 U	--	--	0.77 U
Barium	--	--	--	--	86.5	71	--	--	--	96.5	96.4	--	--	118
Beryllium	--	--	--	--	0.24 U	0.26 U	--	--	--	0.24 U	0.26 U	--	--	0.26 U
Cadmium	--	--	--	--	0.71 U	0.61 U	--	--	--	0.71 U	0.61 U	--	--	0.61 U
Calcium	--	--	--	--	48900	47500	--	--	--	54100	53000	--	--	46700
Chromium, Total	--	--	--	--	1.3 U	1.3 U	--	--	--	1.3 U	1.3 U	--	--	1.3 U
Cobalt	--	--	--	--	1.3 U	1.3 U	--	--	--	1.3 U	1.3 U	--	--	1.3 U
Copper	--	--	--	--	1.4 U	1.9 U	--	--	--	1.4 U	1.9 U	--	--	1.9 U
Iron	--	--	--	--	42.4 U	45.7 U	--	--	--	42.4 U	45.7 U	--	--	45.7 U
Lead	--	--	--	--	0.38 U	0.37 U	--	--	--	0.38 U	0.37 U	--	--	0.37 U
Magnesium	--	--	--	--	11000	10500	--	--	--	12100	11600	--	--	10500
Manganese	--	--	--	--	3.2 J	2.7 U	--	--	--	3.4 J	7.4 J	--	--	2.7 U
Mercury	--	--	--	--	0.17 U	0.12 U	--	--	--	0.17 U	0.12 U	--	--	0.12 U
Nickel	--	--	--	--	1.4 U	1.3 U	--	--	--	1.4 U	1.3 U	--	--	1.3 U
Potassium	--	--	--	--	419	434	--	--	--	397	420	--	--	454
Selenium	--	--	--	--	0.73 U	0.69 U	--	--	--	0.73 U	0.69 U	--	--	0.69 U
Silver	--	--	--	--	1.3 U	1.4 U	--	--	--	1.3 U	1.4 U	--	--	1.4 U
Sodium	--	--	--	--	2070	1940	--	--	--	10400	12000	--	--	7650
Thallium	--	--	--	--	0.26 U	0.24 U	--	--	--	0.26 U	0.24 U	--	--	0.24 U
Vanadium	--	--	--	--	1.9 U	1.2 U	--	--	--	1.9 U	1.2 U	--	--	1.2 U
Zinc	--	--	--	--	7 U	5.4 U	--	--	--	7 U	5.4 U	--	--	5.4 U
Aluminum	30 J	34.6 J	1610	38.6 J	23.1 J	15 U	95.3	5750	112	390	36.5 J	937	140	19 J
Antimony	0.76 U	0.76 U	0.62 U	0.62 U	0.62 U	0.62 U	0.76 U	0.62 U	0.62 U	0.62 U	0.62 U	0.76 U	0.62 U	2.9
Arsenic	0.71 U	0.71 U	1.8 J	2.2	0.64 U	0.77 U	1.2 J	3.7	0.64 U	0.87 J	0.9 J	0.88 J	0.64 U	0.77 U
Barium	78	81.2	183	73	91.3	72.9	98	219	88.7	104	104	125	77.9	132
Beryllium	0.29 U	0.29 U	0.24 U	0.24 U	0.24 U	0.26 U	0.29 U	0.24 U	0.24 U	0.24 U	0.26 U	0.29 U	0.24 U	0.26 U
Cadmium	0.72 U	0.72 U	0.71 U	0.71 U	0.71 U	0.61 U	0.72 U	0.71 U	0.71 U	0.71 U	0.61 U	0.72 U	0.71 U	0.61 U
Calcium	46500	47700	40000	42600	50400	43400	50500	82100	55600	54600	54000	43600	45600	51000
Chromium, Total	1.5 U	1.5 U	1.4 J	1.3 U	1.3 U	1.3 U	1.5 U	3.4 J	1.3 U	1.3 U	1.3 U	1.5 U	1.3 U	1.3 U
Cobalt	1.5 U	1.5 U	2.4 J	1.3 U	1.3 U	1.3 U	1.5 U	2 J	1.3 U	1.3 U	1.3 U	1.5 U	1.3 U	1.3 U
Copper	2.2 J	11.7 J	6.2	1.4 U	1.4 U	1.9 U	1.6 U	5.7	1.4 U	1.4 U	1.9 U	2.6 J	1.4 U	1.9 U
Iron	49.1 U	49.1 U	2910	42.4 U	42.4 U	45.7 U	79.5 J	4760	99.2 J	197	45.7 U	302	50.2 J	45.7 U
Lead	0.44 U	0.44 U	2.1	0.38 U	0.38 U	0.37 U	0.44 U	4.5	0.38 U	0.66 J	0.37 U	0.44 U	0.38 U	0.37 U
Magnesium	10700	11100	11300	10900	12300	10500	11700	19500	12200	12700	13000	10900	10300	11600
Manganese	10.7	11	3750	5.7 J	7.1 J	4.9 J	4.1 J	127	3.3 J	8.1	9.1	17.8	2.5 U	2.7 U
Mercury	0.14 U	0.14 U	0.17 U	0.17 U	0.17 U	0.12 U	0.14 U	0.17 U	0.17 U	0.17 U	0.12 U	0.14 U	0.17 U	0.12 U
Nickel	1.6 U	1.6 U	2.3 J	1.4 U	1.4 U	1.3 U	1.6 U	3.9 J	1.4 U	2.1 J	1.3 U	1.6 U	1.4 U	1.3 U
Potassium	530	556	778	556	480	368	578	1250	499	443	450	785	459	572
Selenium	0.79 U	0.79 U	0.73 U	0.73 U	0.73 U	0.69 U	0.79 U	0.73 U	0.73 U	0.73 U	0.69 U	0.79 U	0.73 U	0.69 U
Silver	1.5 U	1.5 U	1.3 U	1.3 U	1.3 U	1.4 U	1.5 U	1.3 U	1.3 U	1.3 U	1.4 U	1.5 U	1.3 U	1.4 U
Sodium	2030	2120	2340	1410	2250	2260	6150	31000	26300	10700	13800	6900	4490	8000
Thallium	0.31 U	0.31 U	0.26 U	0.26 U	0.26 U	0.24 U	0.31 U	0.26 U	0.26 U	0.26 U	0.24 U	0.31 U	0.26 U	0.24 U
Vanadium	1.9 J	1.8 J	1.9 J	1.9 U	1.9 U	1.2 U	2.1 J	3.9 J	1.9 U	1.9 U	1.2 U	2.2 J	1.9 U	1.2 U

Table E-20
Summary of Data Used in Risk Assessment
North-Central Undeveloped Area (surface water) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Chemical	CFSWP-013 460-114997-5 CFSWP-013-SW 6/7/2016	CFSWP-013-DUP 460-114997-6 CFSWP-DUP1-SW 6/7/2016	CFSWP-013 460-124553-1 CFSWP-013-SW 11/30/2016	CFSWP-013 460-129899-3 CFSWP-013-SW 3/15/2017	CFSWP-013 460-135182-5 CFSWP-013-SW 6/12/2017	CFSWP-013 460-158366-5 CFSWP-013-SW 6/14/2018	CFSWP-021 460-114944-4 CFSWP-021-SW 6/6/2016	CFSWP-021 460-124553-7 CFSWP-021-SW 11/30/2016	CFSWP-021 460-129899-1 CFSWP-021-SW 3/15/2017	CFSWP-021 460-135444-4 CFSWP-021-SW 6/15/2017	CFSWP-021 460-158717-1 CFSWP-021-SW 6/19/2018	CFSWP-022 460-114944-5 CFSWP-022-SW 6/6/2016	CFSWP-022 460-130874-2 CFSWP-022-SW 4/3/2017	CFSWP-022 460-158804-2 CFSWP-022-SW 6/20/2018
Zinc	6.5 U	6.5 U	18.9	7 U	14.1 J	5.4 U	6.5 U	19.2	7 U	9.1 J	5.4 U	6.5 U	7 U	5.4 U

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-20
Summary of Data Used in Risk Assessment
North-Central Undeveloped Area (surface water) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Chemical	CFSWP-042 460-158366-7 CFSWP-042-SW 6/14/2018	CFSWP-043 460-158366-8 CFSWP-043-SW 6/14/2018	CFSWP-043 460-158618-3 CFSWP-043-SW 6/18/2018	CFSWP-046 460-158717-3 CFSWP-046-SW 6/19/2018	CFSWP-047 460-158717-2 CFSWP-047-SW 6/19/2018	CFSWP-048 460-158804-1 CFSWP-048-SW 6/20/2018	CFSWP-049 460-158804-3 CFSWP-049-SW 6/20/2018	CFSWP-050 460-158910-6 CFSWP-050-SW 6/21/2018	CFSWP-051 460-158910-7 CFSWP-051-SW 6/21/2018	CFSWP-052 460-158618-2 CFSWP-052-SW 6/18/2018	CFSWP-053 460-158618-1 CFSWP-053-SW 6/18/2018
GENERAL CHEMISTRY (µg/L)											
Fluoride	--	--	--	--	--	--	--	--	--	--	--
Fluoride	88.8 J-	90.9 J-	--	301 J-	204 J-	199 J-	216 J-	216 J-	214 J-	214	219
Cyanide	--	--	--	--	--	--	--	--	--	--	--
Cyanide	2 U	2 U	--	4.4 J	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Cyanide (Free)	1.5 U	1.5 U	--	2.7 J	2.4 J	1.8 J	1.5 U	1.5 UJ	1.5 UJ	3.5 J	2.5 J
METALS (µg/L)											
Aluminum	15 U	15 U	--	15 U	15 U	15 U	15 U	15 U	15 U	15 U	15 U
Antimony	0.62 U	0.62 U	--	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U
Arsenic	0.77 U	0.77 U	--	0.77 U	0.86 J	0.77 U	0.77 U	0.79 J	0.77 U	1.5 J	0.77 U
Barium	69.9	84.7	--	83.5	94.4	106	229	95.3	94.9	198	122
Beryllium	0.26 U	0.26 U	--	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U
Cadmium	0.61 U	0.61 U	--	0.61 U	0.61 U	0.61 U	0.61 U	0.61 U	0.61 U	0.61 U	0.61 U
Calcium	48400	49400	--	75400	50400	47600	59300	51300	51200	66400	50400
Chromium, Total	1.3 U	1.3 U	--	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
Cobalt	1.3 U	1.3 U	--	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
Copper	1.9 U	1.9 U	--	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U
Iron	45.7 U	45.7 U	--	45.7 U	45.7 U	45.7 U	45.7 U	45.7 U	45.7 U	45.7 U	45.7 U
Lead	0.37 U	0.37 U	--	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U
Magnesium	10600	11000	--	16500	10900	10900	15200	11000	11100	16500	11300
Manganese	2.7 U	2.7 U	--	28.4	10.4	2.7 U	7.8 J	5.7 J	8.8	80.5	2.7 U
Mercury	0.12 U	0.12 U	--	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U
Nickel	1.3 U	1.3 U	--	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
Potassium	460	486	--	969	416	477	778	419	416	643	462
Selenium	0.69 U	0.69 U	--	1.4 J	0.69 U	0.69 U	0.69 U	0.69 U	0.69 U	0.69 U	0.69 U
Silver	1.4 U	1.4 U	--	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U
Sodium	1970	1940 J+	--	89200	11000	6400	19700	11000	11800	17500	8530
Thallium	0.24 U	0.24 U	--	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U
Vanadium	1.2 U	1.2 U	--	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U
Zinc	5.4 U	5.4 U	--	5.4 U	5.4 U	5.4 U	5.4 U	5.4 U	5.4 U	5.4 U	5.4 U
Aluminum	15 U	15 U	--	45.8	34.2 J	16.1 J	17.1 J	66.5	15 U	59.2	47.8
Antimony	0.62 U	0.62 U	--	0.62 U	0.62 U	2.4	2.7	0.62 U	0.62 U	0.62 U	0.62 U
Arsenic	0.77 U	0.77 U	--	0.78 J	0.8 J	0.77 U	0.77 U	0.95 J	0.95 J	1.5 J	0.77 U
Barium	75.7	84.2	--	89.8	101	112	245	89.4	101	190	122
Beryllium	0.26 U	0.26 U	--	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U
Cadmium	0.61 U	0.61 U	--	0.61 U	0.61 U	0.61 U	0.61 U	0.61 U	0.61 U	0.61 U	0.61 U
Calcium	44300	44800	--	77000	52100	50200	64100	42600	50700	65400	49000
Chromium, Total	1.3 U	1.3 U	--	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
Cobalt	1.3 U	1.3 U	--	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
Copper	4.4	1.9 U	--	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U
Iron	45.7 U	45.7 U	--	45.7 U	45.7 U	45.7 U	45.7 U	64.5 J	45.7 U	78.5 J	45.7 U
Lead	0.37 U	0.37 U	--	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U
Magnesium	10800	11100	--	18200	12600	11600	16000	10400	12400	17300	12200
Manganese	4.7 J	4.5 J	--	36.5	13.2	3 J	8.5	23.1	10.6	69.5	2.7 U
Mercury	0.12 U	0.12 U	--	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U
Nickel	1.3 U	1.3 U	--	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
Potassium	368	383	--	951	439	573	857	432	468	633	458
Selenium	0.69 U	0.69 U	--	1.5 J	0.69 U	0.69 U	0.69 U	0.69 U	0.69 U	0.69 U	0.69 U
Silver	1.4 U	1.4 U	--	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U
Sodium	2170	2140	--	108000	13000	6740	20900	10400	13100	19600	9390
Thallium	0.24 U	0.24 U	--	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U
Vanadium	1.2 U	1.2 U	--	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U

Table E-20
Summary of Data Used in Risk Assessment
North-Central Undeveloped Area (surface water) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Chemical	CFSWP-042 460-158366-7 CFSWP-042-SW 6/14/2018	CFSWP-043 460-158366-8 CFSWP-043-SW 6/14/2018	CFSWP-043 460-158618-3 CFSWP-043-SW 6/18/2018	CFSWP-046 460-158717-3 CFSWP-046-SW 6/19/2018	CFSWP-047 460-158717-2 CFSWP-047-SW 6/19/2018	CFSWP-048 460-158804-1 CFSWP-048-SW 6/20/2018	CFSWP-049 460-158804-3 CFSWP-049-SW 6/20/2018	CFSWP-050 460-158910-6 CFSWP-050-SW 6/21/2018	CFSWP-051 460-158910-7 CFSWP-051-SW 6/21/2018	CFSWP-052 460-158618-2 CFSWP-052-SW 6/18/2018	CFSWP-053 460-158618-1 CFSWP-053-SW 6/18/2018
Zinc	5.4 U	5.4 U	--	5.4 U	5.4 U	5.4 U	5.4 U	5.4 U	5.4 U	5.4 U	5.4 U

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-21
Summary of Data Used in Risk Assessment
North-Central Undeveloped Area (sediment) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Chemical	CFSDP-013 200-35201-8, 460-119741-5 CFSDP-013-SO 9/6/2016	CFSDP-021 200-35201-9, 460-119741-7 CFSDP-021-SO 9/6/2016	CFSDP-021 180-79106-1, 200-44014-1, 460-158719-1 CFSDP-021-SD 6/19/2018	CFSDP-022 200-35201-10, 460-119741-8 CFSDP-022-SO 9/6/2016	CFSDP-022 180-79106-5, 200-44014-3, 460-158806-2 CFSDP-022-SD 6/20/2018	CFSDP-046 180-79106-3, 460-158719-3 CFSDP-046-SD 6/19/2018	CFSDP-047 180-79106-2, 460-158719-2 CFSDP-047-SD 6/19/2018	CFSDP-048 180-79106-4, 200-44014-2, 460-158806-1 CFSDP-048-SD 6/20/2018	CFSDP-049 180-79106-6, 200-44014-4, 460-158806-3 CFSDP-049-SD 6/20/2018	CFSDP-050 180-79106-7, 460-158918-1 CFSDP-050-SD 6/21/2018	CFSDP-050-DUP 180-79106-9, 460-158918-3 CFSDP-DUP3-SD 6/21/2018	CFSDP-051 180-79106-8, 460-158918-2 CFSDP-051-SD 6/21/2018	CFSDP-052 180-78893-2, 200-43929-2, 460-158622-2 CFSDP-052-SD 6/18/2018	CFSDP-053 180-78893-1, 200-43929-1, 460-158622-1 CFSDP-053-SD 6/18/2018
GENERAL CHEMISTRY (mg/kg)														
Fluoride	1.81	2.6	1.19	3.79	3.53	9.59	8.71	3.71	3.47	2.08	1.49	1.14	2.01	2.39
Cyanide	1.5	0.24	0.07 U	0.84	0.11 U	0.59 J	0.6 J	0.34 J	0.15 J	0.11 J+	0.12 J+	0.078 U	0.088 U	0.11 U
METALS (mg/kg)														
Aluminum	18400	15500	12100	34700	18700	27800	15000	15700	20700	15300	14400	19900	16600	35400
Antimony	0.46 UJ	0.31 UJ	0.36 U	0.44 UJ	0.52 U	1.1 U	1.2 U	0.59 U	0.43 U	0.38 U	0.3 U	0.32 UJ	0.47 U	0.54 U
Arsenic	4.1	7.6	6.9	6.2	5.1	14.5	13.8	3.7	3.2	8.9	8.4	9.8	3.9	5
Barium	290	191	136	905	381	716	340	283	884	171	189	385	375	605
Beryllium	1	0.62	0.39 J	1.1	0.43 J	0.75 J	0.67 U	0.32 U	0.7	0.63	0.51	0.62	0.32 J	1.1
Cadmium	0.48 U	0.33 U	0.41 U	0.47 U	0.6 U	1.3 U	1.4 U	0.68 U	0.5 U	0.43 U	0.35 U	0.37 U	0.54 U	0.61 U
Calcium	28500	11000	2500	10900	5230	17800	15200	6680	8740	3910	3500	2590	4890	8390
Chromium, Total	15	9.1	8.3	11.3	5.9	19.5	9.4	5.9	12.2	11.7	11.7	8	5	13.4
Cobalt	7.6	5.6	5.7	4	3.3 J	6.4 J	4.6 J	1.9 J	5.4	6.6	9.2	5.7	2.8 J	5.4
Copper	27.8	12.3	10.1	32.1	14	42.5	32.4	27.4	22.4	10.3	8.7	10.5	11.1	19.6
Iron	16300	14000	13100	12700	10300	25200	14300	7770	14300	20500	19200	14200	8930	15600
Lead	17.4	10.6	9.6	14.6	9.1	17.6	11.7	6.2	14.8	13.8	12.6	11.1	6.1	14.5
Magnesium	11500	5690	5460	5590	2990	13800	5560	2570	7100	11700	12400	5130	2660	7700
Manganese	1140	234	309	175	80.5	988	747	34.1	63.3	641 J	1210 J	370	85.6	83.4
Mercury	0.045	0.012 J	0.012 J	0.025 J	0.016 U	0.062 J	0.048 J	0.022 U	0.02 U	0.019 J	0.02 J	0.013 U	0.017 U	0.019 U
Nickel	18.1 J+	9.8 J+	9.6	13.3 J+	7.5	15.2	13	6	13.8	12.4	11.3	9.4	6.6	12.8
Potassium	1700	1040	774	1180	612	1070	911	452	1200	1130	826	811	530	1190
Selenium	1.4 J	0.29 U	0.35 U	0.81 J	0.52 U	4.4 J	2.5 J	0.59 U	0.57 J	0.37 U	0.3 U	0.32 U	0.47 U	0.53 U
Silver	0.89 U	0.61 U	0.75 U	0.86 U	1.1 U	2.3 U	2.6 U	1.2 U	0.91 U	0.8 U	0.64 U	0.68 U	0.99 U	1.1 U
Sodium	120 J	152	38 U	477	473	844	137 J	390	223	51 J	39.9 J	179	549	573
Thallium	0.18 U	0.12 U	0.15 U	0.17 U	0.22 U	0.47 U	0.52 U	0.25 U	0.18 U	0.16 U	0.13 U	0.14 U	0.2 U	0.23 U
Vanadium	11.6	11	10.9	13.3	10.3	17.2	11.3	7.9	12.7	13.5	11.4	9.9	8.3	13.2
Zinc	89.8	41.6	36.4	41	20.4	45.9	28.6 J	16 J	38.2	65.3	61.3	30.7	16.9	47.7
PESTICIDES (mg/kg)														
Aldrin	0.0015 U	0.00093 U	--	0.0013 U	--	--	--	--	--	--	--	--	--	--
Alpha Bhc (Alpha Hexachlorocyclohexane)	0.0011 U	0.0007 U	--	0.00097 U	--	--	--	--	--	--	--	--	--	--
Alpha Endosulfan	0.0017 U	0.0011 U	--	0.0015 U	--	--	--	--	--	--	--	--	--	--
Beta Bhc (Beta Hexachlorocyclohexane)	0.0012 U	0.00075 U	--	0.001 U	--	--	--	--	--	--	--	--	--	--
Beta Endosulfan	0.0019 U	0.0012 U	--	0.0017 U	--	--	--	--	--	--	--	--	--	--
cis-Chlordane	0.002 U	0.0013 U	--	0.0017 U	--	--	--	--	--	--	--	--	--	--
Delta BHC (Delta Hexachlorocyclohexane)	0.0013 U	0.00084 U	--	0.0012 U	--	--	--	--	--	--	--	--	--	--
Dieldrin	0.0016 U	0.001 U	--	0.0014 U	--	--	--	--	--	--	--	--	--	--
Endosulfan Sulfate	0.0014 U	0.0009 U	--	0.0012 U	--	--	--	--	--	--	--	--	--	--
Endrin	0.0015 U	0.00098 U	--	0.0013 U	--	--	--	--	--	--	--	--	--	--
Endrin Aldehyde	0.0015 U	0.00095 U	--	0.0013 U	--	--	--	--	--	--	--	--	--	--
Endrin Ketone	0.0017 U	0.0011 U	--	0.0015 U	--	--	--	--	--	--	--	--	--	--
Gamma Bhc (Lindane)	0.0011 U	0.00069 U	--	0.00095 U	--	--	--	--	--	--	--	--	--	--
Heptachlor	0.0016 U	0.00099 U	--	0.0014 U	--	--	--	--	--	--	--	--	--	--
Heptachlor Epoxide	0.0024 U	0.0015 U	--	0.0021 U	--	--	--	--	--	--	--	--	--	--
Methoxychlor	0.0026 U	0.0016 U	--	0.0022 U	--	--	--	--	--	--	--	--	--	--
P,P'-DDD	0.0016 U	0.001 U	--	0.0014 U	--	--	--	--	--	--	--	--	--	--
P,P'-DDE	0.0018 U	0.0011 U	--	0.0015 U	--	--	--	--	--	--	--	--	--	--
P,P'-DDT	0.0012 U	0.00079 U	--	0.0011 U	--	--	--	--	--	--	--	--	--	--
Toxaphene	0.035 U	0.022 U	--	0.031 U	--	--	--	--	--	--	--	--	--	--
trans-Chlordane	0.0026 U	0.0017 U	--	0.0023 U	--	--	--	--	--	--	--	--	--	--
POLYCHLORINATED BIPHENYLS (mg/kg)														
PCB-1016 (Aroclor 1016)	0.016 U	0.01 U	--	0.014 U	--	--	--	--	--	--	--	--	--	--
PCB-1221 (Aroclor 1221)	0.016 U	0.01 U	--	0.014 U	--	--	--	--	--	--	--	--	--	--
PCB-1232 (Aroclor 1232)	0.016 U	0.01 U	--	0.014 U	--	--	--	--	--	--	--	--	--	--
PCB-1242 (Aroclor 1242)	0.016 U	0.01 U	--	0.014 U	--	--	--	--	--	--	--	--	--	--
PCB-1248 (Aroclor 1248)	0.016 U	0.01 U	--	0.014 U	--	--	--	--	--	--	--	--	--	--
PCB-1254 (Aroclor 1254)	0.017 U	0.011 U	--	0.015 U	--	--	--	--	--	--	--	--	--	--
PCB-1260 (Aroclor 1260)	0.017 U	0.011 U	--	0.015 U	--	--	--	--	--	--	--	--	--	--
PCB-1262 (Aroclor 1262)	0.017 U	0.011 U	--	0.015 U	--	--	--	--	--	--	--	--	--	--
PCB-1268 (Aroclor 1268)	0.017 U	0.011 U	--	0.015 U	--	--	--	--	--	--	--	--	--	--
Polychlorinated Biphenyl (PCBs)	0.017 U	0.011 U	--	0.015 U	--	--	--	--	--	--	--	--	--	--

Table E-21
Summary of Data Used in Risk Assessment
North-Central Undeveloped Area (sediment) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Chemical	CFSDP-013 200-35201-8, 460-119741-5 CFSDP-013-SO 9/6/2016	CFSDP-021 200-35201-9, 460-119741-7 CFSDP-021-SO 9/6/2016	CFSDP-021 180-79106-1, 200-44014-1, 460-158719-1 CFSDP-021-SD 6/19/2018	CFSDP-022 200-35201-10, 460-119741-8 CFSDP-022-SO 9/6/2016	CFSDP-022 180-79106-5, 200-44014-3, 460-158806-2 CFSDP-022-SD 6/20/2018	CFSDP-046 180-79106-3, 460-158719-3 CFSDP-046-SD 6/19/2018	CFSDP-047 180-79106-2, 460-158719-2 CFSDP-047-SD 6/19/2018	CFSDP-048 180-79106-4, 200-44014-2, 460-158806-1 CFSDP-048-SD 6/20/2018	CFSDP-049 180-79106-6, 200-44014-4, 460-158806-3 CFSDP-049-SD 6/20/2018	CFSDP-050 180-79106-7, 460-158918-1 CFSDP-050-SD 6/21/2018	CFSDP-050-DUP 180-79106-9, 460-158918-3 CFSDP-DUP3-SD 6/21/2018	CFSDP-051 180-79106-8, 460-158918-2 CFSDP-051-SD 6/21/2018	CFSDP-052 180-78893-2, 200-43929-2, 460-158622-2 CFSDP-052-SD 6/18/2018	CFSDP-053 180-78893-1, 200-43929-1, 460-158622-1 CFSDP-053-SD 6/18/2018
SEMIVOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,2,4,5-Tetrachlorobenzene	0.044 U	0.028 U	0.0018 U	0.039 U	0.0053 U	0.014 U	0.0071 U	0.0063 U	0.0068 U	0.0049 U	0.0033 U	0.002 U	0.0044 U	0.0051 U
1,4-Dioxane (P-Dioxane)	0.16 U	0.1 U	0.013 U	0.14 U	0.038 U	0.1 U	0.051 U	0.045 U	0.049 U	0.036 U	0.024 U	0.015 U	0.032 U	0.037 U
2,3,4,6-Tetrachlorophenol	0.056 UJ	0.036 U	0.018 UJ	0.049 U	0.051 UJ	0.14 UJ	0.068 U	0.061 UJ	0.066 UJ	0.048 UJ	0.032 UJ	0.019 UJ	0.042 U	0.05 U
2,4,5-Trichlorophenol	0.059 UJ	0.038 U	0.003 U	0.052 U	0.0087 U	0.023 U	0.012 U	0.01 U	0.011 U	0.0081 U	0.0054 U	0.0033 U	0.0073 U	0.0085 U
2,4,6-Trichlorophenol	0.017 UJ	0.011 U	0.0023 U	0.015 U	0.0067 U	0.018 U	0.009 U	0.008 U	0.0087 U	0.0063 U	0.0042 U	0.0026 U	0.0056 U	0.0065 U
2,4-Dichlorophenol	0.014 UJ	0.009 U	0.0033 U	0.012 U	0.0094 U	0.025 U	0.013 U	0.011 U	0.012 U	0.0088 U	0.0059 U	0.0036 U	0.0079 U	0.0092 U
2,4-Dimethylphenol	0.13 UJ	0.083 U	0.0026 U	0.12 U	0.0076 U	0.02 U	0.01 U	0.0091 U	0.0098 U	0.0071 U	0.0048 U	0.0029 UJ	0.0063 UJ	0.0074 UJ
2,4-Dinitrophenol	0.45 UR	0.29 UJ	0.11 UJ	0.4 U	0.33 UJ	0.87 UJ	0.44 U	0.39 UJ	0.42 UJ	0.31 UJ	0.21 UJ	0.13 UJ	0.27 U	0.32 U
2,4-Dinitrotoluene	0.024 UJ	0.015 U	0.0021 U	0.021 U	0.0061 U	0.016 U	0.0081 U	0.0072 U	0.0079 U	0.0057 U	0.0038 U	0.0023 U	0.0051 U	0.0059 U
2,6-Dinitrotoluene	0.032 UJ	0.02 U	0.0026 U	0.028 U	0.0075 U	0.02 U	0.01 U	0.009 U	0.0097 U	0.007 U	0.0047 U	0.0029 U	0.0063 U	0.0073 U
2-Chloronaphthalene	0.014 UJ	0.0086 U	0.0019 U	0.012 U	0.0056 U	0.015 U	0.0075 U	0.0067 U	0.0072 U	0.0052 U	0.0035 U	0.0021 U	0.0047 U	0.0054 U
2-Chlorophenol	0.015 UJ	0.0096 U	0.002 U	0.013 U	0.0057 U	0.015 U	0.0076 U	0.0068 U	0.0073 U	0.0053 U	0.0035 U	0.0022 U	0.0047 U	0.0055 U
2-Methylnaphthalene	0.013 UJ	0.0084 U	0.002 U	0.012 U	0.0058 U	0.016 U	0.0078 U	0.007 U	0.0076 U	0.0055 U	0.0037 U	0.0022 U	0.0049 U	0.0057 U
2-Methylphenol (O-Cresol)	0.026 UJ	0.017 U	0.012 U	0.023 U	0.035 U	0.093 U	0.047 U	0.042 U	0.045 U	0.033 U	0.022 U	0.013 U	0.029 U	0.034 U
2-Nitroaniline	0.02 U	0.013 U	0.019 U	0.017 U	0.055 U	0.15 U	0.074 U	0.066 U	0.072 U	0.052 U	0.035 U	0.021 U	0.046 U	0.054 U
2-Nitrophenol	0.02 UJ	0.013 U	0.0024 U	0.018 U	0.007 U	0.019 U	0.0094 U	0.0083 U	0.009 U	0.0065 U	0.0044 U	0.0027 U	0.0058 U	0.0068 U
3- And 4- Methylphenol (Total)	0.016 UJ	0.01 U	--	0.014 U	--	--	--	--	--	--	--	--	--	--
3,3'-Dichlorobenzidine	0.067 UJ	0.042 U	0.04 U	0.058 U	0.11 U	0.3 U	0.15 U	0.14 U	0.15 U	0.11 U	0.071 U	0.044 UJ	0.095 U	0.11 U
3-Nitroaniline	0.018 U	0.011 U	0.011 U	0.016 U	0.031 U	0.083 U	0.042 U	0.037 U	0.04 U	0.029 U	0.019 U	0.012 U	0.026 U	0.03 U
4,6-Dinitro-2-Methylphenol	0.16 UJ	0.1 U	0.073 U	0.14 U	0.21 U	0.56 U	0.28 U	0.25 U	0.27 U	0.2 U	0.13 U	0.08 U	0.18 U	0.21 U
4-Bromophenyl Phenyl Ether	0.019 U	0.012 U	0.003 U	0.016 U	0.0085 U	0.023 U	0.011 U	0.01 U	0.011 U	0.008 U	0.0054 U	0.0033 U	0.0071 U	0.0083 U
4-Chloro-3-Methylphenol	0.026 UJ	0.016 U	0.002 U	0.023 U	0.0057 U	0.015 U	0.0077 U	0.0069 U	0.0074 U	0.0054 U	0.0036 U	0.0022 U	0.0048 U	0.0056 U
4-Chloroaniline	0.015 U	0.0098 U	0.0014 U	0.013 U	0.0041 U	0.011 U	0.0054 U	0.0048 U	0.0053 U	0.0038 U	0.0025 U	0.0015 UJ	0.0034 U	0.004 U
4-Chlorophenyl Phenyl Ether	0.018 UJ	0.011 U	0.0026 U	0.016 U	0.0074 U	0.02 U	0.0099 U	0.0088 U	0.0096 U	0.0069 U	0.0046 U	0.0028 U	0.0062 U	0.0072 U
4-Nitroaniline	0.023 UJ	0.014 U	0.0021 U	0.02 U	0.0059 U	0.016 U	0.0079 U	0.0071 U	0.0077 U	0.0055 U	0.0037 U	0.0023 U	0.0049 U	0.0058 U
4-Nitrophenol	0.29 UJ	0.18 UJ	0.03 UJ	0.25 UJ	0.085 UJ	0.23 UJ	0.11 U	0.1 UJ	0.11 UJ	0.08 UJ	0.054 UJ	0.033 UJ	0.071 U	0.083 U
Acenaphthene	0.014 UJ	0.0092 U	0.0024 U	0.013 U	0.007 U	0.019 U	0.0094 U	0.0084 U	0.0091 U	0.0066 U	0.0044 U	0.0027 U	0.0059 U	0.0068 U
Acenaphthylene	0.015 UJ	0.0098 U	0.0019 U	0.013 U	0.0053 U	0.014 U	0.0071 U	0.0064 U	0.0069 U	0.005 U	0.0033 U	0.002 U	0.0045 U	0.0052 U
Acetophenone	0.013 U	0.0083 U	0.0023 U	0.011 U	0.0066 U	0.018 U	0.0089 U	0.0079 U	0.0093 J	0.0062 U	0.0041 U	0.0025 U	0.0055 U	0.0064 U
Anthracene	0.057 UJ	0.036 U	0.0022 U	0.05 U	0.0063 U	0.017 U	0.012 J	0.0076 U	0.013 J	0.0059 U	0.004 U	0.0024 U	0.0053 U	0.0098 J
Atrazine	0.027 U	0.017 U	0.019 UJ	0.023 U	0.053 UJ	0.14 UJ	0.071 UJ	0.064 UJ	0.069 UJ	0.05 UJ	0.033 UJ	0.02 UJ	0.045 UJ	0.052 UJ
Benzaldehyde	0.046 UJ	0.029 U	0.0053 UR	0.04 U	0.015 UR	0.1 J	0.02 UR	0.018 UR	0.039 J	0.014 UR	0.0095 UR	0.0058 UR	0.013 UR	0.015 UR
Benzo(A)Anthracene	0.093 J-	0.032 U	0.0061 J	0.074	0.021 J	0.069	0.057	0.025 J	0.052	0.028 J	0.015 J	0.0018 U	0.019 J	0.062
Benzo(A)Pyrene	0.11 J-	0.021 J	0.007 J	0.091	0.023 J	0.086	0.083	0.033	0.079	0.036 J	0.018 J	0.002 U	0.024	0.071
Benzo(B)Fluoranthene	0.19 J-	0.036 J	0.015	0.15	0.038	0.13	0.11	0.041	0.11	0.052 J	0.029 J	0.0023 U	0.031	0.16
Benzo(G,H,I)Perylene	0.13 J	0.027 J	0.0076 J	0.1 J	0.024	0.079	0.082	0.033	0.082	0.04 J	0.02 J	0.002 U	0.023	0.072
Benzo(K)Fluoranthene	0.051 J-	0.017 U	0.0039 J	0.053	0.019 J	0.045 J	0.047	0.024 J	0.043	0.028 J	0.011 J	0.0028 U	0.017 J	0.057
Benzyl Butyl Phthalate	0.018 U	0.012 U	0.029 U	0.016 U	0.084 U	0.22 U	0.11 U	0.1 U	0.11 U	0.079 U	0.053 U	0.032 U	0.07 U	0.082 U
Biphenyl (Diphenyl)	0.051 U	0.032 U	0.0018 U	0.045 U	0.0051 U	0.014 U	0.0069 U	0.0061 U	0.0066 U	0.0048 U	0.0032 U	0.002 U	0.0043 U	0.005 U
Bis(2-Chloroethoxy) Methane	0.019 UJ	0.012 U	0.002 U	0.016 U	0.0058 U	0.015 U	0.0078 U	0.0069 U	0.0075 U	0.0054 U	0.0036 U	0.0022 U	0.0048 U	0.0057 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.014 UJ	0.009 U	0.0015 U	0.012 U	0.0044 U	0.012 U	0.0059 U	0.0053 U	0.0057 U	0.0041 U	0.0028 U	0.0017 U	0.0037 U	0.0043 U
Bis(2-Chloroisopropyl) Ether	0.025 U	0.016 U	0.0032 U	0.022 U	0.0091 U	0.024 U	0.012 U	0.011 U	0.012 U	0.0085 U	0.0057 U	0.0035 U	0.0076 U	0.0088 U
Bis(2-Ethylhexyl) Phthalate	0.023 U	0.015 U	0.045 U	0.02 U	0.13 U	0.35 U	0.17 U	0.16 U	0.17 U	0.12 U	0.081 U	0.05 U	0.11 U	0.13 U
Caprolactam	0.043 UJ	0.027 UJ	0.028 U	0.038 U	0.08 U	0.21 U	0.11 U	0.095 U	0.1 U	0.075 U	0.05 U	0.03 U	0.066 U	0.078 U
Carbazole	0.017 J-	0.0094 U	0.0023 J	0.013 U	0.0067 J	0.022 J	0.023 J	0.0093 J	0.016 J	0.0086 J	0.0045 J	0.0022 U	0.0053 J	0.021 J
Chrysene	0.13 J-	0.019 J	0.016	0.13 J	0.054	0.1	0.092	0.044	0.084	0.048	0.03	0.0018 U	0.03	0.2
Dibenz(A,H)Anthracene	0.031 U	0.02 U	0.0019 U	0.027 U	0.0071 J	0.021 J	0.017 J	0.0065 U	0.015 J	0.0082 J	0.0043 J	0.0021 U	0.0066 J	0.013 J
Dibenzofuran	0.018 UJ	0.011 U	0.0019 U	0.016 U	0.0053 U	0.014 U	0.0071 U	0.0064 U	0.0069 U	0.005 U	0.0033 U	0.002 U	0.0045 U	0.0052 U
Diethyl Phthalate	0.017 UJ	0.011 U	0.013 U	0.015 U	0.037 U	0.097 U	0.049 U	0.044 U	0.047 U	0.034 U	0.023 U	0.014 U	0.03 U	0.036 U
Dimethyl Phthalate	0.017 UJ	0.011 U	0.0015 U	0.015 U	0.0044 U	0.012 U	0.0059 U	0.0053 U	0.0057 U	0.0041 U	0.0028 U	0.0017 U	0.0037 U	0.0043 U
Di-N-Butyl Phthalate	0.018 UJ	0.011 U	0.019 U	0.016 U	0.053 U	0.14 U	0.071 U	0.064 U	0.069 U	0.05 U	0.033 U	0.02 U	0.045 U	0.052 U
Di-N-Octylphthalate	0.03 U	0.019 U	0.025 U	0.027 U	0.071 U	0.19 U	0.095 U	0.085 U	0.092 U	0.066 U	0.044 U	0.027 U	0.059 U	0.069 U
Fluoranthene	0.14 J-	0.018 J	0.013	0.12 J	0.047	0.11	0.11	0.051	0.1	0.055 J	0.029 J	0.0025 U	0.039	0.15
Fluorene	0.013 UJ	0.0083 U	0.0017 U	0.011 U	0.0048 U	0.013 U	0.0064 U	0.0057 U	0.0062 J	0.0045 U	0.003 U	0.0018 U	0.004 U	0.0047 U
Hexachlorobenzene	0.024 U	0.015 U	0.0031 U	0.021 U	0.0088 U	0.023 U	0.012 U	0.01 U	0.011 U	0.0082 U	0.0055 U	0.0033 U	0.0073 U	0.0085 U
Hexachlorobutadiene	0.017 UJ	0.011 U	0.0025 U	0.015 U	0.0071 U	0.019 U	0.0095 U	0.0085 U	0.0092 U	0.0067 U	0.0045 U	0.0027 U	0.0059 UJ	0.0069 UJ
Hexachlorocyclopentadiene	0.037 UJ	0.024 U	0.0022 UJ	0.033 U	0.0062 UJ	0.017 UJ	0.0083 U	0.0074 UJ	0.008 UJ	0.0058 UJ	0.0039 UJ	0.0024 UJ	0.0052 U	0.0061 U
Hexachloroethane	0.022 UJ	0.014 U	0.0022 U	0.019 U	0.0063 U	0.017 U	0.0084 U	0.0075 U	0.0081 U	0.0059 U	0.0039 U	0.0024 U	0.0052 UJ	0.0061 UJ
Indeno(1,2,3-C,D)Pyrene	0.11	0.025 J	0.0061 J	0.093	0.02 J	0.062 J	0.058	0.025 J	0.061	0.029 J	0.016 J	0.0019 U	0.018 J	0.057

Table E-21
Summary of Data Used in Risk Assessment
North-Central Undeveloped Area (sediment) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Chemical	CFSDP-013 200-35201-8, 460-119741-5 CFSDP-013-SO 9/6/2016	CFSDP-021 200-35201-9, 460-119741-7 CFSDP-021-SO 9/6/2016	CFSDP-021 180-79106-1, 200-44014-1, 460-158719-1 CFSDP-021-SD 6/19/2018	CFSDP-022 200-35201-10, 460-119741-8 CFSDP-022-SO 9/6/2016	CFSDP-022 180-79106-5, 200-44014-3, 460-158806-2 CFSDP-022-SD 6/20/2018	CFSDP-046 180-79106-3, 460-158719-3 CFSDP-046-SD 6/19/2018	CFSDP-047 180-79106-2, 460-158719-2 CFSDP-047-SD 6/19/2018	CFSDP-048 180-79106-4, 200-44014-2, 460-158806-1 CFSDP-048-SD 6/20/2018	CFSDP-049 180-79106-6, 200-44014-4, 460-158806-3 CFSDP-049-SD 6/20/2018	CFSDP-050 180-79106-7, 460-158918-1 CFSDP-050-SD 6/21/2018	CFSDP-050-DUP 180-79106-9, 460-158918-3 CFSDP-DUP3-SD 6/21/2018	CFSDP-051 180-79106-8, 460-158918-2 CFSDP-051-SD 6/21/2018	CFSDP-052 180-78893-2, 200-43929-2, 460-158622-2 CFSDP-052-SD 6/18/2018	CFSDP-053 180-78893-1, 200-43929-1, 460-158622-1 CFSDP-053-SD 6/18/2018
Isophorone	0.016 J-	0.0081 U	0.0022 U	0.015 J	0.0062 U	0.017 U	0.0083 U	0.0074 U	0.008 U	0.0058 U	0.0039 U	0.0024 U	0.0052 U	0.0061 U
Naphthalene	0.015 UJ	0.0096 U	0.0017 U	0.013 U	0.0047 U	0.013 U	0.0064 U	0.0057 U	0.0062 U	0.0044 U	0.003 U	0.0018 U	0.004 U	0.0046 U
Nitrobenzene	0.019 UJ	0.012 U	0.016 U	0.016 U	0.045 U	0.12 U	0.06 U	0.053 U	0.058 U	0.042 U	0.028 U	0.017 U	0.037 U	0.043 U
N-Nitrosodi-N-Propylamine	0.02 U	0.013 U	0.0029 U	0.018 U	0.0082 U	0.022 U	0.011 U	0.0099 U	0.011 U	0.0077 U	0.0052 U	0.0032 U	0.0069 U	0.008 U
N-Nitrosodiphenylamine	0.054 U	0.034 U	0.014 U	0.048 U	0.041 U	0.11 U	0.054 U	0.048 U	0.053 U	0.038 U	0.025 U	0.015 U	0.034 U	0.04 U
Pentachlorophenol	0.072 UJ	0.046 U	0.068 UJ	0.063 U	0.2 UJ	0.52 UJ	0.26 U	0.23 UJ	0.25 UJ	0.18 UJ	0.12 UJ	0.075 UJ	0.16 U	0.19 U
Phenanthrene	0.067 J-	0.011 J	0.0058 J	0.058 J	0.018 J	0.085	0.069	0.045	0.06	0.028 J	0.016 J	0.0025 U	0.026	0.047
Phenol	0.02 UJ	0.012 U	0.013 U	0.017 U	0.037 U	0.13 J	0.049 U	0.044 U	0.048 U	0.035 U	0.023 U	0.014 U	0.031 U	0.036 U
Pyrene	0.13 J	0.027 J	0.011	0.11 J	0.041	0.1	0.092	0.046	0.087	0.049 J	0.025 J	0.0022 U	0.03	0.12

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-22
Summary of Data Used in Risk Assessment
Western Undeveloped Area Soil (0-0.5 ft-bgs) - Current
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-056A	CFMW-056A-DUP	CFMW-057A	CFMW-059A	CFMW-065	CFMW-068	CFMW-069	CFMW-071	CFSB-120	CFSB-123	CFSB-124	CFSB-125	CFSB-126	CFSB-127
Sample Lab IDs	460-117203-2	460-117203-7	460-117886-1	460-117573-6	180-77393-51, 460-155369-7	180-77673-51, 460-155989-73	180-77673-5, 460-155989-25	180-77393-68, 460-155369-26	460-114141-10	460-114141-31	460-114141-25	460-114141-4	460-114141-7	460-114141-1
Sample Name	CFMW-056a-SO-0-0.5	CFMW-DUP20-SO	CFMW-057a-SO-0-0.5	CFMW-059a-SO-0-0.5	CFMW-065-SO-0-0.5	CFMW-068-SO-0-0.5	CFMW-069-SO-0-0.5	CFMW-071-SO-0-0.5	CFSB-120-SO-0-0.5	CFSB-123-SO-0-0.5	CFSB-124-SO-0-0.5	CFSB-125-SO-0-0.5	CFSB-126-SO-0-0.5	CFSB-127-SO-0-0.5
Sample Depth	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft
Chemical	7/15/2016	7/15/2016	7/27/2016	7/22/2016	5/2/2018	5/10/2018	5/8/2018	5/3/2018	5/18/2016	5/19/2016	5/19/2016	5/18/2016	5/18/2016	5/18/2016
GENERAL CHEMISTRY (mg/kg)														
Fluoride	3.15 J	10.7 J	15.4	14.2	1.16 J-	3.94 J-	5.83 J+	3.37 J-	5.63 J	10.5 J-	10.8 J-	8.31 J-	6.31 J-	3.93 J-
Cyanide	0.22	0.18	0.086 J	0.057 J	0.085 J	0.26 J	0.26 J	0.072 U	0.11 J	0.12 J	0.68	0.12	0.17	0.087 J
METALS (mg/kg)														
"Chromium, Hexavalent - Estimated"	0.337226	0.33455	0.222141	0.195377	0.396107	0.313139	0.222141	0.235523	0.452311	0.409489	0.489781	0.29708	0.414842	0.355961
"Chromium, Trivalent - Estimated"	12.2628	12.1655	8.07786	7.10462	14.4039	11.3869	8.07786	8.56448	16.4477	14.8905	17.8102	10.8029	15.0852	12.944
Aluminum	19700	19100	14200	16600	16400	16500	16000	11200	20400	17300 J	20500 J	19600	29200	26900
Antimony	0.47 UJ	0.44 UJ	0.35 UJ	0.47 U	0.28 UJ	0.33 U	0.3 UJ	0.34 UJ	0.37 UJ	0.41 UJ	0.43 UJ	0.37 UJ	0.4 UJ	0.35 UJ
Arsenic	6.4	5.8	4	3.8 J+	4.6	4.1	4.9	4.4	4.5	4.8 J	5.9 J	4.8	7.1	6.4
Barium	230	221	170	218	280	226	336	105	245	278	347	229	429	429
Beryllium	0.7	0.69	0.51	0.61 J	0.84	0.56	0.68	0.19 U	0.97	0.77	0.95	0.65	1.2	0.98
Cadmium	0.36 U	0.33 U	0.27 U	0.35 U	0.32 U	0.37 U	0.34 U	0.39 U	0.28 U	0.31 U	0.33 U	0.28 U	0.3 U	0.26 U
Calcium	5740 J	5520 J	2440 J+	2500 J	4180	2630	4320	32300	3520	5430	5850	17200	6000	3630
Chromium, Total	12.6	12.5	8.3	7.3	14.8	11.7	8.3	8.8	16.9	15.3	18.3	11.1	15.5	13.3
Cobalt	6.7	6.3	5.4	5.4	5.9	6.7	5.7	5.4	6.2	5.8	7	7.2	6.1	6.1
Copper	20	19.1	11.2	13.9 J+	19.3 J	11.4	11	16.9 J	20.3	18.5 J	27 J	14.1	24.5	17
Iron	17700	17200	14000	13100	16200	15100	14200	13600	17300	15800	19900	17200	18600	18700
Lead	13.1	12	9.6	9.3 J+	12.8 J	16	33.1	10.3 J+	14.8	13.7	15.9	12.5	15.2	12.5
Magnesium	8450	8090	5840	4660	8830 J	6910	4740	10000	11200	10100	11400	8510	9020	7440
Manganese	588	549	682	499	240 J	648	1130 J	407 J	222	363 J	470 J	576	446	347
Mercury	0.031	0.028	0.012 U	0.022	0.018 J	0.02	0.022	0.028 J+	0.026	0.033	0.019 J	0.018	0.036	0.021
Nickel	14.3	13.1	10.4	8.9	11.3	13.3	11.1	13.6	13.4	11.4	14.2	13.3	13.6	12.1
Potassium	1120	1090	1140	768	915	969	1340	759	1230	1160	1510	1020	1310	953
Selenium	0.57 J	0.58 J	0.33 U	0.44 U	0.27 U	0.32 U	0.3 U	0.34 U	0.49 J	0.9 J	0.93 J	0.35 U	0.71 J	0.4 J
Silver	0.86 U	0.8 U	0.65 U	0.86 U	0.58 UJ	0.69 U	0.63 U	0.72 UJ	0.68 U	0.75 U	0.8 U	0.68 U	0.73 U	0.63 U
Sodium	158 J	49.6 J	34.6 J	80.2 J	59.7 J	42.1 J	32.1 U	56.9 J	95.1	78.7 J	76.5 J	62.7 J	136	135
Thallium	0.18 U	0.16 U	0.13 U	0.18 U	0.12 U	0.14 U	0.13 U	0.14 U	0.14 U	0.16 U	0.16 U	0.14 U	0.15 U	0.13 U
Vanadium	13.8	12.5	13.9	14.2	9.7	16.3	15.6	11	13	10.5	12.7	16.5	13.8	14.7
Zinc	89	84.2	63.8	38.9	44.1	58.7	83.5	45.1	50.7	47.3	72	79.6	66.8	59.4
PESTICIDES (mg/kg)														
Aldrin	0.001 U	--	0.0009 U	0.00099 U	--	--	--	--	0.00094 U	0.001 U	0.0011 U	0.00091 U	0.0011 U	0.00093 U
Alpha Bhc (Alpha Hexachlorocyclohexane)	0.00075 U	--	0.00068 U	0.00074 U	--	--	--	--	0.00071 U	0.00079 U	0.00083 U	0.00068 U	0.00079 U	0.0007 U
Alpha Endosulfan	0.0011 U	--	0.001 U	0.0011 U	--	--	--	--	0.0011 U	0.0012 U	0.0013 U	0.001 U	0.0012 U	0.0011 U
Beta Bhc (Beta Hexachlorocyclohexane)	0.0008 U	--	0.00072 U	0.00079 U	--	--	--	--	0.00075 U	0.00084 U	0.00088 U	0.00073 U	0.00084 U	0.00074 U
Beta Endosulfan	0.0013 U	--	0.0012 U	0.0013 U	--	--	--	--	0.0012 U	0.0014 U	0.0014 U	0.0012 U	0.0014 U	0.0012 U
cis-Chlordane	0.0013 U	--	0.0012 U	0.0013 U	--	--	--	--	0.0013 U	0.0014 U	0.0015 U	0.0012 U	0.0014 U	0.0012 U
Delta BHC (Delta Hexachlorocyclohexane)	0.0009 U	--	0.00081 U	0.00089 U	--	--	--	--	0.00085 U	0.00094 U	0.00099 U	0.00082 U	0.00095 U	0.00083 U
Dieldrin	0.0011 U	--	0.00097 U	0.0011 U	--	--	--	--	0.001 U	0.0011 U	0.0012 U	0.00097 U	0.0011 U	0.00099 U
Endosulfan Sulfate	0.00096 U	--	0.00087 U	0.00095 U	--	--	--	--	0.0009 U	0.001 U	0.0011 U	0.00087 U	0.001 U	0.00089 U
Endrin	0.0011 U	--	0.00095 U	0.001 U	--	--	--	--	0.00099 U	0.0011 U	0.0011 U	0.00095 U	0.0011 U	0.00097 U
Endrin Aldehyde	0.001 U	--	0.00092 U	0.001 U	--	--	--	--	0.00096 U	0.0011 U	0.0011 U	0.00093 U	0.0011 U	0.00095 U
Endrin Ketone	0.0011 U	--	0.001 U	0.0011 U	--	--	--	--	0.0011 U	0.0012 U	0.0013 U	0.001 U	0.0012 U	0.0011 U
Gamma Bhc (Lindane)	0.00074 U	--	0.00067 U	0.00073 U	--	--	--	--	0.0007 U	0.00077 U	0.00081 U	0.00067 U	0.00078 U	0.00069 U
Heptachlor	0.0011 U	--	0.00096 U	0.001 U	--	--	--	--	0.001 U	0.0011 U	0.0012 U	0.00096 U	0.0011 U	0.00098 U
Heptachlor Epoxide	0.0016 U	--	0.0015 U	0.0016 U	--	--	--	--	0.0015 U	0.0017 U	0.0018 U	0.0015 U	0.0017 U	0.0015 U
Methoxychlor	0.0018 U	--	0.0016 U	0.0017 U	--	--	--	--	0.0016 U	0.0018 U	0.0019 U	0.0016 U	0.0018 U	0.0016 U
P,P'-DDD	0.0011 U	--	0.00098 U	0.0011 U	--	--	--	--	0.001 U	0.0011 U	0.0012 U	0.00099 U	0.0011 U	0.001 U
P,P'-DDE	0.0012 U	--	0.0011 U	0.0012 U	--	--	--	--	0.0011 U	0.0013 U	0.0013 U	0.0011 U	0.0013 U	0.0011 U
P,P'-DDT	0.00085 U	--	0.00077 U	0.00084 U	--	--	--	--	0.0008 U	0.00089 U	0.00093 U	0.00077 U	0.0009 U	0.00079 U
Toxaphene	0.024 U	--	0.022 U	0.024 U	--	--	--	--	0.023 U	0.025 U	0.026 U	0.022 U	0.025 U	0.022 U
trans-Chlordane	0.0018 U	--	0.0016 U	0.0018 U	--	--	--	--	0.0017 U	0.0019 U	0.002 U	0.0016 U	0.0019 U	0.0017 U
POLYCHLORINATED BIPHENYLS (mg/kg)														
PCB-1016 (Aroclor 1016)	0.011 U	0.01 U	0.0099 U	0.011 U	--	--	--	--	0.01 U	0.011 U	0.012 U	0.01 U	0.012 U	0.01 U
PCB-1221 (Aroclor 1221)	0.011 U	0.01 U	0.0099 U	0.011 U	--	--	--	--	0.01 U	0.011 U	0.012 U	0.01 U	0.012 U	0.01 U
PCB-1232 (Aroclor 1232)	0.011 U	0.01 U	0.0099 U	0.011 U	--	--	--	--	0.01 U	0.011 U	0.012 U	0.01 U	0.012 U	0.01 U
PCB-1242 (Aroclor 1242)	0.011 U	0.01 U	0.0099 U	0.011 U	--	--	--	--	0.01 U	0.011 U	0.012 U	0.01 U	0.012 U	0.01 U
PCB-1248 (Aroclor 1248)	0.011 U	0.01 U	0.0099 U	0.011 U	--	--	--	--	0.01 U	0.011 U	0.012 U	0.01 U	0.012 U	0.01 U

Table E-22
Summary of Data Used in Risk Assessment
Western Undeveloped Area Soil (0-0.5 ft-bgs) - Current
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-056A	CFMW-056A-DUP	CFMW-057A	CFMW-059A	CFMW-065	CFMW-068	CFMW-069	CFMW-071	CFSB-120	CFSB-123	CFSB-124	CFSB-125	CFSB-126	CFSB-127
Sample Lab IDs	460-117203-2	460-117203-7	460-117886-1	460-117573-6	180-77393-51, 460-155369-7	180-77673-51, 460-155989-73	180-77673-5, 460-155989-25	180-77393-68, 460-155369-26	460-114141-10	460-114141-31	460-114141-25	460-114141-4	460-114141-7	460-114141-1
Sample Name	CFMW-056a-SO-0-0.5	CFMW-DUP20-SO	CFMW-057a-SO-0-0.5	CFMW-059a-SO-0-0.5	CFMW-065-SO-0-0.5	CFMW-068-SO-0-0.5	CFMW-069-SO-0-0.5	CFMW-071-SO-0-0.5	CFSB-120-SO-0-0.5	CFSB-123-SO-0-0.5	CFSB-124-SO-0-0.5	CFSB-125-SO-0-0.5	CFSB-126-SO-0-0.5	CFSB-127-SO-0-0.5
Sample Depth	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft
Chemical	7/15/2016	7/15/2016	7/27/2016	7/22/2016	5/2/2018	5/10/2018	5/8/2018	5/3/2018	5/18/2016	5/19/2016	5/19/2016	5/18/2016	5/18/2016	5/18/2016
PCB-1254 (Aroclor 1254)	0.011 U	0.011 U	0.01 U	0.011 U	--	--	--	--	0.011 U	0.012 U	0.012 U	0.01 U	0.012 U	0.011 U
PCB-1260 (Aroclor 1260)	0.011 U	0.011 U	0.01 U	0.011 U	--	--	--	--	0.011 U	0.012 U	0.012 U	0.01 U	0.012 U	0.011 U
PCB-1262 (Aroclor 1262)	0.011 U	0.011 U	0.01 U	0.011 U	--	--	--	--	0.011 U	0.012 U	0.012 U	0.01 U	0.012 U	0.011 U
PCB-1268 (Aroclor 1268)	0.011 U	0.011 U	0.01 U	0.011 U	--	--	--	--	0.011 U	0.012 U	0.012 U	0.01 U	0.012 U	0.011 U
Polychlorinated Biphenyl (PCBs)	0.011 U	0.011 U	0.01 U	0.011 U	--	--	--	--	0.011 U	0.012 U	0.012 U	0.01 U	0.012 U	0.011 U
SEMIVOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,2,4,5-Tetrachlorobenzene	0.03 U	0.028 U	0.027 UJ	0.03 U	0.0018 U	0.0017 U	0.0037 U	0.0032 U	0.028 U	0.032 U	0.033 U	0.028 U	0.032 U	0.028 U
1,4-Dioxane (P-Dioxane)	0.11 U	0.1 U	0.099 U	0.11 U	0.013 U	0.012 U	0.026 U	0.023 U	0.1 U	0.11 U	0.12 U	0.099 U	0.11 U	0.1 U
2,3,4,6-Tetrachlorophenol	0.038 U	0.036 U	0.035 UJ	0.038 U	0.017 U	0.016 U	0.035 U	0.031 U	0.036 U	0.04 U	0.042 U	0.035 U	0.04 U	0.036 U
2,4,5-Trichlorophenol	0.041 U	0.038 U	0.037 UJ	0.04 U	0.0029 U	0.0028 U	0.006 U	0.0053 U	0.038 U	0.042 U	0.044 U	0.037 U	0.043 U	0.038 U
2,4,6-Trichlorophenol	0.012 U	0.011 U	0.01 UJ	0.011 U	0.0022 U	0.0021 U	0.0046 U	0.004 U	0.011 U	0.012 U	0.013 U	0.011 U	0.012 U	0.011 U
2,4-Dichlorophenol	0.0096 U	0.009 U	0.0087 UJ	0.0095 U	0.0032 U	0.003 U	0.0065 U	0.0057 U	0.009 U	0.01 U	0.011 U	0.0087 U	0.01 U	0.0089 U
2,4-Dimethylphenol	0.09 U	0.084 U	0.081 UJ	0.088 U	0.0025 U	0.0024 U	0.0052 U	0.0046 U	0.084 U	0.094 U	0.098 U	0.081 U	0.094 U	0.083 U
2,4-Dinitrophenol	0.31 U	0.29 U	0.28 UJ	0.3 U	0.11 U	0.1 U	0.23 U	0.2 UJ	0.29 U	0.32 U	0.34 U	0.28 U	0.32 U	0.29 U
2,4-Dinitrotoluene	0.016 U	0.015 U	0.015 UJ	0.016 U	0.002 U	0.0019 U	0.0042 U	0.0037 U	0.015 U	0.017 U	0.018 U	0.015 U	0.017 U	0.015 U
2,6-Dinitrotoluene	0.022 U	0.02 U	0.02 UJ	0.021 U	0.0025 U	0.0024 U	0.0052 U	0.0046 U	0.02 U	0.023 U	0.024 U	0.02 U	0.023 U	0.02 U
2-Chloronaphthalene	0.0093 U	0.0086 U	0.0084 UJ	0.0091 U	0.0019 U	0.0018 U	0.0039 U	0.0034 U	0.0087 U	0.0097 U	0.01 U	0.0084 U	0.0097 U	0.0086 U
2-Chlorophenol	0.01 U	0.0097 U	0.0094 UJ	0.01 U	0.0019 U	0.0018 U	0.0039 U	0.0034 U	0.0097 U	0.011 U	0.011 U	0.0094 U	0.011 U	0.0096 U
2-Methylnaphthalene	0.009 U	0.0084 U	0.0081 UJ	0.0089 U	0.002 U	0.014	0.0041 U	0.0035 U	0.0085 U	0.0094 U	0.0099 U	0.0082 U	0.0095 U	0.0083 U
2-Methylphenol (O-Cresol)	0.018 U	0.017 U	0.016 UJ	0.017 U	0.012 U	0.011 U	0.024 U	0.021 U	0.017 U	0.019 U	0.019 U	0.016 U	0.019 U	0.016 U
2-Nitroaniline	0.013 U	0.013 U	0.012 U	0.013 U	0.019 U	0.018 U	0.039 U	0.034 U	0.013 U	0.014 U	0.015 U	0.012 U	0.014 U	0.012 U
2-Nitrophenol	0.014 U	0.013 U	0.012 UJ	0.013 U	0.0023 U	0.0022 U	0.0048 U	0.0042 U	0.013 U	0.014 U	0.015 U	0.012 U	0.014 U	0.013 U
3- And 4- Methylphenol (Total)	0.011 U	0.01 U	0.0098 UJ	0.011 U	--	--	--	--	0.01 U	0.011 U	0.012 U	0.0098 U	0.011 U	0.01 U
3,3'-Dichlorobenzidine	0.046 U	0.043 U	0.041 U	0.045 U	0.038 U	0.036 U	0.079 U	0.069 U	0.043 U	0.048 U	0.05 U	0.041 U	0.048 U	0.042 U
3-Nitroaniline	0.012 U	0.011 U	0.011 U	0.012 U	0.01 U	0.0099 U	0.021 U	0.019 U	0.011 U	0.013 U	0.013 U	0.011 U	0.013 U	0.011 U
4,6-Dinitro-2-Methylphenol	0.11 U	0.1 U	0.098 UJ	0.11 U	0.071 U	0.067 U	0.15 U	0.13 UJ	0.1 U	0.11 U	0.12 U	0.099 U	0.11 U	0.1 U
4-Bromophenyl Phenyl Ether	0.013 U	0.012 U	0.012 UJ	0.013 U	0.0029 U	0.0027 U	0.0059 U	0.0052 U	0.012 U	0.013 U	0.014 U	0.012 U	0.013 U	0.012 U
4-Chloro-3-Methylphenol	0.018 U	0.016 U	0.016 UJ	0.017 U	0.0019 U	0.0018 U	0.004 U	0.0035 U	0.016 U	0.018 U	0.019 U	0.016 U	0.018 U	0.016 U
4-Chloroaniline	0.01 U	0.0098 U	0.0095 U	0.01 U	0.0014 U	0.0013 U	0.0028 U	0.0025 U	0.0098 U	0.011 U	0.011 U	0.0095 U	0.011 U	0.0097 U
4-Chlorophenyl Phenyl Ether	0.012 U	0.011 U	0.011 UJ	0.012 U	0.0025 U	0.0024 U	0.0051 U	0.0045 U	0.011 U	0.013 U	0.013 U	0.011 U	0.013 U	0.011 U
4-Nitroaniline	0.015 U	0.014 U	0.014 UJ	0.015 U	0.002 U	0.0019 U	0.0041 U	0.0036 U	0.014 U	0.016 U	0.017 U	0.014 U	0.016 U	0.014 U
4-Nitrophenol	0.2 U	0.18 U	0.18 U	0.19 U	0.029 U	0.027 U	0.059 U	0.052 U	0.18 U	0.21 U	0.21 U	0.18 U	0.21 U	0.18 U
Acenaphthene	0.0099 U	0.0092 U	0.0089 UJ	0.0097 U	0.0024 U	0.0035 J	0.012 J	0.018	0.0093 U	0.01 U	0.011 U	0.0089 U	0.01 U	0.0091 U
Acenaphthylene	0.01 U	0.0098 U	0.0095 UJ	0.01 U	0.0018 U	0.0017 U	0.0037 U	0.0032 U	0.0098 U	0.011 U	0.011 U	0.0095 U	0.011 U	0.0097 U
Acetophenone	0.0089 U	0.0083 U	0.008 UJ	0.0087 U	0.0022 U	0.0021 U	0.0046 U	0.004 U	0.0083 U	0.0093 U	0.0097 U	0.0081 U	0.0093 U	0.0082 U
Anthracene	0.039 U	0.036 U	0.035 UJ	0.038 U	0.0021 U	0.0036 J	0.02	0.031	0.036 U	0.041 U	0.042 U	0.035 U	0.041 U	0.036 U
Atrazine	0.018 U	0.017 U	0.016 U	0.018 U	0.018 U	0.017 U	0.037 UJ	0.032 U	0.017 U	0.019 U	0.02 U	0.016 U	0.019 U	0.017 U
Benzaldehyde	0.031 U	0.029 U	0.028 UJ	0.031 U	0.0051 U	0.0048 UR	0.01 U	0.0092 UR	0.029 U	0.033 U	0.034 U	0.028 U	0.033 U	0.029 U
Benzo(A)Anthracene	0.076	0.056	0.031 UJ	0.034 U	0.0019 J	0.021	0.1	0.19	0.032 U	0.036 U	0.037 J	0.044	0.036 U	0.032 U
Benzo(A)Pyrene	0.11	0.069	0.011 UJ	0.012 U	0.002 J	0.025	0.13	0.27	0.017 J	0.014 J	0.028 J	0.051	0.023 J	0.011 U
Benzo(B)Fluoranthene	0.24	0.15	0.014 UJ	0.016 U	0.0032 J	0.033	0.21	0.35	0.044	0.032 J	0.063	0.1	0.049	0.02 J
Benzo(G,H,I)Perylene	0.097 J	0.058 J	0.021 U	0.023 U	0.0025 J	0.025	0.15	0.24	0.022 U	0.025 U	0.037 J+	0.074 J	0.025 U	0.022 U
Benzo(K)Fluoranthene	0.063	0.038	0.016 UJ	0.017 U	0.0025 U	0.015	0.074	0.18	0.02 J	0.019 U	0.028 J	0.035 J	0.019 U	0.016 U
Benzyl Butyl Phthalate	0.013 U	0.012 U	0.011 UJ	0.012 U	0.028 U	0.027 U	0.058 U	0.051 U	0.012 U	0.013 U	0.014 U	0.011 U	0.013 U	0.012 U
Biphenyl (Diphenyl)	0.035 U	0.033 U	0.031 UJ	0.034 U	0.0017 U	0.0044 J	0.0035 U	0.0031 U	0.033 U	0.036 U	0.038 U	0.032 U	0.037 U	0.032 U
Bis(2-Chloroethoxy) Methane	0.013 U	0.012 U	0.011 UJ	0.013 U	0.002 U	0.0019 U	0.004 U	0.0035 U	0.012 U	0.013 U	0.014 U	0.012 U	0.013 U	0.012 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.0096 U	0.009 U	0.0087 UJ	0.0095 U	0.0015 U	0.0014 U	0.0031 U	0.0027 U	0.009 U	0.01 U	0.011 U	0.0087 U	0.01 U	0.0089 U
Bis(2-Chloroisopropyl) Ether	0.017 U	0.016 U	0.015 U	0.017 U	0.003 U	0.0029 U	0.0063 U	0.0055 U	0.016 UJ	0.018 U	0.018 U	0.015 UJ	0.018 UJ	0.016 U
Bis(2-Ethylhexyl) Phthalate	0.016 U	0.015 U	0.014 UJ	0.016 U	0.044 U	0.041 U	0.09 U	0.079 U	0.015 U	0.017 U	0.017 U	0.014 U	0.017 U	0.015 U
Caprolactam	0.029 U	0.027 U	0.027 UJ	0.029 U	0.027 U	0.025 U	0.055 U	0.048 U	0.028 U	0.031 U	0.032 U	0.027 U	0.031 U	0.027 U
Carbazole	0.016 J	0.012 J	0.0091 UJ	0.01 U	0.0019 U	0.0048 J	0.026	0.037	0.0095 U	0.011 U	0.011 U	0.0092 U	0.011 U	0.0094 U
Chrysene	0.15 J	0.1 J	0.01 UJ	0.011 U	0.0027 J	0.036	0.16	0.31	0.032 J	0.02 J	0.048 J	0.065 J	0.031 J	0.013 J
Dibenz(A,H)Anthracene	0.027 J	0.02 U	0.019 U	0.021 U	0.0018 U	0.0043 J	0.034	0.055	0.02 U	0.022 U	0.023 U	0.019 U	0.022 U	0.02 U
Dibenzofuran	0.012 U	0.012 U	0.011 UJ	0.012 U	0.0018 U	0.003 J	0.0048 J	0.0063 J	0.012 U	0.013 U	0.014 U	0.011 U	0.013 U	0.011 U
Diethyl Phthalate	0.012 U	0.011 U	0.01 UJ	0.011 U	0.012 U	0.012 U	0.025 U	0.022 U	0.011 U	0.012 U	0.013 U	0.011 U	0.012 U	0.011 U
Dimethyl Phthalate	0.012 U	0.011 U	0.011 UJ	0.012 U	0.0015 U	0.0014 U	0.0031 U	0.0027 U	0.011 U	0.012 U	0.013 U	0.011 U	0.012 U	0.011 U
Di-N-Butyl Phthalate	0.012 U	0.011 U	0.011 J	0.012 U	0.018 U	0.017 U	0.037 U	0.032 U	0.011 U	0.013 U	0.013 U	0.011 U	0.013 U	0.011 U

Table E-22
Summary of Data Used in Risk Assessment
Western Undeveloped Area Soil (0-0.5 ft-bgs) - Current
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-056A	CFMW-056A-DUP	CFMW-057A	CFMW-059A	CFMW-065	CFMW-068	CFMW-069	CFMW-071	CFSB-120	CFSB-123	CFSB-124	CFSB-125	CFSB-126	CFSB-127
Sample Lab IDs	460-117203-2	460-117203-7	460-117886-1	460-117573-6	180-77393-51, 460-155369-7	180-77673-51, 460-155989-73	180-77673-5, 460-155989-25	180-77393-68, 460-155369-26	460-114141-10	460-114141-31	460-114141-25	460-114141-4	460-114141-7	460-114141-1
Sample Name	CFMW-056a-SO-0-0.5	CFMW-DUP20-SO	CFMW-057a-SO-0-0.5	CFMW-059a-SO-0-0.5	CFMW-065-SO-0-0.5	CFMW-068-SO-0-0.5	CFMW-069-SO-0-0.5	CFMW-071-SO-0-0.5	CFSB-120-SO-0-0.5	CFSB-123-SO-0-0.5	CFSB-124-SO-0-0.5	CFSB-125-SO-0-0.5	CFSB-126-SO-0-0.5	CFSB-127-SO-0-0.5
Sample Depth	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft
Chemical	7/15/2016	7/15/2016	7/27/2016	7/22/2016	5/2/2018	5/10/2018	5/8/2018	5/3/2018	5/18/2016	5/19/2016	5/19/2016	5/18/2016	5/18/2016	5/18/2016
Di-N-Octylphthalate	0.021 U	0.019 U	0.019 U	0.02 U	0.024 U	0.023 U	0.049 U	0.043 U	0.019 U	0.022 U	0.023 U	0.019 U	0.022 U	0.019 U
Fluoranthene	0.15 J	0.1 J	0.011 UJ	0.012 U	0.0031 J	0.046	0.23	0.41	0.028 J	0.019 J	0.043 J	0.065 J	0.034 J	0.016 J
Fluorene	0.0089 U	0.0083 U	0.008 UJ	0.0087 U	0.0016 U	0.003 J	0.0091 J	0.013 J	0.0083 U	0.0093 U	0.0097 U	0.0081 U	0.0093 U	0.0082 U
Hexachlorobenzene	0.017 U	0.015 U	0.015 UJ	0.016 U	0.0029 U	0.0028 U	0.0061 U	0.0053 U	0.016 U	0.017 U	0.018 U	0.015 U	0.017 U	0.015 U
Hexachlorobutadiene	0.011 U	0.011 U	0.01 UJ	0.011 U	0.0024 U	0.0023 U	0.0049 U	0.0043 U	0.011 U	0.012 U	0.013 U	0.01 U	0.012 U	0.011 U
Hexachlorocyclopentadiene	0.025 U	0.024 U	0.023 U	0.025 U	0.0021 U	0.002 U	0.0043 U	0.0038 U	0.024 U	0.027 U	0.028 U	0.023 U	0.027 U	0.024 U
Hexachloroethane	0.015 U	0.014 U	0.013 UJ	0.015 U	0.0021 U	0.002 U	0.0044 U	0.0038 U	0.014 U	0.016 U	0.016 U	0.014 U	0.016 U	0.014 U
Indeno(1,2,3-C,D)Pyrene	0.086	0.06	0.025 U	0.027 U	0.0017 U	0.019	0.13	0.2	0.025 U	0.028 U	0.033 J	0.082	0.029 U	0.025 U
Isophorone	0.0088 U	0.0082 U	0.0079 UJ	0.0086 U	0.0021 U	0.002 U	0.0043 U	0.0038 U	0.0082 U	0.0092 U	0.0096 U	0.0079 U	0.0092 U	0.0081 U
Naphthalene	0.01 U	0.0097 U	0.0094 UJ	0.01 U	0.0016 U	0.0051 J	0.0033 U	0.0043 J	0.0097 U	0.011 U	0.011 U	0.0094 U	0.011 U	0.0096 U
Nitrobenzene	0.013 U	0.012 U	0.012 UJ	0.013 U	0.015 U	0.014 U	0.031 U	0.027 U	0.012 U	0.013 U	0.014 U	0.012 U	0.013 U	0.012 U
N-Nitrosodi-N-Propylamine	0.014 U	0.013 U	0.012 U	0.013 U	0.0028 U	0.0026 U	0.0057 U	0.005 U	0.013 U	0.014 U	0.015 U	0.012 U	0.014 U	0.013 U
N-Nitrosodiphenylamine	0.037 U	0.035 U	0.033 UJ	0.036 U	0.014 U	0.013 U	0.028 U	0.025 U	0.035 U	0.039 U	0.041 U	0.034 U	0.039 U	0.034 U
Pentachlorophenol	0.049 U	0.046 U	0.045 UJ	0.049 U	0.066 U	0.063 U	0.14 U	0.12 UJ	0.046 U	0.052 U	0.054 U	0.045 U	0.052 U	0.046 U
Phenanthrene	0.077 J	0.058 J	0.0098 UJ	0.011 U	0.0022 U	0.031	0.11	0.16	0.016 J	0.015 J	0.028 J	0.031 J	0.015 J	0.01 U
Phenol	0.013 U	0.012 U	0.012 UJ	0.013 U	0.012 U	0.012 U	0.026 U	0.022 U	0.013 U	0.014 U	0.015 U	0.012 U	0.014 U	0.012 U
Pyrene	0.16 J	0.1 J	0.017 U	0.018 U	0.0024 J	0.04	0.2	0.38	0.027 J	0.02 J	0.044 J	0.067 J	0.033 J	0.017 U
VOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,1,1-Trichloroethane	--	0.00046 U	--	--	--	--	--	--	--	--	--	--	--	--
1,1,2,2-Tetrachloroethane	--	0.00021 UJ	--	--	--	--	--	--	--	--	--	--	--	--
1,1,2-Trichloro-1,2,2-Trifluoroethane	--	0.00053 U	--	--	--	--	--	--	--	--	--	--	--	--
1,1,2-Trichloroethane	--	0.00034 U	--	--	--	--	--	--	--	--	--	--	--	--
1,1-Dichloroethane	--	0.00041 U	--	--	--	--	--	--	--	--	--	--	--	--
1,1-Dichloroethene	--	0.0005 U	--	--	--	--	--	--	--	--	--	--	--	--
1,2,3-Trichlorobenzene	--	0.00013 UJ	--	--	--	--	--	--	--	--	--	--	--	--
1,2,4-Trichlorobenzene	--	0.00039 U	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dibromo-3-Chloropropane	--	0.00057 U	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dibromoethane (Ethylene Dibromide)	--	0.00014 U	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichlorobenzene	--	0.00017 U	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichloroethane	--	0.00013 U	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichloropropane	--	0.00021 U	--	--	--	--	--	--	--	--	--	--	--	--
1,3-Dichlorobenzene	--	0.00014 U	--	--	--	--	--	--	--	--	--	--	--	--
1,4-Dichlorobenzene	--	0.00016 U	--	--	--	--	--	--	--	--	--	--	--	--
2-Hexanone	--	0.0011 U	--	--	--	--	--	--	--	--	--	--	--	--
Acetone	--	0.0013 U	--	--	--	--	--	--	--	--	--	--	--	--
Benzene	--	0.00024 U	--	--	--	--	--	--	--	--	--	--	--	--
Bromochloromethane	--	0.00021 U	--	--	--	--	--	--	--	--	--	--	--	--
Bromodichloromethane	--	0.00046 U	--	--	--	--	--	--	--	--	--	--	--	--
Bromoform	--	0.00016 UJ	--	--	--	--	--	--	--	--	--	--	--	--
Bromomethane	--	0.00039 U	--	--	--	--	--	--	--	--	--	--	--	--
Carbon Disulfide	--	0.00052 U	--	--	--	--	--	--	--	--	--	--	--	--
Carbon Tetrachloride	--	0.00052 UJ	--	--	--	--	--	--	--	--	--	--	--	--
Chlorobenzene	--	0.00017 U	--	--	--	--	--	--	--	--	--	--	--	--
Chloroethane	--	0.00042 U	--	--	--	--	--	--	--	--	--	--	--	--
Chloroform	--	0.00025 U	--	--	--	--	--	--	--	--	--	--	--	--
Chloromethane	--	0.00046 U	--	--	--	--	--	--	--	--	--	--	--	--
Cis-1,2-Dichloroethylene	--	0.00027 U	--	--	--	--	--	--	--	--	--	--	--	--
Cis-1,3-Dichloropropene	--	0.00018 U	--	--	--	--	--	--	--	--	--	--	--	--
Cyclohexane	--	0.00056 U	--	--	--	--	--	--	--	--	--	--	--	--
Dibromochloromethane	--	0.00018 UJ	--	--	--	--	--	--	--	--	--	--	--	--
Dichlorodifluoromethane	--	0.00039 UJ	--	--	--	--	--	--	--	--	--	--	--	--
Ethylbenzene	--	0.00022 U	--	--	--	--	--	--	--	--	--	--	--	--
Isopropylbenzene (Cumene)	--	0.00021 U	--	--	--	--	--	--	--	--	--	--	--	--
M,P-Xylene	--	0.00013 U	--	--	--	--	--	--	--	--	--	--	--	--
Methyl Acetate	--	0.0011 U	--	--	--	--	--	--	--	--	--	--	--	--
Methyl Ethyl Ketone (2-Butanone)	--	0.00093 U	--	--	--	--	--	--	--	--	--	--	--	--
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	--	0.0027 U	--	--	--	--	--	--	--	--	--	--	--	--

Table E-22
Summary of Data Used in Risk Assessment
Western Undeveloped Area Soil (0-0.5 ft-bgs) - Current
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-056A	CFMW-056A-DUP	CFMW-057A	CFMW-059A	CFMW-065	CFMW-068	CFMW-069	CFMW-071	CFSB-120	CFSB-123	CFSB-124	CFSB-125	CFSB-126	CFSB-127
Sample Lab IDs	460-117203-2	460-117203-7	460-117886-1	460-117573-6	180-77393-51, 460-155369-7	180-77673-51, 460-155989-73	180-77673-5, 460-155989-25	180-77393-68, 460-155369-26	460-114141-10	460-114141-31	460-114141-25	460-114141-4	460-114141-7	460-114141-1
Sample Name	CFMW-056a-SO-0-0.5	CFMW-DUP20-SO	CFMW-057a-SO-0-0.5	CFMW-059a-SO-0-0.5	CFMW-065-SO-0-0.5	CFMW-068-SO-0-0.5	CFMW-069-SO-0-0.5	CFMW-071-SO-0-0.5	CFSB-120-SO-0-0.5	CFSB-123-SO-0-0.5	CFSB-124-SO-0-0.5	CFSB-125-SO-0-0.5	CFSB-126-SO-0-0.5	CFSB-127-SO-0-0.5
Sample Depth	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft
Chemical	7/15/2016	7/15/2016	7/27/2016	7/22/2016	5/2/2018	5/10/2018	5/8/2018	5/3/2018	5/18/2016	5/19/2016	5/19/2016	5/18/2016	5/18/2016	5/18/2016
Methylcyclohexane	--	0.0006 U	--	--	--	--	--	--	--	--	--	--	--	--
Methylene Chloride	--	0.00039 U	--	--	--	--	--	--	--	--	--	--	--	--
O-Xylene (1,2-Dimethylbenzene)	--	0.00019 U	--	--	--	--	--	--	--	--	--	--	--	--
Styrene	--	0.00018 U	--	--	--	--	--	--	--	--	--	--	--	--
Tert-Butyl Methyl Ether	--	0.00021 U	--	--	--	--	--	--	--	--	--	--	--	--
Tetrachloroethylene (PCE)	--	0.00034 U	--	--	--	--	--	--	--	--	--	--	--	--
Toluene	--	0.00023 U	--	--	--	--	--	--	--	--	--	--	--	--
Trans-1,2-Dichloroethene	--	0.00047 U	--	--	--	--	--	--	--	--	--	--	--	--
Trans-1,3-Dichloropropene	--	0.00012 U	--	--	--	--	--	--	--	--	--	--	--	--
Trichloroethylene (TCE)	--	0.00031 U	--	--	--	--	--	--	--	--	--	--	--	--
Trichlorofluoromethane	--	0.00041 U	--	--	--	--	--	--	--	--	--	--	--	--
Vinyl Chloride	--	0.00047 U	--	--	--	--	--	--	--	--	--	--	--	--

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-22
Summary of Data Used in Risk Assessment
Western Undeveloped Area Soil (0-0.5 ft-bgs) - Current
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Sample Depth Chemical	CFSB-132 460-115008-1 CFSB-132-SO-0-0.5 0-0.5 ft 6/3/2016	CFSB-133 460-115008-4 CFSB-133-SO-0-0.5 0-0.5 ft 6/3/2016	CFSB-168 180-79434-14, 460-159377-14 CFSB-168-SO-0-0.5 0-0.5 ft 6/27/2018	CFSB-168 320-43709-4 CFSB-168-SO-0-0.5 0-0.5 ft 9/27/2018	CFSB-169 180-79434-17, 460-159377-17 CFSB-169-SO-0-0.5 0-0.5 ft 6/27/2018	CFSB-170 180-79434-12, 460-159377-12 CFSB-170-SO-0-0.5 0-0.5 ft 6/27/2018	CFSB-171 180-79434-10, 460-159377-10 CFSB-171-SO-0-0.5 0-0.5 ft 6/27/2018	CFSB-172 180-79434-21, 460-159377-20 CFSB-172-SO-0-0.5 0-0.5 ft 6/27/2018	CFSB-172 320-43646-5 CFSB-172-SO-0-0.5 0-0.5 ft 9/26/2018	CFSB-196 180-79434-19, 460-159377-18 CFSB-196-SO-0-0.5 0-0.5 ft 6/27/2018	CFSB-196 320-43709-2 CFSB-196-SO-0-0.5 0-0.5 ft 9/27/2018	CFSB-196-DUP 320-43709-1 CFSB-DUP50-SO 0-0.5 ft 9/27/2018	CFSB-215 180-79108-1, 320-40608-7, 460-158919-1 CFSB-215-SO-0-0.5 0-0.5 ft 6/21/2018	CFSB-216 180-79108-11, 320-40608-13, 460-158919-11 CFSB-216-SO-0-0.5 0-0.5 ft 6/21/2018
GENERAL CHEMISTRY (mg/kg)														
Fluoride	1.78 J	2.4 J	2.67 J-	--	2.01 J-	2.1 J-	1.67 J-	2.89 J-	--	2.88 J-	--	--	7.27	5.36
Cyanide	0.024 J	0.057 J	2.2 J+	--	0.11 J+	0.15 J+	0.24 J+	0.37 J+	--	0.29 J+	--	--	0.085 J	0.34
METALS (mg/kg)														
"Chromium, Hexavalent - Estimated"	0.206083	0.382725	0.382725	--	0.377372	0.382725	0.323844	0.232847	--	0.176642	--	--	0.2382	0.441606
"Chromium, Trivalent - Estimated"	7.49392	13.9173	13.9173	--	13.7226	13.9173	11.7762	8.46715	--	6.42336	--	--	8.6618	16.0584
Aluminum	8330	18700	24100	--	21300	17900	14700	18100	--	13300	--	--	12600	19600
Antimony	0.44 UJ	0.49 UJ	0.33 UJ	--	0.28 UJ	0.28 UJ	0.31 UJ	0.32 UJ	--	0.3 UJ	--	--	0.28 U	0.38 U
Arsenic	3.5	2.1	4.3	--	4.3	3	3.9	6.2	--	5.3	--	--	4	7.5
Barium	84.9	245	499	--	371	315	243	321	--	422	--	--	168	333
Beryllium	0.32 J	0.75	1	--	0.87	0.83	0.69	0.55	--	0.55	--	--	0.36 J	0.91
Cadmium	0.33 U	0.37 U	0.38 U	--	0.32 U	0.32 U	0.35 U	0.37 U	--	0.35 U	--	--	0.32 U	0.43 U
Calcium	18900	4410	8290	--	4330	4710	8350	3830	--	2580	--	--	1990	7010
Chromium, Total	7.7	14.3	14.3	--	14.1	14.3	12.1	8.7	--	6.6	--	--	8.9	16.5
Cobalt	3.5	5	6.6	--	5.6	4.9	5	4.4	--	5.8	--	--	5.9	6.5
Copper	13.9 J-	17 J-	26.8	--	16.9	20.7	14.5	9 J+	--	9.6 J+	--	--	11.9	25.3
Iron	11300	13500	13500	--	15200	13100	13200	13700	--	12000	--	--	14200	17200
Lead	10.2 J	12.7 J	14.5	--	14.3	13.9	12.3	14.3	--	13.1	--	--	10.3	16.9
Magnesium	9640	10700	7520	--	9130	9630	9280	6620	--	5360	--	--	5890	11100
Manganese	284	62.7	165	--	162	92	235	824 J	--	2210 J	--	--	547	434
Mercury	0.021	0.04	0.014 U	--	0.012 U	0.014 J-	0.022 J-	0.012 J	--	0.011 U	--	--	0.015 J	0.03
Nickel	8.9 J	11 J	11.5	--	10.8	10.4	10.1	11	--	12.4	--	--	10.3	13.5
Potassium	737	851	1130	--	1350	1090	1000	1060	--	1290	--	--	1140	1520
Selenium	0.41 U	0.56 J	0.8 J	--	0.29 J	0.48 J	0.73 J	0.32 U	--	0.3 U	--	--	0.27 U	0.93 J
Silver	0.8 U	0.9 U	0.7 U	--	0.6 U	0.59 U	0.65 U	0.68 U	--	0.64 U	--	--	0.58 U	0.79 U
Sodium	51 J	87.7 J	235	--	131	94.6 J	82.6 J	84.2 J	--	79.3 J	--	--	29.5 U	60.7 J
Thallium	0.17 U	0.18 U	0.14 U	--	0.12 U	0.12 U	0.13 U	0.14 U	--	0.13 U	--	--	0.12 U	0.16 U
Vanadium	6.3	10.2	11.4	--	10.5	9.8	9.4	12.8	--	9.3	--	--	14.3	11.4
Zinc	34.1	39.8	42.1	--	43	45.5	36.1	70.3	--	63.9	--	--	57.4	68.2
PESTICIDES (mg/kg)														
Aldrin	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Alpha Bhc (Alpha Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Alpha Endosulfan	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Beta Bhc (Beta Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Beta Endosulfan	--	--	--	--	--	--	--	--	--	--	--	--	--	--
cis-Chlordane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Delta BHC (Delta Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dieldrin	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endosulfan Sulfate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin Aldehyde	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin Ketone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Gamma Bhc (Lindane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Heptachlor	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Heptachlor Epoxide	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methoxychlor	--	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDD	--	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDT	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Toxaphene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
trans-Chlordane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
POLYCHLORINATED BIPHENYLS (mg/kg)														
PCB-1016 (Aroclor 1016)	0.0096 U	0.012 U	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1221 (Aroclor 1221)	0.0096 U	0.012 U	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1232 (Aroclor 1232)	0.0096 U	0.012 U	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1242 (Aroclor 1242)	0.0096 U	0.012 U	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1248 (Aroclor 1248)	0.0096 U	0.012 U	--	--	--	--	--	--	--	--	--	--	--	--

Table E-22
Summary of Data Used in Risk Assessment
Western Undeveloped Area Soil (0-0.5 ft-bgs) - Current
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Sample Depth Chemical	CFSB-132 460-115008-1 CFSB-132-SO-0-0.5 0-0.5 ft 6/3/2016	CFSB-133 460-115008-4 CFSB-133-SO-0-0.5 0-0.5 ft 6/3/2016	CFSB-168 180-79434-14, 460-159377-14 CFSB-168-SO-0-0.5 0-0.5 ft 6/27/2018	CFSB-168 320-43709-4 CFSB-168-SO-0-0.5 0-0.5 ft 9/27/2018	CFSB-169 180-79434-17, 460-159377-17 CFSB-169-SO-0-0.5 0-0.5 ft 6/27/2018	CFSB-170 180-79434-12, 460-159377-12 CFSB-170-SO-0-0.5 0-0.5 ft 6/27/2018	CFSB-171 180-79434-10, 460-159377-10 CFSB-171-SO-0-0.5 0-0.5 ft 6/27/2018	CFSB-172 180-79434-21, 460-159377-20 CFSB-172-SO-0-0.5 0-0.5 ft 6/27/2018	CFSB-172 320-43646-5 CFSB-172-SO-0-0.5 0-0.5 ft 9/26/2018	CFSB-196 180-79434-19, 460-159377-18 CFSB-196-SO-0-0.5 0-0.5 ft 6/27/2018	CFSB-196 320-43709-2 CFSB-196-SO-0-0.5 0-0.5 ft 9/27/2018	CFSB-196-DUP 320-43709-1 CFSB-DUP50-SO 0-0.5 ft 9/27/2018	CFSB-215 180-79108-1, 320-40608-7, 460-158919-1 CFSB-215-SO-0-0.5 0-0.5 ft 6/21/2018	CFSB-216 180-79108-11, 320-40608-13, 460-158919-11 CFSB-216-SO-0-0.5 0-0.5 ft 6/21/2018
PCB-1254 (Aroclor 1254)	0.0099 U	0.012 U	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1260 (Aroclor 1260)	0.0099 U	0.012 U	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1262 (Aroclor 1262)	0.0099 U	0.012 U	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1268 (Aroclor 1268)	0.0099 U	0.012 U	--	--	--	--	--	--	--	--	--	--	--	--
Polychlorinated Biphenyl (PCBs)	0.0099 U	0.012 U	--	--	--	--	--	--	--	--	--	--	--	--
SEMIVOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,2,4,5-Tetrachlorobenzene	0.026 U	0.033 U	0.0021 U	--	0.0017 U	0.0018 U	0.0021 U	0.0016 U	--	0.0016 U	--	--	0.0016 U	0.0038 UJ
1,4-Dioxane (P-Dioxane)	0.095 U	0.12 U	0.015 U	--	0.013 U	0.013 U	0.015 U	0.012 U	--	0.012 U	--	--	0.012 U	0.028 U
2,3,4,6-Tetrachlorophenol	0.033 U	0.041 U	0.02 U	--	0.017 U	0.017 U	0.02 U	0.016 U	--	0.016 U	--	--	0.016 UJ	0.037 UJ
2,4,5-Trichlorophenol	0.035 U	0.044 U	0.0034 U	--	0.0029 U	0.003 U	0.0035 U	0.0027 U	--	0.0027 U	--	--	0.0027 U	0.0064 U
2,4,6-Trichlorophenol	0.01 U	0.013 U	0.0026 U	--	0.0022 U	0.0023 U	0.0027 U	0.0021 U	--	0.0021 U	--	--	0.0021 U	0.0049 U
2,4-Dichlorophenol	0.0084 U	0.01 U	0.0037 U	--	0.0031 U	0.0032 U	0.0037 U	0.0029 U	--	0.0029 U	--	--	0.0029 U	0.0069 U
2,4-Dimethylphenol	0.078 U	0.097 U	0.003 U	--	0.0025 U	0.0026 U	0.003 U	0.0024 U	--	0.0023 U	--	--	0.0024 U	0.0055 U
2,4-Dinitrophenol	0.27 U	0.33 U	0.13 U	--	0.11 U	0.11 U	0.13 U	0.1 U	--	0.1 U	--	--	0.1 UJ	0.24 UJ
2,4-Dinitrotoluene	0.014 U	0.017 U	0.0024 U	--	0.002 U	0.0021 U	0.0024 U	0.0019 U	--	0.0019 U	--	--	0.0019 U	0.0044 U
2,6-Dinitrotoluene	0.019 U	0.023 U	0.0029 U	--	0.0025 U	0.0026 U	0.003 U	0.0024 U	--	0.0023 U	--	--	0.0023 U	0.0055 U
2-Chloronaphthalene	0.0081 U	0.01 U	0.0022 U	--	0.0018 U	0.0019 U	0.0022 U	0.0018 U	--	0.0017 U	--	--	0.0017 U	0.0041 U
2-Chlorophenol	0.009 U	0.011 U	0.0022 U	--	0.0019 U	0.0019 U	0.0022 U	0.0018 U	--	0.0017 U	--	--	0.0018 U	0.0041 U
2-Methylnaphthalene	0.023 J	0.016 J	0.0023 U	--	0.0019 U	0.002 U	0.0023 U	0.0018 U	--	0.0018 U	--	--	0.0018 U	0.0073 J
2-Methylphenol (O-Cresol)	0.016 U	0.019 U	0.014 U	--	0.012 U	0.012 U	0.014 U	0.011 U	--	0.011 U	--	--	0.011 U	0.026 U
2-Nitroaniline	0.012 U	0.015 U	0.022 U	--	0.018 U	0.019 U	0.022 U	0.017 U	--	0.017 U	--	--	0.017 U	0.041 U
2-Nitrophenol	0.012 U	0.015 U	0.0027 U	--	0.0023 U	0.0024 U	0.0028 U	0.0022 U	--	0.0022 U	--	--	0.0022 U	0.0051 U
3- And 4- Methylphenol (Total)	0.0095 U	0.012 U	--	--	--	--	--	--	--	--	--	--	--	--
3,3'-Dichlorobenzidine	0.04 U	0.049 U	0.045 U	--	0.038 U	0.039 U	0.045 U	0.036 U	--	0.035 U	--	--	0.035 U	0.083 U
3-Nitroaniline	0.011 U	0.013 U	0.012 U	--	0.01 U	0.011 U	0.012 U	0.0097 U	--	0.0095 U	--	--	0.0096 U	0.023 U
4,6-Dinitro-2-Methylphenol	0.095 U	0.12 U	0.082 U	--	0.069 U	0.072 U	0.083 U	0.066 U	--	0.065 U	--	--	0.065 U	0.15 U
4-Bromophenyl Phenyl Ether	0.011 U	0.014 U	0.0033 U	--	0.0028 U	0.0029 U	0.0034 U	0.0027 U	--	0.0026 U	--	--	0.0026 U	0.0062 U
4-Chloro-3-Methylphenol	0.015 U	0.019 U	0.0022 U	--	0.0019 U	0.002 U	0.0023 U	0.0018 U	--	0.0018 U	--	--	0.0018 U	0.0042 U
4-Chloroaniline	0.0092 U	0.011 U	0.0016 U	--	0.0013 U	0.0014 U	0.0016 U	0.0013 U	--	0.0012 U	--	--	0.0013 U	0.003 U
4-Chlorophenyl Phenyl Ether	0.011 U	0.013 U	0.0029 U	--	0.0024 U	0.0025 U	0.0029 U	0.0023 U	--	0.0023 U	--	--	0.0023 U	0.0054 U
4-Nitroaniline	0.013 U	0.017 U	0.0023 U	--	0.002 U	0.0059 J	0.0024 U	0.0019 U	--	0.0018 U	--	--	0.0018 U	0.0043 U
4-Nitrophenol	0.17 U	0.21 U	0.033 U	--	0.028 U	0.029 U	0.034 U	0.027 U	--	0.026 U	--	--	0.027 UJ	0.062 UJ
Acenaphthene	0.0086 U	0.011 U	0.0027 J	--	0.0023 U	0.0024 U	0.0028 U	0.0022 U	--	0.004 J	--	--	0.0022 U	0.011 J
Acenaphthylene	0.0092 U	0.011 U	0.0021 U	--	0.0018 U	0.0018 U	0.0021 U	0.0017 U	--	0.0016 U	--	--	0.0017 U	0.0039 U
Acetophenone	0.0078 U	0.0096 U	0.0026 U	--	0.0022 U	0.0023 U	0.025 J	0.0021 U	--	0.002 U	--	--	0.0021 U	0.0048 U
Anthracene	0.034 U	0.042 U	0.0046 J	--	0.0024 J	0.0022 J	0.0048 J	0.0031 J	--	0.0059 J	--	--	0.0024 J	0.0074 J
Atrazine	0.016 U	0.02 U	0.021 UJ	--	0.018 UJ	0.018 UJ	0.021 U	0.017 UJ	--	0.016 UJ	--	--	0.017 UJ	0.039 UJ
Benzaldehyde	0.027 U	0.034 U	0.0059 U	--	0.005 U	0.0052 U	0.044 J	0.0047 U	--	0.0056 J	--	--	0.0047 UR	0.011 UR
Benzo(A)Anthracene	0.03 U	0.037 U	0.021	--	0.013	0.012	0.021	0.022	--	0.043	--	--	0.0083	0.034
Benzo(A)Pyrene	0.011 U	0.013 U	0.022	--	0.014	0.013	0.028	0.025	--	0.048	--	--	0.0097	0.051
Benzo(B)Fluoranthene	0.014 U	0.017 U	0.037	--	0.023	0.027	0.04	0.051	--	0.095	--	--	0.017	0.073
Benzo(G,H,I)Perylene	0.02 U	0.025 U	0.03	--	0.019	0.018	0.019	0.037	--	0.067	--	--	0.012	0.054
Benzo(K)Fluoranthene	0.016 U	0.019 U	0.012	--	0.011	0.0078 J	0.011	0.015	--	0.029	--	--	0.0051 J	0.027
Benzyl Butyl Phthalate	0.011 U	0.014 U	0.041 J	--	0.028 U	0.034 J	0.033 U	0.026 U	--	0.026 U	--	--	0.026 U	0.061 U
Biphenyl (Diphenyl)	0.03 U	0.038 U	0.002 U	--	0.0017 U	0.0018 U	0.002 U	0.0016 U	--	0.0016 U	--	--	0.0016 U	0.0053 J
Bis(2-Chloroethoxy) Methane	0.011 U	0.014 U	0.0023 U	--	0.0019 U	0.002 U	0.0023 U	0.0018 U	--	0.0018 U	--	--	0.0018 U	0.0042 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.0084 U	0.01 U	0.0017 U	--	0.0015 U	0.0015 U	0.0018 U	0.0014 U	--	0.0014 U	--	--	0.0014 U	0.0032 U
Bis(2-Chloroisopropyl) Ether	0.015 U	0.018 U	0.0035 U	--	0.003 U	0.0031 U	0.0036 U	0.0028 U	--	0.0028 U	--	--	0.0028 U	0.0066 U
Bis(2-Ethylhexyl) Phthalate	0.016 J	0.017 U	0.063 J	--	0.043 U	0.044 U	0.052 U	0.041 U	--	0.04 U	--	--	0.04 U	0.12 J
Caprolactam	0.026 U	0.032 U	0.031 U	--	0.026 U	0.027 U	0.031 U	0.025 U	--	0.024 U	--	--	0.025 U	0.058 U
Carbazole	0.0088 U	0.011 U	0.0048 J	--	0.0038 J	0.0036 J	0.0046 J	0.0049 J	--	0.0086	--	--	0.0024 J	0.011 J
Chrysene	0.0097 U	0.012 U	0.032	--	0.021	0.019	0.033	0.038	--	0.069	--	--	0.013	0.055
Dibenz(A,H)Anthracene	0.019 U	0.023 U	0.0021 U	--	0.0018 U	0.0045 J	0.0022 U	0.0087	--	0.015	--	--	0.0031 J	0.013 J
Dibenzofuran	0.011 U	0.013 U	0.0021 U	--	0.0018 U	0.0018 U	0.0021 U	0.0017 U	--	0.0018 J	--	--	0.0018 J	0.0075 J
Diethyl Phthalate	0.01 U	0.013 U	0.014 U	--	0.012 U	0.013 U	0.015 U	0.011 U	--	0.011 U	--	--	0.011 U	0.027 U
Dimethyl Phthalate	0.01 U	0.013 U	0.0017 U	--	0.0015 U	0.0015 U	0.0018 U	0.0014 U	--	0.0014 U	--	--	0.0014 U	0.0032 U
Di-N-Butyl Phthalate	0.011 U	0.013 U	0.021 U	--	0.018 U	0.018 U	0.021 U	0.017 U	--	0.016 U	--	--	0.017 U	0.039 U

Table E-22
Summary of Data Used in Risk Assessment
Western Undeveloped Area Soil (0-0.5 ft-bgs) - Current
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-132	CFSB-133	CFSB-168	CFSB-168	CFSB-169	CFSB-170	CFSB-171	CFSB-172	CFSB-172	CFSB-196	CFSB-196	CFSB-196-DUP	CFSB-215	CFSB-216
Sample Lab IDs	460-115008-1	460-115008-4	180-79434-14, 460-159377-14	320-43709-4	180-79434-17, 460-159377-17	180-79434-12, 460-159377-12	180-79434-10, 460-159377-10	180-79434-21, 460-159377-20	320-43646-5	180-79434-19, 460-159377-18	320-43709-2	320-43709-1	180-79108-1, 320-40608-7, 460-158919-1	180-79108-11, 320-40608-13, 460-158919-11
Sample Name	CFSB-132-SO-0-0.5	CFSB-133-SO-0-0.5	CFSB-168-SO-0-0.5	CFSB-168-SO-0-0.5	CFSB-169-SO-0-0.5	CFSB-170-SO-0-0.5	CFSB-171-SO-0-0.5	CFSB-172-SO-0-0.5	CFSB-172-SO-0-0.5	CFSB-196-SO-0-0.5	CFSB-196-SO-0-0.5	CFSB-DUP50-SO	CFSB-215-SO-0-0.5	CFSB-216-SO-0-0.5
Sample Depth	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft
Chemical	6/3/2016	6/3/2016	6/27/2018	9/27/2018	6/27/2018	6/27/2018	6/27/2018	6/27/2018	9/26/2018	6/27/2018	9/27/2018	9/27/2018	6/21/2018	6/21/2018
Di-N-Octylphthalate	0.018 U	0.022 U	0.028 U	--	0.023 U	0.024 U	0.028 U	0.022 U	--	0.022 U	--	--	0.022 U	0.052 U
Fluoranthene	0.011 U	0.013 U	0.04	--	0.027	0.023	0.044	0.044	--	0.087	--	--	0.016	0.064
Fluorene	0.0078 U	0.0096 U	0.0023 J	--	0.0016 U	0.0016 J	0.0051 J	0.002 J	--	0.0028 J	--	--	0.0015 J	0.0071 J
Hexachlorobenzene	0.014 U	0.018 U	0.0034 U	--	0.0029 U	0.003 U	0.0035 U	0.0027 U	--	0.0027 U	--	--	0.0027 U	0.0064 U
Hexachlorobutadiene	0.01 U	0.012 U	0.0028 U	--	0.0024 U	0.0024 U	0.0028 U	0.0022 U	--	0.0022 U	--	--	0.0022 U	0.0052 U
Hexachlorocyclopentadiene	0.022 U	0.027 U	0.0024 U	--	0.0021 U	0.0021 U	0.0025 U	0.0019 U	--	0.0019 U	--	--	0.0019 UJ	0.0045 UJ
Hexachloroethane	0.013 U	0.016 U	0.0025 U	--	0.0021 U	0.0022 U	0.0025 U	0.002 U	--	0.0019 U	--	--	0.002 U	0.0046 U
Indeno(1,2,3-C,D)Pyrene	0.024 U	0.029 U	0.021	--	0.016	0.017	0.021	0.03	--	0.053	--	--	0.0084	0.044
Isophorone	0.0076 U	0.0095 U	0.0024 U	--	0.0021 U	0.0021 U	0.0025 U	0.0019 U	--	0.0019 U	--	--	0.0019 U	0.0045 U
Naphthalene	0.01 J	0.011 U	0.002 J	--	0.0024 J	0.0016 J	0.0019 U	0.0015 U	--	0.0025 J	--	--	0.0015 J	0.013 J
Nitrobenzene	0.011 U	0.014 U	0.017 U	--	0.015 U	0.015 U	0.018 U	0.014 U	--	0.014 U	--	--	0.014 U	0.033 U
N-Nitrosodi-N-Propylamine	0.012 U	0.015 U	0.0032 U	--	0.0027 U	0.0028 U	0.0033 U	0.0026 U	--	0.0025 U	--	--	0.0026 U	0.006 U
N-Nitrosodiphenylamine	0.032 U	0.04 U	0.016 U	--	0.013 U	0.014 U	0.016 U	0.013 U	--	0.012 U	--	--	0.013 U	0.03 U
Pentachlorophenol	0.043 U	0.053 U	0.077 U	--	0.065 U	0.067 U	0.078 U	0.061 U	--	0.06 U	--	--	0.061 UJ	0.14 UJ
Phenanthrene	0.0095 U	0.012 U	0.024	--	0.016	0.013	0.033	0.02	--	0.04	--	--	0.015	0.045
Phenol	0.012 U	0.014 U	0.014 U	--	0.012 U	0.013 U	0.015 U	0.012 U	--	0.011 U	--	--	0.011 U	0.027 U
Pyrene	0.016 U	0.02 U	0.037	--	0.023	0.021	0.036	0.039	--	0.076	--	--	0.014	0.065
VOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,1,1-Trichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,2,2-Tetrachloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,2-Trichloro-1,2,2-Trifluoroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,2-Trichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1-Dichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1-Dichloroethene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,3-Trichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,4-Trichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dibromo-3-Chloropropane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dibromoethane (Ethylene Dibromide)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichloropropane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,3-Dichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,4-Dichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Hexanone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acetone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromochloromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromodichloromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromoform	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromomethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Carbon Disulfide	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Carbon Tetrachloride	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chloroform	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chloromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cis-1,2-Dichloroethylene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cis-1,3-Dichloropropene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cyclohexane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibromochloromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dichlorodifluoromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Ethylbenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Isopropylbenzene (Cumene)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
M,P-Xylene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methyl Acetate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methyl Ethyl Ketone (2-Butanone)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Table E-22
Summary of Data Used in Risk Assessment
Western Undeveloped Area Soil (0-0.5 ft-bgs) - Current
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-132	CFSB-133	CFSB-168	CFSB-168	CFSB-169	CFSB-170	CFSB-171	CFSB-172	CFSB-172	CFSB-196	CFSB-196	CFSB-196-DUP	CFSB-215	CFSB-216
Sample Lab IDs	460-115008-1	460-115008-4	180-79434-14, 460-159377-14	320-43709-4	180-79434-17, 460-159377-17	180-79434-12, 460-159377-12	180-79434-10, 460-159377-10	180-79434-21, 460-159377-20	320-43646-5	180-79434-19, 460-159377-18	320-43709-2	320-43709-1	180-79108-1, 320-40608-7, 460-158919-1	180-79108-11, 320-40608-13, 460-158919-11
Sample Name	CFSB-132-SO-0-0.5	CFSB-133-SO-0-0.5	CFSB-168-SO-0-0.5	CFSB-168-SO-0-0.5	CFSB-169-SO-0-0.5	CFSB-170-SO-0-0.5	CFSB-171-SO-0-0.5	CFSB-172-SO-0-0.5	CFSB-172-SO-0-0.5	CFSB-196-SO-0-0.5	CFSB-196-SO-0-0.5	CFSB-DUP50-SO	CFSB-215-SO-0-0.5	CFSB-216-SO-0-0.5
Sample Depth	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft
Chemical	6/3/2016	6/3/2016	6/27/2018	9/27/2018	6/27/2018	6/27/2018	6/27/2018	6/27/2018	9/26/2018	6/27/2018	9/27/2018	9/27/2018	6/21/2018	6/21/2018
Methylcyclohexane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methylene Chloride	--	--	--	--	--	--	--	--	--	--	--	--	--	--
O-Xylene (1,2-Dimethylbenzene)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Styrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Tert-Butyl Methyl Ether	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Tetrachloroethylene (PCE)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Toluene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Trans-1,2-Dichloroethene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Trans-1,3-Dichloropropene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Trichloroethylene (TCE)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Trichlorofluoromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Vinyl Chloride	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-22
Summary of Data Used in Risk Assessment
Western Undeveloped Area Soil (0-0.5 ft-bgs) - Current
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-217	CFSB-218	CFSB-237	CFSB-238	CFSB-238	CFSB-238	CFSB-239	CFSB-239	CFSB-244	CFSB-245	CFSB-249
Sample Lab IDs	180-79108-9, 320-40608-11, 460-158919-9	180-79108-3, 320-40608-5, 460-158919-3	180-79108-13, 320-40608-15, 460-158919-13	180-79434-31, 460-159377-31	460-165504-1	320-43646-1	180-79434-25, 460-159377-25	320-43709-18	180-77673-26, 460-155989-48	180-77673-8, 460-155989-28	180-77393-32, 460-155265-34
Sample Name	CFSB-217-SO-0-0.5	CFSB-218-SO-0-0.5	CFSB-237-SO-0-0.5	CFSB-238-SO-0-0.5	CFSB-238a-SO-0-0.5	CFSB-238-SO-0-0.5	CFSB-239-SO-0-0.5	CFSB-239-SO-0-0.5	CFSB-244-SO-0-0.5	CFSB-245-SO-0-0.5	CFSB-249-SO-0-0.5
Sample Depth	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft
Chemical	6/21/2018	6/21/2018	6/21/2018	6/27/2018	9/25/2018	9/25/2018	6/27/2018	9/27/2018	5/9/2018	5/8/2018	5/1/2018
GENERAL CHEMISTRY (mg/kg)											
Fluoride	6.93	2.74	3.47	3.44	--	--	3.11	--	8.04 J	9.21 J+	1.15
Cyanide	0.069 U	0.058 U	0.056 U	0.16 J+	--	--	0.22 J+	--	0.2 J	0.12 J	0.066 U
METALS (mg/kg)											
"Chromium, Hexavalent - Estimated"	0.377372	0.291727	0.224818	0.305109	--	--	0.227494	--	0.281022	0.214112	0.232847
"Chromium, Trivalent - Estimated"	13.7226	10.6083	8.17518	11.0949	--	--	8.27251	--	10.219	7.78589	8.46715
Aluminum	20500	26700	12600	21100	--	--	19500	--	12600	10800	10600 J
Antimony	0.27 U	0.26 U	0.25 UJ	0.32 U	--	--	0.33 UJ	--	0.27 UJ	0.26 UJ	0.33 UJ
Arsenic	8	9	3.2	8.1	--	--	4.6	--	3.8	2.7	6.2 J
Barium	320	466	164	285	--	--	353	--	125	99.6	83.8
Beryllium	0.95	0.72	0.44	0.7	--	--	0.59	--	0.49	0.45	0.34 J
Cadmium	0.31 U	0.3 U	0.29 U	0.37 U	--	--	0.38 U	--	0.3 U	0.29 U	0.37 U
Calcium	6660	3700	2210	3110	--	--	3340	--	2170 J	1630	41600 J+
Chromium, Total	14.1	10.9	8.4	11.4	--	--	8.5	--	10.5	8	8.7
Cobalt	6.5	5.7	5.1	7	--	--	5.4	--	5.6	4.7	5.2
Copper	23.5	16.1	10.5	18.4	--	--	12 J+	--	10.9 J	7	14.7 J
Iron	17100	17400	13200	19200	--	--	14400	--	14000	12600	14300
Lead	15.2	11.2	11.6 J	15.3	--	--	16	--	11.7 J	5.8	11.1 J+
Magnesium	9260	6790	6410	7500	--	--	5720	--	6440 J	5530	10200 J
Manganese	609	333	525	820	--	--	768 J	--	391	323 J	510 J
Mercury	0.033	0.063	0.014 J	0.016 J	--	--	0.018 J	--	0.011 U	0.011 U	0.05
Nickel	13.2	10.7	10.7	13	--	--	10.2	--	11.3	9.6	10.1
Potassium	1220	950	1070	1010	--	--	1140	--	745 J+	807	929 J+
Selenium	0.74 J	0.26 U	0.25 U	0.32 U	--	--	0.32 U	--	0.26 U	0.25 U	0.32 U
Silver	0.57 U	0.55 U	0.54 U	0.68 U	--	--	0.69 U	--	0.56 U	0.54 U	0.69 U
Sodium	58 J	206	29.8 J	43.8 J	--	--	74.7 J	--	28.4 U	27.3 U	34.8 U
Thallium	0.12 U	0.11 U	0.11 U	0.14 U	--	--	0.14 U	--	0.11 U	0.11 U	0.14 U
Vanadium	12.5	12	11.4	17.3	--	--	15.2	--	13.7	10.6	6.4 J+
Zinc	69.7	55.7	52.8	61.4	--	--	58.7	--	38.6	41.4	38.4
PESTICIDES (mg/kg)											
Aldrin	--	--	--	--	--	--	--	--	--	--	--
Alpha Bhc (Alpha Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--
Alpha Endosulfan	--	--	--	--	--	--	--	--	--	--	--
Beta Bhc (Beta Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--
Beta Endosulfan	--	--	--	--	--	--	--	--	--	--	--
cis-Chlordane	--	--	--	--	--	--	--	--	--	--	--
Delta BHC (Delta Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--
Dieldrin	--	--	--	--	--	--	--	--	--	--	--
Endosulfan Sulfate	--	--	--	--	--	--	--	--	--	--	--
Endrin	--	--	--	--	--	--	--	--	--	--	--
Endrin Aldehyde	--	--	--	--	--	--	--	--	--	--	--
Endrin Ketone	--	--	--	--	--	--	--	--	--	--	--
Gamma Bhc (Lindane)	--	--	--	--	--	--	--	--	--	--	--
Heptachlor	--	--	--	--	--	--	--	--	--	--	--
Heptachlor Epoxide	--	--	--	--	--	--	--	--	--	--	--
Methoxychlor	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDD	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDE	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDT	--	--	--	--	--	--	--	--	--	--	--
Toxaphene	--	--	--	--	--	--	--	--	--	--	--
trans-Chlordane	--	--	--	--	--	--	--	--	--	--	--
POLYCHLORINATED BIPHENYLS (mg/kg)											
PCB-1016 (Aroclor 1016)	--	--	--	--	--	--	--	--	--	--	--
PCB-1221 (Aroclor 1221)	--	--	--	--	--	--	--	--	--	--	--
PCB-1232 (Aroclor 1232)	--	--	--	--	--	--	--	--	--	--	--
PCB-1242 (Aroclor 1242)	--	--	--	--	--	--	--	--	--	--	--
PCB-1248 (Aroclor 1248)	--	--	--	--	--	--	--	--	--	--	--

Table E-22
Summary of Data Used in Risk Assessment
Western Undeveloped Area Soil (0-0.5 ft-bgs) - Current
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-217	CFSB-218	CFSB-237	CFSB-238	CFSB-238	CFSB-238	CFSB-239	CFSB-239	CFSB-244	CFSB-245	CFSB-249
Sample Lab IDs	180-79108-9, 320-40608-11, 460-158919-9	180-79108-3, 320-40608-5, 460-158919-3	180-79108-13, 320-40608-15, 460-158919-13	180-79434-31, 460-159377-31	460-165504-1	320-43646-1	180-79434-25, 460-159377-25	320-43709-18	180-77673-26, 460-155989-48	180-77673-8, 460-155989-28	180-77393-32, 460-155265-34
Sample Name	CFSB-217-SO-0-0.5	CFSB-218-SO-0-0.5	CFSB-237-SO-0-0.5	CFSB-238-SO-0-0.5	CFSB-238a-SO-0-0.5	CFSB-238-SO-0-0.5	CFSB-239-SO-0-0.5	CFSB-239-SO-0-0.5	CFSB-244-SO-0-0.5	CFSB-245-SO-0-0.5	CFSB-249-SO-0-0.5
Sample Depth	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft
Chemical	6/21/2018	6/21/2018	6/21/2018	6/27/2018	9/25/2018	9/25/2018	6/27/2018	9/27/2018	5/9/2018	5/8/2018	5/1/2018
PCB-1254 (Aroclor 1254)	--	--	--	--	--	--	--	--	--	--	--
PCB-1260 (Aroclor 1260)	--	--	--	--	--	--	--	--	--	--	--
PCB-1262 (Aroclor 1262)	--	--	--	--	--	--	--	--	--	--	--
PCB-1268 (Aroclor 1268)	--	--	--	--	--	--	--	--	--	--	--
Polychlorinated Biphenyl (PCBs)	--	--	--	--	--	--	--	--	--	--	--
SEMIVOLATILE ORGANIC COMPOUNDS (mg/kg)											
1,2,4,5-Tetrachlorobenzene	0.0034 UJ	0.0015 U	0.003 U	0.0016 U	--	--	0.0017 U	--	0.0016 U	0.0017 U	0.0016 U
1,4-Dioxane (P-Dioxane)	0.024 U	0.011 U	0.022 U	0.012 U	--	--	0.012 U	--	0.012 U	0.012 U	0.011 U
2,3,4,6-Tetrachlorophenol	0.033 UJ	0.015 U	0.029 UJ	0.016 U	--	--	0.017 U	--	0.015 U	0.016 U	0.015 U
2,4,5-Trichlorophenol	0.0056 U	0.0026 U	0.005 U	0.0027 U	--	--	0.0029 U	--	0.0027 U	0.0027 U	0.0026 U
2,4,6-Trichlorophenol	0.0043 U	0.002 U	0.0038 U	0.0021 U	--	--	0.0022 U	--	0.002 U	0.0021 U	0.002 U
2,4-Dichlorophenol	0.006 U	0.0028 U	0.0053 U	0.0029 U	--	--	0.0031 U	--	0.0029 U	0.003 U	0.0028 U
2,4-Dimethylphenol	0.0049 U	0.0022 U	0.0043 U	0.0023 U	--	--	0.0025 U	--	0.0023 U	0.0024 U	0.0022 U
2,4-Dinitrophenol	0.21 UJ	0.096 U	0.19 UJ	0.1 U	--	--	0.11 U	--	0.1 U	0.1 U	0.097 UJ
2,4-Dinitrotoluene	0.0039 U	0.0018 U	0.0035 U	0.0019 U	--	--	0.002 U	--	0.0018 U	0.0019 U	0.0018 U
2,6-Dinitrotoluene	0.0048 U	0.0022 U	0.0043 U	0.0023 U	--	--	0.0025 U	--	0.0023 U	0.0024 U	0.0022 U
2-Chloronaphthalene	0.0036 U	0.0016 U	0.0032 U	0.0017 U	--	--	0.0018 U	--	0.0017 U	0.0018 U	0.0017 U
2-Chlorophenol	0.0036 U	0.0017 U	0.0032 U	0.0018 U	--	--	0.0019 U	--	0.0017 U	0.0018 U	0.0017 U
2-Methylnaphthalene	0.0064 J	0.0017 U	0.0053 J	0.0018 U	--	--	0.0019 U	--	0.0018 U	0.0018 U	0.0017 U
2-Methylphenol (O-Cresol)	0.022 U	0.01 U	0.02 U	0.011 U	--	--	0.011 U	--	0.011 U	0.011 U	0.01 U
2-Nitroaniline	0.036 U	0.016 U	0.032 U	0.017 U	--	--	0.018 U	--	0.017 U	0.018 U	0.017 U
2-Nitrophenol	0.0045 U	0.002 U	0.004 U	0.0022 U	--	--	0.0023 U	--	0.0021 U	0.0022 U	0.0021 U
3- And 4- Methylphenol (Total)	--	--	--	--	--	--	--	--	--	--	--
3,3'-Dichlorobenzidine	0.073 U	0.033 U	0.065 U	0.035 U	--	--	0.037 U	--	0.035 U	0.036 U	0.034 U
3-Nitroaniline	0.02 U	0.0091 U	0.018 U	0.0096 U	--	--	0.01 U	--	0.0094 U	0.0098 U	0.0092 U
4,6-Dinitro-2-Methylphenol	0.13 U	0.062 U	0.12 U	0.065 U	--	--	0.069 U	--	0.064 U	0.066 U	0.062 UJ
4-Bromophenyl Phenyl Ether	0.0055 U	0.0025 U	0.0048 U	0.0026 U	--	--	0.0028 U	--	0.0026 U	0.0027 U	0.0025 U
4-Chloro-3-Methylphenol	0.0037 U	0.0017 U	0.0033 U	0.0018 U	--	--	0.0019 U	--	0.0017 U	0.0018 U	0.0017 U
4-Chloroaniline	0.0026 U	0.0012 U	0.0023 U	0.0013 U	--	--	0.0013 U	--	0.0012 U	0.0013 U	0.0012 U
4-Chlorophenyl Phenyl Ether	0.0047 U	0.0022 U	0.0042 U	0.0023 U	--	--	0.0024 U	--	0.0022 U	0.0023 U	0.0022 U
4-Nitroaniline	0.0038 U	0.0017 U	0.0034 U	0.0018 U	--	--	0.0019 U	--	0.0018 U	0.0019 U	0.0018 U
4-Nitrophenol	0.055 UJ	0.025 U	0.049 UJ	0.027 U	--	--	0.028 U	--	0.026 U	0.027 U	0.025 U
Acenaphthene	0.0093 J	0.0021 U	0.0069 J	0.0024 J	--	--	0.005 J	--	0.014	0.0084	0.0021 U
Acenaphthylene	0.0034 U	0.0016 U	0.003 U	0.0017 U	--	--	0.0018 U	--	0.0016 U	0.0017 U	0.0016 U
Acetophenone	0.0042 U	0.0019 U	0.0038 U	0.0021 U	--	--	0.0022 U	--	0.002 U	0.0021 U	0.002 U
Anthracene	0.0085 J	0.0019 U	0.011 J	0.0033 J	--	--	0.0081	--	0.025	0.013	0.0019 U
Atrazine	0.034 UJ	0.016 UJ	0.03 UJ	0.017 UJ	--	--	0.018 UJ	--	0.016 UJ	0.017 UJ	0.016 U
Benzaldehyde	0.011 J	0.0044 UR	0.0086 UR	0.0047 U	--	--	0.005 U	--	0.0046 U	0.0068 J	0.0045 UR
Benzo(A)Anthracene	0.04	0.0095	0.033	0.021	--	--	0.035	--	0.12	0.069	0.0072 J
Benzo(A)Pyrene	0.052	0.014	0.047	0.023	--	--	0.041	--	0.13	0.083	0.0071 J
Benzo(B)Fluoranthene	0.075	0.023	0.084	0.045	--	--	0.072	--	0.2	0.14	0.012
Benzo(G,H,I)Perylene	0.05	0.015	0.052	0.035	--	--	0.049	--	0.16	0.095	0.0076
Benzo(K)Fluoranthene	0.033	0.01	0.025	0.015	--	--	0.024	--	0.069	0.046	0.0037 J
Benzyl Butyl Phthalate	0.054 U	0.025 U	0.048 U	0.026 U	--	--	0.027 U	--	0.025 U	0.026 U	0.025 U
Biphenyl (Diphenyl)	0.0051 J	0.0015 U	0.0048 J	0.0016 U	--	--	0.0017 U	--	0.0016 U	0.0016 U	0.0015 U
Bis(2-Chloroethoxy) Methane	0.0037 U	0.0017 U	0.0033 U	0.0018 U	--	--	0.0019 U	--	0.0018 U	0.0018 U	0.0017 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.0028 U	0.0013 U	0.0025 U	0.0014 U	--	--	0.0015 U	--	0.0013 U	0.0014 U	0.0013 U
Bis(2-Chloroisopropyl) Ether	0.0058 U	0.0026 U	0.0051 U	0.0028 U	--	--	0.003 U	--	0.0028 U	0.0028 U	0.0027 U
Bis(2-Ethylhexyl) Phthalate	0.083 U	0.038 U	0.074 U	0.04 U	--	--	0.043 U	--	0.04 U	0.041 U	0.039 U
Caprolactam	0.051 U	0.023 U	0.045 U	0.025 U	--	--	0.026 U	--	0.024 U	0.025 U	0.024 U
Carbazole	0.011 J	0.0024 J	0.0088 J	0.005 J	--	--	0.01	--	0.021	0.016	0.0017 U
Chrysene	0.063	0.023	0.061	0.033	--	--	0.054	--	0.16	0.1	0.0089
Dibenz(A,H)Anthracene	0.012 J	0.0032 J	0.011 J	0.0017 U	--	--	0.0098	--	0.038	0.022	0.0023 J
Dibenzofuran	0.0061 J	0.0016 U	0.0058 J	0.0017 U	--	--	0.0026 J	--	0.006 J	0.0017 U	0.0016 U
Diethyl Phthalate	0.023 U	0.011 U	0.021 U	0.011 U	--	--	0.012 U	--	0.011 U	0.012 U	0.011 U
Dimethyl Phthalate	0.0028 U	0.0013 U	0.0025 U	0.0014 U	--	--	0.0015 U	--	0.0013 U	0.0014 U	0.0013 U
Di-N-Butyl Phthalate	0.034 U	0.016 U	0.03 U	0.017 U	--	--	0.018 U	--	0.016 U	0.017 U	0.016 U

Table E-22
Summary of Data Used in Risk Assessment
Western Undeveloped Area Soil (0-0.5 ft-bgs) - Current
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-217	CFSB-218	CFSB-237	CFSB-238	CFSB-238	CFSB-238	CFSB-239	CFSB-239	CFSB-244	CFSB-245	CFSB-249
Sample Lab IDs	180-79108-9, 320-40608-11, 460-158919-9	180-79108-3, 320-40608-5, 460-158919-3	180-79108-13, 320-40608-15, 460-158919-13	180-79434-31, 460-159377-31	460-165504-1	320-43646-1	180-79434-25, 460-159377-25	320-43709-18	180-77673-26, 460-155989-48	180-77673-8, 460-155989-28	180-77393-32, 460-155265-34
Sample Name	CFSB-217-SO-0-0.5	CFSB-218-SO-0-0.5	CFSB-237-SO-0-0.5	CFSB-238-SO-0-0.5	CFSB-238a-SO-0-0.5	CFSB-238-SO-0-0.5	CFSB-239-SO-0-0.5	CFSB-239-SO-0-0.5	CFSB-244-SO-0-0.5	CFSB-245-SO-0-0.5	CFSB-249-SO-0-0.5
Sample Depth	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft
Chemical	6/21/2018	6/21/2018	6/21/2018	6/27/2018	9/25/2018	9/25/2018	6/27/2018	9/27/2018	5/9/2018	5/8/2018	5/1/2018
Di-N-Octylphthalate	0.045 U	0.021 U	0.04 U	0.022 U	--	--	0.023 U	--	0.022 U	0.022 U	0.021 U
Fluoranthene	0.076	0.022	0.07	0.038	--	--	0.074	--	0.2	0.15	0.012
Fluorene	0.007 J	0.0014 U	0.0061 J	0.0019 J	--	--	0.0043 J	--	0.01	0.0067 J	0.0014 U
Hexachlorobenzene	0.0056 U	0.0026 U	0.005 U	0.0027 U	--	--	0.0029 U	--	0.0027 U	0.0028 U	0.0026 U
Hexachlorobutadiene	0.0046 U	0.0021 U	0.0041 U	0.0022 U	--	--	0.0023 U	--	0.0022 U	0.0022 U	0.0021 U
Hexachlorocyclopentadiene	0.004 UJ	0.0018 U	0.0035 UJ	0.0019 U	--	--	0.002 U	--	0.0019 U	0.002 U	0.0018 U
Hexachloroethane	0.004 U	0.0018 U	0.0036 U	0.0019 U	--	--	0.0021 U	--	0.0019 U	0.002 U	0.0019 U
Indeno(1,2,3-C,D)Pyrene	0.042	0.012	0.04	0.028	--	--	0.039	--	0.13	0.079	0.0059 J
Isophorone	0.004 U	0.0018 U	0.0035 U	0.0019 U	--	--	0.002 U	--	0.0019 U	0.002 U	0.0018 U
Naphthalene	0.0099 J	0.0014 U	0.0069 J	0.0015 U	--	--	0.0016 U	--	0.004 J	0.003 J	0.0014 U
Nitrobenzene	0.029 U	0.013 U	0.025 U	0.014 U	--	--	0.015 U	--	0.014 U	0.014 U	0.013 U
N-Nitrosodi-N-Propylamine	0.0053 U	0.0024 U	0.0047 U	0.0026 U	--	--	0.0027 U	--	0.0025 U	0.0026 U	0.0025 U
N-Nitrosodiphenylamine	0.026 U	0.012 U	0.023 U	0.013 U	--	--	0.013 U	--	0.012 U	0.013 U	0.012 U
Pentachlorophenol	0.13 UJ	0.057 U	0.11 UJ	0.061 U	--	--	0.064 U	--	0.06 U	0.062 U	0.058 U
Phenanthrene	0.054	0.012	0.042	0.023	--	--	0.041	--	0.13	0.073	0.0083
Phenol	0.024 U	0.011 U	0.021 U	0.011 U	--	--	0.012 U	--	0.011 U	0.012 U	0.011 U
Pyrene	0.073	0.018	0.072	0.042	--	--	0.069	--	0.28	0.12	0.012
VOLATILE ORGANIC COMPOUNDS (mg/kg)											
1,1,1-Trichloroethane	--	--	--	--	0.00032 U	--	--	--	--	--	--
1,1,2,2-Tetrachloroethane	--	--	--	--	0.0003 U	--	--	--	--	--	--
1,1,2-Trichloro-1,2,2-Trifluoroethane	--	--	--	--	0.00042 U	--	--	--	--	--	--
1,1,2-Trichloroethane	--	--	--	--	0.00025 U	--	--	--	--	--	--
1,1-Dichloroethane	--	--	--	--	0.00029 U	--	--	--	--	--	--
1,1-Dichloroethene	--	--	--	--	0.00031 U	--	--	--	--	--	--
1,2,3-Trichlorobenzene	--	--	--	--	0.00025 U	--	--	--	--	--	--
1,2,4-Trichlorobenzene	--	--	--	--	0.00013 U	--	--	--	--	--	--
1,2-Dibromo-3-Chloropropane	--	--	--	--	0.00064 U	--	--	--	--	--	--
1,2-Dibromoethane (Ethylene Dibromide)	--	--	--	--	0.00025 U	--	--	--	--	--	--
1,2-Dichlorobenzene	--	--	--	--	0.0002 U	--	--	--	--	--	--
1,2-Dichloroethane	--	--	--	--	0.00041 U	--	--	--	--	--	--
1,2-Dichloropropane	--	--	--	--	0.00059 U	--	--	--	--	--	--
1,3-Dichlorobenzene	--	--	--	--	0.00022 U	--	--	--	--	--	--
1,4-Dichlorobenzene	--	--	--	--	0.00014 U	--	--	--	--	--	--
2-Hexanone	--	--	--	--	0.0011 U	--	--	--	--	--	--
Acetone	--	--	--	--	0.17 J+	--	--	--	--	--	--
Benzene	--	--	--	--	0.00036 U	--	--	--	--	--	--
Bromochloromethane	--	--	--	--	0.00039 U	--	--	--	--	--	--
Bromodichloromethane	--	--	--	--	0.00036 U	--	--	--	--	--	--
Bromoform	--	--	--	--	0.00059 U	--	--	--	--	--	--
Bromomethane	--	--	--	--	0.00066 UJ	--	--	--	--	--	--
Carbon Disulfide	--	--	--	--	0.00037 U	--	--	--	--	--	--
Carbon Tetrachloride	--	--	--	--	0.00025 U	--	--	--	--	--	--
Chlorobenzene	--	--	--	--	0.00025 U	--	--	--	--	--	--
Chloroethane	--	--	--	--	0.00073 U	--	--	--	--	--	--
Chloroform	--	--	--	--	0.00044 U	--	--	--	--	--	--
Chloromethane	--	--	--	--	0.0006 UJ	--	--	--	--	--	--
Cis-1,2-Dichloroethylene	--	--	--	--	0.00021 U	--	--	--	--	--	--
Cis-1,3-Dichloropropene	--	--	--	--	0.00038 U	--	--	--	--	--	--
Cyclohexane	--	--	--	--	0.00031 U	--	--	--	--	--	--
Dibromochloromethane	--	--	--	--	0.00027 U	--	--	--	--	--	--
Dichlorodifluoromethane	--	--	--	--	0.00047 UJ	--	--	--	--	--	--
Ethylbenzene	--	--	--	--	0.00028 U	--	--	--	--	--	--
Isopropylbenzene (Cumene)	--	--	--	--	0.00018 U	--	--	--	--	--	--
M,P-Xylene	--	--	--	--	0.00024 U	--	--	--	--	--	--
Methyl Acetate	--	--	--	--	0.4	--	--	--	--	--	--
Methyl Ethyl Ketone (2-Butanone)	--	--	--	--	0.009	--	--	--	--	--	--
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	--	--	--	--	0.00092 U	--	--	--	--	--	--

Table E-22
Summary of Data Used in Risk Assessment
Western Undeveloped Area Soil (0-0.5 ft-bgs) - Current
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-217	CFSB-218	CFSB-237	CFSB-238	CFSB-238	CFSB-238	CFSB-239	CFSB-239	CFSB-244	CFSB-245	CFSB-249
Sample Lab IDs	180-79108-9, 320-40608-11, 460-158919-9	180-79108-3, 320-40608-5, 460-158919-3	180-79108-13, 320-40608-15, 460-158919-13	180-79434-31, 460-159377-31	460-165504-1	320-43646-1	180-79434-25, 460-159377-25	320-43709-18	180-77673-26, 460-155989-48	180-77673-8, 460-155989-28	180-77393-32, 460-155265-34
Sample Name	CFSB-217-SO-0-0.5	CFSB-218-SO-0-0.5	CFSB-237-SO-0-0.5	CFSB-238-SO-0-0.5	CFSB-238a-SO-0-0.5	CFSB-238-SO-0-0.5	CFSB-239-SO-0-0.5	CFSB-239-SO-0-0.5	CFSB-244-SO-0-0.5	CFSB-245-SO-0-0.5	CFSB-249-SO-0-0.5
Sample Depth	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft
Chemical	6/21/2018	6/21/2018	6/21/2018	6/27/2018	9/25/2018	9/25/2018	6/27/2018	9/27/2018	5/9/2018	5/8/2018	5/1/2018
Methylcyclohexane	--	--	--	--	0.00022 U	--	--	--	--	--	--
Methylene Chloride	--	--	--	--	0.00023 U	--	--	--	--	--	--
O-Xylene (1,2-Dimethylbenzene)	--	--	--	--	0.00013 U	--	--	--	--	--	--
Styrene	--	--	--	--	0.00017 U	--	--	--	--	--	--
Tert-Butyl Methyl Ether	--	--	--	--	0.00017 U	--	--	--	--	--	--
Tetrachloroethylene (PCE)	--	--	--	--	0.0002 U	--	--	--	--	--	--
Toluene	--	--	--	--	0.003	--	--	--	--	--	--
Trans-1,2-Dichloroethene	--	--	--	--	0.00034 U	--	--	--	--	--	--
Trans-1,3-Dichloropropene	--	--	--	--	0.00037 U	--	--	--	--	--	--
Trichloroethylene (TCE)	--	--	--	--	0.0002 U	--	--	--	--	--	--
Trichlorofluoromethane	--	--	--	--	0.00056 U	--	--	--	--	--	--
Vinyl Chloride	--	--	--	--	0.00076 UJ	--	--	--	--	--	--

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-23
Summary of Data Used in Risk Assessment
Western Undeveloped Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-056A	CFMW-056A-DUP	CFMW-056A	CFMW-056A	CFMW-057A	CFMW-057A	CFMW-057A	CFMW-059A	CFMW-059A	CFMW-059A	CFMW-065	CFMW-065	CFMW-065	CFMW-065-DUP
Sample Lab IDs	460-117203-2	460-117203-7	460-117203-4	460-117203-5	460-117886-1	460-117886-2	460-117886-3	460-117573-6	460-117573-7	460-117573-8	180-77393-51, 460-155369-7	180-77393-52, 460-155369-8	180-77393-53, 460-155369-9	180-77393-54
Sample Name	CFMW-056a-SO-0-0.5	CFMW-DUP20-SO	CFMW-056a-SO-0.5-2	CFMW-056a-SO-10-12	CFMW-057a-SO-0-0.5	CFMW-057a-SO-0.5-2	CFMW-057a-SO-10-12	CFMW-059a-SO-0-0.5	CFMW-059a-SO-0.5-2	CFMW-059a-SO-10-12	CFMW-065-SO-0-0.5	CFMW-065-SO-0.5-2	CFMW-065-SO-10-12	CFMW-DUP27-S0
Sample Depth	0-0.5 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	10-12 ft
Chemical	7/15/2016	7/15/2016	7/15/2016	7/15/2016	7/27/2016	7/27/2016	7/27/2016	7/22/2016	7/22/2016	7/22/2016	5/2/2018	5/2/2018	5/2/2018	5/2/2018
GENERAL CHEMISTRY (mg/kg)														
Fluoride	3.15 J	10.7 J	3.64 J+	2.27 J+	15.4	1.41	1.34	14.2	2.87	3.17	1.16 J-	0.6 J-	0.77 J-	--
Cyanide	0.22	0.18	0.022 J	0.017 U	0.086 J	0.022 J	0.017 J	0.057 J	0.034 J	0.026 J	0.085 J	0.077 U	0.064 U	--
METALS (mg/kg)														
"Chromium, Hexavalent - Estimated"	0.337226	0.33455	0.299757	0.248905	0.222141	0.23017	0.337226	0.195377	0.232847	0.208759	0.396107	0.406813	0.235523	--
"Chromium, Trivalent - Estimated"	12.2628	12.1655	10.9002	9.05109	8.07786	8.36983	12.2628	7.10462	8.46715	7.59124	14.4039	14.7932	8.56448	--
Aluminum	19700	19100	19500	7250	14200	15400	4920	16600	14700	7030	16400	19600	8970	--
Antimony	0.47 UJ	0.44 UJ	0.4 UJ	0.41 UJ	0.35 UJ	0.36 UJ	0.34 UJ	0.47 U	0.41 U	0.41 U	0.28 UJ	0.29 UJ	0.27 UJ	--
Arsenic	6.4	5.8	5.7	3.3	4	3.7	2.3	3.8 J+	4.7 J+	4.6 J+	4.6	5.4	3.5	--
Barium	230	221	218	44.9	170	137	41.2	218	176	52.1	280	308	109	--
Beryllium	0.7	0.69	0.58	0.45	0.51	0.55	0.21 J	0.61 J	0.53 J	0.77 J	0.84	0.73	0.38	--
Cadmium	0.36 U	0.33 U	0.3 U	0.31 U	0.27 U	0.28 U	0.26 U	0.35 U	0.31 U	0.31 U	0.32 U	0.34 U	0.31 U	--
Calcium	5740 J	5520 J	2710 J	20300 J	2440 J+	1470 J+	1820 J+	2500 J	1800 J	39900 J	4180	2540	2960	--
Chromium, Total	12.6	12.5	11.2	9.3	8.3	8.6	12.6	7.3	8.7	7.8	14.8	15.2	8.8	--
Cobalt	6.7	6.3	6.6	4.8	5.4	5.8	4.6	5.4	4.7	3.8	5.9	6.4	3.6	--
Copper	20	19.1	11.5	9.9	11.2	11.3	12.4	13.9 J+	13.1 J+	12 J+	19.3 J	22.8	6.1 J	--
Iron	17700	17200	18500	12000	14000	14700	8160	13100	13600	11900	16200	16700	11100	--
Lead	13.1	12	9.6	4.2	9.6	8.1	3.6	9.3 J+	8.9 J+	5.4 J+	12.8 J	14.2	6.6 J	--
Magnesium	8450	8090	7640	8750	5840	6320	5320	4660	6780	13400	8830 J	10500	7230 J	--
Manganese	588	549	410	285	682	367	211	499	376	293	240 J	130	159 J	--
Mercury	0.031	0.028	0.012 J	0.011 J	0.012 U	0.012 U	0.013 U	0.022	0.017 J	0.022	0.018 J	0.012 U	0.011 U	--
Nickel	14.3	13.1	12.2	9.3	10.4	10.6	13.4	8.9	8.9	8.5	11.3	12.2	7.8	--
Potassium	1120	1090	751	870	1140	982	574	768	651	604	915	881	696	--
Selenium	0.57 J	0.58 J	0.37 U	0.39 U	0.33 U	0.34 U	0.31 U	0.44 U	0.38 U	0.38 U	0.27 U	0.29 U	0.27 U	--
Silver	0.86 U	0.8 U	0.73 U	0.76 U	0.65 U	0.67 U	0.61 U	0.86 U	0.74 U	0.75 U	0.58 UJ	0.62 U	0.57 UJ	--
Sodium	158 J	49.6 J	57.4 J	75.6 J	34.6 J	45.2 J	40.3 J	80.2 J	71.9 J	50.9 J	59.7 J	60.8 J	62.1 J	--
Thallium	0.18 U	0.16 U	0.15 U	0.16 U	0.13 U	0.14 U	0.13 U	0.18 U	0.15 U	0.15 U	0.12 U	0.12 U	0.11 U	--
Vanadium	13.8	12.5	13.5	9.5	13.9	16.7	8.3	14.2	12.6	5.9	9.7	10.3	6.6	--
Zinc	89	84.2	48.7	29.5	63.8	39.8	18.1	38.9	31.3	27	44.1	45.6	28	--
PESTICIDES (mg/kg)														
Aldrin	0.001 U	--	--	--	0.0009 U	--	--	0.00099 U	--	--	--	--	--	--
Alpha Bhc (Alpha Hexachlorocyclohexane)	0.00075 U	--	--	--	0.00068 U	--	--	0.00074 U	--	--	--	--	--	--
Alpha Endosulfan	0.0011 U	--	--	--	0.001 U	--	--	0.0011 U	--	--	--	--	--	--
Beta Bhc (Beta Hexachlorocyclohexane)	0.0008 U	--	--	--	0.00072 U	--	--	0.00079 U	--	--	--	--	--	--
Beta Endosulfan	0.0013 U	--	--	--	0.0012 U	--	--	0.0013 U	--	--	--	--	--	--
cis-Chlordane	0.0013 U	--	--	--	0.0012 U	--	--	0.0013 U	--	--	--	--	--	--
Delta BHC (Delta Hexachlorocyclohexane)	0.0009 U	--	--	--	0.00081 U	--	--	0.00089 U	--	--	--	--	--	--
Dieldrin	0.0011 U	--	--	--	0.00097 U	--	--	0.0011 U	--	--	--	--	--	--
Endosulfan Sulfate	0.00096 U	--	--	--	0.00087 U	--	--	0.00095 U	--	--	--	--	--	--
Endrin	0.0011 U	--	--	--	0.00095 U	--	--	0.001 U	--	--	--	--	--	--
Endrin Aldehyde	0.001 U	--	--	--	0.00092 U	--	--	0.001 U	--	--	--	--	--	--
Endrin Ketone	0.0011 U	--	--	--	0.001 U	--	--	0.0011 U	--	--	--	--	--	--
Gamma Bhc (Lindane)	0.00074 U	--	--	--	0.00067 U	--	--	0.00073 U	--	--	--	--	--	--
Heptachlor	0.0011 U	--	--	--	0.00096 U	--	--	0.001 U	--	--	--	--	--	--
Heptachlor Epoxide	0.0016 U	--	--	--	0.0015 U	--	--	0.0016 U	--	--	--	--	--	--
Methoxychlor	0.0018 U	--	--	--	0.0016 U	--	--	0.0017 U	--	--	--	--	--	--
P,P'-DDD	0.0011 U	--	--	--	0.00098 U	--	--	0.0011 U	--	--	--	--	--	--
P,P'-DDE	0.0012 U	--	--	--	0.0011 U	--	--	0.0012 U	--	--	--	--	--	--
P,P'-DDT	0.00085 U	--	--	--	0.00077 U	--	--	0.00084 U	--	--	--	--	--	--
Toxaphene	0.024 U	--	--	--	0.022 U	--	--	0.024 U	--	--	--	--	--	--
trans-Chlordane	0.0018 U	--	--	--	0.0016 U	--	--	0.0018 U	--	--	--	--	--	--
POLYCHLORINATED BIPHENYLS (mg/kg)														
PCB-1016 (Aroclor 1016)	0.011 U	0.01 U	0.0097 U	0.0093 U	0.0099 U	0.0096 U	0.0096 U	0.011 U	0.0098 U	0.0092 U	--	--	--	--
PCB-1221 (Aroclor 1221)	0.011 U	0.01 U	0.0097 U	0.0093 U	0.0099 U	0.0096 U	0.0096 U	0.011 U	0.0098 U	0.0092 U	--	--	--	--
PCB-1232 (Aroclor 1232)	0.011 U	0.01 U	0.0097 U	0.0093 U	0.0099 U	0.0096 U	0.0096 U	0.011 U	0.0098 U	0.0092 U	--	--	--	--
PCB-1242 (Aroclor 1242)	0.011 U	0.01 U	0.0097 U	0.0093 U	0.0099 U	0.0096 U	0.0096 U	0.011 U	0.0098 U	0.0092 U	--	--	--	--

Table E-23
Summary of Data Used in Risk Assessment
Western Undeveloped Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-056A	CFMW-056A-DUP	CFMW-056A	CFMW-056A	CFMW-057A	CFMW-057A	CFMW-057A	CFMW-059A	CFMW-059A	CFMW-059A	CFMW-065	CFMW-065	CFMW-065	CFMW-065-DUP
Sample Lab IDs	460-117203-2	460-117203-7	460-117203-4	460-117203-5	460-117886-1	460-117886-2	460-117886-3	460-117573-6	460-117573-7	460-117573-8	180-77393-51, 460-155369-7	180-77393-52, 460-155369-8	180-77393-53, 460-155369-9	180-77393-54
Sample Name	CFMW-056a-SO-0-0.5	CFMW-DUP20-SO	CFMW-056a-SO-0.5-2	CFMW-056a-SO-10-12	CFMW-057a-SO-0-0.5	CFMW-057a-SO-0.5-2	CFMW-057a-SO-10-12	CFMW-059a-SO-0-0.5	CFMW-059a-SO-0.5-2	CFMW-059a-SO-10-12	CFMW-065-SO-0-0.5	CFMW-065-SO-0.5-2	CFMW-065-SO-10-12	CFMW-DUP27-S0
Sample Depth	0-0.5 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	10-12 ft
Chemical	7/15/2016	7/15/2016	7/15/2016	7/15/2016	7/27/2016	7/27/2016	7/27/2016	7/22/2016	7/22/2016	7/22/2016	5/2/2018	5/2/2018	5/2/2018	5/2/2018
PCB-1248 (Aroclor 1248)	0.011 U	0.01 U	0.0097 U	0.0093 U	0.0099 U	0.0096 U	0.0096 U	0.011 U	0.0098 U	0.0092 U	--	--	--	--
PCB-1254 (Aroclor 1254)	0.011 U	0.011 U	0.01 U	0.0096 U	0.01 U	0.0099 U	0.0099 U	0.011 U	0.01 U	0.0095 U	--	--	--	--
PCB-1260 (Aroclor 1260)	0.011 U	0.011 U	0.01 U	0.0096 U	0.01 U	0.0099 U	0.0099 U	0.011 U	0.01 U	0.0095 U	--	--	--	--
PCB-1262 (Aroclor 1262)	0.011 U	0.011 U	0.01 U	0.0096 U	0.01 U	0.0099 U	0.0099 U	0.011 U	0.01 U	0.0095 U	--	--	--	--
PCB-1268 (Aroclor 1268)	0.011 U	0.011 U	0.01 U	0.0096 U	0.01 U	0.0099 U	0.0099 U	0.011 U	0.01 U	0.0095 U	--	--	--	--
Polychlorinated Biphenyl (PCBs)	0.011 U	0.011 U	0.01 U	0.0096 U	0.01 U	0.0099 U	0.0099 U	0.011 U	0.01 U	0.0095 U	--	--	--	--
SEMIVOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,2,4,5-Tetrachlorobenzene	0.03 U	0.028 U	0.027 U	0.026 U	0.027 UJ	0.027 U	0.026 U	0.03 U	0.027 U	0.025 U	0.0018 U	0.0018 U	0.0016 U	0.0016 U
1,4-Dioxane (P-Dioxane)	0.11 U	0.1 U	0.096 U	0.092 U	0.099 U	0.095 U	0.095 U	0.11 U	0.098 U	0.091 U	0.013 U	0.013 U	0.011 U	0.012 U
2,3,4,6-Tetrachlorophenol	0.038 U	0.036 U	0.034 U	0.032 UJ	0.035 UJ	0.034 U	0.033 U	0.038 U	0.034 U	0.032 U	0.017 U	0.018 U	0.015 U	0.016 U
2,4,5-Trichlorophenol	0.041 U	0.038 U	0.036 U	0.034 UJ	0.037 UJ	0.035 U	0.035 U	0.04 U	0.036 U	0.034 U	0.0029 U	0.003 U	0.0026 U	0.0027 U
2,4,6-Trichlorophenol	0.012 U	0.011 U	0.01 U	0.0098 UJ	0.01 UJ	0.01 U	0.01 U	0.011 U	0.01 U	0.0097 U	0.0022 U	0.0023 U	0.002 U	0.0021 U
2,4-Dichlorophenol	0.0096 U	0.009 U	0.0085 U	0.0081 U	0.0087 UJ	0.0084 U	0.0084 U	0.0095 U	0.0086 U	0.008 U	0.0032 U	0.0033 U	0.0028 U	0.0029 U
2,4-Dimethylphenol	0.09 U	0.084 U	0.079 U	0.076 U	0.081 UJ	0.078 U	0.078 U	0.088 U	0.08 U	0.075 U	0.0025 U	0.0026 U	0.0023 U	0.0023 U
2,4-Dinitrophenol	0.31 U	0.29 U	0.27 U	0.26 UR	0.28 UJ	0.27 U	0.27 U	0.3 U	0.28 U	0.26 U	0.11 U	0.11 UJ	0.098 U	0.1 U
2,4-Dinitrotoluene	0.016 U	0.015 U	0.014 U	0.014 U	0.015 UJ	0.014 U	0.014 U	0.016 U	0.014 U	0.013 U	0.002 U	0.0021 U	0.0018 U	0.0019 U
2,6-Dinitrotoluene	0.022 U	0.02 U	0.019 U	0.018 U	0.02 UJ	0.019 U	0.019 U	0.021 U	0.019 U	0.018 U	0.0025 U	0.0026 U	0.0023 U	0.0023 U
2-Chloronaphthalene	0.0093 U	0.0086 U	0.0081 U	0.0078 U	0.0084 UJ	0.0081 U	0.0081 U	0.0091 U	0.0083 U	0.0077 U	0.0019 U	0.0019 U	0.0017 U	0.0017 U
2-Chlorophenol	0.01 U	0.0097 U	0.0091 U	0.0088 U	0.0094 UJ	0.0091 U	0.009 U	0.01 U	0.0093 U	0.0087 U	0.0019 U	0.002 U	0.0017 U	0.0018 U
2-Methylnaphthalene	0.009 U	0.0084 U	0.0079 U	0.0076 U	0.0081 UJ	0.0079 U	0.0079 U	0.0089 U	0.0081 U	0.0075 U	0.002 U	0.002 U	0.0018 U	0.0018 U
2-Methylphenol (O-Cresol)	0.018 U	0.017 U	0.016 U	0.015 U	0.016 UJ	0.016 U	0.016 U	0.017 U	0.016 U	0.015 U	0.012 U	0.012 U	0.01 U	0.011 U
2-Nitroaniline	0.013 U	0.013 U	0.012 U	0.011 U	0.012 U	0.012 U	0.012 U	0.013 U	0.012 U	0.011 U	0.019 U	0.019 U	0.017 U	0.017 U
2-Nitrophenol	0.014 U	0.013 U	0.012 U	0.012 UJ	0.012 UJ	0.012 U	0.012 U	0.013 U	0.012 U	0.011 U	0.0023 U	0.0024 U	0.0021 U	0.0022 U
3- And 4- Methylphenol (Total)	0.011 U	0.01 U	0.0096 U	0.0092 U	0.0098 UJ	0.0095 U	0.0095 U	0.011 U	0.0097 U	0.0091 U	--	--	--	--
3,3'-Dichlorobenzidine	0.046 U	0.043 U	0.04 U	0.039 U	0.041 U	0.04 U	0.04 U	0.045 U	0.041 U	0.038 U	0.038 U	0.039 U	0.034 U	0.035 U
3-Nitroaniline	0.012 U	0.011 U	0.011 U	0.01 U	0.011 U	0.011 U	0.011 U	0.012 U	0.011 U	0.01 U	0.01 U	0.011 U	0.0093 U	0.0096 U
4,6-Dinitro-2-Methylphenol	0.11 U	0.1 U	0.096 U	0.092 UJ	0.098 UJ	0.095 U	0.095 U	0.11 U	0.097 U	0.091 U	0.071 U	0.073 U	0.063 U	0.065 U
4-Bromophenyl Phenyl Ether	0.013 U	0.012 U	0.011 U	0.011 U	0.012 UJ	0.011 U	0.011 U	0.013 U	0.011 U	0.011 U	0.0029 U	0.003 U	0.0026 U	0.0026 U
4-Chloro-3-Methylphenol	0.018 U	0.016 U	0.015 U	0.015 U	0.016 UJ	0.015 U	0.015 U	0.017 U	0.016 U	0.015 U	0.0019 U	0.002 U	0.0017 U	0.0018 U
4-Chloroaniline	0.01 U	0.0098 U	0.0092 U	0.0089 U	0.0095 U	0.0092 U	0.0092 U	0.01 U	0.0094 U	0.0088 U	0.0014 U	0.0014 U	0.0012 U	0.0013 U
4-Chlorophenyl Phenyl Ether	0.012 U	0.011 U	0.011 U	0.01 U	0.011 UJ	0.011 U	0.011 U	0.012 U	0.011 U	0.01 U	0.0025 U	0.0026 U	0.0022 U	0.0023 U
4-Nitroaniline	0.015 U	0.014 U	0.014 U	0.013 U	0.014 UJ	0.013 U	0.013 U	0.015 U	0.014 U	0.013 U	0.002 U	0.0021 U	0.0018 U	0.0018 U
4-Nitrophenol	0.2 U	0.18 U	0.17 U	0.17 U	0.18 U	0.17 U	0.17 U	0.19 U	0.18 U	0.16 U	0.029 U	0.03 U	0.026 U	0.027 U
Acenaphthene	0.0099 U	0.0092 U	0.0087 U	0.0084 U	0.0089 UJ	0.0086 U	0.0086 U	0.0097 U	0.0088 U	0.0082 U	0.0024 U	0.0024 U	0.0021 U	0.0022 U
Acenaphthylene	0.01 U	0.0098 U	0.0092 U	0.0089 U	0.0095 UJ	0.0092 U	0.0092 U	0.01 U	0.0094 U	0.0088 U	0.0018 U	0.0018 U	0.0016 U	0.0017 U
Acetophenone	0.0089 U	0.0083 U	0.0078 U	0.0075 U	0.008 UJ	0.0078 U	0.0078 U	0.0087 U	0.008 U	0.0074 U	0.0022 U	0.0023 U	0.002 U	0.0021 U
Anthracene	0.039 U	0.036 U	0.034 U	0.033 U	0.035 UJ	0.034 U	0.034 U	0.038 U	0.035 U	0.032 U	0.0021 U	0.0022 U	0.0019 U	0.002 U
Atrazine	0.018 U	0.017 U	0.016 U	0.015 U	0.016 U	0.016 U	0.016 U	0.018 U	0.016 U	0.015 U	0.018 U	0.018 U	0.016 U	0.017 U
Benzaldehyde	0.031 U	0.029 U	0.027 U	0.026 U	0.028 UJ	0.027 U	0.027 U	0.031 U	0.028 U	0.026 U	0.0051 U	0.0052 U	0.0045 U	0.0047 U
Benzo(A)Anthracene	0.076	0.056	0.03 U	0.029 U	0.031 UJ	0.03 U	0.03 U	0.034 U	0.03 U	0.028 U	0.0019 J	0.0016 U	0.0014 U	0.0014 U
Benzo(A)Pyrene	0.11	0.069	0.011 U	0.01 U	0.011 UJ	0.011 U	0.011 U	0.012 U	0.011 U	0.01 U	0.002 J	0.0018 U	0.0016 U	0.0016 U
Benzo(B)Fluoranthene	0.24	0.15	0.014 U	0.013 U	0.014 UJ	0.014 U	0.014 U	0.016 U	0.014 U	0.013 U	0.0032 J	0.0021 U	0.0018 U	0.0019 U
Benzo(G,H,I)Perylene	0.097 J	0.058 J	0.021 U	0.02 U	0.021 U	0.02 U	0.02 U	0.023 U	0.021 U	0.02 U	0.0025 J	0.0018 U	0.0016 U	0.0016 U
Benzo(K)Fluoranthene	0.063	0.038	0.016 U	0.015 U	0.016 UJ	0.016 U	0.016 U	0.017 U	0.016 U	0.015 U	0.0025 U	0.0025 U	0.0022 U	0.0023 U
Benzyl Butyl Phthalate	0.013 U	0.012 U	0.011 U	0.011 U	0.011 UJ	0.011 U	0.011 U	0.012 U	0.011 U	0.011 U	0.028 U	0.029 U	0.025 U	0.026 U
Biphenyl (Diphenyl)	0.035 U	0.033 U	0.031 U	0.029 U	0.031 UJ	0.03 U	0.03 U	0.034 U	0.031 U	0.029 U	0.0017 U	0.0018 U	0.0015 U	0.0016 U
Bis(2-Chloroethoxy) Methane	0.013 U	0.012 U	0.011 U	0.011 U	0.011 UJ	0.011 U	0.011 U	0.013 U	0.011 U	0.011 U	0.002 U	0.002 U	0.0017 U	0.0018 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.0096 U	0.009 U	0.0085 U	0.0081 U	0.0087 UJ	0.0084 U	0.0084 U	0.0095 U	0.0086 U	0.008 U	0.0015 U	0.0015 U	0.0013 U	0.0014 U
Bis(2-Chloroisopropyl) Ether	0.017 U	0.016 U	0.015 U	0.014 U	0.015 U	0.015 U	0.015 U	0.017 U	0.015 U	0.014 U	0.003 U	0.0031 U	0.0027 U	0.0028 U
Bis(2-Ethylhexyl) Phthalate	0.016 U	0.015 U	0.014 U	0.013 U	0.014 UJ	0.014 U	0.014 U	0.016 U	0.014 U	0.013 U	0.044 U	0.045 U	0.039 U	0.04 U
Caprolactam	0.029 U	0.027 U	0.026 U	0.025 U	0.027 UJ	0.026 U	0.026 U	0.029 U	0.026 U	0.025 U	0.027 U	0.027 U	0.024 U	0.025 U
Carbazole	0.016 J	0.012 J	0.0089 U	0.0086 U	0.0091 UJ	0.0088 U	0.0088 U	0.01 U	0.0091 U	0.0084 U	0.0019 U	0.002 U	0.0017 U	0.0018 U
Chrysene	0.15 J	0.1 J	0.0098 U	0.0094 U	0.01 UJ	0.0097 U	0.0097 U	0.011 U	0.0099 U	0.0093 U	0.0027 J	0.0017 U	0.0014 U	0.0015 U
Dibenz(A,H)Anthracene	0.027 J	0.02 U	0.019 U	0.018 U	0.019 U	0.019 U	0.019 U	0.021 U	0.019 U	0.018 U	0.0018 U	0.0019 U	0.0016 U	0.0017 U
Dibenzofuran	0.012 U	0.012 U	0.011 U	0.01 U	0.011 UJ	0.011 U	0.011 U	0.012 U	0.011 U	0.01 U	0.0018 U	0.0018 U	0.0016 U	0.0017 U
Diethyl Phthalate	0.012 U	0.011 U	0.01 U	0.0098 U	0.01 UJ	0.01 U	0.01 U	0.011 U	0.01 U	0.0097 U	0.012 U	0.013 U	0.011 U	0.011 U

Table E-23
Summary of Data Used in Risk Assessment
Western Undeveloped Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-056A	CFMW-056A-DUP	CFMW-056A	CFMW-056A	CFMW-057A	CFMW-057A	CFMW-057A	CFMW-059A	CFMW-059A	CFMW-059A	CFMW-065	CFMW-065	CFMW-065	CFMW-065-DUP
Sample Lab IDs	460-117203-2	460-117203-7	460-117203-4	460-117203-5	460-117886-1	460-117886-2	460-117886-3	460-117573-6	460-117573-7	460-117573-8	180-77393-51, 460-155369-7	180-77393-52, 460-155369-8	180-77393-53, 460-155369-9	180-77393-54
Sample Name	CFMW-056a-SO-0-0.5	CFMW-DUP20-SO	CFMW-056a-SO-0.5-2	CFMW-056a-SO-10-12	CFMW-057a-SO-0-0.5	CFMW-057a-SO-0.5-2	CFMW-057a-SO-10-12	CFMW-059a-SO-0-0.5	CFMW-059a-SO-0.5-2	CFMW-059a-SO-10-12	CFMW-065-SO-0-0.5	CFMW-065-SO-0.5-2	CFMW-065-SO-10-12	CFMW-DUP27-S0
Sample Depth	0-0.5 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	10-12 ft
Chemical	7/15/2016	7/15/2016	7/15/2016	7/15/2016	7/27/2016	7/27/2016	7/27/2016	7/22/2016	7/22/2016	7/22/2016	5/2/2018	5/2/2018	5/2/2018	5/2/2018
Dimethyl Phthalate	0.012 U	0.011 U	0.01 U	0.01 U	0.011 UJ	0.01 U	0.01 U	0.012 U	0.011 U	0.0099 U	0.0015 U	0.0015 U	0.0013 U	0.0014 U
Di-N-Butyl Phthalate	0.012 U	0.011 U	0.011 U	0.01 U	0.011 J	0.011 U	0.011 U	0.012 U	0.013 J	0.01 U	0.018 U	0.018 U	0.016 U	0.017 U
Di-N-Octylphthalate	0.021 U	0.019 U	0.018 U	0.018 U	0.019 U	0.018 U	0.018 U	0.02 U	0.019 U	0.017 U	0.024 U	0.025 U	0.021 U	0.022 U
Fluoranthene	0.15 J	0.1 J	0.011 U	0.01 U	0.011 UJ	0.011 U	0.011 U	0.012 U	0.011 U	0.01 U	0.0031 J	0.0022 U	0.0019 U	0.002 U
Fluorene	0.0089 U	0.0083 U	0.0078 U	0.0075 U	0.008 UJ	0.0078 U	0.0078 U	0.0087 U	0.008 U	0.0074 U	0.0016 U	0.0017 U	0.0014 U	0.0015 U
Hexachlorobenzene	0.017 U	0.015 U	0.015 U	0.014 U	0.015 UJ	0.014 U	0.014 U	0.016 U	0.015 U	0.014 U	0.0029 U	0.003 U	0.0026 U	0.0027 U
Hexachlorobutadiene	0.011 U	0.011 U	0.01 U	0.0097 U	0.01 UJ	0.01 U	0.01 U	0.011 U	0.01 U	0.0096 U	0.0024 U	0.0025 U	0.0021 U	0.0022 U
Hexachlorocyclopentadiene	0.025 U	0.024 U	0.022 U	0.022 U	0.023 U	0.022 U	0.022 U	0.025 U	0.023 U	0.021 U	0.0021 U	0.0022 U	0.0019 U	0.0019 U
Hexachloroethane	0.015 U	0.014 U	0.013 U	0.013 U	0.013 UJ	0.013 U	0.013 U	0.015 U	0.013 U	0.012 U	0.0021 U	0.0022 U	0.0019 U	0.002 U
Indeno(1,2,3-C,D)Pyrene	0.086	0.06	0.024 U	0.023 U	0.025 U	0.024 U	0.024 U	0.027 U	0.024 U	0.023 U	0.0017 U	0.0017 U	0.0015 U	0.0015 U
Isophorone	0.0088 U	0.0082 U	0.0077 U	0.0074 U	0.0079 UJ	0.0077 U	0.0076 U	0.0086 U	0.0078 U	0.0073 U	0.0021 U	0.0022 U	0.0019 U	0.0019 U
Naphthalene	0.01 U	0.0097 U	0.0091 U	0.0088 U	0.0094 UJ	0.0091 U	0.009 U	0.01 U	0.0093 U	0.0087 U	0.0016 U	0.0016 U	0.0014 U	0.0015 U
Nitrobenzene	0.013 U	0.012 U	0.011 U	0.011 U	0.012 UJ	0.011 U	0.011 U	0.013 U	0.011 U	0.011 U	0.015 U	0.015 U	0.013 U	0.014 U
N-Nitrosodi-N-Propylamine	0.014 U	0.013 U	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U	0.013 U	0.012 U	0.011 U	0.0028 U	0.0029 U	0.0025 U	0.0026 U
N-Nitrosodiphenylamine	0.037 U	0.035 U	0.033 U	0.031 UJ	0.033 UJ	0.032 U	0.032 U	0.036 U	0.033 U	0.031 U	0.014 U	0.014 U	0.012 U	0.013 U
Pentachlorophenol	0.049 U	0.046 U	0.043 U	0.042 UJ	0.045 UJ	0.043 U	0.043 U	0.049 U	0.044 U	0.041 U	0.066 U	0.068 U	0.059 U	0.061 U
Phenanthrene	0.077 J	0.058 J	0.0096 U	0.0092 U	0.0098 UJ	0.0095 U	0.0095 U	0.011 U	0.0097 U	0.0091 U	0.0022 U	0.0023 U	0.002 U	0.002 U
Phenol	0.013 U	0.012 U	0.012 U	0.011 U	0.012 UJ	0.012 U	0.012 U	0.013 U	0.012 U	0.011 U	0.012 U	0.013 U	0.011 U	0.011 U
Pyrene	0.16 J	0.1 J	0.016 U	0.016 U	0.017 U	0.016 U	0.016 U	0.018 U	0.017 U	0.015 U	0.0024 J	0.002 U	0.0017 U	0.0018 U
VOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,1,1-Trichloroethane	--	0.00046 U	0.00038 U	0.00035 U	--	0.00033 U	0.00033 U	--	0.00034 U	0.00033 U	--	--	--	--
1,1,2,2-Tetrachloroethane	--	0.00021 UJ	0.00017 UJ	0.00016 UJ	--	0.00015 U	0.00015 U	--	0.00015 U	0.00015 U	--	--	--	--
1,1,2-Trichloro-1,2,2-Trifluoroethane	--	0.00053 U	0.00044 U	0.00041 U	--	0.00038 U	0.00039 U	--	0.00039 U	0.00038 U	--	--	--	--
1,1,2-Trichloroethane	--	0.00034 U	0.00028 U	0.00026 U	--	0.00024 U	0.00025 U	--	0.00025 U	0.00024 U	--	--	--	--
1,1-Dichloroethane	--	0.00041 U	0.00034 U	0.00032 U	--	0.0003 U	0.0003 U	--	0.0003 U	0.00029 U	--	--	--	--
1,1-Dichloroethene	--	0.0005 U	0.00041 U	0.00038 U	--	0.00036 U	0.00036 U	--	0.00036 U	0.00035 U	--	--	--	--
1,2,3-Trichlorobenzene	--	0.00013 UJ	0.00011 UJ	0.0001 UJ	--	0.000096 U	0.000097 U	--	0.000097 U	0.000094 U	--	--	--	--
1,2,4-Trichlorobenzene	--	0.00039 U	0.00032 U	0.0003 UJ	--	0.00028 U	0.00028 U	--	0.00028 U	0.00027 U	--	--	--	--
1,2-Dibromo-3-Chloropropane	--	0.00057 U	0.00047 U	0.00044 U	--	0.00041 U	0.00041 UJ	--	0.00042 UJ	0.0004 UJ	--	--	--	--
1,2-Dibromoethane (Ethylene Dibromide)	--	0.00014 U	0.00012 U	0.00011 U	--	0.0001 U	0.00011 U	--	0.00011 U	0.0001 U	--	--	--	--
1,2-Dichlorobenzene	--	0.00017 U	0.00014 U	0.00013 U	--	0.00012 U	0.00012 UJ	--	0.00012 U	0.00012 U	--	--	--	--
1,2-Dichloroethane	--	0.00013 U	0.00011 U	0.0001 U	--	0.000096 U	0.000097 U	--	0.000097 U	0.000094 U	--	--	--	--
1,2-Dichloropropane	--	0.00021 U	0.00017 U	0.00016 U	--	0.00015 U	0.00015 U	--	0.00015 U	0.00015 U	--	--	--	--
1,3-Dichlorobenzene	--	0.00014 U	0.00012 U	0.00011 U	--	0.0001 U	0.00011 U	--	0.00011 U	0.0001 U	--	--	--	--
1,4-Dichlorobenzene	--	0.00016 U	0.00013 U	0.00012 U	--	0.00011 U	0.00011 U	--	0.00012 U	0.00011 U	--	--	--	--
2-Hexanone	--	0.0011 U	0.00094 U	0.00087 U	--	0.00082 U	0.00083 U	--	0.00083 U	0.00081 U	--	--	--	--
Acetone	--	0.0013 U	0.034 J+	0.00099 U	--	0.025	0.0069 J-	--	0.051	0.01	--	--	--	--
Benzene	--	0.00024 U	0.0002 U	0.00019 U	--	0.00017 U	0.00018 U	--	0.00018 U	0.00036 J	--	--	--	--
Bromochloromethane	--	0.00021 U	0.00017 U	0.00016 U	--	0.00015 U	0.00015 U	--	0.00015 U	0.00015 U	--	--	--	--
Bromodichloromethane	--	0.00046 U	0.00038 U	0.00035 U	--	0.00033 U	0.00033 U	--	0.00034 U	0.00033 U	--	--	--	--
Bromoform	--	0.00016 UJ	0.00013 UJ	0.00012 UJ	--	0.00011 U	0.00011 UJ	--	0.00012 U	0.00011 U	--	--	--	--
Bromomethane	--	0.00039 U	0.00032 U	0.0003 U	--	0.00028 U	0.00028 U	--	0.00028 U	0.00027 U	--	--	--	--
Carbon Disulfide	--	0.00052 U	0.00043 U	0.0004 U	--	0.00037 U	0.00038 U	--	0.00038 U	0.00056 J	--	--	--	--
Carbon Tetrachloride	--	0.00052 UJ	0.00043 UJ	0.0004 UJ	--	0.00037 U	0.00038 U	--	0.00038 U	0.00037 U	--	--	--	--
Chlorobenzene	--	0.00017 U	0.00014 U	0.00013 U	--	0.00012 U	0.00012 U	--	0.00012 U	0.00012 U	--	--	--	--
Chloroethane	--	0.00042 U	0.00035 U	0.00033 U	--	0.0003 U	0.00031 U	--	0.00031 U	0.0003 U	--	--	--	--
Chloroform	--	0.00025 U	0.00021 U	0.0002 U	--	0.00018 U	0.00018 U	--	0.00019 U	0.00018 U	--	--	--	--
Chloromethane	--	0.00046 U	0.00038 U	0.00035 U	--	0.00033 U	0.00033 U	--	0.00034 U	0.00033 U	--	--	--	--
Cis-1,2-Dichloroethylene	--	0.00027 U	0.00022 U	0.0002 U	--	0.00019 U	0.00019 U	--	0.00019 U	0.00019 U	--	--	--	--
Cis-1,3-Dichloropropene	--	0.00018 U	0.00015 U	0.00014 U	--	0.00013 U	0.00013 U	--	0.00013 U	0.00013 U	--	--	--	--
Cyclohexane	--	0.00056 U	0.00046 U	0.00044 J	--	0.0004 U	0.00041 U	--	0.00041 U	0.00039 U	--	--	--	--
Dibromochloromethane	--	0.00018 UJ	0.00015 UJ	0.00014 UJ	--	0.00013 U	0.00013 U	--	0.00013 U	0.00013 U	--	--	--	--
Dichlorodifluoromethane	--	0.00039 UJ	0.00032 UJ	0.0003 UJ	--	0.00028 U	0.00028 U	--	0.00028 U	0.00027 U	--	--	--	--
Ethylbenzene	--	0.00022 U	0.00018 U	0.00017 U	--	0.00016 U	0.00016 U	--	0.00016 U	0.0003 J	--	--	--	--
Isopropylbenzene (Cumene)	--	0.00021 U	0.00017 U	0.00016 U	--	0.00015 U	0.00015 U	--	0.00015 U	0.00015 U	--	--	--	--
M,P-Xylene	--	0.00013 U	0.00011 U	0.0001 U	--	0.000096 U	0.00026 J	--	0.000097 U	0.001	--	--	--	--

Table E-23
Summary of Data Used in Risk Assessment
Western Undeveloped Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-056A	CFMW-056A-DUP	CFMW-056A	CFMW-056A	CFMW-057A	CFMW-057A	CFMW-057A	CFMW-059A	CFMW-059A	CFMW-059A	CFMW-065	CFMW-065	CFMW-065	CFMW-065-DUP
Sample Lab IDs	460-117203-2	460-117203-7	460-117203-4	460-117203-5	460-117886-1	460-117886-2	460-117886-3	460-117573-6	460-117573-7	460-117573-8	180-77393-51, 460-155369-7	180-77393-52, 460-155369-8	180-77393-53, 460-155369-9	180-77393-54
Sample Name	CFMW-056a-SO-0-0.5	CFMW-DUP20-SO	CFMW-056a-SO-0.5-2	CFMW-056a-SO-10-12	CFMW-057a-SO-0-0.5	CFMW-057a-SO-0.5-2	CFMW-057a-SO-10-12	CFMW-059a-SO-0-0.5	CFMW-059a-SO-0.5-2	CFMW-059a-SO-10-12	CFMW-065-SO-0-0.5	CFMW-065-SO-0.5-2	CFMW-065-SO-10-12	CFMW-DUP27-S0
Sample Depth	0-0.5 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	10-12 ft
Chemical	7/15/2016	7/15/2016	7/15/2016	7/15/2016	7/27/2016	7/27/2016	7/27/2016	7/22/2016	7/22/2016	7/22/2016	5/2/2018	5/2/2018	5/2/2018	5/2/2018
Methyl Acetate	--	0.0011 U	0.0009 U	0.00084 U	--	0.00078 U	0.00079 U	--	0.0008 U	0.00077 U	--	--	--	--
Methyl Ethyl Ketone (2-Butanone)	--	0.00093 U	0.00077 U	0.00072 U	--	0.0022 J	0.0044 J-	--	0.00068 U	0.00066 U	--	--	--	--
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	--	0.0027 U	0.0022 U	0.0021 U	--	0.0019 U	0.002 UJ	--	0.002 U	0.0019 U	--	--	--	--
Methylcyclohexane	--	0.0006 U	0.0005 U	0.0005 J	--	0.00043 U	0.00044 U	--	0.00044 U	0.0012	--	--	--	--
Methylene Chloride	--	0.00039 U	0.00032 U	0.0003 U	--	0.00028 U	0.00028 U	--	0.00028 U	0.00027 U	--	--	--	--
O-Xylene (1,2-Dimethylbenzene)	--	0.00019 U	0.00016 U	0.00015 U	--	0.00014 U	0.00014 U	--	0.00014 U	0.00033 J	--	--	--	--
Styrene	--	0.00018 U	0.00015 U	0.00014 U	--	0.00013 U	0.00013 U	--	0.00013 U	0.00013 U	--	--	--	--
Tert-Butyl Methyl Ether	--	0.00021 U	0.00017 U	0.00016 U	--	0.00015 U	0.00015 U	--	0.00015 U	0.00015 U	--	--	--	--
Tetrachloroethylene (PCE)	--	0.00034 U	0.00028 U	0.00026 U	--	0.00024 U	0.00025 U	--	0.00025 U	0.00024 U	--	--	--	--
Toluene	--	0.00023 U	0.00019 U	0.0006 J	--	0.00017 U	0.00053 J	--	0.0011	0.0014	--	--	--	--
Trans-1,2-Dichloroethene	--	0.00047 U	0.00039 U	0.00036 U	--	0.00034 U	0.00034 U	--	0.00035 U	0.00033 U	--	--	--	--
Trans-1,3-Dichloropropene	--	0.00012 U	0.0001 U	0.000093 U	--	0.000087 U	0.000088 U	--	0.000089 U	0.000086 U	--	--	--	--
Trichloroethylene (TCE)	--	0.00031 U	0.00026 U	0.00024 U	--	0.00023 U	0.00023 U	--	0.00023 U	0.00022 U	--	--	--	--
Trichlorofluoromethane	--	0.00041 U	0.00034 U	0.00032 U	--	0.0003 U	0.0003 U	--	0.0003 U	0.00029 U	--	--	--	--
Vinyl Chloride	--	0.00047 U	0.00039 U	0.00036 U	--	0.00034 U	0.00034 U	--	0.00035 U	0.00033 U	--	--	--	--

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-23
Summary of Data Used in Risk Assessment
Western Undeveloped Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-065-DUP	CFMW-068	CFMW-068	CFMW-068-DUP	CFMW-068	CFMW-069	CFMW-069	CFMW-069	CFMW-071	CFMW-071	CFMW-071-DUP	CFMW-071	CFSB-120	CFSB-120
Sample Lab IDs	460-155369-10	180-77673-51, 460-155989-73	180-77673-52, 460-155989-74	180-77673-54, 460-155989-76	180-77673-53, 460-155989-75	180-77673-5, 460-155989-25	180-77673-6, 460-155989-26	180-77673-7, 460-155989-27	180-77393-68, 460-155369-26	180-77393-69, 460-155369-27	180-77393-70, 460-155369-28	180-77393-71, 460-155369-29	460-114141-10	460-114141-11
Sample Name	CFMW-DUP27-SO	CFMW-068-SO-0-0.5	CFMW-068-SO-0.5-2	CFSB-DUP33-SO	CFMW-068-SO-10-12	CFMW-069-SO-0-0.5	CFMW-069-SO-0.5-2	CFMW-069-SO-10-12	CFMW-071-SO-0-0.5	CFMW-071-SO-0.5-2	CFMW-DUP28-SO	CFMW-071-SO-10-12	CFSB-120-SO-0-0.5	CFSB-120-SO-0.5-2.0
Sample Depth	10-12 ft	0-0.5 ft	0.5-2 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft
Chemical	5/2/2018	5/10/2018	5/10/2018	5/10/2018	5/10/2018	5/8/2018	5/8/2018	5/8/2018	5/3/2018	5/3/2018	5/3/2018	5/3/2018	5/18/2016	5/18/2016
GENERAL CHEMISTRY (mg/kg)														
Fluoride	0.61 J-	3.94 J-	3.11 J-	2.8 J-	3.16 J-	5.83 J+	9.54 J+	0.75 J+	3.37 J-	6.01 J-	9 J-	3.91 J-	5.63 J	2.43 J-
Cyanide	0.065 U	0.26 J	0.13 J-	0.098 J-	0.078 J-	0.26 J	0.084 J	0.059 U	0.072 U	0.18 J	0.091 J	0.063 U	0.11 J	0.078 J
METALS (mg/kg)														
"Chromium, Hexavalent - Estimated"	0.289051	0.313139	0.275669	0.264964	0.216788	0.222141	0.281022	0.232847	0.235523	0.275669	0.222141	0.286375	0.452311	0.559367
"Chromium, Trivalent - Estimated"	10.5109	11.3869	10.0243	9.63504	7.88321	8.07786	10.219	8.46715	8.56448	10.0243	8.07786	10.4136	16.4477	20.3406
Aluminum	11000	16500	10300	11300	6600	16000	23600	7130	11200	22000	18700	9350	20400	30900
Antimony	0.26 UJ	0.33 U	0.3 U	0.32 U	0.24 UJ	0.3 UJ	0.25 UJ	0.24 UJ	0.34 UJ	0.33 UJ	0.31 UJ	0.24 UJ	0.37 UJ	0.42 UJ
Arsenic	3.3	4.1	4 J	7.9 J	4.2	4.9	4.9	5.3	4.4	6.8	4.2	5.4	4.5	5.6
Barium	151	226	74.5	90.6	83.3	336	274	88.8	105	224	192	98.2	245	440
Beryllium	0.36	0.56	0.42	0.58	0.26 J	0.68	0.99	0.46	0.19 U	0.79	0.73	0.41	0.97	1.2
Cadmium	0.3 U	0.37 U	0.35 U	0.36 U	0.28 U	0.34 U	0.29 U	0.28 U	0.39 U	0.37 U	0.35 U	0.28 U	0.28 U	0.32 U
Calcium	2820	2630	6640 J	1720 J	36300 J	4320	1950	26900	32300	3290	2840	15500	3520	3600
Chromium, Total	10.8	11.7	10.3	9.9	8.1	8.3	10.5	8.7	8.8	10.3	8.3	10.7	16.9	20.9
Cobalt	4	6.7	5.4	6.3	4.3	5.7	6.9	5	5.4	6.7	6.3	4.9	6.2	7.2
Copper	7.3 J	11.4	17.7	20.8	20.2 J	11	12	12.3	16.9 J	13.2 J	11.7 J	16.2 J	20.3	23
Iron	11000	15100	14700	16800	11400	14200	18300	13700	13600	16600	14100	14200	17300	18200
Lead	6.6 J	16	6.8 J	12.7 J	4 J	33.1	12.1	5.5	10.3 J+	11 J+	9.1 J+	9.1 J	14.8	16
Magnesium	6460 J	6910	8200	8570	12800 J	4740	5960	11800	10000	6000	5630	8000 J	11200	10600
Manganese	169 J	648	244 J	421 J	303	1130 J	523 J	365 J	407 J	590 J	465 J	543 J	222	296
Mercury	0.016 J	0.02	0.01 U	0.011 U	0.017	0.022	0.011 U	0.0097 U	0.028 J+	0.011 U	0.011 U	0.01 J	0.026	0.039
Nickel	8.2	13.3	11.8	12.2	8.3	11.1	11.5	10.7	13.6	11.2	10.4	10.6	13.4	14.2
Potassium	632	969	786	754	566 J+	1340	1020	606	759	756	671	742	1230	1340
Selenium	0.26 U	0.32 U	0.3 U	0.31 U	0.24 U	0.3 U	0.25 U	0.24 U	0.34 U	0.32 U	0.31 U	0.24 U	0.49 J	0.39 J
Silver	0.55 UJ	0.69 U	0.64 U	0.67 U	0.51 U	0.63 U	0.53 U	0.51 U	0.72 UJ	0.69 UJ	0.65 UJ	0.51 UJ	0.68 U	0.76 U
Sodium	107 J	42.1 J	32.4 U	33.8 U	26 U	32.1 U	44.2 J	26 U	56.9 J	86 J	72.2 J	63.6 J	95.1	251
Thallium	0.11 U	0.14 U	0.13 U	0.13 U	0.1 U	0.13 U	0.11 U	0.1 U	0.14 U	0.14 U	0.13 U	0.1 U	0.14 U	0.16 U
Vanadium	6.4	16.3	10.7	13.2	7.7	15.6	21.4	8.2	11	18.6	15.1	9.1	13	12.4
Zinc	27.7	58.7	34.2	38.1	25.9	83.5	45.1	31.9	45.1	41.4	35.1	35.2	50.7	46.9
PESTICIDES (mg/kg)														
Aldrin	--	--	--	--	--	--	--	--	--	--	--	--	0.00094 U	--
Alpha Bhc (Alpha Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--	0.00071 U	--
Alpha Endosulfan	--	--	--	--	--	--	--	--	--	--	--	--	0.0011 U	--
Beta Bhc (Beta Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--	0.00075 U	--
Beta Endosulfan	--	--	--	--	--	--	--	--	--	--	--	--	0.0012 U	--
cis-Chlordane	--	--	--	--	--	--	--	--	--	--	--	--	0.0013 U	--
Delta BHC (Delta Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--	0.00085 U	--
Dieldrin	--	--	--	--	--	--	--	--	--	--	--	--	0.001 U	--
Endosulfan Sulfate	--	--	--	--	--	--	--	--	--	--	--	--	0.0009 U	--
Endrin	--	--	--	--	--	--	--	--	--	--	--	--	0.00099 U	--
Endrin Aldehyde	--	--	--	--	--	--	--	--	--	--	--	--	0.00096 U	--
Endrin Ketone	--	--	--	--	--	--	--	--	--	--	--	--	0.0011 U	--
Gamma Bhc (Lindane)	--	--	--	--	--	--	--	--	--	--	--	--	0.0007 U	--
Heptachlor	--	--	--	--	--	--	--	--	--	--	--	--	0.001 U	--
Heptachlor Epoxide	--	--	--	--	--	--	--	--	--	--	--	--	0.0015 U	--
Methoxychlor	--	--	--	--	--	--	--	--	--	--	--	--	0.0016 U	--
P,P'-DDD	--	--	--	--	--	--	--	--	--	--	--	--	0.001 U	--
P,P'-DDE	--	--	--	--	--	--	--	--	--	--	--	--	0.0011 U	--
P,P'-DDT	--	--	--	--	--	--	--	--	--	--	--	--	0.0008 U	--
Toxaphene	--	--	--	--	--	--	--	--	--	--	--	--	0.023 U	--
trans-Chlordane	--	--	--	--	--	--	--	--	--	--	--	--	0.0017 U	--
POLYCHLORINATED BIPHENYLS (mg/kg)														
PCB-1016 (Aroclor 1016)	--	--	--	--	--	--	--	--	--	--	--	--	0.01 U	0.012 U
PCB-1221 (Aroclor 1221)	--	--	--	--	--	--	--	--	--	--	--	--	0.01 U	0.012 U
PCB-1232 (Aroclor 1232)	--	--	--	--	--	--	--	--	--	--	--	--	0.01 U	0.012 U
PCB-1242 (Aroclor 1242)	--	--	--	--	--	--	--	--	--	--	--	--	0.01 U	0.012 U

Table E-23
Summary of Data Used in Risk Assessment
Western Undeveloped Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-065-DUP	CFMW-068	CFMW-068	CFMW-068-DUP	CFMW-068	CFMW-069	CFMW-069	CFMW-069	CFMW-071	CFMW-071	CFMW-071-DUP	CFMW-071	CFSB-120	CFSB-120
Sample Lab IDs	460-155369-10	180-77673-51, 460-155989-73	180-77673-52, 460-155989-74	180-77673-54, 460-155989-76	180-77673-53, 460-155989-75	180-77673-5, 460-155989-25	180-77673-6, 460-155989-26	180-77673-7, 460-155989-27	180-77393-68, 460-155369-26	180-77393-69, 460-155369-27	180-77393-70, 460-155369-28	180-77393-71, 460-155369-29	460-114141-10	460-114141-11
Sample Name	CFMW-DUP27-SO	CFMW-068-SO-0-0.5	CFMW-068-SO-0.5-2	CFSB-DUP33-SO	CFMW-068-SO-SO-12	CFMW-069-SO-0-0.5	CFMW-069-SO-0.5-2	CFMW-069-SO-SO-12	CFMW-071-SO-0-0.5	CFMW-071-SO-0.5-2	CFMW-DUP28-SO	CFMW-071-SO-SO-12	CFSB-120-SO-0-0.5	CFSB-120-SO-0.5-2.0
Sample Depth	10-12 ft	0-0.5 ft	0.5-2 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft
Chemical	5/2/2018	5/10/2018	5/10/2018	5/10/2018	5/10/2018	5/8/2018	5/8/2018	5/8/2018	5/3/2018	5/3/2018	5/3/2018	5/3/2018	5/18/2016	5/18/2016
PCB-1248 (Aroclor 1248)	--	--	--	--	--	--	--	--	--	--	--	--	0.01 U	0.012 U
PCB-1254 (Aroclor 1254)	--	--	--	--	--	--	--	--	--	--	--	--	0.011 U	0.012 U
PCB-1260 (Aroclor 1260)	--	--	--	--	--	--	--	--	--	--	--	--	0.011 U	0.012 U
PCB-1262 (Aroclor 1262)	--	--	--	--	--	--	--	--	--	--	--	--	0.011 U	0.012 U
PCB-1268 (Aroclor 1268)	--	--	--	--	--	--	--	--	--	--	--	--	0.011 U	0.012 U
Polychlorinated Biphenyl (PCBs)	--	--	--	--	--	--	--	--	--	--	--	--	0.011 U	0.012 U
SEMIVOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,2,4,5-Tetrachlorobenzene	--	0.0017 U	0.0015 U	0.0016 U	0.0015 U	0.0037 U	0.0016 U	0.0015 U	0.0032 U	0.0018 U	0.0016 U	0.0015 U	0.028 U	0.032 U
1,4-Dioxane (P-Dioxane)	--	0.012 U	0.011 U	0.011 U	0.011 U	0.026 U	0.012 U	0.011 U	0.023 U	0.013 U	0.012 U	0.011 U	0.1 U	0.12 U
2,3,4,6-Tetrachlorophenol	--	0.016 U	0.015 U	0.015 U	0.014 U	0.035 U	0.015 U	0.015 U	0.031 U	0.018 U	0.016 U	0.015 U	0.036 U	0.041 U
2,4,5-Trichlorophenol	--	0.0028 U	0.0025 U	0.0026 U	0.0025 U	0.006 U	0.0026 U	0.0025 U	0.0053 U	0.003 U	0.0027 U	0.0025 U	0.038 U	0.043 U
2,4,6-Trichlorophenol	--	0.0021 U	0.0019 U	0.002 U	0.0019 U	0.0046 U	0.002 U	0.0019 U	0.004 U	0.0023 U	0.0021 U	0.002 U	0.011 U	0.012 U
2,4-Dichlorophenol	--	0.003 U	0.0027 U	0.0028 U	0.0027 U	0.0065 U	0.0029 U	0.0027 U	0.0057 U	0.0033 U	0.0029 U	0.0027 U	0.009 U	0.01 U
2,4-Dimethylphenol	--	0.0024 U	0.0022 U	0.0022 U	0.0022 U	0.0052 U	0.0023 U	0.0022 U	0.0046 U	0.0026 U	0.0024 U	0.0022 U	0.084 U	0.096 U
2,4-Dinitrophenol	--	0.1 U	0.095 U	0.097 U	0.093 UJ	0.23 U	0.1 U	0.094 U	0.2 UJ	0.11 UJ	0.1 UJ	0.096 UJ	0.29 U	0.33 U
2,4-Dinitrotoluene	--	0.0019 U	0.0018 U	0.0018 U	0.0017 U	0.0042 U	0.0018 U	0.0017 U	0.0037 U	0.0021 U	0.0019 U	0.0018 U	0.015 U	0.017 U
2,6-Dinitrotoluene	--	0.0024 U	0.0022 U	0.0022 U	0.0021 U	0.0052 U	0.0023 U	0.0021 U	0.0046 U	0.0026 U	0.0024 U	0.0022 U	0.02 U	0.023 U
2-Chloronaphthalene	--	0.0018 U	0.0016 U	0.0017 U	0.0016 U	0.0039 U	0.0017 U	0.0016 U	0.0034 U	0.0019 U	0.0017 U	0.0016 U	0.0087 U	0.0099 U
2-Chlorophenol	--	0.0018 U	0.0016 U	0.0017 U	0.0016 U	0.0039 U	0.0017 U	0.0016 U	0.0034 U	0.002 U	0.0018 U	0.0017 U	0.0097 U	0.011 U
2-Methylnaphthalene	--	0.014	0.0017 U	0.0017 U	0.0017 U	0.0041 U	0.0018 U	0.0017 U	0.0035 U	0.01 J	0.0018 UJ	0.0017 U	0.0085 U	0.0096 U
2-Methylphenol (O-Cresol)	--	0.011 U	0.01 U	0.01 U	0.01 U	0.024 U	0.011 U	0.01 U	0.021 U	0.012 U	0.011 U	0.01 U	0.017 U	0.019 U
2-Nitroaniline	--	0.018 U	0.016 U	0.016 U	0.016 U	0.039 U	0.017 U	0.016 U	0.034 U	0.019 U	0.017 U	0.016 U	0.013 U	0.014 U
2-Nitrophenol	--	0.0022 U	0.002 U	0.0021 U	0.002 U	0.0048 U	0.0021 U	0.002 U	0.0042 U	0.0024 U	0.0022 U	0.002 U	0.013 U	0.015 U
3- And 4- Methylphenol (Total)	--	--	--	--	--	--	--	--	--	--	--	--	0.01 U	0.012 U
3,3'-Dichlorobenzidine	--	0.036 U	0.033 U	0.034 U	0.032 U	0.079 U	0.035 U	0.032 U	0.069 U	0.039 U	0.036 U	0.033 U	0.043 U	0.049 U
3-Nitroaniline	--	0.0099 U	0.009 U	0.0092 U	0.0088 U	0.021 U	0.0094 U	0.0088 U	0.019 U	0.011 U	0.0097 U	0.009 U	0.011 U	0.013 U
4,6-Dinitro-2-Methylphenol	--	0.067 U	0.061 U	0.062 U	0.06 U	0.15 U	0.064 U	0.06 U	0.13 UJ	0.073 UJ	0.066 UJ	0.061 UJ	0.1 U	0.12 U
4-Bromophenyl Phenyl Ether	--	0.0027 U	0.0025 U	0.0025 U	0.0024 U	0.0059 U	0.0026 U	0.0024 U	0.0052 U	0.003 U	0.0027 U	0.0025 U	0.012 U	0.014 U
4-Chloro-3-Methylphenol	--	0.0018 U	0.0017 U	0.0017 U	0.0016 U	0.004 U	0.0017 U	0.0016 U	0.0035 U	0.002 U	0.0018 U	0.0017 U	0.016 U	0.019 U
4-Chloroaniline	--	0.0013 U	0.0012 U	0.0012 U	0.0012 U	0.0028 U	0.0012 U	0.0012 U	0.0025 U	0.0014 U	0.0013 U	0.0012 U	0.0098 U	0.011 U
4-Chlorophenyl Phenyl Ether	--	0.0024 U	0.0021 U	0.0022 U	0.0021 U	0.0051 U	0.0022 U	0.0021 U	0.0045 U	0.0026 U	0.0023 U	0.0022 U	0.011 U	0.013 U
4-Nitroaniline	--	0.0019 U	0.0017 U	0.0018 U	0.0017 U	0.0041 U	0.0018 U	0.0017 U	0.0036 U	0.0021 U	0.0019 U	0.0017 U	0.014 U	0.016 U
4-Nitrophenol	--	0.027 U	0.025 U	0.025 U	0.024 U	0.059 U	0.026 U	0.024 U	0.052 U	0.03 U	0.027 U	0.025 U	0.18 U	0.21 UJ
Acenaphthene	--	0.0035 J	0.002 U	0.0021 U	0.002 U	0.012 J	0.0021 U	0.002 U	0.018	0.017 J	0.0022 UJ	0.0026 J	0.0093 U	0.011 U
Acenaphthylene	--	0.0017 U	0.0016 U	0.0016 U	0.0015 U	0.0037 U	0.0016 U	0.0015 U	0.0032 U	0.0018 U	0.0017 U	0.0016 U	0.0098 U	0.011 U
Acetophenone	--	0.0021 U	0.0019 U	0.002 U	0.0019 U	0.0046 U	0.002 U	0.0019 U	0.004 U	0.0029 J	0.0021 U	0.0019 U	0.0083 U	0.0095 U
Anthracene	--	0.0036 J	0.0018 U	0.0019 U	0.0018 U	0.02	0.0027 J	0.0018 U	0.031	0.025 J	0.002 UJ	0.0031 J	0.036 U	0.041 U
Atrazine	--	0.017 U	0.016 U	0.016 U	0.015 U	0.037 UJ	0.016 UJ	0.015 UJ	0.032 U	0.018 U	0.017 U	0.016 U	0.017 U	0.019 U
Benzaldehyde	--	0.0048 UR	0.0044 UR	0.0045 UR	0.0043 UR	0.01 U	0.0046 U	0.0043 U	0.0092 UR	0.0052 UR	0.0047 UR	0.0044 UR	0.029 U	0.033 U
Benzo(A)Anthracene	--	0.021	0.0013 U	0.0014 U	0.0013 U	0.1	0.012	0.0013 U	0.19	0.11 J	0.0057 J	0.016	0.032 U	0.036 U
Benzo(A)Pyrene	--	0.025	0.0015 U	0.0016 U	0.0015 U	0.13	0.013	0.0015 U	0.27	0.14 J	0.0061 J	0.02	0.017 J	0.013 U
Benzo(B)Fluoranthene	--	0.033	0.0017 U	0.0018 U	0.0017 U	0.21	0.025	0.0017 U	0.35	0.16 J	0.0077 J	0.025	0.044	0.017 U
Benzo(G,H,I)Perylene	--	0.025	0.0015 U	0.0016 U	0.0015 U	0.15	0.019	0.0015 U	0.24	0.11 J	0.0053 J	0.019	0.022 U	0.025 U
Benzo(K)Fluoranthene	--	0.015	0.0021 U	0.0022 U	0.0021 U	0.074	0.0066 J	0.0021 U	0.18	0.078 J	0.0034 J	0.013	0.02 J	0.019 U
Benzyl Butyl Phthalate	--	0.027 U	0.024 U	0.025 U	0.024 U	0.058 U	0.025 U	0.024 U	0.051 U	0.029 U	0.026 U	0.024 U	0.012 U	0.013 U
Biphenyl (Diphenyl)	--	0.0044 J	0.0015 U	0.0015 U	0.0015 U	0.0035 U	0.0016 U	0.0015 U	0.0031 U	0.0035 J	0.0016 UJ	0.0015 U	0.033 U	0.037 U
Bis(2-Chloroethoxy) Methane	--	0.0019 U	0.0017 U	0.0017 U	0.0017 U	0.004 U	0.0018 U	0.0017 U	0.0035 U	0.002 U	0.0018 U	0.0017 U	0.012 U	0.014 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	--	0.0014 U	0.0013 U	0.0013 U	0.0013 U	0.0031 U	0.0013 U	0.0013 U	0.0027 U	0.0015 U	0.0014 U	0.0013 U	0.009 U	0.01 U
Bis(2-Chloroisopropyl) Ether	--	0.0029 U	0.0026 U	0.0027 U	0.0026 UJ	0.0063 U	0.0027 U	0.0026 U	0.0055 U	0.0031 U	0.0028 U	0.0026 U	0.016 UJ	0.018 UJ
Bis(2-Ethylhexyl) Phthalate	--	0.041 U	0.038 U	0.038 U	0.037 U	0.09 U	0.039 U	0.037 U	0.079 U	0.045 UJ	0.18 J	0.038 U	0.015 U	0.017 U
Caprolactam	--	0.025 U	0.023 U	0.023 U	0.023 U	0.055 U	0.024 U	0.023 U	0.048 U	0.027 U	0.025 U	0.023 UJ	0.028 U	0.031 U
Carbazole	--	0.0048 J	0.0017 U	0.0017 U	0.0016 U	0.026	0.0035 J	0.0016 U	0.037	0.02 J	0.0018 UJ	0.0031 J	0.0095 U	0.011 U
Chrysene	--	0.036	0.0014 U	0.0014 U	0.0014 U	0.16	0.019	0.0014 U	0.31	0.14 J	0.0069 J	0.022	0.032 J	0.012 U
Dibenz(A,H)Anthracene	--	0.0043 J	0.0016 U	0.0016 U	0.0016 U	0.034	0.0046 J	0.0016 U	0.055	0.026 J	0.0017 J	0.0039 J	0.02 U	0.023 U
Dibenzofuran	--	0.003 J	0.0016 U	0.0016 U	0.0015 U	0.0048 J	0.0016 U	0.0015 U	0.0063 J	0.0087 J	0.0017 UJ	0.0016 U	0.012 U	0.013 U
Diethyl Phthalate	--	0.012 U	0.011 U	0.011 U	0.01 U	0.025 U	0.011 U	0.01 U	0.022 U	0.013 U	0.011 U	0.011 U	0.011 U	0.012 U

Table E-23
Summary of Data Used in Risk Assessment
Western Undeveloped Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-065-DUP	CFMW-068	CFMW-068	CFMW-068-DUP	CFMW-068	CFMW-069	CFMW-069	CFMW-069	CFMW-071	CFMW-071	CFMW-071-DUP	CFMW-071	CFSB-120	CFSB-120
Sample Lab IDs	460-155369-10	180-77673-51, 460-155989-73	180-77673-52, 460-155989-74	180-77673-54, 460-155989-76	180-77673-53, 460-155989-75	180-77673-5, 460-155989-25	180-77673-6, 460-155989-26	180-77673-7, 460-155989-27	180-77393-68, 460-155369-26	180-77393-69, 460-155369-27	180-77393-70, 460-155369-28	180-77393-71, 460-155369-29	460-114141-10	460-114141-11
Sample Name	CFMW-DUP27-SO	CFMW-068-SO-0-0.5	CFMW-068-SO-0.5-2	CFSB-DUP33-SO	CFMW-068-SO-SO-10-12	CFMW-069-SO-0-0.5	CFMW-069-SO-0.5-2	CFMW-069-SO-SO-10-12	CFMW-071-SO-0-0.5	CFMW-071-SO-0.5-2	CFMW-DUP28-SO	CFMW-071-SO-SO-10-12	CFSB-120-SO-0-0.5	CFSB-120-SO-0.5-2.0
Sample Depth	10-12 ft	0-0.5 ft	0.5-2 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft
Chemical	5/2/2018	5/10/2018	5/10/2018	5/10/2018	5/10/2018	5/8/2018	5/8/2018	5/8/2018	5/3/2018	5/3/2018	5/3/2018	5/3/2018	5/18/2016	5/18/2016
Dimethyl Phthalate	--	0.0014 U	0.0013 U	0.0013 U	0.0013 U	0.0031 U	0.0013 U	0.0013 U	0.0027 U	0.0015 U	0.0014 U	0.0013 U	0.011 U	0.013 U
Di-N-Butyl Phthalate	--	0.017 U	0.016 U	0.016 U	0.015 U	0.037 U	0.016 U	0.015 U	0.032 U	0.018 U	0.017 U	0.016 U	0.011 U	0.013 U
Di-N-Octylphthalate	--	0.023 U	0.021 U	0.021 U	0.02 U	0.049 U	0.022 U	0.02 U	0.043 U	0.025 U	0.022 U	0.021 U	0.019 U	0.022 U
Fluoranthene	--	0.046	0.0019 U	0.0019 U	0.0018 U	0.23	0.028	0.0018 U	0.41	0.21 J	0.0092 J	0.032	0.028 J	0.013 U
Fluorene	--	0.003 J	0.0014 U	0.0014 U	0.0014 U	0.0091 J	0.0015 U	0.0014 U	0.013 J	0.014 J	0.0015 UJ	0.0021 J	0.0083 U	0.0095 U
Hexachlorobenzene	--	0.0028 U	0.0025 U	0.0026 U	0.0025 U	0.0061 U	0.0027 U	0.0025 U	0.0053 U	0.003 U	0.0027 U	0.0025 U	0.016 U	0.018 U
Hexachlorobutadiene	--	0.0023 U	0.0021 U	0.0021 U	0.002 U	0.0049 U	0.0022 U	0.002 U	0.0043 U	0.0025 U	0.0022 U	0.0021 U	0.011 U	0.012 U
Hexachlorocyclopentadiene	--	0.002 U	0.0018 U	0.0018 U	0.0018 U	0.0043 U	0.0019 U	0.0018 U	0.0038 U	0.0022 U	0.0019 U	0.0018 U	0.024 U	0.027 U
Hexachloroethane	--	0.002 U	0.0018 U	0.0019 U	0.0018 U	0.0044 U	0.0019 U	0.0018 U	0.0038 U	0.0022 U	0.002 U	0.0018 U	0.014 U	0.016 U
Indeno(1,2,3-C,D)Pyrene	--	0.019	0.0014 U	0.0015 U	0.0014 U	0.13	0.015	0.0014 U	0.2	0.092 J	0.0036 J	0.015	0.025 U	0.029 U
Isophorone	--	0.002 U	0.0018 U	0.0018 U	0.0018 U	0.0043 U	0.0019 U	0.0018 U	0.0038 U	0.0022 U	0.0019 U	0.0018 U	0.0082 U	0.0094 U
Naphthalene	--	0.0051 J	0.0014 U	0.0014 U	0.0014 U	0.0033 U	0.0014 U	0.0014 U	0.0043 J	0.0067 J	0.0015 UJ	0.0016 J	0.0097 U	0.011 U
Nitrobenzene	--	0.014 U	0.013 U	0.013 U	0.013 U	0.031 U	0.014 U	0.013 U	0.027 U	0.015 U	0.014 U	0.013 U	0.012 U	0.014 U
N-Nitrosodi-N-Propylamine	--	0.0026 U	0.0024 U	0.0024 U	0.0024 U	0.0057 U	0.0025 U	0.0024 U	0.005 U	0.0029 U	0.0026 U	0.0024 U	0.013 U	0.015 U
N-Nitrosodiphenylamine	--	0.013 U	0.012 U	0.012 U	0.012 U	0.028 U	0.012 U	0.012 U	0.025 U	0.014 U	0.013 U	0.012 U	0.035 U	0.04 U
Pentachlorophenol	--	0.063 U	0.057 U	0.058 U	0.056 UJ	0.14 U	0.06 U	0.056 U	0.12 UJ	0.068 UJ	0.061 UJ	0.057 UJ	0.046 U	0.053 U
Phenanthrene	--	0.031	0.0019 U	0.0019 U	0.0019 U	0.11	0.015	0.002 J	0.16	0.13 J	0.0068 J	0.017	0.016 J	0.012 U
Phenol	--	0.012 U	0.011 U	0.011 U	0.011 U	0.026 U	0.011 U	0.011 U	0.022 U	0.013 U	0.012 U	0.011 U	0.013 U	0.014 U
Pyrene	--	0.04	0.0017 U	0.0017 U	0.0016 U	0.2	0.021	0.0016 U	0.38	0.2 J	0.009 J	0.029	0.027 J	0.02 U
VOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,1,1-Trichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00043 U
1,1,2,2-Tetrachloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00019 U
1,1,2-Trichloro-1,2,2-Trifluoroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	0.0005 U
1,1,2-Trichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00032 U
1,1-Dichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00039 U
1,1-Dichloroethene	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00047 U
1,2,3-Trichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00013 U
1,2,4-Trichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00037 U
1,2-Dibromo-3-Chloropropane	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00054 U
1,2-Dibromoethane (Ethylene Dibromide)	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00014 U
1,2-Dichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00016 U
1,2-Dichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00013 U
1,2-Dichloropropane	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00019 U
1,3-Dichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00014 U
1,4-Dichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00015 U
2-Hexanone	--	--	--	--	--	--	--	--	--	--	--	--	--	0.0011 U
Acetone	--	--	--	--	--	--	--	--	--	--	--	--	--	0.049
Benzene	--	--	--	--	--	--	--	--	--	--	--	--	--	0.001 J
Bromochloromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00019 U
Bromodichloromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00043 U
Bromoform	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00015 U
Bromomethane	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00037 U
Carbon Disulfide	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00049 U
Carbon Tetrachloride	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00049 U
Chlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00016 U
Chloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	0.0004 U
Chloroform	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00024 U
Chloromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00043 U
Cis-1,2-Dichloroethylene	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00025 U
Cis-1,3-Dichloropropene	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00017 U
Cyclohexane	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00053 U
Dibromochloromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00017 U
Dichlorodifluoromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00037 U
Ethylbenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00021 U
Isopropylbenzene (Cumene)	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00019 U
M,P-Xylene	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00013 U

Table E-23
Summary of Data Used in Risk Assessment
Western Undeveloped Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-065-DUP	CFMW-068	CFMW-068	CFMW-068-DUP	CFMW-068	CFMW-069	CFMW-069	CFMW-069	CFMW-071	CFMW-071	CFMW-071-DUP	CFMW-071	CFSB-120	CFSB-120
Sample Lab IDs	460-155369-10	180-77673-51, 460-155989-73	180-77673-52, 460-155989-74	180-77673-54, 460-155989-76	180-77673-53, 460-155989-75	180-77673-5, 460-155989-25	180-77673-6, 460-155989-26	180-77673-7, 460-155989-27	180-77393-68, 460-155369-26	180-77393-69, 460-155369-27	180-77393-70, 460-155369-28	180-77393-71, 460-155369-29	460-114141-10	460-114141-11
Sample Name	CFMW-DUP27-SO	CFMW-068-SO-0-0.5	CFMW-068-SO-0.5-2	CFSB-DUP33-SO	CFMW-068-SO-10-12	CFMW-069-SO-0-0.5	CFMW-069-SO-0.5-2	CFMW-069-SO-10-12	CFMW-071-SO-0-0.5	CFMW-071-SO-0.5-2	CFMW-DUP28-SO	CFMW-071-SO-10-12	CFSB-120-SO-0-0.5	CFSB-120-SO-0.5-2.0
Sample Depth	10-12 ft	0-0.5 ft	0.5-2 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft
Chemical	5/2/2018	5/10/2018	5/10/2018	5/10/2018	5/10/2018	5/8/2018	5/8/2018	5/8/2018	5/3/2018	5/3/2018	5/3/2018	5/3/2018	5/18/2016	5/18/2016
Methyl Acetate	--	--	--	--	--	--	--	--	--	--	--	--	--	0.001 U
Methyl Ethyl Ketone (2-Butanone)	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00088 U
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	--	--	--	--	--	--	--	--	--	--	--	--	--	0.0025 U
Methylcyclohexane	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00057 U
Methylene Chloride	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00037 U
O-Xylene (1,2-Dimethylbenzene)	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00018 U
Styrene	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00017 U
Tert-Butyl Methyl Ether	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00019 U
Tetrachloroethylene (PCE)	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00032 U
Toluene	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00024 J
Trans-1,2-Dichloroethene	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00045 U
Trans-1,3-Dichloropropene	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00011 U
Trichloroethylene (TCE)	--	--	--	--	--	--	--	--	--	--	--	--	--	0.0003 U
Trichlorofluoromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00039 U
Vinyl Chloride	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00045 U

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-23
Summary of Data Used in Risk Assessment
Western Undeveloped Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-120	CFSB-123	CFSB-123	CFSB-123	CFSB-124	CFSB-124	CFSB-124	CFSB-125	CFSB-125	CFSB-125	CFSB-126	CFSB-126	CFSB-126	CFSB-127
Sample Lab IDs	460-114141-12	460-114141-31	460-114141-32	460-114141-33	460-114141-25	460-114141-26	460-114141-27	460-114141-4	460-114141-5	460-114141-6	460-114141-7	460-114141-8	460-114141-9	460-114141-1
Sample Name	CFSB-120-SO-10-12	CFSB-123-SO-0-0.5	CFSB-123-SO-0.5-2.0	CFSB-123-SO-10-12	CFSB-124-SO-0-0.5	CFSB-124-SO-0.5-2.0	CFSB-124-SO-10-12	CFSB-125-SO-0-0.5	CFSB-125-SO-0.5-2.0	CFSB-125-SO-10-12	CFSB-126-SO-0-0.5	CFSB-126-SO-0.5-2.0	CFSB-126-SO-10-12	CFSB-127-SO-0-0.5
Sample Depth	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft
Chemical	5/18/2016	5/19/2016	5/19/2016	5/19/2016	5/19/2016	5/19/2016	5/19/2016	5/18/2016	5/18/2016	5/18/2016	5/18/2016	5/18/2016	5/18/2016	5/18/2016
GENERAL CHEMISTRY (mg/kg)														
Fluoride	0.43 J-	10.5 J-	9.29 J-	0.58 J-	10.8 J-	6.61 J-	0.92 J-	8.31 J-	8.91 J-	0.97 J-	6.31 J-	5.3 J-	0.75 J-	3.93 J-
Cyanide	0.022 J	0.12 J	0.093 J	0.018 U	0.68	0.16	0.024 J	0.12	0.034 J	0.034 J	0.17	0.12	0.026 J	0.087 J
METALS (mg/kg)														
"Chromium, Hexavalent - Estimated"	0.195377	0.409489	0.436253	0.179319	0.489781	0.409489	0.264964	0.29708	0.29708	0.294404	0.414842	0.372019	0.570073	0.355961
"Chromium, Trivalent - Estimated"	7.10462	14.8905	15.8637	6.52068	17.8102	14.8905	9.63504	10.8029	10.8029	10.7056	15.0852	13.528	20.7299	12.944
Aluminum	6030	17300 J	18800 J	3840 J	20500 J	19600 J	6740 J	19600	16200	8380	29200	18900	9010	26900
Antimony	0.35 UJ	0.41 UJ	0.44 UJ	0.35 UJ	0.43 UJ	0.42 UJ	0.35 UJ	0.37 UJ	0.36 UJ	0.35 UJ	0.4 UJ	0.38 UJ	0.33 UJ	0.35 UJ
Arsenic	2.8	4.8 J	5.3 J	2.1 J	5.9 J	6.8 J	5.3 J	4.8	4.7	4.1	7.1	5.3	4.5	6.4
Barium	30.3	278	305	45.1	347	303	60.4	229	188	87	429	245	80	429
Beryllium	0.3 J	0.77	0.87	0.22 J	0.95	0.81	0.33 J	0.65	0.76	0.48	1.2	0.61	0.37	0.98
Cadmium	0.26 U	0.31 U	0.33 U	0.27 U	0.33 U	0.32 U	0.26 U	0.28 U	0.27 U	0.27 U	0.3 U	0.29 U	0.25 U	0.26 U
Calcium	9280	5430	5820	9420	5850	4730	13400	17200	10900	15600	6000	3040	17100	3630
Chromium, Total	7.3	15.3	16.3	6.7	18.3	15.3	9.9	11.1	11.1	11	15.5	13.9	21.3	13.3
Cobalt	3.8	5.8	6.3	3.2	7	7.2	4.7	7.2	5.9	5.7	6.1	7.4	5.1	6.1
Copper	9.6	18.5 J	18.4 J	3.7 J	27 J	18.4 J	9.2 J	14.1	15	17.4	24.5	20.6	12.3	17
Iron	9730	15800	17100	7100	19900	19200	12100	17200	15000	12900	18600	17800	13300	18700
Lead	7	13.7	14.3	3.1	15.9	12.5	4.8	12.5	12.4	7.9	15.2	19.3	6.5	12.5
Magnesium	8470	10100	10700	6250	11400	9440	8020	8510	7960	10900	9020	9280	12100	7440
Manganese	115	363 J	411 J	362 J	470 J	558 J	432 J	576	462	424	446	462	494	347
Mercury	0.012 U	0.033	0.032	0.012 U	0.019 J	0.016 J	0.012 J	0.018	0.017 J	0.026	0.036	0.021	0.016 J	0.021
Nickel	7.1	11.4	12	5.2	14.2	13	9	13.3	10.5	11.1	13.6	12.6	10.8	12.1
Potassium	529	1160	1210	475	1510	1220	710	1020	969	693	1310	782	733	953
Selenium	0.33 U	0.9 J	1.1 J	0.33 U	0.93 J	0.74 J	0.33 U	0.35 U	0.34 U	0.33 U	0.71 J	0.35 U	0.31 U	0.4 J
Silver	0.64 U	0.75 U	0.81 U	0.64 U	0.8 U	0.77 U	0.64 U	0.68 U	0.66 U	0.65 U	0.73 U	0.69 U	0.6 U	0.63 U
Sodium	32.5 U	78.7 J	93.9 J	32.8 U	76.5 J	74 J	32.5 U	62.7 J	63.3 J	33.1 U	136	78 J	35.2 J	135
Thallium	0.13 U	0.16 U	0.17 U	0.13 U	0.16 U	0.16 U	0.13 U	0.14 U	0.14 U	0.13 U	0.15 U	0.14 U	0.12 U	0.13 U
Vanadium	6.7	10.5	11.3	4.9	12.7	13.3	6.9	16.5	14	8.6	13.8	12.6	9.3	14.7
Zinc	24.7	47.3	50.8	16.9	72	59.9	29.3	79.6	53.7	32.4	66.8	52.1	31.7	59.4
PESTICIDES (mg/kg)														
Aldrin	--	0.001 U	--	--	0.0011 U	--	--	0.00091 U	--	--	0.0011 U	--	--	0.00093 U
Alpha Bhc (Alpha Hexachlorocyclohexane)	--	0.00079 U	--	--	0.00083 U	--	--	0.00068 U	--	--	0.00079 U	--	--	0.0007 U
Alpha Endosulfan	--	0.0012 U	--	--	0.0013 U	--	--	0.001 U	--	--	0.0012 U	--	--	0.0011 U
Beta Bhc (Beta Hexachlorocyclohexane)	--	0.00084 U	--	--	0.00088 U	--	--	0.00073 U	--	--	0.00084 U	--	--	0.00074 U
Beta Endosulfan	--	0.0014 U	--	--	0.0014 U	--	--	0.0012 U	--	--	0.0014 U	--	--	0.0012 U
cis-Chlordane	--	0.0014 U	--	--	0.0015 U	--	--	0.0012 U	--	--	0.0014 U	--	--	0.0012 U
Delta BHC (Delta Hexachlorocyclohexane)	--	0.00094 U	--	--	0.00099 U	--	--	0.00082 U	--	--	0.00095 U	--	--	0.00083 U
Dieldrin	--	0.0011 U	--	--	0.0012 U	--	--	0.00097 U	--	--	0.0011 U	--	--	0.00099 U
Endosulfan Sulfate	--	0.001 U	--	--	0.0011 U	--	--	0.00087 U	--	--	0.001 U	--	--	0.00089 U
Endrin	--	0.0011 U	--	--	0.0011 U	--	--	0.00095 U	--	--	0.0011 U	--	--	0.00097 U
Endrin Aldehyde	--	0.0011 U	--	--	0.0011 U	--	--	0.00093 U	--	--	0.0011 U	--	--	0.00095 U
Endrin Ketone	--	0.0012 U	--	--	0.0013 U	--	--	0.001 U	--	--	0.0012 U	--	--	0.0011 U
Gamma Bhc (Lindane)	--	0.00077 U	--	--	0.00081 U	--	--	0.00067 U	--	--	0.00078 U	--	--	0.00069 U
Heptachlor	--	0.0011 U	--	--	0.0012 U	--	--	0.00096 U	--	--	0.0011 U	--	--	0.00098 U
Heptachlor Epoxide	--	0.0017 U	--	--	0.0018 U	--	--	0.0015 U	--	--	0.0017 U	--	--	0.0015 U
Methoxychlor	--	0.0018 U	--	--	0.0019 U	--	--	0.0016 U	--	--	0.0018 U	--	--	0.0016 U
P,P'-DDD	--	0.0011 U	--	--	0.0012 U	--	--	0.00099 U	--	--	0.0011 U	--	--	0.001 U
P,P'-DDE	--	0.0013 U	--	--	0.0013 U	--	--	0.0011 U	--	--	0.0013 U	--	--	0.0011 U
P,P'-DDT	--	0.00089 U	--	--	0.00093 U	--	--	0.00077 U	--	--	0.0009 U	--	--	0.00079 U
Toxaphene	--	0.025 U	--	--	0.026 U	--	--	0.022 U	--	--	0.025 U	--	--	0.022 U
trans-Chlordane	--	0.0019 U	--	--	0.002 U	--	--	0.0016 U	--	--	0.0019 U	--	--	0.0017 U
POLYCHLORINATED BIPHENYLS (mg/kg)														
PCB-1016 (Aroclor 1016)	0.0094 U	0.011 U	0.012 U	0.0094 U	0.012 U	0.012 U	0.0095 U	0.01 U	0.0097 U	0.0095 U	0.012 U	0.01 U	0.0095 U	0.01 U
PCB-1221 (Aroclor 1221)	0.0094 U	0.011 U	0.012 U	0.0094 U	0.012 U	0.012 U	0.0095 U	0.01 U	0.0097 U	0.0095 U	0.012 U	0.01 U	0.0095 U	0.01 U
PCB-1232 (Aroclor 1232)	0.0094 U	0.011 U	0.012 U	0.0094 U	0.012 U	0.012 U	0.0095 U	0.01 U	0.0097 U	0.0095 U	0.012 U	0.01 U	0.0095 U	0.01 U
PCB-1242 (Aroclor 1242)	0.0094 U	0.011 U	0.012 U	0.0094 U	0.012 U	0.012 U	0.0095 U	0.01 U	0.0097 U	0.0095 U	0.012 U	0.01 U	0.0095 U	0.01 U

Table E-23
Summary of Data Used in Risk Assessment
Western Undeveloped Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-120	CFSB-123	CFSB-123	CFSB-123	CFSB-124	CFSB-124	CFSB-124	CFSB-125	CFSB-125	CFSB-125	CFSB-126	CFSB-126	CFSB-126	CFSB-127
Sample Lab IDs	460-114141-12	460-114141-31	460-114141-32	460-114141-33	460-114141-25	460-114141-26	460-114141-27	460-114141-4	460-114141-5	460-114141-6	460-114141-7	460-114141-8	460-114141-9	460-114141-1
Sample Name	CFSB-120-SO-10-12	CFSB-123-SO-0-0.5	CFSB-123-SO-0.5-2.0	CFSB-123-SO-10-12	CFSB-124-SO-0-0.5	CFSB-124-SO-0.5-2.0	CFSB-124-SO-10-12	CFSB-125-SO-0-0.5	CFSB-125-SO-0.5-2.0	CFSB-125-SO-10-12	CFSB-126-SO-0-0.5	CFSB-126-SO-0.5-2.0	CFSB-126-SO-10-12	CFSB-127-SO-0-0.5
Sample Depth	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft
Chemical	5/18/2016	5/19/2016	5/19/2016	5/19/2016	5/19/2016	5/19/2016	5/19/2016	5/18/2016	5/18/2016	5/18/2016	5/18/2016	5/18/2016	5/18/2016	5/18/2016
PCB-1248 (Aroclor 1248)	0.0094 U	0.011 U	0.012 U	0.0094 U	0.012 U	0.012 U	0.0095 U	0.01 U	0.0097 U	0.0095 U	0.012 U	0.01 U	0.0095 U	0.01 U
PCB-1254 (Aroclor 1254)	0.0097 U	0.012 U	0.013 U	0.0098 U	0.012 U	0.012 U	0.0098 U	0.01 U	0.01 U	0.0098 U	0.012 U	0.01 U	0.0098 U	0.011 U
PCB-1260 (Aroclor 1260)	0.0097 U	0.012 U	0.013 U	0.0098 U	0.012 U	0.012 U	0.0098 U	0.01 U	0.01 U	0.0098 U	0.012 U	0.01 U	0.0098 U	0.011 U
PCB-1262 (Aroclor 1262)	0.0097 U	0.012 U	0.013 U	0.0098 U	0.012 U	0.012 U	0.0098 U	0.01 U	0.01 U	0.0098 U	0.012 U	0.01 U	0.0098 U	0.011 U
PCB-1268 (Aroclor 1268)	0.0097 U	0.012 U	0.013 U	0.0098 U	0.012 U	0.012 U	0.0098 U	0.01 U	0.01 U	0.0098 U	0.012 U	0.01 U	0.0098 U	0.011 U
Polychlorinated Biphenyl (PCBs)	0.0097 U	0.012 U	0.013 U	0.0098 U	0.012 U	0.012 U	0.0098 U	0.01 U	0.01 U	0.0098 U	0.012 U	0.01 U	0.0098 U	0.011 U
SEMIVOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,2,4,5-Tetrachlorobenzene	0.026 U	0.032 U	0.033 U	0.026 U	0.033 U	0.032 U	0.026 U	0.028 U	0.027 U	0.026 U	0.032 U	0.028 U	0.026 U	0.028 U
1,4-Dioxane (P-Dioxane)	0.093 U	0.11 U	0.12 U	0.094 U	0.12 U	0.11 U	0.094 U	0.099 U	0.096 U	0.094 U	0.11 U	0.099 U	0.094 U	0.1 U
2,3,4,6-Tetrachlorophenol	0.033 U	0.04 U	0.042 U	0.033 U	0.042 U	0.04 U	0.033 U	0.035 U	0.034 U	0.033 U	0.04 U	0.035 U	0.033 U	0.036 U
2,4,5-Trichlorophenol	0.035 U	0.042 U	0.045 U	0.035 U	0.044 U	0.043 U	0.035 U	0.037 U	0.036 U	0.035 U	0.043 U	0.037 U	0.035 U	0.038 U
2,4,6-Trichlorophenol	0.0099 U	0.012 U	0.013 U	0.01 U	0.013 U	0.012 U	0.01 U	0.011 U	0.01 U	0.01 U	0.012 U	0.011 U	0.01 U	0.011 U
2,4-Dichlorophenol	0.0082 U	0.01 U	0.011 U	0.0083 U	0.011 U	0.01 U	0.0083 U	0.0087 U	0.0085 U	0.0083 U	0.01 U	0.0088 U	0.0083 U	0.0089 U
2,4-Dimethylphenol	0.077 U	0.094 U	0.099 U	0.077 U	0.098 U	0.095 U	0.077 U	0.081 U	0.079 U	0.078 U	0.094 U	0.082 U	0.077 U	0.083 U
2,4-Dinitrophenol	0.26 U	0.32 U	0.34 U	0.26 U	0.34 U	0.33 U	0.27 U	0.28 U	0.27 U	0.27 U	0.32 U	0.28 U	0.27 U	0.29 U
2,4-Dinitrotoluene	0.014 U	0.017 U	0.018 U	0.014 U	0.018 U	0.017 U	0.014 U	0.015 U	0.014 U	0.014 U	0.017 U	0.015 U	0.014 U	0.015 U
2,6-Dinitrotoluene	0.019 U	0.023 U	0.024 U	0.019 U	0.024 U	0.023 U	0.019 U	0.02 U	0.019 U	0.019 U	0.023 U	0.02 U	0.019 U	0.02 U
2-Chloronaphthalene	0.0079 U	0.0097 U	0.01 U	0.0079 U	0.01 U	0.0098 U	0.008 U	0.0084 U	0.0081 U	0.008 U	0.0097 U	0.0084 U	0.008 U	0.0086 U
2-Chlorophenol	0.0089 U	0.011 U	0.011 U	0.0089 U	0.011 U	0.011 U	0.0089 U	0.0094 U	0.0091 U	0.009 U	0.011 U	0.0094 U	0.0089 U	0.0096 U
2-Methylnaphthalene	0.0077 U	0.0094 U	0.0099 U	0.0077 U	0.0099 U	0.0095 U	0.0078 U	0.0082 U	0.0079 U	0.0078 U	0.0095 U	0.0082 U	0.0078 U	0.0083 U
2-Methylphenol (O-Cresol)	0.015 U	0.019 U	0.02 U	0.015 U	0.019 U	0.019 U	0.015 U	0.016 U	0.016 U	0.015 U	0.019 U	0.016 U	0.015 U	0.016 U
2-Nitroaniline	0.012 U	0.014 U	0.015 U	0.012 U	0.015 U	0.014 U	0.012 U	0.012 U	0.012 U	0.012 U	0.014 U	0.012 U	0.012 U	0.012 U
2-Nitrophenol	0.012 U	0.014 U	0.015 U	0.012 U	0.015 U	0.014 U	0.012 U	0.012 U	0.012 U	0.012 U	0.014 U	0.012 U	0.012 U	0.013 U
3- And 4- Methylphenol (Total)	0.0093 U	0.011 U	0.012 U	0.0093 U	0.012 U	0.011 U	0.0094 U	0.0098 U	0.0095 U	0.0094 U	0.011 U	0.0099 U	0.0094 U	0.01 U
3,3'-Dichlorobenzidine	0.039 U	0.048 U	0.05 U	0.039 U	0.05 U	0.048 U	0.039 U	0.041 U	0.04 U	0.039 U	0.048 U	0.041 U	0.039 U	0.042 U
3-Nitroaniline	0.01 U	0.013 U	0.013 U	0.01 U	0.013 U	0.013 U	0.01 U	0.011 U	0.011 U	0.01 U	0.013 U	0.011 U	0.01 U	0.011 U
4,6-Dinitro-2-Methylphenol	0.093 U	0.11 U	0.12 U	0.093 U	0.12 U	0.11 U	0.094 U	0.099 U	0.096 U	0.094 U	0.11 U	0.099 U	0.094 U	0.1 U
4-Bromophenyl Phenyl Ether	0.011 U	0.013 U	0.014 U	0.011 U	0.014 U	0.014 U	0.011 U	0.012 U	0.011 U	0.011 U	0.013 U	0.012 U	0.011 U	0.012 U
4-Chloro-3-Methylphenol	0.015 U	0.018 U	0.019 U	0.015 U	0.019 U	0.018 U	0.015 U	0.016 U	0.015 U	0.015 U	0.018 U	0.016 U	0.015 U	0.016 U
4-Chloroaniline	0.009 U	0.011 U	0.012 U	0.009 U	0.011 U	0.011 U	0.0091 U	0.0095 U	0.0092 U	0.0091 U	0.011 U	0.0095 U	0.009 U	0.0097 U
4-Chlorophenyl Phenyl Ether	0.01 U	0.013 U	0.013 U	0.01 U	0.013 U	0.013 U	0.011 U	0.011 U	0.011 U	0.011 U	0.013 U	0.011 U	0.011 U	0.011 U
4-Nitroaniline	0.013 U	0.016 U	0.017 U	0.013 U	0.017 U	0.016 U	0.013 U	0.014 U	0.014 U	0.013 U	0.016 U	0.014 U	0.013 U	0.014 U
4-Nitrophenol	0.17 UJ	0.21 U	0.22 U	0.17 U	0.21 U	0.21 U	0.17 U	0.18 U	0.17 U	0.17 UJ	0.21 U	0.18 U	0.17 UJ	0.18 U
Acenaphthene	0.0085 U	0.01 U	0.011 U	0.0085 U	0.011 U	0.01 U	0.0085 U	0.0089 U	0.0087 U	0.0085 U	0.01 U	0.009 U	0.0085 U	0.0091 U
Acenaphthylene	0.009 U	0.011 U	0.012 U	0.009 U	0.011 U	0.011 U	0.0091 U	0.0095 U	0.0092 U	0.0091 U	0.011 U	0.0095 U	0.009 U	0.0097 U
Acetophenone	0.0076 U	0.0093 U	0.0098 U	0.0076 U	0.0097 U	0.0094 U	0.0077 U	0.0081 U	0.0078 U	0.0077 U	0.0093 U	0.0081 U	0.0077 U	0.0082 U
Anthracene	0.033 U	0.041 U	0.043 U	0.033 U	0.042 U	0.041 U	0.033 U	0.035 U	0.034 U	0.033 U	0.041 U	0.035 U	0.033 U	0.036 U
Atrazine	0.016 U	0.019 U	0.02 U	0.016 U	0.02 U	0.019 U	0.016 U	0.016 U	0.016 U	0.016 U	0.019 U	0.017 U	0.016 U	0.017 U
Benzaldehyde	0.027 U	0.033 U	0.034 U	0.027 U	0.034 U	0.033 U	0.027 U	0.028 U	0.027 U	0.027 U	0.033 U	0.028 U	0.027 U	0.029 U
Benzo(A)Anthracene	0.029 U	0.036 U	0.038 U	0.029 U	0.037 J	0.036 U	0.029 U	0.044	0.03 U	0.029 U	0.036 U	0.031 U	0.029 U	0.032 U
Benzo(A)Pyrene	0.011 U	0.014 J	0.014 U	0.011 U	0.028 J	0.015 J	0.011 U	0.051	0.013 J	0.011 U	0.023 J	0.011 U	0.011 U	0.011 U
Benzo(B)Fluoranthene	0.014 U	0.032 J	0.018 U	0.014 U	0.063	0.031 J	0.014 U	0.1	0.026 J	0.014 U	0.049	0.014 U	0.014 U	0.02 J
Benzo(G,H,I)Perylene	0.02 U	0.025 U	0.026 U	0.02 U	0.037 J+	0.025 U	0.02 U	0.074 J	0.022 J	0.02 U	0.025 U	0.021 U	0.02 U	0.022 U
Benzo(K)Fluoranthene	0.015 U	0.019 U	0.02 U	0.015 U	0.028 J	0.019 U	0.015 U	0.035 J	0.016 U	0.015 U	0.019 U	0.016 U	0.015 U	0.016 U
Benzyl Butyl Phthalate	0.011 U	0.013 U	0.014 U	0.011 U	0.014 U	0.013 U	0.011 U	0.011 U	0.011 U	0.011 U	0.013 U	0.011 U	0.011 U	0.012 U
Biphenyl (Diphenyl)	0.03 U	0.036 U	0.038 U	0.03 U	0.038 U	0.037 U	0.03 U	0.032 U	0.031 U	0.03 U	0.037 U	0.032 U	0.03 U	0.032 U
Bis(2-Chloroethoxy) Methane	0.011 U	0.013 U	0.014 U	0.011 U	0.014 U	0.013 U	0.011 U	0.012 U	0.011 U	0.011 U	0.013 U	0.012 U	0.011 U	0.012 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.0082 U	0.01 U	0.011 U	0.0083 U	0.011 U	0.01 U	0.0083 U	0.0087 U	0.0085 U	0.0083 U	0.01 U	0.0088 U	0.0083 U	0.0089 U
Bis(2-Chloroisopropyl) Ether	0.014 UJ	0.018 U	0.019 U	0.014 U	0.018 U	0.018 U	0.014 U	0.015 UJ	0.015 UJ	0.015 UJ	0.018 UJ	0.015 UJ	0.014 UJ	0.016 U
Bis(2-Ethylhexyl) Phthalate	0.014 U	0.017 U	0.018 U	0.014 U	0.017 U	0.017 U	0.014 U	0.014 U	0.014 U	0.014 U	0.017 U	0.014 U	0.014 U	0.015 U
Caprolactam	0.025 U	0.031 U	0.032 U	0.025 U	0.032 U	0.031 U	0.025 U	0.027 U	0.026 U	0.025 U	0.031 U	0.027 U	0.025 U	0.027 U
Carbazole	0.0087 U	0.011 U	0.011 U	0.0087 U	0.011 U	0.011 U	0.0087 U	0.0092 U	0.0089 U	0.0087 U	0.011 U	0.0092 U	0.0087 U	0.0094 U
Chrysene	0.0095 U	0.02 J	0.014 J	0.0095 U	0.048 J	0.02 J	0.0096 U	0.065 J	0.014 J	0.0096 U	0.031 J	0.01 U	0.0096 U	0.013 J
Dibenz(A,H)Anthracene	0.018 U	0.022 U	0.023 U	0.018 U	0.023 U	0.022 U	0.018 U	0.019 U	0.019 U	0.018 U	0.022 U	0.019 U	0.018 U	0.02 U
Dibenzofuran	0.011 U	0.013 U	0.014 U	0.011 U	0.014 U	0.013 U	0.011 U	0.011 U	0.011 U	0.011 U	0.013 U	0.011 U	0.011 U	0.011 U
Diethyl Phthalate	0.0099 U	0.012 U	0.013 U	0.01 U	0.013 U	0.012 U	0.01 U	0.011 U	0.01 U	0.01 U	0.012 U	0.011 U	0.01 U	0.011 U

Table E-23
Summary of Data Used in Risk Assessment
Western Undeveloped Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-120	CFSB-123	CFSB-123	CFSB-123	CFSB-124	CFSB-124	CFSB-124	CFSB-125	CFSB-125	CFSB-125	CFSB-126	CFSB-126	CFSB-126	CFSB-127
Sample Lab IDs	460-114141-12	460-114141-31	460-114141-32	460-114141-33	460-114141-25	460-114141-26	460-114141-27	460-114141-4	460-114141-5	460-114141-6	460-114141-7	460-114141-8	460-114141-9	460-114141-1
Sample Name	CFSB-120-SO-10-12	CFSB-123-SO-0-0.5	CFSB-123-SO-0.5-2.0	CFSB-123-SO-10-12	CFSB-124-SO-0-0.5	CFSB-124-SO-0.5-2.0	CFSB-124-SO-10-12	CFSB-125-SO-0-0.5	CFSB-125-SO-0.5-2.0	CFSB-125-SO-10-12	CFSB-126-SO-0-0.5	CFSB-126-SO-0.5-2.0	CFSB-126-SO-10-12	CFSB-127-SO-0-0.5
Sample Depth	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft
Chemical	5/18/2016	5/19/2016	5/19/2016	5/19/2016	5/19/2016	5/19/2016	5/19/2016	5/18/2016	5/18/2016	5/18/2016	5/18/2016	5/18/2016	5/18/2016	5/18/2016
Dimethyl Phthalate	0.01 U	0.012 U	0.013 U	0.01 U	0.013 U	0.012 U	0.01 U	0.011 U	0.01 U	0.01 U	0.012 U	0.011 U	0.01 U	0.011 U
Di-N-Butyl Phthalate	0.01 U	0.013 U	0.013 U	0.01 U	0.013 U	0.013 U	0.011 U	0.011 U	0.011 U	0.011 U	0.013 U	0.011 U	0.011 U	0.011 U
Di-N-Octylphthalate	0.018 U	0.022 U	0.023 U	0.018 U	0.023 U	0.022 U	0.018 U	0.019 U	0.018 U	0.018 U	0.022 U	0.019 U	0.018 U	0.019 U
Fluoranthene	0.01 U	0.019 J	0.013 U	0.01 U	0.043 J	0.018 J	0.01 U	0.065 J	0.013 J	0.01 U	0.034 J	0.011 U	0.01 U	0.016 J
Fluorene	0.0076 U	0.0093 U	0.0098 U	0.0076 U	0.0097 U	0.0094 U	0.0077 U	0.0081 U	0.0078 U	0.0077 U	0.0093 U	0.0081 U	0.0077 U	0.0082 U
Hexachlorobenzene	0.014 U	0.017 U	0.018 U	0.014 U	0.018 U	0.017 U	0.014 U	0.015 U	0.015 U	0.014 U	0.017 U	0.015 U	0.014 U	0.015 U
Hexachlorobutadiene	0.0098 U	0.012 U	0.013 U	0.0098 U	0.013 U	0.012 U	0.0099 U	0.01 U	0.01 U	0.0099 U	0.012 U	0.01 U	0.0099 U	0.011 U
Hexachlorocyclopentadiene	0.022 U	0.027 U	0.028 U	0.022 U	0.028 U	0.027 U	0.022 U	0.023 U	0.022 U	0.022 U	0.027 U	0.023 U	0.022 U	0.024 U
Hexachloroethane	0.013 U	0.016 U	0.016 U	0.013 U	0.016 U	0.016 U	0.013 U	0.014 U	0.013 U	0.013 U	0.016 U	0.014 U	0.013 U	0.014 U
Indeno(1,2,3-C,D)Pyrene	0.023 U	0.028 U	0.03 U	0.023 U	0.033 J	0.029 U	0.023 U	0.082	0.024 U	0.023 U	0.029 U	0.025 U	0.023 U	0.025 U
Isophorone	0.0075 U	0.0092 U	0.0097 U	0.0075 U	0.0096 U	0.0092 U	0.0076 U	0.0079 U	0.0077 U	0.0076 U	0.0092 U	0.008 U	0.0076 U	0.0081 U
Naphthalene	0.0089 U	0.011 U	0.011 U	0.0089 U	0.011 U	0.011 U	0.0089 U	0.0094 U	0.0091 U	0.009 U	0.011 U	0.0094 U	0.0089 U	0.0096 U
Nitrobenzene	0.011 U	0.013 U	0.014 U	0.011 U	0.014 U	0.014 U	0.011 U	0.012 U	0.011 U	0.011 U	0.013 U	0.012 U	0.011 U	0.012 U
N-Nitrosodi-N-Propylamine	0.012 U	0.014 U	0.015 U	0.012 U	0.015 U	0.014 U	0.012 U	0.012 U	0.012 U	0.012 U	0.014 U	0.012 U	0.012 U	0.013 U
N-Nitrosodiphenylamine	0.032 U	0.039 U	0.041 U	0.032 U	0.041 U	0.039 U	0.032 U	0.034 U	0.033 U	0.032 U	0.039 U	0.034 U	0.032 U	0.034 U
Pentachlorophenol	0.042 U	0.052 U	0.054 U	0.042 U	0.054 U	0.052 U	0.043 U	0.045 U	0.043 U	0.043 U	0.052 U	0.045 U	0.043 U	0.046 U
Phenanthrene	0.0093 U	0.015 J	0.012 U	0.0093 U	0.028 J	0.013 J	0.0094 U	0.031 J	0.0095 U	0.0094 U	0.015 J	0.0099 U	0.0094 U	0.01 U
Phenol	0.011 U	0.014 U	0.015 U	0.011 U	0.015 U	0.014 U	0.012 U	0.012 U	0.012 U	0.012 U	0.014 U	0.012 U	0.011 U	0.012 U
Pyrene	0.016 U	0.02 J	0.02 U	0.016 U	0.044 J	0.022 J	0.016 U	0.067 J	0.016 U	0.016 U	0.033 J	0.017 U	0.016 U	0.017 U
VOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,1,1-Trichloroethane	0.00039 U	--	0.0006 U	0.00041 U	--	0.00054 U	0.00033 U	--	0.00039 U	0.00034 U	--	0.00056 U	0.00039 U	--
1,1,2,2-Tetrachloroethane	0.00017 U	--	0.00027 U	0.00019 U	--	0.00024 U	0.00015 U	--	0.00017 U	0.00015 U	--	0.00025 U	0.00018 U	--
1,1,2-Trichloro-1,2,2-Trifluoroethane	0.00045 U	--	0.0007 U	0.00048 U	--	0.00063 U	0.00039 U	--	0.00045 U	0.0004 U	--	0.00065 U	0.00045 U	--
1,1,2-Trichloroethane	0.00028 U	--	0.00044 U	0.00031 U	--	0.0004 U	0.00025 U	--	0.00029 U	0.00025 U	--	0.00041 U	0.00029 U	--
1,1-Dichloroethane	0.00035 U	--	0.00054 U	0.00037 U	--	0.00049 U	0.0003 U	--	0.00035 U	0.00031 U	--	0.0005 U	0.00035 U	--
1,1-Dichloroethene	0.00042 U	--	0.00065 U	0.00045 U	--	0.00059 U	0.00036 U	--	0.00042 U	0.00037 U	--	0.0006 U	0.00042 U	--
1,2,3-Trichlorobenzene	0.00011 U	--	0.00017 U	0.00012 U	--	0.00016 U	0.000096 U	--	0.00011 U	0.000099 U	--	0.00016 U	0.00011 U	--
1,2,4-Trichlorobenzene	0.00032 U	--	0.00051 U	0.00035 U	--	0.00046 U	0.00028 U	--	0.00033 U	0.00029 U	--	0.00047 U	0.00033 U	--
1,2-Dibromo-3-Chloropropane	0.00048 U	--	0.00074 U	0.00051 U	--	0.00067 U	0.00041 U	--	0.00048 U	0.00043 U	--	0.00069 U	0.00049 U	--
1,2-Dibromoethane (Ethylene Dibromide)	0.00012 U	--	0.00019 U	0.00013 U	--	0.00017 U	0.00011 U	--	0.00012 U	0.00011 U	--	0.00018 U	0.00012 U	--
1,2-Dichlorobenzene	0.00014 U	--	0.00022 U	0.00015 U	--	0.0002 U	0.00012 U	--	0.00014 U	0.00013 U	--	0.00021 U	0.00014 U	--
1,2-Dichloroethane	0.00011 U	--	0.00017 U	0.00012 U	--	0.00016 U	0.000096 U	--	0.00011 U	0.000099 U	--	0.00016 U	0.00011 U	--
1,2-Dichloropropane	0.00017 U	--	0.00027 U	0.00019 U	--	0.00024 U	0.00015 U	--	0.00017 U	0.00015 U	--	0.00025 U	0.00018 U	--
1,3-Dichlorobenzene	0.00012 U	--	0.00019 U	0.00013 U	--	0.00017 U	0.00011 U	--	0.00012 U	0.00011 U	--	0.00018 U	0.00012 U	--
1,4-Dichlorobenzene	0.00013 U	--	0.00021 U	0.00014 U	--	0.00019 U	0.00011 U	--	0.00013 U	0.00012 U	--	0.00019 U	0.00013 U	--
2-Hexanone	0.00095 U	--	0.0015 U	0.001 U	--	0.0013 U	0.00082 U	--	0.00097 U	0.00085 U	--	0.0014 U	0.00097 U	--
Acetone	0.0082	--	0.068	0.0087	--	0.093	0.013	--	0.02	0.017	--	0.05	0.022	--
Benzene	0.00066 J	--	0.0015 J	0.00022 U	--	0.00082 J	0.00019 J	--	0.0013	0.00034 J	--	0.00035 J	0.00024 J	--
Bromochloromethane	0.00017 U	--	0.00027 U	0.00019 U	--	0.00024 U	0.00015 U	--	0.00017 U	0.00015 U	--	0.00025 U	0.00018 U	--
Bromodichloromethane	0.00039 U	--	0.0006 U	0.00041 U	--	0.00054 U	0.00033 U	--	0.00039 U	0.00034 U	--	0.00056 U	0.00039 U	--
Bromoform	0.00013 U	--	0.00021 U	0.00014 U	--	0.00019 U	0.00011 U	--	0.00013 U	0.00012 U	--	0.00019 U	0.00013 U	--
Bromomethane	0.00032 U	--	0.00051 U	0.00035 U	--	0.00046 U	0.00028 U	--	0.00033 U	0.00029 U	--	0.00047 U	0.00033 U	--
Carbon Disulfide	0.00044 U	--	0.00068 U	0.00047 U	--	0.00062 U	0.00039 J	--	0.00044 U	0.0005 J	--	0.00063 U	0.00044 U	--
Carbon Tetrachloride	0.00044 U	--	0.00068 U	0.00047 U	--	0.00062 U	0.00038 U	--	0.00044 U	0.00039 U	--	0.00063 U	0.00044 U	--
Chlorobenzene	0.00014 U	--	0.00022 U	0.00015 U	--	0.0002 U	0.00012 U	--	0.00014 U	0.00013 U	--	0.00021 U	0.00014 U	--
Chloroethane	0.00036 U	--	0.00055 U	0.00038 U	--	0.0005 U	0.00031 U	--	0.00036 U	0.00032 U	--	0.00051 U	0.00036 U	--
Chloroform	0.00021 U	--	0.00033 U	0.00023 U	--	0.0003 U	0.00018 U	--	0.00022 U	0.00019 U	--	0.00031 U	0.00022 U	--
Chloromethane	0.00039 U	--	0.0006 U	0.00041 U	--	0.00054 U	0.00033 U	--	0.00039 U	0.00034 U	--	0.00056 U	0.00039 U	--
Cis-1,2-Dichloroethylene	0.00022 U	--	0.00035 U	0.00024 U	--	0.00031 U	0.00019 U	--	0.00023 U	0.0002 U	--	0.00032 U	0.00023 U	--
Cis-1,3-Dichloropropene	0.00015 U	--	0.00024 U	0.00016 U	--	0.00021 U	0.00013 U	--	0.00015 U	0.00014 U	--	0.00022 U	0.00016 U	--
Cyclohexane	0.0018	--	0.00073 U	0.0005 U	--	0.00066 U	0.0004 U	--	0.001	0.00049 J	--	0.00068 U	0.00048 U	--
Dibromochloromethane	0.00015 U	--	0.00024 U	0.00016 U	--	0.00021 U	0.00013 U	--	0.00015 U	0.00014 U	--	0.00022 U	0.00016 U	--
Dichlorodifluoromethane	0.00032 U	--	0.00051 U	0.00035 U	--	0.00046 U	0.00028 U	--	0.00033 U	0.00029 U	--	0.00047 U	0.00033 U	--
Ethylbenzene	0.00067 J	--	0.00028 U	0.00021 J	--	0.00026 U	0.00016 U	--	0.00018 U	0.00016 U	--	0.00026 U	0.00019 U	--
Isopropylbenzene (Cumene)	0.00017 U	--	0.00027 U	0.00019 U	--	0.00024 U	0.00015 U	--	0.00017 U	0.00015 U	--	0.00025 U	0.00018 U	--
M,P-Xylene	0.0022	--	0.00017 U	0.00036 J	--	0.00016 U	0.000096 U	--	0.00051 J	0.000099 U	--	0.00016 U	0.00011 U	--

Table E-23
Summary of Data Used in Risk Assessment
Western Undeveloped Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-120	CFSB-123	CFSB-123	CFSB-123	CFSB-124	CFSB-124	CFSB-124	CFSB-125	CFSB-125	CFSB-125	CFSB-126	CFSB-126	CFSB-126	CFSB-127
Sample Lab IDs	460-114141-12	460-114141-31	460-114141-32	460-114141-33	460-114141-25	460-114141-26	460-114141-27	460-114141-4	460-114141-5	460-114141-6	460-114141-7	460-114141-8	460-114141-9	460-114141-1
Sample Name	CFSB-120-SO-10-12	CFSB-123-SO-0-0.5	CFSB-123-SO-0.5-2.0	CFSB-123-SO-10-12	CFSB-124-SO-0-0.5	CFSB-124-SO-0.5-2.0	CFSB-124-SO-10-12	CFSB-125-SO-0-0.5	CFSB-125-SO-0.5-2.0	CFSB-125-SO-10-12	CFSB-126-SO-0-0.5	CFSB-126-SO-0.5-2.0	CFSB-126-SO-10-12	CFSB-127-SO-0-0.5
Sample Depth	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft
Chemical	5/18/2016	5/19/2016	5/19/2016	5/19/2016	5/19/2016	5/19/2016	5/19/2016	5/18/2016	5/18/2016	5/18/2016	5/18/2016	5/18/2016	5/18/2016	5/18/2016
Methyl Acetate	0.00091 U	--	0.0039 J	0.00098 U	--	0.035	0.0096	--	0.00092 U	0.00081 U	--	0.002 J	0.0078	--
Methyl Ethyl Ketone (2-Butanone)	0.00078 U	--	0.0012 U	0.00084 U	--	0.0011 U	0.00067 U	--	0.00079 U	0.0007 U	--	0.0011 U	0.0008 U	--
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	0.0023 U	--	0.0035 U	0.0024 U	--	0.0032 U	0.0019 U	--	0.0023 U	0.002 U	--	0.0033 U	0.0023 U	--
Methylcyclohexane	0.0035	--	0.00079 U	0.00075 J	--	0.00072 U	0.00044 U	--	0.0015	0.00091	--	0.00073 U	0.00052 U	--
Methylene Chloride	0.00032 U	--	0.00051 U	0.00035 U	--	0.00046 U	0.00028 U	--	0.00033 U	0.00029 U	--	0.00047 U	0.00033 U	--
O-Xylene (1,2-Dimethylbenzene)	0.00072 J	--	0.00025 U	0.00017 U	--	0.00023 U	0.00014 U	--	0.00016 U	0.00014 U	--	0.00023 U	0.00017 U	--
Styrene	0.00015 U	--	0.00024 U	0.00016 U	--	0.00021 U	0.00013 U	--	0.00015 U	0.00014 U	--	0.00022 U	0.00016 U	--
Tert-Butyl Methyl Ether	0.00017 U	--	0.00027 U	0.00019 U	--	0.00024 U	0.00015 U	--	0.00017 U	0.00015 U	--	0.00025 U	0.00018 U	--
Tetrachloroethylene (PCE)	0.00028 U	--	0.00044 U	0.00031 U	--	0.0004 U	0.00025 U	--	0.00029 U	0.00025 U	--	0.00041 U	0.00029 U	--
Toluene	0.0031	--	0.0003 U	0.00068 J	--	0.00027 U	0.00043 J	--	0.0014	0.00095	--	0.00028 U	0.00033 J	--
Trans-1,2-Dichloroethene	0.0004 U	--	0.00062 U	0.00043 U	--	0.00056 U	0.00034 U	--	0.0004 U	0.00035 U	--	0.00057 U	0.0004 U	--
Trans-1,3-Dichloropropene	0.0001 U	--	0.00016 U	0.00011 U	--	0.00014 U	0.000088 U	--	0.0001 U	0.00009 U	--	0.00015 U	0.0001 U	--
Trichloroethylene (TCE)	0.00026 U	--	0.00041 U	0.00028 U	--	0.00037 U	0.00023 U	--	0.00027 U	0.00024 U	--	0.00038 U	0.00027 U	--
Trichlorofluoromethane	0.00035 U	--	0.00054 U	0.00037 U	--	0.00049 U	0.0003 U	--	0.00035 U	0.00031 U	--	0.0005 U	0.00035 U	--
Vinyl Chloride	0.0004 U	--	0.00062 U	0.00043 U	--	0.00056 U	0.00034 U	--	0.0004 U	0.00035 U	--	0.00057 U	0.0004 U	--

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-23
Summary of Data Used in Risk Assessment
Western Undeveloped Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-127	CFSB-127	CFSB-132	CFSB-132	CFSB-132	CFSB-133	CFSB-133	CFSB-133	CFSB-168	CFSB-168	CFSB-168	CFSB-168	CFSB-169	CFSB-169
Sample Lab IDs	460-114141-2	460-114141-3	460-115008-1	460-115008-2	460-115008-3	460-115008-4	460-115008-5	460-115008-6	180-79434-14, 460-159377-14	180-79434-15, 460-159377-15	320-43709-4	320-43709-5	180-79434-17, 460-159377-17	180-79434-18, 460-159377-16
Sample Name	CFSB-127-SO-0.5-2.0	CFSB-127-SO-10-12	CFSB-132-SO-0-0.5	CFSB-132-SO-0.5-2	CFSB-132-SO-10-12	CFSB-133-SO-0-0.5	CFSB-133-SO-0.5-2	CFSB-133-SO-10-12	CFSB-168-SO-0-0.5	CFSB-168-SO-0.5-2	CFSB-168-SO-0-0.5	CFSB-168-SO-0.5-2	CFSB-169-SO-0-0.5	CFSB-169-SO-0.5-2
Sample Depth	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft
Chemical	5/18/2016	5/18/2016	6/3/2016	6/3/2016	6/3/2016	6/3/2016	6/3/2016	6/3/2016	6/27/2018	6/27/2018	9/27/2018	9/27/2018	6/27/2018	6/27/2018
GENERAL CHEMISTRY (mg/kg)														
Fluoride	1.54 J-	2.61 J-	1.78 J	0.31 J	0.24 UJ	2.4 J	0.92 J	0.21 UJ	2.67 J-	2.68 J-	--	--	2.01 J-	1.46 J-
Cyanide	0.052 J	0.029 J	0.024 J	0.069 J	0.024 U	0.057 J	0.17	0.018 U	2.2 J+	0.084 U	--	--	0.11 J+	0.081 U
METALS (mg/kg)														
"Chromium, Hexavalent - Estimated"	0.286375	0.374696	0.206083	0.337226	0.259611	0.382725	0.350608	0.222141	0.382725	0.331873	--	--	0.377372	0.372019
"Chromium, Trivalent - Estimated"	10.4136	13.6253	7.49392	12.2628	9.44039	13.9173	12.7494	8.07786	13.9173	12.0681	--	--	13.7226	13.528
Aluminum	11700	13800	8330	16300	8400	18700	17200	9040	24100	22300	--	--	21300	26500
Antimony	0.38 UJ	0.35 UJ	0.44 UJ	0.51 UJ	0.54 UJ	0.49 UJ	0.53 UJ	0.36 UJ	0.33 UJ	0.33 UJ	--	--	0.28 UJ	0.28 UJ
Arsenic	6	4.7	3.5	2.2	9.2	2.1	2.5	2.8	4.3	3.2	--	--	4.3	4.4
Barium	120	172	84.9	200	53	245	231	71.9	499	433	--	--	371	533
Beryllium	0.35 J	0.49	0.32 J	0.59	0.42 J	0.75	0.68	0.26 J	1	0.82	--	--	0.87	1.1
Cadmium	0.29 U	0.27 U	0.33 U	0.39 U	0.41 U	0.37 U	0.4 U	0.28 U	0.38 U	0.38 U	--	--	0.32 U	0.32 U
Calcium	2370	9300	18900	3660	29600	4410	4960	34000	8290	5940	--	--	4330	4010
Chromium, Total	10.7	14	7.7	12.6	9.7	14.3	13.1	8.3	14.3	12.4	--	--	14.1	13.9
Cobalt	5.5	5.7	3.5	4.7	6.1	5	4.8	5.7	6.6	6.3	--	--	5.6	6.3
Copper	10.6	10.9	13.9 J-	13.3 J-	12.1 J-	17 J-	15.7 J-	13 J	26.8	15.2	--	--	16.9	17.2
Iron	15800	15000	11300	12700	15100	13500	13100	11500	13500	15800	--	--	15200	15600
Lead	21.2	7.7	10.2 J	10.3 J	9.1 J	12.7 J	13.5 J	12 J	14.5	12.2	--	--	14.3	14
Magnesium	9240	11400	9640	9980	12400	10700	9970	11000	7520	7460	--	--	9130	8370
Manganese	659	642	284	70.2	174	62.7	89.9	256	165	136	--	--	162	95.4
Mercury	0.017 J	0.019	0.021	0.04	0.018 J	0.04	0.034	0.012 U	0.014 U	0.013 U	--	--	0.012 U	0.015 J
Nickel	10.3	11.6	8.9 J	9.5 J	10.6 J	11 J	10.5 J	10.1	11.5	9.8	--	--	10.8	11.5
Potassium	555	788	737	695	731	851	1090	975 J+	1130	886	--	--	1350	1000
Selenium	0.35 U	0.33 U	0.41 U	0.5 J	0.7 J	0.56 J	0.63 J	0.34 U	0.8 J	0.32 U	--	--	0.29 J	0.27 U
Silver	0.69 U	0.65 U	0.8 U	0.94 U	0.98 U	0.9 U	0.97 U	0.67 U	0.7 U	0.69 U	--	--	0.6 U	0.58 U
Sodium	38.8 J	64.3 J	51 J	73.8 J	50 U	87.7 J	73.7 J	34.1 U	235	289	--	--	131	211
Thallium	0.14 U	0.13 U	0.17 U	0.19 U	0.2 U	0.18 U	0.2 U	0.14 U	0.14 U	0.14 U	--	--	0.12 U	0.12 U
Vanadium	12	10.4	6.3	9.3	11.4	10.2	9.7	6.1	11.4	10.5	--	--	10.5	10
Zinc	36.1	41.3	34.1	35.6	40.4	39.8	54.4	38.9	42.1	33.8	--	--	43	36.2
PESTICIDES (mg/kg)														
Aldrin	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Alpha Bhc (Alpha Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Alpha Endosulfan	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Beta Bhc (Beta Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Beta Endosulfan	--	--	--	--	--	--	--	--	--	--	--	--	--	--
cis-Chlordane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Delta BHC (Delta Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dieldrin	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endosulfan Sulfate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin Aldehyde	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin Ketone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Gamma Bhc (Lindane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Heptachlor	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Heptachlor Epoxide	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methoxychlor	--	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDD	--	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDT	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Toxaphene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
trans-Chlordane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
POLYCHLORINATED BIPHENYLS (mg/kg)														
PCB-1016 (Aroclor 1016)	0.0098 U	0.0096 U	0.0096 U	0.012 U	0.012 U	0.012 U	0.012 U	0.01 U	--	--	--	--	--	--
PCB-1221 (Aroclor 1221)	0.0098 U	0.0096 U	0.0096 U	0.012 U	0.012 U	0.012 U	0.012 U	0.01 U	--	--	--	--	--	--
PCB-1232 (Aroclor 1232)	0.0098 U	0.0096 U	0.0096 U	0.012 U	0.012 U	0.012 U	0.012 U	0.01 U	--	--	--	--	--	--
PCB-1242 (Aroclor 1242)	0.0098 U	0.0096 U	0.0096 U	0.012 U	0.012 U	0.012 U	0.012 U	0.01 U	--	--	--	--	--	--

Table E-23
Summary of Data Used in Risk Assessment
Western Undeveloped Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-127	CFSB-127	CFSB-132	CFSB-132	CFSB-132	CFSB-133	CFSB-133	CFSB-133	CFSB-168	CFSB-168	CFSB-168	CFSB-168	CFSB-169	CFSB-169
Sample Lab IDs	460-114141-2	460-114141-3	460-115008-1	460-115008-2	460-115008-3	460-115008-4	460-115008-5	460-115008-6	180-79434-14, 460-159377-14	180-79434-15, 460-159377-15	320-43709-4	320-43709-5	180-79434-17, 460-159377-17	180-79434-18, 460-159377-16
Sample Name	CFSB-127-SO-0.5-2.0	CFSB-127-SO-10-12	CFSB-132-SO-0-0.5	CFSB-132-SO-0.5-2	CFSB-132-SO-10-12	CFSB-133-SO-0-0.5	CFSB-133-SO-0.5-2	CFSB-133-SO-10-12	CFSB-168-SO-0-0.5	CFSB-168-SO-0.5-2	CFSB-168-SO-0-0.5	CFSB-168-SO-0.5-2	CFSB-169-SO-0-0.5	CFSB-169-SO-0.5-2
Sample Depth	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft
Chemical	5/18/2016	5/18/2016	6/3/2016	6/3/2016	6/3/2016	6/3/2016	6/3/2016	6/3/2016	6/27/2018	6/27/2018	9/27/2018	9/27/2018	6/27/2018	6/27/2018
PCB-1248 (Aroclor 1248)	0.0098 U	0.0096 U	0.0096 U	0.012 U	0.012 U	0.012 U	0.012 U	0.01 U	--	--	--	--	--	--
PCB-1254 (Aroclor 1254)	0.01 U	0.01 U	0.0099 U	0.012 U	0.012 U	0.012 U	0.012 U	0.011 U	--	--	--	--	--	--
PCB-1260 (Aroclor 1260)	0.01 U	0.01 U	0.0099 U	0.012 U	0.012 U	0.012 U	0.012 U	0.011 U	--	--	--	--	--	--
PCB-1262 (Aroclor 1262)	0.01 U	0.01 U	0.0099 U	0.012 U	0.012 U	0.012 U	0.012 U	0.011 U	--	--	--	--	--	--
PCB-1268 (Aroclor 1268)	0.01 U	0.01 U	0.0099 U	0.012 U	0.012 U	0.012 U	0.012 U	0.011 U	--	--	--	--	--	--
Polychlorinated Biphenyl (PCBs)	0.01 U	0.01 U	0.0099 U	0.012 U	0.012 U	0.012 U	0.012 U	0.011 U	--	--	--	--	--	--
SEMIVOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,2,4,5-Tetrachlorobenzene	0.027 U	0.027 U	0.026 U	0.032 U	0.033 U	0.033 U	0.032 U	0.028 U	0.0021 U	0.002 U	--	--	0.0017 U	0.0018 U
1,4-Dioxane (P-Dioxane)	0.098 U	0.096 U	0.095 U	0.11 U	0.12 U	0.12 U	0.12 U	0.1 U	0.015 U	0.014 U	--	--	0.013 U	0.013 U
2,3,4,6-Tetrachlorophenol	0.034 U	0.034 U	0.033 U	0.04 U	0.041 U	0.041 U	0.041 U	0.035 U	0.02 U	0.019 U	--	--	0.017 U	0.018 U
2,4,5-Trichlorophenol	0.036 U	0.036 U	0.035 U	0.043 U	0.044 U	0.044 U	0.043 U	0.038 U	0.0034 U	0.0033 U	--	--	0.0029 U	0.003 U
2,4,6-Trichlorophenol	0.01 U	0.01 U	0.01 U	0.012 U	0.013 U	0.013 U	0.012 U	0.011 U	0.0026 U	0.0025 U	--	--	0.0022 U	0.0023 U
2,4-Dichlorophenol	0.0086 U	0.0084 U	0.0084 U	0.01 U	0.01 U	0.01 U	0.01 U	0.0089 U	0.0037 U	0.0035 U	--	--	0.0031 U	0.0033 U
2,4-Dimethylphenol	0.08 U	0.079 U	0.078 U	0.094 U	0.097 U	0.097 U	0.095 U	0.083 U	0.003 U	0.0029 U	--	--	0.0025 U	0.0026 U
2,4-Dinitrophenol	0.28 U	0.27 U	0.27 U	0.32 U	0.33 U	0.33 U	0.33 U	0.29 U	0.13 U	0.12 U	--	--	0.11 U	0.11 U
2,4-Dinitrotoluene	0.014 U	0.014 U	0.014 U	0.017 U	0.017 U	0.017 U	0.017 U	0.015 U	0.0024 U	0.0023 U	--	--	0.002 U	0.0021 U
2,6-Dinitrotoluene	0.019 U	0.019 U	0.019 U	0.023 U	0.023 U	0.023 U	0.023 U	0.02 U	0.0029 U	0.0028 U	--	--	0.0025 U	0.0026 U
2-Chloronaphthalene	0.0083 U	0.0081 U	0.0081 U	0.0097 U	0.01 U	0.01 U	0.0098 U	0.0086 U	0.0022 U	0.0021 U	--	--	0.0018 U	0.002 U
2-Chlorophenol	0.0093 U	0.0091 U	0.009 U	0.011 U	0.011 U	0.011 U	0.011 U	0.0096 U	0.0022 U	0.0021 U	--	--	0.0019 U	0.002 U
2-Methylnaphthalene	0.0081 U	0.0079 U	0.023 J	0.0094 U	0.0097 U	0.016 J	0.013 J	0.0083 U	0.0023 U	0.0022 U	--	--	0.0019 U	0.002 U
2-Methylphenol (O-Cresol)	0.016 U	0.016 U	0.016 U	0.019 U	0.019 U	0.019 U	0.019 U	0.016 U	0.014 U	0.013 U	--	--	0.012 U	0.012 U
2-Nitroaniline	0.012 U	0.012 U	0.012 U	0.014 U	0.015 U	0.015 U	0.014 U	0.012 U	0.022 U	0.021 U	--	--	0.018 U	0.019 U
2-Nitrophenol	0.012 U	0.012 U	0.012 U	0.014 U	0.015 U	0.015 U	0.015 U	0.013 U	0.0027 U	0.0026 U	--	--	0.0023 U	0.0024 U
3- And 4- Methylphenol (Total)	0.0097 U	0.0095 U	0.0095 U	0.011 U	0.012 U	0.012 U	0.012 U	0.01 U	--	--	--	--	--	--
3,3'-Dichlorobenzidine	0.041 U	0.04 U	0.04 U	0.048 U	0.049 U	0.049 U	0.048 U	0.042 U	0.045 U	0.043 U	--	--	0.038 U	0.04 U
3-Nitroaniline	0.011 U	0.011 U	0.011 U	0.013 U	0.013 U	0.013 U	0.013 U	0.011 U	0.012 U	0.012 U	--	--	0.01 U	0.011 U
4,6-Dinitro-2-Methylphenol	0.097 U	0.095 U	0.095 U	0.11 U	0.12 U	0.12 U	0.12 U	0.1 U	0.082 U	0.079 U	--	--	0.069 U	0.073 U
4-Bromophenyl Phenyl Ether	0.011 U	0.011 U	0.011 U	0.013 U	0.014 U	0.014 U	0.014 U	0.012 U	0.0033 U	0.0032 U	--	--	0.0028 U	0.003 U
4-Chloro-3-Methylphenol	0.016 U	0.015 U	0.015 U	0.018 U	0.019 U	0.019 U	0.019 U	0.016 U	0.0022 U	0.0022 U	--	--	0.0019 U	0.002 U
4-Chloroaniline	0.0094 U	0.0092 U	0.0092 U	0.011 U	0.011 U	0.011 U	0.011 U	0.0097 U	0.0016 U	0.0015 U	--	--	0.0013 U	0.0014 U
4-Chlorophenyl Phenyl Ether	0.011 U	0.011 U	0.011 U	0.013 U	0.013 U	0.013 U	0.013 U	0.011 U	0.0029 U	0.0028 U	--	--	0.0024 U	0.0026 U
4-Nitroaniline	0.014 U	0.014 U	0.013 U	0.016 U	0.017 U	0.017 U	0.016 U	0.014 U	0.0023 U	0.0022 U	--	--	0.002 U	0.0021 U
4-Nitrophenol	0.18 U	0.17 UJ	0.17 U	0.21 U	0.21 U	0.21 U	0.21 U	0.18 U	0.033 U	0.032 U	--	--	0.028 U	0.03 U
Acenaphthene	0.0088 U	0.0087 U	0.0086 U	0.01 U	0.011 U	0.011 U	0.01 U	0.0091 U	0.0027 J	0.0026 U	--	--	0.0023 U	0.0025 U
Acenaphthylene	0.0094 U	0.0092 U	0.0092 U	0.011 U	0.011 U	0.011 U	0.011 U	0.0097 U	0.0021 U	0.002 U	--	--	0.0018 U	0.0019 U
Acetophenone	0.0079 U	0.0078 U	0.0078 U	0.0093 U	0.0096 U	0.0096 U	0.0094 U	0.0082 U	0.0026 U	0.0025 U	--	--	0.0022 U	0.0023 U
Anthracene	0.035 U	0.034 U	0.034 U	0.041 U	0.042 U	0.042 U	0.041 U	0.036 U	0.0046 J	0.0024 U	--	--	0.0024 J	0.0022 U
Atrazine	0.016 U	0.016 U	0.016 U	0.019 U	0.02 U	0.02 U	0.019 U	0.017 U	0.021 UJ	0.02 UJ	--	--	0.018 UJ	0.019 UJ
Benzaldehyde	0.028 U	0.027 U	0.027 U	0.033 U	0.034 U	0.034 U	0.033 U	0.029 U	0.0059 U	0.0057 U	--	--	0.005 U	0.0053 U
Benzo(A)Anthracene	0.03 U	0.03 U	0.03 U	0.036 U	0.037 U	0.037 U	0.036 U	0.031 U	0.021	0.0017 U	--	--	0.013	0.0016 U
Benzo(A)Pyrene	0.011 U	0.011 U	0.011 U	0.013 U	0.013 U	0.013 U	0.013 U	0.011 U	0.022	0.002 U	--	--	0.014	0.0019 U
Benzo(B)Fluoranthene	0.014 U	0.014 U	0.014 U	0.017 U	0.017 U	0.017 U	0.017 U	0.015 U	0.037	0.0023 U	--	--	0.023	0.0021 U
Benzo(G,H,I)Perylene	0.021 U	0.021 U	0.02 U	0.025 U	0.025 U	0.025 U	0.025 U	0.022 U	0.03	0.002 U	--	--	0.019	0.0018 U
Benzo(K)Fluoranthene	0.016 U	0.016 U	0.016 U	0.019 U	0.019 U	0.019 U	0.019 U	0.016 U	0.012	0.0028 U	--	--	0.011	0.0026 U
Benzyl Butyl Phthalate	0.011 U	0.011 U	0.011 U	0.013 U	0.014 U	0.014 U	0.013 U	0.012 U	0.041 J	0.032 U	--	--	0.028 U	0.029 U
Biphenyl (Diphenyl)	0.031 U	0.031 U	0.03 U	0.036 U	0.038 U	0.038 U	0.037 U	0.032 U	0.002 U	0.0019 U	--	--	0.0017 U	0.0018 U
Bis(2-Chloroethoxy) Methane	0.011 U	0.011 U	0.011 U	0.013 U	0.014 U	0.014 U	0.014 U	0.012 U	0.0023 U	0.0022 U	--	--	0.0019 U	0.002 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.0086 U	0.0084 U	0.0084 U	0.01 U	0.01 U	0.01 U	0.01 U	0.0089 U	0.0017 U	0.0017 U	--	--	0.0015 U	0.0015 U
Bis(2-Chloroisopropyl) Ether	0.015 U	0.015 UJ	0.015 U	0.018 U	0.018 U	0.018 U	0.018 U	0.016 U	0.0035 U	0.0034 U	--	--	0.003 U	0.0032 U
Bis(2-Ethylhexyl) Phthalate	0.014 U	0.014 U	0.016 J	0.017 U	0.017 U	0.017 U	0.017 U	0.015 U	0.063 J	0.049 U	--	--	0.043 U	0.045 U
Caprolactam	0.026 U	0.026 U	0.026 U	0.031 U	0.032 U	0.032 U	0.031 U	0.027 U	0.031 U	0.03 U	--	--	0.026 U	0.028 U
Carbazole	0.009 U	0.0089 U	0.0088 U	0.011 U	0.011 U	0.011 U	0.011 U	0.0094 U	0.0048 J	0.0022 U	--	--	0.0038 J	0.002 U
Chrysene	0.0099 U	0.0097 U	0.0097 U	0.012 U	0.012 U	0.012 U	0.012 U	0.01 U	0.032	0.0018 U	--	--	0.021	0.0017 U
Dibenz(A,H)Anthracene	0.019 U	0.019 U	0.019 U	0.022 U	0.023 U	0.023 U	0.023 U	0.02 U	0.0021 U	0.0021 U	--	--	0.0018 U	0.0019 U
Dibenzofuran	0.011 U	0.011 U	0.011 U	0.013 U	0.013 U	0.013 U	0.013 U	0.011 U	0.0021 U	0.002 U	--	--	0.0018 U	0.0019 U
Diethyl Phthalate	0.01 U	0.01 U	0.01 U	0.012 U	0.013 U	0.013 U	0.012 U	0.011 U	0.014 U	0.014 U	--	--	0.012 U	0.013 U

Table E-23
Summary of Data Used in Risk Assessment
Western Undeveloped Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-127	CFSB-127	CFSB-132	CFSB-132	CFSB-132	CFSB-133	CFSB-133	CFSB-133	CFSB-168	CFSB-168	CFSB-168	CFSB-168	CFSB-169	CFSB-169
Sample Lab IDs	460-114141-2	460-114141-3	460-115008-1	460-115008-2	460-115008-3	460-115008-4	460-115008-5	460-115008-6	180-79434-14, 460-159377-14	180-79434-15, 460-159377-15	320-43709-4	320-43709-5	180-79434-17, 460-159377-17	180-79434-18, 460-159377-16
Sample Name	CFSB-127-SO-0.5-2.0	CFSB-127-SO-10-12	CFSB-132-SO-0-0.5	CFSB-132-SO-0.5-2	CFSB-132-SO-10-12	CFSB-133-SO-0-0.5	CFSB-133-SO-0.5-2	CFSB-133-SO-10-12	CFSB-168-SO-0-0.5	CFSB-168-SO-0.5-2	CFSB-168-SO-0-0.5	CFSB-168-SO-0.5-2	CFSB-169-SO-0-0.5	CFSB-169-SO-0.5-2
Sample Depth	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft
Chemical	5/18/2016	5/18/2016	6/3/2016	6/3/2016	6/3/2016	6/3/2016	6/3/2016	6/3/2016	6/27/2018	6/27/2018	9/27/2018	9/27/2018	6/27/2018	6/27/2018
Dimethyl Phthalate	0.011 U	0.01 U	0.01 U	0.012 U	0.013 U	0.013 U	0.013 U	0.011 U	0.0017 U	0.0017 U	--	--	0.0015 U	0.0015 U
Di-N-Butyl Phthalate	0.011 U	0.011 U	0.011 U	0.013 U	0.013 U	0.013 U	0.013 U	0.011 U	0.021 U	0.02 U	--	--	0.018 U	0.019 U
Di-N-Octylphthalate	0.019 U	0.018 U	0.018 U	0.022 U	0.022 U	0.022 U	0.022 U	0.019 U	0.028 U	0.027 U	--	--	0.023 U	0.025 U
Fluoranthene	0.011 U	0.011 U	0.011 U	0.013 U	0.013 U	0.013 U	0.013 U	0.011 U	0.04	0.0024 U	--	--	0.027	0.0022 U
Fluorene	0.0079 U	0.0078 U	0.0078 U	0.0093 U	0.0096 U	0.0096 U	0.0094 U	0.0082 U	0.0023 J	0.0018 U	--	--	0.0016 U	0.0017 U
Hexachlorobenzene	0.015 U	0.015 U	0.014 U	0.017 U	0.018 U	0.018 U	0.018 U	0.015 U	0.0034 U	0.0033 U	--	--	0.0029 U	0.0031 U
Hexachlorobutadiene	0.01 U	0.01 U	0.01 U	0.012 U	0.012 U	0.012 U	0.012 U	0.011 U	0.0028 U	0.0027 U	--	--	0.0024 U	0.0025 U
Hexachlorocyclopentadiene	0.023 U	0.022 U	0.022 U	0.027 U	0.027 U	0.027 U	0.027 U	0.024 U	0.0024 U	0.0023 U	--	--	0.0021 U	0.0022 U
Hexachloroethane	0.013 U	0.013 U	0.013 U	0.016 U	0.016 U	0.016 U	0.016 U	0.014 U	0.0025 U	0.0024 U	--	--	0.0021 U	0.0022 U
Indeno(1,2,3-C,D)Pyrene	0.024 U	0.024 U	0.024 U	0.028 U	0.029 U	0.029 U	0.029 U	0.025 U	0.021	0.0019 U	--	--	0.016	0.0017 U
Isophorone	0.0078 U	0.0077 U	0.0076 U	0.0092 U	0.0095 U	0.0095 U	0.0093 U	0.0081 U	0.0024 U	0.0023 U	--	--	0.0021 U	0.0022 U
Naphthalene	0.0093 U	0.0091 U	0.01 J	0.011 U	0.011 U	0.011 U	0.011 U	0.0096 U	0.002 J	0.0018 U	--	--	0.0024 J	0.0017 U
Nitrobenzene	0.011 U	0.011 U	0.011 U	0.013 U	0.014 U	0.014 U	0.014 U	0.012 U	0.017 U	0.017 U	--	--	0.015 U	0.016 U
N-Nitrosodi-N-Propylamine	0.012 U	0.012 U	0.012 U	0.014 U	0.015 U	0.015 U	0.015 U	0.013 U	0.0032 U	0.0031 U	--	--	0.0027 U	0.0029 U
N-Nitrosodiphenylamine	0.033 U	0.032 U	0.032 U	0.039 U	0.04 U	0.04 U	0.039 U	0.034 U	0.016 U	0.015 U	--	--	0.013 U	0.014 U
Pentachlorophenol	0.044 U	0.043 U	0.043 U	0.052 U	0.053 U	0.053 U	0.052 U	0.046 U	0.077 U	0.074 U	--	--	0.065 U	0.068 U
Phenanthrene	0.0097 U	0.0095 U	0.0095 U	0.011 U	0.012 U	0.012 U	0.012 U	0.01 U	0.024	0.0034 J	--	--	0.016	0.0026 J
Phenol	0.012 U	0.012 U	0.012 U	0.014 U	0.014 U	0.014 U	0.014 U	0.012 U	0.014 U	0.014 U	--	--	0.012 U	0.013 U
Pyrene	0.017 U	0.016 U	0.016 U	0.019 U	0.02 U	0.02 U	0.02 U	0.017 U	0.037	0.0022 U	--	--	0.023	0.002 U
VOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,1,1-Trichloroethane	0.00049 U	0.00039 U	--	0.00038 U	0.0011 U	--	0.00037 U	0.00029 U	--	--	--	--	--	--
1,1,2,2-Tetrachloroethane	0.00022 U	0.00017 U	--	0.00017 U	0.00051 U	--	0.00016 U	0.00013 U	--	--	--	--	--	--
1,1,2-Trichloro-1,2,2-Trifluoroethane	0.00056 U	0.00045 U	--	0.00044 U	0.0013 U	--	0.00042 U	0.00033 U	--	--	--	--	--	--
1,1,2-Trichloroethane	0.00036 U	0.00028 U	--	0.00028 U	0.00083 U	--	0.00027 U	0.00021 U	--	--	--	--	--	--
1,1-Dichloroethane	0.00043 U	0.00035 U	--	0.00034 U	0.001 U	--	0.00033 U	0.00026 U	--	--	--	--	--	--
1,1-Dichloroethene	0.00052 U	0.00042 U	--	0.00041 U	0.0012 U	--	0.0004 U	0.00031 U	--	--	--	--	--	--
1,2,3-Trichlorobenzene	0.00014 U	0.00011 U	--	0.00011 U	0.00033 U	--	0.00011 U	0.000083 U	--	--	--	--	--	--
1,2,4-Trichlorobenzene	0.00041 U	0.00033 U	--	0.00032 U	0.00095 U	--	0.00031 U	0.00024 U	--	--	--	--	--	--
1,2-Dibromo-3-Chloropropane	0.0006 U	0.00048 U	--	0.00047 U	0.0014 U	--	0.00045 U	0.00035 U	--	--	--	--	--	--
1,2-Dibromoethane (Ethylene Dibromide)	0.00015 U	0.00012 U	--	0.00012 U	0.00036 U	--	0.00012 U	0.00009 U	--	--	--	--	--	--
1,2-Dichlorobenzene	0.00018 U	0.00014 U	--	0.00014 U	0.00042 U	--	0.00014 U	0.00011 U	--	--	--	--	--	--
1,2-Dichloroethane	0.00014 U	0.00011 U	--	0.00011 U	0.00033 U	--	0.00011 U	0.000083 U	--	--	--	--	--	--
1,2-Dichloropropane	0.00022 U	0.00017 U	--	0.00017 U	0.00051 U	--	0.00016 U	0.00013 U	--	--	--	--	--	--
1,3-Dichlorobenzene	0.00015 U	0.00012 U	--	0.00012 U	0.00036 U	--	0.00012 U	0.00009 U	--	--	--	--	--	--
1,4-Dichlorobenzene	0.00017 U	0.00013 U	--	0.00013 U	0.00039 U	--	0.00013 U	0.000098 U	--	--	--	--	--	--
2-Hexanone	0.0012 U	0.00096 U	--	0.00094 U	0.0028 U	--	0.00091 U	0.00071 U	--	--	--	--	--	--
Acetone	0.042	0.022	--	0.019	0.025	--	0.0094	0.0087	--	--	--	--	--	--
Benzene	0.00029 J	0.0004 J	--	0.00044 J	0.00086 J	--	0.00072 J	0.00015 U	--	--	--	--	--	--
Bromochloromethane	0.00022 U	0.00017 U	--	0.00017 U	0.00051 U	--	0.00016 U	0.00013 U	--	--	--	--	--	--
Bromodichloromethane	0.00049 U	0.00039 U	--	0.00038 U	0.0011 U	--	0.00037 U	0.00029 U	--	--	--	--	--	--
Bromoform	0.00017 U	0.00013 U	--	0.00013 U	0.00039 U	--	0.00013 U	0.000098 U	--	--	--	--	--	--
Bromomethane	0.00041 U	0.00033 U	--	0.00032 U	0.00095 U	--	0.00031 U	0.00024 U	--	--	--	--	--	--
Carbon Disulfide	0.00055 U	0.00079 J	--	0.00043 U	0.0013 U	--	0.00041 U	0.00032 U	--	--	--	--	--	--
Carbon Tetrachloride	0.00055 U	0.00044 U	--	0.00043 U	0.0013 U	--	0.00041 U	0.00032 U	--	--	--	--	--	--
Chlorobenzene	0.00018 U	0.00014 U	--	0.00014 U	0.00042 U	--	0.00014 U	0.00011 U	--	--	--	--	--	--
Chloroethane	0.00045 U	0.00036 U	--	0.00035 U	0.001 U	--	0.00034 U	0.00026 U	--	--	--	--	--	--
Chloroform	0.00027 U	0.00021 U	--	0.00021 U	0.00062 U	--	0.0002 U	0.00016 U	--	--	--	--	--	--
Chloromethane	0.00049 U	0.00039 U	--	0.00038 U	0.0011 U	--	0.00037 U	0.00029 U	--	--	--	--	--	--
Cis-1,2-Dichloroethylene	0.00028 U	0.00022 U	--	0.00022 U	0.00065 U	--	0.00021 U	0.00017 U	--	--	--	--	--	--
Cis-1,3-Dichloropropene	0.00019 U	0.00015 U	--	0.00015 U	0.00045 U	--	0.00014 U	0.00011 U	--	--	--	--	--	--
Cyclohexane	0.00059 U	0.00047 J	--	0.00046 U	0.0019 J	--	0.00044 U	0.00035 U	--	--	--	--	--	--
Dibromochloromethane	0.00019 U	0.00015 U	--	0.00015 U	0.00045 U	--	0.00014 U	0.00011 U	--	--	--	--	--	--
Dichlorodifluoromethane	0.00041 U	0.00033 U	--	0.00032 U	0.00095 U	--	0.00031 U	0.00024 U	--	--	--	--	--	--
Ethylbenzene	0.00023 U	0.00018 U	--	0.00018 U	0.00054 U	--	0.00017 U	0.00014 U	--	--	--	--	--	--
Isopropylbenzene (Cumene)	0.00022 U	0.00017 U	--	0.00017 U	0.00051 U	--	0.00016 U	0.00013 U	--	--	--	--	--	--
M,P-Xylene	0.00014 U	0.00011 U	--	0.00011 U	0.0024 J	--	0.00011 U	0.0001 J	--	--	--	--	--	--

Table E-23
Summary of Data Used in Risk Assessment
Western Undeveloped Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-127	CFSB-127	CFSB-132	CFSB-132	CFSB-132	CFSB-133	CFSB-133	CFSB-133	CFSB-168	CFSB-168	CFSB-168	CFSB-168	CFSB-169	CFSB-169
Sample Lab IDs	460-114141-2	460-114141-3	460-115008-1	460-115008-2	460-115008-3	460-115008-4	460-115008-5	460-115008-6	180-79434-14, 460-159377-14	180-79434-15, 460-159377-15	320-43709-4	320-43709-5	180-79434-17, 460-159377-17	180-79434-18, 460-159377-16
Sample Name	CFSB-127-SO-0.5-2.0	CFSB-127-SO-10-12	CFSB-132-SO-0-0.5	CFSB-132-SO-0.5-2	CFSB-132-SO-10-12	CFSB-133-SO-0-0.5	CFSB-133-SO-0.5-2	CFSB-133-SO-10-12	CFSB-168-SO-0-0.5	CFSB-168-SO-0.5-2	CFSB-168-SO-0-0.5	CFSB-168-SO-0.5-2	CFSB-169-SO-0-0.5	CFSB-169-SO-0.5-2
Sample Depth	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft
Chemical	5/18/2016	5/18/2016	6/3/2016	6/3/2016	6/3/2016	6/3/2016	6/3/2016	6/3/2016	6/27/2018	6/27/2018	9/27/2018	9/27/2018	6/27/2018	6/27/2018
Methyl Acetate	0.011	0.00092 U	--	0.0028 J	0.0027 U	--	0.00087 U	0.00068 U	--	--	--	--	--	--
Methyl Ethyl Ketone (2-Butanone)	0.00098 U	0.00078 U	--	0.00077 U	0.0023 U	--	0.00074 U	0.00058 U	--	--	--	--	--	--
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	0.0028 U	0.0023 U	--	0.0022 U	0.0066 U	--	0.0021 U	0.0017 U	--	--	--	--	--	--
Methylcyclohexane	0.00064 U	0.0007 J	--	0.0005 U	0.0041	--	0.00048 U	0.00038 U	--	--	--	--	--	--
Methylene Chloride	0.00041 U	0.00033 U	--	0.00032 U	0.00095 U	--	0.00031 U	0.00024 U	--	--	--	--	--	--
O-Xylene (1,2-Dimethylbenzene)	0.0002 U	0.00016 U	--	0.00016 U	0.00073 J	--	0.00015 U	0.00012 U	--	--	--	--	--	--
Styrene	0.00019 U	0.00015 U	--	0.00015 U	0.00045 U	--	0.00014 U	0.00011 U	--	--	--	--	--	--
Tert-Butyl Methyl Ether	0.00022 U	0.00017 U	--	0.00017 U	0.00051 U	--	0.00016 U	0.00013 U	--	--	--	--	--	--
Tetrachloroethylene (PCE)	0.00036 U	0.00028 U	--	0.00028 U	0.00083 U	--	0.00027 U	0.00021 U	--	--	--	--	--	--
Toluene	0.00024 U	0.00053 J	--	0.00019 U	0.0031	--	0.00018 J	0.00014 U	--	--	--	--	--	--
Trans-1,2-Dichloroethene	0.0005 U	0.0004 U	--	0.00039 U	0.0012 U	--	0.00038 U	0.00029 U	--	--	--	--	--	--
Trans-1,3-Dichloropropene	0.00013 U	0.0001 U	--	0.000099 U	0.0003 U	--	0.000096 U	0.000075 U	--	--	--	--	--	--
Trichloroethylene (TCE)	0.00033 U	0.00026 U	--	0.00026 U	0.00077 U	--	0.00025 U	0.0002 U	--	--	--	--	--	--
Trichlorofluoromethane	0.00043 U	0.00035 U	--	0.00034 U	0.001 U	--	0.00033 U	0.00026 U	--	--	--	--	--	--
Vinyl Chloride	0.0005 U	0.0004 U	--	0.00039 U	0.0012 U	--	0.00038 U	0.00029 U	--	--	--	--	--	--

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-23
Summary of Data Used in Risk Assessment
Western Undeveloped Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-170	CFSB-170	CFSB-171	CFSB-171	CFSB-172	CFSB-172	CFSB-172	CFSB-172	CFSB-196	CFSB-196	CFSB-196	CFSB-196-DUP	CFSB-196	CFSB-215
Sample Lab IDs	180-79434-12, 460-159377-12	180-79434-13, 460-159377-13	180-79434-10, 460-159377-10	180-79434-11, 460-159377-11	180-79434-21, 460-159377-20	180-79434-22, 460-159377-21	320-43646-5	320-43646-6	180-79434-19, 460-159377-18	180-79434-20, 460-159377-19	320-43709-2	320-43709-1	320-43709-3	180-79108-1, 320-40608-7, 460-158919-1
Sample Name	CFSB-170-SO-0-0.5	CFSB-170-SO-0.5-2	CFSB-171-SO-0-0.5	CFSB-171-SO-0.5-2	CFSB-172-SO-0-0.5	CFSB-172-SO-0.5-2	CFSB-172-SO-0-0.5	CFSB-172-SO-0.5-2	CFSB-196-SO-0-0.5	CFSB-196-SO-0.5-2	CFSB-196-SO-0-0.5	CFSB-DUP50-SO	CFSB-196-SO-0.5-2	CFSB-215-SO-0-0.5
Sample Depth	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft
Chemical	6/27/2018	6/27/2018	6/27/2018	6/27/2018	6/27/2018	6/27/2018	9/26/2018	9/26/2018	6/27/2018	6/27/2018	9/27/2018	9/27/2018	9/27/2018	6/21/2018
GENERAL CHEMISTRY (mg/kg)														
Fluoride	2.1 J-	1.53 J-	1.67 J-	2.11 J-	2.89 J-	1.93 J-	--	--	2.88 J-	3.71	--	--	--	7.27
Cyanide	0.15 J+	0.073 U	0.24 J+	0.076 U	0.37 J+	0.069 U	--	--	0.29 J+	0.061 U	--	--	--	0.085 J
METALS (mg/kg)														
"Chromium, Hexavalent - Estimated"	0.382725	0.444282	0.323844	0.331873	0.232847	0.270316	--	--	0.176642	0.206083	--	--	--	0.2382
"Chromium, Trivalent - Estimated"	13.9173	16.1557	11.7762	12.0681	8.46715	9.82968	--	--	6.42336	7.49392	--	--	--	8.6618
Aluminum	17900	22200	14700	14400	18100	20300	--	--	13300	12700	--	--	--	12600
Antimony	0.28 UJ	0.29 UJ	0.31 UJ	0.3 UJ	0.32 UJ	0.29 UJ	--	--	0.3 UJ	0.3 UJ	--	--	--	0.28 U
Arsenic	3	3.3	3.9	2	6.2	4.8	--	--	5.3	4.1	--	--	--	4
Barium	315	428	243	175	321	208	--	--	422	114	--	--	--	168
Beryllium	0.83	1	0.69	0.55	0.55	0.57	--	--	0.55	0.37 J	--	--	--	0.36 J
Cadmium	0.32 U	0.33 U	0.35 U	0.34 U	0.37 U	0.33 U	--	--	0.35 U	0.35 U	--	--	--	0.32 U
Calcium	4710	4530	8350	2860	3830	1590	--	--	2580	988	--	--	--	1990
Chromium, Total	14.3	16.6	12.1	12.4	8.7	10.1	--	--	6.6	7.7	--	--	--	8.9
Cobalt	4.9	5.2	5	4.2	4.4	4.4	--	--	5.8	5.4	--	--	--	5.9
Copper	20.7	24.2	14.5	11.3	9 J+	8.1 J+	--	--	9.6 J+	9 J+	--	--	--	11.9
Iron	13100	14800	13200	12500	13700	16400	--	--	12000	12300	--	--	--	14200
Lead	13.9	15	12.3	9.4	14.3	9.6	--	--	13.1	9.8	--	--	--	10.3
Magnesium	9630	10400	9280	10000	6620	9520	--	--	5360	6200	--	--	--	5890
Manganese	92	78.6	235	53.7	824 J	161 J	--	--	2210 J	256 J	--	--	--	547
Mercury	0.014 J-	0.029 J-	0.022 J-	0.019 J-	0.012 J	0.01 U	--	--	0.011 U	0.01 U	--	--	--	0.015 J
Nickel	10.4	11.7	10.1	9.5	11	10.8	--	--	12.4	8.9	--	--	--	10.3
Potassium	1090	1000	1000	656	1060	658	--	--	1290	1040	--	--	--	1140
Selenium	0.48 J	0.34 J	0.73 J	0.29 U	0.32 U	0.29 U	--	--	0.3 U	0.3 U	--	--	--	0.27 U
Silver	0.59 U	0.61 U	0.65 U	0.63 U	0.68 U	0.61 U	--	--	0.64 U	0.64 U	--	--	--	0.58 U
Sodium	94.6 J	119	82.6 J	60.6 J	84.2 J	85.1 J	--	--	79.3 J	51.8 J	--	--	--	29.5 U
Thallium	0.12 U	0.12 J	0.13 U	0.13 U	0.14 U	0.12 U	--	--	0.13 U	0.13 U	--	--	--	0.12 U
Vanadium	9.8	9.7	9.4	9.1	12.8	15.4	--	--	9.3	11.3	--	--	--	14.3
Zinc	45.5	44.6	36.1	34.6	70.3	44.6	--	--	63.9	35.5	--	--	--	57.4
PESTICIDES (mg/kg)														
Aldrin	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Alpha Bhc (Alpha Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Alpha Endosulfan	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Beta Bhc (Beta Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Beta Endosulfan	--	--	--	--	--	--	--	--	--	--	--	--	--	--
cis-Chlordane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Delta BHC (Delta Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dieldrin	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endosulfan Sulfate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin Aldehyde	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin Ketone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Gamma Bhc (Lindane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Heptachlor	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Heptachlor Epoxide	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methoxychlor	--	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDD	--	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDT	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Toxaphene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
trans-Chlordane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
POLYCHLORINATED BIPHENYLS (mg/kg)														
PCB-1016 (Aroclor 1016)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1221 (Aroclor 1221)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1232 (Aroclor 1232)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1242 (Aroclor 1242)	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Table E-23
Summary of Data Used in Risk Assessment
Western Undeveloped Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-170	CFSB-170	CFSB-171	CFSB-171	CFSB-172	CFSB-172	CFSB-172	CFSB-172	CFSB-196	CFSB-196	CFSB-196	CFSB-196-DUP	CFSB-196	CFSB-215
Sample Lab IDs	180-79434-12, 460-159377-12	180-79434-13, 460-159377-13	180-79434-10, 460-159377-10	180-79434-11, 460-159377-11	180-79434-21, 460-159377-20	180-79434-22, 460-159377-21	320-43646-5	320-43646-6	180-79434-19, 460-159377-18	180-79434-20, 460-159377-19	320-43709-2	320-43709-1	320-43709-3	180-79108-1, 320-40608-7, 460-158919-1
Sample Name	CFSB-170-SO-0-0.5	CFSB-170-SO-0.5-2	CFSB-171-SO-0-0.5	CFSB-171-SO-0.5-2	CFSB-172-SO-0-0.5	CFSB-172-SO-0.5-2	CFSB-172-SO-0-0.5	CFSB-172-SO-0.5-2	CFSB-196-SO-0-0.5	CFSB-196-SO-0.5-2	CFSB-196-SO-0-0.5	CFSB-DUP50-SO	CFSB-196-SO-0.5-2	CFSB-215-SO-0-0.5
Sample Depth	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft
Chemical	6/27/2018	6/27/2018	6/27/2018	6/27/2018	6/27/2018	6/27/2018	9/26/2018	9/26/2018	6/27/2018	6/27/2018	9/27/2018	9/27/2018	9/27/2018	6/21/2018
PCB-1248 (Aroclor 1248)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1254 (Aroclor 1254)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1260 (Aroclor 1260)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1262 (Aroclor 1262)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1268 (Aroclor 1268)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Polychlorinated Biphenyl (PCBs)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SEMIVOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,2,4,5-Tetrachlorobenzene	0.0018 U	0.0018 U	0.0021 U	0.0019 U	0.0016 U	0.0016 U	--	--	0.0016 U	0.0016 U	--	--	--	0.0016 U
1,4-Dioxane (P-Dioxane)	0.013 U	0.013 U	0.015 U	0.014 U	0.012 U	0.011 U	--	--	0.012 U	0.011 U	--	--	--	0.012 U
2,3,4,6-Tetrachlorophenol	0.017 U	0.017 U	0.02 U	0.018 U	0.016 U	0.015 U	--	--	0.016 U	0.015 U	--	--	--	0.016 UJ
2,4,5-Trichlorophenol	0.003 U	0.003 U	0.0035 U	0.0032 U	0.0027 U	0.0026 U	--	--	0.0027 U	0.0026 U	--	--	--	0.0027 U
2,4,6-Trichlorophenol	0.0023 U	0.0023 U	0.0027 U	0.0024 U	0.0021 U	0.002 U	--	--	0.0021 U	0.002 U	--	--	--	0.0021 U
2,4-Dichlorophenol	0.0032 U	0.0032 U	0.0037 U	0.0034 U	0.0029 U	0.0028 U	--	--	0.0029 U	0.0028 U	--	--	--	0.0029 U
2,4-Dimethylphenol	0.0026 U	0.0026 U	0.003 U	0.0028 U	0.0024 U	0.0023 U	--	--	0.0023 U	0.0022 U	--	--	--	0.0024 U
2,4-Dinitrophenol	0.11 U	0.11 U	0.13 U	0.12 U	0.1 U	0.098 U	--	--	0.1 U	0.097 UJ	--	--	--	0.1 UJ
2,4-Dinitrotoluene	0.0021 U	0.0021 U	0.0024 U	0.0022 U	0.0019 U	0.0018 U	--	--	0.0019 U	0.0018 U	--	--	--	0.0019 U
2,6-Dinitrotoluene	0.0026 U	0.0026 U	0.003 U	0.0027 U	0.0024 U	0.0022 U	--	--	0.0023 U	0.0022 U	--	--	--	0.0023 U
2-Chloronaphthalene	0.0019 U	0.0019 U	0.0022 U	0.002 U	0.0018 U	0.0017 U	--	--	0.0017 U	0.0017 U	--	--	--	0.0017 U
2-Chlorophenol	0.0019 U	0.0019 U	0.0022 U	0.0021 U	0.0018 U	0.0017 U	--	--	0.0017 U	0.0017 U	--	--	--	0.0018 U
2-Methylnaphthalene	0.002 U	0.002 U	0.0023 U	0.0021 U	0.0018 U	0.0017 U	--	--	0.0018 U	0.0017 U	--	--	--	0.0018 U
2-Methylphenol (O-Cresol)	0.012 U	0.012 U	0.014 U	0.013 U	0.011 U	0.01 U	--	--	0.011 U	0.01 U	--	--	--	0.011 U
2-Nitroaniline	0.019 U	0.019 U	0.022 U	0.02 U	0.017 U	0.017 U	--	--	0.017 U	0.016 U	--	--	--	0.017 U
2-Nitrophenol	0.0024 U	0.0024 U	0.0028 U	0.0025 U	0.0022 U	0.0021 U	--	--	0.0022 U	0.0021 U	--	--	--	0.0022 U
3- And 4- Methylphenol (Total)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3,3'-Dichlorobenzidine	0.039 U	0.039 U	0.045 U	0.041 U	0.036 U	0.034 U	--	--	0.035 U	0.034 U	--	--	--	0.035 U
3-Nitroaniline	0.011 U	0.011 U	0.012 U	0.011 U	0.0097 U	0.0092 U	--	--	0.0095 U	0.0092 U	--	--	--	0.0096 U
4,6-Dinitro-2-Methylphenol	0.072 U	0.071 U	0.083 U	0.077 U	0.066 U	0.063 U	--	--	0.065 U	0.062 U	--	--	--	0.065 U
4-Bromophenyl Phenyl Ether	0.0029 U	0.0029 U	0.0034 U	0.0031 U	0.0027 U	0.0025 U	--	--	0.0026 U	0.0025 U	--	--	--	0.0026 U
4-Chloro-3-Methylphenol	0.002 U	0.0019 U	0.0023 U	0.0021 U	0.0018 U	0.0017 U	--	--	0.0018 U	0.0017 U	--	--	--	0.0018 U
4-Chloroaniline	0.0014 U	0.0014 U	0.0016 U	0.0015 U	0.0013 U	0.0012 U	--	--	0.0012 U	0.0012 U	--	--	--	0.0013 U
4-Chlorophenyl Phenyl Ether	0.0025 U	0.0025 U	0.0029 U	0.0027 U	0.0023 U	0.0022 U	--	--	0.0023 U	0.0022 U	--	--	--	0.0023 U
4-Nitroaniline	0.0059 J	0.002 U	0.0024 U	0.0022 U	0.0019 U	0.0018 U	--	--	0.0018 U	0.0017 U	--	--	--	0.0018 U
4-Nitrophenol	0.029 U	0.029 U	0.034 U	0.031 U	0.027 U	0.026 U	--	--	0.026 U	0.025 U	--	--	--	0.027 UJ
Acenaphthene	0.0024 U	0.0024 U	0.0028 U	0.0026 U	0.0022 U	0.0021 U	--	--	0.004 J	0.0021 U	--	--	--	0.0022 U
Acenaphthylene	0.0018 U	0.0018 U	0.0021 U	0.0019 U	0.0017 U	0.0016 U	--	--	0.0016 U	0.0016 U	--	--	--	0.0017 U
Acetophenone	0.0023 U	0.0022 U	0.025 J	0.0036 J	0.0021 U	0.002 U	--	--	0.002 U	0.002 U	--	--	--	0.0021 U
Anthracene	0.0022 J	0.0021 U	0.0048 J	0.0023 U	0.0031 J	0.0019 U	--	--	0.0059 J	0.0019 U	--	--	--	0.0024 J
Atrazine	0.018 UJ	0.018 UJ	0.021 U	0.019 UJ	0.017 UJ	0.016 UJ	--	--	0.016 UJ	0.016 UJ	--	--	--	0.017 UJ
Benzaldehyde	0.0052 U	0.0051 U	0.044 J	0.0059 J	0.0047 U	0.0045 U	--	--	0.0056 J	0.0045 U	--	--	--	0.0047 UR
Benzo(A)Anthracene	0.012	0.0072 J	0.021	0.0017 U	0.022	0.0014 U	--	--	0.043	0.0017 J	--	--	--	0.0083
Benzo(A)Pyrene	0.013	0.0077 J	0.028	0.0019 U	0.025	0.0016 U	--	--	0.048	0.0016 U	--	--	--	0.0097
Benzo(B)Fluoranthene	0.027	0.014	0.04	0.0022 U	0.051	0.0018 U	--	--	0.095	0.003 J	--	--	--	0.017
Benzo(G,H,I)Perylene	0.018	0.011	0.019	0.0019 U	0.037	0.0016 U	--	--	0.067	0.0016 U	--	--	--	0.012
Benzo(K)Fluoranthene	0.0078 J	0.0039 J	0.011	0.0027 U	0.015	0.0022 U	--	--	0.029	0.0022 U	--	--	--	0.0051 J
Benzyl Butyl Phthalate	0.034 J	0.034 J	0.033 U	0.074	0.026 U	0.025 U	--	--	0.026 U	0.025 U	--	--	--	0.026 U
Biphenyl (Diphenyl)	0.0018 U	0.0017 U	0.002 U	0.0019 U	0.0016 U	0.0015 U	--	--	0.0016 U	0.0015 U	--	--	--	0.0016 U
Bis(2-Chloroethoxy) Methane	0.002 U	0.002 U	0.0023 U	0.0021 U	0.0018 U	0.0017 U	--	--	0.0018 U	0.0017 U	--	--	--	0.0018 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.0015 U	0.0015 U	0.0018 U	0.0016 U	0.0014 U	0.0013 U	--	--	0.0014 U	0.0013 U	--	--	--	0.0014 U
Bis(2-Chloroisopropyl) Ether	0.0031 U	0.0031 U	0.0036 U	0.0033 U	0.0028 U	0.0027 U	--	--	0.0028 U	0.0027 U	--	--	--	0.0028 U
Bis(2-Ethylhexyl) Phthalate	0.044 U	0.069 J	0.052 U	0.099 J	0.041 U	0.039 U	--	--	0.04 U	0.038 U	--	--	--	0.04 U
Caprolactam	0.027 U	0.027 U	0.031 U	0.029 U	0.025 U	0.024 U	--	--	0.024 U	0.023 UJ	--	--	--	0.025 U
Carbazole	0.0036 J	0.0025 J	0.0046 J	0.0033 J	0.0049 J	0.0017 U	--	--	0.0086	0.0017 U	--	--	--	0.0024 J
Chrysene	0.019	0.011	0.033	0.0017 U	0.038	0.0014 U	--	--	0.069	0.0021 J	--	--	--	0.013
Dibenz(A,H)Anthracene	0.0045 J	0.0018 U	0.0022 U	0.002 U	0.0087	0.0016 U	--	--	0.015	0.0016 U	--	--	--	0.0031 J
Dibenzofuran	0.0018 U	0.0018 U	0.0021 U	0.0019 U	0.0017 U	0.0016 U	--	--	0.0018 J	0.0016 U	--	--	--	0.0018 J
Diethyl Phthalate	0.013 U	0.012 U	0.015 U	0.013 U	0.011 U	0.011 U	--	--	0.011 U	0.011 U	--	--	--	0.011 U

Table E-23
Summary of Data Used in Risk Assessment
Western Undeveloped Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-170	CFSB-170	CFSB-171	CFSB-171	CFSB-172	CFSB-172	CFSB-172	CFSB-172	CFSB-196	CFSB-196	CFSB-196	CFSB-196-DUP	CFSB-196	CFSB-215
Sample Lab IDs	180-79434-12, 460-159377-12	180-79434-13, 460-159377-13	180-79434-10, 460-159377-10	180-79434-11, 460-159377-11	180-79434-21, 460-159377-20	180-79434-22, 460-159377-21	320-43646-5	320-43646-6	180-79434-19, 460-159377-18	180-79434-20, 460-159377-19	320-43709-2	320-43709-1	320-43709-3	180-79108-1, 320-40608-7, 460-158919-1
Sample Name	CFSB-170-SO-0-0.5	CFSB-170-SO-0.5-2	CFSB-171-SO-0-0.5	CFSB-171-SO-0.5-2	CFSB-172-SO-0-0.5	CFSB-172-SO-0.5-2	CFSB-172-SO-0-0.5	CFSB-172-SO-0.5-2	CFSB-196-SO-0-0.5	CFSB-196-SO-0.5-2	CFSB-196-SO-0-0.5	CFSB-DUP50-SO	CFSB-196-SO-0.5-2	CFSB-215-SO-0-0.5
Sample Depth	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft
Chemical	6/27/2018	6/27/2018	6/27/2018	6/27/2018	6/27/2018	6/27/2018	9/26/2018	9/26/2018	6/27/2018	6/27/2018	9/27/2018	9/27/2018	9/27/2018	6/21/2018
Dimethyl Phthalate	0.0015 U	0.0015 U	0.0018 U	0.0016 U	0.0014 U	0.0013 U	--	--	0.0014 U	0.0013 U	--	--	--	0.0014 U
Di-N-Butyl Phthalate	0.018 U	0.018 U	0.021 U	0.019 U	0.017 U	0.016 U	--	--	0.016 U	0.016 U	--	--	--	0.017 U
Di-N-Octylphthalate	0.024 U	0.024 U	0.028 U	0.026 U	0.022 U	0.021 U	--	--	0.022 U	0.021 U	--	--	--	0.022 U
Fluoranthene	0.023	0.012	0.044	0.0023 U	0.044	0.0019 U	--	--	0.087	0.0029 J	--	--	--	0.016
Fluorene	0.0016 J	0.0016 U	0.0051 J	0.0017 U	0.002 J	0.0014 U	--	--	0.0028 J	0.0014 U	--	--	--	0.0015 J
Hexachlorobenzene	0.003 U	0.003 U	0.0035 U	0.0032 U	0.0027 U	0.0026 U	--	--	0.0027 U	0.0026 U	--	--	--	0.0027 U
Hexachlorobutadiene	0.0024 U	0.0024 U	0.0028 U	0.0026 U	0.0022 U	0.0021 U	--	--	0.0022 U	0.0021 U	--	--	--	0.0022 U
Hexachlorocyclopentadiene	0.0021 U	0.0021 U	0.0025 U	0.0023 U	0.0019 U	0.0019 U	--	--	0.0019 U	0.0018 U	--	--	--	0.0019 UJ
Hexachloroethane	0.0022 U	0.0021 U	0.0025 U	0.0023 U	0.002 U	0.0019 U	--	--	0.0019 U	0.0019 U	--	--	--	0.002 U
Indeno(1,2,3-C,D)Pyrene	0.017	0.0077 J	0.021	0.0018 U	0.03	0.0015 U	--	--	0.053	0.0015 J	--	--	--	0.0084
Isophorone	0.0021 U	0.0021 U	0.0025 U	0.0023 U	0.0019 U	0.0019 U	--	--	0.0019 U	0.0018 U	--	--	--	0.0019 U
Naphthalene	0.0016 J	0.0016 U	0.0019 U	0.0017 U	0.0015 U	0.0014 U	--	--	0.0025 J	0.0014 U	--	--	--	0.0015 J
Nitrobenzene	0.015 U	0.015 U	0.018 U	0.016 U	0.014 U	0.013 U	--	--	0.014 U	0.013 U	--	--	--	0.014 U
N-Nitrosodi-N-Propylamine	0.0028 U	0.0028 U	0.0033 U	0.003 U	0.0026 U	0.0025 U	--	--	0.0025 U	0.0024 U	--	--	--	0.0026 U
N-Nitrosodiphenylamine	0.014 U	0.014 U	0.016 U	0.015 U	0.013 U	0.012 U	--	--	0.012 U	0.012 U	--	--	--	0.013 U
Pentachlorophenol	0.067 U	0.066 U	0.078 U	0.071 U	0.061 U	0.058 U	--	--	0.06 U	0.058 U	--	--	--	0.061 UJ
Phenanthrene	0.013	0.008 J	0.033	0.0056 J	0.02	0.002 J	--	--	0.04	0.0026 J	--	--	--	0.015
Phenol	0.013 U	0.013 U	0.015 U	0.013 U	0.012 U	0.011 U	--	--	0.011 U	0.011 U	--	--	--	0.011 U
Pyrene	0.021	0.011	0.036	0.0021 U	0.039	0.0017 U	--	--	0.076	0.0026 J	--	--	--	0.014
VOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,1,1-Trichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,2,2-Tetrachloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,2-Trichloro-1,2,2-Trifluoroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,2-Trichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1-Dichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1-Dichloroethene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,3-Trichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,4-Trichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dibromo-3-Chloropropane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dibromoethane (Ethylene Dibromide)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichloropropane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,3-Dichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,4-Dichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Hexanone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acetone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromochloromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromodichloromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromoform	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromomethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Carbon Disulfide	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Carbon Tetrachloride	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chloroform	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chloromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cis-1,2-Dichloroethylene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cis-1,3-Dichloropropene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cyclohexane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibromochloromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dichlorodifluoromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Ethylbenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Isopropylbenzene (Cumene)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
M,P-Xylene	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Table E-23
Summary of Data Used in Risk Assessment
Western Undeveloped Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-170	CFSB-170	CFSB-171	CFSB-171	CFSB-172	CFSB-172	CFSB-172	CFSB-172	CFSB-196	CFSB-196	CFSB-196	CFSB-196-DUP	CFSB-196	CFSB-215
Sample Lab IDs	180-79434-12, 460-159377-12	180-79434-13, 460-159377-13	180-79434-10, 460-159377-10	180-79434-11, 460-159377-11	180-79434-21, 460-159377-20	180-79434-22, 460-159377-21	320-43646-5	320-43646-6	180-79434-19, 460-159377-18	180-79434-20, 460-159377-19	320-43709-2	320-43709-1	320-43709-3	180-79108-1, 320-40608-7, 460-158919-1
Sample Name	CFSB-170-SO-0-0.5	CFSB-170-SO-0.5-2	CFSB-171-SO-0-0.5	CFSB-171-SO-0.5-2	CFSB-172-SO-0-0.5	CFSB-172-SO-0.5-2	CFSB-172-SO-0-0.5	CFSB-172-SO-0.5-2	CFSB-196-SO-0-0.5	CFSB-196-SO-0.5-2	CFSB-196-SO-0-0.5	CFSB-DUP50-SO	CFSB-196-SO-0.5-2	CFSB-215-SO-0-0.5
Sample Depth	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft
Chemical	6/27/2018	6/27/2018	6/27/2018	6/27/2018	6/27/2018	6/27/2018	9/26/2018	9/26/2018	6/27/2018	6/27/2018	9/27/2018	9/27/2018	9/27/2018	6/21/2018
Methyl Acetate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methyl Ethyl Ketone (2-Butanone)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methylcyclohexane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methylene Chloride	--	--	--	--	--	--	--	--	--	--	--	--	--	--
O-Xylene (1,2-Dimethylbenzene)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Styrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Tert-Butyl Methyl Ether	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Tetrachloroethylene (PCE)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Toluene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Trans-1,2-Dichloroethene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Trans-1,3-Dichloropropene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Trichloroethylene (TCE)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Trichlorofluoromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Vinyl Chloride	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-23
Summary of Data Used in Risk Assessment
Western Undeveloped Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-215	CFSB-216	CFSB-216	CFSB-217	CFSB-217	CFSB-218	CFSB-218	CFSB-237	CFSB-237	CFSB-238	CFSB-238	CFSB-238	CFSB-238	CFSB-238
Sample Lab IDs	180-79108-2, 320-40608-8, 460-158919-2	180-79108-11, 320-40608-13, 460-158919-11	180-79108-12, 320-40608-14, 460-158919-12	180-79108-9, 320-40608-11, 460-158919-9	180-79108-10, 320-40608-12, 460-158919-10	180-79108-3, 320-40608-5, 460-158919-3	180-79108-4, 320-40608-6, 460-158919-4	180-79108-13, 320-40608-15, 460-158919-13	180-79108-14, 320-40608-16, 460-158919-14	180-79434-31, 460-159377-31	180-79434-32, 460-159377-32	460-165504-1	320-43646-1	460-165504-2
Sample Name	CFSB-215-SO-0.5-2	CFSB-216-SO-0-0.5	CFSB-216-SO-0.5-2	CFSB-217-SO-0-0.5	CFSB-217-SO-0.5-2	CFSB-218-SO-0-0.5	CFSB-218-SO-0.5-2	CFSB-237-SO-0-0.5	CFSB-237-SO-0.5-2	CFSB-238-SO-0-0.5	CFSB-238-SO-0.5-2	CFSB-238a-SO-0-0.5	CFSB-238-SO-0-0.5	CFSB-238a-SO-0.5-2
Sample Depth	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0-0.5 ft	0.5-2 ft
Chemical	6/21/2018	6/21/2018	6/21/2018	6/21/2018	6/21/2018	6/21/2018	6/21/2018	6/21/2018	6/21/2018	6/27/2018	6/27/2018	9/25/2018	9/25/2018	9/25/2018
GENERAL CHEMISTRY (mg/kg)														
Fluoride	4.12	5.36	2.42	6.93	5.8	2.74	1.82	3.47	2.47	3.44	4.81	--	--	--
Cyanide	0.07 U	0.34	0.15 J	0.069 U	0.21 J+	0.058 U	0.063 U	0.056 U	0.07 J	0.16 J+	0.083 J+	--	--	--
METALS (mg/kg)														
"Chromium, Hexavalent - Estimated"	0.259611	0.441606	0.489781	0.377372	0.372019	0.291727	0.313139	0.224818	0.240876	0.305109	0.216788	--	--	--
"Chromium, Trivalent - Estimated"	9.44039	16.0584	17.8102	13.7226	13.528	10.6083	11.3869	8.17518	8.75912	11.0949	7.88321	--	--	--
Aluminum	15100	19600	23400	20500	23800	26700	19300	12600	14700	21100	10900	--	--	--
Antimony	0.24 U	0.38 U	0.36 J-	0.27 U	0.28 U	0.26 U	0.24 U	0.25 UJ	0.29 UJ	0.32 U	0.27 U	--	--	--
Arsenic	3.9	7.5	8.5	8	9.9	9	10.8	3.2	3.8	8.1	5.8	--	--	--
Barium	144	333	351	320	353	466	266	164	118	285	122	--	--	--
Beryllium	0.55	0.91	1	0.95	0.91	0.72	0.72	0.44	0.52	0.7	0.45	--	--	--
Cadmium	0.27 U	0.43 U	0.37 U	0.31 U	0.32 U	0.3 U	0.28 U	0.29 U	0.33 U	0.37 U	0.31 U	--	--	--
Calcium	1830	7010	7240	6660	6710	3700	2780	2210	1790	3110	4620	--	--	--
Chromium, Total	9.7	16.5	18.3	14.1	13.9	10.9	11.7	8.4	9	11.4	8.1	--	--	--
Cobalt	6.9	6.5	6.9	6.5	7.2	5.7	7.2	5.1	5.9	7	4.8	--	--	--
Copper	11.3	25.3	25.9	23.5	22.3	16.1	13	10.5	12.3	18.4	20.1	--	--	--
Iron	16200	17200	19000	17100	18200	17400	21100	13200	15300	19200	12500	--	--	--
Lead	8.8	16.9	16.5 J	15.2	12.9	11.2	10.1	11.6 J	10.2 J	15.3	8	--	--	--
Magnesium	6650	11100	12500	9260	9210	6790	8510	6410	7140	7500	6380	--	--	--
Manganese	445	434	411	609	662	333	327	525	417	820	427	--	--	--
Mercury	0.011 U	0.03	0.036	0.033	0.029	0.063	0.015 J	0.014 J	0.0099 U	0.016 J	0.015 J-	--	--	--
Nickel	11.8	13.5	13.3	13.2	12.8	10.7	11.7	10.7	10.9	13	10.1	--	--	--
Potassium	1060	1520	1160	1220	992	950	784	1070	825	1010	543	--	--	--
Selenium	0.23 U	0.93 J	0.67 J	0.74 J	0.58 J	0.26 U	0.24 U	0.25 U	0.29 U	0.32 U	0.26 U	--	--	--
Silver	0.5 U	0.79 U	0.69 U	0.57 U	0.58 U	0.55 U	0.52 U	0.54 U	0.61 U	0.68 U	0.56 U	--	--	--
Sodium	25.3 U	60.7 J	55.7 J	58 J	81 J	206	76.6 J	29.8 J	41.9 J	43.8 J	33.1 J	--	--	--
Thallium	0.1 U	0.16 U	0.14 J	0.12 U	0.12 U	0.11 U	0.1 U	0.11 U	0.12 U	0.14 U	0.11 U	--	--	--
Vanadium	16.7	11.4	11	12.5	13.3	12	13.9	11.4	13.2	17.3	8.5	--	--	--
Zinc	50.1	68.2	61.4	69.7	64.8	55.7	60.4	52.8	40.7	61.4	34.4	--	--	--
PESTICIDES (mg/kg)														
Aldrin	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Alpha Bhc (Alpha Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Alpha Endosulfan	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Beta Bhc (Beta Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Beta Endosulfan	--	--	--	--	--	--	--	--	--	--	--	--	--	--
cis-Chlordane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Delta BHC (Delta Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dieldrin	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endosulfan Sulfate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin Aldehyde	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin Ketone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Gamma Bhc (Lindane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Heptachlor	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Heptachlor Epoxide	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methoxychlor	--	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDD	--	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDT	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Toxaphene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
trans-Chlordane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
POLYCHLORINATED BIPHENYLS (mg/kg)														
PCB-1016 (Aroclor 1016)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1221 (Aroclor 1221)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1232 (Aroclor 1232)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1242 (Aroclor 1242)	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Table E-23
Summary of Data Used in Risk Assessment
Western Undeveloped Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-215	CFSB-216	CFSB-216	CFSB-217	CFSB-217	CFSB-218	CFSB-218	CFSB-237	CFSB-237	CFSB-238	CFSB-238	CFSB-238	CFSB-238	CFSB-238
Sample Lab IDs	180-79108-2, 320-40608-8, 460-158919-2	180-79108-11, 320-40608-13, 460-158919-11	180-79108-12, 320-40608-14, 460-158919-12	180-79108-9, 320-40608-11, 460-158919-9	180-79108-10, 320-40608-12, 460-158919-10	180-79108-3, 320-40608-5, 460-158919-3	180-79108-4, 320-40608-6, 460-158919-4	180-79108-13, 320-40608-15, 460-158919-13	180-79108-14, 320-40608-16, 460-158919-14	180-79434-31, 460-159377-31	180-79434-32, 460-159377-32	460-165504-1	320-43646-1	460-165504-2
Sample Name	CFSB-215-SO-0.5-2	CFSB-216-SO-0-0.5	CFSB-216-SO-0.5-2	CFSB-217-SO-0-0.5	CFSB-217-SO-0.5-2	CFSB-218-SO-0-0.5	CFSB-218-SO-0.5-2	CFSB-237-SO-0-0.5	CFSB-237-SO-0.5-2	CFSB-238-SO-0-0.5	CFSB-238-SO-0.5-2	CFSB-238a-SO-0-0.5	CFSB-238-SO-0-0.5	CFSB-238a-SO-0.5-2
Sample Depth	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0-0.5 ft	0.5-2 ft
Chemical	6/21/2018	6/21/2018	6/21/2018	6/21/2018	6/21/2018	6/21/2018	6/21/2018	6/21/2018	6/21/2018	6/27/2018	6/27/2018	9/25/2018	9/25/2018	9/25/2018
PCB-1248 (Aroclor 1248)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1254 (Aroclor 1254)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1260 (Aroclor 1260)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1262 (Aroclor 1262)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1268 (Aroclor 1268)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Polychlorinated Biphenyl (PCBs)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SEMIVOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,2,4,5-Tetrachlorobenzene	0.0016 U	0.0038 UJ	0.0018 UJ	0.0034 UJ	0.0017 UJ	0.0015 U	0.0016 UJ	0.003 U	0.0015 U	0.0016 U	0.0016 U	--	--	--
1,4-Dioxane (P-Dioxane)	0.011 U	0.028 U	0.013 U	0.024 U	0.013 U	0.011 U	0.011 UJ	0.022 U	0.011 U	0.012 U	0.011 U	--	--	--
2,3,4,6-Tetrachlorophenol	0.015 U	0.037 UJ	0.018 UJ	0.033 UJ	0.017 UJ	0.015 U	0.015 UJ	0.029 UJ	0.014 UJ	0.016 U	0.015 U	--	--	--
2,4,5-Trichlorophenol	0.0026 U	0.0064 U	0.0031 U	0.0056 U	0.0029 U	0.0026 U	0.0026 UJ	0.005 U	0.0025 U	0.0027 U	0.0026 U	--	--	--
2,4,6-Trichlorophenol	0.002 U	0.0049 U	0.0023 U	0.0043 U	0.0022 U	0.002 U	0.002 UJ	0.0038 U	0.0019 U	0.0021 U	0.002 U	--	--	--
2,4-Dichlorophenol	0.0028 U	0.0069 U	0.0033 U	0.006 U	0.0031 U	0.0028 U	0.0028 UJ	0.0053 U	0.0027 U	0.0029 U	0.0028 U	--	--	--
2,4-Dimethylphenol	0.0023 U	0.0055 U	0.0027 U	0.0049 U	0.0025 U	0.0022 U	0.0022 UJ	0.0043 U	0.0022 U	0.0023 U	0.0022 U	--	--	--
2,4-Dinitrophenol	0.098 U	0.24 UJ	0.11 UJ	0.21 UJ	0.11 UJ	0.096 U	0.097 UR	0.19 UJ	0.093 UJ	0.1 U	0.097 U	--	--	--
2,4-Dinitrotoluene	0.0018 U	0.0044 U	0.0021 U	0.0039 U	0.002 U	0.0018 U	0.0018 UJ	0.0035 U	0.0017 U	0.0019 U	0.0018 U	--	--	--
2,6-Dinitrotoluene	0.0023 U	0.0055 U	0.0026 U	0.0048 U	0.0025 U	0.0022 U	0.0022 U	0.0043 U	0.0021 U	0.0023 U	0.0022 U	--	--	--
2-Chloronaphthalene	0.0017 U	0.0041 U	0.002 U	0.0036 U	0.0018 U	0.0016 U	0.0017 UJ	0.0032 U	0.0016 U	0.0017 U	0.0017 U	--	--	--
2-Chlorophenol	0.0017 U	0.0041 U	0.002 U	0.0036 U	0.0019 U	0.0017 U	0.0017 UJ	0.0032 U	0.0016 U	0.0018 U	0.0017 U	--	--	--
2-Methylnaphthalene	0.0018 U	0.0073 J	0.0067 J	0.0064 J	0.0051 J	0.0017 U	0.0024 J	0.0053 J	0.0019 J	0.0018 U	0.0017 U	--	--	--
2-Methylphenol (O-Cresol)	0.01 U	0.026 U	0.012 U	0.022 U	0.012 U	0.01 U	0.01 UJ	0.02 U	0.0099 U	0.011 U	0.01 U	--	--	--
2-Nitroaniline	0.017 U	0.041 U	0.019 U	0.036 U	0.018 U	0.016 U	0.016 UJ	0.032 U	0.016 U	0.017 U	0.016 U	--	--	--
2-Nitrophenol	0.0021 U	0.0051 U	0.0024 U	0.0045 U	0.0023 U	0.002 U	0.0021 UJ	0.004 U	0.002 U	0.0022 U	0.0021 U	--	--	--
3- And 4- Methylphenol (Total)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3,3'-Dichlorobenzidine	0.034 U	0.083 U	0.04 U	0.073 U	0.037 U	0.033 U	0.034 UR	0.065 U	0.032 U	0.035 U	0.034 U	--	--	--
3-Nitroaniline	0.0093 U	0.023 U	0.011 U	0.02 U	0.01 U	0.0091 U	0.0092 UJ	0.018 U	0.0088 U	0.0096 U	0.0092 U	--	--	--
4,6-Dinitro-2-Methylphenol	0.063 U	0.15 U	0.074 U	0.13 U	0.069 U	0.062 U	0.062 UR	0.12 U	0.06 U	0.065 U	0.062 U	--	--	--
4-Bromophenyl Phenyl Ether	0.0026 U	0.0062 U	0.003 U	0.0055 U	0.0028 U	0.0025 U	0.0025 UJ	0.0048 U	0.0024 U	0.0026 U	0.0025 U	--	--	--
4-Chloro-3-Methylphenol	0.0017 U	0.0042 U	0.002 U	0.0037 U	0.0019 U	0.0017 U	0.0017 UJ	0.0033 U	0.0016 U	0.0018 U	0.0017 U	--	--	--
4-Chloroaniline	0.0012 U	0.003 U	0.0014 U	0.0026 U	0.0013 U	0.0012 U	0.0012 UJ	0.0023 U	0.0012 U	0.0013 U	0.0012 U	--	--	--
4-Chlorophenyl Phenyl Ether	0.0022 U	0.0054 U	0.0026 U	0.0047 U	0.0024 U	0.0022 U	0.0022 UJ	0.0042 U	0.0021 U	0.0023 U	0.0022 U	--	--	--
4-Nitroaniline	0.0018 U	0.0043 U	0.0021 U	0.0038 U	0.002 U	0.0017 U	0.0018 UJ	0.0034 U	0.0017 U	0.0018 U	0.0018 U	--	--	--
4-Nitrophenol	0.026 U	0.062 UJ	0.03 UJ	0.055 UJ	0.028 UJ	0.025 U	0.025 UR	0.049 UJ	0.024 UJ	0.027 U	0.025 U	--	--	--
Acenaphthene	0.0021 U	0.011 J	0.0091	0.0093 J	0.0063 J	0.0021 U	0.0025 J	0.0069 J	0.002 U	0.0024 J	0.0021 U	--	--	--
Acenaphthylene	0.0016 U	0.0039 U	0.0019 U	0.0034 U	0.0018 U	0.0016 U	0.0016 U	0.003 U	0.0015 U	0.0017 U	0.0016 U	--	--	--
Acetophenone	0.002 U	0.0048 U	0.0023 U	0.0042 U	0.0022 J	0.0019 U	0.002 UJ	0.0038 U	0.0033 J	0.0021 U	0.002 U	--	--	--
Anthracene	0.0019 U	0.0074 J	0.0022 U	0.0085 J	0.0021 U	0.0019 U	0.0019 U	0.011 J	0.0018 U	0.0033 J	0.0019 U	--	--	--
Atrazine	0.016 UJ	0.039 UJ	0.019 UJ	0.034 UJ	0.018 UJ	0.016 UJ	0.016 UJ	0.03 UJ	0.015 UJ	0.017 UJ	0.016 UJ	--	--	--
Benzaldehyde	0.0045 UR	0.011 UR	0.0076 J	0.011 J	0.0072 J	0.0044 UR	0.0045 UR	0.0086 UR	0.0062 J	0.0047 U	0.0045 U	--	--	--
Benzo(A)Anthracene	0.0014 U	0.034	0.0054 J	0.04	0.0059 J	0.0095	0.0044 J	0.033	0.0028 J	0.021	0.0022 J	--	--	--
Benzo(A)Pyrene	0.0016 U	0.051	0.0071 J	0.052	0.0089	0.014	0.0058 J	0.047	0.0031 J	0.023	0.0016 U	--	--	--
Benzo(B)Fluoranthene	0.0018 U	0.073	0.0098	0.075	0.012	0.023	0.011 J	0.084	0.0049 J	0.045	0.003 J	--	--	--
Benzo(G,H,I)Perylene	0.0016 U	0.054	0.0077 J	0.05	0.0086	0.015	0.007 J	0.052	0.0028 J	0.035	0.002 J	--	--	--
Benzo(K)Fluoranthene	0.0022 U	0.027	0.0042 J	0.033	0.0053 J	0.01	0.0039 J	0.025	0.0022 J	0.015	0.0022 U	--	--	--
Benzyl Butyl Phthalate	0.025 U	0.061 U	0.029 U	0.054 U	0.028 U	0.025 U	0.025 U	0.048 U	0.024 U	0.026 U	0.025 U	--	--	--
Biphenyl (Diphenyl)	0.0015 U	0.0053 J	0.0055 J	0.0051 J	0.0041 J	0.0015 U	0.0024 J	0.0048 J	0.0037 J	0.0016 U	0.0015 U	--	--	--
Bis(2-Chloroethoxy) Methane	0.0017 U	0.0042 U	0.002 U	0.0037 U	0.0019 U	0.0017 U	0.0017 UJ	0.0033 U	0.0017 U	0.0018 U	0.0017 U	--	--	--
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.0013 U	0.0032 U	0.0016 U	0.0028 U	0.0015 U	0.0013 U	0.0013 UJ	0.0025 U	0.0013 U	0.0014 U	0.0013 U	--	--	--
Bis(2-Chloroisopropyl) Ether	0.0027 U	0.0066 U	0.0032 U	0.0058 U	0.003 U	0.0026 U	0.0027 U	0.0051 U	0.0026 U	0.0028 U	0.0027 U	--	--	--
Bis(2-Ethylhexyl) Phthalate	0.039 U	0.12 J	0.071 J	0.083 U	0.043 U	0.038 U	0.31 J	0.074 U	0.037 U	0.04 U	0.038 U	--	--	--
Caprolactam	0.024 U	0.058 U	0.028 U	0.051 U	0.026 U	0.023 U	0.023 UR	0.045 U	0.023 U	0.025 U	0.023 U	--	--	--
Carbazole	0.0017 U	0.011 J	0.0028 J	0.011 J	0.0019 J	0.0024 J	0.0017 U	0.0088 J	0.0016 U	0.005 J	0.0017 U	--	--	--
Chrysene	0.0014 U	0.055	0.0075 J	0.063	0.01	0.023	0.0092 J	0.061	0.0034 J	0.033	0.0022 J	--	--	--
Dibenz(A,H)Anthracene	0.0016 U	0.013 J	0.0019 U	0.012 J	0.0022 J	0.0032 J	0.0016 U	0.011 J	0.0015 U	0.0017 U	0.0016 U	--	--	--
Dibenzofuran	0.0016 U	0.0075 J	0.0073 J	0.0061 J	0.0054 J	0.0016 U	0.0033 J	0.0058 J	0.0031 J	0.0017 U	0.0016 U	--	--	--
Diethyl Phthalate	0.011 U	0.027 U	0.013 U	0.023 U	0.012 U	0.011 U	0.011 UJ	0.021 U	0.01 U	0.011 U	0.011 U	--	--	--

Table E-23
Summary of Data Used in Risk Assessment
Western Undeveloped Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-215	CFSB-216	CFSB-216	CFSB-217	CFSB-217	CFSB-218	CFSB-218	CFSB-237	CFSB-237	CFSB-238	CFSB-238	CFSB-238	CFSB-238	CFSB-238
Sample Lab IDs	180-79108-2, 320-40608-8, 460-158919-2	180-79108-11, 320-40608-13, 460-158919-11	180-79108-12, 320-40608-14, 460-158919-12	180-79108-9, 320-40608-11, 460-158919-9	180-79108-10, 320-40608-12, 460-158919-10	180-79108-3, 320-40608-5, 460-158919-3	180-79108-4, 320-40608-6, 460-158919-4	180-79108-13, 320-40608-15, 460-158919-13	180-79108-14, 320-40608-16, 460-158919-14	180-79434-31, 460-159377-31	180-79434-32, 460-159377-32	460-165504-1	320-43646-1	460-165504-2
Sample Name	CFSB-215-SO-0.5-2	CFSB-216-SO-0-0.5	CFSB-216-SO-0.5-2	CFSB-217-SO-0-0.5	CFSB-217-SO-0.5-2	CFSB-218-SO-0-0.5	CFSB-218-SO-0.5-2	CFSB-237-SO-0-0.5	CFSB-237-SO-0.5-2	CFSB-238-SO-0-0.5	CFSB-238-SO-0.5-2	CFSB-238a-SO-0-0.5	CFSB-238-SO-0-0.5	CFSB-238a-SO-0.5-2
Sample Depth	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0-0.5 ft	0.5-2 ft
Chemical	6/21/2018	6/21/2018	6/21/2018	6/21/2018	6/21/2018	6/21/2018	6/21/2018	6/21/2018	6/21/2018	6/27/2018	6/27/2018	9/25/2018	9/25/2018	9/25/2018
Dimethyl Phthalate	0.0013 U	0.0032 U	0.0016 U	0.0028 U	0.0015 U	0.0013 U	0.0013 UJ	0.0025 U	0.0013 U	0.0014 U	0.0013 U	--	--	--
Di-N-Butyl Phthalate	0.016 U	0.039 U	0.019 U	0.034 U	0.018 U	0.016 U	0.016 UJ	0.03 U	0.015 U	0.017 U	0.016 U	--	--	--
Di-N-Octylphthalate	0.021 U	0.052 U	0.025 U	0.045 U	0.023 U	0.021 U	0.021 U	0.04 U	0.02 U	0.022 U	0.021 U	--	--	--
Fluoranthene	0.0019 U	0.064	0.01	0.076	0.012	0.022	0.0099 J	0.07	0.007	0.038	0.0036 J	--	--	--
Fluorene	0.0014 U	0.0071 J	0.0055 J	0.007 J	0.0048 J	0.0014 U	0.0026 J	0.0061 J	0.0027 J	0.0019 J	0.0014 U	--	--	--
Hexachlorobenzene	0.0026 U	0.0064 U	0.0031 U	0.0056 U	0.0029 U	0.0026 U	0.0026 UJ	0.005 U	0.0025 U	0.0027 U	0.0026 U	--	--	--
Hexachlorobutadiene	0.0021 U	0.0052 U	0.0025 U	0.0046 U	0.0023 U	0.0021 U	0.0021 UJ	0.0041 U	0.002 U	0.0022 U	0.0021 U	--	--	--
Hexachlorocyclopentadiene	0.0019 U	0.0045 UJ	0.0022 UJ	0.004 UJ	0.002 UJ	0.0018 U	0.0018 UJ	0.0035 UJ	0.0018 UJ	0.0019 U	0.0018 U	--	--	--
Hexachloroethane	0.0019 U	0.0046 U	0.0022 U	0.004 U	0.0021 U	0.0018 U	0.0019 UJ	0.0036 U	0.0018 U	0.0019 U	0.0019 U	--	--	--
Indeno(1,2,3-C,D)Pyrene	0.0015 U	0.044	0.0062 J	0.042	0.0065 J	0.012	0.0045 J	0.04	0.0024 J	0.028	0.0015 U	--	--	--
Isophorone	0.0019 U	0.0045 U	0.0022 U	0.004 U	0.002 U	0.0018 U	0.0018 UJ	0.0035 U	0.0018 U	0.0019 U	0.0018 U	--	--	--
Naphthalene	0.0014 U	0.013 J	0.0083 J	0.0099 J	0.0073 J	0.0014 U	0.003 J	0.0069 J	0.0031 J	0.0015 U	0.0014 U	--	--	--
Nitrobenzene	0.013 U	0.033 U	0.016 U	0.029 U	0.015 U	0.013 U	0.013 UJ	0.025 U	0.013 U	0.014 U	0.013 U	--	--	--
N-Nitrosodi-N-Propylamine	0.0025 U	0.006 U	0.0029 U	0.0053 U	0.0027 U	0.0024 U	0.0024 UJ	0.0047 U	0.0023 U	0.0026 U	0.0024 U	--	--	--
N-Nitrosodiphenylamine	0.012 U	0.03 U	0.014 U	0.026 U	0.013 U	0.012 U	0.012 UJ	0.023 U	0.012 U	0.013 U	0.012 U	--	--	--
Pentachlorophenol	0.059 U	0.14 UJ	0.069 UJ	0.13 UJ	0.065 UJ	0.057 U	0.058 UR	0.11 UJ	0.056 UJ	0.061 U	0.058 U	--	--	--
Phenanthrene	0.002 U	0.045	0.017	0.054	0.015	0.012	0.0095 J	0.042	0.01	0.023	0.0037 J	--	--	--
Phenol	0.011 U	0.027 U	0.013 U	0.024 U	0.012 U	0.011 U	0.011 UJ	0.021 U	0.01 U	0.011 U	0.011 U	--	--	--
Pyrene	0.0017 U	0.065	0.0095	0.073	0.012	0.018	0.0082 J	0.072	0.0048 J	0.042	0.0033 J	--	--	--
VOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,1,1-Trichloroethane	--	--	--	--	--	--	--	--	--	--	--	0.00032 U	--	0.00032 U
1,1,2,2-Tetrachloroethane	--	--	--	--	--	--	--	--	--	--	--	0.0003 U	--	0.00029 U
1,1,2-Trichloro-1,2,2-Trifluoroethane	--	--	--	--	--	--	--	--	--	--	--	0.00042 U	--	0.00041 U
1,1,2-Trichloroethane	--	--	--	--	--	--	--	--	--	--	--	0.00025 U	--	0.00024 U
1,1-Dichloroethane	--	--	--	--	--	--	--	--	--	--	--	0.00029 U	--	0.00028 U
1,1-Dichloroethene	--	--	--	--	--	--	--	--	--	--	--	0.00031 U	--	0.0003 U
1,2,3-Trichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	0.00025 U	--	0.00025 U
1,2,4-Trichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	0.00013 U	--	0.00012 U
1,2-Dibromo-3-Chloropropane	--	--	--	--	--	--	--	--	--	--	--	0.00064 U	--	0.00062 U
1,2-Dibromoethane (Ethylene Dibromide)	--	--	--	--	--	--	--	--	--	--	--	0.00025 U	--	0.00024 U
1,2-Dichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	0.0002 U	--	0.0002 U
1,2-Dichloroethane	--	--	--	--	--	--	--	--	--	--	--	0.00041 U	--	0.0004 U
1,2-Dichloropropane	--	--	--	--	--	--	--	--	--	--	--	0.00059 U	--	0.00057 U
1,3-Dichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	0.00022 U	--	0.00022 U
1,4-Dichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	0.00014 U	--	0.00014 U
2-Hexanone	--	--	--	--	--	--	--	--	--	--	--	0.0011 U	--	0.0011 U
Acetone	--	--	--	--	--	--	--	--	--	--	--	0.17 J+	--	0.12 J+
Benzene	--	--	--	--	--	--	--	--	--	--	--	0.00036 U	--	0.00035 U
Bromochloromethane	--	--	--	--	--	--	--	--	--	--	--	0.00039 U	--	0.00038 U
Bromodichloromethane	--	--	--	--	--	--	--	--	--	--	--	0.00036 U	--	0.00035 U
Bromoform	--	--	--	--	--	--	--	--	--	--	--	0.00059 U	--	0.00058 U
Bromomethane	--	--	--	--	--	--	--	--	--	--	--	0.00066 UJ	--	0.00064 UJ
Carbon Disulfide	--	--	--	--	--	--	--	--	--	--	--	0.00037 U	--	0.00036 U
Carbon Tetrachloride	--	--	--	--	--	--	--	--	--	--	--	0.00025 U	--	0.00025 U
Chlorobenzene	--	--	--	--	--	--	--	--	--	--	--	0.00025 U	--	0.00024 U
Chloroethane	--	--	--	--	--	--	--	--	--	--	--	0.00073 U	--	0.00071 U
Chloroform	--	--	--	--	--	--	--	--	--	--	--	0.00044 U	--	0.00043 U
Chloromethane	--	--	--	--	--	--	--	--	--	--	--	0.0006 UJ	--	0.00059 UJ
Cis-1,2-Dichloroethylene	--	--	--	--	--	--	--	--	--	--	--	0.00021 U	--	0.00021 U
Cis-1,3-Dichloropropene	--	--	--	--	--	--	--	--	--	--	--	0.00038 U	--	0.00037 U
Cyclohexane	--	--	--	--	--	--	--	--	--	--	--	0.00031 U	--	0.0003 U
Dibromochloromethane	--	--	--	--	--	--	--	--	--	--	--	0.00027 U	--	0.00026 U
Dichlorodifluoromethane	--	--	--	--	--	--	--	--	--	--	--	0.00047 UJ	--	0.00046 UJ
Ethylbenzene	--	--	--	--	--	--	--	--	--	--	--	0.00028 U	--	0.00027 U
Isopropylbenzene (Cumene)	--	--	--	--	--	--	--	--	--	--	--	0.00018 U	--	0.00017 U
M,P-Xylene	--	--	--	--	--	--	--	--	--	--	--	0.00024 U	--	0.00024 U

Table E-23
Summary of Data Used in Risk Assessment
Western Undeveloped Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-215	CFSB-216	CFSB-216	CFSB-217	CFSB-217	CFSB-218	CFSB-218	CFSB-237	CFSB-237	CFSB-238	CFSB-238	CFSB-238	CFSB-238	CFSB-238
Sample Lab IDs	180-79108-2, 320-40608-8, 460-158919-2	180-79108-11, 320-40608-13, 460-158919-11	180-79108-12, 320-40608-14, 460-158919-12	180-79108-9, 320-40608-11, 460-158919-9	180-79108-10, 320-40608-12, 460-158919-10	180-79108-3, 320-40608-5, 460-158919-3	180-79108-4, 320-40608-6, 460-158919-4	180-79108-13, 320-40608-15, 460-158919-13	180-79108-14, 320-40608-16, 460-158919-14	180-79434-31, 460-159377-31	180-79434-32, 460-159377-32	460-165504-1	320-43646-1	460-165504-2
Sample Name	CFSB-215-SO-0.5-2	CFSB-216-SO-0-0.5	CFSB-216-SO-0.5-2	CFSB-217-SO-0-0.5	CFSB-217-SO-0.5-2	CFSB-218-SO-0-0.5	CFSB-218-SO-0.5-2	CFSB-237-SO-0-0.5	CFSB-237-SO-0.5-2	CFSB-238-SO-0-0.5	CFSB-238-SO-0.5-2	CFSB-238a-SO-0-0.5	CFSB-238-SO-0-0.5	CFSB-238a-SO-0.5-2
Sample Depth	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0-0.5 ft	0.5-2 ft
Chemical	6/21/2018	6/21/2018	6/21/2018	6/21/2018	6/21/2018	6/21/2018	6/21/2018	6/21/2018	6/21/2018	6/27/2018	6/27/2018	9/25/2018	9/25/2018	9/25/2018
Methyl Acetate	--	--	--	--	--	--	--	--	--	--	--	0.4	--	0.32
Methyl Ethyl Ketone (2-Butanone)	--	--	--	--	--	--	--	--	--	--	--	0.009	--	0.0056 J
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	--	--	--	--	--	--	--	--	--	--	--	0.00092 U	--	0.0009 U
Methylcyclohexane	--	--	--	--	--	--	--	--	--	--	--	0.00022 U	--	0.00022 U
Methylene Chloride	--	--	--	--	--	--	--	--	--	--	--	0.00023 U	--	0.00022 U
O-Xylene (1,2-Dimethylbenzene)	--	--	--	--	--	--	--	--	--	--	--	0.00013 U	--	0.00013 U
Styrene	--	--	--	--	--	--	--	--	--	--	--	0.00017 U	--	0.00017 U
Tert-Butyl Methyl Ether	--	--	--	--	--	--	--	--	--	--	--	0.00017 U	--	0.00017 U
Tetrachloroethylene (PCE)	--	--	--	--	--	--	--	--	--	--	--	0.0002 U	--	0.00019 U
Toluene	--	--	--	--	--	--	--	--	--	--	--	0.003	--	0.0016
Trans-1,2-Dichloroethene	--	--	--	--	--	--	--	--	--	--	--	0.00034 U	--	0.00033 U
Trans-1,3-Dichloropropene	--	--	--	--	--	--	--	--	--	--	--	0.00037 U	--	0.00036 U
Trichloroethylene (TCE)	--	--	--	--	--	--	--	--	--	--	--	0.0002 U	--	0.0002 U
Trichlorofluoromethane	--	--	--	--	--	--	--	--	--	--	--	0.00056 U	--	0.00078 J
Vinyl Chloride	--	--	--	--	--	--	--	--	--	--	--	0.00076 UJ	--	0.00074 UJ

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-23
Summary of Data Used in Risk Assessment
Western Undeveloped Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-238	CFSB-238	CFSB-239	CFSB-239	CFSB-239	CFSB-239	CFSB-244	CFSB-244	CFSB-244	CFSB-245	CFSB-245	CFSB-245	CFSB-249
Sample Lab IDs	320-43646-2	460-165504-3	180-79434-25, 460-159377-25	180-79434-26, 460-159377-26	320-43709-18	320-43709-19	180-77673-26, 460-155989-48	180-77673-27, 460-155989-49	180-77673-28, 460-155989-50	180-77673-8, 460-155989-28	180-77673-9, 460-155989-29	180-77673-10, 460-155989-30	180-77393-32, 460-155265-34
Sample Name	CFSB-238-SO-0.5-2	CFSB-238a-SO-3.5-4	CFSB-239-SO-0-0.5	CFSB-239-SO-0.5-2	CFSB-239-SO-0-0.5	CFSB-239-SO-0.5-2	CFSB-244-SO-0-0.5	CFSB-244-SO-0.5-2	CFSB-244-SO-10-12	CFSB-245-SO-0-0.5	CFSB-245-SO-0.5-2	CFSB-245-SO-10-12	CFSB-249-SO-0-0.5
Sample Depth	0.5-2 ft	3.5-4 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft
Chemical	9/25/2018	9/25/2018	6/27/2018	6/27/2018	9/27/2018	9/27/2018	5/9/2018	5/9/2018	5/9/2018	5/8/2018	5/8/2018	5/8/2018	5/1/2018
GENERAL CHEMISTRY (mg/kg)													
Fluoride	--	--	3.11	5.77	--	--	8.04 J	12.5 J	4.55 J	9.21 J+	8.53 J+	1.19 J	1.15
Cyanide	--	--	0.22 J+	0.068 U	--	--	0.2 J	0.087 J	0.069 U	0.12 J	0.059 U	0.055 U	0.066 U
METALS (mg/kg)													
"Chromium, Hexavalent - Estimated"	--	--	0.227494	0.227494	--	--	0.281022	0.224818	0.693187	0.214112	0.256934	0.248905	0.232847
"Chromium, Trivalent - Estimated"	--	--	8.27251	8.27251	--	--	10.219	8.17518	25.2068	7.78589	9.34307	9.05109	8.46715
Aluminum	--	--	19500	21400	--	--	12600	8380	7170	10800	14000	7650	10600 J
Antimony	--	--	0.33 UJ	0.31 UJ	--	--	0.27 UJ	0.23 UJ	0.25 UJ	0.26 UJ	0.25 UJ	0.24 UJ	0.33 UJ
Arsenic	--	--	4.6	4.3	--	--	3.8	3.2	3.7	2.7	4.2	2.9	6.2 J
Barium	--	--	353	289	--	--	125	98.4	89.6	99.6	114	62.7	83.8
Beryllium	--	--	0.59	0.77	--	--	0.49	0.32	0.31 J	0.45	0.51	0.28 J	0.34 J
Cadmium	--	--	0.38 U	0.35 U	--	--	0.3 U	0.27 U	0.28 U	0.29 U	0.29 U	0.28 U	0.37 U
Calcium	--	--	3340	2160	--	--	2170 J	3790 J	28900 J	1630	1620	28600	41600 J+
Chromium, Total	--	--	8.5	8.5	--	--	10.5	8.4	25.9	8	9.6	9.3	8.7
Cobalt	--	--	5.4	5.8	--	--	5.6	4.4	4.7	4.7	6	4.4	5.2
Copper	--	--	12 J+	12.9 J+	--	--	10.9 J	12.9 J	12.9 J	7	10.5	10.1	14.7 J
Iron	--	--	14400	15200	--	--	14000	10900	11300	12600	16000	12100	14300
Lead	--	--	16	10.8	--	--	11.7 J	6.6 J	6.1 J	5.8	8.4	5.2	11.1 J+
Magnesium	--	--	5720	5740	--	--	6440 J	6370 J	9480 J	5530	6880	11900	10200 J
Manganese	--	--	768 J	441 J	--	--	391	292	325	323 J	394 J	299 J	510 J
Mercury	--	--	0.018 J	0.011 U	--	--	0.011 U	0.043	0.016 J	0.011 U	0.011 U	0.0096 U	0.05
Nickel	--	--	10.2	10.4	--	--	11.3	9.8	10.1	9.6	11.2	9.1	10.1
Potassium	--	--	1140	816	--	--	745 J+	523 J+	636 J+	807	840	606	929 J+
Selenium	--	--	0.32 U	0.3 U	--	--	0.26 U	0.23 U	0.24 U	0.25 U	0.25 U	0.24 U	0.32 U
Silver	--	--	0.69 U	0.65 U	--	--	0.56 U	0.49 U	0.52 U	0.54 U	0.53 U	0.51 U	0.69 U
Sodium	--	--	74.7 J	95.7 J	--	--	28.4 U	24.7 U	27.7 J	27.3 U	26.7 U	25.8 U	34.8 U
Thallium	--	--	0.14 U	0.13 U	--	--	0.11 U	0.099 U	0.11 U	0.11 U	0.11 U	0.1 U	0.14 U
Vanadium	--	--	15.2	17.2	--	--	13.7	7.7	8	10.6	13.8	10	6.4 J+
Zinc	--	--	58.7	42.1	--	--	38.6	30.1	30	41.4	43.7	28.4	38.4
PESTICIDES (mg/kg)													
Aldrin	--	--	--	--	--	--	--	--	--	--	--	--	--
Alpha Bhc (Alpha Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--	--
Alpha Endosulfan	--	--	--	--	--	--	--	--	--	--	--	--	--
Beta Bhc (Beta Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--	--
Beta Endosulfan	--	--	--	--	--	--	--	--	--	--	--	--	--
cis-Chlordane	--	--	--	--	--	--	--	--	--	--	--	--	--
Delta BHC (Delta Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--	--
Dieldrin	--	--	--	--	--	--	--	--	--	--	--	--	--
Endosulfan Sulfate	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin Aldehyde	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin Ketone	--	--	--	--	--	--	--	--	--	--	--	--	--
Gamma Bhc (Lindane)	--	--	--	--	--	--	--	--	--	--	--	--	--
Heptachlor	--	--	--	--	--	--	--	--	--	--	--	--	--
Heptachlor Epoxide	--	--	--	--	--	--	--	--	--	--	--	--	--
Methoxychlor	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDD	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDE	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDT	--	--	--	--	--	--	--	--	--	--	--	--	--
Toxaphene	--	--	--	--	--	--	--	--	--	--	--	--	--
trans-Chlordane	--	--	--	--	--	--	--	--	--	--	--	--	--
POLYCHLORINATED BIPHENYLS (mg/kg)													
PCB-1016 (Aroclor 1016)	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1221 (Aroclor 1221)	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1232 (Aroclor 1232)	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1242 (Aroclor 1242)	--	--	--	--	--	--	--	--	--	--	--	--	--

Table E-23
Summary of Data Used in Risk Assessment
Western Undeveloped Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-238	CFSB-238	CFSB-239	CFSB-239	CFSB-239	CFSB-239	CFSB-244	CFSB-244	CFSB-244	CFSB-245	CFSB-245	CFSB-245	CFSB-249
Sample Lab IDs	320-43646-2	460-165504-3	180-79434-25, 460-159377-25	180-79434-26, 460-159377-26	320-43709-18	320-43709-19	180-77673-26, 460-155989-48	180-77673-27, 460-155989-49	180-77673-28, 460-155989-50	180-77673-8, 460-155989-28	180-77673-9, 460-155989-29	180-77673-10, 460-155989-30	180-77393-32, 460-155265-34
Sample Name	CFSB-238-SO-0.5-2	CFSB-238a-SO-3.5-4	CFSB-239-SO-0-0.5	CFSB-239-SO-0.5-2	CFSB-239-SO-0-0.5	CFSB-239-SO-0.5-2	CFSB-244-SO-0-0.5	CFSB-244-SO-0.5-2	CFSB-244-SO-10-12	CFSB-245-SO-0-0.5	CFSB-245-SO-0.5-2	CFSB-245-SO-10-12	CFSB-249-SO-0-0.5
Sample Depth	0.5-2 ft	3.5-4 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft
Chemical	9/25/2018	9/25/2018	6/27/2018	6/27/2018	9/27/2018	9/27/2018	5/9/2018	5/9/2018	5/9/2018	5/8/2018	5/8/2018	5/8/2018	5/1/2018
PCB-1248 (Aroclor 1248)	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1254 (Aroclor 1254)	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1260 (Aroclor 1260)	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1262 (Aroclor 1262)	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1268 (Aroclor 1268)	--	--	--	--	--	--	--	--	--	--	--	--	--
Polychlorinated Biphenyl (PCBs)	--	--	--	--	--	--	--	--	--	--	--	--	--
SEMIVOLATILE ORGANIC COMPOUNDS (mg/kg)													
1,2,4,5-Tetrachlorobenzene	--	--	0.0017 U	0.0016 U	--	--	0.0016 U	0.0015 U	0.0015 U	0.0017 U	0.0016 U	0.0015 U	0.0016 U
1,4-Dioxane (P-Dioxane)	--	--	0.012 U	0.012 U	--	--	0.012 U	0.011 U	0.011 U	0.012 U	0.012 U	0.011 U	0.011 U
2,3,4,6-Tetrachlorophenol	--	--	0.017 U	0.016 U	--	--	0.015 U	0.015 U	0.014 U	0.016 U	0.016 U	0.015 U	0.015 U
2,4,5-Trichlorophenol	--	--	0.0029 U	0.0027 U	--	--	0.0027 U	0.0025 U	0.0025 U	0.0027 U	0.0027 U	0.0025 U	0.0026 U
2,4,6-Trichlorophenol	--	--	0.0022 U	0.0021 U	--	--	0.002 U	0.0019 U	0.0019 U	0.0021 U	0.002 U	0.0019 U	0.002 U
2,4-Dichlorophenol	--	--	0.0031 U	0.0029 U	--	--	0.0029 U	0.0027 U	0.0027 U	0.003 U	0.0029 U	0.0027 U	0.0028 U
2,4-Dimethylphenol	--	--	0.0025 U	0.0023 U	--	--	0.0023 U	0.0022 U	0.0022 U	0.0024 U	0.0023 U	0.0022 U	0.0022 U
2,4-Dinitrophenol	--	--	0.11 U	0.1 U	--	--	0.1 U	0.095 U	0.093 U	0.1 U	0.1 U	0.095 U	0.097 UJ
2,4-Dinitrotoluene	--	--	0.002 U	0.0019 U	--	--	0.0018 U	0.0018 U	0.0017 U	0.0019 U	0.0019 U	0.0018 U	0.0018 U
2,6-Dinitrotoluene	--	--	0.0025 U	0.0023 U	--	--	0.0023 U	0.0022 U	0.0021 U	0.0024 U	0.0023 U	0.0022 U	0.0022 U
2-Chloronaphthalene	--	--	0.0018 U	0.0017 U	--	--	0.0017 U	0.0016 U	0.0016 U	0.0018 U	0.0017 U	0.0016 U	0.0017 U
2-Chlorophenol	--	--	0.0019 U	0.0018 U	--	--	0.0017 U	0.0016 U	0.0016 U	0.0018 U	0.0017 U	0.0016 U	0.0017 U
2-Methylnaphthalene	--	--	0.0019 U	0.0018 U	--	--	0.0018 U	0.0017 U	0.0017 U	0.0018 U	0.0018 U	0.0017 U	0.0017 U
2-Methylphenol (O-Cresol)	--	--	0.011 U	0.011 U	--	--	0.011 U	0.01 U	0.0099 U	0.011 U	0.011 U	0.01 U	0.01 U
2-Nitroaniline	--	--	0.018 U	0.017 U	--	--	0.017 U	0.016 U	0.016 U	0.018 U	0.017 U	0.016 U	0.017 U
2-Nitrophenol	--	--	0.0023 U	0.0022 U	--	--	0.0021 U	0.002 U	0.002 U	0.0022 U	0.0021 U	0.002 U	0.0021 U
3- And 4- Methylphenol (Total)	--	--	--	--	--	--	--	--	--	--	--	--	--
3,3'-Dichlorobenzidine	--	--	0.037 U	0.035 U	--	--	0.035 U	0.033 U	0.032 U	0.036 U	0.035 U	0.033 U	0.034 U
3-Nitroaniline	--	--	0.01 U	0.0096 U	--	--	0.0094 U	0.009 U	0.0088 U	0.0098 U	0.0095 U	0.009 U	0.0092 U
4,6-Dinitro-2-Methylphenol	--	--	0.069 U	0.065 U	--	--	0.064 U	0.061 U	0.06 U	0.066 U	0.064 U	0.061 U	0.062 UJ
4-Bromophenyl Phenyl Ether	--	--	0.0028 U	0.0026 U	--	--	0.0026 U	0.0025 U	0.0024 U	0.0027 U	0.0026 U	0.0025 U	0.0025 U
4-Chloro-3-Methylphenol	--	--	0.0019 U	0.0018 U	--	--	0.0017 U	0.0017 U	0.0016 U	0.0018 U	0.0018 U	0.0017 U	0.0017 U
4-Chloroaniline	--	--	0.0013 U	0.0013 U	--	--	0.0012 U	0.0012 U	0.0012 U	0.0013 U	0.0012 U	0.0012 U	0.0012 U
4-Chlorophenyl Phenyl Ether	--	--	0.0024 U	0.0023 U	--	--	0.0022 U	0.0021 U	0.0021 U	0.0023 U	0.0023 U	0.0021 U	0.0022 U
4-Nitroaniline	--	--	0.0019 U	0.0018 U	--	--	0.0018 U	0.0017 U	0.0017 U	0.0019 U	0.0018 U	0.0017 U	0.0018 U
4-Nitrophenol	--	--	0.028 U	0.026 U	--	--	0.026 U	0.025 U	0.024 U	0.027 U	0.026 U	0.025 U	0.025 U
Acenaphthene	--	--	0.005 J	0.0022 U	--	--	0.014	0.002 U	0.002 U	0.0084	0.0021 U	0.002 U	0.0021 U
Acenaphthylene	--	--	0.0018 U	0.0016 U	--	--	0.0016 U	0.0015 U	0.0015 U	0.0017 U	0.0016 U	0.0016 U	0.0016 U
Acetophenone	--	--	0.0022 U	0.002 U	--	--	0.002 U	0.0019 U	0.0019 U	0.0021 U	0.002 U	0.0019 U	0.002 U
Anthracene	--	--	0.0081	0.002 U	--	--	0.025	0.0018 U	0.0018 U	0.013	0.0019 U	0.0018 U	0.0019 U
Atrazine	--	--	0.018 UJ	0.016 UJ	--	--	0.016 UJ	0.015 UJ	0.015 U	0.017 UJ	0.016 UJ	0.016 UJ	0.016 U
Benzaldehyde	--	--	0.005 U	0.0047 U	--	--	0.0046 U	0.0044 U	0.0043 U	0.0068 J	0.0046 U	0.0044 U	0.0045 UR
Benzo(A)Anthracene	--	--	0.035	0.0043 J	--	--	0.12	0.002 J	0.0056 J	0.069	0.009	0.003 J	0.0072 J
Benzo(A)Pyrene	--	--	0.041	0.0034 J	--	--	0.13	0.0021 J	0.0067 J	0.083	0.011	0.0044 J	0.0071 J
Benzo(B)Fluoranthene	--	--	0.072	0.0061 J	--	--	0.2	0.003 J	0.011	0.14	0.017	0.0056 J	0.012
Benzo(G,H,I)Perylene	--	--	0.049	0.0039 J	--	--	0.16	0.0025 J	0.0065 J	0.095	0.01	0.0043 J	0.0076
Benzo(K)Fluoranthene	--	--	0.024	0.0023 U	--	--	0.069	0.0021 U	0.0049 J	0.046	0.0058 J	0.0021 U	0.0037 J
Benzyl Butyl Phthalate	--	--	0.027 U	0.026 U	--	--	0.025 U	0.024 U	0.024 U	0.026 U	0.026 U	0.024 U	0.025 U
Biphenyl (Diphenyl)	--	--	0.0017 U	0.0016 U	--	--	0.0016 U	0.0015 U	0.0015 U	0.0016 U	0.0016 U	0.0015 U	0.0015 U
Bis(2-Chloroethoxy) Methane	--	--	0.0019 U	0.0018 U	--	--	0.0018 U	0.0017 U	0.0017 U	0.0018 U	0.0018 U	0.0017 U	0.0017 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	--	--	0.0015 U	0.0014 U	--	--	0.0013 U	0.0013 U	0.0013 U	0.0014 U	0.0014 U	0.0013 U	0.0013 U
Bis(2-Chloroisopropyl) Ether	--	--	0.003 U	0.0028 U	--	--	0.0028 U	0.0026 U	0.0026 U	0.0028 U	0.0028 U	0.0026 U	0.0027 U
Bis(2-Ethylhexyl) Phthalate	--	--	0.043 U	0.043 J	--	--	0.04 U	0.038 U	0.037 U	0.041 U	0.04 U	0.038 U	0.039 U
Caprolactam	--	--	0.026 U	0.025 U	--	--	0.024 U	0.023 U	0.023 U	0.025 U	0.024 U	0.023 U	0.024 U
Carbazole	--	--	0.01	0.0018 U	--	--	0.021	0.0017 U	0.0016 U	0.016	0.0024 J	0.0017 U	0.0017 U
Chrysene	--	--	0.054	0.0037 J	--	--	0.16	0.0022 J	0.0084	0.1	0.014	0.0042 J	0.0089
Dibenz(A,H)Anthracene	--	--	0.0098	0.0017 U	--	--	0.038	0.0016 U	0.0015 U	0.022	0.0017 U	0.0016 U	0.0023 J
Dibenzofuran	--	--	0.0026 J	0.0016 U	--	--	0.006 J	0.0015 U	0.0015 U	0.0017 U	0.0016 U	0.0016 U	0.0016 U
Diethyl Phthalate	--	--	0.012 U	0.011 U	--	--	0.011 U	0.011 U	0.01 U	0.012 U	0.011 U	0.011 U	0.011 U

Table E-23
Summary of Data Used in Risk Assessment
Western Undeveloped Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-238	CFSB-238	CFSB-239	CFSB-239	CFSB-239	CFSB-239	CFSB-244	CFSB-244	CFSB-244	CFSB-245	CFSB-245	CFSB-245	CFSB-249
Sample Lab IDs	320-43646-2	460-165504-3	180-79434-25, 460-159377-25	180-79434-26, 460-159377-26	320-43709-18	320-43709-19	180-77673-26, 460-155989-48	180-77673-27, 460-155989-49	180-77673-28, 460-155989-50	180-77673-8, 460-155989-28	180-77673-9, 460-155989-29	180-77673-10, 460-155989-30	180-77393-32, 460-155265-34
Sample Name	CFSB-238-SO-0.5-2	CFSB-238a-SO-3.5-4	CFSB-239-SO-0-0.5	CFSB-239-SO-0.5-2	CFSB-239-SO-0-0.5	CFSB-239-SO-0.5-2	CFSB-244-SO-0-0.5	CFSB-244-SO-0.5-2	CFSB-244-SO-10-12	CFSB-245-SO-0-0.5	CFSB-245-SO-0.5-2	CFSB-245-SO-10-12	CFSB-249-SO-0-0.5
Sample Depth	0.5-2 ft	3.5-4 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft
Chemical	9/25/2018	9/25/2018	6/27/2018	6/27/2018	9/27/2018	9/27/2018	5/9/2018	5/9/2018	5/9/2018	5/8/2018	5/8/2018	5/8/2018	5/1/2018
Dimethyl Phthalate	--	--	0.0015 U	0.0014 U	--	--	0.0013 U	0.0013 U	0.0013 U	0.0014 U	0.0014 U	0.0013 U	0.0013 U
Di-N-Butyl Phthalate	--	--	0.018 U	0.016 U	--	--	0.016 U	0.015 U	0.015 U	0.017 U	0.016 U	0.016 U	0.016 U
Di-N-Octylphthalate	--	--	0.023 U	0.022 U	--	--	0.022 U	0.021 U	0.02 U	0.022 U	0.022 U	0.021 U	0.021 U
Fluoranthene	--	--	0.074	0.0061 J	--	--	0.2	0.0019 U	0.011	0.15	0.02	0.0064 J	0.012
Fluorene	--	--	0.0043 J	0.0015 U	--	--	0.01	0.0014 U	0.0014 U	0.0067 J	0.0015 U	0.0014 U	0.0014 U
Hexachlorobenzene	--	--	0.0029 U	0.0027 U	--	--	0.0027 U	0.0025 U	0.0025 U	0.0028 U	0.0027 U	0.0025 U	0.0026 U
Hexachlorobutadiene	--	--	0.0023 U	0.0022 U	--	--	0.0022 U	0.0021 U	0.002 U	0.0022 U	0.0022 U	0.0021 U	0.0021 U
Hexachlorocyclopentadiene	--	--	0.002 U	0.0019 U	--	--	0.0019 U	0.0018 U	0.0018 U	0.002 U	0.0019 U	0.0018 U	0.0018 U
Hexachloroethane	--	--	0.0021 U	0.0019 U	--	--	0.0019 U	0.0018 U	0.0018 U	0.002 U	0.0019 U	0.0018 U	0.0019 U
Indeno(1,2,3-C,D)Pyrene	--	--	0.039	0.0034 J	--	--	0.13	0.0022 J	0.006 J	0.079	0.0095	0.0033 J	0.0059 J
Isophorone	--	--	0.002 U	0.0019 U	--	--	0.0019 U	0.0018 U	0.0018 U	0.002 U	0.0019 U	0.0018 U	0.0018 U
Naphthalene	--	--	0.0016 U	0.0015 U	--	--	0.004 J	0.0014 U	0.0014 U	0.003 J	0.0015 U	0.0014 U	0.0014 U
Nitrobenzene	--	--	0.015 U	0.014 U	--	--	0.014 U	0.013 U	0.013 U	0.014 U	0.014 U	0.013 U	0.013 U
N-Nitrosodi-N-Propylamine	--	--	0.0027 U	0.0026 U	--	--	0.0025 U	0.0024 U	0.0024 U	0.0026 U	0.0025 U	0.0024 U	0.0025 U
N-Nitrosodiphenylamine	--	--	0.013 U	0.013 U	--	--	0.012 U	0.012 U	0.012 U	0.013 U	0.012 U	0.012 U	0.012 U
Pentachlorophenol	--	--	0.064 U	0.061 U	--	--	0.06 U	0.057 U	0.056 U	0.062 U	0.06 U	0.057 U	0.058 U
Phenanthrene	--	--	0.041	0.0047 J	--	--	0.13	0.0027 J	0.0056 J	0.073	0.0091	0.0028 J	0.0083
Phenol	--	--	0.012 U	0.011 U	--	--	0.011 U	0.011 U	0.011 U	0.012 U	0.011 U	0.011 U	0.011 U
Pyrene	--	--	0.069	0.0054 J	--	--	0.28	0.0017 U	0.0099	0.12	0.016	0.005 J	0.012
VOLATILE ORGANIC COMPOUNDS (mg/kg)													
1,1,1-Trichloroethane	--	0.00028 U	--	--	--	--	--	--	--	--	--	--	--
1,1,2,2-Tetrachloroethane	--	0.00026 U	--	--	--	--	--	--	--	--	--	--	--
1,1,2-Trichloro-1,2,2-Trifluoroethane	--	0.00037 U	--	--	--	--	--	--	--	--	--	--	--
1,1,2-Trichloroethane	--	0.00022 U	--	--	--	--	--	--	--	--	--	--	--
1,1-Dichloroethane	--	0.00025 U	--	--	--	--	--	--	--	--	--	--	--
1,1-Dichloroethene	--	0.00027 U	--	--	--	--	--	--	--	--	--	--	--
1,2,3-Trichlorobenzene	--	0.00022 U	--	--	--	--	--	--	--	--	--	--	--
1,2,4-Trichlorobenzene	--	0.00011 U	--	--	--	--	--	--	--	--	--	--	--
1,2-Dibromo-3-Chloropropane	--	0.00056 U	--	--	--	--	--	--	--	--	--	--	--
1,2-Dibromoethane (Ethylene Dibromide)	--	0.00022 U	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichlorobenzene	--	0.00018 U	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichloroethane	--	0.00036 U	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichloropropane	--	0.00052 U	--	--	--	--	--	--	--	--	--	--	--
1,3-Dichlorobenzene	--	0.00019 U	--	--	--	--	--	--	--	--	--	--	--
1,4-Dichlorobenzene	--	0.00012 U	--	--	--	--	--	--	--	--	--	--	--
2-Hexanone	--	0.00095 U	--	--	--	--	--	--	--	--	--	--	--
Acetone	--	0.035 J+	--	--	--	--	--	--	--	--	--	--	--
Benzene	--	0.00032 U	--	--	--	--	--	--	--	--	--	--	--
Bromochloromethane	--	0.00034 U	--	--	--	--	--	--	--	--	--	--	--
Bromodichloromethane	--	0.00031 U	--	--	--	--	--	--	--	--	--	--	--
Bromoform	--	0.00052 U	--	--	--	--	--	--	--	--	--	--	--
Bromomethane	--	0.00058 UJ	--	--	--	--	--	--	--	--	--	--	--
Carbon Disulfide	--	0.00032 U	--	--	--	--	--	--	--	--	--	--	--
Carbon Tetrachloride	--	0.00022 U	--	--	--	--	--	--	--	--	--	--	--
Chlorobenzene	--	0.00022 U	--	--	--	--	--	--	--	--	--	--	--
Chloroethane	--	0.00064 U	--	--	--	--	--	--	--	--	--	--	--
Chloroform	--	0.00039 U	--	--	--	--	--	--	--	--	--	--	--
Chloromethane	--	0.00053 UJ	--	--	--	--	--	--	--	--	--	--	--
Cis-1,2-Dichloroethylene	--	0.00019 U	--	--	--	--	--	--	--	--	--	--	--
Cis-1,3-Dichloropropene	--	0.00033 U	--	--	--	--	--	--	--	--	--	--	--
Cyclohexane	--	0.00027 U	--	--	--	--	--	--	--	--	--	--	--
Dibromochloromethane	--	0.00024 U	--	--	--	--	--	--	--	--	--	--	--
Dichlorodifluoromethane	--	0.00041 UJ	--	--	--	--	--	--	--	--	--	--	--
Ethylbenzene	--	0.00024 U	--	--	--	--	--	--	--	--	--	--	--
Isopropylbenzene (Cumene)	--	0.00015 U	--	--	--	--	--	--	--	--	--	--	--
M,P-Xylene	--	0.00021 U	--	--	--	--	--	--	--	--	--	--	--

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Columbia Falls, Montana

Sample Location ID	CFSB-238	CFSB-238	CFSB-239	CFSB-239	CFSB-239	CFSB-239	CFSB-244	CFSB-244	CFSB-244	CFSB-245	CFSB-245	CFSB-245	CFSB-249
Sample Lab IDs	320-43646-2	460-165504-3	180-79434-25, 460-159377-25	180-79434-26, 460-159377-26	320-43709-18	320-43709-19	180-77673-26, 460-155989-48	180-77673-27, 460-155989-49	180-77673-28, 460-155989-50	180-77673-8, 460-155989-28	180-77673-9, 460-155989-29	180-77673-10, 460-155989-30	180-77393-32, 460-155265-34
Sample Name	CFSB-238-SO-0.5-2	CFSB-238a-SO-3.5-4	CFSB-239-SO-0-0.5	CFSB-239-SO-0.5-2	CFSB-239-SO-0-0.5	CFSB-239-SO-0.5-2	CFSB-244-SO-0-0.5	CFSB-244-SO-0.5-2	CFSB-244-SO-10-12	CFSB-245-SO-0-0.5	CFSB-245-SO-0.5-2	CFSB-245-SO-10-12	CFSB-249-SO-0-0.5
Sample Depth	0.5-2 ft	3.5-4 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft
Chemical	9/25/2018	9/25/2018	6/27/2018	6/27/2018	9/27/2018	9/27/2018	5/9/2018	5/9/2018	5/9/2018	5/8/2018	5/8/2018	5/8/2018	5/1/2018
Methyl Acetate	--	0.16	--	--	--	--	--	--	--	--	--	--	--
Methyl Ethyl Ketone (2-Butanone)	--	0.0021 J	--	--	--	--	--	--	--	--	--	--	--
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	--	0.00081 U	--	--	--	--	--	--	--	--	--	--	--
Methylcyclohexane	--	0.0002 U	--	--	--	--	--	--	--	--	--	--	--
Methylene Chloride	--	0.0002 U	--	--	--	--	--	--	--	--	--	--	--
O-Xylene (1,2-Dimethylbenzene)	--	0.00012 U	--	--	--	--	--	--	--	--	--	--	--
Styrene	--	0.00015 U	--	--	--	--	--	--	--	--	--	--	--
Tert-Butyl Methyl Ether	--	0.00015 U	--	--	--	--	--	--	--	--	--	--	--
Tetrachloroethylene (PCE)	--	0.00017 U	--	--	--	--	--	--	--	--	--	--	--
Toluene	--	0.00083 J	--	--	--	--	--	--	--	--	--	--	--
Trans-1,2-Dichloroethene	--	0.0003 U	--	--	--	--	--	--	--	--	--	--	--
Trans-1,3-Dichloropropene	--	0.00032 U	--	--	--	--	--	--	--	--	--	--	--
Trichloroethylene (TCE)	--	0.00018 U	--	--	--	--	--	--	--	--	--	--	--
Trichlorofluoromethane	--	0.0005 U	--	--	--	--	--	--	--	--	--	--	--
Vinyl Chloride	--	0.00067 UJ	--	--	--	--	--	--	--	--	--	--	--

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-23
Summary of Data Used in Risk Assessment
Western Undeveloped Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-249	CFSB-249
Sample Lab IDs	180-77393-33, 460-155265-35	180-77393-34, 460-155265-36
Sample Name	CFSB-249-SO-0.5-2	CFSB-249-SO-10-12
Sample Depth	0.5-2 ft	10-12 ft
Chemical	5/1/2018	5/1/2018
GENERAL CHEMISTRY (mg/kg)		
Fluoride	1.3	0.67 J-
Cyanide	0.066 U	0.064 U
METALS (mg/kg)		
"Chromium, Hexavalent - Estimated"	0.219465	0.318491
"Chromium, Trivalent - Estimated"	7.98054	11.5815
Aluminum	9260 J	8470 J
Antimony	0.32 UJ	0.33 UJ
Arsenic	6.4 J	6.1 J
Barium	89.2	82.6
Beryllium	0.34 J	0.35 J
Cadmium	0.37 U	0.38 U
Calcium	36300 J+	33500 J+
Chromium, Total	8.2	11.9
Cobalt	5.3	4.8
Copper	16.3 J	13.6 J
Iron	13000	12800
Lead	8.6 J+	7.6 J+
Magnesium	10300 J	9810 J
Manganese	413 J	377 J
Mercury	0.021	0.011 J
Nickel	10.1	9.5
Potassium	1070 J+	1050 J+
Selenium	0.32 U	0.33 U
Silver	0.68 U	0.69 U
Sodium	34.2 U	35.2 U
Thallium	0.14 U	0.14 U
Vanadium	6.8 J+	7 J+
Zinc	38.6	35.2
PESTICIDES (mg/kg)		
Aldrin	--	--
Alpha Bhc (Alpha Hexachlorocyclohexane)	--	--
Alpha Endosulfan	--	--
Beta Bhc (Beta Hexachlorocyclohexane)	--	--
Beta Endosulfan	--	--
cis-Chlordane	--	--
Delta BHC (Delta Hexachlorocyclohexane)	--	--
Dieldrin	--	--
Endosulfan Sulfate	--	--
Endrin	--	--
Endrin Aldehyde	--	--
Endrin Ketone	--	--
Gamma Bhc (Lindane)	--	--
Heptachlor	--	--
Heptachlor Epoxide	--	--
Methoxychlor	--	--
P,P'-DDD	--	--
P,P'-DDE	--	--
P,P'-DDT	--	--
Toxaphene	--	--
trans-Chlordane	--	--
POLYCHLORINATED BIPHENYLS (mg/kg)		
PCB-1016 (Aroclor 1016)	--	--
PCB-1221 (Aroclor 1221)	--	--
PCB-1232 (Aroclor 1232)	--	--
PCB-1242 (Aroclor 1242)	--	--

Table E-23
Summary of Data Used in Risk Assessment
Western Undeveloped Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-249	CFSB-249
Sample Lab IDs	180-77393-33, 460-155265-35	180-77393-34, 460-155265-36
Sample Name	CFSB-249-SO-0.5-2	CFSB-249-SO-10-12
Sample Depth	0.5-2 ft	10-12 ft
Chemical	5/1/2018	5/1/2018
PCB-1248 (Aroclor 1248)	--	--
PCB-1254 (Aroclor 1254)	--	--
PCB-1260 (Aroclor 1260)	--	--
PCB-1262 (Aroclor 1262)	--	--
PCB-1268 (Aroclor 1268)	--	--
Polychlorinated Biphenyl (PCBs)	--	--
SEMIVOLATILE ORGANIC COMPOUNDS (mg/kg)		
1,2,4,5-Tetrachlorobenzene	0.0016 U	0.0016 U
1,4-Dioxane (P-Dioxane)	0.011 U	0.012 U
2,3,4,6-Tetrachlorophenol	0.015 U	0.016 U
2,4,5-Trichlorophenol	0.0026 U	0.0027 U
2,4,6-Trichlorophenol	0.002 U	0.002 U
2,4-Dichlorophenol	0.0028 U	0.0029 U
2,4-Dimethylphenol	0.0022 U	0.0023 U
2,4-Dinitrophenol	0.097 UJ	0.1 UJ
2,4-Dinitrotoluene	0.0018 U	0.0019 U
2,6-Dinitrotoluene	0.0022 U	0.0023 U
2-Chloronaphthalene	0.0016 U	0.0017 U
2-Chlorophenol	0.0017 U	0.0017 U
2-Methylnaphthalene	0.0017 U	0.0018 U
2-Methylphenol (O-Cresol)	0.01 U	0.011 U
2-Nitroaniline	0.016 U	0.017 U
2-Nitrophenol	0.0021 U	0.0021 U
3- And 4- Methylphenol (Total)	--	--
3,3'-Dichlorobenzidine	0.034 U	0.035 U
3-Nitroaniline	0.0091 U	0.0095 U
4,6-Dinitro-2-Methylphenol	0.062 UJ	0.064 UJ
4-Bromophenyl Phenyl Ether	0.0025 U	0.0026 U
4-Chloro-3-Methylphenol	0.0017 U	0.0018 U
4-Chloroaniline	0.0012 U	0.0012 U
4-Chlorophenyl Phenyl Ether	0.0022 U	0.0023 U
4-Nitroaniline	0.0017 U	0.0018 U
4-Nitrophenol	0.025 U	0.026 U
Acenaphthene	0.0021 U	0.0021 U
Acenaphthylene	0.0016 U	0.0016 U
Acetophenone	0.002 U	0.002 U
Anthracene	0.0019 U	0.0019 U
Atrazine	0.016 U	0.016 U
Benzaldehyde	0.0045 UR	0.0046 UR
Benzo(A)Anthracene	0.0014 U	0.0014 U
Benzo(A)Pyrene	0.0016 U	0.0016 U
Benzo(B)Fluoranthene	0.0018 U	0.0018 U
Benzo(G,H,I)Perylene	0.0016 U	0.0016 U
Benzo(K)Fluoranthene	0.0022 U	0.0022 U
Benzyl Butyl Phthalate	0.025 U	0.026 U
Biphenyl (Diphenyl)	0.0015 U	0.0016 U
Bis(2-Chloroethoxy) Methane	0.0017 U	0.0018 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.0013 U	0.0013 U
Bis(2-Chloroisopropyl) Ether	0.0027 U	0.0028 U
Bis(2-Ethylhexyl) Phthalate	0.038 U	0.04 U
Caprolactam	0.023 U	0.024 U
Carbazole	0.0017 U	0.0017 U
Chrysene	0.0014 U	0.0015 U
Dibenz(A,H)Anthracene	0.0016 U	0.0017 U
Dibenzofuran	0.0016 U	0.0016 U
Diethyl Phthalate	0.011 U	0.011 U

Table E-23
Summary of Data Used in Risk Assessment
Western Undeveloped Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Sample Depth Chemical	CFSB-249 180-77393-33, 460-155265-35 CFSB-249-SO-0.5-2 0.5-2 ft 5/1/2018	CFSB-249 180-77393-34, 460-155265-36 CFSB-249-SO-10-12 10-12 ft 5/1/2018
Dimethyl Phthalate	0.0013 U	0.0013 U
Di-N-Butyl Phthalate	0.016 U	0.016 U
Di-N-Octylphthalate	0.021 U	0.022 U
Fluoranthene	0.0019 U	0.002 U
Fluorene	0.0014 U	0.0015 U
Hexachlorobenzene	0.0026 U	0.0027 U
Hexachlorobutadiene	0.0021 U	0.0022 U
Hexachlorocyclopentadiene	0.0018 U	0.0019 U
Hexachloroethane	0.0019 U	0.0019 U
Indeno(1,2,3-C,D)Pyrene	0.0015 U	0.0015 U
Isophorone	0.0018 U	0.0019 U
Naphthalene	0.0014 U	0.0015 U
Nitrobenzene	0.013 U	0.014 U
N-Nitrosodi-N-Propylamine	0.0024 U	0.0025 U
N-Nitrosodiphenylamine	0.012 U	0.012 U
Pentachlorophenol	0.058 U	0.06 U
Phenanthrene	0.0019 U	0.002 U
Phenol	0.011 U	0.011 U
Pyrene	0.0017 U	0.0018 U
VOLATILE ORGANIC COMPOUNDS (mg/kg)		
1,1,1-Trichloroethane	--	--
1,1,2,2-Tetrachloroethane	--	--
1,1,2-Trichloro-1,2,2-Trifluoroethane	--	--
1,1,2-Trichloroethane	--	--
1,1-Dichloroethane	--	--
1,1-Dichloroethene	--	--
1,2,3-Trichlorobenzene	--	--
1,2,4-Trichlorobenzene	--	--
1,2-Dibromo-3-Chloropropane	--	--
1,2-Dibromoethane (Ethylene Dibromide)	--	--
1,2-Dichlorobenzene	--	--
1,2-Dichloroethane	--	--
1,2-Dichloropropane	--	--
1,3-Dichlorobenzene	--	--
1,4-Dichlorobenzene	--	--
2-Hexanone	--	--
Acetone	--	--
Benzene	--	--
Bromochloromethane	--	--
Bromodichloromethane	--	--
Bromoform	--	--
Bromomethane	--	--
Carbon Disulfide	--	--
Carbon Tetrachloride	--	--
Chlorobenzene	--	--
Chloroethane	--	--
Chloroform	--	--
Chloromethane	--	--
Cis-1,2-Dichloroethylene	--	--
Cis-1,3-Dichloropropene	--	--
Cyclohexane	--	--
Dibromochloromethane	--	--
Dichlorodifluoromethane	--	--
Ethylbenzene	--	--
Isopropylbenzene (Cumene)	--	--
M,P-Xylene	--	--

Table E-23
Summary of Data Used in Risk Assessment
Western Undeveloped Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-249	CFSB-249
Sample Lab IDs	180-77393-33, 460-155265-35	180-77393-34, 460-155265-36
Sample Name	CFSB-249-SO-0.5-2	CFSB-249-SO-10-12
Sample Depth	0.5-2 ft	10-12 ft
Chemical	5/1/2018	5/1/2018
Methyl Acetate	--	--
Methyl Ethyl Ketone (2-Butanone)	--	--
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	--	--
Methylcyclohexane	--	--
Methylene Chloride	--	--
O-Xylene (1,2-Dimethylbenzene)	--	--
Styrene	--	--
Tert-Butyl Methyl Ether	--	--
Tetrachloroethylene (PCE)	--	--
Toluene	--	--
Trans-1,2-Dichloroethene	--	--
Trans-1,3-Dichloropropene	--	--
Trichloroethylene (TCE)	--	--
Trichlorofluoromethane	--	--
Vinyl Chloride	--	--

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-24
Summary of Data Used in Risk Assessment
Western Undeveloped Area (surface water) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Chemical	CFSWP-014 460-119361-1 CFSWP-014-SW 8/29/2016	CFSWP-014 460-124553-2 CFSWP-014-SW 11/30/2016	CFSWP-014-DUP 460-124553-5 CFSWP-DUP3-SW 11/30/2016	CFSWP-014 460-129850-1 CFSWP-014-SW 3/13/2017	CFSWP-014-DUP 460-129850-5 CFSWP-Dup4-SW 3/13/2017	CFSWP-014 460-135255-1 CFSWP-014-SW 6/13/2017	CFSWP-014 460-158059-1 CFSWP-014-SW 6/11/2018	CFSWP-014 460-166579-4 CFSWP-014-SW 10/10/2018	CFSWP-014 460-167026-4 CFSWP-014-SW 10/16/2018	CFSWP-015 460-119361-2 CFSWP-015-SW 8/29/2016	CFSWP-015-DUP 460-119361-4 CFSWP-DUP2-SW 8/29/2016	CFSWP-015 460-124553-3 CFSWP-015-SW 11/30/2016	CFSWP-015 460-125810-1 CFSWP-015-SW 12/20/2016	CFSWP-015 460-129850-2 CFSWP-015-SW 3/13/2017
GENERAL CHEMISTRY (µg/L)														
Fluoride	--	--	--	--	--	130 J+	--	--	--	--	--	--	--	--
Cyanide	--	--	--	--	--	2 U	--	--	--	--	--	--	--	--
Cyanide (Free)	--	--	--	--	--	1.5 U	--	--	--	--	--	--	--	--
Cyanide	2 U	15.3 J	2 UJ	2 U	2 U	2 U	2.3 J	--	--	2.3 J	2 U	10.6	2 U	2 U
Cyanide (Free)	--	--	--	1.5 U	1.5 U	1.5 U	1.5 UJ	1.5 U	1.5 U	--	--	--	--	1.5 U
METALS (µg/L)														
Aluminum	--	--	--	--	--	18.2 U	15 U	15 U	--	--	--	--	--	--
Antimony	--	--	--	--	--	0.62 U	0.62 U	0.62 U	--	--	--	--	--	--
Arsenic	--	--	--	--	--	0.64 U	0.77 U	0.77 U	--	--	--	--	--	--
Barium	--	--	--	--	--	88.5	85.9	108	--	--	--	--	--	--
Beryllium	--	--	--	--	--	0.24 U	0.26 U	0.26 U	--	--	--	--	--	--
Cadmium	--	--	--	--	--	0.71 U	0.61 U	0.61 U	--	--	--	--	--	--
Calcium	--	--	--	--	--	50100	44500	48700	--	--	--	--	--	--
Chromium, Total	--	--	--	--	--	1.3 U	1.3 U	1.3 U	--	--	--	--	--	--
Cobalt	--	--	--	--	--	1.3 U	1.3 U	1.3 U	--	--	--	--	--	--
Copper	--	--	--	--	--	1.4 U	1.9 U	1.9 U	--	--	--	--	--	--
Iron	--	--	--	--	--	42.4 U	45.7 U	45.7 U	--	--	--	--	--	--
Lead	--	--	--	--	--	0.38 U	0.37 U	0.37 U	--	--	--	--	--	--
Magnesium	--	--	--	--	--	11700	10500	14300	--	--	--	--	--	--
Manganese	--	--	--	--	--	2.7 J	4.2 J	2.7 U	--	--	--	--	--	--
Mercury	--	--	--	--	--	0.17 U	0.12 U	0.12 U	--	--	--	--	--	--
Nickel	--	--	--	--	--	1.4 U	1.3 U	1.3 U	--	--	--	--	--	--
Potassium	--	--	--	--	--	435	389	410	--	--	--	--	--	--
Selenium	--	--	--	--	--	0.73 U	0.69 U	0.69 U	--	--	--	--	--	--
Silver	--	--	--	--	--	1.3 U	1.4 U	1.4 U	--	--	--	--	--	--
Sodium	--	--	--	--	--	2000	1910	2850	--	--	--	--	--	--
Thallium	--	--	--	--	--	0.26 U	0.24 U	0.24 U	--	--	--	--	--	--
Vanadium	--	--	--	--	--	1.9 U	1.2 U	1.2 U	--	--	--	--	--	--
Zinc	--	--	--	--	--	7 U	5.4 U	5.4 U	--	--	--	--	--	--
Aluminum	37.6 J	18.2 UJ	27.4 J	18.2 U	18.2 U	33.7 J	17.6 J	15 U	--	44.9	39.7 J	18.2 U	20 J	18.2 U
Antimony	0.62 U	0.62 U	0.62 U	0.64 J	0.62 J	0.62 U	0.62 U	0.62 U	--	0.62 U	0.62 U	0.62 U	0.62 U	0.67 J
Arsenic	0.64 U	0.64 U	0.64 U	0.64 U	0.64 U	0.64 U	0.77 U	0.77 U	--	0.64 U	0.64 U	0.64 U	0.64 U	0.64 U
Barium	98.1	101	103	109	104	94.4	85.9	115	--	103	101	106	118	107
Beryllium	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.26 U	0.26 U	--	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U
Cadmium	0.71 U	0.71 U	0.71 U	0.71 U	0.71 U	0.71 U	0.61 U	0.61 U	--	0.71 U	0.71 U	0.71 U	0.71 U	0.71 U
Calcium	43100	52800	53300	55800	52800	50900	43500	51900	--	47500	44600	53100	56800	53500
Chromium, Total	1.3 U	1.3 U	1.3 U	37.7 J	2.4 J	1.3 U	1.3 U	1.3 U	--	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
Cobalt	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	--	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
Copper	5.4	1.4 U	1.4 U	2.3 J	1.4 UJ	1.4 U	1.9 U	3.8 J	--	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U
Iron	42.4 U	42.4 U	42.4 U	304 J	51.7 J	42.4 U	45.7 U	45.7 U	--	42.4 U	42.4 U	42.4 U	42.4 U	42.4 U
Lead	0.41 J	0.38 U	0.38 U	0.38 U	0.38 U	0.38 U	0.37 U	0.37 U	--	0.38 U	0.38 U	0.38 U	0.38 U	0.38 U
Magnesium	13500	13500	13900	13500	12400	12400	10700	15900	--	13600	13400	13600	14000	12500
Manganese	13.2	5.2 J	3.9 J	13.7 J	9.7 J	12.7	11.1	4.5 J	--	8.6 J	5.9 J	4 J	5.5 J	6.6 J
Mercury	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.12 U	0.12 U	--	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U
Nickel	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.3 U	1.3 U	--	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U
Potassium	377	481	486	656	486	467	398	473	--	405	357	484	519	502
Selenium	0.73 U	0.73 U	0.73 U	0.73 U	0.73 U	0.73 U	0.69 U	0.69 U	--	0.73 U	0.73 U	0.73 U	0.73 U	0.73 U
Silver	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.4 U	1.4 U	--	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
Sodium	3240	2590	2660	5530 J	2490 J	2240 J+	2010	3200	--	2870	2620	2610	2940	2520
Thallium	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.24 U	0.24 U	--	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U
Vanadium	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.2 U	1.2 U	--	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U

Table E-24
Summary of Data Used in Risk Assessment
Western Undeveloped Area (surface water) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Chemical	CFSWP-014 460-119361-1 CFSWP-014-SW 8/29/2016	CFSWP-014 460-124553-2 CFSWP-014-SW 11/30/2016	CFSWP-014-DUP 460-124553-5 CFSWP-DUP3-SW 11/30/2016	CFSWP-014 460-129850-1 CFSWP-014-SW 3/13/2017	CFSWP-014-DUP 460-129850-5 CFSWP-Dup4-SW 3/13/2017	CFSWP-014 460-135255-1 CFSWP-014-SW 6/13/2017	CFSWP-014 460-158059-1 CFSWP-014-SW 6/11/2018	CFSWP-014 460-166579-4 CFSWP-014-SW 10/10/2018	CFSWP-014 460-167026-4 CFSWP-014-SW 10/16/2018	CFSWP-015 460-119361-2 CFSWP-015-SW 8/29/2016	CFSWP-015-DUP 460-119361-4 CFSWP-DUP2-SW 8/29/2016	CFSWP-015 460-124553-3 CFSWP-015-SW 11/30/2016	CFSWP-015 460-125810-1 CFSWP-015-SW 12/20/2016	CFSWP-015 460-129850-2 CFSWP-015-SW 3/13/2017
Zinc	16.4	7 U	7 U	7 U	7 U	7 U	5.4 U	5.4 U	--	7 U	7 U	7 U	7 U	7 U

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-24
Summary of Data Used in Risk Assessment
Western Undeveloped Area (surface water) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Chemical	CFSWP-015 460-135255-2 CFSWP-015-SW 6/13/2017	CFSWP-015-DUP 460-135255-4 CFSWP-DUP7-SW 6/13/2017	CFSWP-015 460-158059-2 CFSWP-015-SW 6/11/2018	CFSWP-015 460-166505-3 CFSWP-015-SW 10/9/2018	CFSWP-015 460-167026-2 CFSWP-015-SW 10/16/2018	CFSWP-016 460-119361-3 CFSWP-016-SW 8/29/2016	CFSWP-016 460-124553-4 CFSWP-016-SW 11/30/2016	CFSWP-016 460-129850-4 CFSWP-016-SW 3/13/2017	CFSWP-016 460-135182-6 CFSWP-016-SW 6/12/2017	CFSWP-016-DUP 460-135182-7 CFSWP-DUP6-SW 6/12/2017	CFSWP-016 460-158184-1 CFSWP-016-SW 6/12/2018	CFSWP-016 460-166505-1 CFSWP-016-SW 10/9/2018	CFSWP-025 460-125810-2 CFSWP-025-SW 12/20/2016	CFSWP-025 460-129850-3 CFSWP-025-SW 3/13/2017
GENERAL CHEMISTRY (µg/L)														
Fluoride	121 J+	130 J+	--	--	--	--	--	--	131 J+	138 J+	--	--	--	--
Cyanide	2 U	2 U	--	--	--	--	--	--	2 U	2 U	--	--	--	--
Cyanide (Free)	1.5 U	1.5 U	--	--	--	--	--	--	--	--	--	--	--	--
Cyanide	2 U	2 U	3 J	--	--	2 U	2 U	2 U	2 U	2 U	2 U	--	2 U	2 U
Cyanide (Free)	1.5 U	1.5 U	1.9 J-	1.5 U	1.5 UJ	--	--	--	--	--	1.5 U	1.5 U	--	--
METALS (µg/L)														
Aluminum	18.2 U	18.2 U	15 U	15 U	--	--	--	--	18.2 U	18.2 U	15 U	15 U	--	--
Antimony	0.62 U	6.2 U	0.62 U	0.62 U	--	--	--	--	0.62 U	0.62 U	0.62 U	0.62 U	--	--
Arsenic	0.64 U	6.4 U	0.77 U	0.77 U	--	--	--	--	0.64 U	0.64 U	0.77 U	0.77 U	--	--
Barium	93	96.3	92.1	113	--	--	--	--	93.5	99.8	92.9	113	--	--
Beryllium	0.24 U	0.24 U	0.26 U	0.26 U	--	--	--	--	0.24 U	0.24 U	0.26 U	0.26 U	--	--
Cadmium	0.71 U	7.1 U	0.61 U	0.61 U	--	--	--	--	0.71 U	0.71 U	0.61 U	0.61 U	--	--
Calcium	50500	50100	46600	48700	--	--	--	--	50300	50600	47000	49600	--	--
Chromium, Total	1.3 U	1.3 U	1.3 U	1.3 U	--	--	--	--	1.3 U	1.3 U	1.3 U	1.3 U	--	--
Cobalt	1.3 U	1.3 U	1.3 U	1.3 U	--	--	--	--	1.3 U	1.3 U	1.3 U	1.3 U	--	--
Copper	1.4 U	1.4 U	1.9 U	1.9 U	--	--	--	--	1.4 U	1.4 U	1.9 U	1.9 U	--	--
Iron	42.4 U	42.4 U	45.7 U	45.7 U	--	--	--	--	42.4 U	42.4 U	45.7 U	45.7 U	--	--
Lead	0.38 U	0.38 U	0.37 U	0.37 U	--	--	--	--	0.38 U	0.38 U	0.37 U	0.37 U	--	--
Magnesium	11700	11700	10900	14300	--	--	--	--	11400	11400	11000	14400	--	--
Manganese	3.5 J	3.2 J	5.3 J	3.6 J	--	--	--	--	3.4 J	3.2 J	2.8 J	2.7 U	--	--
Mercury	0.17 U	0.17 U	0.12 U	0.12 U	--	--	--	--	0.17 U	0.17 U	0.12 U	0.12 U	--	--
Nickel	1.4 U	1.4 U	1.3 U	1.3 U	--	--	--	--	1.4 U	1.4 U	1.3 U	1.3 U	--	--
Potassium	434	429	400	444	--	--	--	--	439	436	393	478	--	--
Selenium	0.73 U	0.73 U	0.69 U	0.69 U	--	--	--	--	0.73 U	0.73 U	0.69 U	0.69 U	--	--
Silver	1.3 U	12.8 U	1.4 U	1.4 U	--	--	--	--	1.3 U	1.3 U	1.4 U	1.4 U	--	--
Sodium	1960	1940	1950	2840	--	--	--	--	2070	2020	1920	2820	--	--
Thallium	0.26 U	0.26 U	0.24 U	0.24 U	--	--	--	--	0.26 U	0.26 U	0.24 U	0.24 U	--	--
Vanadium	1.9 U	1.9 U	1.2 U	1.2 U	--	--	--	--	1.9 U	1.9 U	1.2 U	1.2 U	--	--
Zinc	7 U	7 U	5.4 U	5.4 U	--	--	--	--	7 U	7 U	5.4 U	5.4 U	--	--
Aluminum	45.6	40	20 J	15 U	--	59.2	19.5 J	19.6 J	85.5	66.8	32.8 J	15 U	44.4	18.2 U
Antimony	0.62 U	0.62 U	0.62 U	0.62 U	--	0.62 U	0.62 U	0.78 J	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.74 J
Arsenic	0.64 U	0.64 U	0.77 U	0.77 U	--	0.64 U	0.64 U	0.64 U	0.64 U	0.64 U	0.77 U	0.77 U	0.64 U	0.64 U
Barium	97.5	97.1	95.7	114	--	99.5	105	106	98.8	99.4	94.1	116	122	110
Beryllium	0.24 U	0.24 U	0.26 U	0.26 U	--	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.26 U	0.26 U	0.24 U	0.24 U
Cadmium	0.71 U	0.71 U	0.61 U	0.61 U	--	0.71 U	0.71 U	0.71 U	0.71 U	0.71 U	0.61 U	0.61 U	0.71 U	0.71 U
Calcium	51600	51700	46700	52100	--	44400	53100	53700	50500	51000	44600	52900	56700	54200
Chromium, Total	1.3 U	1.3 U	1.3 U	1.3 U	--	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	8.9
Cobalt	1.3 U	1.3 U	1.3 U	1.3 U	--	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
Copper	1.4 U	1.4 U	1.9 U	4.2	--	1.4 U	1.4 U	1.4 U	1.9 J	1.4 U	1.9 U	2 J	1.4 U	1.4 U
Iron	42.4 U	42.4 U	45.7 U	45.7 U	--	42.4 U	42.4 U	42.4 U	129 J	54.7 J	45.7 U	45.7 U	42.4 U	100 J
Lead	0.38 U	0.38 U	0.37 U	0.37 U	--	0.38 U	0.38 U	0.38 U	0.38 U	0.38 U	0.37 U	0.37 U	0.38 U	0.38 U
Magnesium	12600	12700	11500	14900	--	13500	13900	12600	12200	12400	11100	15200	13900	12700
Manganese	12.5	13	11.4	5.9 J	--	3.5 J	3.6 J	5.6 J	14.7	14	10	3.8 J	8.9	6.7 J
Mercury	0.17 U	0.17 U	0.12 U	0.12 U	--	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.12 U	0.12 U	0.17 U	0.17 U
Nickel	1.4 U	1.4 U	1.3 U	1.3 U	--	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.3 U	1.3 U	1.4 U	1.4 U
Potassium	469	466	427	493	--	367	483	495	477	479	443	517	528	509
Selenium	0.73 U	0.73 U	0.69 U	0.69 U	--	0.73 U	0.73 U	0.73 U	0.73 U	0.73 U	0.69 U	0.69 U	0.73 U	0.73 U
Silver	1.3 U	1.3 U	1.4 U	1.4 U	--	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.4 U	1.4 U	1.3 U	1.3 U
Sodium	2250	2270	2140	3370	--	3260	2630	2480	2200	2200	2060	3420	2880	2530
Thallium	0.26 U	0.26 U	0.24 U	0.24 U	--	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.24 U	0.24 U	0.26 U	0.26 U
Vanadium	1.9 U	1.9 U	1.2 U	1.2 U	--	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.2 U	1.2 U	1.9 U	1.9 U

Table E-24
Summary of Data Used in Risk Assessment
Western Undeveloped Area (surface water) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Chemical	CFSWP-015 460-135255-2 CFSWP-015-SW 6/13/2017	CFSWP-015-DUP 460-135255-4 CFSWP-DUP7-SW 6/13/2017	CFSWP-015 460-158059-2 CFSWP-015-SW 6/11/2018	CFSWP-015 460-166505-3 CFSWP-015-SW 10/9/2018	CFSWP-015 460-167026-2 CFSWP-015-SW 10/16/2018	CFSWP-016 460-119361-3 CFSWP-016-SW 8/29/2016	CFSWP-016 460-124553-4 CFSWP-016-SW 11/30/2016	CFSWP-016 460-129850-4 CFSWP-016-SW 3/13/2017	CFSWP-016 460-135182-6 CFSWP-016-SW 6/12/2017	CFSWP-016-DUP 460-135182-7 CFSWP-DUP6-SW 6/12/2017	CFSWP-016 460-158184-1 CFSWP-016-SW 6/12/2018	CFSWP-016 460-166505-1 CFSWP-016-SW 10/9/2018	CFSWP-025 460-125810-2 CFSWP-025-SW 12/20/2016	CFSWP-025 460-129850-3 CFSWP-025-SW 3/13/2017
Zinc	7 U	7 U	5.4 U	5.4 U	--	7 U	7 U	7 U	13.5 J	7 UJ	5.4 U	5.4 U	7 U	7 U

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-24
Summary of Data Used in Risk Assessment
Western Undeveloped Area (surface water) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Chemical	CFSWP-025 460-135255-3 CFSWP-025-SW 6/13/2017	CFSWP-025 460-158184-2 CFSWP-025-SW 6/12/2018	CFSWP-025 460-166579-2 CFSWP-025-SW 10/10/2018	CFSWP-044 460-158059-3 CFSWP-044-SW 6/11/2018	CFSWP-044 460-166579-1 CFSWP-044-SW 10/10/2018	CFSWP-044-DUP 460-166579-3 CFSWP-DUP14-SW 10/10/2018	CFSWP-044 460-167026-3 CFSWP-044-SW 10/16/2018	CFSWP-045 460-158059-4 CFSWP-045-SW 6/11/2018	CFSWP-045 460-166505-2 CFSWP-045-SW 10/9/2018	CFSWP-045 460-167026-1 CFSWP-045-SW 10/16/2018
GENERAL CHEMISTRY (µg/L)										
Fluoride	130 J+	--	--	--	--	--	--	--	--	--
Cyanide	2 U	--	--	--	--	--	--	--	--	--
Cyanide (Free)	--	--	--	--	--	--	--	--	--	--
Cyanide	2 U	2 U	--	2 J	--	--	--	2.7 J	--	--
Cyanide (Free)	--	1.5 U	1.5 U	1.5 UJ	1.5 U	1.5 U	7.7	1.5 UJ	1.5 U	1.5 U
METALS (µg/L)										
Aluminum	18.2 U	15 U	15 U	15 U	15 U	15 U	--	15 U	15 U	--
Antimony	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	--	0.62 U	0.62 U	--
Arsenic	0.64 U	0.77 U	0.77 U	0.77 U	0.77 U	0.77 U	--	0.77 U	0.77 U	--
Barium	93.3	93.4	117	89.8	116	117	--	92.3	113	--
Beryllium	0.24 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	--	0.26 U	0.26 U	--
Cadmium	0.71 U	0.61 U	0.61 U	0.61 U	0.61 U	0.61 U	--	0.61 U	0.61 U	--
Calcium	50400	47200	50900	46300	50200	50600	--	46700	48900	--
Chromium, Total	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	--	1.3 U	1.3 U	--
Cobalt	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	--	1.3 U	1.3 U	--
Copper	1.4 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	--	1.9 U	1.9 U	--
Iron	42.4 U	45.7 U	45.7 U	45.7 U	45.7 U	45.7 U	--	45.7 U	45.7 U	--
Lead	0.38 U	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U	--	0.37 U	0.37 U	--
Magnesium	11700	11100	14400	10900	14800	14500	--	10900	14100	--
Manganese	3.1 J	3.1 J	2.7 U	5.5 J	4.8 J	3.9 J	--	4.9 J	3.6 J	--
Mercury	0.17 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	--	0.12 U	0.12 U	--
Nickel	1.4 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	--	1.3 U	1.3 U	--
Potassium	421	396	440	391	476	452	--	414	454	--
Selenium	0.73 U	0.69 U	0.69 U	0.69 U	0.69 U	0.69 U	--	0.69 U	0.69 U	--
Silver	1.3 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	--	1.4 U	1.4 U	--
Sodium	2010	1940	2810	5570	2850	2790	--	1980	2820	--
Thallium	0.26 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	--	0.24 U	0.24 U	--
Vanadium	1.9 U	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U	--	1.2 U	1.2 U	--
Zinc	7 U	5.4 U	5.4 U	25.4	5.4 U	5.4 U	--	5.4 U	5.4 U	--
Aluminum	49.5	26.5 J	15 U	21.3 J	22.5 J	28.2 J	--	20.3 J	15 U	--
Antimony	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	--	0.62 U	0.62 U	--
Arsenic	0.64 U	0.77 U	0.77 U	0.77 U	0.77 U	0.77 U	--	0.77 U	0.77 U	--
Barium	94.7	91.9	130	91	119	118	--	93.6	115	--
Beryllium	0.24 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	--	0.26 U	0.26 U	--
Cadmium	0.71 U	0.61 U	0.61 U	0.61 U	0.61 U	0.61 U	--	0.61 U	0.61 U	--
Calcium	51100	45800	52800	43800	53600	52200	--	45400	52800	--
Chromium, Total	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	--	1.3 U	1.3 U	--
Cobalt	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	--	1.3 U	1.3 U	--
Copper	1.4 U	1.9 U	3.5 J	1.9 U	8.5 J	6 J	--	1.9 U	7.3	--
Iron	42.4 U	45.7 U	45.7 U	45.7 U	45.7 U	45.7 U	--	45.7 U	45.7 U	--
Lead	0.38 U	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U	--	0.37 U	0.37 U	--
Magnesium	12400	11200	16800	10800	15400	15500	--	11200	15100	--
Manganese	13.5	10.5	5.2 J	11.1	6.9 J	6.5 J	--	11.2	6 J	--
Mercury	0.17 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	--	0.12 U	0.12 U	--
Nickel	1.4 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	--	1.3 U	1.3 U	--
Potassium	456	435	582	392	481	499	--	425	489	--
Selenium	0.73 U	0.69 U	0.69 U	0.69 U	0.69 U	0.69 U	--	0.69 U	0.69 U	--
Silver	1.3 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	--	1.4 U	1.4 U	--
Sodium	2250	2120	3320	2060	3010	3030	--	2100	3400	--
Thallium	0.26 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	--	0.24 U	0.24 U	--
Vanadium	1.9 U	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U	--	1.2 U	1.2 U	--

Table E-24
Summary of Data Used in Risk Assessment
Western Undeveloped Area (surface water) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Chemical	CFSWP-025 460-135255-3 CFSWP-025-SW 6/13/2017	CFSWP-025 460-158184-2 CFSWP-025-SW 6/12/2018	CFSWP-025 460-166579-2 CFSWP-025-SW 10/10/2018	CFSWP-044 460-158059-3 CFSWP-044-SW 6/11/2018	CFSWP-044 460-166579-1 CFSWP-044-SW 10/10/2018	CFSWP-044-DUP 460-166579-3 CFSWP-DUP14- SW 10/10/2018	CFSWP-044 460-167026-3 CFSWP-044-SW 10/16/2018	CFSWP-045 460-158059-4 CFSWP-045-SW 6/11/2018	CFSWP-045 460-166505-2 CFSWP-045-SW 10/9/2018	CFSWP-045 460-167026-1 CFSWP-045-SW 10/16/2018
Zinc	7 U	5.4 U	5.4 U	5.4 U	5.4 U	5.4 U	--	5.4 U	5.4 U	--

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-25
Summary of Data Used in Risk Assessment
Western Undeveloped Area (sediment) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Chemical	CFSDP-014 200-35201-1, 460-119363-1 CFSDP-014-SD 8/29/2016	CFSDP-014 180-82906-4, 200-45660-3, 460-166608-4 CFSDP-014-SD 10/10/2018	CFSDP-015 200-35201-2, 460-119363-2 CFSDP-015-SD 8/29/2016	CFSDP-015 180-82835-3, 200-45651-3, 460-166517-3 CFSDP-015-SD 10/9/2018	CFSDP-016 200-35201-3, 460-119363-3 CFSDP-016-SD 8/29/2016	CFSDP-016 180-82835-1, 200-45651-1, 460-166517-1 CFSDP-016-SD 10/9/2018	CFSDP-016-DUP 180-82835-4, 460-166517-4 CFSDP-DUP4-SD 10/9/2018	CFSDP-025 180-82906-2, 200-45660-2, 460-166608-2 CFSDP-025-SD 10/10/2018	CFSDP-025-DUP 180-82906-3, 460-166608-3 CFSDP-DUP5-SD 10/10/2018	CFSDP-044 180-82906-1, 200-45660-1, 460-166608-1 CFSDP-044-SD 10/10/2018	CFSDP-045 180-82835-2, 200-45651-2, 460-166517-2 CFSDP-045-SD 10/9/2018
GENERAL CHEMISTRY (mg/kg)											
Fluoride	1.63 J+	0.23 U	1.41 J+	0.2 U	1.71 J+	0.21 U	0.24 U	0.21 U	0.23 U	0.76 U	0.21 U
Cyanide	0.24 J	0.1 J	0.15 J	0.075 U	0.15 J	0.079 U	0.095 U	0.076 U	0.086 U	0.28 U	0.083 U
METALS (mg/kg)											
Aluminum	10300	11100	8250	6900	9100	9260	9660	12600	11300	12100	11800
Antimony	0.86 U	0.34 UJ	0.84 U	0.3 UJ	0.93 U	0.32 UJ	0.38 UJ	0.31 UJ	0.35 UJ	1.1 UJ	0.33 UJ
Arsenic	2.3 J	4.2	2.1 J	1.8	2.3 J	2.5	1.9	2.5	2.2	3.6 J	2
Barium	173	97.1	151	20.2	165	85.6	106	92.8	92	249	71.8
Beryllium	0.43 J	0.34 J	0.34 J	0.21 J	0.4 J	0.22 J	0.21 U	0.28 J	0.31 J	0.68 J	0.33 J
Cadmium	0.91 U	0.39 U	0.89 U	0.34 U	0.99 U	0.37 U	0.43 U	0.36 U	0.4 U	1.3 U	0.38 U
Calcium	13800	13900	14800	1120	16400	30000 J	52600 J	10500 J	17600 J	37000	2500
Chromium, Total	9.7	11.4	7.7	6.9	8.3	9.4	10.3	13	11.9	11.6	12.7
Cobalt	4.2 J	5.2	3.2 J	6.5	3.5 J	5.4	4.4	5.4	5.9	4.7 J	6.5
Copper	13.6	5.4	12.2	3.3	13.6	4.9	4.1	4.9	4.6	20.8	4.5
Iron	10100	15300	7770	11900	8680	13000	11500	15700	15100	12000	16400
Lead	7.6	5.8	6.1	6	6.8	5.6	4.3	4.9	4.7	10.3	4.9
Magnesium	7710	11800	5410	7430	6010	9000	10200	13700	12400	8370	12200
Manganese	280	571 J-	272	67.3 J-	302	174 J-	228 J-	125 J-	160 J-	367 J-	112 J-
Mercury	0.032 J	0.014 U	0.036 J	0.013 U	0.044 J	0.013 U	0.014 U	0.013 U	0.014 U	0.045 U	0.013 U
Nickel	8.6	10.6 J-	6.9	11.9 J-	7.1	10.1 J-	8.9 J-	11.5 J-	11.8 J-	9.2 J-	13.8 J-
Potassium	789	621 J+	613	177 J+	672	476 J+	574 J+	684 J+	597 J+	1230 J+	659 J+
Selenium	0.8 U	0.34 U	0.78 U	0.3 U	0.87 U	0.32 U	0.37 U	0.31 U	0.34 U	1.8 J	0.33 U
Silver	1.7 U	0.72 U	1.6 U	0.63 U	1.8 U	0.67 U	0.79 U	0.65 U	0.73 U	2.4 U	0.7 U
Sodium	116 U	40.2 J	128 J	32.1 U	148 J	46.4 J	66.9 J	33.1 UJ	75.9 J	154 J	35.7 U
Thallium	0.34 U	0.14 U	0.33 U	0.13 U	0.37 U	0.14 U	0.16 U	0.13 U	0.15 U	0.48 U	0.14 U
Vanadium	7.2	8.1	5.4	4.6	5.9	7.4	7.2	8.3	7.6	8.8	8.1
Zinc	47	50.3	37.3	38.9	48.9	44	42.3	48.8	51.2	58.5	54.7
PESTICIDES (mg/kg)											
Aldrin	0.0025 U	--	0.0024 U	--	0.0027 U	--	--	--	--	--	--
Alpha Bhc (Alpha Hexachlorocyclohexane)	0.0019 U	--	0.0018 U	--	0.002 U	--	--	--	--	--	--
Alpha Endosulfan	0.0029 U	--	0.0028 U	--	0.0031 U	--	--	--	--	--	--
Beta Bhc (Beta Hexachlorocyclohexane)	0.002 U	--	0.002 U	--	0.0022 U	--	--	--	--	--	--
Beta Endosulfan	0.0033 U	--	0.0032 U	--	0.0035 U	--	--	--	--	--	--
cis-Chlordane	0.0034 U	--	0.0033 U	--	0.0036 U	--	--	--	--	--	--
Delta BHC (Delta Hexachlorocyclohexane)	0.0023 U	--	0.0022 U	--	0.0024 U	--	--	--	--	--	--
Dieldrin	0.0027 U	--	0.0026 U	--	0.0029 U	--	--	--	--	--	--
Endosulfan Sulfate	0.0025 U	--	0.0024 U	--	0.0026 U	--	--	--	--	--	--
Endrin	0.0027 U	--	0.0026 U	--	0.0028 U	--	--	--	--	--	--
Endrin Aldehyde	0.0026 U	--	0.0025 U	--	0.0028 U	--	--	--	--	--	--
Endrin Ketone	0.0029 U	--	0.0028 U	--	0.0031 U	--	--	--	--	--	--
Gamma Bhc (Lindane)	0.0019 U	--	0.0018 U	--	0.002 U	--	--	--	--	--	--
Heptachlor	0.0027 U	--	0.0026 U	--	0.0029 U	--	--	--	--	--	--
Heptachlor Epoxide	0.0041 U	--	0.004 U	--	0.0044 U	--	--	--	--	--	--
Methoxychlor	0.0045 U	--	0.0043 U	--	0.0048 U	--	--	--	--	--	--
P,P'-DDD	0.0028 U	--	0.0027 U	--	0.0029 U	--	--	--	--	--	--
P,P'-DDE	0.003 U	--	0.0029 U	--	0.0032 U	--	--	--	--	--	--
P,P'-DDT	0.0022 U	--	0.0021 U	--	0.0023 U	--	--	--	--	--	--
Toxaphene	0.061 U	--	0.059 U	--	0.065 U	--	--	--	--	--	--
trans-Chlordane	0.0046 U	--	0.0044 U	--	0.0049 U	--	--	--	--	--	--
POLYCHLORINATED BIPHENYLS (mg/kg)											
PCB-1016 (Aroclor 1016)	0.028 U	--	0.027 U	--	0.03 U	--	--	--	--	--	--
PCB-1221 (Aroclor 1221)	0.028 U	--	0.027 U	--	0.03 U	--	--	--	--	--	--
PCB-1232 (Aroclor 1232)	0.028 U	--	0.027 U	--	0.03 U	--	--	--	--	--	--
PCB-1242 (Aroclor 1242)	0.028 U	--	0.027 U	--	0.03 U	--	--	--	--	--	--
PCB-1248 (Aroclor 1248)	0.028 U	--	0.027 U	--	0.03 U	--	--	--	--	--	--
PCB-1254 (Aroclor 1254)	0.029 U	--	0.028 U	--	0.031 U	--	--	--	--	--	--
PCB-1260 (Aroclor 1260)	0.029 U	--	0.028 U	--	0.031 U	--	--	--	--	--	--
PCB-1262 (Aroclor 1262)	0.029 U	--	0.028 U	--	0.031 U	--	--	--	--	--	--
PCB-1268 (Aroclor 1268)	0.029 U	--	0.028 U	--	0.031 U	--	--	--	--	--	--
Polychlorinated Biphenyl (PCBs)	0.029 U	--	0.028 U	--	0.031 U	--	--	--	--	--	--

Table E-25
Summary of Data Used in Risk Assessment
Western Undeveloped Area (sediment) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Chemical	CFSDP-014 200-35201-1, 460-119363-1 CFSDP-014-SD 8/29/2016	CFSDP-014 180-82906-4, 200-45660-3, 460-166608-4 CFSDP-014-SD 10/10/2018	CFSDP-015 200-35201-2, 460-119363-2 CFSDP-015-SD 8/29/2016	CFSDP-015 180-82835-3, 200-45651-3, 460-166517-3 CFSDP-015-SD 10/9/2018	CFSDP-016 200-35201-3, 460-119363-3 CFSDP-016-SD 8/29/2016	CFSDP-016 180-82835-1, 200-45651-1, 460-166517-1 CFSDP-016-SD 10/9/2018	CFSDP-016-DUP 180-82835-4, 460-166517-4 CFSDP-DUP4-SD 10/9/2018	CFSDP-025 180-82906-2, 200-45660-2, 460-166608-2 CFSDP-025-SD 10/10/2018	CFSDP-025-DUP 180-82906-3, 460-166608-3 CFSDP-DUP5-SD 10/10/2018	CFSDP-044 180-82906-1, 200-45660-1, 460-166608-1 CFSDP-044-SD 10/10/2018	CFSDP-045 180-82835-2, 200-45651-2, 460-166517-2 CFSDP-045-SD 10/9/2018
SEMIVOLATILE ORGANIC COMPOUNDS (mg/kg)											
1,2,4,5-Tetrachlorobenzene	0.077 U	--	0.074 U	--	0.082 U	--	--	--	--	--	--
1,4-Dioxane (P-Dioxane)	0.28 U	--	0.27 U	--	0.3 U	--	--	--	--	--	--
2,3,4,6-Tetrachlorophenol	0.098 U	--	0.094 U	--	0.1 U	--	--	--	--	--	--
2,4,5-Trichlorophenol	0.1 U	--	0.099 U	--	0.11 U	--	--	--	--	--	--
2,4,6-Trichlorophenol	0.03 U	--	0.028 U	--	0.031 U	--	--	--	--	--	--
2,4-Dichlorophenol	0.024 U	--	0.024 U	--	0.026 U	--	--	--	--	--	--
2,4-Dimethylphenol	0.23 U	--	0.22 U	--	0.24 U	--	--	--	--	--	--
2,4-Dinitrophenol	0.78 UJ	--	0.75 UJ	--	0.84 UJ	--	--	--	--	--	--
2,4-Dinitrotoluene	0.041 U	--	0.04 U	--	0.044 U	--	--	--	--	--	--
2,6-Dinitrotoluene	0.055 U	--	0.053 U	--	0.059 U	--	--	--	--	--	--
2-Chloronaphthalene	0.024 U	--	0.023 U	--	0.025 U	--	--	--	--	--	--
2-Chlorophenol	0.026 U	--	0.025 U	--	0.028 U	--	--	--	--	--	--
2-Methylnaphthalene	0.023 U	--	0.022 U	--	0.024 U	--	--	--	--	--	--
2-Methylphenol (O-Cresol)	0.045 U	--	0.043 U	--	0.048 U	--	--	--	--	--	--
2-Nitroaniline	0.034 U	--	0.033 U	--	0.036 U	--	--	--	--	--	--
2-Nitrophenol	0.035 U	--	0.034 U	--	0.037 U	--	--	--	--	--	--
3- And 4- Methylphenol (Total)	0.028 U	--	0.027 U	--	0.029 U	--	--	--	--	--	--
3,3'-Dichlorobenzidine	0.12 U	--	0.11 U	--	0.12 U	--	--	--	--	--	--
3-Nitroaniline	0.031 U	--	0.03 U	--	0.033 U	--	--	--	--	--	--
4,6-Dinitro-2-Methylphenol	0.28 U	--	0.27 U	--	0.29 U	--	--	--	--	--	--
4-Bromophenyl Phenyl Ether	0.033 U	--	0.031 U	--	0.035 U	--	--	--	--	--	--
4-Chloro-3-Methylphenol	0.045 U	--	0.043 U	--	0.047 U	--	--	--	--	--	--
4-Chloroaniline	0.027 U	--	0.026 U	--	0.028 U	--	--	--	--	--	--
4-Chlorophenyl Phenyl Ether	0.031 U	--	0.03 U	--	0.033 U	--	--	--	--	--	--
4-Nitroaniline	0.039 U	--	0.038 U	--	0.042 U	--	--	--	--	--	--
4-Nitrophenol	0.5 U	--	0.48 U	--	0.53 U	--	--	--	--	--	--
Acenaphthene	0.025 U	--	0.024 U	--	0.027 U	--	--	--	--	--	--
Acenaphthylene	0.027 U	--	0.026 U	--	0.028 U	--	--	--	--	--	--
Acetophenone	0.023 U	--	0.022 U	--	0.024 U	--	--	--	--	--	--
Anthracene	0.099 U	--	0.095 U	--	0.1 U	--	--	--	--	--	--
Atrazine	0.046 U	--	0.044 U	--	0.049 U	--	--	--	--	--	--
Benzaldehyde	0.079 U	--	0.15 J	--	0.17 J	--	--	--	--	--	--
Benzo(A)Anthracene	0.087 U	--	0.083 U	--	0.12	--	--	--	--	--	--
Benzo(A)Pyrene	0.031 U	--	0.043 J	--	0.094 J	--	--	--	--	--	--
Benzo(B)Fluoranthene	0.04 U	--	0.039 U	--	0.12	--	--	--	--	--	--
Benzo(G,H,I)Perylene	0.06 U	--	0.057 U	--	0.081 J	--	--	--	--	--	--
Benzo(K)Fluoranthene	0.045 U	--	0.043 U	--	0.048 U	--	--	--	--	--	--
Benzyl Butyl Phthalate	0.032 U	--	0.031 U	--	0.034 U	--	--	--	--	--	--
Biphenyl (Diphenyl)	0.089 U	--	0.085 U	--	0.094 U	--	--	--	--	--	--
Bis(2-Chloroethoxy) Methane	0.032 U	--	0.031 U	--	0.034 U	--	--	--	--	--	--
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.024 U	--	0.024 U	--	0.026 U	--	--	--	--	--	--
Bis(2-Chloroisopropyl) Ether	0.043 U	--	0.041 U	--	0.045 U	--	--	--	--	--	--
Bis(2-Ethylhexyl) Phthalate	0.04 U	--	0.04 J	--	0.043 U	--	--	--	--	--	--
Caprolactam	0.075 U	--	0.072 U	--	0.08 U	--	--	--	--	--	--
Carbazole	0.026 U	--	0.025 U	--	0.027 U	--	--	--	--	--	--
Chrysene	0.038 J	--	0.069 J	--	0.13 J	--	--	--	--	--	--
Dibenz(A,H)Anthracene	0.054 U	--	0.052 U	--	0.058 U	--	--	--	--	--	--
Dibenzofuran	0.031 U	--	0.03 U	--	0.033 U	--	--	--	--	--	--
Diethyl Phthalate	0.03 U	--	0.028 U	--	0.031 U	--	--	--	--	--	--
Dimethyl Phthalate	0.03 U	--	0.029 U	--	0.032 U	--	--	--	--	--	--
Di-N-Butyl Phthalate	0.031 U	--	0.03 U	--	0.033 U	--	--	--	--	--	--
Di-N-Octylphthalate	0.053 U	--	0.051 U	--	0.056 U	--	--	--	--	--	--
Fluoranthene	0.042 J	--	0.08 J	--	0.19 J	--	--	--	--	--	--
Fluorene	0.023 U	--	0.022 U	--	0.024 U	--	--	--	--	--	--
Hexachlorobenzene	0.042 U	--	0.04 U	--	0.045 U	--	--	--	--	--	--
Hexachlorobutadiene	0.029 U	--	0.028 U	--	0.031 U	--	--	--	--	--	--
Hexachlorocyclopentadiene	0.065 U	--	0.062 U	--	0.069 U	--	--	--	--	--	--
Hexachloroethane	0.038 U	--	0.037 U	--	0.04 U	--	--	--	--	--	--
Indeno(1,2,3-C,D)Pyrene	0.069 U	--	0.066 U	--	0.087 J+	--	--	--	--	--	--

Table E-25
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Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Chemical	CFSDP-014 200-35201-1, 460-119363-1 CFSDP-014-SD 8/29/2016	CFSDP-014 180-82906-4, 200-45660-3, 460-166608-4 CFSDP-014-SD 10/10/2018	CFSDP-015 200-35201-2, 460-119363-2 CFSDP-015-SD 8/29/2016	CFSDP-015 180-82835-3, 200-45651-3, 460-166517-3 CFSDP-015-SD 10/9/2018	CFSDP-016 200-35201-3, 460-119363-3 CFSDP-016-SD 8/29/2016	CFSDP-016 180-82835-1, 200-45651-1, 460-166517-1 CFSDP-016-SD 10/9/2018	CFSDP-016-DUP 180-82835-4, 460-166517-4 CFSDP-DUP4-SD 10/9/2018	CFSDP-025 180-82906-2, 200-45660-2, 460-166608-2 CFSDP-025-SD 10/10/2018	CFSDP-025-DUP 180-82906-3, 460-166608-3 CFSDP-DUP5-SD 10/10/2018	CFSDP-044 180-82906-1, 200-45660-1, 460-166608-1 CFSDP-044-SD 10/10/2018	CFSDP-045 180-82835-2, 200-45651-2, 460-166517-2 CFSDP-045-SD 10/9/2018
Isophorone	0.078 J	--	0.021 U	--	0.06 J	--	--	--	--	--	--
Naphthalene	0.026 U	--	0.025 U	--	0.028 U	--	--	--	--	--	--
Nitrobenzene	0.033 U	--	0.031 U	--	0.035 U	--	--	--	--	--	--
N-Nitrosodi-N-Propylamine	0.035 U	--	0.034 U	--	0.037 U	--	--	--	--	--	--
N-Nitrosodiphenylamine	0.094 U	--	0.091 U	--	0.1 U	--	--	--	--	--	--
Pentachlorophenol	0.13 U	--	0.12 U	--	0.13 U	--	--	--	--	--	--
Phenanthrene	0.039 J	--	0.072 J	--	0.17 J	--	--	--	--	--	--
Phenol	0.034 U	--	0.033 U	--	0.036 U	--	--	--	--	--	--
Pyrene	0.047 U	--	0.069 J	--	0.16 J	--	--	--	--	--	--
SEMIVOLATILE ORGANIC COMPOUNDS|LOW LEVEL (mg/kg)											
2-Fluorobiphenyl	--	0.41	--	0.31	--	0.49	0.22	0.41	0.2	0.83	0.39
1,2,4,5-Tetrachlorobenzene	--	0.0048 U	--	0.0017 U	--	0.0042 U	0.006 UJ	0.0031 U	0.0018 U	0.027 U	0.0029 U
1,4-Dioxane (P-Dioxane)	--	0.035 U	--	0.012 U	--	0.031 U	0.043 UJ	0.022 U	0.013 U	0.2 U	0.021 U
2,3,4,6-Tetrachlorophenol	--	0.047 U	--	0.017 U	--	0.041 U	0.057 UJ	0.029 U	0.017 U	0.26 U	0.028 U
2,4,5-Trichlorophenol	--	0.008 U	--	0.0028 U	--	0.007 U	0.0098 UJ	0.005 U	0.003 U	0.045 U	0.0048 U
2,4,6-Trichlorophenol	--	0.0062 U	--	0.0022 U	--	0.0054 U	0.0076 UJ	0.0039 U	0.0023 U	0.035 U	0.0037 U
2,4-Dichlorophenol	--	0.0087 U	--	0.0031 U	--	0.0076 U	0.011 UJ	0.0055 U	0.0032 U	0.049 U	0.0052 U
2,4-Dimethylphenol	--	0.007 U	--	0.0025 U	--	0.0061 U	0.0086 UJ	0.0044 U	0.0026 U	0.039 U	0.0042 U
2,4-Dinitrophenol	--	0.3 U	--	0.11 U	--	0.26 U	0.37 UJ	0.19 U	0.11 U	1.7 U	0.18 U
2,4-Dinitrotoluene	--	0.0056 U	--	0.002 U	--	0.0049 U	0.0069 UJ	0.0035 U	0.0021 U	0.031 U	0.0033 U
2,6-Dinitrotoluene	--	0.0069 U	--	0.0025 U	--	0.0061 U	0.0085 UJ	0.0044 U	0.0026 U	0.039 U	0.0041 U
2-Chloronaphthalene	--	0.0051 U	--	0.0018 U	--	0.0045 U	0.0063 UJ	0.0032 U	0.0019 U	0.029 U	0.0031 U
2-Chlorophenol	--	0.0052 U	--	0.0019 U	--	0.0046 U	0.0064 UJ	0.0033 U	0.0019 U	0.029 U	0.0031 U
2-Methylnaphthalene	--	0.0054 U	--	0.0019 U	--	0.0047 U	0.0066 UJ	0.0034 U	0.002 U	0.03 U	0.0038 J
2-Methylphenol (O-Cresol)	--	0.032 U	--	0.011 U	--	0.028 U	0.04 UJ	0.02 U	0.012 U	0.18 U	0.019 U
2-Nitroaniline	--	0.051 U	--	0.018 U	--	0.045 U	0.063 UJ	0.032 U	0.019 U	0.29 U	0.03 U
2-Nitrophenol	--	0.0064 U	--	0.0023 U	--	0.0056 U	0.0079 UJ	0.0041 U	0.0024 U	0.036 U	0.0038 U
3,3'-Dichlorobenzidine	--	0.1 U	--	0.037 U	--	0.092 U	0.13 UJ	0.066 U	0.039 U	0.59 U	0.062 UR
3-Nitroaniline	--	0.029 U	--	0.01 U	--	0.025 U	0.035 UJ	0.018 U	0.011 U	0.16 U	0.017 U
4,6-Dinitro-2-Methylphenol	--	0.19 U	--	0.069 U	--	0.17 U	0.24 UJ	0.12 U	0.072 U	1.1 U	0.12 U
4-Bromophenyl Phenyl Ether	--	0.0079 U	--	0.0028 U	--	0.0069 U	0.0097 UJ	0.005 U	0.0029 U	0.044 U	0.0047 U
4-Chloro-3-Methylphenol	--	0.0053 U	--	0.0019 U	--	0.0046 U	0.0065 UJ	0.0033 U	0.002 U	0.03 U	0.0031 U
4-Chloroaniline	--	0.0037 U	--	0.0013 U	--	0.0033 U	0.0046 UJ	0.0024 U	0.0014 U	0.021 U	0.0022 U
4-Chlorophenyl Phenyl Ether	--	0.0068 U	--	0.0024 U	--	0.0059 U	0.0083 UJ	0.0043 U	0.0025 U	0.038 U	0.004 U
4-Nitroaniline	--	0.0054 U	--	0.0019 U	--	0.0048 U	0.0067 UJ	0.0034 U	0.002 U	0.031 U	0.0032 U
4-Nitrophenol	--	0.079 U	--	0.028 U	--	0.069 U	0.097 UJ	0.05 U	0.029 U	0.44 U	0.047 U
Acenaphthene	--	0.0065 U	--	0.0023 U	--	0.0058 J	0.0079 UJ	0.0041 U	0.0024 U	0.036 U	0.011 J
Acenaphthylene	--	0.0049 U	--	0.0017 U	--	0.011 J	0.006 UJ	0.0031 U	0.0018 U	0.033 J	0.022
Acetophenone	--	0.0061 U	--	0.0022 U	--	0.0053 U	0.0075 UJ	0.0038 U	0.0023 U	0.034 U	0.0036 U
Anthracene	--	0.0058 U	--	0.0021 U	--	0.026 J	0.0072 UJ	0.0037 U	0.0022 U	0.051 J	0.049 J
Atrazine	--	0.049 UJ	--	0.017 UJ	--	0.043 UJ	0.06 UJ	0.031 UJ	0.018 UJ	0.28 UJ	0.029 UJ
Benzaldehyde	--	0.014 UR	--	0.0049 UR	--	0.012 UR	0.017 J	0.0088 UR	0.0052 UR	0.17 J	0.0083 UR
Benzo(A)Anthracene	--	0.0042 U	--	0.0015 U	--	0.052 J	0.011 J	0.0034 J	0.0016 UJ	0.091 J	0.061 J
Benzo(A)Pyrene	--	0.0049 U	--	0.0017 U	--	0.043 J	0.006 UJ	0.0032 J	0.0018 UJ	0.094 J	0.051 J
Benzo(B)Fluoranthene	--	0.0055 U	--	0.002 U	--	0.061 J	0.0068 UJ	0.0035 J	0.002 UJ	0.096 J	0.044 J
Benzo(G,H,I)Perylene	--	0.0048 U	--	0.0017 U	--	0.038 J	0.006 UJ	0.0031 U	0.0018 U	0.08 J	0.03 J
Benzo(K)Fluoranthene	--	0.0067 U	--	0.0024 U	--	0.029 J	0.0083 UJ	0.0042 U	0.0025 U	0.04 J	0.014
Benzyl Butyl Phthalate	--	0.077 U	--	0.027 U	--	0.068 U	0.095 UJ	0.049 U	0.029 U	0.44 U	0.046 U
Biphenyl (Diphenyl)	--	0.0047 U	--	0.0017 U	--	0.0041 U	0.0058 UJ	0.003 U	0.0017 U	0.027 U	0.0028 U
Bis(2-Chloroethoxy) Methane	--	0.0053 U	--	0.0019 U	--	0.0047 U	0.0066 UJ	0.0034 U	0.002 U	0.03 U	0.0032 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	--	0.0041 U	--	0.0014 U	--	0.0036 U	0.005 UJ	0.0026 U	0.0015 U	0.023 U	0.0024 U
Bis(2-Chloroisopropyl) Ether	--	0.0083 U	--	0.003 U	--	0.0073 U	0.01 UJ	0.0053 U	0.0031 U	0.047 U	0.005 U
Bis(2-Ethylhexyl) Phthalate	--	0.12 U	--	0.043 U	--	0.1 U	0.15 UJ	0.076 U	0.044 U	0.67 U	0.071 U
Caprolactam	--	0.073 U	--	0.026 U	--	0.064 U	0.09 UJ	0.046 U	0.027 U	0.41 U	0.044 U
Carbazole	--	0.0052 U	--	0.0019 U	--	0.0098 J	0.0064 UJ	0.0033 U	0.0019 U	0.03 U	0.0049 J
Chrysene	--	0.0061 J	--	0.0016 U	--	0.085 J	0.017 J	0.0052 J	0.0021 J	0.11 J	0.072
Dibenz(A,H)Anthracene	--	0.005 U	--	0.0018 U	--	0.0066 J	0.0062 UJ	0.0032 U	0.0019 U	0.028 U	0.0075 J
Dibenzofuran	--	0.0049 U	--	0.0017 U	--	0.0043 U	0.006 UJ	0.0031 U	0.0018 U	0.028 U	0.0031 J
Diethyl Phthalate	--	0.034 U	--	0.012 U	--	0.029 U	0.041 UJ	0.021 U	0.012 U	0.19 U	0.02 U
Dimethyl Phthalate	--	0.0041 U	--	0.0014 U	--	0.0036 U	0.005 UJ	0.0026 U	0.0015 U	0.023 U	0.0024 U

Table E-25
Summary of Data Used in Risk Assessment
Western Undeveloped Area (sediment) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Chemical	CFSDP-014 200-35201-1, 460-119363-1 CFSDP-014-SD 8/29/2016	CFSDP-014 180-82906-4, 200-45660-3, 460-166608-4 CFSDP-014-SD 10/10/2018	CFSDP-015 200-35201-2, 460-119363-2 CFSDP-015-SD 8/29/2016	CFSDP-015 180-82835-3, 200-45651-3, 460-166517-3 CFSDP-015-SD 10/9/2018	CFSDP-016 200-35201-3, 460-119363-3 CFSDP-016-SD 8/29/2016	CFSDP-016 180-82835-1, 200-45651-1, 460-166517-1 CFSDP-016-SD 10/9/2018	CFSDP-016-DUP 180-82835-4, 460-166517-4 CFSDP-DUP4-SD 10/9/2018	CFSDP-025 180-82906-2, 200-45660-2, 460-166608-2 CFSDP-025-SD 10/10/2018	CFSDP-025-DUP 180-82906-3, 460-166608-3 CFSDP-DUP5-SD 10/10/2018	CFSDP-044 180-82906-1, 200-45660-1, 460-166608-1 CFSDP-044-SD 10/10/2018	CFSDP-045 180-82835-2, 200-45651-2, 460-166517-2 CFSDP-045-SD 10/9/2018
Di-N-Butyl Phthalate	--	0.049 U	--	0.017 U	--	0.043 U	0.06 UJ	0.031 U	0.018 U	0.28 U	0.029 U
Di-N-Octylphthalate	--	0.065 U	--	0.023 U	--	0.057 U	0.08 UJ	0.041 U	0.024 U	0.37 U	0.039 U
Fluoranthene	--	0.0079 J	--	0.0023 J	--	0.12 J	0.026 J	0.0063 J	0.0023 J	0.18	0.12 J
Fluorene	--	0.0044 U	--	0.0016 U	--	0.013 J	0.0054 UJ	0.0028 U	0.0016 U	0.025 U	0.028 J
Hexachlorobenzene	--	0.0081 U	--	0.0029 U	--	0.0071 U	0.0099 UJ	0.0051 U	0.003 U	0.045 U	0.0048 U
Hexachlorobutadiene	--	0.0066 U	--	0.0023 U	--	0.0057 U	0.0081 UJ	0.0041 U	0.0024 U	0.037 U	0.0039 U
Hexachlorocyclopentadiene	--	0.0057 U	--	0.002 U	--	0.005 U	0.007 UJ	0.0036 U	0.0021 U	0.032 U	0.0034 UJ
Hexachloroethane	--	0.0058 U	--	0.0021 U	--	0.0051 U	0.0071 UJ	0.0036 U	0.0021 U	0.033 U	0.0034 U
Indeno(1,2,3-C,D)Pyrene	--	0.0045 U	--	0.0016 U	--	0.032 J	0.0064 J	0.0029 U	0.0017 U	0.056 J	0.022 J
Isophorone	--	0.0057 U	--	0.002 U	--	0.005 U	0.007 UJ	0.0036 U	0.0021 U	0.032 U	0.0034 U
Naphthalene	--	0.0044 U	--	0.0016 U	--	0.0038 U	0.0054 UJ	0.0028 U	0.0016 U	0.025 U	0.0026 U
Nitrobenzene	--	0.041 U	--	0.015 U	--	0.036 U	0.05 UJ	0.026 U	0.015 U	0.23 U	0.024 U
N-Nitrosodi-N-Propylamine	--	0.0076 U	--	0.0027 U	--	0.0066 U	0.0093 UJ	0.0048 U	0.0028 U	0.043 U	0.0045 U
N-Nitrosodiphenylamine	--	0.037 U	--	0.013 U	--	0.033 U	0.046 UJ	0.024 U	0.014 U	0.21 U	0.022 U
Pentachlorophenol	--	0.18 U	--	0.064 U	--	0.16 U	0.22 UJ	0.11 U	0.067 U	1 U	0.11 U
Phenanthrene	--	0.006 U	--	0.0028 J	--	0.1 J	0.017 J	0.0072 J	0.0034 J	0.19	0.21 J-
Phenol	--	0.034 U	--	0.012 U	--	0.03 U	0.042 UJ	0.021 U	0.013 U	0.19 U	0.02 U
Pyrene	--	0.007 J	--	0.0019 U	--	0.095 J	0.021 J	0.0058 J	0.0031 J	0.16	0.11

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-26
Summary of Data Used in Risk Assessment
South Percolation Pond Area Soil (0-0.5 ft-bgs) - Current
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-061	CFMW-064	CFSB-101	CFSB-104	CFSB-109	CFSB-110	CFSB-113	CFSB-113	CFSB-114	CFSB-115	CFSB-116	CFSB-118	CFSB-119	CFSB-142
Sample Lab IDs	460-116987-13	460-116987-2	460-117506-1	460-117124-7	460-117124-14	460-117124-17	460-119512-1	460-119512-9	460-116987-10	460-119512-4	460-117573-1	460-117506-4	460-116987-7	460-144400-5
Sample Name	CFMW-061-SO-0-0.5	CFMW-064-SO-0-0.5	CFSB-101-SO-0-0.5	CFSB-104-SO-0-0.5	CFSB-109-SO-0-0.5	CFSB-110-SO-0-0.5	CFSB-113-SO-0-0.5	CFSB-113-SO-0-0.5Pb	CFSB-114-SO-0-0.5	CFSB-115-SO-0-0.5	CFSB-116-SO-0-0.5	CFSB-118-SO-0-0.5	CFSB-119-SO-0-0.5	CFSB-142-SO-0-0.5
Sample Depth	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft
Chemical	7/12/2016	7/11/2016	7/21/2016	7/13/2016	7/13/2016	7/14/2016	8/31/2016	8/31/2016	7/12/2016	8/31/2016	7/22/2016	7/21/2016	7/12/2016	11/2/2017
GENERAL CHEMISTRY (mg/kg)														
Fluoride	3.06 J	15 J	18.5 J+	12.6 J	17.4 J	28.4 J	2.97 J+	--	3.18 J	2.4 J+	3.81	1.8 J+	4.81 J	22.1 J+
Cyanide	0.061 J	0.17	0.7	0.4	0.59	0.6	0.12 J	--	0.03 J	0.31	0.29	0.02 U	0.14	0.43
Cyanide (Free)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
METALS (mg/kg)														
"Chromium, Hexavalent - Estimated"	0.214112	0.259611	0.272993	0.227494	0.149878	0.281022	0.160584	--	0.17129	0.0695864	0.246229	0.246229	0.23017	0.184672
"Chromium, Trivalent - Estimated"	7.78589	9.44039	9.92701	8.27251	5.45012	10.219	5.83942	--	6.22871	2.53041	8.95377	8.95377	8.36983	6.71533
Aluminum	8430	10000	11800	5520	5370	8660	6850	--	6070	2570	8380	7200	8300	7380
Antimony	0.4 U	0.48 U	0.54 UJ	0.67 UJ	0.77 UJ	0.91 UJ	0.41 U	--	0.44 U	0.35 U	0.63 U	0.45 UJ	0.42 U	0.29 UJ
Arsenic	3.5	4.6	2.4	1.2 J	0.84 U	1.5 J	1.2	--	3.5	0.46 J	1.7 J+	2.5	4.8	5.7
Barium	74	98.7	174	459	653	911	972	--	125	371	265	52.3	79.3	67.6
Beryllium	0.38 J	0.4 J	0.39 J	0.21 U	0.43 J	0.65 J	0.16 J	--	0.35 J	0.11 U	0.52 J	0.25 J	0.36 J	0.35
Cadmium	0.31 U	0.37 U	0.41 U	0.51 U	0.58 U	0.69 U	0.43 U	--	0.33 U	0.38 U	0.48 U	0.34 U	0.32 U	0.31 U
Calcium	7410	9450	8540	168000	244000	289000	313000	--	8030	116000	57100 J	13700	14300	13000
Chromium, Total	8	9.7	10.2	8.5 J	5.6 J	10.5 J	6	--	6.4	2.6	9.2	9.2	8.6	6.9
Cobalt	4.7	5.7	5.5	2.5 J	1.4 U	3.9 J	2.1 J	--	4.2	1.2 J	4.9	4.7	5.1	4.2 J+
Copper	13.9	18.3	39.4	87.5	101	204	30.6	--	8.9	10.2	22.7 J+	9	14.4	11.3
Iron	11300	14100	12600	4030 J	1760 J	5790 J	4240	--	9640	2550	11200	12200	12300	12400
Lead	8.9	12.4	12.9	14.4	11.6	22.3	8	6.6	7.8	3.4	8.2 J+	4.7	10.7	6.3 J+
Magnesium	8370	8460	8340	5040	3840	7490	7060	--	7060	2510	9060	9630	8100	9230
Manganese	332	359	111	40.8 J	14.8 J	44.1 J	67.2	--	340	32.8	99.6	215	312	415
Mercury	0.023	0.049	0.034	0.12	0.11	0.14	0.024	--	0.021	0.024	0.018 J	0.025	0.03	0.011 J+
Nickel	12.7	18.1	15.8	17.5 J	11 J	17.4 J	12.3	--	10.8	4.4	12.6	9.8	15.7	9.3
Potassium	638	1050	1080	344	238	787	541	--	619	240	732	490	972	436
Selenium	0.38 U	0.45 U	0.5 U	0.63 U	0.72 U	0.85 U	0.4 J	--	0.41 U	0.33 U	0.59 U	0.42 U	0.4 U	0.27 U
Silver	0.74 U	0.88 U	0.98 U	1.2 U	1.4 U	1.7 U	0.8 U	--	0.8 U	0.69 U	1.2 U	0.82 U	0.77 U	0.57 U
Sodium	37.6 U	45.2 U	78 J	180	150 J	268	120 J	--	40.8 U	54.3 J	59.1 U	42 U	39.4 U	42.1 J
Thallium	0.15 U	0.18 U	0.2 U	0.25 U	0.29 U	0.34 U	0.16 U	--	0.16 U	0.14 U	0.24 U	0.17 U	0.16 U	0.12 U
Vanadium	9.3	15.1	14.2	5.5 J	3.2 J	7.6 J	5.7	--	8	3.4	14.8	10.8	11.1	7.6 J+
Zinc	37.4	49.8	64.9	100	76.6	131	40.2	--	27.7	16.3	44.3	34.5	42.6	35.4 J+
PESTICIDES (mg/kg)														
Aldrin	--	0.001 U	0.0011 U	0.0013 U	--	0.0018 U	0.001 U	--	--	--	0.0013 U	0.001 U	--	--
Alpha Bhc (Alpha Hexachlorocyclohexane)	--	0.00079 U	0.00083 U	0.001 U	--	0.0014 U	0.00076 U	--	--	--	0.00099 U	0.00077 U	--	--
Alpha Endosulfan	--	0.0012 U	0.0013 U	0.0015 U	--	0.0021 U	0.0012 U	--	--	--	0.0015 U	0.0012 U	--	--
Beta Bhc (Beta Hexachlorocyclohexane)	--	0.00084 U	0.00089 U	0.0011 U	--	0.0015 U	0.00081 U	--	--	--	0.0011 U	0.00082 U	--	--
Beta Endosulfan	--	0.0014 U	0.0014 U	0.0017 U	--	0.0024 U	0.0013 U	--	--	--	0.0017 U	0.0013 U	--	--
cis-Chlordane	--	0.0014 U	0.0015 U	0.0018 U	--	0.0025 U	0.0014 U	--	--	--	0.0018 U	0.0014 U	--	--
Delta BHC (Delta Hexachlorocyclohexane)	--	0.00094 U	0.001 U	0.0012 U	--	0.0017 U	0.00091 U	--	--	--	0.0012 U	0.00092 U	--	--
Dieldrin	--	0.0011 U	0.0012 U	0.0014 U	--	0.002 U	0.0011 U	--	--	--	0.0014 U	0.0011 U	--	--
Endosulfan Sulfate	--	0.001 U	0.0011 U	0.0013 U	--	0.0018 U	0.00098 U	--	--	--	0.0013 U	0.00098 U	--	--
Endrin	--	0.0011 U	0.0012 U	0.0014 U	--	0.0019 U	0.0011 U	--	--	--	0.0014 U	0.0011 U	--	--
Endrin Aldehyde	--	0.0011 U	0.0011 U	0.0014 U	--	0.0019 U	0.001 U	--	--	--	0.0013 U	0.001 U	--	--
Endrin Ketone	--	0.0012 U	0.0013 U	0.0015 U	--	0.0021 U	0.0012 U	--	--	--	0.0015 U	0.0012 U	--	--
Gamma Bhc (Lindane)	--	0.00078 U	0.00082 U	0.00099 U	--	0.0014 U	0.00075 U	--	--	--	0.00097 U	0.00075 U	--	--
Heptachlor	--	0.0011 U	0.0012 U	0.0014 U	--	0.002 U	0.0011 U	--	--	--	0.0014 U	0.0011 U	--	--
Heptachlor Epoxide	--	0.0017 U	0.0018 U	0.0022 U	--	0.003 U	0.0016 U	--	--	--	0.0021 U	0.0016 U	--	--
Methoxychlor	--	0.0018 U	0.0019 U	0.0023 U	--	0.0032 U	0.0018 U	--	--	--	0.0023 U	0.0018 U	--	--
P,P'-DDD	--	0.0011 U	0.0012 U	0.0014 U	--	0.002 U	0.0011 U	--	--	--	0.0014 U	0.0011 U	--	--
P,P'-DDE	--	0.0013 U	0.0013 U	0.0016 U	--	0.0022 U	0.0012 U	--	--	--	0.0016 U	0.0012 U	--	--
P,P'-DDT	--	0.00089 U	0.00094 U	0.0011 U	--	0.0016 U	0.00086 U	--	--	--	0.0011 U	0.00087 U	--	--
Toxaphene	--	0.025 U	0.027 U	0.032 U	--	0.044 U	0.024 U	--	--	--	0.032 U	0.025 U	--	--
trans-Chlordane	--	0.0019 U	0.002 U	0.0024 U	--	0.0033 U	0.0018 U	--	--	--	0.0023 U	0.0018 U	--	--
POLYCHLORINATED BIPHENYLS (mg/kg)														
PCB-1016 (Aroclor 1016)	0.0094 U	0.012 U	0.012 U	0.015 U	0.018 U	0.02 U	0.011 U	--	0.0097 U	0.01 U	0.014 U	0.011 U	0.01 U	--
PCB-1221 (Aroclor 1221)	0.0094 U	0.012 U	0.012 U	0.015 U	0.018 U	0.02 U	0.011 U	--	0.0097 U	0.01 U	0.014 U	0.011 U	0.01 U	--
PCB-1232 (Aroclor 1232)	0.0094 U	0.012 U	0.012 U	0.015 U	0.018 U	0.02 U	0.011 U	--	0.0097 U	0.01 U	0.014 U	0.011 U	0.01 U	--
PCB-1242 (Aroclor 1242)	0.0094 U	0.012 U	0.012 U	0.015 U	0.018 U	0.02 U	0.011 U	--	0.0097 U	0.01 U	0.014 U	0.011 U	0.01 U	--
PCB-1248 (Aroclor 1248)	0.0094 U	0.012 U	0.012 U	0.015 U	0.018 U	0.02 U	0.011 U	--	0.0097 U	0.01 U	0.014 U	0.011 U	0.01 U	--

Table E-26
Summary of Data Used in Risk Assessment
South Percolation Pond Area Soil (0-0.5 ft-bgs) - Current
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-061	CFMW-064	CFSB-101	CFSB-104	CFSB-109	CFSB-110	CFSB-113	CFSB-113	CFSB-114	CFSB-115	CFSB-116	CFSB-118	CFSB-119	CFSB-142
Sample Lab IDs	460-116987-13	460-116987-2	460-117506-1	460-117124-7	460-117124-14	460-117124-17	460-119512-1	460-119512-9	460-116987-10	460-119512-4	460-117573-1	460-117506-4	460-116987-7	460-144400-5
Sample Name	CFMW-061-SO-0-0.5	CFMW-064-SO-0-0.5	CFSB-101-SO-0-0.5	CFSB-104-SO-0-0.5	CFSB-109-SO-0-0.5	CFSB-110-SO-0-0.5	CFSB-113-SO-0-0.5	CFSB-113-SO-0-0.5Pb	CFSB-114-SO-0-0.5	CFSB-115-SO-0-0.5	CFSB-116-SO-0-0.5	CFSB-118-SO-0-0.5	CFSB-119-SO-0-0.5	CFSB-142-SO-0-0.5
Sample Depth	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft
Chemical	7/12/2016	7/11/2016	7/21/2016	7/13/2016	7/13/2016	7/14/2016	8/31/2016	8/31/2016	7/12/2016	8/31/2016	7/22/2016	7/21/2016	7/12/2016	11/2/2017
PCB-1254 (Aroclor 1254)	0.0097 U	0.012 U	0.013 U	0.015 U	0.019 U	0.021 U	0.012 U	--	0.01 U	0.011 U	0.015 U	0.012 U	0.011 U	--
PCB-1260 (Aroclor 1260)	0.0097 U	0.012 U	0.013 U	0.015 U	0.019 U	0.021 U	0.012 U	--	0.01 U	0.011 U	0.015 U	0.012 U	0.011 U	--
PCB-1262 (Aroclor 1262)	0.0097 U	0.012 U	0.013 U	0.015 U	0.019 U	0.021 U	0.012 U	--	0.01 U	0.011 U	0.015 U	0.012 U	0.011 U	--
PCB-1268 (Aroclor 1268)	0.0097 U	0.012 U	0.013 U	0.015 U	0.019 U	0.021 U	0.012 U	--	0.01 U	0.011 U	0.015 U	0.012 U	0.011 U	--
Polychlorinated Biphenyl (PCBs)	0.0097 U	0.012 U	0.013 U	0.015 U	0.019 U	0.021 U	0.012 U	--	0.01 U	0.011 U	0.015 U	0.012 U	0.011 U	--
SEMIVOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,2,4,5-Tetrachlorobenzene	0.026 U	0.032 U	0.034 U	0.04 U	0.051 U	0.056 U	0.031 U	--	0.027 U	0.029 U	0.04 U	0.031 U	0.029 U	0.027 U
1,4-Dioxane (P-Dioxane)	0.093 U	0.11 U	0.12 U	0.15 U	0.18 U	0.2 U	0.11 U	--	0.096 U	0.1 U	0.14 U	0.11 U	0.1 U	0.097 U
2,3,4,6-Tetrachlorophenol	0.033 U	0.04 UJ	0.042 U	0.051 U	0.065 U	0.071 U	0.039 U	--	0.034 U	0.037 U	0.05 U	0.039 U	0.036 UJ	0.034 U
2,4,5-Trichlorophenol	0.035 U	0.042 U	0.045 U	0.054 U	0.068 U	0.075 U	0.041 U	--	0.036 U	0.039 U	0.053 U	0.041 U	0.038 U	0.036 U
2,4,6-Trichlorophenol	0.0099 U	0.012 U	0.013 U	0.015 U	0.02 U	0.021 U	0.012 U	--	0.01 U	0.011 U	0.015 U	0.012 U	0.011 U	0.01 U
2,4-Dichlorophenol	0.0082 U	0.01 U	0.011 U	0.013 U	0.016 U	0.018 U	0.0098 U	--	0.0084 U	0.0092 U	0.013 U	0.0098 U	0.0091 U	0.0085 U
2,4-Dimethylphenol	0.077 U	0.094 U	0.099 U	0.12 U	0.15 U	0.17 U	0.091 U	--	0.079 U	0.086 U	0.12 U	0.091 U	0.085 U	0.08 U
2,4-Dinitrophenol	0.26 U	0.32 U	0.34 U	0.41 U	0.52 U	0.57 U	0.31 U	--	0.27 U	0.29 U	0.4 U	0.31 U	0.29 U	0.27 U
2,4-Dinitrotoluene	0.014 U	0.017 U	0.018 U	0.022 U	0.027 U	0.03 U	0.016 U	--	0.014 U	0.015 U	0.021 U	0.016 U	0.015 U	0.014 U
2,6-Dinitrotoluene	0.019 U	0.023 U	0.024 U	0.029 U	0.037 U	0.04 U	0.022 U	--	0.019 U	0.021 U	0.028 U	0.022 U	0.021 U	0.019 U
2-Chloronaphthalene	0.0079 U	0.0097 U	0.01 U	0.012 U	0.016 U	0.017 U	0.0094 U	--	0.0081 U	0.0088 U	0.012 U	0.0094 U	0.0088 U	0.0082 U
2-Chlorophenol	0.0089 U	0.011 U	0.011 U	0.014 U	0.017 U	0.019 U	0.011 U	--	0.0091 U	0.0099 U	0.014 U	0.011 U	0.0098 U	0.0092 U
2-Methylnaphthalene	0.0077 U	0.0094 U	0.01 J	0.012 U	0.015 U	0.017 U	0.0091 U	--	0.0079 U	0.0086 U	0.012 U	0.0092 U	0.0085 U	0.008 U
2-Methylphenol (O-Cresol)	0.015 U	0.019 U	0.02 U	0.024 U	0.03 U	0.033 U	0.018 U	--	0.016 U	0.017 U	0.023 U	0.018 U	0.017 U	0.016 U
2-Nitroaniline	0.011 U	0.014 U	0.015 U	0.018 U	0.023 U	0.025 U	0.014 U	--	0.012 U	0.013 U	0.018 U	0.014 U	0.013 U	0.012 U
2-Nitrophenol	0.012 U	0.014 U	0.015 U	0.018 U	0.023 U	0.025 U	0.014 U	--	0.012 U	0.013 U	0.018 U	0.014 U	0.013 U	0.012 U
3- And 4- Methylphenol (Total)	0.0093 U	0.011 U	0.012 U	0.014 U	0.018 U	0.02 U	0.011 U	--	0.0095 U	0.01 U	0.014 U	0.011 U	0.01 U	0.0096 U
3,3'-Dichlorobenzidine	0.039 U	0.048 U	0.05 U	0.061 U	0.077 U	0.084 U	0.046 U	--	0.04 U	0.043 U	0.06 U	0.046 U	0.043 U	0.04 U
3-Nitroaniline	0.01 U	0.013 U	0.013 U	0.016 U	0.02 U	0.022 U	0.012 U	--	0.011 U	0.012 U	0.016 U	0.012 U	0.011 U	0.011 U
4,6-Dinitro-2-Methylphenol	0.093 U	0.11 U	0.12 U	0.15 U	0.18 U	0.2 U	0.11 U	--	0.095 U	0.1 U	0.14 U	0.11 U	0.1 U	0.096 U
4-Bromophenyl Phenyl Ether	0.011 U	0.013 U	0.014 U	0.017 U	0.022 U	0.024 U	0.013 U	--	0.011 U	0.012 U	0.017 U	0.013 U	0.012 U	0.011 U
4-Chloro-3-Methylphenol	0.015 U	0.018 U	0.019 U	0.023 U	0.029 U	0.032 U	0.018 U	--	0.015 U	0.017 U	0.023 U	0.018 U	0.017 U	0.016 U
4-Chloroaniline	0.009 U	0.011 U	0.012 U	0.014 U	0.018 U	0.019 U	0.011 U	--	0.0092 U	0.01 U	0.014 U	0.011 U	0.0099 U	0.0093 U
4-Chlorophenyl Phenyl Ether	0.01 U	0.013 U	0.014 U	0.016 U	0.021 U	0.022 U	0.012 U	--	0.011 U	0.012 U	0.016 U	0.012 U	0.012 U	0.011 U
4-Nitroaniline	0.013 U	0.016 U	0.017 U	0.021 U	0.026 U	0.028 U	0.016 U	--	0.014 U	0.015 U	0.02 U	0.016 U	0.015 U	0.014 U
4-Nitrophenol	0.17 U	0.21 U	0.22 U	0.26 U	0.33 U	0.36 U	0.2 U	--	0.17 U	0.19 U	0.26 U	0.2 U	0.19 U	0.17 U
Acenaphthene	0.0084 U	0.024 J	0.011 U	0.013 U	0.02 J	0.018 U	0.01 J	--	0.0087 U	0.0094 U	0.013 U	0.01 U	0.0093 U	0.0088 U
Acenaphthylene	0.009 U	0.011 U	0.012 U	0.014 U	0.018 U	0.019 U	0.011 U	--	0.0092 U	0.01 U	0.014 U	0.011 U	0.0099 U	0.0093 U
Acetophenone	0.0076 U	0.0093 U	0.0098 U	0.012 U	0.015 U	0.016 U	0.009 U	--	0.0078 U	0.0085 U	0.012 U	0.009 U	0.011 J	0.0079 U
Anthracene	0.033 U	0.041 U	0.043 U	0.052 U	0.065 U	0.071 U	0.039 U	--	0.034 U	0.037 U	0.051 U	0.039 U	0.037 U	0.034 U
Atrazine	0.015 U	0.019 U	0.02 U	0.024 U	0.031 U	0.033 U	0.018 U	--	0.016 U	0.017 U	0.024 U	0.018 U	0.017 U	0.016 U
Benzaldehyde	0.031 J	0.033 J	0.038 J	0.041 U	0.052 U	0.057 U	0.032 U	--	0.027 U	0.03 U	0.041 U	0.032 U	0.088 J	0.028 U
Benzo(A)Anthracene	0.072	0.26	0.042 J	0.18	0.36	0.18	0.12	--	0.05	0.059	0.11	0.035 U	0.13	0.038
Benzo(A)Pyrene	0.081	0.36	0.014 U	0.25	0.48	0.23	0.17	--	0.07	0.084	0.15	0.013 U	0.18	0.062
Benzo(B)Fluoranthene	0.14	0.62	0.084	0.35	0.62	0.29	0.29	--	0.11	0.17	0.25	0.016 U	0.35	0.11
Benzo(G,H,I)Perylene	0.11 J	0.46	0.057 J+	0.33 J	0.36 J	0.9	0.2 J	--	0.076 J	0.11 J	0.2 J	0.024 U	0.24 J	0.049 J
Benzo(K)Fluoranthene	0.049	0.21	0.022 J	0.15	0.25	0.12	0.1	--	0.036	0.06	0.083	0.018 U	0.1	0.042
Benzyl Butyl Phthalate	0.011 U	0.013 U	0.014 U	0.017 U	0.021 U	0.023 U	0.013 U	--	0.011 U	0.012 U	0.016 U	0.013 U	0.012 U	0.011 U
Biphenyl (Diphenyl)	0.03 U	0.036 U	0.038 U	0.046 U	0.059 U	0.064 U	0.035 U	--	0.03 U	0.033 U	0.046 U	0.035 U	0.033 U	0.031 U
Bis(2-Chloroethoxy) Methane	0.011 U	0.013 U	0.014 U	0.017 U	0.021 U	0.023 U	0.013 U	--	0.011 U	0.012 U	0.017 U	0.013 U	0.012 U	0.011 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.0082 U	0.01 U	0.011 U	0.013 U	0.016 U	0.018 U	0.0098 U	--	0.0084 U	0.0092 U	0.017 J	0.0098 U	0.0091 U	0.0085 U
Bis(2-Chloroisopropyl) Ether	0.014 U	0.018 UJ	0.019 U	0.022 U	0.028 U	0.031 U	0.017 U	--	0.015 U	0.016 U	0.022 U	0.017 U	0.016 UJ	0.015 U
Bis(2-Ethylhexyl) Phthalate	0.014 U	0.017 U	0.018 U	0.021 U	0.027 U	0.029 U	0.016 U	--	0.014 U	0.015 U	0.021 U	0.016 U	0.015 U	0.014 U
Caprolactam	0.025 U	0.031 U	0.032 U	0.039 U	0.049 U	0.054 U	0.03 U	--	0.026 U	0.028 U	0.038 U	0.03 U	0.028 U	0.026 U
Carbazole	0.012 J	0.051 J	0.011 U	0.04 J	0.073 J	0.059 J	0.016 J	--	0.0089 J	0.0097 U	0.016 J	0.01 U	0.024 J	0.009 U
Chrysene	0.1 J	0.42 J	0.067 J	0.3 J	0.55 J	0.28 J	0.19 J	--	0.081 J	0.1 J	0.17 J	0.011 U	0.23 J	0.057 J
Dibenz(A,H)Anthracene	0.018 U	0.079	0.023 U	0.037 J	0.036 U	0.14	0.035 J	--	0.019 U	0.02 U	0.05 J	0.022 U	0.051	0.019 U
Dibenzofuran	0.011 U	0.013 U	0.014 U	0.016 U	0.021 U	0.023 U	0.013 U	--	0.011 U	0.012 U	0.016 U	0.013 U	0.012 U	0.011 U
Diethyl Phthalate	0.0099 U	0.012 U	0.013 U	0.015 U	0.02 U	0.021 U	0.012 U	--	0.01 U	0.011 U	0.015 U	0.012 U	0.011 U	0.01 U
Dimethyl Phthalate	0.01 U	0.012 U	0.013 U	0.016 U	0.02 U	0.022 U	0.012 U	--	0.01 U	0.011 U	0.015 U	0.012 U	0.011 U	0.011 U
Di-N-Butyl Phthalate	0.01 U	0.014 J	0.014 U	0.019 J	0.021 U	0.058 J	0.012 U	--	0.011 U	0.012 U	0.016 U	0.012 U	0.012 U	0.011 U
Di-N-Octylphthalate	0.018 U	0.022 U	0.023 U	0.028 U	0.035 U	0.038 U	0.021 U	--	0.018 U	0.02 U	0.027 U	0.021 U	0.02 U	0.018 U

Table E-26
Summary of Data Used in Risk Assessment
South Percolation Pond Area Soil (0-0.5 ft-bgs) - Current
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-061	CFMW-064	CFSB-101	CFSB-104	CFSB-109	CFSB-110	CFSB-113	CFSB-113	CFSB-114	CFSB-115	CFSB-116	CFSB-118	CFSB-119	CFSB-142
Sample Lab IDs	460-116987-13	460-116987-2	460-117506-1	460-117124-7	460-117124-14	460-117124-17	460-119512-1	460-119512-9	460-116987-10	460-119512-4	460-117573-1	460-117506-4	460-116987-7	460-144400-5
Sample Name	CFMW-061-SO-0-0.5	CFMW-064-SO-0-0.5	CFSB-101-SO-0-0.5	CFSB-104-SO-0-0.5	CFSB-109-SO-0-0.5	CFSB-110-SO-0-0.5	CFSB-113-SO-0-0.5	CFSB-113-SO-0-0.5Pb	CFSB-114-SO-0-0.5	CFSB-115-SO-0-0.5	CFSB-116-SO-0-0.5	CFSB-118-SO-0-0.5	CFSB-119-SO-0-0.5	CFSB-142-SO-0-0.5
Sample Depth	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft
Chemical	7/12/2016	7/11/2016	7/21/2016	7/13/2016	7/13/2016	7/14/2016	8/31/2016	8/31/2016	7/12/2016	8/31/2016	7/22/2016	7/21/2016	7/12/2016	11/2/2017
Fluoranthene	0.1 J	0.42 J	0.053 J	0.27 J	0.56 J	0.24 J	0.2 J	--	0.075 J	0.089 J	0.16 J	0.012 U	0.21 J	0.053 J
Fluorene	0.0076 U	0.015 J	0.0098 U	0.012 U	0.02 J	0.016 U	0.009 U	--	0.0078 U	0.0085 U	0.012 U	0.009 U	0.0084 U	0.0079 U
Hexachlorobenzene	0.014 U	0.017 UJ	0.018 U	0.022 U	0.028 U	0.03 U	0.017 U	--	0.014 U	0.016 U	0.022 U	0.017 U	0.016 UJ	0.015 U
Hexachlorobutadiene	0.0098 U	0.012 UJ	0.013 U	0.015 U	0.019 U	0.021 U	0.012 U	--	0.01 U	0.011 U	0.015 U	0.012 U	0.011 UJ	0.01 U
Hexachlorocyclopentadiene	0.022 U	0.027 U	0.028 U	0.034 U	0.043 U	0.047 U	0.026 U	--	0.022 U	0.024 U	0.033 U	0.026 U	0.024 U	0.023 UJ
Hexachloroethane	0.013 U	0.016 U	0.017 U	0.02 U	0.025 U	0.027 U	0.015 U	--	0.013 U	0.014 U	0.02 U	0.015 U	0.014 U	0.013 U
Indeno(1,2,3-C,D)Pyrene	0.096	0.43	0.061 J+	0.33	0.38	0.66	0.2	--	0.075	0.12	0.23	0.028 U	0.22	0.08
Isophorone	0.0075 U	0.0092 U	0.0097 U	0.012 U	0.015 U	0.016 U	0.024 J	--	0.0077 U	0.02 J	0.011 U	0.0089 U	0.0083 U	0.0078 U
Naphthalene	0.0089 U	0.011 U	0.011 U	0.014 U	0.017 U	0.019 U	0.011 U	--	0.0091 U	0.0099 U	0.015 J	0.011 U	0.0098 U	0.0092 U
Nitrobenzene	0.011 U	0.013 U	0.014 U	0.017 U	0.022 U	0.024 U	0.013 U	--	0.011 U	0.012 U	0.017 U	0.013 U	0.012 U	0.011 U
N-Nitrosodi-N-Propylamine	0.012 U	0.014 U	0.015 U	0.018 U	0.023 U	0.025 U	0.014 U	--	0.012 U	0.013 U	0.018 UJ	0.014 U	0.013 U	0.012 U
N-Nitrosodiphenylamine	0.032 U	0.039 U	0.041 U	0.049 U	0.062 U	0.068 U	0.038 U	--	0.032 U	0.035 U	0.048 U	0.038 U	0.035 U	0.033 U
Pentachlorophenol	0.042 U	0.052 UJ	0.055 U	0.066 U	0.083 U	0.091 U	0.05 U	--	0.043 U	0.047 U	0.065 U	0.05 U	0.047 UJ	0.044 U
Phenanthrene	0.058 J	0.21 J	0.037 J	0.14 J	0.27 J	0.12 J	0.1 J	--	0.044 J	0.044 J	0.089 J	0.011 U	0.1 J	0.025 J
Phenol	0.011 U	0.014 U	0.015 U	0.018 U	0.022 U	0.025 U	0.014 U	--	0.012 U	0.013 U	0.017 U	0.014 U	0.013 U	0.012 U
Pyrene	0.14 J	0.56 J+	0.058 J	0.32 J	0.57 J	0.23 J	0.22 J	--	0.1 J	0.096 J	0.17 J	0.019 U	0.29 J+	0.064 J

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-26
Summary of Data Used in Risk Assessment
South Percolation Pond Area Soil (0-0.5 ft-bgs) - Current
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-143	CFSB-144	CFSB-145	CFSB-146	CFSB-147	CFSB-147-DUP	CFSB-148	CFSB-151	CFSB-152	CFSB-153
Sample Lab IDs	460-144400-8	460-144400-17	460-144478-1	460-144478-4	460-144478-8	460-144478-7	460-144478-11	200-40872-1, 460-144726-8	200-40872-4, 460-144726-6	200-40872-7, 460-144478-14
Sample Name	CFSB-143-SO-0-0.5	CFSB-144-SO-0-0.5	CFSB-145-SO-0-0.5	CFSB-146-SO-0-0.5	CFSB-147-SO-0-0.5	CFSB-DUP16-SO	CFSB-148-SO-0-0.5	CFSB-151-SO-0-0.5	CFSB-152-SO-0-0.5	CFSB-153-SO-0-0.5
Sample Depth	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft
Chemical	11/2/2017	11/3/2017	11/6/2017	11/6/2017	11/6/2017	11/6/2017	11/6/2017	11/7/2017	11/7/2017	11/6/2017
GENERAL CHEMISTRY (mg/kg)										
Fluoride	17.1 J+	19.5 J+	14.4 J+	14.7 J+	12.4 J+	10.6 J+	12.3 J+	18.3 J+	44.1 J+	30.4 J+
Cyanide	0.24 J	1	0.07 U	0.064 U	0.067 U	0.069 U	0.071 U	0.095 U	1.4	16.4
Cyanide (Free)	--	--	--	--	--	--	--	--	--	0.56 U
METALS (mg/kg)										
"Chromium, Hexavalent - Estimated"	0.294404	0.286375	0.235523	0.190024	0.219465	0.224818	0.23017	0.305109	0.374696	0.877859
"Chromium, Trivalent - Estimated"	10.7056	10.4136	8.56448	6.90998	7.98054	8.17518	8.36983	11.0949	13.6253	31.9221
Aluminum	9900	9430	10600	7960	7810	7710	8450	11000	10400	16100
Antimony	0.32 UJ	0.34 U	0.37 UJ	0.35 UJ	0.38 UJ	0.35 UJ	0.37 UJ	0.42 UJ	0.5 UJ	0.67 J-
Arsenic	5.7	3.2	4.2	3.4	4	3.6	4.5	1.8	3.7	2.9
Barium	175	165	100	74.8	77.2	82	118	227	706	380
Beryllium	0.56	0.47	0.46	0.3 J	0.4 J	0.38 J	0.46	0.36 J	0.37 J	0.79
Cadmium	0.34 U	0.36 U	0.39 U	0.37 U	0.4 U	0.37 U	0.39 U	0.45 U	1.1 J	2.5
Calcium	21600	22300	11800	12500	14600	17700	13600	122000	220000	28700
Chromium, Total	11	10.7	8.8	7.1	8.2	8.4	8.6	11.4	14	32.8
Cobalt	6.7 J+	6.3	5.4	4	5	5.1	5.5	6.1	5.3	4
Copper	18.4	16.3	12.4 J	17.1 J	11.3 J	10.6 J	13.5 J	20.9	206	694 J
Iron	15300	14800	13900	10300	12500	12700	13900	14200	8960	10500
Lead	10.2 J+	8.8	9.6	10.1	7.3	6.4	8.5	12.7	35.1	116
Magnesium	12300	12600	8970	7600	8940	9290	8190	14800	8360	6830
Manganese	410	157	329 J	321 J	257 J	268 J	388 J	226	96	69.4 J
Mercury	0.026 J+	0.022	0.012 J	0.021	0.014 J	0.014 J	0.023	0.018 U	0.26	1.4
Nickel	15.9	12.7	12.6	10	11.5	10.5	10.9	14.9	24.5	53.9
Potassium	1270	983	933	663	776	735	877	882	1140	845
Selenium	0.3 U	0.32 U	0.34 U	0.33 U	0.35 U	0.33 U	0.34 U	0.39 U	1.1 J	1.3 J
Silver	0.63 U	0.67 U	0.72 U	0.69 U	0.74 U	0.69 U	0.71 U	0.82 U	1.7	23.5
Sodium	97.3	158	50 U	47.5 U	51.2 U	47.5 U	49.4 U	57.1 U	280	184
Thallium	0.13 U	0.14 U	0.15 U	0.14 U	0.15 U	0.14 U	0.14 U	0.17 U	0.2 J	0.24 U
Vanadium	17.3 J+	15.2	14.1	7.9	13	12.5	15.9	12.7	14.4	26.2
Zinc	50.3 J+	46.4	42.1	35.7	35.2	35	47.9	63	225	351
PESTICIDES (mg/kg)										
Aldrin	--	--	--	--	--	--	--	--	--	--
Alpha Bhc (Alpha Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--
Alpha Endosulfan	--	--	--	--	--	--	--	--	--	--
Beta Bhc (Beta Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--
Beta Endosulfan	--	--	--	--	--	--	--	--	--	--
cis-Chlordane	--	--	--	--	--	--	--	--	--	--
Delta BHC (Delta Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--
Dieldrin	--	--	--	--	--	--	--	--	--	--
Endosulfan Sulfate	--	--	--	--	--	--	--	--	--	--
Endrin	--	--	--	--	--	--	--	--	--	--
Endrin Aldehyde	--	--	--	--	--	--	--	--	--	--
Endrin Ketone	--	--	--	--	--	--	--	--	--	--
Gamma Bhc (Lindane)	--	--	--	--	--	--	--	--	--	--
Heptachlor	--	--	--	--	--	--	--	--	--	--
Heptachlor Epoxide	--	--	--	--	--	--	--	--	--	--
Methoxychlor	--	--	--	--	--	--	--	--	--	--
P,P'-DDD	--	--	--	--	--	--	--	--	--	--
P,P'-DDE	--	--	--	--	--	--	--	--	--	--
P,P'-DDT	--	--	--	--	--	--	--	--	--	--
Toxaphene	--	--	--	--	--	--	--	--	--	--
trans-Chlordane	--	--	--	--	--	--	--	--	--	--
POLYCHLORINATED BIPHENYLS (mg/kg)										
PCB-1016 (Aroclor 1016)	--	--	--	--	--	--	--	--	--	--
PCB-1221 (Aroclor 1221)	--	--	--	--	--	--	--	--	--	--
PCB-1232 (Aroclor 1232)	--	--	--	--	--	--	--	--	--	--
PCB-1242 (Aroclor 1242)	--	--	--	--	--	--	--	--	--	--
PCB-1248 (Aroclor 1248)	--	--	--	--	--	--	--	--	--	--

Table E-26
Summary of Data Used in Risk Assessment
South Percolation Pond Area Soil (0-0.5 ft-bgs) - Current
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-143	CFSB-144	CFSB-145	CFSB-146	CFSB-147	CFSB-147-DUP	CFSB-148	CFSB-151	CFSB-152	CFSB-153
Sample Lab IDs	460-144400-8	460-144400-17	460-144478-1	460-144478-4	460-144478-8	460-144478-7	460-144478-11	200-40872-1, 460-144726-8	200-40872-4, 460-144726-6	200-40872-7, 460-144478-14
Sample Name	CFSB-143-SO-0-0.5	CFSB-144-SO-0-0.5	CFSB-145-SO-0-0.5	CFSB-146-SO-0-0.5	CFSB-147-SO-0-0.5	CFSB-DUP16-SO	CFSB-148-SO-0-0.5	CFSB-151-SO-0-0.5	CFSB-152-SO-0-0.5	CFSB-153-SO-0-0.5
Sample Depth	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft
Chemical	11/2/2017	11/3/2017	11/6/2017	11/6/2017	11/6/2017	11/6/2017	11/6/2017	11/7/2017	11/7/2017	11/6/2017
PCB-1254 (Aroclor 1254)	--	--	--	--	--	--	--	--	--	--
PCB-1260 (Aroclor 1260)	--	--	--	--	--	--	--	--	--	--
PCB-1262 (Aroclor 1262)	--	--	--	--	--	--	--	--	--	--
PCB-1268 (Aroclor 1268)	--	--	--	--	--	--	--	--	--	--
Polychlorinated Biphenyl (PCBs)	--	--	--	--	--	--	--	--	--	--
SEMIVOLATILE ORGANIC COMPOUNDS (mg/kg)										
1,2,4,5-Tetrachlorobenzene	0.031 U	0.033 U	0.027 U	0.028 U	0.028 U	0.028 U	0.028 U	0.041 U	0.046 U	0.45 U
1,4-Dioxane (P-Dioxane)	0.11 U	0.12 U	0.099 U	0.1 U	0.1 U	0.1 U	0.099 U	0.15 U	0.16 U	1.6 U
2,3,4,6-Tetrachlorophenol	0.039 U	0.041 U	0.035 U	0.035 U	0.036 U	0.035 U	0.035 U	0.052 U	0.058 U	0.56 U
2,4,5-Trichlorophenol	0.041 U	0.044 U	0.037 U	0.037 U	0.038 U	0.037 U	0.037 U	0.055 U	0.061 U	0.6 U
2,4,6-Trichlorophenol	0.012 U	0.013 U	0.01 U	0.011 U	0.011 U	0.011 U	0.011 U	0.016 U	0.017 U	0.17 U
2,4-Dichlorophenol	0.0098 U	0.01 U	0.0087 U	0.0088 U	0.009 U	0.0089 U	0.0088 U	0.013 U	0.014 U	0.14 U
2,4-Dimethylphenol	0.091 U	0.097 U	0.081 U	0.082 U	0.084 U	0.083 U	0.082 U	0.12 UJ	0.13 UJ	1.3 U
2,4-Dinitrophenol	0.31 U	0.33 U	0.28 UJ	0.28 U	0.29 U	0.28 U	0.28 U	0.42 U	0.46 U	4.5 U
2,4-Dinitrotoluene	0.016 U	0.017 U	0.015 U	0.015 U	0.015 U	0.015 U	0.015 U	0.022 U	0.024 U	0.24 U
2,6-Dinitrotoluene	0.022 U	0.023 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.03 U	0.033 U	0.32 U
2-Chloronaphthalene	0.0094 U	0.01 U	0.0084 U	0.0085 U	0.0087 U	0.0085 U	0.0084 U	0.013 U	0.014 U	0.14 U
2-Chlorophenol	0.011 U	0.011 U	0.0094 U	0.0095 U	0.0097 U	0.0095 U	0.0094 U	0.014 U	0.016 U	0.15 U
2-Methylnaphthalene	0.0091 U	0.0097 U	0.0081 U	0.0083 U	0.0084 U	0.0083 U	0.0082 U	0.012 U	0.014 U	0.13 U
2-Methylphenol (O-Cresol)	0.018 U	0.019 U	0.016 U	0.016 U	0.017 U	0.016 U	0.016 U	0.024 U	0.027 U	0.26 U
2-Nitroaniline	0.014 U	0.015 U	0.012 U	0.012 U	0.013 U	0.012 U	0.012 U	0.018 U	0.02 U	0.2 U
2-Nitrophenol	0.014 U	0.015 U	0.012 U	0.013 U	0.013 U	0.013 U	0.012 U	0.019 U	0.021 U	0.2 U
3- And 4- Methylphenol (Total)	0.011 U	0.012 U	0.0098 U	0.01 U	0.01 U	0.01 U	0.0099 U	0.015 U	0.016 U	0.16 U
3,3'-Dichlorobenzidine	0.046 U	0.049 U	0.041 U	0.042 U	0.043 U	0.042 U	0.041 U	0.062 U	0.068 U	0.67 U
3-Nitroaniline	0.012 U	0.013 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.017 U	0.018 U	0.18 U
4,6-Dinitro-2-Methylphenol	0.11 U	0.12 U	0.098 UJ	0.1 U	0.1 U	0.1 U	0.099 U	0.15 U	0.16 U	1.6 U
4-Bromophenyl Phenyl Ether	0.013 U	0.014 U	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U	0.018 U	0.019 U	0.19 U
4-Chloro-3-Methylphenol	0.018 U	0.019 U	0.016 U	0.016 U	0.016 U	0.016 U	0.016 U	0.024 U	0.026 U	0.26 U
4-Chloroaniline	0.011 U	0.011 U	0.0095 U	0.0096 U	0.0098 U	0.0096 U	0.0096 U	0.014 U	0.016 U	1.9 J
4-Chlorophenyl Phenyl Ether	0.012 U	0.013 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.017 U	0.018 U	0.18 U
4-Nitroaniline	0.016 U	0.017 U	0.014 U	0.014 U	0.014 U	0.014 U	0.014 U	0.021 U	0.023 U	0.23 U
4-Nitrophenol	0.2 U	0.21 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.27 U	0.29 U	2.9 U
Acenaphthene	0.01 U	0.011 U	0.0089 U	0.01 J	0.0092 U	0.0091 U	0.009 U	0.013 U	0.015 U	0.14 U
Acenaphthylene	0.011 U	0.011 U	0.0095 U	0.0096 U	0.0098 U	0.0096 U	0.0096 U	0.014 U	0.016 U	0.15 U
Acetophenone	0.009 U	0.0096 U	0.008 U	0.0082 U	0.0083 U	0.0082 U	0.0081 U	0.012 U	0.013 U	0.13 U
Anthracene	0.039 U	0.042 U	0.035 U	0.036 U	0.036 U	0.036 U	0.035 U	0.053 U	0.058 U	0.57 U
Atrazine	0.018 U	0.02 U	0.016 U	0.017 U	0.017 U	0.017 U	0.017 U	0.025 U	0.027 U	0.27 U
Benzaldehyde	0.032 U	0.055 J	0.028 U	0.029 U	0.029 U	0.029 U	0.028 U	0.042 U	0.047 U	0.46 U
Benzo(A)Anthracene	0.11	0.037 U	0.054	0.11	0.042	0.031 U	0.042	0.053 J	0.2	0.5 U
Benzo(A)Pyrene	0.15	0.013 U	0.082	0.16	0.067 J	0.011 UJ	0.06	0.059	0.019 U	2.8
Benzo(B)Fluoranthene	0.25	0.017 U	0.13	0.24	0.12 J	0.015 UJ	0.095	0.11	0.024 U	6.6
Benzo(G,H,I)Perylene	0.13 J	0.025 U	0.085 J	0.19 J	0.066 J	0.022 UJ	0.021 U	0.045 J	0.035 U	2.7 J
Benzo(K)Fluoranthene	0.091	0.019 U	0.05	0.092	0.036 J	0.016 UJ	0.016 U	0.046 J	0.14	0.26 U
Benzyl Butyl Phthalate	0.013 U	0.014 U	0.011 U	0.012 U	0.012 U	0.012 U	0.011 U	0.017 U	0.019 U	0.18 U
Biphenyl (Diphenyl)	0.035 U	0.038 U	0.031 U	0.032 U	0.033 U	0.032 U	0.032 U	0.048 U	0.052 U	0.51 U
Bis(2-Chloroethoxy) Methane	0.013 U	0.014 U	0.011 U	0.012 U	0.012 U	0.012 U	0.012 U	0.017 U	0.019 U	0.19 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.0098 U	0.01 U	0.0087 UJ	0.0088 U	0.009 U	0.0089 U	0.0088 U	0.013 U	0.014 U	0.14 U
Bis(2-Chloroisopropyl) Ether	0.017 U	0.018 U	0.015 U	0.015 U	0.016 U	0.015 U	0.015 U	0.023 U	0.025 U	0.25 U
Bis(2-Ethylhexyl) Phthalate	0.016 U	0.017 U	0.014 U	0.015 U	0.015 U	0.015 U	0.015 U	0.022 U	0.074 J	0.23 U
Caprolactam	0.03 U	0.032 U	0.027 U	0.027 U	0.027 U	0.027 U	0.027 U	0.04 U	0.044 U	0.43 U
Carbazole	0.015 J	0.011 U	0.0094 J	0.016 J	0.0095 U	0.0093 U	0.0092 U	0.014 U	0.1 J	0.97 J
Chrysene	0.16 J	0.012 U	0.078 J	0.15 J	0.056 J	0.01 UJ	0.048 J	0.067 J	0.34 J	2.6 J
Dibenz(A,H)Anthracene	0.055	0.023 U	0.019 U	0.053	0.02 U	0.02 U	0.019 U	0.029 U	0.032 U	0.31 U
Dibenzofuran	0.013 U	0.013 U	0.011 U	0.011 U	0.012 U	0.011 U	0.011 U	0.017 U	0.019 U	0.18 U
Diethyl Phthalate	0.012 U	0.013 U	0.01 U	0.011 U	0.011 U	0.011 U	0.011 U	0.016 U	0.017 U	0.17 U
Dimethyl Phthalate	0.012 U	0.013 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.016 U	0.018 U	0.17 U
Di-N-Butyl Phthalate	0.012 U	0.013 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.017 U	0.018 U	0.18 U
Di-N-Octylphthalate	0.021 U	0.022 U	0.019 U	0.019 U	0.019 U	0.019 U	0.019 U	0.028 U	0.031 U	0.3 U

Table E-26
Summary of Data Used in Risk Assessment
South Percolation Pond Area Soil (0-0.5 ft-bgs) - Current
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-143	CFSB-144	CFSB-145	CFSB-146	CFSB-147	CFSB-147-DUP	CFSB-148	CFSB-151	CFSB-152	CFSB-153
Sample Lab IDs	460-144400-8	460-144400-17	460-144478-1	460-144478-4	460-144478-8	460-144478-7	460-144478-11	200-40872-1, 460-144726-8	200-40872-4, 460-144726-6	200-40872-7, 460-144478-14
Sample Name	CFSB-143-SO-0-0.5	CFSB-144-SO-0-0.5	CFSB-145-SO-0-0.5	CFSB-146-SO-0-0.5	CFSB-147-SO-0-0.5	CFSB-DUP16-SO	CFSB-148-SO-0-0.5	CFSB-151-SO-0-0.5	CFSB-152-SO-0-0.5	CFSB-153-SO-0-0.5
Sample Depth	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft
Chemical	11/2/2017	11/3/2017	11/6/2017	11/6/2017	11/6/2017	11/6/2017	11/6/2017	11/7/2017	11/7/2017	11/6/2017
Fluoranthene	0.14 J	0.013 U	0.069 J	0.17 J	0.052 J	0.011 UJ	0.053 J	0.094 J	0.31 J	1.3 J
Fluorene	0.009 U	0.0096 U	0.008 U	0.0082 U	0.0083 U	0.0082 U	0.0081 U	0.012 U	0.013 U	0.13 U
Hexachlorobenzene	0.017 U	0.018 U	0.015 U	0.015 U	0.015 U	0.015 U	0.015 U	0.023 U	0.025 U	0.24 U
Hexachlorobutadiene	0.012 U	0.012 U	0.01 U	0.011 U	0.011 U	0.011 U	0.01 U	0.016 U	0.017 U	0.17 U
Hexachlorocyclopentadiene	0.026 UJ	0.027 UJ	0.023 UJ	0.023 UJ	0.024 UJ	0.023 UJ	0.023 UJ	0.035 UJ	0.038 UJ	0.37 UJ
Hexachloroethane	0.015 U	0.016 U	0.014 UJ	0.014 U	0.014 U	0.014 U	0.014 U	0.02 U	0.022 U	0.22 U
Indeno(1,2,3-C,D)Pyrene	0.18	0.029 U	0.11	0.23	0.1 J	0.025 UJ	0.072	0.06	0.041 U	3.1
Isophorone	0.0089 U	0.0094 U	0.0079 U	0.008 U	0.0082 U	0.0081 U	0.008 U	0.012 U	0.013 U	0.13 U
Naphthalene	0.011 U	0.011 U	0.0094 U	0.0095 U	0.0097 U	0.0095 U	0.0094 U	0.014 U	0.016 U	0.15 U
Nitrobenzene	0.013 U	0.014 U	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U	0.018 U	0.019 U	0.19 U
N-Nitrosodi-N-Propylamine	0.014 U	0.015 U	0.012 U	0.013 U	0.013 U	0.013 U	0.012 U	0.019 U	0.021 U	0.2 U
N-Nitrosodiphenylamine	0.038 U	0.04 U	0.033 U	0.034 U	0.035 U	0.034 U	0.034 U	0.051 U	0.056 U	0.54 U
Pentachlorophenol	0.05 U	0.053 U	0.045 U	0.045 U	0.046 U	0.045 U	0.045 U	0.067 U	0.074 U	0.72 U
Phenanthrene	0.072 J	0.012 U	0.038 J	0.11 J	0.025 J	0.01 UJ	0.032 J	0.047 J	0.13 J	0.55 J
Phenol	0.014 U	0.014 U	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U	0.018 U	0.02 U	0.2 U
Pyrene	0.19 J	0.02 U	0.086 J	0.21 J	0.065 J	0.017 UJ	0.063 J	0.09 J	0.25 J	1.3 J

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-27
Summary of Data Used in Risk Assessment
South Percolation Pond Area Soil (0-2 ft-bgs) - Current
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-061	CFMW-061	CFMW-064	CFMW-064	CFSB-101	CFSB-101	CFSB-102	CFSB-102	CFSB-104	CFSB-104	CFSB-109	CFSB-109	CFSB-110	CFSB-110
Sample Lab IDs	460-116987-13	460-116987-14	460-116987-2	460-116987-3	460-117506-1	460-117506-2	460-117124-10	460-117124-11	460-117124-7	460-117124-8	460-117124-14	460-117124-15	460-117124-17	460-117124-18
Sample Name	CFMW-061-SO-0-0.5	CFMW-061-SO-0.5-2	CFMW-064-SO-0-0.5	CFMW-064-SO-0.5-2	CFSB-101-SO-0-0.5	CFSB-101-SO-0.5-2	CFSB-102-SO-0-0.5	CFSB-102-SO-0.5-2	CFSB-104-SO-0-0.5	CFSB-104-SO-0.5-2	CFSB-109-SO-0-0.5	CFSB-109-SO-0.5-2	CFSB-110-SO-0-0.5	CFSB-110-SO-0.5-2
Sample Depth	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft
Chemical	7/12/2016	7/12/2016	7/11/2016	7/11/2016	7/21/2016	7/21/2016	7/13/2016	7/13/2016	7/13/2016	7/13/2016	7/13/2016	7/13/2016	7/14/2016	7/14/2016
GENERAL CHEMISTRY (mg/kg)														
Fluoride	3.06 J	4.88 J	15 J	15.2 J	18.5 J+	10.2 J+	7.21 J	8.74 J	12.6 J	11.4 J	17.4 J	17.7 J	28.4 J	11.2 J
Cyanide	0.061 J	0.062 J	0.17	0.042 J	0.7	0.3	0.6	0.33	0.4	0.33	0.59	0.42	0.6	0.34
Cyanide (Free)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
METALS (mg/kg)														
"Chromium, Hexavalent - Estimated"	0.214112	0.270316	0.259611	0.272993	0.272993	0.248905	0.243552	0.190024	0.227494	0.23017	0.149878	0.13382	0.281022	0.224818
"Chromium, Trivalent - Estimated"	7.78589	9.82968	9.44039	9.92701	9.92701	9.05109	8.85645	6.90998	8.27251	8.36983	5.45012	4.86618	10.219	8.17518
Aluminum	8430	10500	10000	8810	11800	8020	7170	6590	5520	5870	5370	4170	8660	8190
Antimony	0.4 U	0.41 U	0.48 U	0.42 U	0.54 UJ	0.52 UJ	0.49 UJ	0.42 UJ	0.67 UJ	0.51 UJ	0.77 UJ	0.65 UJ	0.91 UJ	0.48 UJ
Arsenic	3.5	4.5	4.6	4.6	2.4	3.2	1.3	1.3	1.2 J	1.3	0.84 U	0.7 U	1.5 J	1.4
Barium	74	85.7	98.7	85.9	174	85.5	242	65.4	459	181	653	555	911	207
Beryllium	0.38 J	0.43	0.4 J	0.4 J	0.39 J	0.55	0.51	0.47	0.21 U	0.36 J	0.43 J	0.24 J	0.65 J	0.48
Cadmium	0.31 U	0.31 U	0.37 U	0.32 U	0.41 U	0.4 U	0.37 U	0.32 U	0.51 U	0.39 U	0.58 U	0.49 U	0.69 U	0.37 U
Calcium	7410	33900	9450	13200	8540	5450	77200	21200	168000	55500	244000	201000	289000	53200
Chromium, Total	8	10.1	9.7	10.2	10.2	9.3	9.1 J	7.1 J	8.5 J	8.6 J	5.6 J	5 J	10.5 J	8.4 J
Cobalt	4.7	4.8	5.7	6.1	5.5	4.2	3.9	4.3	2.5 J	3.1	1.4 U	1.5 J	3.9 J	4.8
Copper	13.9	19.2	18.3	14.7	39.4	9.1	44.3	25	87.5	44.8	101	118	204	57.3
Iron	11300	14200	14100	15800	12600	12600	8430 J	9270 J	4030 J	7510 J	1760 J	1580 J	5790 J	10700 J
Lead	8.9	8.9	12.4	8.1	12.9	6.3	11.5	7.5	14.4	8.4	11.6	10.3	22.3	9
Magnesium	8370	11600	8460	10300	8340	8110	6650	8270	5040	5810	3840	3130	7490	7780
Manganese	332	355	359	284	111	71	73.5 J	78 J	40.8 J	83.2 J	14.8 J	10.7 J	44.1 J	71.7 J
Mercury	0.023	0.032	0.049	0.025	0.034	0.017 J	0.054	0.048	0.12	0.1	0.11	0.093	0.14	0.042
Nickel	12.7	11.7	18.1	12.8	15.8	9	14.7 J	11.5 J	17.5 J	12.8 J	11 J	10.7 J	17.4 J	11 J
Potassium	638	749	1050	818	1080	929	534	501	344	432	238	194	787	716
Selenium	0.38 U	0.39 U	0.45 U	0.4 U	0.5 U	0.49 U	0.46 U	0.39 U	0.63 U	0.48 U	0.72 U	0.61 U	0.85 U	0.45 U
Silver	0.74 U	0.76 U	0.88 U	0.77 U	0.98 U	0.96 U	0.9 U	0.76 U	1.2 U	0.94 U	1.4 U	1.2 U	1.7 U	0.89 U
Sodium	37.6 U	38.7 U	45.2 U	39.5 U	78 J	56.7 J	87 J	47.4 J	180	74.8 J	150 J	136 J	268	87.4 J
Thallium	0.15 U	0.16 U	0.18 U	0.16 U	0.2 U	0.2 U	0.19 U	0.16 U	0.25 U	0.19 U	0.29 U	0.24 U	0.34 U	0.18 U
Vanadium	9.3	10.2	15.1	16.2	14.2	13.2	7.1 J	6.3 J	5.5 J	6.4 J	3.2 J	2.7 J	7.6 J	9.6 J
Zinc	37.4	41.7	49.8	41.4	64.9	29.2	79.5	54	100	68.3	76.6	75.9	131	66.4
PESTICIDES (mg/kg)														
Aldrin	--	--	0.001 U	--	0.0011 U	--	--	--	0.0013 U	--	--	--	0.0018 U	--
Alpha Bhc (Alpha Hexachlorocyclohexane)	--	--	0.00079 U	--	0.00083 U	--	--	--	0.001 U	--	--	--	0.0014 U	--
Alpha Endosulfan	--	--	0.0012 U	--	0.0013 U	--	--	--	0.0015 U	--	--	--	0.0021 U	--
Beta Bhc (Beta Hexachlorocyclohexane)	--	--	0.00084 U	--	0.00089 U	--	--	--	0.0011 U	--	--	--	0.0015 U	--
Beta Endosulfan	--	--	0.0014 U	--	0.0014 U	--	--	--	0.0017 U	--	--	--	0.0024 U	--
cis-Chlordane	--	--	0.0014 U	--	0.0015 U	--	--	--	0.0018 U	--	--	--	0.0025 U	--
Delta BHC (Delta Hexachlorocyclohexane)	--	--	0.00094 U	--	0.001 U	--	--	--	0.0012 U	--	--	--	0.0017 U	--
Dieldrin	--	--	0.0011 U	--	0.0012 U	--	--	--	0.0014 U	--	--	--	0.002 U	--
Endosulfan Sulfate	--	--	0.001 U	--	0.0011 U	--	--	--	0.0013 U	--	--	--	0.0018 U	--
Endrin	--	--	0.0011 U	--	0.0012 U	--	--	--	0.0014 U	--	--	--	0.0019 U	--
Endrin Aldehyde	--	--	0.0011 U	--	0.0011 U	--	--	--	0.0014 U	--	--	--	0.0019 U	--
Endrin Ketone	--	--	0.0012 U	--	0.0013 U	--	--	--	0.0015 U	--	--	--	0.0021 U	--
Gamma Bhc (Lindane)	--	--	0.00078 U	--	0.00082 U	--	--	--	0.00099 U	--	--	--	0.0014 U	--
Heptachlor	--	--	0.0011 U	--	0.0012 U	--	--	--	0.0014 U	--	--	--	0.002 U	--
Heptachlor Epoxide	--	--	0.0017 U	--	0.0018 U	--	--	--	0.0022 U	--	--	--	0.003 U	--
Methoxychlor	--	--	0.0018 U	--	0.0019 U	--	--	--	0.0023 U	--	--	--	0.0032 U	--
P,P'-DDD	--	--	0.0011 U	--	0.0012 U	--	--	--	0.0014 U	--	--	--	0.002 U	--
P,P'-DDE	--	--	0.0013 U	--	0.0013 U	--	--	--	0.0016 U	--	--	--	0.0022 U	--
P,P'-DDT	--	--	0.00089 U	--	0.00094 U	--	--	--	0.0011 U	--	--	--	0.0016 U	--
Toxaphene	--	--	0.025 U	--	0.027 U	--	--	--	0.032 U	--	--	--	0.044 U	--
trans-Chlordane	--	--	0.0019 U	--	0.002 U	--	--	--	0.0024 U	--	--	--	0.0033 U	--
POLYCHLORINATED BIPHENYLS (mg/kg)														
PCB-1016 (Aroclor 1016)	0.0094 U	0.0093 U	0.012 U	0.01 U	0.012 U	0.012 U	0.012 U	0.01 U	0.015 U	0.013 U	0.018 U	0.014 U	0.02 U	0.012 U
PCB-1221 (Aroclor 1221)	0.0094 U	0.0093 U	0.012 U	0.01 U	0.012 U	0.012 U	0.012 U	0.01 U	0.015 U	0.013 U	0.018 U	0.014 U	0.02 U	0.012 U
PCB-1232 (Aroclor 1232)	0.0094 U	0.0093 U	0.012 U	0.01 U	0.012 U	0.012 U	0.012 U	0.01 U	0.015 U	0.013 U	0.018 U	0.014 U	0.02 U	0.012 U
PCB-1242 (Aroclor 1242)	0.0094 U	0.0093 U	0.012 U	0.01 U	0.012 U	0.012 U	0.012 U	0.01 U	0.015 U	0.013 U	0.018 U	0.014 U	0.02 U	0.012 U
PCB-1248 (Aroclor 1248)	0.0094 U	0.0093 U	0.012 U	0.01 U	0.012 U	0.012 U	0.012 U	0.01 U	0.015 U	0.013 U	0.018 U	0.014 U	0.02 U	0.012 U

Table E-27
Summary of Data Used in Risk Assessment
South Percolation Pond Area Soil (0-2 ft-bgs) - Current
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-061	CFMW-061	CFMW-064	CFMW-064	CFSB-101	CFSB-101	CFSB-102	CFSB-102	CFSB-104	CFSB-104	CFSB-109	CFSB-109	CFSB-110	CFSB-110
Sample Lab IDs	460-116987-13	460-116987-14	460-116987-2	460-116987-3	460-117506-1	460-117506-2	460-117124-10	460-117124-11	460-117124-7	460-117124-8	460-117124-14	460-117124-15	460-117124-17	460-117124-18
Sample Name	CFMW-061-SO-0-0.5	CFMW-061-SO-0.5-2	CFMW-064-SO-0-0.5	CFMW-064-SO-0.5-2	CFSB-101-SO-0-0.5	CFSB-101-SO-0.5-2	CFSB-102-SO-0-0.5	CFSB-102-SO-0.5-2	CFSB-104-SO-0-0.5	CFSB-104-SO-0.5-2	CFSB-109-SO-0-0.5	CFSB-109-SO-0.5-2	CFSB-110-SO-0-0.5	CFSB-110-SO-0.5-2
Sample Depth	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft
Chemical	7/12/2016	7/12/2016	7/11/2016	7/11/2016	7/21/2016	7/21/2016	7/13/2016	7/13/2016	7/13/2016	7/13/2016	7/13/2016	7/13/2016	7/14/2016	7/14/2016
PCB-1254 (Aroclor 1254)	0.0097 U	0.0096 U	0.012 U	0.01 U	0.013 U	0.012 U	0.012 U	0.01 U	0.015 U	0.014 U	0.019 U	0.015 U	0.021 U	0.012 U
PCB-1260 (Aroclor 1260)	0.0097 U	0.0096 U	0.012 U	0.01 U	0.013 U	0.012 U	0.012 U	0.01 U	0.015 U	0.014 U	0.019 U	0.015 U	0.021 U	0.012 U
PCB-1262 (Aroclor 1262)	0.0097 U	0.0096 U	0.012 U	0.01 U	0.013 U	0.012 U	0.012 U	0.01 U	0.015 U	0.014 U	0.019 U	0.015 U	0.021 U	0.012 U
PCB-1268 (Aroclor 1268)	0.0097 U	0.0096 U	0.012 U	0.01 U	0.013 U	0.012 U	0.012 U	0.01 U	0.015 U	0.014 U	0.019 U	0.015 U	0.021 U	0.012 U
Polychlorinated Biphenyl (PCBs)	0.0097 U	0.0096 U	0.012 U	0.01 U	0.013 U	0.012 U	0.012 U	0.01 U	0.015 U	0.014 U	0.019 U	0.015 U	0.021 U	0.012 U
SEMIVOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,2,4,5-Tetrachlorobenzene	0.026 U	0.026 U	0.032 U	0.028 U	0.034 U	0.033 U	0.032 U	0.028 U	0.04 U	0.036 U	0.051 U	0.039 U	0.056 U	0.032 U
1,4-Dioxane (P-Dioxane)	0.093 U	0.092 U	0.11 U	0.1 U	0.12 U	0.12 U	0.11 U	0.1 U	0.15 U	0.13 U	0.18 U	0.14 U	0.2 U	0.11 U
2,3,4,6-Tetrachlorophenol	0.033 U	0.032 U	0.04 UJ	0.035 UJ	0.042 U	0.042 U	0.04 U	0.035 U	0.051 U	0.046 U	0.065 U	0.049 U	0.071 U	0.04 U
2,4,5-Trichlorophenol	0.035 U	0.034 U	0.042 U	0.037 U	0.045 U	0.044 U	0.043 U	0.037 U	0.054 U	0.048 U	0.068 U	0.052 U	0.075 U	0.043 U
2,4,6-Trichlorophenol	0.0099 U	0.0098 U	0.012 U	0.011 U	0.013 U	0.013 U	0.012 U	0.011 U	0.015 U	0.014 U	0.02 U	0.015 U	0.021 U	0.012 U
2,4-Dichlorophenol	0.0082 U	0.0081 U	0.01 U	0.0088 U	0.011 U	0.01 U	0.01 U	0.0088 U	0.013 U	0.011 U	0.016 U	0.012 U	0.018 U	0.01 U
2,4-Dimethylphenol	0.077 U	0.076 U	0.094 U	0.082 U	0.099 U	0.098 U	0.094 U	0.082 U	0.12 U	0.11 U	0.15 U	0.12 U	0.17 U	0.094 U
2,4-Dinitrophenol	0.26 U	0.26 U	0.32 U	0.28 U	0.34 U	0.34 U	0.32 U	0.28 U	0.41 U	0.37 U	0.52 U	0.4 U	0.57 U	0.32 U
2,4-Dinitrotoluene	0.014 U	0.014 U	0.017 U	0.015 U	0.018 U	0.018 U	0.017 U	0.015 U	0.022 U	0.019 U	0.027 U	0.021 U	0.03 U	0.017 U
2,6-Dinitrotoluene	0.019 U	0.018 U	0.023 U	0.02 U	0.024 U	0.024 U	0.023 U	0.02 U	0.029 U	0.026 U	0.037 U	0.028 U	0.04 U	0.023 U
2-Chloronaphthalene	0.0079 U	0.0078 U	0.0097 U	0.0085 U	0.01 U	0.01 U	0.0097 U	0.0085 U	0.012 U	0.011 U	0.016 U	0.012 U	0.017 U	0.0097 U
2-Chlorophenol	0.0089 U	0.0088 U	0.011 U	0.0095 U	0.011 U	0.011 U	0.011 U	0.0095 U	0.014 U	0.012 U	0.017 U	0.013 U	0.019 U	0.011 U
2-Methylnaphthalene	0.0077 U	0.0076 U	0.0094 U	0.0082 U	0.01 J	0.0098 U	0.0095 U	0.0083 U	0.012 U	0.011 U	0.015 U	0.012 U	0.017 U	0.0095 U
2-Methylphenol (O-Cresol)	0.015 U	0.015 U	0.019 U	0.016 U	0.02 U	0.019 U	0.019 U	0.016 U	0.024 U	0.021 U	0.03 U	0.023 U	0.033 U	0.019 U
2-Nitroaniline	0.011 U	0.011 U	0.014 U	0.012 U	0.015 U	0.015 U	0.014 U	0.012 U	0.018 U	0.016 U	0.023 U	0.017 U	0.025 U	0.014 U
2-Nitrophenol	0.012 U	0.012 U	0.014 U	0.013 U	0.015 U	0.015 U	0.014 U	0.013 U	0.018 U	0.016 U	0.023 U	0.018 U	0.025 U	0.014 U
3- And 4- Methylphenol (Total)	0.0093 U	0.0092 U	0.011 U	0.0099 U	0.012 U	0.012 U	0.011 U	0.01 U	0.014 U	0.013 U	0.018 U	0.014 U	0.02 U	0.011 U
3,3'-Dichlorobenzidine	0.039 U	0.039 U	0.048 U	0.042 U	0.05 U	0.05 U	0.048 U	0.042 U	0.061 U	0.054 U	0.077 U	0.058 U	0.084 U	0.048 U
3-Nitroaniline	0.01 U	0.01 U	0.013 U	0.011 U	0.013 U	0.013 U	0.013 U	0.011 U	0.016 U	0.014 U	0.02 U	0.016 U	0.022 U	0.013 U
4,6-Dinitro-2-Methylphenol	0.093 U	0.092 U	0.11 U	0.099 U	0.12 U	0.12 U	0.11 U	0.1 U	0.15 U	0.13 U	0.18 U	0.14 U	0.2 U	0.11 U
4-Bromophenyl Phenyl Ether	0.011 U	0.011 U	0.013 U	0.012 U	0.014 U	0.014 U	0.013 U	0.012 U	0.017 U	0.015 U	0.022 U	0.016 U	0.024 U	0.013 U
4-Chloro-3-Methylphenol	0.015 U	0.015 U	0.018 U	0.016 U	0.019 U	0.019 U	0.018 U	0.016 U	0.023 U	0.021 U	0.029 U	0.023 U	0.032 U	0.018 U
4-Chloroaniline	0.009 U	0.0089 U	0.011 U	0.0096 U	0.012 U	0.011 U	0.011 U	0.0096 U	0.014 U	0.012 U	0.018 U	0.019 J	0.019 U	0.011 U
4-Chlorophenyl Phenyl Ether	0.01 U	0.01 U	0.013 U	0.011 U	0.014 U	0.013 U	0.013 U	0.011 U	0.016 U	0.015 U	0.021 U	0.016 U	0.022 U	0.013 U
4-Nitroaniline	0.013 U	0.013 U	0.016 U	0.014 U	0.017 U	0.017 U	0.016 U	0.014 U	0.021 U	0.018 U	0.026 U	0.02 U	0.028 U	0.016 U
4-Nitrophenol	0.17 U	0.17 U	0.21 U	0.18 U	0.22 U	0.21 U	0.21 U	0.18 U	0.26 U	0.23 U	0.33 U	0.25 U	0.36 U	0.21 U
Acenaphthene	0.0084 U	0.0084 U	0.024 J	0.009 U	0.011 U	0.011 U	0.01 U	0.0091 U	0.013 U	0.012 U	0.02 J	0.016 J	0.018 U	0.01 U
Acenaphthylene	0.009 U	0.0089 U	0.011 U	0.0096 U	0.012 U	0.011 U	0.011 U	0.0096 U	0.014 U	0.012 U	0.018 U	0.013 U	0.019 U	0.011 U
Acetophenone	0.0076 U	0.0075 U	0.0093 U	0.0081 U	0.0098 U	0.0097 U	0.0093 U	0.0082 U	0.012 U	0.011 U	0.015 U	0.011 U	0.016 U	0.0093 U
Anthracene	0.033 U	0.033 U	0.041 U	0.035 U	0.043 U	0.042 U	0.041 U	0.036 U	0.052 U	0.046 U	0.065 U	0.05 J	0.071 U	0.041 U
Atrazine	0.015 U	0.015 U	0.019 U	0.017 U	0.02 U	0.02 U	0.019 U	0.017 U	0.024 U	0.022 U	0.031 U	0.023 U	0.033 U	0.019 U
Benzaldehyde	0.031 J	0.026 U	0.033 J	0.028 U	0.038 J	0.034 U	0.033 U	0.029 U	0.041 U	0.037 U	0.052 U	0.04 U	0.057 U	0.033 U
Benzo(A)Anthracene	0.072	0.064	0.26	0.031 U	0.042 J	0.037 U	0.11	0.04	0.18	0.11	0.36	0.17	0.18	0.036 U
Benzo(A)Pyrene	0.081	0.075	0.36	0.039	0.014 U	0.013 U	0.13	0.051	0.25	0.16	0.48	0.22	0.23	0.013 U
Benzo(B)Fluoranthene	0.14	0.12	0.62	0.092	0.084	0.017 U	0.22	0.081	0.35	0.23	0.62	0.32	0.29	0.11
Benzo(G,H,I)Perylene	0.11 J	0.092 J	0.46	0.061 J	0.057 J+	0.026 U	0.25 J	0.21 J	0.33 J	0.26 J	0.36 J	1.1	0.9	0.16 J
Benzo(K)Fluoranthene	0.049	0.049	0.21	0.02 J	0.022 J	0.019 U	0.079	0.032 J	0.15	0.066	0.25	0.14	0.12	0.036 J
Benzyl Butyl Phthalate	0.011 U	0.011 U	0.013 U	0.012 U	0.014 U	0.014 U	0.013 U	0.012 U	0.017 U	0.015 U	0.021 U	0.016 U	0.023 U	0.013 U
Biphenyl (Diphenyl)	0.03 U	0.029 U	0.036 U	0.032 U	0.038 U	0.038 U	0.037 U	0.032 U	0.046 U	0.041 U	0.059 U	0.045 U	0.064 U	0.037 U
Bis(2-Chloroethoxy) Methane	0.011 U	0.011 U	0.013 U	0.012 U	0.014 U	0.014 U	0.013 U	0.012 U	0.017 U	0.015 U	0.021 U	0.016 U	0.023 U	0.013 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.0082 U	0.0081 U	0.01 U	0.0088 U	0.011 U	0.01 U	0.01 U	0.0088 U	0.013 U	0.011 U	0.016 U	0.012 U	0.018 U	0.01 U
Bis(2-Chloroisopropyl) Ether	0.014 U	0.014 U	0.018 UJ	0.015 UJ	0.019 U	0.018 U	0.018 U	0.015 U	0.022 U	0.02 U	0.028 U	0.022 U	0.031 U	0.018 U
Bis(2-Ethylhexyl) Phthalate	0.014 U	0.013 U	0.017 U	0.015 U	0.018 U	0.017 U	0.017 U	0.015 U	0.021 U	0.019 U	0.027 U	0.02 U	0.029 U	0.017 U
Caprolactam	0.025 U	0.025 U	0.031 U	0.042 J	0.032 U	0.032 U	0.031 U	0.027 U	0.039 U	0.035 U	0.049 U	0.038 U	0.054 U	0.031 U
Carbazole	0.012 J	0.0086 U	0.051 J	0.0093 U	0.011 U	0.011 U	0.021 J	0.011 J	0.04 J	0.029 J	0.073 J	0.1 J	0.059 J	0.013 J
Chrysene	0.1 J	0.08 J	0.42 J	0.051 J	0.067 J	0.012 U	0.19 J	0.056 J	0.3 J	0.19 J	0.55 J	0.26 J	0.28 J	0.071 J
Dibenz(A,H)Anthracene	0.018 U	0.019 J	0.079	0.019 U	0.023 U	0.023 U	0.043	0.019 U	0.037 J	0.054	0.036 U	0.17	0.14	0.022 U
Dibenzofuran	0.011 U	0.01 U	0.013 U	0.011 U	0.014 U	0.013 U	0.013 U	0.011 U	0.016 U	0.015 U	0.021 U	0.016 U	0.023 U	0.013 U
Diethyl Phthalate	0.0099 U	0.0098 U	0.012 U	0.011 U	0.013 U	0.013 U	0.012 U	0.011 U	0.015 U	0.014 U	0.02 U	0.015 U	0.021 U	0.012 U
Dimethyl Phthalate	0.01 U	0.01 U	0.012 U	0.011 U	0.013 U	0.013 U	0.012 U	0.011 U	0.016 U	0.014 U	0.02 U	0.015 U	0.022 U	0.012 U
Di-N-Butyl Phthalate	0.01 U	0.02 J	0.014 J	0.018 J	0.014 U	0.013 U	0.034 J	0.027 J	0.019 J	0.031 J	0.021 U	0.056 J	0.058 J	0.013 U
Di-N-Octylphthalate	0.018 U	0.018 U	0.022 U	0.019 U	0.023 U	0.023 U	0.022 U	0.019 U	0.028 U	0.025 U	0.035 U	0.027 U	0.038 U	0.022 U

Table E-27
Summary of Data Used in Risk Assessment
South Percolation Pond Area Soil (0-2 ft-bgs) - Current
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-061	CFMW-061	CFMW-064	CFMW-064	CFSB-101	CFSB-101	CFSB-102	CFSB-102	CFSB-104	CFSB-104	CFSB-109	CFSB-109	CFSB-110	CFSB-110
Sample Lab IDs	460-116987-13	460-116987-14	460-116987-2	460-116987-3	460-117506-1	460-117506-2	460-117124-10	460-117124-11	460-117124-7	460-117124-8	460-117124-14	460-117124-15	460-117124-17	460-117124-18
Sample Name	CFMW-061-SO-0-0.5	CFMW-061-SO-0.5-2	CFMW-064-SO-0-0.5	CFMW-064-SO-0.5-2	CFSB-101-SO-0-0.5	CFSB-101-SO-0.5-2	CFSB-102-SO-0-0.5	CFSB-102-SO-0.5-2	CFSB-104-SO-0-0.5	CFSB-104-SO-0.5-2	CFSB-109-SO-0-0.5	CFSB-109-SO-0.5-2	CFSB-110-SO-0-0.5	CFSB-110-SO-0.5-2
Sample Depth	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft
Chemical	7/12/2016	7/12/2016	7/11/2016	7/11/2016	7/21/2016	7/21/2016	7/13/2016	7/13/2016	7/13/2016	7/13/2016	7/13/2016	7/13/2016	7/14/2016	7/14/2016
Fluoranthene	0.1 J	0.081 J	0.42 J	0.037 J	0.053 J	0.013 U	0.16 J	0.06 J	0.27 J	0.18 J	0.56 J	0.23 J	0.24 J	0.054 J
Fluorene	0.0076 U	0.0075 U	0.015 J	0.0081 U	0.0098 U	0.0097 U	0.0093 U	0.0082 U	0.012 U	0.011 U	0.02 J	0.011 U	0.016 U	0.0093 U
Hexachlorobenzene	0.014 U	0.014 U	0.017 UJ	0.015 UJ	0.018 U	0.018 U	0.017 U	0.015 U	0.022 U	0.02 U	0.028 U	0.021 U	0.03 U	0.017 U
Hexachlorobutadiene	0.0098 U	0.0097 U	0.012 UJ	0.01 UJ	0.013 U	0.013 U	0.012 U	0.011 U	0.015 U	0.014 U	0.019 U	0.015 U	0.021 U	0.012 U
Hexachlorocyclopentadiene	0.022 U	0.022 U	0.027 U	0.023 U	0.028 U	0.028 U	0.027 U	0.023 U	0.034 U	0.03 U	0.043 U	0.033 U	0.047 U	0.027 U
Hexachloroethane	0.013 U	0.013 U	0.016 U	0.014 U	0.017 U	0.016 U	0.016 U	0.014 U	0.02 U	0.018 U	0.025 U	0.019 U	0.027 U	0.016 U
Indeno(1,2,3-C,D)Pyrene	0.096	0.087	0.43	0.053	0.061 J+	0.03 U	0.21	0.14	0.33	0.23	0.38	0.91	0.66	0.13
Isophorone	0.0075 U	0.0074 U	0.0092 U	0.008 U	0.0097 U	0.0096 U	0.0092 U	0.008 U	0.012 U	0.01 U	0.015 U	0.011 U	0.016 U	0.0092 U
Naphthalene	0.0089 U	0.0088 U	0.011 U	0.0095 U	0.011 U	0.011 U	0.011 U	0.0095 U	0.014 U	0.012 U	0.017 U	0.013 U	0.019 U	0.011 U
Nitrobenzene	0.011 U	0.011 U	0.013 U	0.012 U	0.014 U	0.014 U	0.013 U	0.012 U	0.017 U	0.015 U	0.022 U	0.016 U	0.024 U	0.013 U
N-Nitrosodi-N-Propylamine	0.012 U	0.012 U	0.014 U	0.013 U	0.015 U	0.015 U	0.014 U	0.013 U	0.018 U	0.016 U	0.023 U	0.018 U	0.025 U	0.014 U
N-Nitrosodiphenylamine	0.032 U	0.031 U	0.039 U	0.034 U	0.041 U	0.04 U	0.039 U	0.034 U	0.049 U	0.044 U	0.062 U	0.048 U	0.068 U	0.039 U
Pentachlorophenol	0.042 U	0.042 U	0.052 UJ	0.045 UJ	0.055 U	0.054 U	0.052 U	0.045 U	0.066 U	0.059 U	0.083 U	0.063 U	0.091 U	0.052 U
Phenanthrene	0.058 J	0.048 J	0.21 J	0.019 J	0.037 J	0.012 U	0.075 J	0.028 J	0.14 J	0.092 J	0.27 J	0.12 J	0.12 J	0.033 J
Phenol	0.011 U	0.011 U	0.014 U	0.012 U	0.015 U	0.015 U	0.014 U	0.012 U	0.018 U	0.016 U	0.022 U	0.017 U	0.025 U	0.014 U
Pyrene	0.14 J	0.11 J	0.56 J+	0.055 J+	0.058 J	0.02 U	0.18 J	0.07 J	0.32 J	0.22 J	0.57 J	0.21 J	0.23 J	0.061 J
VOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,1,1-Trichloroethane	--	0.00032 U	--	0.00042 U	--	0.00046 U	--	0.0003 U	--	0.00044 U	--	0.00068 U	--	0.00023 U
1,1,2,2-Tetrachloroethane	--	0.00014 U	--	0.00019 U	--	0.00021 U	--	0.00014 U	--	0.0002 U	--	0.0003 UJ	--	0.0001 UJ
1,1,2-Trichloro-1,2,2-Trifluoroethane	--	0.00037 U	--	0.00048 UJ	--	0.00054 U	--	0.00035 U	--	0.00051 U	--	0.00079 U	--	0.00026 U
1,1,2-Trichloroethane	--	0.00024 U	--	0.00031 U	--	0.00034 U	--	0.00022 U	--	0.00033 U	--	0.0005 U	--	0.00017 U
1,1-Dichloroethane	--	0.00029 U	--	0.00037 U	--	0.00041 U	--	0.00027 U	--	0.0004 U	--	0.00061 U	--	0.0002 U
1,1-Dichloroethene	--	0.00034 U	--	0.00045 U	--	0.0005 U	--	0.00033 U	--	0.00048 U	--	0.00073 U	--	0.00025 U
1,2,3-Trichlorobenzene	--	0.000092 U	--	0.00012 U	--	0.00013 U	--	0.000088 U	--	0.00013 U	--	0.0002 UJ	--	0.000066 UJ
1,2,4-Trichlorobenzene	--	0.00027 U	--	0.00035 U	--	0.00039 U	--	0.00026 U	--	0.00037 U	--	0.00057 UJ	--	0.00019 UJ
1,2-Dibromo-3-Chloropropane	--	0.00039 U	--	0.00052 U	--	0.00057 U	--	0.00037 U	--	0.00055 U	--	0.00084 UJ	--	0.00028 UJ
1,2-Dibromoethane (Ethylene Dibromide)	--	0.0001 U	--	0.00013 U	--	0.00015 U	--	0.000096 U	--	0.00014 U	--	0.00021 U	--	0.000072 U
1,2-Dichlorobenzene	--	0.00012 U	--	0.00015 U	--	0.00017 U	--	0.00011 U	--	0.00016 U	--	0.00025 UJ	--	0.000084 UJ
1,2-Dichloroethane	--	0.000092 U	--	0.00012 U	--	0.00013 U	--	0.000088 U	--	0.00013 U	--	0.0002 U	--	0.000066 U
1,2-Dichloropropane	--	0.00014 U	--	0.00019 U	--	0.00021 U	--	0.00014 U	--	0.0002 U	--	0.0003 U	--	0.0001 U
1,3-Dichlorobenzene	--	0.0001 U	--	0.00013 U	--	0.00015 U	--	0.000096 U	--	0.00014 U	--	0.00021 UJ	--	0.000072 UJ
1,4-Dichlorobenzene	--	0.00011 U	--	0.00014 U	--	0.00016 U	--	0.0001 U	--	0.00015 U	--	0.00023 UJ	--	0.00021 J
2-Hexanone	--	0.00079 U	--	0.001 U	--	0.0011 U	--	0.00075 U	--	0.0011 U	--	0.0017 U	--	0.00056 U
Acetone	--	0.074 J+	--	0.18	--	0.03	--	0.014	--	0.043	--	0.087	--	0.033
Benzene	--	0.00052 J	--	0.0017	--	0.0019	--	0.00027 J	--	0.00037 J	--	0.00036 U	--	0.0002 J
Bromochloromethane	--	0.00014 U	--	0.00019 U	--	0.00021 U	--	0.00014 U	--	0.0002 U	--	0.0003 U	--	0.0001 U
Bromodichloromethane	--	0.00032 U	--	0.00042 U	--	0.00046 U	--	0.0003 U	--	0.00044 U	--	0.00068 U	--	0.00023 U
Bromoform	--	0.00011 U	--	0.00014 U	--	0.00016 U	--	0.0001 U	--	0.00015 U	--	0.00023 U	--	0.000078 U
Bromomethane	--	0.00027 U	--	0.00035 UJ	--	0.00039 U	--	0.00026 U	--	0.00037 U	--	0.00057 U	--	0.00019 U
Carbon Disulfide	--	0.00052 J	--	0.0015 J-	--	0.00052 U	--	0.0018	--	0.0014	--	0.0018	--	0.00051 J
Carbon Tetrachloride	--	0.00036 U	--	0.00047 U	--	0.00052 U	--	0.00034 U	--	0.0005 U	--	0.00077 U	--	0.00026 U
Chlorobenzene	--	0.00012 U	--	0.00015 U	--	0.00017 U	--	0.00011 U	--	0.00016 U	--	0.00025 U	--	0.000084 U
Chloroethane	--	0.00029 U	--	0.00039 U	--	0.00043 U	--	0.00028 U	--	0.00041 U	--	0.00063 U	--	0.00021 U
Chloroform	--	0.00018 U	--	0.00023 U	--	0.00026 U	--	0.00017 U	--	0.00024 U	--	0.00038 U	--	0.00013 U
Chloromethane	--	0.00032 U	--	0.00042 U	--	0.00046 U	--	0.0003 U	--	0.00044 U	--	0.00068 U	--	0.00023 U
Cis-1,2-Dichloroethylene	--	0.00018 U	--	0.00024 U	--	0.00027 U	--	0.00018 U	--	0.00026 U	--	0.00039 U	--	0.00013 U
Cis-1,3-Dichloropropene	--	0.00013 U	--	0.00017 U	--	0.00018 U	--	0.00012 U	--	0.00017 U	--	0.00027 U	--	0.00009 U
Cyclohexane	--	0.00092	--	0.0025 J-	--	0.004 J+	--	0.00037 U	--	0.00054 U	--	0.00082 U	--	0.00028 U
Dibromochloromethane	--	0.00013 U	--	0.00017 U	--	0.00018 U	--	0.00012 U	--	0.00017 U	--	0.00027 U	--	0.00009 U
Dichlorodifluoromethane	--	0.00027 U	--	0.00035 U	--	0.00039 U	--	0.00026 U	--	0.00037 U	--	0.00057 U	--	0.00019 U
Ethylbenzene	--	0.00015 U	--	0.00083 J	--	0.0011 J	--	0.00014 U	--	0.00023 J	--	0.00032 U	--	0.00012 J
Isopropylbenzene (Cumene)	--	0.00014 U	--	0.00019 U	--	0.00021 U	--	0.00014 U	--	0.0002 U	--	0.0003 U	--	0.0001 U
M,P-Xylene	--	0.00034 J	--	0.0024	--	0.0026	--	0.000088 U	--	0.00057 J	--	0.0002 U	--	0.00039 J
Methyl Acetate	--	0.00076 U	--	0.00099 U	--	0.0011 U	--	0.00072 U	--	0.001 U	--	0.0081 J	--	0.0089
Methyl Ethyl Ketone (2-Butanone)	--	0.0076	--	0.011	--	0.003 J	--	0.0026 J	--	0.0052 J	--	0.0078 J	--	0.0034
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	--	0.0019 U	--	0.0024 U	--	0.0027 U	--	0.0018 U	--	0.0026 U	--	0.004 U	--	0.0013 U
Methylcyclohexane	--	0.0009	--	0.004	--	0.006 J+	--	0.0004 U	--	0.00058 U	--	0.0009 U	--	0.0003 U

Table E-27
Summary of Data Used in Risk Assessment
South Percolation Pond Area Soil (0-2 ft-bgs) - Current
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-061	CFMW-061	CFMW-064	CFMW-064	CFSB-101	CFSB-101	CFSB-102	CFSB-102	CFSB-104	CFSB-104	CFSB-109	CFSB-109	CFSB-110	CFSB-110
Sample Lab IDs	460-116987-13	460-116987-14	460-116987-2	460-116987-3	460-117506-1	460-117506-2	460-117124-10	460-117124-11	460-117124-7	460-117124-8	460-117124-14	460-117124-15	460-117124-17	460-117124-18
Sample Name	CFMW-061-SO-0-0.5	CFMW-061-SO-0.5-2	CFMW-064-SO-0-0.5	CFMW-064-SO-0.5-2	CFSB-101-SO-0-0.5	CFSB-101-SO-0.5-2	CFSB-102-SO-0-0.5	CFSB-102-SO-0.5-2	CFSB-104-SO-0-0.5	CFSB-104-SO-0.5-2	CFSB-109-SO-0-0.5	CFSB-109-SO-0.5-2	CFSB-110-SO-0-0.5	CFSB-110-SO-0.5-2
Sample Depth	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft
Chemical	7/12/2016	7/12/2016	7/11/2016	7/11/2016	7/21/2016	7/21/2016	7/13/2016	7/13/2016	7/13/2016	7/13/2016	7/13/2016	7/13/2016	7/14/2016	7/14/2016
Methylene Chloride	--	0.00027 U	--	0.00035 U	--	0.00039 U	--	0.00026 U	--	0.00037 U	--	0.00057 U	--	0.00019 U
O-Xylene (1,2-Dimethylbenzene)	--	0.00013 U	--	0.00078 J	--	0.00091 J	--	0.00013 U	--	0.00019 J	--	0.00029 U	--	0.00011 J
Styrene	--	0.00013 U	--	0.00017 U	--	0.00018 U	--	0.00012 U	--	0.00017 U	--	0.00027 U	--	0.00009 U
Tert-Butyl Methyl Ether	--	0.00014 U	--	0.00019 U	--	0.00021 U	--	0.00014 U	--	0.0002 U	--	0.0003 U	--	0.0001 U
Tetrachloroethylene (PCE)	--	0.00024 U	--	0.00031 U	--	0.00034 U	--	0.00022 U	--	0.00033 U	--	0.0005 U	--	0.00017 U
Toluene	--	0.0011	--	0.004	--	0.0051	--	0.00044 J	--	0.001 J	--	0.00034 U	--	0.00068
Trans-1,2-Dichloroethene	--	0.00033 U	--	0.00043 U	--	0.00048 U	--	0.00031 U	--	0.00045 U	--	0.0007 U	--	0.00023 U
Trans-1,3-Dichloropropene	--	0.000084 U	--	0.00011 U	--	0.00012 U	--	0.00008 U	--	0.00012 U	--	0.00018 U	--	0.00006 U
Trichloroethylene (TCE)	--	0.00022 U	--	0.00029 U	--	0.00032 U	--	0.00021 U	--	0.0003 U	--	0.00047 U	--	0.00016 U
Trichlorofluoromethane	--	0.00029 U	--	0.00037 UJ	--	0.00041 U	--	0.00027 U	--	0.0004 U	--	0.00061 U	--	0.0002 U
Vinyl Chloride	--	0.00033 U	--	0.00043 U	--	0.00048 U	--	0.00031 U	--	0.00045 U	--	0.0007 U	--	0.00023 U

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-27
Summary of Data Used in Risk Assessment
South Percolation Pond Area Soil (0-2 ft-bgs) - Current
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-113	CFSB-113	CFSB-114	CFSB-114	CFSB-115	CFSB-115	CFSB-116	CFSB-116	CFSB-118	CFSB-118	CFSB-119	CFSB-119	CFSB-142	CFSB-142
Sample Lab IDs	460-119512-1	460-119512-2	460-116987-10	460-116987-11	460-119512-4	460-119512-5	460-117573-1	460-117573-2	460-117506-4	460-117506-5	460-116987-7	460-116987-8	460-144400-5	460-144400-6
Sample Name	CFSB-113-SO-0-0.5	CFSB-113-SO-0.5-2	CFSB-114-SO-0-0.5	CFSB-114-SO-0.5-2	CFSB-115-SO-0-0.5	CFSB-115-SO-0.5-2	CFSB-116-SO-0-0.5	CFSB-116-SO-0.5-2	CFSB-118-SO-0-0.5	CFSB-118-SO-0.5-2	CFSB-119-SO-0-0.5	CFSB-119-SO-0.5-2	CFSB-142-SO-0-0.5	CFSB-142-SO-0.5-2
Sample Depth	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft
Chemical	8/31/2016	8/31/2016	7/12/2016	7/12/2016	8/31/2016	8/31/2016	7/22/2016	7/22/2016	7/21/2016	7/21/2016	7/12/2016	7/12/2016	11/2/2017	11/2/2017
GENERAL CHEMISTRY (mg/kg)														
Fluoride	2.97 J+	1.26 J+	3.18 J	10.1 J	2.4 J+	1.58 J+	3.81	1.96 J	1.8 J+	1.85 J+	4.81 J	14.6 J	22.1 J+	17.8 J+
Cyanide	0.12 J	0.07 J	0.03 J	0.017 U	0.31	0.087 J	0.29	0.059 J	0.02 U	0.038 J	0.14	0.045 J	0.43	0.44
Cyanide (Free)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
METALS (mg/kg)														
"Chromium, Hexavalent - Estimated"	0.160584	0.227494	0.17129	0.248905	0.0695864	0.0776156	0.246229	0.214112	0.246229	0.179319	0.23017	0.211436	0.184672	0.195377
"Chromium, Trivalent - Estimated"	5.83942	8.27251	6.22871	9.05109	2.53041	2.82238	8.95377	7.78589	8.95377	6.52068	8.36983	7.68856	6.71533	7.10462
Aluminum	6850	7740	6070	8000	2570	2560	8380	7090	7200	5980	8300	6880	7380	6540
Antimony	0.41 U	0.3 U	0.44 U	0.42 U	0.35 U	0.32 U	0.63 U	0.53 U	0.45 UJ	0.42 UJ	0.42 U	0.45 U	0.29 UJ	0.3 UJ
Arsenic	1.2	1.4	3.5	5	0.46 J	0.66 J	1.7 J+	2 J+	2.5	1.6	4.8	3.4	5.7	8.2
Barium	972	178	125	119	371	63.6	265	43.1	52.3	55.7	79.3	88.8	67.6	91.5
Beryllium	0.16 J	0.34 J	0.35 J	0.48	0.11 U	0.11 J	0.52 J	0.3 J	0.25 J	0.21 J	0.36 J	0.37 J	0.35	0.44
Cadmium	0.43 U	0.32 U	0.33 U	0.32 U	0.38 U	0.33 U	0.48 U	0.4 U	0.34 U	0.32 U	0.32 U	0.34 U	0.31 U	0.32 U
Calcium	313000	55900	8030	8280	116000	13600	57100 J	5140 J	13700	8040	14300	11500	13000	8590
Chromium, Total	6	8.5	6.4	9.3	2.6	2.9	9.2	8	9.2	6.7	8.6	7.9	6.9	7.3
Cobalt	2.1 J	4.4	4.2	5.9	1.2 J	1.8 J	4.9	4.9	4.7	3.7	5.1	4.7	4.2 J+	4.2 J+
Copper	30.6	12.1	8.9	12.7	10.2	3.3	22.7 J+	8.1 J+	9	7.8	14.4	11.4	11.3	10.6
Iron	4240	11700	9640	14000	2550	3350	11200	12500	12200	9750	12300	11400	12400	12700
Lead	8	6.9	7.8	7.9	3.4	2.1	8.2 J+	5.5 J+	4.7	4.4	10.7	6.3	6.3 J+	13.6 J+
Magnesium	7060	10300	7060	8850	2510	3750	9060	7790	9630	6810	8100	8400	9230	7770
Manganese	67.2	121	340	297	32.8	55.6	99.6	107	215	88	312	261	415	314
Mercury	0.024	0.016 J	0.021	0.026	0.024	0.016 J	0.018 J	0.014 U	0.025	0.015 J	0.03	0.02	0.011 J+	0.014 J+
Nickel	12.3	10.8	10.8	11.2	4.4	4.3	12.6	9.5	9.8	8.3	15.7	9.6	9.3	10.4
Potassium	541	518	619	765	240	230	732	448	490	441	972	803	436	536
Selenium	0.4 J	0.28 U	0.41 U	0.39 U	0.33 U	0.29 U	0.59 U	0.5 U	0.42 U	0.4 U	0.4 U	0.42 U	0.27 U	0.28 U
Silver	0.8 U	0.59 U	0.8 U	0.77 U	0.69 U	0.62 U	1.2 U	0.97 U	0.82 U	0.77 U	0.77 U	0.82 U	0.57 U	0.59 U
Sodium	120 J	43.6 J	40.8 U	39.3 U	54.3 J	42.8 U	59.1 U	49.4 U	42 U	39.5 U	39.4 U	42 U	42.1 J	55.8 J
Thallium	0.16 U	0.12 U	0.16 U	0.16 U	0.14 U	0.13 U	0.24 U	0.2 U	0.17 U	0.16 U	0.16 U	0.17 U	0.12 U	0.12 U
Vanadium	5.7	11.5	8	14.5	3.4	2.6	14.8	10.6	10.8	7.9	11.1	11.3	7.6 J+	11 J+
Zinc	40.2	42.9	27.7	37.1	16.3	13.1	44.3	35.4	34.5	32.5	42.6	31.3	35.4 J+	37.4 J+
PESTICIDES (mg/kg)														
Aldrin	0.001 U	--	--	--	--	--	0.0013 U	--	0.001 U	--	--	--	--	--
Alpha Bhc (Alpha Hexachlorocyclohexane)	0.00076 U	--	--	--	--	--	0.00099 U	--	0.00077 U	--	--	--	--	--
Alpha Endosulfan	0.0012 U	--	--	--	--	--	0.0015 U	--	0.0012 U	--	--	--	--	--
Beta Bhc (Beta Hexachlorocyclohexane)	0.00081 U	--	--	--	--	--	0.0011 U	--	0.00082 U	--	--	--	--	--
Beta Endosulfan	0.0013 U	--	--	--	--	--	0.0017 U	--	0.0013 U	--	--	--	--	--
cis-Chlordane	0.0014 U	--	--	--	--	--	0.0018 U	--	0.0014 U	--	--	--	--	--
Delta BHC (Delta Hexachlorocyclohexane)	0.00091 U	--	--	--	--	--	0.0012 U	--	0.00092 U	--	--	--	--	--
Dieldrin	0.0011 U	--	--	--	--	--	0.0014 U	--	0.0011 U	--	--	--	--	--
Endosulfan Sulfate	0.00098 U	--	--	--	--	--	0.0013 U	--	0.00098 U	--	--	--	--	--
Endrin	0.0011 U	--	--	--	--	--	0.0014 U	--	0.0011 U	--	--	--	--	--
Endrin Aldehyde	0.001 U	--	--	--	--	--	0.0013 U	--	0.001 U	--	--	--	--	--
Endrin Ketone	0.0012 U	--	--	--	--	--	0.0015 U	--	0.0012 U	--	--	--	--	--
Gamma Bhc (Lindane)	0.00075 U	--	--	--	--	--	0.00097 U	--	0.00075 U	--	--	--	--	--
Heptachlor	0.0011 U	--	--	--	--	--	0.0014 U	--	0.0011 U	--	--	--	--	--
Heptachlor Epoxide	0.0016 U	--	--	--	--	--	0.0021 U	--	0.0016 U	--	--	--	--	--
Methoxychlor	0.0018 U	--	--	--	--	--	0.0023 U	--	0.0018 U	--	--	--	--	--
P,P'-DDD	0.0011 U	--	--	--	--	--	0.0014 U	--	0.0011 U	--	--	--	--	--
P,P'-DDE	0.0012 U	--	--	--	--	--	0.0016 U	--	0.0012 U	--	--	--	--	--
P,P'-DDT	0.00086 U	--	--	--	--	--	0.0011 U	--	0.00087 U	--	--	--	--	--
Toxaphene	0.024 U	--	--	--	--	--	0.032 U	--	0.025 U	--	--	--	--	--
trans-Chlordane	0.0018 U	--	--	--	--	--	0.0023 U	--	0.0018 U	--	--	--	--	--
POLYCHLORINATED BIPHENYLS (mg/kg)														
PCB-1016 (Aroclor 1016)	0.011 U	0.0098 U	0.0097 U	0.0096 U	0.01 U	0.0094 U	0.014 U	0.012 U	0.011 U	0.01 U	0.01 U	0.01 U	--	--
PCB-1221 (Aroclor 1221)	0.011 U	0.0098 U	0.0097 U	0.0096 U	0.01 U	0.0094 U	0.014 U	0.012 U	0.011 U	0.01 U	0.01 U	0.01 U	--	--
PCB-1232 (Aroclor 1232)	0.011 U	0.0098 U	0.0097 U	0.0096 U	0.01 U	0.0094 U	0.014 U	0.012 U	0.011 U	0.01 U	0.01 U	0.01 U	--	--
PCB-1242 (Aroclor 1242)	0.011 U	0.0098 U	0.0097 U	0.0096 U	0.01 U	0.0094 U	0.014 U	0.012 U	0.011 U	0.01 U	0.01 U	0.01 U	--	--
PCB-1248 (Aroclor 1248)	0.011 U	0.0098 U	0.0097 U	0.0096 U	0.01 U	0.0094 U	0.014 U	0.012 U	0.011 U	0.01 U	0.01 U	0.01 U	--	--

Table E-27
Summary of Data Used in Risk Assessment
South Percolation Pond Area Soil (0-2 ft-bgs) - Current
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-113	CFSB-113	CFSB-114	CFSB-114	CFSB-115	CFSB-115	CFSB-116	CFSB-116	CFSB-118	CFSB-118	CFSB-119	CFSB-119	CFSB-142	CFSB-142
Sample Lab IDs	460-119512-1	460-119512-2	460-116987-10	460-116987-11	460-119512-4	460-119512-5	460-117573-1	460-117573-2	460-117506-4	460-117506-5	460-116987-7	460-116987-8	460-144400-5	460-144400-6
Sample Name	CFSB-113-SO-0-0.5	CFSB-113-SO-0.5-2	CFSB-114-SO-0-0.5	CFSB-114-SO-0.5-2	CFSB-115-SO-0-0.5	CFSB-115-SO-0.5-2	CFSB-116-SO-0-0.5	CFSB-116-SO-0.5-2	CFSB-118-SO-0-0.5	CFSB-118-SO-0.5-2	CFSB-119-SO-0-0.5	CFSB-119-SO-0.5-2	CFSB-142-SO-0-0.5	CFSB-142-SO-0.5-2
Sample Depth	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft
Chemical	8/31/2016	8/31/2016	7/12/2016	7/12/2016	8/31/2016	8/31/2016	7/22/2016	7/22/2016	7/21/2016	7/21/2016	7/12/2016	7/12/2016	11/2/2017	11/2/2017
PCB-1254 (Aroclor 1254)	0.012 U	0.01 U	0.01 U	0.01 U	0.011 U	0.0097 U	0.015 U	0.012 U	0.012 U	0.011 U	0.011 U	0.011 U	--	--
PCB-1260 (Aroclor 1260)	0.012 U	0.01 U	0.01 U	0.01 U	0.011 U	0.0097 U	0.015 U	0.012 U	0.012 U	0.011 U	0.011 U	0.011 U	--	--
PCB-1262 (Aroclor 1262)	0.012 U	0.01 U	0.01 U	0.01 U	0.011 U	0.0097 U	0.015 U	0.012 U	0.012 U	0.011 U	0.011 U	0.011 U	--	--
PCB-1268 (Aroclor 1268)	0.012 U	0.01 U	0.01 U	0.01 U	0.011 U	0.0097 U	0.015 U	0.012 U	0.012 U	0.011 U	0.011 U	0.011 U	--	--
Polychlorinated Biphenyl (PCBs)	0.012 U	0.01 U	0.01 U	0.01 U	0.011 U	0.0097 U	0.015 U	0.012 U	0.012 U	0.011 U	0.011 U	0.011 U	--	--
SEMIVOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,2,4,5-Tetrachlorobenzene	0.031 U	0.027 U	0.027 U	0.027 U	0.029 U	0.026 U	0.04 U	0.032 U	0.031 U	0.028 U	0.029 U	0.029 U	0.027 U	0.028 U
1,4-Dioxane (P-Dioxane)	0.11 U	0.097 U	0.096 U	0.096 U	0.1 U	0.093 U	0.14 U	0.12 U	0.11 U	0.1 U	0.1 U	0.1 U	0.097 U	0.1 U
2,3,4,6-Tetrachlorophenol	0.039 U	0.034 U	0.034 U	0.034 U	0.037 U	0.033 U	0.05 U	0.041 U	0.039 U	0.036 U	0.036 UJ	0.036 UJ	0.034 U	0.036 U
2,4,5-Trichlorophenol	0.041 U	0.036 U	0.036 U	0.036 U	0.039 U	0.035 U	0.053 U	0.043 U	0.041 U	0.038 U	0.038 U	0.038 U	0.036 U	0.038 U
2,4,6-Trichlorophenol	0.012 U	0.01 U	0.01 U	0.01 U	0.011 U	0.0099 U	0.015 U	0.012 U	0.012 U	0.011 U	0.011 U	0.011 U	0.01 U	0.011 U
2,4-Dichlorophenol	0.0098 U	0.0085 U	0.0084 U	0.0084 U	0.0092 U	0.0082 U	0.013 U	0.01 U	0.0098 U	0.009 U	0.0091 U	0.009 U	0.0085 U	0.009 U
2,4-Dimethylphenol	0.091 U	0.08 U	0.079 U	0.079 U	0.086 U	0.076 U	0.12 U	0.095 U	0.091 U	0.084 U	0.085 U	0.084 U	0.08 U	0.084 U
2,4-Dinitrophenol	0.31 U	0.27 U	0.27 U	0.27 U	0.29 U	0.26 U	0.4 U	0.33 U	0.31 U	0.29 U	0.29 U	0.29 U	0.27 U	0.29 U
2,4-Dinitrotoluene	0.016 U	0.014 U	0.014 U	0.014 U	0.015 U	0.014 U	0.021 U	0.017 U	0.016 U	0.015 U	0.015 U	0.015 U	0.014 U	0.015 U
2,6-Dinitrotoluene	0.022 U	0.019 U	0.019 U	0.019 U	0.021 U	0.018 U	0.028 U	0.023 U	0.022 U	0.02 U	0.021 U	0.02 U	0.019 U	0.02 U
2-Chloronaphthalene	0.0094 U	0.0082 U	0.0081 U	0.0081 U	0.0088 U	0.0079 U	0.012 U	0.0098 U	0.0094 U	0.0086 U	0.0088 U	0.0087 U	0.0082 U	0.0087 U
2-Chlorophenol	0.011 U	0.0092 U	0.0091 U	0.0091 U	0.0099 U	0.0088 U	0.014 U	0.011 U	0.011 U	0.0097 U	0.0098 U	0.0097 U	0.0092 U	0.0097 U
2-Methylnaphthalene	0.0091 U	0.008 U	0.0079 U	0.0079 U	0.0086 U	0.0077 U	0.012 U	0.0096 U	0.0092 U	0.013 J	0.0085 U	0.0085 U	0.008 U	0.0084 U
2-Methylphenol (O-Cresol)	0.018 U	0.016 U	0.016 U	0.016 U	0.017 U	0.015 U	0.023 U	0.019 U	0.018 U	0.017 U	0.017 U	0.017 U	0.016 U	0.017 U
2-Nitroaniline	0.014 U	0.012 U	0.012 U	0.012 U	0.013 U	0.011 U	0.018 U	0.014 U	0.014 U	0.013 U	0.013 U	0.013 U	0.012 U	0.013 U
2-Nitrophenol	0.014 U	0.012 U	0.012 U	0.012 U	0.013 U	0.012 U	0.018 U	0.015 U	0.014 U	0.013 U	0.013 U	0.013 U	0.012 U	0.013 U
3- And 4- Methylphenol (Total)	0.011 U	0.0096 U	0.0095 U	0.0095 U	0.01 U	0.0092 U	0.014 U	0.012 U	0.011 U	0.01 U	0.01 U	0.01 U	0.0096 U	0.01 U
3,3'-Dichlorobenzidine	0.046 U	0.04 U	0.04 U	0.04 U	0.043 U	0.039 U	0.06 U	0.048 U	0.046 U	0.042 U	0.043 U	0.043 U	0.04 U	0.043 U
3-Nitroaniline	0.012 U	0.011 U	0.011 U	0.011 U	0.012 U	0.01 U	0.016 U	0.013 U	0.012 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U
4,6-Dinitro-2-Methylphenol	0.11 U	0.097 U	0.095 U	0.095 U	0.1 U	0.093 U	0.14 U	0.12 U	0.11 U	0.1 U	0.1 U	0.1 U	0.096 U	0.1 U
4-Bromophenyl Phenyl Ether	0.013 U	0.011 U	0.011 U	0.011 U	0.012 U	0.011 U	0.017 U	0.014 U	0.013 U	0.012 U	0.012 U	0.012 U	0.011 U	0.012 U
4-Chloro-3-Methylphenol	0.018 U	0.016 U	0.015 U	0.015 U	0.017 U	0.015 U	0.023 U	0.019 U	0.018 U	0.016 U	0.017 U	0.016 U	0.016 U	0.016 U
4-Chloroaniline	0.011 U	0.0093 U	0.0092 U	0.0092 U	0.01 U	0.0089 U	0.014 U	0.011 U	0.011 U	0.0098 U	0.0099 U	0.0099 U	0.0093 U	0.0098 U
4-Chlorophenyl Phenyl Ether	0.012 U	0.011 U	0.011 U	0.011 U	0.012 U	0.01 U	0.016 U	0.013 U	0.012 U	0.011 U	0.012 U	0.011 U	0.011 U	0.011 U
4-Nitroaniline	0.016 U	0.014 U	0.014 U	0.014 U	0.015 U	0.013 U	0.02 U	0.016 U	0.016 U	0.014 U	0.015 U	0.014 U	0.014 U	0.014 U
4-Nitrophenol	0.2 U	0.17 U	0.17 U	0.17 U	0.19 U	0.17 U	0.26 U	0.21 U	0.2 U	0.18 U	0.19 U	0.18 U	0.17 U	0.18 U
Acenaphthene	0.01 J	0.0088 U	0.0087 U	0.0087 U	0.0094 U	0.0084 U	0.013 U	0.01 U	0.01 U	0.0092 U	0.0093 U	0.0093 U	0.0088 U	0.0092 U
Acenaphthylene	0.011 U	0.0093 U	0.0092 U	0.0092 U	0.01 U	0.0089 U	0.014 U	0.011 U	0.011 U	0.0098 U	0.0099 U	0.0099 U	0.0093 U	0.0098 U
Acetophenone	0.009 U	0.0079 U	0.0078 U	0.0078 U	0.0085 U	0.0076 U	0.012 U	0.0094 U	0.009 U	0.0083 U	0.011 J	0.0083 U	0.0079 U	0.0083 U
Anthracene	0.039 U	0.034 U	0.034 U	0.034 U	0.037 U	0.033 U	0.051 U	0.041 U	0.039 U	0.036 U	0.037 U	0.036 U	0.034 U	0.036 U
Atrazine	0.018 U	0.016 U	0.016 U	0.016 U	0.017 U	0.015 U	0.024 U	0.019 U	0.018 U	0.017 U	0.017 U	0.017 U	0.016 U	0.017 U
Benzaldehyde	0.032 U	0.028 U	0.027 U	0.027 U	0.03 U	0.026 U	0.041 U	0.033 U	0.032 U	0.029 U	0.088 J	0.029 U	0.028 U	0.029 U
Benzo(A)Anthracene	0.12	0.047	0.05	0.03 U	0.059	0.052	0.11	0.036 U	0.035 U	0.032 U	0.13	0.032 U	0.038	0.069
Benzo(A)Pyrene	0.17	0.054	0.07	0.011 U	0.084	0.06	0.15	0.013 U	0.013 U	0.018 J	0.18	0.024 J	0.062	0.093
Benzo(B)Fluoranthene	0.29	0.11	0.11	0.014 U	0.17	0.13	0.25	0.017 U	0.016 U	0.029 J	0.35	0.036 J	0.11	0.17
Benzo(G,H,I)Perylene	0.2 J	0.071 J	0.076 J	0.021 U	0.11 J	0.087 J	0.2 J	0.025 U	0.024 U	0.022 U	0.24 J	0.022 U	0.049 J	0.072 J
Benzo(K)Fluoranthene	0.1	0.036	0.036	0.016 U	0.06	0.049	0.083	0.019 U	0.018 U	0.017 U	0.1	0.017 U	0.042	0.057
Benzyl Butyl Phthalate	0.013 U	0.011 U	0.011 U	0.011 U	0.012 U	0.011 U	0.016 U	0.013 U	0.013 U	0.012 U	0.012 U	0.012 U	0.011 U	0.012 U
Biphenyl (Diphenyl)	0.035 U	0.031 U	0.03 U	0.031 U	0.033 U	0.03 U	0.046 U	0.037 U	0.035 U	0.032 U	0.033 U	0.033 U	0.031 U	0.033 U
Bis(2-Chloroethoxy) Methane	0.013 U	0.011 U	0.011 U	0.011 U	0.012 U	0.011 U	0.017 U	0.013 U	0.013 U	0.012 U	0.012 U	0.012 U	0.011 U	0.012 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.0098 U	0.0085 U	0.0084 U	0.0084 U	0.0092 U	0.0082 U	0.017 J	0.01 U	0.0098 U	0.009 U	0.0091 U	0.009 U	0.0085 U	0.009 U
Bis(2-Chloroisopropyl) Ether	0.017 U	0.015 U	0.015 U	0.015 U	0.016 U	0.014 U	0.022 U	0.018 U	0.017 U	0.016 U	0.016 UJ	0.016 UJ	0.015 U	0.016 U
Bis(2-Ethylhexyl) Phthalate	0.016 U	0.014 U	0.014 U	0.014 U	0.015 U	0.014 U	0.021 U	0.017 U	0.016 U	0.015 U	0.015 U	0.015 U	0.014 U	0.015 U
Caprolactam	0.03 U	0.026 U	0.026 U	0.026 U	0.028 U	0.025 U	0.038 U	0.031 U	0.03 U	0.027 U	0.028 U	0.046 J	0.026 U	0.027 U
Carbazole	0.016 J	0.009 U	0.0089 J	0.0089 U	0.0097 U	0.0086 U	0.016 J	0.011 U	0.01 U	0.0094 U	0.024 J	0.0095 U	0.009 U	0.011 J
Chrysene	0.19 J	0.071 J	0.081 J	0.0097 U	0.1 J	0.087 J	0.17 J	0.012 U	0.011 U	0.026 J	0.23 J	0.026 J	0.057 J	0.11 J
Dibenz(A,H)Anthracene	0.035 J	0.019 U	0.019 U	0.019 U	0.02 U	0.018 U	0.05 J	0.023 U	0.022 U	0.02 U	0.051	0.02 U	0.019 U	0.042
Dibenzofuran	0.013 U	0.011 U	0.011 U	0.011 U	0.012 U	0.011 U	0.016 U	0.013 U	0.013 U	0.012 U	0.012 U	0.012 U	0.011 U	0.012 U
Diethyl Phthalate	0.012 U	0.01 U	0.01 U	0.01 U	0.011 U	0.0099 U	0.015 U	0.012 U	0.012 U	0.011 U	0.011 U	0.011 U	0.01 U	0.011 U
Dimethyl Phthalate	0.012 U	0.011 U	0.01 U	0.01 U	0.011 U	0.01 U	0.015 U	0.013 U	0.012 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U
Di-N-Butyl Phthalate	0.012 U	0.011 U	0.011 U	0.011 U	0.012 U	0.01 U	0.016 U	0.013 U	0.012 U	0.011 U	0.012 U	0.034 J	0.011 U	0.011 U
Di-N-Octylphthalate	0.021 U	0.018 U	0.018 U	0.018 U	0.02 U	0.018 U	0.027 U	0.022 U	0.021 U	0.019 U	0.02 U	0.019 U	0.018 U	0.019 U

Table E-27
Summary of Data Used in Risk Assessment
South Percolation Pond Area Soil (0-2 ft-bgs) - Current
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-113	CFSB-113	CFSB-114	CFSB-114	CFSB-115	CFSB-115	CFSB-116	CFSB-116	CFSB-118	CFSB-118	CFSB-119	CFSB-119	CFSB-142	CFSB-142
Sample Lab IDs	460-119512-1	460-119512-2	460-116987-10	460-116987-11	460-119512-4	460-119512-5	460-117573-1	460-117573-2	460-117506-4	460-117506-5	460-116987-7	460-116987-8	460-144400-5	460-144400-6
Sample Name	CFSB-113-SO-0-0.5	CFSB-113-SO-0.5-2	CFSB-114-SO-0-0.5	CFSB-114-SO-0.5-2	CFSB-115-SO-0-0.5	CFSB-115-SO-0.5-2	CFSB-116-SO-0-0.5	CFSB-116-SO-0.5-2	CFSB-118-SO-0-0.5	CFSB-118-SO-0.5-2	CFSB-119-SO-0-0.5	CFSB-119-SO-0.5-2	CFSB-142-SO-0-0.5	CFSB-142-SO-0.5-2
Sample Depth	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft
Chemical	8/31/2016	8/31/2016	7/12/2016	7/12/2016	8/31/2016	8/31/2016	7/22/2016	7/22/2016	7/21/2016	7/21/2016	7/12/2016	7/12/2016	11/2/2017	11/2/2017
Fluoranthene	0.2 J	0.076 J	0.075 J	0.011 U	0.089 J	0.091 J	0.16 J	0.013 U	0.012 U	0.033 J	0.21 J	0.026 J	0.053 J	0.1 J
Fluorene	0.009 U	0.0079 U	0.0078 U	0.0078 U	0.0085 U	0.0076 U	0.012 U	0.0094 U	0.009 U	0.0083 U	0.0084 U	0.0083 U	0.0079 U	0.0083 U
Hexachlorobenzene	0.017 U	0.015 U	0.014 U	0.014 U	0.016 U	0.014 U	0.022 U	0.018 U	0.017 U	0.015 U	0.016 UJ	0.016 UJ	0.015 U	0.015 U
Hexachlorobutadiene	0.012 U	0.01 U	0.01 U	0.01 U	0.011 U	0.0098 U	0.015 U	0.012 U	0.012 U	0.011 U	0.011 UJ	0.011 UJ	0.01 U	0.011 U
Hexachlorocyclopentadiene	0.026 U	0.023 U	0.022 U	0.022 U	0.024 U	0.022 U	0.033 U	0.027 U	0.026 U	0.024 U	0.024 U	0.024 U	0.023 UJ	0.024 UJ
Hexachloroethane	0.015 U	0.013 U	0.013 U	0.013 U	0.014 U	0.013 U	0.02 U	0.016 U	0.015 U	0.014 U	0.014 U	0.014 U	0.013 U	0.014 U
Indeno(1,2,3-C,D)Pyrene	0.2	0.071	0.075	0.024 U	0.12	0.093	0.23	0.029 U	0.028 U	0.025 U	0.22	0.025 U	0.08	0.11
Isophorone	0.024 J	0.0078 U	0.0077 U	0.0077 U	0.02 J	0.0095 J	0.011 U	0.0093 U	0.0089 U	0.0082 U	0.0083 U	0.0082 U	0.0078 U	0.0082 U
Naphthalene	0.011 U	0.0092 U	0.0091 U	0.0091 U	0.0099 U	0.0088 U	0.015 J	0.011 U	0.011 U	0.0097 U	0.0098 U	0.0097 U	0.0092 U	0.0097 U
Nitrobenzene	0.013 U	0.011 U	0.011 U	0.011 U	0.012 U	0.011 U	0.017 U	0.014 U	0.013 U	0.012 U	0.012 U	0.012 U	0.011 U	0.012 U
N-Nitrosodi-N-Propylamine	0.014 U	0.012 U	0.012 U	0.012 U	0.013 U	0.012 U	0.018 UJ	0.015 U	0.014 U	0.013 U	0.013 U	0.013 U	0.012 U	0.013 U
N-Nitrosodiphenylamine	0.038 U	0.033 U	0.032 U	0.032 U	0.035 U	0.032 U	0.048 U	0.039 U	0.038 U	0.035 U	0.035 U	0.035 U	0.033 U	0.035 U
Pentachlorophenol	0.05 U	0.044 U	0.043 U	0.043 U	0.047 U	0.042 U	0.065 U	0.052 U	0.05 U	0.046 U	0.047 UJ	0.046 UJ	0.044 U	0.046 U
Phenanthrene	0.1 J	0.047 J	0.044 J	0.0095 U	0.044 J	0.053 J	0.089 J	0.012 U	0.011 U	0.013 J	0.1 J	0.021 J	0.025 J	0.046 J
Phenol	0.014 U	0.012 U	0.012 U	0.012 U	0.013 U	0.011 U	0.017 U	0.014 U	0.014 U	0.012 U	0.013 U	0.013 U	0.012 U	0.012 U
Pyrene	0.22 J	0.076 J	0.1 J	0.016 U	0.096 J	0.091 J	0.17 J	0.02 U	0.019 U	0.032 J	0.29 J+	0.033 J+	0.064 J	0.12 J
VOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,1,1-Trichloroethane	--	0.00035 U	--	0.00041 U	--	0.00037 U	--	0.00045 U	--	0.00039 U	--	0.00046 U	--	0.00023 U
1,1,2,2-Tetrachloroethane	--	0.00016 U	--	0.00018 U	--	0.00016 U	--	0.0002 U	--	0.00018 U	--	0.0002 U	--	0.00021 U
1,1,2-Trichloro-1,2,2-Trifluoroethane	--	0.00041 U	--	0.00047 U	--	0.00043 U	--	0.00052 U	--	0.00046 U	--	0.00053 UJ	--	0.00029 U
1,1,2-Trichloroethane	--	0.00026 U	--	0.0003 U	--	0.00027 U	--	0.00033 U	--	0.00029 U	--	0.00034 U	--	0.00017 U
1,1-Dichloroethane	--	0.00032 U	--	0.00037 U	--	0.00033 U	--	0.00041 U	--	0.00035 U	--	0.00041 U	--	0.0002 U
1,1-Dichloroethene	--	0.00038 U	--	0.00044 U	--	0.0004 U	--	0.00049 U	--	0.00042 U	--	0.00049 U	--	0.00022 U
1,2,3-Trichlorobenzene	--	0.0001 U	--	0.00012 U	--	0.00011 U	--	0.00013 U	--	0.00011 U	--	0.00013 U	--	0.00018 U
1,2,4-Trichlorobenzene	--	0.0003 U	--	0.00035 U	--	0.00031 U	--	0.00038 U	--	0.00033 U	--	0.00038 U	--	0.00009 U
1,2-Dibromo-3-Chloropropane	--	0.00044 U	--	0.00051 U	--	0.00045 U	--	0.00056 UJ	--	0.00049 U	--	0.00056 U	--	0.00045 U
1,2-Dibromoethane (Ethylene Dibromide)	--	0.00011 U	--	0.00013 U	--	0.00012 U	--	0.00014 U	--	0.00012 U	--	0.00014 U	--	0.00018 U
1,2-Dichlorobenzene	--	0.00013 U	--	0.00015 U	--	0.00014 U	--	0.00017 U	--	0.00015 U	--	0.00017 U	--	0.00014 U
1,2-Dichloroethane	--	0.0001 U	--	0.00012 U	--	0.00011 U	--	0.00013 U	--	0.00011 U	--	0.00013 U	--	0.00029 U
1,2-Dichloropropane	--	0.00016 U	--	0.00018 U	--	0.00016 U	--	0.0002 U	--	0.00018 U	--	0.0002 U	--	0.00041 U
1,3-Dichlorobenzene	--	0.00011 U	--	0.00013 U	--	0.00012 U	--	0.00014 U	--	0.00012 U	--	0.00014 U	--	0.00016 U
1,4-Dichlorobenzene	--	0.00012 U	--	0.00014 U	--	0.00013 U	--	0.00016 U	--	0.00013 U	--	0.00016 U	--	0.000098 U
2-Hexanone	--	0.00087 UJ	--	0.001 U	--	0.00091 UJ	--	0.0011 U	--	0.00097 U	--	0.0011 U	--	0.00076 U
Acetone	--	0.022	--	0.017 J+	--	0.011	--	0.012	--	0.011	--	0.16	--	0.035
Benzene	--	0.00023 J	--	0.00031 J	--	0.00027 J	--	0.00047 J	--	0.00024 J	--	0.0022	--	0.00071 J
Bromochloromethane	--	0.00016 U	--	0.00018 U	--	0.00016 U	--	0.0002 U	--	0.00018 U	--	0.0002 U	--	0.00027 U
Bromodichloromethane	--	0.00035 U	--	0.00041 U	--	0.00037 U	--	0.00045 U	--	0.00039 U	--	0.00046 U	--	0.00025 U
Bromoform	--	0.00012 U	--	0.00014 U	--	0.00013 U	--	0.00016 U	--	0.00013 U	--	0.00016 U	--	0.00042 U
Bromomethane	--	0.0003 U	--	0.00035 U	--	0.00031 U	--	0.00038 U	--	0.00033 U	--	0.00038 UJ	--	0.00046 U
Carbon Disulfide	--	0.0058	--	0.00046 U	--	0.0034	--	0.00075 J	--	0.0077	--	0.00099 J-	--	0.00036 J
Carbon Tetrachloride	--	0.0004 UJ	--	0.00046 U	--	0.00042 UJ	--	0.00051 U	--	0.00045 U	--	0.00052 U	--	0.00018 U
Chlorobenzene	--	0.00013 U	--	0.00015 U	--	0.00014 U	--	0.00017 U	--	0.00015 U	--	0.00017 U	--	0.00017 U
Chloroethane	--	0.00032 U	--	0.00038 U	--	0.00034 U	--	0.00042 U	--	0.00036 U	--	0.00042 U	--	0.00051 U
Chloroform	--	0.00019 U	--	0.00023 U	--	0.0002 U	--	0.00025 U	--	0.00022 U	--	0.00025 U	--	0.00031 U
Chloromethane	--	0.00035 U	--	0.00041 U	--	0.00037 U	--	0.00045 U	--	0.00039 U	--	0.00046 U	--	0.00043 U
Cis-1,2-Dichloroethylene	--	0.0002 U	--	0.00024 U	--	0.00021 U	--	0.00026 U	--	0.00023 U	--	0.00026 U	--	0.00015 U
Cis-1,3-Dichloropropene	--	0.00014 U	--	0.00016 U	--	0.00014 U	--	0.00018 U	--	0.00016 U	--	0.00018 U	--	0.00027 U
Cyclohexane	--	0.00073 J	--	0.0005 U	--	0.00076 J	--	0.00055 U	--	0.00048 U	--	0.0032 J-	--	0.00086 J
Dibromochloromethane	--	0.00014 U	--	0.00016 U	--	0.00014 U	--	0.00018 U	--	0.00016 U	--	0.00018 U	--	0.00019 U
Dichlorodifluoromethane	--	0.0003 U	--	0.00035 U	--	0.00031 U	--	0.00038 U	--	0.00033 U	--	0.00038 U	--	0.00033 U
Ethylbenzene	--	0.00018 J	--	0.0004 J	--	0.00017 U	--	0.00021 U	--	0.00019 U	--	0.0012	--	0.00019 U
Isopropylbenzene (Cumene)	--	0.00016 U	--	0.00018 U	--	0.00016 U	--	0.0002 U	--	0.00018 U	--	0.0002 U	--	0.00012 U
M,P-Xylene	--	0.00067 J	--	0.0013	--	0.0004 J	--	0.00013 U	--	0.00035 J	--	0.0033	--	0.00071 J
Methyl Acetate	--	0.0043 J	--	0.00097 U	--	0.00087 U	--	0.0011 U	--	0.00093 U	--	0.36	--	0.0042 U
Methyl Ethyl Ketone (2-Butanone)	--	0.0025 J-	--	0.00083 U	--	0.0012 J-	--	0.00092 U	--	0.0008 U	--	0.01	--	0.0046 J
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	--	0.0021 UJ	--	0.0024 U	--	0.0021 UJ	--	0.0026 U	--	0.0023 U	--	0.0027 U	--	0.00065 U
Methylcyclohexane	--	0.00086 J	--	0.00058 J	--	0.00093 J	--	0.0006 U	--	0.00056 J+	--	0.0056	--	0.0016

Table E-27
Summary of Data Used in Risk Assessment
South Percolation Pond Area Soil (0-2 ft-bgs) - Current
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-113	CFSB-113	CFSB-114	CFSB-114	CFSB-115	CFSB-115	CFSB-116	CFSB-116	CFSB-118	CFSB-118	CFSB-119	CFSB-119	CFSB-142	CFSB-142
Sample Lab IDs	460-119512-1	460-119512-2	460-116987-10	460-116987-11	460-119512-4	460-119512-5	460-117573-1	460-117573-2	460-117506-4	460-117506-5	460-116987-7	460-116987-8	460-144400-5	460-144400-6
Sample Name	CFSB-113-SO-0-0.5	CFSB-113-SO-0.5-2	CFSB-114-SO-0-0.5	CFSB-114-SO-0.5-2	CFSB-115-SO-0-0.5	CFSB-115-SO-0.5-2	CFSB-116-SO-0-0.5	CFSB-116-SO-0.5-2	CFSB-118-SO-0-0.5	CFSB-118-SO-0.5-2	CFSB-119-SO-0-0.5	CFSB-119-SO-0.5-2	CFSB-142-SO-0-0.5	CFSB-142-SO-0.5-2
Sample Depth	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft
Chemical	8/31/2016	8/31/2016	7/12/2016	7/12/2016	8/31/2016	8/31/2016	7/22/2016	7/22/2016	7/21/2016	7/21/2016	7/12/2016	7/12/2016	11/2/2017	11/2/2017
Methylene Chloride	--	0.0003 U	--	0.00035 U	--	0.00031 U	--	0.00038 U	--	0.00033 U	--	0.00038 U	--	0.00016 U
O-Xylene (1,2-Dimethylbenzene)	--	0.00019 J	--	0.00044 J	--	0.00015 U	--	0.00019 U	--	0.00017 U	--	0.0011 J	--	0.00025 J
Styrene	--	0.00014 U	--	0.00016 U	--	0.00014 U	--	0.00018 U	--	0.00016 U	--	0.00018 U	--	0.00012 U
Tert-Butyl Methyl Ether	--	0.00016 U	--	0.00018 U	--	0.00016 U	--	0.0002 U	--	0.00018 U	--	0.0002 U	--	0.00012 U
Tetrachloroethylene (PCE)	--	0.00026 U	--	0.0003 U	--	0.00027 U	--	0.00033 U	--	0.00029 U	--	0.00034 U	--	0.00014 U
Toluene	--	0.00089 J	--	0.0014	--	0.00081 J	--	0.00069 J	--	0.00061 J	--	0.0069	--	0.0014
Trans-1,2-Dichloroethene	--	0.00036 U	--	0.00042 U	--	0.00038 U	--	0.00047 U	--	0.0004 U	--	0.00047 U	--	0.00024 U
Trans-1,3-Dichloropropene	--	0.000093 U	--	0.00011 U	--	0.000097 U	--	0.00012 U	--	0.0001 U	--	0.00012 U	--	0.00026 U
Trichloroethylene (TCE)	--	0.00024 U	--	0.00028 U	--	0.00025 U	--	0.00031 U	--	0.00027 U	--	0.00031 U	--	0.00014 U
Trichlorofluoromethane	--	0.00032 U	--	0.00037 U	--	0.00033 U	--	0.00041 U	--	0.00035 U	--	0.00041 UJ	--	0.0004 U
Vinyl Chloride	--	0.00036 U	--	0.00042 U	--	0.00038 U	--	0.00047 U	--	0.0004 U	--	0.00047 U	--	0.00053 U

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-27
Summary of Data Used in Risk Assessment
South Percolation Pond Area Soil (0-2 ft-bgs) - Current
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-143	CFSB-143	CFSB-143-DUP	CFSB-144	CFSB-144	CFSB-145	CFSB-145	CFSB-146	CFSB-146	CFSB-147	CFSB-147-DUP	CFSB-147	CFSB-148	CFSB-148
Sample Lab IDs	460-144400-8	460-144400-9	460-144400-11	460-144400-17	460-144400-18	460-144478-1	460-144478-2	460-144478-4	460-144478-5	460-144478-8	460-144478-7	460-144478-9	460-144478-11	460-144478-12
Sample Name	CFSB-143-SO-0-0.5	CFSB-143-SO-0.5-2	CFSB-DUP15-SO	CFSB-144-SO-0-0.5	CFSB-144-SO-0.5-2	CFSB-145-SO-0-0.5	CFSB-145-SO-0.5-2	CFSB-146-SO-0-0.5	CFSB-146-SO-0.5-2	CFSB-147-SO-0-0.5	CFSB-DUP16-SO	CFSB-147-SO-0.5-2	CFSB-148-SO-0-0.5	CFSB-148-SO-0.5-2
Sample Depth	0-0.5 ft	0.5-2 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft
Chemical	11/2/2017	11/2/2017	11/2/2017	11/3/2017	11/3/2017	11/6/2017	11/6/2017	11/6/2017	11/6/2017	11/6/2017	11/6/2017	11/6/2017	11/6/2017	11/6/2017
GENERAL CHEMISTRY (mg/kg)														
Fluoride	17.1 J+	15.5 J+	14.3 J+	19.5 J+	18.6 J+	14.4 J+	16.9 J+	14.7 J+	18.9 J+	12.4 J+	10.6 J+	12.4 J+	12.3 J+	18.6 J+
Cyanide	0.24 J	0.17 J	0.2 J	1	0.54	0.07 U	0.06 U	0.064 U	0.067 U	0.067 U	0.069 U	0.064 U	0.071 U	0.066 U
Cyanide (Free)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
METALS (mg/kg)														
"Chromium, Hexavalent - Estimated"	0.294404	0.264964	0.270316	0.286375	0.286375	0.235523	0.2382	0.190024	0.227494	0.219465	0.224818	0.219465	0.23017	0.214112
"Chromium, Trivalent - Estimated"	10.7056	9.63504	9.82968	10.4136	10.4136	8.56448	8.6618	6.90998	8.27251	7.98054	8.17518	7.98054	8.36983	7.78589
Aluminum	9900	8860	8500	9430	9310	10600	8600	7960	10100	7810	7710	7560	8450	7490
Antimony	0.32 UJ	0.32 UJ	0.27 UJ	0.34 U	0.34 U	0.37 UJ	0.34 UJ	0.35 UJ	0.36 UJ	0.38 UJ	0.35 UJ	0.34 UJ	0.37 UJ	0.34 UJ
Arsenic	5.7	5.1	5.2	3.2	3.1	4.2	4.6	3.4	4	4	3.6	4	4.5	4
Barium	175	158	154	165	190	100	111	74.8	97.9	77.2	82	98.6	118	85.4
Beryllium	0.56	0.58	0.48	0.47	0.38 J	0.46	0.44	0.3 J	0.39 J	0.4 J	0.38 J	0.44	0.46	0.47
Cadmium	0.34 U	0.33 U	0.29 U	0.36 U	0.36 U	0.39 U	0.36 U	0.37 U	0.38 U	0.4 U	0.37 U	0.36 U	0.39 U	0.36 U
Calcium	21600	17700	16800	22300	25500	11800	14400	12500	16300	14600	17700	22900	13600	21300
Chromium, Total	11	9.9	10.1	10.7	10.7	8.8	8.9	7.1	8.5	8.2	8.4	8.2	8.6	8
Cobalt	6.7 J+	6.3 J+	6.2 J+	6.3	6.6	5.4	5.4	4	4.9	5	5.1	5	5.5	4.8
Copper	18.4	17.5	17.9	16.3	18.2	12.4 J	12.1 J	17.1 J	13.3 J	11.3 J	10.6 J	11 J	13.5 J	10.7 J
Iron	15300	14500	14400	14800	15100	13900	13300	10300	12500	12500	12700	12400	13900	11700
Lead	10.2 J+	9.1 J+	9 J+	8.8	9.7	9.6	7.9	10.1	12.9	7.3	6.4	6.3	8.5	6.5
Magnesium	12300	11300	10900	12600	13300	8970	9020	7600	8590	8940	9290	9940	8190	10200
Manganese	410	365	347	157	168	329 J	311 J	321 J	350 J	257 J	268 J	262 J	388 J	261 J
Mercury	0.026 J+	0.02 J+	0.02 J+	0.022	0.017 J	0.012 J	0.017 J	0.021	0.021	0.014 J	0.014 J	0.012 J	0.023	0.015 J
Nickel	15.9	13.3	13	12.7	13.3	12.6	11.1	10	10.7	11.5	10.5	10.3	10.9	9.5
Potassium	1270	1060	924	983	954	933	866	663	720	776	735	772	877	775
Selenium	0.3 U	0.29 U	0.26 U	0.32 U	0.32 U	0.34 U	0.31 U	0.33 U	0.33 U	0.35 U	0.33 U	0.32 U	0.34 U	0.32 U
Silver	0.63 U	0.62 U	0.54 U	0.67 U	0.67 U	0.72 U	0.66 U	0.69 U	0.69 U	0.74 U	0.69 U	0.67 U	0.71 U	0.67 U
Sodium	97.3	71.6 J	70.7 J	158	140	50 U	45.6 U	47.5 U	48.2 U	51.2 U	47.5 U	46.3 U	49.4 U	46.1 U
Thallium	0.13 U	0.12 U	0.11 U	0.14 U	0.13 U	0.15 U	0.13 U	0.14 U	0.14 U	0.15 U	0.14 U	0.14 U	0.14 U	0.13 U
Vanadium	17.3 J+	17.1 J+	17.4 J+	15.2	15.4	14.1	14.5	7.9	8.5	13	12.5	14.2	15.9	11.1
Zinc	50.3 J+	43 J+	42.1 J+	46.4	45.4	42.1	37	35.7	41.1	35.2	35	33.6	47.9	32.3
PESTICIDES (mg/kg)														
Aldrin	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Alpha Bhc (Alpha Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Alpha Endosulfan	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Beta Bhc (Beta Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Beta Endosulfan	--	--	--	--	--	--	--	--	--	--	--	--	--	--
cis-Chlordane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Delta BHC (Delta Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dieldrin	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endosulfan Sulfate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin Aldehyde	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin Ketone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Gamma Bhc (Lindane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Heptachlor	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Heptachlor Epoxide	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methoxychlor	--	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDD	--	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDT	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Toxaphene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
trans-Chlordane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
POLYCHLORINATED BIPHENYLS (mg/kg)														
PCB-1016 (Aroclor 1016)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1221 (Aroclor 1221)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1232 (Aroclor 1232)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1242 (Aroclor 1242)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1248 (Aroclor 1248)	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Table E-27
Summary of Data Used in Risk Assessment
South Percolation Pond Area Soil (0-2 ft-bgs) - Current
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-143	CFSB-143	CFSB-143-DUP	CFSB-144	CFSB-144	CFSB-145	CFSB-145	CFSB-146	CFSB-146	CFSB-147	CFSB-147-DUP	CFSB-147	CFSB-148	CFSB-148
Sample Lab IDs	460-144400-8	460-144400-9	460-144400-11	460-144400-17	460-144400-18	460-144478-1	460-144478-2	460-144478-4	460-144478-5	460-144478-8	460-144478-7	460-144478-9	460-144478-11	460-144478-12
Sample Name	CFSB-143-SO-0-0.5	CFSB-143-SO-0.5-2	CFSB-DUP15-SO	CFSB-144-SO-0-0.5	CFSB-144-SO-0.5-2	CFSB-145-SO-0-0.5	CFSB-145-SO-0.5-2	CFSB-146-SO-0-0.5	CFSB-146-SO-0.5-2	CFSB-147-SO-0-0.5	CFSB-DUP16-SO	CFSB-147-SO-0.5-2	CFSB-148-SO-0-0.5	CFSB-148-SO-0.5-2
Sample Depth	0-0.5 ft	0.5-2 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft
Chemical	11/2/2017	11/2/2017	11/2/2017	11/3/2017	11/3/2017	11/6/2017	11/6/2017	11/6/2017	11/6/2017	11/6/2017	11/6/2017	11/6/2017	11/6/2017	11/6/2017
PCB-1254 (Aroclor 1254)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1260 (Aroclor 1260)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1262 (Aroclor 1262)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1268 (Aroclor 1268)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Polychlorinated Biphenyl (PCBs)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SEMIVOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,2,4,5-Tetrachlorobenzene	0.031 U	0.029 U	0.027 U	0.033 U	0.032 U	0.027 U	0.026 U	0.028 U	0.027 U	0.028 U	0.028 U	0.026 U	0.028 U	0.026 U
1,4-Dioxane (P-Dioxane)	0.11 U	0.1 U	0.098 U	0.12 U	0.11 U	0.099 U	0.094 U	0.1 U	0.097 U	0.1 U	0.1 U	0.093 U	0.099 U	0.093 U
2,3,4,6-Tetrachlorophenol	0.039 U	0.037 U	0.035 U	0.041 U	0.04 U	0.035 U	0.033 U	0.035 U	0.034 U	0.036 U	0.035 U	0.033 U	0.035 U	0.033 U
2,4,5-Trichlorophenol	0.041 U	0.039 U	0.036 U	0.044 U	0.043 U	0.037 U	0.035 U	0.037 U	0.036 U	0.038 U	0.037 U	0.035 U	0.037 U	0.035 U
2,4,6-Trichlorophenol	0.012 U	0.011 U	0.01 U	0.013 U	0.012 U	0.01 U	0.0099 U	0.011 U	0.01 U	0.011 U	0.011 U	0.0099 U	0.011 U	0.0099 U
2,4-Dichlorophenol	0.0098 U	0.0092 U	0.0087 U	0.01 U	0.01 U	0.0087 U	0.0083 U	0.0088 U	0.0086 U	0.009 U	0.0089 U	0.0082 U	0.0088 U	0.0082 U
2,4-Dimethylphenol	0.091 U	0.086 U	0.081 U	0.097 U	0.094 U	0.081 U	0.077 U	0.082 U	0.08 U	0.084 U	0.083 U	0.077 U	0.082 U	0.076 U
2,4-Dinitrophenol	0.31 U	0.3 U	0.28 U	0.33 U	0.32 U	0.28 UJ	0.26 U	0.28 U	0.27 U	0.29 U	0.28 U	0.26 U	0.28 U	0.26 U
2,4-Dinitrotoluene	0.016 U	0.015 U	0.015 U	0.017 U	0.017 U	0.015 U	0.014 U	0.015 U	0.014 U	0.015 U	0.015 U	0.014 U	0.015 U	0.014 U
2,6-Dinitrotoluene	0.022 U	0.021 U	0.02 U	0.023 U	0.023 U	0.02 U	0.019 U	0.02 U	0.019 U	0.02 U	0.02 U	0.019 U	0.02 U	0.018 U
2-Chloronaphthalene	0.0094 U	0.0089 U	0.0083 U	0.01 U	0.0097 U	0.0084 U	0.0079 U	0.0085 U	0.0082 U	0.0087 U	0.0085 U	0.0079 U	0.0084 U	0.0079 U
2-Chlorophenol	0.011 U	0.0099 U	0.0093 U	0.011 U	0.011 U	0.0094 U	0.0089 U	0.0095 U	0.0092 U	0.0097 U	0.0095 U	0.0088 U	0.0094 U	0.0088 U
2-Methylnaphthalene	0.0091 U	0.0086 U	0.0081 U	0.0097 U	0.0095 U	0.0081 U	0.0077 U	0.0083 U	0.008 U	0.0084 U	0.0083 U	0.0077 U	0.0082 U	0.0077 U
2-Methylphenol (O-Cresol)	0.018 U	0.017 U	0.016 U	0.019 U	0.019 U	0.016 U	0.015 U	0.016 U	0.016 U	0.017 U	0.016 U	0.015 U	0.016 U	0.015 U
2-Nitroaniline	0.014 U	0.013 U	0.012 U	0.015 U	0.014 U	0.012 U	0.012 U	0.012 U	0.012 U	0.013 U	0.012 U	0.011 U	0.012 U	0.011 U
2-Nitrophenol	0.014 U	0.013 U	0.012 U	0.015 U	0.014 U	0.012 U	0.012 U	0.013 U	0.012 U	0.013 U	0.013 U	0.012 U	0.012 U	0.012 U
3- And 4- Methylphenol (Total)	0.011 U	0.01 U	0.0098 U	0.012 U	0.011 U	0.0098 U	0.0093 U	0.01 U	0.0097 U	0.01 U	0.01 U	0.0093 U	0.0099 U	0.0092 U
3,3'-Dichlorobenzidine	0.046 U	0.044 U	0.041 U	0.049 U	0.048 U	0.041 U	0.039 U	0.042 U	0.04 U	0.043 U	0.042 U	0.039 U	0.041 U	0.039 U
3-Nitroaniline	0.012 U	0.012 U	0.011 U	0.013 U	0.013 U	0.011 U	0.01 U	0.011 U	0.011 U	0.011 U	0.011 U	0.01 U	0.011 U	0.01 U
4,6-Dinitro-2-Methylphenol	0.11 U	0.1 U	0.098 U	0.12 U	0.11 U	0.098 UJ	0.093 U	0.1 U	0.097 U	0.1 U	0.1 U	0.093 U	0.099 U	0.093 U
4-Bromophenyl Phenyl Ether	0.013 U	0.012 U	0.012 U	0.014 U	0.013 U	0.012 U	0.011 U	0.012 U	0.011 U	0.012 U	0.012 U	0.011 U	0.012 U	0.011 U
4-Chloro-3-Methylphenol	0.018 U	0.017 U	0.016 U	0.019 U	0.018 U	0.016 U	0.015 U	0.016 U	0.016 U	0.016 U	0.016 U	0.015 U	0.016 U	0.015 U
4-Chloroaniline	0.011 U	0.01 U	0.0094 U	0.011 U	0.011 U	0.0095 U	0.009 U	0.0096 U	0.0093 U	0.0098 U	0.0096 U	0.009 U	0.0096 U	0.0089 U
4-Chlorophenyl Phenyl Ether	0.012 U	0.012 U	0.011 U	0.013 U	0.013 U	0.011 U	0.01 U	0.011 U	0.011 U	0.011 U	0.011 U	0.01 U	0.011 U	0.01 U
4-Nitroaniline	0.016 U	0.015 U	0.014 U	0.017 U	0.016 U	0.014 U	0.013 U	0.014 U	0.014 U	0.014 U	0.014 U	0.013 U	0.014 U	0.013 U
4-Nitrophenol	0.2 U	0.19 U	0.18 U	0.21 U	0.21 U	0.18 U	0.17 U	0.18 U	0.17 U	0.18 U	0.18 U	0.17 U	0.18 U	0.17 U
Acenaphthene	0.01 U	0.0095 U	0.0089 U	0.011 U	0.01 U	0.0089 U	0.0085 U	0.01 J	0.0088 U	0.0092 U	0.0091 U	0.0084 U	0.009 U	0.0084 U
Acenaphthylene	0.011 U	0.01 U	0.0094 U	0.011 U	0.011 U	0.0095 U	0.009 U	0.0096 U	0.0093 U	0.0098 U	0.0096 U	0.009 U	0.0096 U	0.0089 U
Acetophenone	0.009 U	0.0085 U	0.008 U	0.0096 U	0.0093 U	0.008 U	0.0076 U	0.0082 U	0.0079 U	0.0083 U	0.0082 U	0.0076 U	0.0081 U	0.0076 U
Anthracene	0.039 U	0.037 U	0.035 U	0.042 U	0.041 U	0.035 U	0.033 U	0.036 U	0.034 U	0.036 U	0.036 U	0.033 U	0.035 U	0.033 U
Atrazine	0.018 U	0.017 U	0.016 U	0.02 U	0.019 U	0.016 U	0.016 U	0.017 U	0.016 U	0.017 U	0.017 U	0.015 U	0.017 U	0.015 U
Benzaldehyde	0.032 U	0.03 U	0.028 U	0.055 J	0.033 U	0.028 U	0.027 U	0.029 U	0.028 U	0.029 U	0.029 U	0.027 U	0.028 U	0.026 U
Benzo(A)Anthracene	0.11	0.046	0.031 U	0.037 U	0.036 U	0.054	0.029 U	0.11	0.061	0.042	0.031 U	0.029 U	0.042	0.029 U
Benzo(A)Pyrene	0.15	0.068	0.049	0.013 U	0.013 U	0.082	0.011 U	0.16	0.084	0.067 J	0.011 UJ	0.011 U	0.06	0.01 U
Benzo(B)Fluoranthene	0.25	0.13	0.09	0.017 U	0.017 U	0.13	0.014 U	0.24	0.14	0.12 J	0.015 UJ	0.014 U	0.095	0.014 U
Benzo(G,H,I)Perylene	0.13 J	0.065 J	0.046 J	0.025 U	0.025 U	0.085 J	0.02 U	0.19 J	0.084 J	0.066 J	0.022 UJ	0.02 U	0.021 U	0.02 U
Benzo(K)Fluoranthene	0.091	0.051	0.032 J	0.019 U	0.019 U	0.05	0.015 U	0.092	0.05	0.036 J	0.016 UJ	0.015 U	0.016 U	0.015 U
Benzyl Butyl Phthalate	0.013 U	0.012 U	0.011 U	0.014 U	0.013 U	0.011 U	0.011 U	0.012 U	0.011 U	0.012 U	0.012 U	0.011 U	0.011 U	0.011 U
Biphenyl (Diphenyl)	0.035 U	0.033 U	0.031 U	0.038 U	0.037 U	0.031 U	0.03 U	0.032 U	0.031 U	0.033 U	0.032 U	0.03 U	0.032 U	0.03 U
Bis(2-Chloroethoxy) Methane	0.013 U	0.012 U	0.011 U	0.014 U	0.013 U	0.011 U	0.011 U	0.012 U	0.011 U	0.012 U	0.012 U	0.011 U	0.012 U	0.011 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.0098 U	0.0092 U	0.0087 U	0.01 U	0.01 U	0.0087 UJ	0.0083 U	0.0088 U	0.0086 U	0.009 U	0.0089 U	0.0082 U	0.0088 U	0.0082 U
Bis(2-Chloroisopropyl) Ether	0.017 U	0.016 U	0.015 U	0.018 U	0.018 U	0.015 U	0.014 U	0.015 U	0.015 U	0.016 U	0.015 U	0.014 U	0.015 U	0.014 U
Bis(2-Ethylhexyl) Phthalate	0.016 U	0.015 U	0.014 U	0.017 U	0.017 U	0.014 U	0.014 U	0.015 U	0.014 U	0.015 U	0.015 U	0.014 U	0.015 U	0.014 U
Caprolactam	0.03 U	0.028 U	0.026 U	0.032 U	0.031 U	0.027 U	0.025 U	0.027 U	0.026 U	0.027 U	0.027 U	0.025 U	0.027 U	0.025 U
Carbazole	0.015 J	0.0097 U	0.0091 U	0.011 U	0.011 U	0.0094 J	0.0087 U	0.016 J	0.009 U	0.0095 U	0.0093 U	0.0086 U	0.0092 U	0.0086 U
Chrysene	0.16 J	0.076 J	0.044 J	0.012 U	0.012 U	0.078 J	0.012 J	0.15 J	0.077 J	0.056 J	0.01 UJ	0.0095 U	0.048 J	0.0094 U
Dibenz(A,H)Anthracene	0.055	0.02 U	0.019 U	0.023 U	0.022 U	0.019 U	0.018 U	0.053	0.04	0.02 U	0.02 U	0.018 U	0.019 U	0.018 U
Dibenzofuran	0.013 U	0.012 U	0.011 U	0.013 U	0.013 U	0.011 U	0.011 U	0.011 U	0.011 U	0.012 U	0.011 U	0.011 U	0.011 U	0.01 U
Diethyl Phthalate	0.012 U	0.011 U	0.01 U	0.013 U	0.012 U	0.01 U	0.0099 U	0.011 U	0.01 U	0.011 U	0.011 U	0.0099 U	0.011 U	0.0099 U
Dimethyl Phthalate	0.012 U	0.011 U	0.011 U	0.013 U	0.012 U	0.011 U	0.01 U	0.011 U	0.011 U	0.011 U	0.011 U	0.01 U	0.011 U	0.01 U
Di-N-Butyl Phthalate	0.012 U	0.012 U	0.011 U	0.013 U	0.013 U	0.011 U	0.01 U	0.011 U	0.011 U	0.011 U	0.011 U	0.01 U	0.011 U	0.01 U
Di-N-Octylphthalate	0.021 U	0.02 U	0.019 U	0.022 U	0.022 U	0.019 U	0.018 U	0.019 U	0.018 U	0.019 U	0.019 U	0.018 U	0.019 U	0.018 U

Table E-27
Summary of Data Used in Risk Assessment
South Percolation Pond Area Soil (0-2 ft-bgs) - Current
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-143	CFSB-143	CFSB-143-DUP	CFSB-144	CFSB-144	CFSB-145	CFSB-145	CFSB-146	CFSB-146	CFSB-147	CFSB-147-DUP	CFSB-147	CFSB-148	CFSB-148
Sample Lab IDs	460-144400-8	460-144400-9	460-144400-11	460-144400-17	460-144400-18	460-144478-1	460-144478-2	460-144478-4	460-144478-5	460-144478-8	460-144478-7	460-144478-9	460-144478-11	460-144478-12
Sample Name	CFSB-143-SO-0-0.5	CFSB-143-SO-0.5-2	CFSB-DUP15-SO	CFSB-144-SO-0-0.5	CFSB-144-SO-0.5-2	CFSB-145-SO-0-0.5	CFSB-145-SO-0.5-2	CFSB-146-SO-0-0.5	CFSB-146-SO-0.5-2	CFSB-147-SO-0-0.5	CFSB-DUP16-SO	CFSB-147-SO-0.5-2	CFSB-148-SO-0-0.5	CFSB-148-SO-0.5-2
Sample Depth	0-0.5 ft	0.5-2 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft
Chemical	11/2/2017	11/2/2017	11/2/2017	11/3/2017	11/3/2017	11/6/2017	11/6/2017	11/6/2017	11/6/2017	11/6/2017	11/6/2017	11/6/2017	11/6/2017	11/6/2017
Fluoranthene	0.14 J	0.059 J	0.033 J	0.013 U	0.013 U	0.069 J	0.01 U	0.17 J	0.087 J	0.052 J	0.011 UJ	0.01 U	0.053 J	0.01 U
Fluorene	0.009 U	0.0085 U	0.008 U	0.0096 U	0.0093 U	0.008 U	0.0076 U	0.0082 U	0.0079 U	0.0083 U	0.0082 U	0.0076 U	0.0081 U	0.0076 U
Hexachlorobenzene	0.017 U	0.016 U	0.015 U	0.018 U	0.017 U	0.015 U	0.014 U	0.015 U	0.015 U	0.015 U	0.015 U	0.014 U	0.015 U	0.014 U
Hexachlorobutadiene	0.012 U	0.011 U	0.01 U	0.012 U	0.012 U	0.01 U	0.0098 U	0.011 U	0.01 U	0.011 U	0.011 U	0.0098 U	0.01 U	0.0098 U
Hexachlorocyclopentadiene	0.026 UJ	0.024 UJ	0.023 UJ	0.027 UJ	0.027 UJ	0.023 UJ	0.022 UJ	0.023 UJ	0.023 UJ	0.024 UJ	0.023 UJ	0.022 UJ	0.023 UJ	0.022 UJ
Hexachloroethane	0.015 U	0.014 U	0.013 U	0.016 U	0.016 U	0.014 UJ	0.013 U	0.014 U	0.013 U	0.014 U	0.014 U	0.013 U	0.014 U	0.013 U
Indeno(1,2,3-C,D)Pyrene	0.18	0.092	0.075	0.029 U	0.028 U	0.11	0.031 J	0.23	0.12	0.1 J	0.025 UJ	0.023 U	0.072	0.023 U
Isophorone	0.0089 U	0.0084 U	0.0079 U	0.0094 U	0.0092 U	0.0079 U	0.0075 U	0.008 U	0.0078 U	0.0082 U	0.0081 U	0.0075 U	0.008 U	0.0074 U
Naphthalene	0.011 U	0.0099 U	0.0093 U	0.011 U	0.011 U	0.0094 U	0.0089 U	0.0095 U	0.0092 U	0.0097 U	0.0095 U	0.0088 U	0.0094 U	0.0088 U
Nitrobenzene	0.013 U	0.012 U	0.012 U	0.014 U	0.013 U	0.012 U	0.011 U	0.012 U	0.011 U	0.012 U	0.012 U	0.011 U	0.012 U	0.011 U
N-Nitrosodi-N-Propylamine	0.014 U	0.013 U	0.012 U	0.015 U	0.014 U	0.012 U	0.012 U	0.013 U	0.012 U	0.013 U	0.013 U	0.012 U	0.012 U	0.012 U
N-Nitrosodiphenylamine	0.038 U	0.035 U	0.033 U	0.04 U	0.039 U	0.033 U	0.032 U	0.034 U	0.033 U	0.035 U	0.034 U	0.032 U	0.034 U	0.031 U
Pentachlorophenol	0.05 U	0.047 U	0.044 U	0.053 U	0.052 U	0.045 U	0.042 U	0.045 U	0.044 U	0.046 U	0.045 U	0.042 U	0.045 U	0.042 U
Phenanthrene	0.072 J	0.03 J	0.019 J	0.012 U	0.011 U	0.038 J	0.0093 U	0.11 J	0.051 J	0.025 J	0.01 UJ	0.0093 U	0.032 J	0.0092 U
Phenol	0.014 U	0.013 U	0.012 U	0.014 U	0.014 U	0.012 U	0.011 U	0.012 U	0.012 U	0.012 U	0.012 U	0.011 U	0.012 U	0.011 U
Pyrene	0.19 J	0.079 J	0.046 J	0.02 U	0.019 U	0.086 J	0.016 U	0.21 J	0.11 J	0.065 J	0.017 UJ	0.016 U	0.063 J	0.016 U
VOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,1,1-Trichloroethane	--	0.00029 U	0.00028 U	--	0.00025 U	--	0.00027 U	--	0.00022 U	--	--	0.00024 U	--	0.00025 U
1,1,2,2-Tetrachloroethane	--	0.00026 U	0.00026 U	--	0.00023 U	--	0.00024 U	--	0.0002 U	--	--	0.00022 U	--	0.00023 U
1,1,2-Trichloro-1,2,2-Trifluoroethane	--	0.00037 U	0.00036 U	--	0.00033 U	--	0.00034 U	--	0.00028 U	--	--	0.00031 U	--	0.00033 U
1,1,2-Trichloroethane	--	0.00022 U	0.00022 U	--	0.00019 U	--	0.0002 U	--	0.00017 U	--	--	0.00018 U	--	0.00019 U
1,1-Dichloroethane	--	0.00025 U	0.00025 U	--	0.00022 U	--	0.00023 U	--	0.00019 U	--	--	0.00021 U	--	0.00022 U
1,1-Dichloroethene	--	0.00028 U	0.00027 U	--	0.00024 U	--	0.00026 U	--	0.00021 U	--	--	0.00023 U	--	0.00024 U
1,2,3-Trichlorobenzene	--	0.00022 U	0.00022 U	--	0.0002 U	--	0.00021 U	--	0.00017 U	--	--	0.00018 U	--	0.0002 U
1,2,4-Trichlorobenzene	--	0.00011 U	0.00011 U	--	0.0001 U	--	0.0001 U	--	0.000086 U	--	--	0.000094 U	--	0.0001 U
1,2-Dibromo-3-Chloropropane	--	0.00057 U	0.00056 U	--	0.0005 U	--	0.00052 U	--	0.00043 U	--	--	0.00047 U	--	0.0005 U
1,2-Dibromoethane (Ethylene Dibromide)	--	0.00022 U	0.00022 U	--	0.0002 U	--	0.0002 U	--	0.00017 U	--	--	0.00018 U	--	0.00019 U
1,2-Dichlorobenzene	--	0.00018 U	0.00017 U	--	0.00016 U	--	0.00016 U	--	0.00014 U	--	--	0.00015 U	--	0.00016 U
1,2-Dichloroethane	--	0.00037 U	0.00036 U	--	0.00032 U	--	0.00034 U	--	0.00028 U	--	--	0.0003 U	--	0.00032 U
1,2-Dichloropropane	--	0.00052 U	0.00051 U	--	0.00046 U	--	0.00048 U	--	0.0004 U	--	--	0.00043 U	--	0.00046 U
1,3-Dichlorobenzene	--	0.0002 U	0.00019 U	--	0.00017 U	--	0.00018 U	--	0.00015 U	--	--	0.00016 U	--	0.00017 U
1,4-Dichlorobenzene	--	0.00012 U	0.00012 U	--	0.00011 U	--	0.00011 U	--	0.000094 U	--	--	0.0001 U	--	0.00011 U
2-Hexanone	--	0.00096 U	0.00094 U	--	0.00085 U	--	0.00089 U	--	0.00073 U	--	--	0.00079 U	--	0.00084 U
Acetone	--	0.062 J	0.027 J	--	0.042	--	0.076	--	0.045	--	--	0.038	--	0.037
Benzene	--	0.0022 J	0.0013 J	--	0.0014	--	0.0012	--	0.00061 J	--	--	0.0022	--	0.0022
Bromochloromethane	--	0.00035 U	0.00034 U	--	0.00031 U	--	0.00032 U	--	0.00026 U	--	--	0.00029 U	--	0.0003 U
Bromodichloromethane	--	0.00032 U	0.00031 U	--	0.00028 U	--	0.00029 U	--	0.00024 U	--	--	0.00026 U	--	0.00028 U
Bromoform	--	0.00052 U	0.00051 U	--	0.00046 U	--	0.00048 U	--	0.0004 U	--	--	0.00043 U	--	0.00046 U
Bromomethane	--	0.00058 U	0.00057 U	--	0.00052 U	--	0.00054 U	--	0.00045 U	--	--	0.00048 U	--	0.00051 U
Carbon Disulfide	--	0.0028 J	0.0013 J	--	0.00032 J	--	0.0011	--	0.00065 J	--	--	0.0015	--	0.0038
Carbon Tetrachloride	--	0.00022 U	0.00022 U	--	0.0002 U	--	0.00021 U	--	0.00017 U	--	--	0.00018 U	--	0.0002 U
Chlorobenzene	--	0.00022 U	0.00021 U	--	0.00019 U	--	0.0002 U	--	0.00017 U	--	--	0.00018 U	--	0.00019 U
Chloroethane	--	0.00064 U	0.00063 U	--	0.00057 U	--	0.00059 U	--	0.00049 U	--	--	0.00053 U	--	0.00056 U
Chloroform	--	0.00039 U	0.00039 U	--	0.00035 U	--	0.00036 U	--	0.0003 U	--	--	0.00032 U	--	0.00035 U
Chloromethane	--	0.00054 U	0.00053 U	--	0.00047 U	--	0.0005 U	--	0.00041 U	--	--	0.00044 U	--	0.00047 U
Cis-1,2-Dichloroethylene	--	0.00019 U	0.00018 U	--	0.00017 U	--	0.00017 U	--	0.00014 U	--	--	0.00015 U	--	0.00016 U
Cis-1,3-Dichloropropene	--	0.00034 U	0.00033 U	--	0.0003 U	--	0.00031 U	--	0.00026 U	--	--	0.00028 U	--	0.0003 U
Cyclohexane	--	0.0042 J	0.0025 J	--	0.0019	--	0.0026	--	0.00047 J	--	--	0.0039	--	0.005
Dibromochloromethane	--	0.00024 U	0.00023 U	--	0.00021 U	--	0.00022 U	--	0.00018 U	--	--	0.0002 U	--	0.00021 U
Dichlorodifluoromethane	--	0.00042 U	0.00041 U	--	0.00037 U	--	0.00038 U	--	0.00032 U	--	--	0.00034 U	--	0.00037 U
Ethylbenzene	--	0.00062 J	0.00037 J	--	0.00037 J	--	0.00056 J	--	0.00019 U	--	--	0.00092 J	--	0.0011
Isopropylbenzene (Cumene)	--	0.00016 U	0.00015 U	--	0.00014 U	--	0.00014 U	--	0.00012 U	--	--	0.00013 U	--	0.00014 U
M,P-Xylene	--	0.0018 J	0.00092 J	--	0.001 J	--	0.0015	--	0.00031 J	--	--	0.0023	--	0.0028
Methyl Acetate	--	0.0053 U	0.0052 U	--	0.0047 U	--	0.0049 U	--	0.004 U	--	--	0.0044 U	--	0.0047 U
Methyl Ethyl Ketone (2-Butanone)	--	0.0062 J	0.0035 J	--	0.0044 J	--	0.0059	--	0.0038 J	--	--	0.0037 J	--	0.004 J
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	--	0.00082 U	0.0008 U	--	0.00072 U	--	0.00076 U	--	0.00062 U	--	--	0.00068 U	--	0.00072 U
Methylcyclohexane	--	0.0076 J	0.0043 J	--	0.0034	--	0.0051	--	0.00088 J	--	--	0.0083	--	0.011

Table E-27
Summary of Data Used in Risk Assessment
South Percolation Pond Area Soil (0-2 ft-bgs) - Current
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-143	CFSB-143	CFSB-143-DUP	CFSB-144	CFSB-144	CFSB-145	CFSB-145	CFSB-146	CFSB-146	CFSB-147	CFSB-147-DUP	CFSB-147	CFSB-148	CFSB-148
Sample Lab IDs	460-144400-8	460-144400-9	460-144400-11	460-144400-17	460-144400-18	460-144478-1	460-144478-2	460-144478-4	460-144478-5	460-144478-8	460-144478-7	460-144478-9	460-144478-11	460-144478-12
Sample Name	CFSB-143-SO-0-0.5	CFSB-143-SO-0.5-2	CFSB-DUP15-SO	CFSB-144-SO-0-0.5	CFSB-144-SO-0.5-2	CFSB-145-SO-0-0.5	CFSB-145-SO-0.5-2	CFSB-146-SO-0-0.5	CFSB-146-SO-0.5-2	CFSB-147-SO-0-0.5	CFSB-DUP16-SO	CFSB-147-SO-0.5-2	CFSB-148-SO-0-0.5	CFSB-148-SO-0.5-2
Sample Depth	0-0.5 ft	0.5-2 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft
Chemical	11/2/2017	11/2/2017	11/2/2017	11/3/2017	11/3/2017	11/6/2017	11/6/2017	11/6/2017	11/6/2017	11/6/2017	11/6/2017	11/6/2017	11/6/2017	11/6/2017
Methylene Chloride	--	0.0002 U	0.0002 U	--	0.00018 U	--	0.00019 U	--	0.00015 U	--	--	0.00017 U	--	0.00018 U
O-Xylene (1,2-Dimethylbenzene)	--	0.00063 J	0.00031 J	--	0.00034 J	--	0.00046 J	--	0.00011 J	--	--	0.00077 J	--	0.00083 J
Styrene	--	0.00015 U	0.00015 U	--	0.00013 U	--	0.00014 U	--	0.00012 U	--	--	0.00013 U	--	0.00013 U
Tert-Butyl Methyl Ether	--	0.00015 U	0.00015 U	--	0.00014 U	--	0.00014 U	--	0.00012 U	--	--	0.00013 U	--	0.00014 U
Tetrachloroethylene (PCE)	--	0.00018 U	0.00017 U	--	0.00016 U	--	0.00016 U	--	0.00013 U	--	--	0.00015 U	--	0.00015 U
Toluene	--	0.004 J	0.0023 J	--	0.0024	--	0.0031	--	0.0013	--	--	0.005	--	0.006
Trans-1,2-Dichloroethene	--	0.0003 U	0.0003 U	--	0.00027 U	--	0.00028 U	--	0.00023 U	--	--	0.00025 U	--	0.00027 U
Trans-1,3-Dichloropropene	--	0.00033 U	0.00032 U	--	0.00029 U	--	0.0003 U	--	0.00025 U	--	--	0.00027 U	--	0.00029 U
Trichloroethylene (TCE)	--	0.00018 U	0.00017 U	--	0.00016 U	--	0.00016 U	--	0.00014 U	--	--	0.00015 U	--	0.00016 U
Trichlorofluoromethane	--	0.0005 U	0.00049 U	--	0.00044 U	--	0.00046 U	--	0.00038 U	--	--	0.00041 U	--	0.00044 U
Vinyl Chloride	--	0.00067 U	0.00066 U	--	0.00059 U	--	0.00062 U	--	0.00051 U	--	--	0.00056 U	--	0.00059 U

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-27
Summary of Data Used in Risk Assessment
South Percolation Pond Area Soil (0-2 ft-bgs) - Current
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-151	CFSB-151	CFSB-152	CFSB-152	CFSB-153	CFSB-153
Sample Lab IDs	200-40872-1, 460-144726-8	200-40872-2, 460-144726-9	200-40872-4, 460-144726-6	200-40872-5, 460-144726-7	200-40872-7, 460-144478-14	200-40872-8, 460-144478-15
Sample Name	CFSB-151-SO-0-0.5	CFSB-151-SO-0.5-2	CFSB-152-SO-0-0.5	CFSB-152-SO-0.5-2	CFSB-153-SO-0-0.5	CFSB-153-SO-0.5-2
Sample Depth	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft
Chemical	11/7/2017	11/7/2017	11/7/2017	11/7/2017	11/6/2017	11/6/2017
GENERAL CHEMISTRY (mg/kg)						
Fluoride	18.3 J+	12.4 J+	44.1 J+	24.7 J+	30.4 J+	31.4 J+
Cyanide	0.095 U	0.062 U	1.4	0.44	16.4	0.71
Cyanide (Free)	--	--	--	--	0.56 U	--
METALS (mg/kg)						
"Chromium, Hexavalent - Estimated"	0.305109	0.232847	0.374696	0.120438	0.877859	0.481752
"Chromium, Trivalent - Estimated"	11.0949	8.46715	13.6253	4.37956	31.9221	17.5182
Aluminum	11000	8100	10400	5740	16100	11600
Antimony	0.42 UJ	0.27 UJ	0.5 UJ	0.3 UJ	0.67 J-	0.54 UJ
Arsenic	1.8	1.6	3.7	2.4	2.9	2.7
Barium	227	152	706	172	380	260
Beryllium	0.36 J	0.39	0.37 J	0.19 J	0.79	0.62 J
Cadmium	0.45 U	0.28 U	1.1 J	0.32 U	2.5	1.5 J
Calcium	122000	26700	220000	22400	28700	24300
Chromium, Total	11.4	8.7	14	4.5	32.8	18
Cobalt	6.1	5	5.3	6.1	4	4.3
Copper	20.9	16	206	119	694 J	374 J
Iron	14200	11600	8960	16300	10500	10200
Lead	12.7	6.6	35.1	5.1	116	75.4
Magnesium	14800	7600	8360	3120	6830	7440
Manganese	226	106	96	72.4	69.4 J	80.1 J
Mercury	0.018 U	0.012 U	0.26	0.082	1.4	0.9
Nickel	14.9	11.1	24.5	9.5	53.9	26.6
Potassium	882	749	1140	614	845	736
Selenium	0.39 U	0.25 U	1.1 J	0.28 U	1.3 J	0.61 J
Silver	0.82 U	0.52 U	1.7	0.59 U	23.5	4.2
Sodium	57.1 U	40.3 J	280	270	184	111 J
Thallium	0.17 U	0.11 U	0.2 J	0.12 U	0.24 U	0.21 U
Vanadium	12.7	10	14.4	55.7	26.2	17.6
Zinc	63	41.3	225	37.1	351	266
PESTICIDES (mg/kg)						
Aldrin	--	--	--	--	--	--
Alpha Bhc (Alpha Hexachlorocyclohexane)	--	--	--	--	--	--
Alpha Endosulfan	--	--	--	--	--	--
Beta Bhc (Beta Hexachlorocyclohexane)	--	--	--	--	--	--
Beta Endosulfan	--	--	--	--	--	--
cis-Chlordane	--	--	--	--	--	--
Delta BHC (Delta Hexachlorocyclohexane)	--	--	--	--	--	--
Dieldrin	--	--	--	--	--	--
Endosulfan Sulfate	--	--	--	--	--	--
Endrin	--	--	--	--	--	--
Endrin Aldehyde	--	--	--	--	--	--
Endrin Ketone	--	--	--	--	--	--
Gamma Bhc (Lindane)	--	--	--	--	--	--
Heptachlor	--	--	--	--	--	--
Heptachlor Epoxide	--	--	--	--	--	--
Methoxychlor	--	--	--	--	--	--
P,P'-DDD	--	--	--	--	--	--
P,P'-DDE	--	--	--	--	--	--
P,P'-DDT	--	--	--	--	--	--
Toxaphene	--	--	--	--	--	--
trans-Chlordane	--	--	--	--	--	--
POLYCHLORINATED BIPHENYLS (mg/kg)						
PCB-1016 (Aroclor 1016)	--	--	--	--	--	--
PCB-1221 (Aroclor 1221)	--	--	--	--	--	--
PCB-1232 (Aroclor 1232)	--	--	--	--	--	--
PCB-1242 (Aroclor 1242)	--	--	--	--	--	--
PCB-1248 (Aroclor 1248)	--	--	--	--	--	--

Table E-27
Summary of Data Used in Risk Assessment
South Percolation Pond Area Soil (0-2 ft-bgs) - Current
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-151	CFSB-151	CFSB-152	CFSB-152	CFSB-153	CFSB-153
Sample Lab IDs	200-40872-1, 460-144726-8	200-40872-2, 460-144726-9	200-40872-4, 460-144726-6	200-40872-5, 460-144726-7	200-40872-7, 460-144478-14	200-40872-8, 460-144478-15
Sample Name	CFSB-151-SO-0-0.5	CFSB-151-SO-0.5-2	CFSB-152-SO-0-0.5	CFSB-152-SO-0.5-2	CFSB-153-SO-0-0.5	CFSB-153-SO-0.5-2
Sample Depth	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft
Chemical	11/7/2017	11/7/2017	11/7/2017	11/7/2017	11/6/2017	11/6/2017
PCB-1254 (Aroclor 1254)	--	--	--	--	--	--
PCB-1260 (Aroclor 1260)	--	--	--	--	--	--
PCB-1262 (Aroclor 1262)	--	--	--	--	--	--
PCB-1268 (Aroclor 1268)	--	--	--	--	--	--
Polychlorinated Biphenyl (PCBs)	--	--	--	--	--	--
SEMIVOLATILE ORGANIC COMPOUNDS (mg/kg)						
1,2,4,5-Tetrachlorobenzene	0.041 U	0.028 U	0.046 U	0.033 U	0.45 U	0.2 U
1,4-Dioxane (P-Dioxane)	0.15 U	0.1 U	0.16 U	0.12 U	1.6 U	0.73 U
2,3,4,6-Tetrachlorophenol	0.052 U	0.035 U	0.058 U	0.042 U	0.56 U	0.26 U
2,4,5-Trichlorophenol	0.055 U	0.037 U	0.061 U	0.044 U	0.6 U	0.27 U
2,4,6-Trichlorophenol	0.016 U	0.011 U	0.017 U	0.013 U	0.17 U	0.077 U
2,4-Dichlorophenol	0.013 U	0.0089 U	0.014 U	0.01 U	0.14 U	0.064 U
2,4-Dimethylphenol	0.12 UJ	0.083 UJ	0.13 UJ	0.097 UJ	1.3 U	0.6 U
2,4-Dinitrophenol	0.42 U	0.28 U	0.46 U	0.33 U	4.5 U	2.1 U
2,4-Dinitrotoluene	0.022 U	0.015 U	0.024 U	0.018 U	0.24 U	0.11 U
2,6-Dinitrotoluene	0.03 U	0.02 U	0.033 U	0.024 U	0.32 U	0.14 U
2-Chloronaphthalene	0.013 U	0.0085 U	0.014 U	0.01 U	0.14 U	0.062 U
2-Chlorophenol	0.014 U	0.0096 U	0.016 U	0.011 U	0.15 U	0.069 U
2-Methylnaphthalene	0.012 U	0.0083 U	0.014 U	0.0098 U	0.13 U	0.06 U
2-Methylphenol (O-Cresol)	0.024 U	0.016 U	0.027 U	0.019 U	0.26 U	0.12 U
2-Nitroaniline	0.018 U	0.012 U	0.02 U	0.015 U	0.2 U	0.09 U
2-Nitrophenol	0.019 U	0.013 U	0.021 U	0.015 U	0.2 U	0.091 U
3- And 4- Methylphenol (Total)	0.015 U	0.01 U	0.016 U	0.012 U	0.16 U	0.072 U
3,3'-Dichlorobenzidine	0.062 U	0.042 U	0.068 U	0.049 U	0.67 U	0.3 U
3-Nitroaniline	0.017 U	0.011 U	0.018 U	0.013 U	0.18 U	0.081 U
4,6-Dinitro-2-Methylphenol	0.15 U	0.1 U	0.16 U	0.12 U	1.6 U	0.73 U
4-Bromophenyl Phenyl Ether	0.018 U	0.012 U	0.019 U	0.014 U	0.19 U	0.086 U
4-Chloro-3-Methylphenol	0.024 U	0.016 U	0.026 U	0.019 U	0.26 U	0.12 U
4-Chloroaniline	0.014 U	0.0097 U	0.016 U	0.011 U	1.9 J	0.89 J
4-Chlorophenyl Phenyl Ether	0.017 U	0.011 U	0.018 U	0.013 U	0.18 U	0.081 U
4-Nitroaniline	0.021 U	0.014 U	0.023 U	0.017 U	0.23 U	0.1 U
4-Nitrophenol	0.27 U	0.18 U	0.29 U	0.21 U	2.9 U	1.3 U
Acenaphthene	0.013 U	0.0091 U	0.015 U	0.011 U	0.14 U	0.066 U
Acenaphthylene	0.014 U	0.0097 U	0.016 U	0.011 U	0.15 U	0.07 U
Acetophenone	0.012 U	0.0082 U	0.013 U	0.0096 U	0.13 U	0.059 U
Anthracene	0.053 U	0.036 U	0.058 U	0.042 U	0.57 U	0.26 U
Atrazine	0.025 U	0.017 U	0.027 U	0.02 U	0.27 U	0.12 U
Benzaldehyde	0.042 U	0.029 U	0.047 U	0.034 U	0.46 U	0.21 U
Benzo(A)Anthracene	0.053 J	0.031 U	0.2	0.037 U	0.5 U	0.75
Benzo(A)Pyrene	0.059	0.034 J	0.019 U	0.013 U	2.8	4
Benzo(B)Fluoranthene	0.11	0.072	0.024 U	0.017 U	6.6	5
Benzo(G,H,I)Perylene	0.045 J	0.035 J	0.035 U	0.025 U	2.7 J	1.3 J
Benzo(K)Fluoranthene	0.046 J	0.027 J	0.14	0.088	0.26 U	0.12 U
Benzyl Butyl Phthalate	0.017 U	0.012 U	0.019 U	0.014 U	0.18 U	0.084 U
Biphenyl (Diphenyl)	0.048 U	0.032 U	0.052 U	0.038 U	0.51 U	0.23 U
Bis(2-Chloroethoxy) Methane	0.017 U	0.012 U	0.019 U	0.014 U	0.19 U	0.085 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.013 U	0.0089 U	0.014 U	0.01 U	0.14 U	0.064 U
Bis(2-Chloroisopropyl) Ether	0.023 U	0.015 U	0.025 U	0.018 U	0.25 U	0.11 U
Bis(2-Ethylhexyl) Phthalate	0.022 U	0.11 J	0.074 J	0.076 J	0.23 U	2.2 J
Caprolactam	0.04 U	0.027 U	0.044 U	0.032 U	0.43 U	0.2 U
Carbazole	0.014 U	0.0093 U	0.1 J	0.067 J	0.97 J	0.31 J
Chrysene	0.067 J	0.036 J	0.34 J	0.2 J	2.6 J	1.8 J
Dibenz(A,H)Anthracene	0.029 U	0.02 U	0.032 U	0.023 U	0.31 U	0.44
Dibenzofuran	0.017 U	0.011 U	0.019 U	0.013 U	0.18 U	0.082 U
Diethyl Phthalate	0.016 U	0.011 U	0.017 U	0.013 U	0.17 U	0.077 U
Dimethyl Phthalate	0.016 U	0.011 U	0.018 U	0.013 U	0.17 U	0.079 U
Di-N-Butyl Phthalate	0.017 U	0.011 U	0.018 U	0.013 U	0.18 U	0.081 U
Di-N-Octylphthalate	0.028 U	0.019 U	0.031 U	0.022 U	0.3 U	0.14 U

Table E-27
Summary of Data Used in Risk Assessment
South Percolation Pond Area Soil (0-2 ft-bgs) - Current
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-151	CFSB-151	CFSB-152	CFSB-152	CFSB-153	CFSB-153
Sample Lab IDs	200-40872-1, 460-144726-8	200-40872-2, 460-144726-9	200-40872-4, 460-144726-6	200-40872-5, 460-144726-7	200-40872-7, 460-144478-14	200-40872-8, 460-144478-15
Sample Name	CFSB-151-SO-0-0.5	CFSB-151-SO-0.5-2	CFSB-152-SO-0-0.5	CFSB-152-SO-0.5-2	CFSB-153-SO-0-0.5	CFSB-153-SO-0.5-2
Sample Depth	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft
Chemical	11/7/2017	11/7/2017	11/7/2017	11/7/2017	11/6/2017	11/6/2017
Fluoranthene	0.094 J	0.047 J	0.31 J	0.19 J	1.3 J	0.86 J
Fluorene	0.012 U	0.0082 U	0.013 U	0.0096 U	0.13 U	0.059 U
Hexachlorobenzene	0.023 U	0.015 U	0.025 U	0.018 U	0.24 U	0.11 U
Hexachlorobutadiene	0.016 U	0.011 U	0.017 U	0.012 U	0.17 U	0.077 U
Hexachlorocyclopentadiene	0.035 UJ	0.023 UJ	0.038 UJ	0.028 UJ	0.37 UJ	0.17 UJ
Hexachloroethane	0.02 U	0.014 U	0.022 U	0.016 U	0.22 U	0.1 U
Indeno(1,2,3-C,D)Pyrene	0.06	0.044	0.041 U	0.029 U	3.1	2.2
Isophorone	0.012 U	0.0081 U	0.013 U	0.0095 U	0.13 U	0.058 U
Naphthalene	0.014 U	0.0096 U	0.016 U	0.011 U	0.15 U	0.069 U
Nitrobenzene	0.018 U	0.012 U	0.019 U	0.014 U	0.19 U	0.086 U
N-Nitrosodi-N-Propylamine	0.019 U	0.013 U	0.021 U	0.015 U	0.2 U	0.091 U
N-Nitrosodiphenylamine	0.051 U	0.034 U	0.056 U	0.04 U	0.54 U	0.25 U
Pentachlorophenol	0.067 U	0.045 U	0.074 U	0.053 U	0.72 U	0.33 U
Phenanthrene	0.047 J	0.023 J	0.13 J	0.089 J	0.55 J	0.28 J
Phenol	0.018 U	0.012 U	0.02 U	0.014 U	0.2 U	0.089 U
Pyrene	0.09 J	0.043 J	0.25 J	0.14 J	1.3 J	0.93 J
VOLATILE ORGANIC COMPOUNDS (mg/kg)						
1,1,1-Trichloroethane	--	0.00021 U	--	0.00026 U	--	0.00036 U
1,1,2,2-Tetrachloroethane	--	0.0002 U	--	0.00024 U	--	0.00033 UJ
1,1,2-Trichloro-1,2,2-Trifluoroethane	--	0.00028 U	--	0.00034 U	--	0.00046 U
1,1,2-Trichloroethane	--	0.00016 U	--	0.0002 U	--	0.00027 U
1,1-Dichloroethane	--	0.00019 U	--	0.00023 U	--	0.00031 U
1,1-Dichloroethene	--	0.00021 U	--	0.00025 U	--	0.00034 U
1,2,3-Trichlorobenzene	--	0.00017 U	--	0.0002 U	--	0.00028 UJ
1,2,4-Trichlorobenzene	--	0.000084 U	--	0.0001 U	--	0.00014 UJ
1,2-Dibromo-3-Chloropropane	--	0.00042 UJ	--	0.00052 UJ	--	0.0007 UJ
1,2-Dibromoethane (Ethylene Dibromide)	--	0.00016 U	--	0.0002 U	--	0.00027 U
1,2-Dichlorobenzene	--	0.00013 U	--	0.00016 U	--	0.00022 UJ
1,2-Dichloroethane	--	0.00027 U	--	0.00033 U	--	0.00045 U
1,2-Dichloropropane	--	0.00039 U	--	0.00048 U	--	0.00064 U
1,3-Dichlorobenzene	--	0.00015 U	--	0.00018 U	--	0.00024 UJ
1,4-Dichlorobenzene	--	0.000092 U	--	0.00011 U	--	0.00074 J+
2-Hexanone	--	0.00071 U	--	0.00088 U	--	0.0012 U
Acetone	--	0.036	--	0.059	--	0.063
Benzene	--	0.0005 J	--	0.00031 J	--	0.0011 J
Bromochloromethane	--	0.00026 U	--	0.00032 U	--	0.00043 U
Bromodichloromethane	--	0.00024 U	--	0.00029 U	--	0.00039 U
Bromoform	--	0.00039 U	--	0.00048 U	--	0.00065 U
Bromomethane	--	0.00043 U	--	0.00053 U	--	0.00072 U
Carbon Disulfide	--	0.014	--	0.0021	--	0.0034
Carbon Tetrachloride	--	0.00017 U	--	0.0002 U	--	0.00028 U
Chlorobenzene	--	0.00016 U	--	0.0002 U	--	0.00027 U
Chloroethane	--	0.00048 U	--	0.00059 U	--	0.0008 U
Chloroform	--	0.00029 U	--	0.00036 U	--	0.00049 U
Chloromethane	--	0.0004 U	--	0.00049 U	--	0.00066 U
Cis-1,2-Dichloroethylene	--	0.00014 U	--	0.00017 U	--	0.00023 U
Cis-1,3-Dichloropropene	--	0.00025 UJ	--	0.00031 UJ	--	0.00042 U
Cyclohexane	--	0.00066 J	--	0.00025 U	--	0.00085 J
Dibromochloromethane	--	0.00018 U	--	0.00022 U	--	0.0003 U
Dichlorodifluoromethane	--	0.00031 U	--	0.00038 U	--	0.00052 U
Ethylbenzene	--	0.00019 J	--	0.00022 U	--	0.00041 J
Isopropylbenzene (Cumene)	--	0.00012 U	--	0.00014 U	--	0.00019 U
M,P-Xylene	--	0.00049 J	--	0.00025 J	--	0.00095 J
Methyl Acetate	--	0.0039 UJ	--	0.0048 UJ	--	0.0066 U
Methyl Ethyl Ketone (2-Butanone)	--	0.0061	--	0.0077	--	0.0094
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	--	0.00061 U	--	0.00075 U	--	0.001 U
Methylcyclohexane	--	0.0012	--	0.00027 J	--	0.0013 J

Table E-27
Summary of Data Used in Risk Assessment
South Percolation Pond Area Soil (0-2 ft-bgs) - Current
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-151	CFSB-151	CFSB-152	CFSB-152	CFSB-153	CFSB-153
Sample Lab IDs	200-40872-1, 460-144726-8	200-40872-2, 460-144726-9	200-40872-4, 460-144726-6	200-40872-5, 460-144726-7	200-40872-7, 460-144478-14	200-40872-8, 460-144478-15
Sample Name	CFSB-151-SO-0-0.5	CFSB-151-SO-0.5-2	CFSB-152-SO-0-0.5	CFSB-152-SO-0.5-2	CFSB-153-SO-0-0.5	CFSB-153-SO-0.5-2
Sample Depth	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft
Chemical	11/7/2017	11/7/2017	11/7/2017	11/7/2017	11/6/2017	11/6/2017
Methylene Chloride	--	0.00015 U	--	0.00018 U	--	0.00025 U
O-Xylene (1,2-Dimethylbenzene)	--	0.00014 J	--	0.00011 U	--	0.00035 J
Styrene	--	0.00011 U	--	0.00014 U	--	0.00019 U
Tert-Butyl Methyl Ether	--	0.00011 U	--	0.00014 U	--	0.00019 U
Tetrachloroethylene (PCE)	--	0.00013 U	--	0.00016 U	--	0.00022 U
Toluene	--	0.00099	--	0.0007 U	--	0.0022
Trans-1,2-Dichloroethene	--	0.00023 U	--	0.00028 U	--	0.00037 U
Trans-1,3-Dichloropropene	--	0.00024 UJ	--	0.0003 UJ	--	0.00041 U
Trichloroethylene (TCE)	--	0.00013 U	--	0.00016 U	--	0.00022 U
Trichlorofluoromethane	--	0.00037 U	--	0.00046 U	--	0.00062 U
Vinyl Chloride	--	0.0005 U	--	0.00062 U	--	0.00083 U

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-28
Summary of Data Used in Risk Assessment
South Percolation Pond Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-061	CFMW-061	CFMW-061	CFMW-064	CFMW-064	CFMW-064	CFSB-101	CFSB-101	CFSB-101	CFSB-102	CFSB-102	CFSB-102	CFSB-104	CFSB-104
Sample Lab IDs	460-116987-13	460-116987-14	460-116987-15	460-116987-2	460-116987-3	460-116987-4	460-117506-1	460-117506-2	460-117506-3	460-117124-10	460-117124-11	460-117124-12	460-117124-7	460-117124-8
Sample Name	CFMW-061-SO-0-0.5	CFMW-061-SO-0.5-2	CFMW-061-SO-10-12	CFMW-064-SO-0-0.5	CFMW-064-SO-0.5-2	CFMW-064-SO-10-12	CFSB-101-SO-0-0.5	CFSB-101-SO-0.5-2	CFSB-101-SO-10-12	CFSB-102-SO-0-0.5	CFSB-102-SO-0.5-2	CFSB-102-SO-10-12	CFSB-104-SO-0-0.5	CFSB-104-SO-0.5-2
Sample Depth	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft
Chemical	7/12/2016	7/12/2016	7/12/2016	7/11/2016	7/11/2016	7/11/2016	7/21/2016	7/21/2016	7/21/2016	7/13/2016	7/13/2016	7/13/2016	7/13/2016	7/13/2016
GENERAL CHEMISTRY (mg/kg)														
Fluoride	3.06 J	4.88 J	5.33 J	15 J	15.2 J	8.05 J	18.5 J+	10.2 J+	8.08 J+	7.21 J	8.74 J	5.76 J	12.6 J	11.4 J
Cyanide	0.061 J	0.062 J	0.018 U	0.17	0.042 J	0.044 J	0.7	0.3	0.27	0.6	0.33	0.15	0.4	0.33
Cyanide (Free)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
METALS (mg/kg)														
"Chromium, Hexavalent - Estimated"	0.214112	0.270316	0.33455	0.259611	0.272993	0.302433	0.272993	0.248905	0.219465	0.243552	0.190024	0.176642	0.227494	0.23017
"Chromium, Trivalent - Estimated"	7.78589	9.82968	12.1655	9.44039	9.92701	10.9976	9.92701	9.05109	7.98054	8.85645	6.90998	6.42336	8.27251	8.36983
Aluminum	8430	10500	6980	10000	8810	7660	11800	8020	6850	7170	6590	7290	5520	5870
Antimony	0.4 U	0.41 U	0.41 U	0.48 U	0.42 U	0.43 U	0.54 UJ	0.52 UJ	0.52 UJ	0.49 UJ	0.42 UJ	0.44 UJ	0.67 UJ	0.51 UJ
Arsenic	3.5	4.5	3.3	4.6	4.6	4.2	2.4	3.2	3.5	1.3	1.3	1.7	1.2 J	1.3
Barium	74	85.7	87.9	98.7	85.9	82.1	174	85.5	55.2	242	65.4	44.5	459	181
Beryllium	0.38 J	0.43	0.36 J	0.4 J	0.4 J	0.31 J	0.39 J	0.55	0.35 J	0.51	0.47	0.39 J	0.21 U	0.36 J
Cadmium	0.31 U	0.31 U	0.31 U	0.37 U	0.32 U	0.32 U	0.41 U	0.4 U	0.39 U	0.37 U	0.32 U	0.33 U	0.51 U	0.39 U
Calcium	7410	33900	13800	9450	13200	28800	8540	5450	3670	77200	21200	8090	168000	55500
Chromium, Total	8	10.1	12.5	9.7	10.2	11.3	10.2	9.3	8.2	9.1 J	7.1 J	6.6 J	8.5 J	8.6 J
Cobalt	4.7	4.8	5	5.7	6.1	5.2	5.5	4.2	4	3.9	4.3	4.2	2.5 J	3.1
Copper	13.9	19.2	14.3	18.3	14.7	15.8	39.4	9.1	8	44.3	25	12.4	87.5	44.8
Iron	11300	14200	12800	14100	15800	14100	12600	12600	12200	8430 J	9270 J	10600 J	4030 J	7510 J
Lead	8.9	8.9	5.1	12.4	8.1	7	12.9	6.3	5.6	11.5	7.5	5.9	14.4	8.4
Magnesium	8370	11600	8890	8460	10300	16900	8340	8110	7210	6650	8270	8670	5040	5810
Manganese	332	355	244	359	284	280	111	71	78.2	73.5 J	78 J	106 J	40.8 J	83.2 J
Mercury	0.023	0.032	0.014 J	0.049	0.025	0.022	0.034	0.017 J	0.014 U	0.054	0.048	0.012 U	0.12	0.1
Nickel	12.7	11.7	11	18.1	12.8	11.5	15.8	9	8.4	14.7 J	11.5 J	8.3 J	17.5 J	12.8 J
Potassium	638	749	645	1050	818	810	1080	929	656	534	501	472	344	432
Selenium	0.38 U	0.39 U	0.39 U	0.45 U	0.4 U	0.4 U	0.5 U	0.49 U	0.48 U	0.46 U	0.39 U	0.41 U	0.63 U	0.48 U
Silver	0.74 U	0.76 U	0.75 U	0.88 U	0.77 U	0.78 U	0.98 U	0.96 U	0.95 U	0.9 U	0.76 U	0.81 U	1.2 U	0.94 U
Sodium	37.6 U	38.7 U	58.5 J	45.2 U	39.5 U	48.9 J	78 J	56.7 J	48.3 U	87 J	47.4 J	259	180	74.8 J
Thallium	0.15 U	0.16 U	0.16 U	0.18 U	0.16 U	0.16 U	0.2 U	0.2 U	0.2 U	0.19 U	0.16 U	0.17 U	0.25 U	0.19 U
Vanadium	9.3	10.2	10.9	15.1	16.2	14.4	14.2	13.2	13.6	7.1 J	6.3 J	7.3 J	5.5 J	6.4 J
Zinc	37.4	41.7	33.6	49.8	41.4	35.1	64.9	29.2	29	79.5	54	34.4	100	68.3
PESTICIDES (mg/kg)														
Aldrin	--	--	0.00086 U	0.001 U	--	--	0.0011 U	--	--	--	--	--	0.0013 U	--
Alpha Bhc (Alpha Hexachlorocyclohexane)	--	--	0.00065 U	0.00079 U	--	--	0.00083 U	--	--	--	--	--	0.001 U	--
Alpha Endosulfan	--	--	0.00098 U	0.0012 U	--	--	0.0013 U	--	--	--	--	--	0.0015 U	--
Beta Bhc (Beta Hexachlorocyclohexane)	--	--	0.00069 U	0.00084 U	--	--	0.00089 U	--	--	--	--	--	0.0011 U	--
Beta Endosulfan	--	--	0.0011 U	0.0014 U	--	--	0.0014 U	--	--	--	--	--	0.0017 U	--
cis-Chlordane	--	--	0.0012 U	0.0014 U	--	--	0.0015 U	--	--	--	--	--	0.0018 U	--
Delta BHC (Delta Hexachlorocyclohexane)	--	--	0.00077 U	0.00094 U	--	--	0.001 U	--	--	--	--	--	0.0012 U	--
Dieldrin	--	--	0.00092 U	0.0011 U	--	--	0.0012 U	--	--	--	--	--	0.0014 U	--
Endosulfan Sulfate	--	--	0.00083 U	0.001 U	--	--	0.0011 U	--	--	--	--	--	0.0013 U	--
Endrin	--	--	0.0009 U	0.0011 U	--	--	0.0012 U	--	--	--	--	--	0.0014 U	--
Endrin Aldehyde	--	--	0.00088 U	0.0011 U	--	--	0.0011 U	--	--	--	--	--	0.0014 U	--
Endrin Ketone	--	--	0.00098 U	0.0012 U	--	--	0.0013 U	--	--	--	--	--	0.0015 U	--
Gamma Bhc (Lindane)	--	--	0.00064 U	0.00078 U	--	--	0.00082 U	--	--	--	--	--	0.00099 U	--
Heptachlor	--	--	0.00091 U	0.0011 U	--	--	0.0012 U	--	--	--	--	--	0.0014 U	--
Heptachlor Epoxide	--	--	0.0014 U	0.0017 U	--	--	0.0018 U	--	--	--	--	--	0.0022 U	--
Methoxychlor	--	--	0.0015 U	0.0018 U	--	--	0.0019 U	--	--	--	--	--	0.0023 U	--
P,P'-DDD	--	--	0.00093 U	0.0011 U	--	--	0.0012 U	--	--	--	--	--	0.0014 U	--
P,P'-DDE	--	--	0.001 U	0.0013 U	--	--	0.0013 U	--	--	--	--	--	0.0016 U	--
P,P'-DDT	--	--	0.00073 U	0.00089 U	--	--	0.00094 U	--	--	--	--	--	0.0011 U	--
Toxaphene	--	--	0.021 U	0.025 U	--	--	0.027 U	--	--	--	--	--	0.032 U	--
trans-Chlordane	--	--	0.0015 U	0.0019 U	--	--	0.002 U	--	--	--	--	--	0.0024 U	--
POLYCHLORINATED BIPHENYLS (mg/kg)														
PCB-1016 (Aroclor 1016)	0.0094 U	0.0093 U	0.0094 U	0.012 U	0.01 U	0.0094 U	0.012 U	0.012 U	0.012 U	0.012 U	0.01 U	0.0097 U	0.015 U	0.013 U
PCB-1221 (Aroclor 1221)	0.0094 U	0.0093 U	0.0094 U	0.012 U	0.01 U	0.0094 U	0.012 U	0.012 U	0.012 U	0.012 U	0.01 U	0.0097 U	0.015 U	0.013 U
PCB-1232 (Aroclor 1232)	0.0094 U	0.0093 U	0.0094 U	0.012 U	0.01 U	0.0094 U	0.012 U	0.012 U	0.012 U	0.012 U	0.01 U	0.0097 U	0.015 U	0.013 U
PCB-1242 (Aroclor 1242)	0.0094 U	0.0093 U	0.0094 U	0.012 U	0.01 U	0.0094 U	0.012 U	0.012 U	0.012 U	0.012 U	0.01 U	0.0097 U	0.015 U	0.013 U
PCB-1248 (Aroclor 1248)	0.0094 U	0.0093 U	0.0094 U	0.012 U	0.01 U	0.0094 U	0.012 U	0.012 U	0.012 U	0.012 U	0.01 U	0.0097 U	0.015 U	0.013 U
PCB-1254 (Aroclor 1254)	0.0097 U	0.0096 U	0.0098 U	0.012 U	0.01 U	0.0097 U	0.013 U	0.012 U	0.012 U	0.012 U	0.01 U	0.01 U	0.015 U	0.014 U

Table E-28
Summary of Data Used in Risk Assessment
South Percolation Pond Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-061	CFMW-061	CFMW-061	CFMW-064	CFMW-064	CFMW-064	CFSB-101	CFSB-101	CFSB-101	CFSB-102	CFSB-102	CFSB-102	CFSB-104	CFSB-104
Sample Lab IDs	460-116987-13	460-116987-14	460-116987-15	460-116987-2	460-116987-3	460-116987-4	460-117506-1	460-117506-2	460-117506-3	460-117124-10	460-117124-11	460-117124-12	460-117124-7	460-117124-8
Sample Name	CFMW-061-SO-0-0.5	CFMW-061-SO-0.5-2	CFMW-061-SO-10-12	CFMW-064-SO-0-0.5	CFMW-064-SO-0.5-2	CFMW-064-SO-10-12	CFSB-101-SO-0-0.5	CFSB-101-SO-0.5-2	CFSB-101-SO-10-12	CFSB-102-SO-0-0.5	CFSB-102-SO-0.5-2	CFSB-102-SO-10-12	CFSB-104-SO-0-0.5	CFSB-104-SO-0.5-2
Sample Depth	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft
Chemical	7/12/2016	7/12/2016	7/12/2016	7/11/2016	7/11/2016	7/11/2016	7/21/2016	7/21/2016	7/21/2016	7/13/2016	7/13/2016	7/13/2016	7/13/2016	7/13/2016
PCB-1260 (Aroclor 1260)	0.0097 U	0.0096 U	0.0098 U	0.012 U	0.01 U	0.0097 U	0.013 U	0.012 U	0.012 U	0.012 U	0.01 U	0.01 U	0.015 U	0.014 U
PCB-1262 (Aroclor 1262)	0.0097 U	0.0096 U	0.0098 U	0.012 U	0.01 U	0.0097 U	0.013 U	0.012 U	0.012 U	0.012 U	0.01 U	0.01 U	0.015 U	0.014 U
PCB-1268 (Aroclor 1268)	0.0097 U	0.0096 U	0.0098 U	0.012 U	0.01 U	0.0097 U	0.013 U	0.012 U	0.012 U	0.012 U	0.01 U	0.01 U	0.015 U	0.014 U
Polychlorinated Biphenyl (PCBs)	0.0097 U	0.0096 U	0.0098 U	0.012 U	0.01 U	0.0097 U	0.013 U	0.012 U	0.012 U	0.012 U	0.01 U	0.01 U	0.015 U	0.014 U
SEMIVOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,2,4,5-Tetrachlorobenzene	0.026 U	0.026 U	0.026 U	0.032 U	0.028 U	0.026 UJ	0.034 U	0.033 U	0.032 U	0.032 U	0.028 U	0.027 U	0.04 U	0.036 U
1,4-Dioxane (P-Dioxane)	0.093 U	0.092 U	0.094 U	0.11 U	0.1 U	0.093 U	0.12 U	0.12 U	0.12 U	0.11 U	0.1 U	0.097 U	0.15 U	0.13 U
2,3,4,6-Tetrachlorophenol	0.033 U	0.032 U	0.033 U	0.04 UJ	0.035 UJ	0.033 UJ	0.042 U	0.042 U	0.041 U	0.04 U	0.035 U	0.034 U	0.051 U	0.046 U
2,4,5-Trichlorophenol	0.035 U	0.034 U	0.035 U	0.042 U	0.037 U	0.035 UJ	0.045 U	0.044 U	0.043 U	0.043 U	0.037 U	0.036 U	0.054 U	0.048 U
2,4,6-Trichlorophenol	0.0099 U	0.0098 U	0.01 U	0.012 U	0.011 U	0.0099 UJ	0.013 U	0.013 U	0.012 U	0.012 U	0.011 U	0.01 U	0.015 U	0.014 U
2,4-Dichlorophenol	0.0082 U	0.0081 U	0.0083 U	0.01 U	0.0088 U	0.0082 UJ	0.011 U	0.01 U	0.01 U	0.01 U	0.0088 U	0.0085 U	0.013 U	0.011 U
2,4-Dimethylphenol	0.077 U	0.076 U	0.077 U	0.094 U	0.082 U	0.077 UJ	0.099 U	0.098 U	0.095 U	0.094 U	0.082 U	0.079 U	0.12 U	0.11 U
2,4-Dinitrophenol	0.26 U	0.26 U	0.27 U	0.32 U	0.28 U	0.26 UJ	0.34 U	0.34 U	0.33 U	0.32 U	0.28 U	0.27 U	0.41 U	0.37 U
2,4-Dinitrotoluene	0.014 U	0.014 U	0.014 U	0.017 U	0.015 U	0.014 U	0.018 U	0.018 U	0.017 U	0.017 U	0.015 U	0.014 U	0.022 U	0.019 U
2,6-Dinitrotoluene	0.019 U	0.018 U	0.019 U	0.023 U	0.02 U	0.019 U	0.024 U	0.024 U	0.023 U	0.023 U	0.02 U	0.019 U	0.029 U	0.026 U
2-Chloronaphthalene	0.0079 U	0.0078 U	0.008 U	0.0097 U	0.0085 U	0.0079 U	0.01 U	0.01 U	0.0098 U	0.0097 U	0.0085 U	0.0082 U	0.012 U	0.011 U
2-Chlorophenol	0.0089 U	0.0088 U	0.0089 U	0.011 U	0.0095 U	0.0089 UJ	0.011 U	0.011 U	0.011 U	0.011 U	0.0095 U	0.0092 U	0.014 U	0.012 U
2-Methylnaphthalene	0.0077 U	0.0076 U	0.0077 U	0.0094 U	0.0082 U	0.0077 UJ	0.01 J	0.0098 U	0.0095 U	0.0095 U	0.0083 U	0.008 U	0.012 U	0.011 U
2-Methylphenol (O-Cresol)	0.015 U	0.015 U	0.015 U	0.019 U	0.016 U	0.015 UJ	0.02 U	0.019 U	0.019 U	0.019 U	0.016 U	0.016 U	0.024 U	0.021 U
2-Nitroaniline	0.011 U	0.011 U	0.012 U	0.014 U	0.012 U	0.012 U	0.015 U	0.015 U	0.014 U	0.014 U	0.012 U	0.012 U	0.018 U	0.016 U
2-Nitrophenol	0.012 U	0.012 U	0.012 U	0.014 U	0.013 U	0.012 UJ	0.015 U	0.015 U	0.015 U	0.014 U	0.013 U	0.012 U	0.018 U	0.016 U
3- And 4- Methylphenol (Total)	0.0093 U	0.0092 U	0.0093 U	0.011 U	0.0099 U	0.0093 U	0.012 U	0.012 U	0.012 U	0.011 U	0.01 U	0.0096 U	0.014 U	0.013 U
3,3'-Dichlorobenzidine	0.039 U	0.039 U	0.039 U	0.048 U	0.042 U	0.039 U	0.05 U	0.05 U	0.048 U	0.048 U	0.042 U	0.04 U	0.061 U	0.054 U
3-Nitroaniline	0.01 U	0.01 U	0.01 U	0.013 U	0.011 U	0.01 U	0.013 U	0.013 U	0.013 U	0.013 U	0.011 U	0.011 U	0.016 U	0.014 U
4,6-Dinitro-2-Methylphenol	0.093 U	0.092 U	0.094 U	0.11 U	0.099 U	0.093 UJ	0.12 U	0.12 U	0.12 U	0.11 U	0.1 U	0.096 U	0.15 U	0.13 U
4-Bromophenyl Phenyl Ether	0.011 U	0.011 U	0.011 U	0.013 U	0.012 U	0.011 UJ	0.014 U	0.014 U	0.014 U	0.013 U	0.012 U	0.011 U	0.017 U	0.015 U
4-Chloro-3-Methylphenol	0.015 U	0.015 U	0.015 U	0.018 U	0.016 U	0.015 UJ	0.019 U	0.019 U	0.019 U	0.018 U	0.016 U	0.016 U	0.023 U	0.021 U
4-Chloroaniline	0.009 U	0.0089 U	0.009 U	0.011 U	0.0096 U	0.009 U	0.012 U	0.011 U	0.011 U	0.011 U	0.0096 U	0.0093 U	0.014 U	0.012 U
4-Chlorophenyl Phenyl Ether	0.01 U	0.01 U	0.01 U	0.013 U	0.011 U	0.01 UJ	0.014 U	0.013 U	0.013 U	0.013 U	0.011 U	0.011 U	0.016 U	0.015 U
4-Nitroaniline	0.013 U	0.013 U	0.013 U	0.016 U	0.014 U	0.013 U	0.017 U	0.017 U	0.016 U	0.016 U	0.014 U	0.014 U	0.021 U	0.018 U
4-Nitrophenol	0.17 U	0.17 U	0.17 U	0.21 U	0.18 U	0.17 U	0.22 U	0.21 U	0.21 U	0.21 U	0.18 U	0.17 U	0.26 U	0.23 U
Acenaphthene	0.0084 U	0.0084 U	0.0085 U	0.024 J	0.009 U	0.0085 U	0.011 U	0.011 U	0.01 U	0.01 U	0.0091 U	0.0087 U	0.013 U	0.012 U
Acenaphthylene	0.009 U	0.0089 U	0.009 U	0.011 U	0.0096 U	0.009 U	0.012 U	0.011 U	0.011 U	0.011 U	0.0096 U	0.0093 U	0.014 U	0.012 U
Acetophenone	0.0076 U	0.0075 U	0.0076 U	0.0093 U	0.0081 U	0.0076 UJ	0.0098 U	0.0097 U	0.0094 U	0.0093 U	0.0082 U	0.0079 U	0.012 U	0.011 U
Anthracene	0.033 U	0.033 U	0.033 U	0.041 U	0.035 U	0.033 U	0.043 U	0.042 U	0.041 U	0.041 U	0.036 U	0.034 U	0.052 U	0.046 U
Atrazine	0.015 U	0.015 U	0.016 U	0.019 U	0.017 U	0.016 U	0.02 U	0.02 U	0.019 U	0.019 U	0.017 U	0.016 U	0.024 U	0.022 U
Benzaldehyde	0.031 J	0.026 U	0.027 U	0.033 J	0.028 U	0.027 UJ	0.038 J	0.034 U	0.033 U	0.033 U	0.029 U	0.028 U	0.041 U	0.037 U
Benzo(A)Anthracene	0.072	0.064	0.029 U	0.26	0.031 U	0.029 UJ	0.042 J	0.037 U	0.036 U	0.11	0.04	0.03 U	0.18	0.11
Benzo(A)Pyrene	0.081	0.075	0.014 J	0.36	0.039	0.017 J	0.014 U	0.013 U	0.013 U	0.13	0.051	0.011 U	0.25	0.16
Benzo(B)Fluoranthene	0.14	0.12	0.019 J	0.62	0.092	0.038	0.084	0.017 U	0.017 U	0.22	0.081	0.014 U	0.35	0.23
Benzo(G,H,I)Perylene	0.11 J	0.092 J	0.02 U	0.46	0.061 J	0.02 J	0.057 J+	0.026 U	0.025 U	0.25 J	0.21 J	0.021 U	0.33 J	0.26 J
Benzo(K)Fluoranthene	0.049	0.049	0.015 U	0.21	0.02 J	0.015 U	0.022 J	0.019 U	0.019 U	0.079	0.032 J	0.016 U	0.15	0.066
Benzyl Butyl Phthalate	0.011 U	0.011 U	0.081 J	0.013 U	0.012 U	0.011 U	0.014 U	0.014 U	0.013 U	0.013 U	0.012 U	0.011 U	0.017 U	0.015 U
Biphenyl (Diphenyl)	0.03 U	0.029 U	0.03 U	0.036 U	0.032 U	0.03 U	0.038 U	0.038 U	0.037 U	0.037 U	0.032 U	0.031 U	0.046 U	0.041 U
Bis(2-Chloroethoxy) Methane	0.011 U	0.011 U	0.011 U	0.013 U	0.012 U	0.011 UJ	0.014 U	0.014 U	0.013 U	0.013 U	0.012 U	0.011 U	0.017 U	0.015 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.0082 U	0.0081 U	0.0083 U	0.01 U	0.0088 U	0.0082 UJ	0.011 U	0.01 U	0.01 U	0.01 U	0.0088 U	0.0085 U	0.013 U	0.011 U
Bis(2-Chloroisopropyl) Ether	0.014 U	0.014 U	0.014 U	0.018 UJ	0.015 UJ	0.014 UJ	0.019 U	0.018 U	0.018 U	0.018 U	0.015 U	0.015 U	0.022 U	0.02 U
Bis(2-Ethylhexyl) Phthalate	0.014 U	0.013 U	0.028 J	0.017 U	0.015 U	0.014 U	0.018 U	0.017 U	0.017 U	0.017 U	0.015 U	0.014 U	0.021 U	0.019 U
Caprolactam	0.025 U	0.025 U	0.025 U	0.031 U	0.042 J	0.025 U	0.032 U	0.032 U	0.031 U	0.031 U	0.027 U	0.026 U	0.039 U	0.035 U
Carbazole	0.012 J	0.0086 U	0.0087 U	0.051 J	0.0093 U	0.0087 U	0.011 U	0.011 U	0.011 U	0.021 J	0.011 J	0.009 U	0.04 J	0.029 J
Chrysene	0.1 J	0.08 J	0.014 J	0.42 J	0.051 J	0.021 J-	0.067 J	0.012 U	0.012 U	0.19 J	0.056 J	0.0098 U	0.3 J	0.19 J
Dibenz(A,H)Anthracene	0.018 U	0.019 J	0.018 U	0.079	0.019 U	0.018 U	0.023 U	0.023 U	0.022 U	0.043	0.019 U	0.019 U	0.037 J	0.054
Dibenzofuran	0.011 U	0.01 U	0.011 U	0.013 U	0.011 U	0.011 U	0.014 U	0.013 U	0.013 U	0.013 U	0.011 U	0.011 U	0.016 U	0.015 U
Diethyl Phthalate	0.0099 U	0.0098 U	0.01 U	0.012 U	0.011 U	0.0099 U	0.013 U	0.013 U	0.012 U	0.012 U	0.011 U	0.01 U	0.015 U	0.014 U
Dimethyl Phthalate	0.01 U	0.01 U	0.01 U	0.012 U	0.011 U	0.01 U	0.013 U	0.013 U	0.013 U	0.012 U	0.011 U	0.01 U	0.016 U	0.014 U
Di-N-Butyl Phthalate	0.01 U	0.02 J	0.023 J	0.014 J	0.018 J	0.014 J	0.014 U	0.013 U	0.013 U	0.034 J	0.027 J	0.011 U	0.019 J	0.031 J
Di-N-Octylphthalate	0.018 U	0.018 U	0.018 U	0.022 U	0.019 U	0.018 U	0.023 U	0.023 U	0.022 U	0.022 U	0.019 U	0.018 U	0.028 U	0.025 U
Fluoranthene	0.1 J	0.081 J	0.024 J	0.42 J	0.037 J	0.02 J	0.053 J	0.013 U	0.013 U	0.16 J	0.06 J	0.011 U	0.27 J	0.18 J
Fluorene	0.0076 U	0.0075 U	0.0076 U	0.015 J	0.0081 U	0.0076 U	0.0098 U	0.0097 U	0.0094 U	0.0093 U	0.0082 U	0.0079 U	0.012 U	0.011 U

Table E-28
Summary of Data Used in Risk Assessment
South Percolation Pond Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-061	CFMW-061	CFMW-061	CFMW-064	CFMW-064	CFMW-064	CFSB-101	CFSB-101	CFSB-101	CFSB-102	CFSB-102	CFSB-102	CFSB-104	CFSB-104
Sample Lab IDs	460-116987-13	460-116987-14	460-116987-15	460-116987-2	460-116987-3	460-116987-4	460-117506-1	460-117506-2	460-117506-3	460-117124-10	460-117124-11	460-117124-12	460-117124-7	460-117124-8
Sample Name	CFMW-061-SO-0-0.5	CFMW-061-SO-0.5-2	CFMW-061-SO-10-12	CFMW-064-SO-0-0.5	CFMW-064-SO-0.5-2	CFMW-064-SO-10-12	CFSB-101-SO-0-0.5	CFSB-101-SO-0.5-2	CFSB-101-SO-10-12	CFSB-102-SO-0-0.5	CFSB-102-SO-0.5-2	CFSB-102-SO-10-12	CFSB-104-SO-0-0.5	CFSB-104-SO-0.5-2
Sample Depth	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft
Chemical	7/12/2016	7/12/2016	7/12/2016	7/11/2016	7/11/2016	7/11/2016	7/21/2016	7/21/2016	7/21/2016	7/13/2016	7/13/2016	7/13/2016	7/13/2016	7/13/2016
Hexachlorobenzene	0.014 U	0.014 U	0.014 U	0.017 UJ	0.015 UJ	0.014 UJ	0.018 U	0.018 U	0.018 U	0.017 U	0.015 U	0.015 U	0.022 U	0.02 U
Hexachlorobutadiene	0.0098 U	0.0097 U	0.0099 U	0.012 UJ	0.01 UJ	0.0098 UJ	0.013 U	0.013 U	0.012 U	0.012 U	0.011 U	0.01 U	0.015 U	0.014 U
Hexachlorocyclopentadiene	0.022 U	0.022 U	0.022 U	0.027 U	0.023 U	0.022 U	0.028 U	0.028 U	0.027 U	0.027 U	0.023 U	0.023 U	0.034 U	0.03 U
Hexachloroethane	0.013 U	0.013 U	0.013 U	0.016 U	0.014 U	0.013 UJ	0.017 U	0.016 U	0.016 U	0.016 U	0.014 U	0.013 U	0.02 U	0.018 U
Indeno(1,2,3-C,D)Pyrene	0.096	0.087	0.023 U	0.43	0.053	0.023 U	0.061 J+	0.03 U	0.029 U	0.21	0.14	0.024 U	0.33	0.23
Isophorone	0.0075 U	0.0074 U	0.0075 U	0.0092 U	0.008 U	0.0075 UJ	0.0097 U	0.0096 U	0.0093 U	0.0092 U	0.008 U	0.0078 U	0.012 U	0.01 U
Naphthalene	0.0089 U	0.0088 U	0.0089 U	0.011 U	0.0095 U	0.0089 UJ	0.011 U	0.011 U	0.011 U	0.011 U	0.0095 U	0.0092 U	0.014 U	0.012 U
Nitrobenzene	0.011 U	0.011 U	0.011 U	0.013 U	0.012 U	0.011 UJ	0.014 U	0.014 U	0.014 U	0.013 U	0.012 U	0.011 U	0.017 U	0.015 U
N-Nitrosodi-N-Propylamine	0.012 U	0.012 U	0.012 U	0.014 U	0.013 U	0.012 U	0.015 U	0.015 U	0.015 U	0.014 U	0.013 U	0.012 U	0.018 U	0.016 U
N-Nitrosodiphenylamine	0.032 U	0.031 U	0.032 U	0.039 U	0.034 U	0.032 U	0.041 U	0.04 U	0.039 U	0.039 U	0.034 U	0.033 U	0.049 U	0.044 U
Pentachlorophenol	0.042 U	0.042 U	0.042 U	0.052 UJ	0.045 UJ	0.042 UJ	0.055 U	0.054 U	0.052 U	0.052 U	0.045 U	0.044 U	0.066 U	0.059 U
Phenanthrene	0.058 J	0.048 J	0.017 J	0.21 J	0.019 J	0.01 J	0.037 J	0.012 U	0.012 U	0.075 J	0.028 J	0.0096 U	0.14 J	0.092 J
Phenol	0.011 U	0.011 U	0.011 U	0.014 U	0.012 U	0.011 UJ	0.015 U	0.015 U	0.014 U	0.014 U	0.012 U	0.012 U	0.018 U	0.016 U
Pyrene	0.14 J	0.11 J	0.024 J	0.56 J+	0.055 J+	0.025 J+	0.058 J	0.02 U	0.02 U	0.18 J	0.07 J	0.016 U	0.32 J	0.22 J
VOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,1,1-Trichloroethane	--	0.00032 U	0.00027 U	--	0.00042 U	0.00058 U	--	0.00046 U	0.00035 U	--	0.0003 U	0.00043 UR	--	0.00044 U
1,1,2,2-Tetrachloroethane	--	0.00014 U	0.00012 U	--	0.00019 U	0.00026 U	--	0.00021 U	0.00016 U	--	0.00014 U	0.00019 UR	--	0.0002 U
1,1,2-Trichloro-1,2,2-Trifluoroethane	--	0.00037 U	0.00032 U	--	0.00048 UJ	0.00068 UJ	--	0.00054 U	0.00041 U	--	0.00035 U	0.0005 UR	--	0.00051 U
1,1,2-Trichloroethane	--	0.00024 U	0.0002 U	--	0.00031 U	0.00043 U	--	0.00034 U	0.00026 U	--	0.00022 U	0.00032 UR	--	0.00033 U
1,1-Dichloroethane	--	0.00029 U	0.00024 U	--	0.00037 U	0.00052 U	--	0.00041 U	0.00031 U	--	0.00027 U	0.00039 UR	--	0.0004 U
1,1-Dichloroethene	--	0.00034 U	0.00029 U	--	0.00045 U	0.00063 U	--	0.0005 U	0.00038 U	--	0.00033 U	0.00047 UR	--	0.00048 U
1,2,3-Trichlorobenzene	--	0.000092 U	0.000079 U	--	0.00012 U	0.00017 U	--	0.00013 U	0.0001 U	--	0.000088 U	0.00012 UR	--	0.00013 U
1,2,4-Trichlorobenzene	--	0.00027 U	0.00023 U	--	0.00035 U	0.00049 U	--	0.00039 U	0.00029 U	--	0.00026 U	0.00036 UR	--	0.00037 U
1,2-Dibromo-3-Chloropropane	--	0.00039 U	0.00034 U	--	0.00052 U	0.00072 U	--	0.00057 U	0.00043 U	--	0.00037 U	0.00053 UR	--	0.00055 U
1,2-Dibromoethane (Ethylene Dibromide)	--	0.0001 U	0.000086 U	--	0.00013 U	0.00018 U	--	0.00015 U	0.00011 U	--	0.000096 U	0.00014 UR	--	0.00014 U
1,2-Dichlorobenzene	--	0.00012 U	0.0001 U	--	0.00015 U	0.00021 U	--	0.00017 U	0.00013 U	--	0.00011 U	0.00016 UR	--	0.00016 U
1,2-Dichloroethane	--	0.000092 U	0.000079 U	--	0.00012 U	0.00017 U	--	0.00013 U	0.0001 U	--	0.000088 U	0.00012 UR	--	0.00013 U
1,2-Dichloropropane	--	0.00014 U	0.00012 U	--	0.00019 U	0.00026 U	--	0.00021 U	0.00016 U	--	0.00014 U	0.00019 UR	--	0.0002 U
1,3-Dichlorobenzene	--	0.0001 U	0.000086 U	--	0.00013 U	0.00018 U	--	0.00015 U	0.00011 U	--	0.000096 U	0.00014 UR	--	0.00014 U
1,4-Dichlorobenzene	--	0.00011 U	0.000093 U	--	0.00014 U	0.0002 U	--	0.00016 U	0.00012 U	--	0.0001 U	0.00015 UR	--	0.00015 U
2-Hexanone	--	0.00079 U	0.0011 J	--	0.001 U	0.0014 U	--	0.0011 U	0.00087 U	--	0.00075 U	0.0011 UR	--	0.0011 U
Acetone	--	0.074 J+	0.021 J+	--	0.18	0.098	--	0.03	0.011	--	0.014	0.022 J-	--	0.043
Benzene	--	0.00052 J	0.00078	--	0.0017	0.0022	--	0.0019	0.00062 J	--	0.00027 J	0.00023 UR	--	0.00037 J
Bromochloromethane	--	0.00014 U	0.00012 U	--	0.00019 U	0.00026 U	--	0.00021 U	0.00016 U	--	0.00014 U	0.00019 UR	--	0.0002 U
Bromodichloromethane	--	0.00032 U	0.00027 U	--	0.00042 U	0.00058 U	--	0.00046 U	0.00035 U	--	0.0003 U	0.00043 UR	--	0.00044 U
Bromoform	--	0.00011 U	0.000093 U	--	0.00014 U	0.0002 U	--	0.00016 U	0.00012 U	--	0.0001 U	0.00015 UR	--	0.00015 U
Bromomethane	--	0.00027 U	0.00023 U	--	0.00035 UJ	0.00049 UJ	--	0.00039 U	0.00029 U	--	0.00026 U	0.00036 UR	--	0.00037 U
Carbon Disulfide	--	0.00052 J	0.00093	--	0.0015 J-	0.00088 J-	--	0.00052 U	0.0004 U	--	0.0018	0.00049 UR	--	0.0014
Carbon Tetrachloride	--	0.00036 U	0.00031 U	--	0.00047 U	0.00066 U	--	0.00052 U	0.0004 U	--	0.00034 U	0.00049 UR	--	0.0005 U
Chlorobenzene	--	0.00012 U	0.0001 U	--	0.00015 U	0.00021 U	--	0.00017 U	0.00013 U	--	0.00011 U	0.00016 UR	--	0.00016 U
Chloroethane	--	0.00029 U	0.00025 U	--	0.00039 U	0.00054 U	--	0.00043 U	0.00032 U	--	0.00028 U	0.0004 UR	--	0.00041 U
Chloroform	--	0.00018 U	0.00015 U	--	0.00023 U	0.00032 U	--	0.00026 U	0.00019 U	--	0.00017 U	0.00024 UR	--	0.00024 U
Chloromethane	--	0.00032 U	0.00027 U	--	0.00042 U	0.00058 U	--	0.00046 U	0.00035 U	--	0.0003 U	0.00043 UR	--	0.00044 U
Cis-1,2-Dichloroethylene	--	0.00018 U	0.00016 U	--	0.00024 U	0.00034 U	--	0.00027 U	0.0002 U	--	0.00018 U	0.00025 UR	--	0.00026 U
Cis-1,3-Dichloropropene	--	0.00013 U	0.00011 U	--	0.00017 U	0.00023 U	--	0.00018 U	0.00014 U	--	0.00012 U	0.00017 UR	--	0.00017 U
Cyclohexane	--	0.00092	0.0017	--	0.0025 J-	0.0077 J-	--	0.004 J+	0.00095 J+	--	0.00037 U	0.00052 UR	--	0.00054 U
Dibromochloromethane	--	0.00013 U	0.00011 U	--	0.00017 U	0.00023 U	--	0.00018 U	0.00014 U	--	0.00012 U	0.00017 UR	--	0.00017 U
Dichlorodifluoromethane	--	0.00027 U	0.00023 U	--	0.00035 U	0.00049 U	--	0.00039 U	0.00029 U	--	0.00026 U	0.00036 UR	--	0.00037 U
Ethylbenzene	--	0.00015 U	0.00055 J	--	0.00083 J	0.0032	--	0.0011 J	0.00017 J	--	0.00014 U	0.0002 UR	--	0.00023 J
Isopropylbenzene (Cumene)	--	0.00014 U	0.00012 U	--	0.00019 U	0.00039 J	--	0.00021 U	0.00016 U	--	0.00014 U	0.00019 UR	--	0.0002 U
M,P-Xylene	--	0.00034 J	0.0014	--	0.0024	0.008	--	0.0026	0.00038 J	--	0.000088 U	0.00012 UR	--	0.00057 J
Methyl Acetate	--	0.00076 U	0.00065 U	--	0.00099 U	0.0014 U	--	0.0011 U	0.00083 U	--	0.00072 U	0.001 UR	--	0.001 U
Methyl Ethyl Ketone (2-Butanone)	--	0.0076	0.0043	--	0.011	0.014	--	0.003 J	0.00071 U	--	0.0026 J	0.00087 UR	--	0.0052 J
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	--	0.0019 U	0.0016 U	--	0.0024 U	0.0034 U	--	0.0027 U	0.002 U	--	0.0018 U	0.0025 UR	--	0.0026 U
Methylcyclohexane	--	0.0009	0.0025	--	0.004	0.012	--	0.006 J+	0.0013 J+	--	0.0004 U	0.00057 UR	--	0.00058 U
Methylene Chloride	--	0.00027 U	0.00023 U	--	0.00035 U	0.00049 U	--	0.00039 U	0.00029 U	--	0.00026 U	0.003 J-	--	0.00037 U
O-Xylene (1,2-Dimethylbenzene)	--	0.00013 U	0.00043 J	--	0.00078 J	0.0028	--	0.00091 J	0.00015 U	--	0.00013 U	0.00018 UR	--	0.00019 J
Styrene	--	0.00013 U	0.00011 U	--	0.00017 U	0.00023 U	--	0.00018 U	0.00014 U	--	0.00012 U	0.00017 UR	--	0.00017 U
Tert-Butyl Methyl Ether	--	0.00014 U	0.00012 U	--	0.00019 U	0.00026 U	--	0.00021 U	0.00016 U	--	0.00014 U	0.00019 UR	--	0.0002 U

Table E-28
Summary of Data Used in Risk Assessment
South Percolation Pond Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-061	CFMW-061	CFMW-061	CFMW-064	CFMW-064	CFMW-064	CFSB-101	CFSB-101	CFSB-101	CFSB-102	CFSB-102	CFSB-102	CFSB-104	CFSB-104
Sample Lab IDs	460-116987-13	460-116987-14	460-116987-15	460-116987-2	460-116987-3	460-116987-4	460-117506-1	460-117506-2	460-117506-3	460-117124-10	460-117124-11	460-117124-12	460-117124-7	460-117124-8
Sample Name	CFMW-061-SO-0-0.5	CFMW-061-SO-0.5-2	CFMW-061-SO-10-12	CFMW-064-SO-0-0.5	CFMW-064-SO-0.5-2	CFMW-064-SO-10-12	CFSB-101-SO-0-0.5	CFSB-101-SO-0.5-2	CFSB-101-SO-10-12	CFSB-102-SO-0-0.5	CFSB-102-SO-0.5-2	CFSB-102-SO-10-12	CFSB-104-SO-0-0.5	CFSB-104-SO-0.5-2
Sample Depth	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft
Chemical	7/12/2016	7/12/2016	7/12/2016	7/11/2016	7/11/2016	7/11/2016	7/21/2016	7/21/2016	7/21/2016	7/13/2016	7/13/2016	7/13/2016	7/13/2016	7/13/2016
Tetrachloroethylene (PCE)	--	0.00024 U	0.0002 U	--	0.00031 U	0.00043 U	--	0.00034 U	0.00026 U	--	0.00022 U	0.00032 UR	--	0.00033 U
Toluene	--	0.0011	0.0025	--	0.004	0.01	--	0.0051	0.001	--	0.00044 J	0.00022 UR	--	0.001 J
Trans-1,2-Dichloroethene	--	0.00033 U	0.00028 U	--	0.00043 U	0.0006 U	--	0.00048 U	0.00036 U	--	0.00031 U	0.00044 UR	--	0.00045 U
Trans-1,3-Dichloropropene	--	0.000084 U	0.000072 U	--	0.00011 U	0.00015 U	--	0.00012 U	0.000092 U	--	0.00008 U	0.00011 UR	--	0.00012 U
Trichloroethylene (TCE)	--	0.00022 U	0.00019 U	--	0.00029 U	0.0004 U	--	0.00032 U	0.00024 U	--	0.00021 U	0.0003 UR	--	0.0003 U
Trichlorofluoromethane	--	0.00029 U	0.00024 U	--	0.00037 UJ	0.00052 UJ	--	0.00041 U	0.00031 U	--	0.00027 U	0.00039 UR	--	0.0004 U
Vinyl Chloride	--	0.00033 U	0.00028 U	--	0.00043 U	0.0006 U	--	0.00048 U	0.00036 U	--	0.00031 U	0.00044 UR	--	0.00045 U

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-28
Summary of Data Used in Risk Assessment
South Percolation Pond Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-104	CFSB-109	CFSB-109	CFSB-109	CFSB-110	CFSB-110	CFSB-110	CFSB-113	CFSB-113	CFSB-113	CFSB-114	CFSB-114	CFSB-114	CFSB-115
Sample Lab IDs	460-117124-9	460-117124-14	460-117124-15	460-117124-16	460-117124-17	460-117124-18	460-117124-19	460-119512-1	460-119512-2	460-119512-3	460-116987-10	460-116987-11	460-116987-12	460-119512-4
Sample Name	CFSB-104-SO-10-12	CFSB-109-SO-0-0.5	CFSB-109-SO-0.5-2	CFSB-109-SO-10-12	CFSB-110-SO-0-0.5	CFSB-110-SO-0.5-2	CFSB-110-SO-10-12	CFSB-113-SO-0-0.5	CFSB-113-SO-0.5-2	CFSB-113-SO-2-4	CFSB-114-SO-0-0.5	CFSB-114-SO-0.5-2	CFSB-114-SO-10-12	CFSB-115-SO-0-0.5
Sample Depth	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	2-4 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft
Chemical	7/13/2016	7/13/2016	7/13/2016	7/13/2016	7/14/2016	7/14/2016	7/14/2016	8/31/2016	8/31/2016	8/31/2016	7/12/2016	7/12/2016	7/12/2016	8/31/2016
GENERAL CHEMISTRY (mg/kg)														
Fluoride	3.46 J	17.4 J	17.7 J	3.26 J	28.4 J	11.2 J	3.14 J	2.97 J+	1.26 J+	0.8 J+	3.18 J	10.1 J	7.29 J	2.4 J+
Cyanide	0.11 J	0.59	0.42	0.056 J	0.6	0.34	0.065 J	0.12 J	0.07 J	0.048 J	0.03 J	0.017 U	0.018 U	0.31
Cyanide (Free)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
METALS (mg/kg)														
"Chromium, Hexavalent - Estimated"	0.157908	0.149878	0.13382	0.17129	0.281022	0.224818	0.16326	0.160584	0.227494	0.0776156	0.17129	0.248905	0.406813	0.0695864
"Chromium, Trivalent - Estimated"	5.74209	5.45012	4.86618	6.22871	10.219	8.17518	5.93674	5.83942	8.27251	2.82238	6.22871	9.05109	14.7932	2.53041
Aluminum	5260	5370	4170	4950	8660	8190	5710	6850	7740	4250	6070	8000	6930	2570
Antimony	0.43 UJ	0.77 UJ	0.65 UJ	0.39 UJ	0.91 UJ	0.48 UJ	0.4 UJ	0.41 U	0.3 U	0.3 U	0.44 U	0.42 U	0.41 U	0.35 U
Arsenic	8.4	0.84 U	0.7 U	1.9	1.5 J	1.4	2.6	1.2	1.4	0.53 J	3.5	5	2.9	0.46 J
Barium	35.7	653	555	38	911	207	34.1	972	178	53.3	125	119	71	371
Beryllium	0.37 J	0.43 J	0.24 J	0.34 J	0.65 J	0.48	0.29 J	0.16 J	0.34 J	0.11 J	0.35 J	0.48	0.3 J	0.11 U
Cadmium	0.32 U	0.58 U	0.49 U	0.3 U	0.69 U	0.37 U	0.3 U	0.43 U	0.32 U	0.32 U	0.33 U	0.32 U	0.31 U	0.38 U
Calcium	40100	244000	201000	13500	289000	53200	9770	313000	55900	7240	8030	8280	13700	116000
Chromium, Total	5.9 J	5.6 J	5 J	6.4 J	10.5 J	8.4 J	6.1 J	6	8.5	2.9	6.4	9.3	15.2	2.6
Cobalt	6.3	1.4 U	1.5 J	3.4	3.9 J	4.8	2.8	2.1 J	4.4	2	4.2	5.9	4.5	1.2 J
Copper	12	101	118	5.7	204	57.3	6.8	30.6	12.1	3.8	8.9	12.7	16.2	10.2
Iron	9110 J	1760 J	1580 J	8840 J	5790 J	10700 J	10200 J	4240	11700	5800	9640	14000	12900	2550
Lead	6	11.6	10.3	2.9	22.3	9	3.5	8	6.9	1.8	7.8	7.9	4.4	3.4
Magnesium	6750	3840	3130	9750	7490	7780	8770	7060	10300	4710	7060	8850	8200	2510
Manganese	181 J	14.8 J	10.7 J	286 J	44.1 J	71.7 J	109 J	67.2	121	76.6	340	297	216	32.8
Mercury	0.012 U	0.11	0.093	0.012 U	0.14	0.042	0.013 U	0.024	0.016 J	0.015 J	0.021	0.026	0.014 J	0.024
Nickel	8.3 J	11 J	10.7 J	6.7 J	17.4 J	11 J	6.5 J	12.3	10.8	3.5	10.8	11.2	10.4	4.4
Potassium	356	238	194	369	787	716	439	541	518	168	619	765	854	240
Selenium	0.4 U	0.72 U	0.61 U	0.36 U	0.85 U	0.45 U	0.37 U	0.4 J	0.28 U	0.28 U	0.41 U	0.39 U	0.39 U	0.33 U
Silver	0.78 U	1.4 U	1.2 U	0.71 U	1.7 U	0.89 U	0.73 U	0.8 U	0.59 U	0.58 U	0.8 U	0.77 U	0.75 U	0.69 U
Sodium	39.9 U	150 J	136 J	36.4 U	268	87.4 J	38.9 J	120 J	43.6 J	40.4 U	40.8 U	39.3 U	57.5 J	54.3 J
Thallium	0.16 U	0.29 U	0.24 U	0.15 U	0.34 U	0.18 U	0.15 U	0.16 U	0.12 U	0.12 U	0.16 U	0.16 U	0.16 U	0.14 U
Vanadium	6.4 J	3.2 J	2.7 J	5.2 J	7.6 J	9.6 J	5.5 J	5.7	11.5	4	8	14.5	12.5	3.4
Zinc	36.6	76.6	75.9	24.9	131	66.4	28.5	40.2	42.9	17.6	27.7	37.1	29.3	16.3
PESTICIDES (mg/kg)														
Aldrin	--	--	--	--	0.0018 U	--	--	0.001 U	--	--	--	--	--	--
Alpha Bhc (Alpha Hexachlorocyclohexane)	--	--	--	--	0.0014 U	--	--	0.00076 U	--	--	--	--	--	--
Alpha Endosulfan	--	--	--	--	0.0021 U	--	--	0.0012 U	--	--	--	--	--	--
Beta Bhc (Beta Hexachlorocyclohexane)	--	--	--	--	0.0015 U	--	--	0.00081 U	--	--	--	--	--	--
Beta Endosulfan	--	--	--	--	0.0024 U	--	--	0.0013 U	--	--	--	--	--	--
cis-Chlordane	--	--	--	--	0.0025 U	--	--	0.0014 U	--	--	--	--	--	--
Delta BHC (Delta Hexachlorocyclohexane)	--	--	--	--	0.0017 U	--	--	0.00091 U	--	--	--	--	--	--
Dieldrin	--	--	--	--	0.002 U	--	--	0.0011 U	--	--	--	--	--	--
Endosulfan Sulfate	--	--	--	--	0.0018 U	--	--	0.00098 U	--	--	--	--	--	--
Endrin	--	--	--	--	0.0019 U	--	--	0.0011 U	--	--	--	--	--	--
Endrin Aldehyde	--	--	--	--	0.0019 U	--	--	0.001 U	--	--	--	--	--	--
Endrin Ketone	--	--	--	--	0.0021 U	--	--	0.0012 U	--	--	--	--	--	--
Gamma Bhc (Lindane)	--	--	--	--	0.0014 U	--	--	0.00075 U	--	--	--	--	--	--
Heptachlor	--	--	--	--	0.002 U	--	--	0.0011 U	--	--	--	--	--	--
Heptachlor Epoxide	--	--	--	--	0.003 U	--	--	0.0016 U	--	--	--	--	--	--
Methoxychlor	--	--	--	--	0.0032 U	--	--	0.0018 U	--	--	--	--	--	--
P,P'-DDD	--	--	--	--	0.002 U	--	--	0.0011 U	--	--	--	--	--	--
P,P'-DDE	--	--	--	--	0.0022 U	--	--	0.0012 U	--	--	--	--	--	--
P,P'-DDT	--	--	--	--	0.0016 U	--	--	0.00086 U	--	--	--	--	--	--
Toxaphene	--	--	--	--	0.044 U	--	--	0.024 U	--	--	--	--	--	--
trans-Chlordane	--	--	--	--	0.0033 U	--	--	0.0018 U	--	--	--	--	--	--
POLYCHLORINATED BIPHENYLS (mg/kg)														
PCB-1016 (Aroclor 1016)	0.0099 U	0.018 U	0.014 U	0.0096 U	0.02 U	0.012 U	0.0094 U	0.011 U	0.0098 U	0.0096 U	0.0097 U	0.0096 U	0.0096 U	0.01 U
PCB-1221 (Aroclor 1221)	0.0099 U	0.018 U	0.014 U	0.0096 U	0.02 U	0.012 U	0.0094 U	0.011 U	0.0098 U	0.0096 U	0.0097 U	0.0096 U	0.0096 U	0.01 U
PCB-1232 (Aroclor 1232)	0.0099 U	0.018 U	0.014 U	0.0096 U	0.02 U	0.012 U	0.0094 U	0.011 U	0.0098 U	0.0096 U	0.0097 U	0.0096 U	0.0096 U	0.01 U
PCB-1242 (Aroclor 1242)	0.0099 U	0.018 U	0.014 U	0.0096 U	0.02 U	0.012 U	0.0094 U	0.011 U	0.0098 U	0.0096 U	0.0097 U	0.0096 U	0.0096 U	0.01 U
PCB-1248 (Aroclor 1248)	0.0099 U	0.018 U	0.014 U	0.0096 U	0.02 U	0.012 U	0.0094 U	0.011 U	0.0098 U	0.0096 U	0.0097 U	0.0096 U	0.0096 U	0.01 U
PCB-1254 (Aroclor 1254)	0.01 U	0.019 U	0.015 U	0.0099 U	0.021 U	0.012 U	0.0097 U	0.012 U	0.01 U	0.0099 U	0.01 U	0.01 U	0.0099 U	0.011 U

Table E-28
Summary of Data Used in Risk Assessment
South Percolation Pond Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-104	CFSB-109	CFSB-109	CFSB-109	CFSB-110	CFSB-110	CFSB-110	CFSB-113	CFSB-113	CFSB-113	CFSB-114	CFSB-114	CFSB-114	CFSB-115
Sample Lab IDs	460-117124-9	460-117124-14	460-117124-15	460-117124-16	460-117124-17	460-117124-18	460-117124-19	460-119512-1	460-119512-2	460-119512-3	460-116987-10	460-116987-11	460-116987-12	460-119512-4
Sample Name	CFSB-104-SO-10-12	CFSB-109-SO-0-0.5	CFSB-109-SO-0.5-2	CFSB-109-SO-10-12	CFSB-110-SO-0-0.5	CFSB-110-SO-0.5-2	CFSB-110-SO-10-12	CFSB-113-SO-0-0.5	CFSB-113-SO-0.5-2	CFSB-113-SO-2-4	CFSB-114-SO-0-0.5	CFSB-114-SO-0.5-2	CFSB-114-SO-10-12	CFSB-115-SO-0-0.5
Sample Depth	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	2-4 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft
Chemical	7/13/2016	7/13/2016	7/13/2016	7/13/2016	7/14/2016	7/14/2016	7/14/2016	8/31/2016	8/31/2016	8/31/2016	7/12/2016	7/12/2016	7/12/2016	8/31/2016
PCB-1260 (Aroclor 1260)	0.01 U	0.019 U	0.015 U	0.0099 U	0.021 U	0.012 U	0.0097 U	0.012 U	0.01 U	0.0099 U	0.01 U	0.01 U	0.0099 U	0.011 U
PCB-1262 (Aroclor 1262)	0.01 U	0.019 U	0.015 U	0.0099 U	0.021 U	0.012 U	0.0097 U	0.012 U	0.01 U	0.0099 U	0.01 U	0.01 U	0.0099 U	0.011 U
PCB-1268 (Aroclor 1268)	0.01 U	0.019 U	0.015 U	0.0099 U	0.021 U	0.012 U	0.0097 U	0.012 U	0.01 U	0.0099 U	0.01 U	0.01 U	0.0099 U	0.011 U
Polychlorinated Biphenyl (PCBs)	0.01 U	0.019 U	0.015 U	0.0099 U	0.021 U	0.012 U	0.0097 U	0.012 U	0.01 U	0.0099 U	0.01 U	0.01 U	0.0099 U	0.011 U
SEMIVOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,2,4,5-Tetrachlorobenzene	0.027 U	0.051 U	0.039 U	0.027 U	0.056 U	0.032 U	0.026 U	0.031 U	0.027 U	0.027 U	0.027 U	0.027 U	0.027 U	0.029 U
1,4-Dioxane (P-Dioxane)	0.098 U	0.18 U	0.14 U	0.095 U	0.2 U	0.11 U	0.093 U	0.11 U	0.097 U	0.095 U	0.096 U	0.096 U	0.095 U	0.1 U
2,3,4,6-Tetrachlorophenol	0.034 U	0.065 U	0.049 U	0.034 U	0.071 U	0.04 U	0.033 U	0.039 U	0.034 U	0.034 U	0.034 U	0.034 U	0.034 U	0.037 U
2,4,5-Trichlorophenol	0.036 U	0.068 U	0.052 U	0.035 U	0.075 U	0.043 U	0.035 U	0.041 U	0.036 U	0.036 U	0.036 U	0.036 U	0.035 U	0.039 U
2,4,6-Trichlorophenol	0.01 U	0.02 U	0.015 U	0.01 U	0.021 U	0.012 U	0.0099 U	0.012 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.011 U
2,4-Dichlorophenol	0.0087 U	0.016 U	0.012 U	0.0084 U	0.018 U	0.01 U	0.0082 U	0.0098 U	0.0085 U	0.0084 U	0.0084 U	0.0084 U	0.0084 U	0.0092 U
2,4-Dimethylphenol	0.081 U	0.15 U	0.12 U	0.078 U	0.17 U	0.094 U	0.076 U	0.091 U	0.08 U	0.078 U	0.079 U	0.079 U	0.078 U	0.086 U
2,4-Dinitrophenol	0.28 U	0.52 U	0.4 U	0.27 U	0.57 U	0.32 U	0.26 U	0.31 U	0.27 U	0.27 U	0.27 U	0.27 U	0.27 U	0.29 U
2,4-Dinitrotoluene	0.015 U	0.027 U	0.021 U	0.014 U	0.03 U	0.017 U	0.014 U	0.016 U	0.014 U	0.014 U	0.014 U	0.014 U	0.014 U	0.015 U
2,6-Dinitrotoluene	0.02 U	0.037 U	0.028 U	0.019 U	0.04 U	0.023 U	0.018 U	0.022 U	0.019 U	0.019 U	0.019 U	0.019 U	0.019 U	0.021 U
2-Chloronaphthalene	0.0083 U	0.016 U	0.012 U	0.0081 U	0.017 U	0.0097 U	0.0079 U	0.0094 U	0.0082 U	0.0081 U	0.0081 U	0.0081 U	0.0081 U	0.0088 U
2-Chlorophenol	0.0093 U	0.017 U	0.013 U	0.0091 U	0.019 U	0.011 U	0.0088 U	0.011 U	0.0092 U	0.0091 U	0.0091 U	0.0091 U	0.0091 U	0.0099 U
2-Methylnaphthalene	0.0081 U	0.015 U	0.012 U	0.0079 U	0.017 U	0.0095 U	0.0077 U	0.0091 U	0.008 U	0.0079 U	0.0079 U	0.0079 U	0.0079 U	0.0086 U
2-Methylphenol (O-Cresol)	0.016 U	0.03 U	0.023 U	0.016 U	0.033 U	0.019 U	0.015 U	0.018 U	0.016 U	0.016 U	0.016 U	0.016 U	0.016 U	0.017 U
2-Nitroaniline	0.012 U	0.023 U	0.017 U	0.012 U	0.025 U	0.014 U	0.011 U	0.014 U	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U	0.013 U
2-Nitrophenol	0.012 U	0.023 U	0.018 U	0.012 U	0.025 U	0.014 U	0.012 U	0.014 U	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U	0.013 U
3- And 4- Methylphenol (Total)	0.0098 U	0.018 U	0.014 U	0.0095 U	0.02 U	0.011 U	0.0092 U	0.011 U	0.0096 U	0.0095 U	0.0095 U	0.0095 U	0.0095 U	0.01 U
3,3'-Dichlorobenzidine	0.041 U	0.077 U	0.058 U	0.04 U	0.084 U	0.048 U	0.039 U	0.046 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.043 U
3-Nitroaniline	0.011 U	0.02 U	0.016 U	0.011 U	0.022 U	0.013 U	0.01 U	0.012 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.012 U
4,6-Dinitro-2-Methylphenol	0.098 U	0.18 U	0.14 U	0.095 U	0.2 U	0.11 U	0.093 U	0.11 U	0.097 U	0.095 U	0.095 U	0.095 U	0.095 U	0.1 U
4-Bromophenyl Phenyl Ether	0.012 U	0.022 U	0.016 U	0.011 U	0.024 U	0.013 U	0.011 U	0.013 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.012 U
4-Chloro-3-Methylphenol	0.016 U	0.029 U	0.023 U	0.015 U	0.032 U	0.018 U	0.015 U	0.018 U	0.016 U	0.015 U	0.015 U	0.015 U	0.015 U	0.017 U
4-Chloroaniline	0.0094 U	0.018 U	0.019 J	0.0092 U	0.019 U	0.011 U	0.0089 U	0.011 U	0.0093 U	0.0092 U	0.0092 U	0.0092 U	0.0092 U	0.01 U
4-Chlorophenyl Phenyl Ether	0.011 U	0.021 U	0.016 U	0.011 U	0.022 U	0.013 U	0.01 U	0.012 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.012 U
4-Nitroaniline	0.014 U	0.026 U	0.02 U	0.013 U	0.028 U	0.016 U	0.013 U	0.016 U	0.014 U	0.013 U	0.014 U	0.014 U	0.013 U	0.015 U
4-Nitrophenol	0.18 U	0.33 U	0.25 U	0.17 U	0.36 U	0.21 U	0.17 U	0.2 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.19 U
Acenaphthene	0.0089 U	0.02 J	0.016 J	0.0086 U	0.018 U	0.01 U	0.0084 U	0.01 J	0.0088 U	0.0086 U	0.0087 U	0.0087 U	0.0086 U	0.0094 U
Acenaphthylene	0.0094 U	0.018 U	0.013 U	0.0092 U	0.019 U	0.011 U	0.0089 U	0.011 U	0.0093 U	0.0092 U	0.0092 U	0.0092 U	0.0092 U	0.01 U
Acetophenone	0.008 U	0.015 U	0.011 U	0.0078 U	0.016 U	0.0093 U	0.0076 U	0.009 U	0.0079 U	0.0078 U	0.0078 U	0.0078 U	0.0078 U	0.0085 U
Anthracene	0.035 U	0.065 U	0.05 J	0.034 U	0.071 U	0.041 U	0.033 U	0.039 U	0.034 U	0.034 U	0.034 U	0.034 U	0.034 U	0.037 U
Atrazine	0.016 U	0.031 U	0.023 U	0.016 U	0.033 U	0.019 U	0.015 U	0.018 U	0.016 U	0.016 U	0.016 U	0.016 U	0.016 U	0.017 U
Benzaldehyde	0.028 U	0.052 U	0.04 U	0.027 U	0.057 U	0.033 U	0.026 U	0.032 U	0.028 U	0.027 U	0.027 U	0.027 U	0.027 U	0.03 U
Benzo(A)Anthracene	0.031 U	0.36	0.17	0.03 U	0.18	0.036 U	0.029 U	0.12	0.047	0.03 U	0.05	0.03 U	0.03 U	0.059
Benzo(A)Pyrene	0.011 U	0.48	0.22	0.011 U	0.23	0.013 U	0.011 U	0.17	0.054	0.024 J	0.07	0.011 U	0.011 U	0.084
Benzo(B)Fluoranthene	0.014 U	0.62	0.32	0.014 U	0.29	0.11	0.014 U	0.29	0.11	0.042	0.11	0.014 U	0.014 U	0.17
Benzo(G,H,I)Perylene	0.021 U	0.36 J	1.1	0.02 U	0.9	0.16 J	0.02 U	0.2 J	0.071 J	0.024 J	0.076 J	0.021 U	0.02 U	0.11 J
Benzo(K)Fluoranthene	0.016 U	0.25	0.14	0.016 U	0.12	0.036 J	0.015 U	0.1	0.036	0.019 J	0.036	0.016 U	0.016 U	0.06
Benzyl Butyl Phthalate	0.011 U	0.021 U	0.016 U	0.011 U	0.023 U	0.013 U	0.011 U	0.013 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.012 U
Biphenyl (Diphenyl)	0.031 U	0.059 U	0.045 U	0.03 U	0.064 U	0.037 U	0.03 U	0.035 U	0.031 U	0.03 U	0.03 U	0.031 U	0.03 U	0.033 U
Bis(2-Chloroethoxy) Methane	0.011 U	0.021 U	0.016 U	0.011 U	0.023 U	0.013 U	0.011 U	0.013 U	0.011 U	0.011 U	0.011 U	0.011 U	0.015 J	0.012 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.0087 U	0.016 U	0.012 U	0.0084 U	0.018 U	0.01 U	0.0082 U	0.0098 U	0.0085 U	0.0084 U	0.0084 U	0.0084 U	0.0084 U	0.0092 U
Bis(2-Chloroisopropyl) Ether	0.015 U	0.028 U	0.022 U	0.015 U	0.031 U	0.018 U	0.014 U	0.017 U	0.015 U	0.015 U	0.015 U	0.015 U	0.015 U	0.016 U
Bis(2-Ethylhexyl) Phthalate	0.014 U	0.027 U	0.02 U	0.014 U	0.029 U	0.017 U	0.014 U	0.016 U	0.014 U	0.014 U	0.014 U	0.014 U	0.039 J	0.015 U
Caprolactam	0.026 U	0.049 U	0.038 U	0.026 U	0.054 U	0.031 U	0.025 U	0.03 U	0.026 U	0.026 U	0.026 U	0.026 U	0.026 U	0.028 U
Carbazole	0.0091 U	0.073 J	0.1 J	0.0088 U	0.059 J	0.013 J	0.0086 U	0.016 J	0.009 U	0.0088 U	0.0089 J	0.0089 U	0.0088 U	0.0097 U
Chrysene	0.01 U	0.55 J	0.26 J	0.0097 U	0.28 J	0.071 J	0.0095 U	0.19 J	0.071 J	0.029 J	0.081 J	0.0097 U	0.0097 U	0.1 J
Dibenz(A,H)Anthracene	0.019 U	0.036 U	0.17	0.019 U	0.14	0.022 U	0.018 U	0.035 J	0.019 U	0.019 U	0.019 U	0.019 U	0.019 U	0.02 U
Dibenzofuran	0.011 U	0.021 U	0.016 U	0.011 U	0.023 U	0.013 U	0.011 U	0.013 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.012 U
Diethyl Phthalate	0.01 U	0.02 U	0.015 U	0.01 U	0.021 U	0.012 U	0.0099 U	0.012 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.011 U
Dimethyl Phthalate	0.011 U	0.02 U	0.015 U	0.01 U	0.022 U	0.012 U	0.01 U	0.012 U	0.011 U	0.01 U	0.01 U	0.01 U	0.01 U	0.011 U
Di-N-Butyl Phthalate	0.013 J	0.021 U	0.056 J	0.011 U	0.058 J	0.013 U	0.01 U	0.012 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.012 U
Di-N-Octylphthalate	0.019 U	0.035 U	0.027 U	0.018 U	0.038 U	0.022 U	0.018 U	0.021 U	0.018 U	0.018 U	0.018 U	0.018 U	0.018 U	0.02 U
Fluoranthene	0.011 U	0.56 J	0.23 J	0.011 U	0.24 J	0.054 J	0.014 J	0.2 J	0.076 J	0.029 J	0.075 J	0.011 U	0.011 J	0.089 J
Fluorene	0.008 U	0.02 J	0.011 U	0.0078 U	0.016 U	0.0093 U	0.0076 U	0.009 U	0.0079 U	0.0078 U	0.0078 U	0.0078 U	0.0078 U	0.0085 U

Table E-28
Summary of Data Used in Risk Assessment
South Percolation Pond Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-104	CFSB-109	CFSB-109	CFSB-109	CFSB-110	CFSB-110	CFSB-110	CFSB-113	CFSB-113	CFSB-113	CFSB-114	CFSB-114	CFSB-114	CFSB-115
Sample Lab IDs	460-117124-9	460-117124-14	460-117124-15	460-117124-16	460-117124-17	460-117124-18	460-117124-19	460-119512-1	460-119512-2	460-119512-3	460-116987-10	460-116987-11	460-116987-12	460-119512-4
Sample Name	CFSB-104-SO-10-12	CFSB-109-SO-0-0.5	CFSB-109-SO-0.5-2	CFSB-109-SO-10-12	CFSB-110-SO-0-0.5	CFSB-110-SO-0.5-2	CFSB-110-SO-10-12	CFSB-113-SO-0-0.5	CFSB-113-SO-0.5-2	CFSB-113-SO-2-4	CFSB-114-SO-0-0.5	CFSB-114-SO-0.5-2	CFSB-114-SO-10-12	CFSB-115-SO-0-0.5
Sample Depth	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	2-4 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft
Chemical	7/13/2016	7/13/2016	7/13/2016	7/13/2016	7/14/2016	7/14/2016	7/14/2016	8/31/2016	8/31/2016	8/31/2016	7/12/2016	7/12/2016	7/12/2016	8/31/2016
Hexachlorobenzene	0.015 U	0.028 U	0.021 U	0.014 U	0.03 U	0.017 U	0.014 U	0.017 U	0.015 U	0.014 U	0.014 U	0.014 U	0.014 U	0.016 U
Hexachlorobutadiene	0.01 U	0.019 U	0.015 U	0.01 U	0.021 U	0.012 U	0.0098 U	0.012 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.011 U
Hexachlorocyclopentadiene	0.023 U	0.043 U	0.033 U	0.022 U	0.047 U	0.027 U	0.022 U	0.026 U	0.023 U	0.022 U	0.022 U	0.022 U	0.022 U	0.024 U
Hexachloroethane	0.013 U	0.025 U	0.019 U	0.013 U	0.027 U	0.016 U	0.013 U	0.015 U	0.013 U	0.013 U	0.013 U	0.013 U	0.013 U	0.014 U
Indeno(1,2,3-C,D)Pyrene	0.024 U	0.38	0.91	0.024 U	0.66	0.13	0.023 U	0.2	0.071	0.028 J	0.075	0.024 U	0.024 U	0.12
Isophorone	0.0079 U	0.015 U	0.011 U	0.0077 U	0.016 U	0.0092 U	0.0075 U	0.024 J	0.0078 U	0.0077 U	0.0077 U	0.0077 U	0.0077 U	0.02 J
Naphthalene	0.0093 U	0.017 U	0.013 U	0.0091 U	0.019 U	0.011 U	0.0088 U	0.011 U	0.0092 U	0.0091 U	0.0091 U	0.0091 U	0.0091 U	0.0099 U
Nitrobenzene	0.012 U	0.022 U	0.016 U	0.011 U	0.024 U	0.013 U	0.011 U	0.013 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.012 U
N-Nitrosodi-N-Propylamine	0.012 U	0.023 U	0.018 U	0.012 U	0.025 U	0.014 U	0.012 U	0.014 U	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U	0.013 U
N-Nitrosodiphenylamine	0.033 U	0.062 U	0.048 U	0.032 U	0.068 U	0.039 U	0.032 U	0.038 U	0.033 U	0.032 U	0.032 U	0.032 U	0.032 U	0.035 U
Pentachlorophenol	0.044 U	0.083 U	0.063 U	0.043 U	0.091 U	0.052 U	0.042 U	0.05 U	0.044 U	0.043 U	0.043 U	0.043 U	0.043 U	0.047 U
Phenanthrene	0.0098 U	0.27 J	0.12 J	0.0095 U	0.12 J	0.033 J	0.0092 U	0.1 J	0.047 J	0.017 J	0.044 J	0.0095 U	0.0095 U	0.044 J
Phenol	0.012 U	0.022 U	0.017 U	0.012 U	0.025 U	0.014 U	0.011 U	0.014 U	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U	0.013 U
Pyrene	0.017 U	0.57 J	0.21 J	0.016 U	0.23 J	0.061 J	0.016 U	0.22 J	0.076 J	0.029 J	0.1 J	0.016 U	0.016 U	0.096 J
VOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,1,1-Trichloroethane	0.00038 U	--	0.00068 U	0.00034 U	--	0.00023 U	0.00023 U	--	0.00035 U	0.00034 U	--	0.00041 U	0.00027 U	--
1,1,2,2-Tetrachloroethane	0.00017 U	--	0.0003 UJ	0.00015 U	--	0.0001 UJ	0.0001 U	--	0.00016 U	0.00015 U	--	0.00018 U	0.00012 U	--
1,1,2-Trichloro-1,2,2-Trifluoroethane	0.00044 U	--	0.00079 U	0.00039 U	--	0.00026 U	0.00026 U	--	0.00041 U	0.00039 U	--	0.00047 U	0.00032 U	--
1,1,2-Trichloroethane	0.00028 U	--	0.0005 U	0.00025 U	--	0.00017 U	0.00017 U	--	0.00026 U	0.00025 U	--	0.0003 U	0.0002 U	--
1,1-Dichloroethane	0.00034 U	--	0.00061 U	0.0003 U	--	0.0002 U	0.0002 U	--	0.00032 U	0.0003 U	--	0.00037 U	0.00024 U	--
1,1-Dichloroethene	0.00041 U	--	0.00073 U	0.00037 U	--	0.00025 U	0.00025 U	--	0.00038 U	0.00037 U	--	0.00044 U	0.00029 U	--
1,2,3-Trichlorobenzene	0.00011 U	--	0.0002 UJ	0.000098 U	--	0.000066 UJ	0.000066 U	--	0.0001 U	0.000098 U	--	0.00012 U	0.000079 U	--
1,2,4-Trichlorobenzene	0.00032 U	--	0.00057 UJ	0.00029 U	--	0.00019 UJ	0.00019 U	--	0.0003 U	0.00029 U	--	0.00035 U	0.00023 U	--
1,2-Dibromo-3-Chloropropane	0.00047 U	--	0.00084 UJ	0.00042 U	--	0.00028 UJ	0.00028 U	--	0.00044 U	0.00042 U	--	0.00051 U	0.00034 U	--
1,2-Dibromoethane (Ethylene Dibromide)	0.00012 U	--	0.00021 U	0.00011 U	--	0.000072 U	0.000072 U	--	0.00011 U	0.00011 U	--	0.00013 U	0.000086 U	--
1,2-Dichlorobenzene	0.00014 U	--	0.00025 UJ	0.00013 U	--	0.000084 UJ	0.000084 U	--	0.00013 U	0.00013 U	--	0.00015 U	0.0001 U	--
1,2-Dichloroethane	0.00011 U	--	0.0002 U	0.000098 U	--	0.000066 U	0.000066 U	--	0.0001 U	0.000098 U	--	0.00012 U	0.000079 U	--
1,2-Dichloropropane	0.00017 U	--	0.0003 U	0.00015 U	--	0.0001 U	0.0001 U	--	0.00016 U	0.00015 U	--	0.00018 U	0.00012 U	--
1,3-Dichlorobenzene	0.00012 U	--	0.00021 UJ	0.00011 U	--	0.000072 UJ	0.000072 U	--	0.00011 U	0.00011 U	--	0.00013 U	0.000086 U	--
1,4-Dichlorobenzene	0.00013 U	--	0.00023 UJ	0.00012 U	--	0.00021 J	0.000078 U	--	0.00012 U	0.00012 U	--	0.00014 U	0.000093 U	--
2-Hexanone	0.00094 U	--	0.0017 U	0.00084 U	--	0.00056 U	0.00056 U	--	0.00087 UJ	0.00084 UJ	--	0.001 U	0.00076 J	--
Acetone	0.0048 J	--	0.087	0.019	--	0.033	0.0035	--	0.022	0.018	--	0.017 J+	0.0095 J+	--
Benzene	0.0002 U	--	0.00036 U	0.00027 J	--	0.0002 J	0.00019 J	--	0.00023 J	0.00042 J	--	0.00031 J	0.00018 J	--
Bromochloromethane	0.00017 U	--	0.0003 U	0.00015 U	--	0.0001 U	0.0001 U	--	0.00016 U	0.00015 U	--	0.00018 U	0.00012 U	--
Bromodichloromethane	0.00038 U	--	0.00068 U	0.00034 U	--	0.00023 U	0.00023 U	--	0.00035 U	0.00034 U	--	0.00041 U	0.00027 U	--
Bromoform	0.00013 U	--	0.00023 U	0.00012 U	--	0.000078 U	0.000078 U	--	0.00012 U	0.00012 U	--	0.00014 U	0.000093 U	--
Bromomethane	0.00032 U	--	0.00057 U	0.00029 U	--	0.00019 U	0.00019 U	--	0.0003 U	0.00029 U	--	0.00035 U	0.00023 U	--
Carbon Disulfide	0.00043 U	--	0.0018	0.00044 J	--	0.00051 J	0.0024	--	0.0058	0.0029	--	0.00046 U	0.00031 U	--
Carbon Tetrachloride	0.00043 U	--	0.00077 U	0.00038 U	--	0.00026 U	0.00026 U	--	0.0004 UJ	0.00038 UJ	--	0.00046 U	0.00031 U	--
Chlorobenzene	0.00014 U	--	0.00025 U	0.00013 U	--	0.000084 U	0.000084 U	--	0.00013 U	0.00013 U	--	0.00015 U	0.0001 U	--
Chloroethane	0.00035 U	--	0.00063 U	0.00031 U	--	0.00021 U	0.00021 U	--	0.00032 U	0.00031 U	--	0.00038 U	0.00025 U	--
Chloroform	0.00021 U	--	0.00038 U	0.00019 U	--	0.00013 U	0.00013 U	--	0.00019 U	0.00019 U	--	0.00023 U	0.00015 U	--
Chloromethane	0.00038 U	--	0.00068 U	0.00034 U	--	0.00023 U	0.00023 U	--	0.00035 U	0.00034 U	--	0.00041 U	0.00027 U	--
Cis-1,2-Dichloroethylene	0.00022 U	--	0.00039 U	0.0002 U	--	0.00013 U	0.00013 U	--	0.0002 U	0.0002 U	--	0.00024 U	0.00016 U	--
Cis-1,3-Dichloropropene	0.00015 U	--	0.00027 U	0.00013 U	--	0.00009 U	0.00009 U	--	0.00014 U	0.00013 U	--	0.00016 U	0.00011 U	--
Cyclohexane	0.00046 U	--	0.00082 U	0.00041 U	--	0.00028 U	0.00065	--	0.00073 J	0.00093	--	0.0005 U	0.00033 U	--
Dibromochloromethane	0.00015 U	--	0.00027 U	0.00013 U	--	0.00009 U	0.00009 U	--	0.00014 U	0.00013 U	--	0.00016 U	0.00011 U	--
Dichlorodifluoromethane	0.00032 U	--	0.00057 U	0.00029 U	--	0.00019 U	0.00019 U	--	0.0003 U	0.00029 U	--	0.00035 U	0.00023 U	--
Ethylbenzene	0.00018 U	--	0.00032 U	0.00017 J	--	0.00012 J	0.00012 J	--	0.00018 J	0.00037 J	--	0.0004 J	0.00026 J	--
Isopropylbenzene (Cumene)	0.00017 U	--	0.0003 U	0.00015 U	--	0.0001 U	0.0001 U	--	0.00016 U	0.00015 U	--	0.00018 U	0.00012 U	--
M,P-Xylene	0.00011 U	--	0.0002 U	0.00054 J	--	0.00039 J	0.00028 J	--	0.00067 J	0.00083 J	--	0.0013	0.00073	--
Methyl Acetate	0.0075	--	0.0081 J	0.00081 U	--	0.0089	0.00054 U	--	0.0043 J	0.0008 U	--	0.00097 U	0.00065 U	--
Methyl Ethyl Ketone (2-Butanone)	0.00077 U	--	0.0078 J	0.0015 J	--	0.0034	0.00046 U	--	0.0025 J-	0.0024 J-	--	0.00083 U	0.00055 U	--
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	0.0022 U	--	0.004 U	0.002 U	--	0.0013 U	0.0013 U	--	0.0021 UJ	0.002 UJ	--	0.0024 U	0.0016 U	--
Methylcyclohexane	0.0005 U	--	0.0009 U	0.00083 J	--	0.0003 U	0.00069	--	0.00086 J	0.0013	--	0.00058 J	0.00036 U	--
Methylene Chloride	0.00032 U	--	0.00057 U	0.00029 U	--	0.00019 U	0.00019 U	--	0.0003 U	0.00029 U	--	0.00035 U	0.00023 U	--
O-Xylene (1,2-Dimethylbenzene)	0.00016 U	--	0.00029 U	0.00018 J	--	0.00011 J	0.0001 J	--	0.00019 J	0.00031 J	--	0.00044 J	0.00026 J	--
Styrene	0.00015 U	--	0.00027 U	0.00013 U	--	0.00009 U	0.00009 U	--	0.00014 U	0.00013 U	--	0.00016 U	0.00011 U	--
Tert-Butyl Methyl Ether	0.00017 U	--	0.0003 U	0.00015 U	--	0.0001 U	0.0001 U	--	0.00016 U	0.00015 U	--	0.00018 U	0.00012 U	--

Table E-28
Summary of Data Used in Risk Assessment
South Percolation Pond Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-104	CFSB-109	CFSB-109	CFSB-109	CFSB-110	CFSB-110	CFSB-110	CFSB-113	CFSB-113	CFSB-113	CFSB-114	CFSB-114	CFSB-114	CFSB-115
Sample Lab IDs	460-117124-9	460-117124-14	460-117124-15	460-117124-16	460-117124-17	460-117124-18	460-117124-19	460-119512-1	460-119512-2	460-119512-3	460-116987-10	460-116987-11	460-116987-12	460-119512-4
Sample Name	CFSB-104-SO-10-12	CFSB-109-SO-0-0.5	CFSB-109-SO-0.5-2	CFSB-109-SO-10-12	CFSB-110-SO-0-0.5	CFSB-110-SO-0.5-2	CFSB-110-SO-10-12	CFSB-113-SO-0-0.5	CFSB-113-SO-0.5-2	CFSB-113-SO-2-4	CFSB-114-SO-0-0.5	CFSB-114-SO-0.5-2	CFSB-114-SO-10-12	CFSB-115-SO-0-0.5
Sample Depth	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	2-4 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft
Chemical	7/13/2016	7/13/2016	7/13/2016	7/13/2016	7/14/2016	7/14/2016	7/14/2016	8/31/2016	8/31/2016	8/31/2016	7/12/2016	7/12/2016	7/12/2016	8/31/2016
Tetrachloroethylene (PCE)	0.00028 U	--	0.0005 U	0.00025 U	--	0.00017 U	0.00017 U	--	0.00026 U	0.00025 U	--	0.0003 U	0.0002 U	--
Toluene	0.00019 U	--	0.00034 U	0.00088 J	--	0.00068	0.00097	--	0.00089 J	0.0013	--	0.0014	0.001	--
Trans-1,2-Dichloroethene	0.00039 U	--	0.0007 U	0.00035 U	--	0.00023 U	0.00023 U	--	0.00036 U	0.00035 U	--	0.00042 U	0.00028 U	--
Trans-1,3-Dichloropropene	0.0001 U	--	0.00018 U	0.00009 U	--	0.00006 U	0.00006 U	--	0.000093 U	0.000089 U	--	0.00011 U	0.000072 U	--
Trichloroethylene (TCE)	0.00026 U	--	0.00047 U	0.00023 U	--	0.00016 U	0.00016 U	--	0.00024 U	0.00023 U	--	0.00028 U	0.00019 U	--
Trichlorofluoromethane	0.00034 U	--	0.00061 U	0.0003 U	--	0.0002 U	0.0002 U	--	0.00032 U	0.0003 U	--	0.00037 U	0.00024 U	--
Vinyl Chloride	0.00039 U	--	0.0007 U	0.00035 U	--	0.00023 U	0.00023 U	--	0.00036 U	0.00035 U	--	0.00042 U	0.00028 U	--

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-28
Summary of Data Used in Risk Assessment
South Percolation Pond Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-115	CFSB-115	CFSB-116	CFSB-116	CFSB-116	CFSB-118	CFSB-118	CFSB-118	CFSB-119	CFSB-119	CFSB-119	CFSB-142	CFSB-142	CFSB-142
Sample Lab IDs	460-119512-5	460-119512-6	460-117573-1	460-117573-2	460-117573-3	460-117506-4	460-117506-5	460-117506-6	460-116987-7	460-116987-8	460-116987-9	460-144400-5	460-144400-6	460-144400-7
Sample Name	CFSB-115-SO-0.5-2	CFSB-115-SO-2-4	CFSB-116-SO-0-0.5	CFSB-116-SO-0.5-2	CFSB-116-SO-10-12	CFSB-118-SO-0-0.5	CFSB-118-SO-0.5-2	CFSB-118-SO-10-12	CFSB-119-SO-0-0.5	CFSB-119-SO-0.5-2	CFSB-119-SO-10-12	CFSB-142-SO-0-0.5	CFSB-142-SO-0.5-2	CFSB-142-SO-2-4
Sample Depth	0.5-2 ft	2-4 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	2-4 ft
Chemical	8/31/2016	8/31/2016	7/22/2016	7/22/2016	7/22/2016	7/21/2016	7/21/2016	7/21/2016	7/12/2016	7/12/2016	7/12/2016	11/2/2017	11/2/2017	11/2/2017
GENERAL CHEMISTRY (mg/kg)														
Fluoride	1.58 J+	1.4 J+	3.81	1.96 J	1.62 J	1.8 J+	1.85 J+	1.61 J+	4.81 J	14.6 J	9.41 J	22.1 J+	17.8 J+	15.4 J+
Cyanide	0.087 J	0.034 J	0.29	0.059 J	0.04 J	0.02 U	0.038 J	0.019 U	0.14	0.045 J	0.022 J	0.43	0.44	0.3
Cyanide (Free)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
METALS (mg/kg)														
"Chromium, Hexavalent - Estimated"	0.0776156	0.184672	0.246229	0.214112	0.216788	0.246229	0.179319	0.256934	0.23017	0.211436	0.313139	0.184672	0.195377	0.20073
"Chromium, Trivalent - Estimated"	2.82238	6.71533	8.95377	7.78589	7.88321	8.95377	6.52068	9.34307	8.36983	7.68856	11.3869	6.71533	7.10462	7.29927
Aluminum	2560	6390	8380	7090	6200	7200	5980	8230	8300	6880	8140	7380	6540	7390
Antimony	0.32 U	0.27 U	0.63 U	0.53 U	0.48 U	0.45 UJ	0.42 UJ	0.45 UJ	0.42 U	0.45 U	0.43 U	0.29 UJ	0.3 UJ	0.3 UJ
Arsenic	0.66 J	1.5	1.7 J+	2 J+	2.7 J+	2.5	1.6	4.3	4.8	3.4	6	5.7	8.2	5
Barium	63.6	94.4	265	43.1	44.2	52.3	55.7	54.1	79.3	88.8	87.3	67.6	91.5	83.9
Beryllium	0.11 J	0.24 J	0.52 J	0.3 J	0.22 J	0.25 J	0.21 J	0.21 J	0.36 J	0.37 J	0.39 J	0.35	0.44	0.33 J
Cadmium	0.33 U	0.28 U	0.48 U	0.4 U	0.36 U	0.34 U	0.32 U	0.34 U	0.32 U	0.34 U	0.33 U	0.31 U	0.32 U	0.31 U
Calcium	13600	14400	57100 J	5140 J	7400 J	13700	8040	33600	14300	11500	25400	13000	8590	16100
Chromium, Total	2.9	6.9	9.2	8	8.1	9.2	6.7	9.6	8.6	7.9	11.7	6.9	7.3	7.5
Cobalt	1.8 J	2.7	4.9	4.9	4	4.7	3.7	5	5.1	4.7	5.3	4.2 J+	4.2 J+	5 J+
Copper	3.3	22.1	22.7 J+	8.1 J+	8.1 J+	9	7.8	9.9	14.4	11.4	19.5	11.3	10.6	11.1
Iron	3350	9260	11200	12500	10800	12200	9750	14100	12300	11400	14200	12400	12700	11500
Lead	2.1	3.3	8.2 J+	5.5 J+	4.4 J+	4.7	4.4	6	10.7	6.3	8.3	6.3 J+	13.6 J+	10.3 J+
Magnesium	3750	6810	9060	7790	7770	9630	6810	12800	8100	8400	10500	9230	7770	9730
Manganese	55.6	79.9	99.6	107	120	215	88	293	312	261	280	415	314	394
Mercury	0.016 J	0.013 J	0.018 J	0.014 U	0.014 U	0.025	0.015 J	0.018 J	0.03	0.02	0.016 J	0.011 J+	0.014 J+	0.023 J+
Nickel	4.3	7.7	12.6	9.5	8.3	9.8	8.3	10.7	15.7	9.6	11.2	9.3	10.4	10.2
Potassium	230	491	732	448	437	490	441	526	972	803	794	436	536	529
Selenium	0.29 U	0.25 U	0.59 U	0.5 U	0.45 U	0.42 U	0.4 U	0.42 U	0.4 U	0.42 U	0.4 U	0.27 U	0.28 U	0.28 U
Silver	0.62 U	0.52 U	1.2 U	0.97 U	0.87 U	0.82 U	0.77 U	0.82 U	0.77 U	0.82 U	0.79 U	0.57 U	0.59 U	0.58 U
Sodium	42.8 U	36.1 U	59.1 U	49.4 U	44.6 U	42 U	39.5 U	42.1 U	39.4 U	42 U	40.3 U	42.1 J	55.8 J	55.4 J
Thallium	0.13 U	0.11 U	0.24 U	0.2 U	0.18 U	0.17 U	0.16 U	0.17 U	0.16 U	0.17 U	0.16 U	0.12 U	0.12 U	0.12 U
Vanadium	2.6	8.3	14.8	10.6	9.1	10.8	7.9	7.4	11.1	11.3	11.7	7.6 J+	11 J+	8.3 J+
Zinc	13.1	22.4	44.3	35.4	27.9	34.5	32.5	36.3	42.6	31.3	37.9	35.4 J+	37.4 J+	33.3 J+
PESTICIDES (mg/kg)														
Aldrin	--	--	0.0013 U	--	--	0.001 U	--	--	--	--	--	--	--	--
Alpha Bhc (Alpha Hexachlorocyclohexane)	--	--	0.00099 U	--	--	0.00077 U	--	--	--	--	--	--	--	--
Alpha Endosulfan	--	--	0.0015 U	--	--	0.0012 U	--	--	--	--	--	--	--	--
Beta Bhc (Beta Hexachlorocyclohexane)	--	--	0.0011 U	--	--	0.00082 U	--	--	--	--	--	--	--	--
Beta Endosulfan	--	--	0.0017 U	--	--	0.0013 U	--	--	--	--	--	--	--	--
cis-Chlordane	--	--	0.0018 U	--	--	0.0014 U	--	--	--	--	--	--	--	--
Delta BHC (Delta Hexachlorocyclohexane)	--	--	0.0012 U	--	--	0.00092 U	--	--	--	--	--	--	--	--
Dieldrin	--	--	0.0014 U	--	--	0.0011 U	--	--	--	--	--	--	--	--
Endosulfan Sulfate	--	--	0.0013 U	--	--	0.00098 U	--	--	--	--	--	--	--	--
Endrin	--	--	0.0014 U	--	--	0.0011 U	--	--	--	--	--	--	--	--
Endrin Aldehyde	--	--	0.0013 U	--	--	0.001 U	--	--	--	--	--	--	--	--
Endrin Ketone	--	--	0.0015 U	--	--	0.0012 U	--	--	--	--	--	--	--	--
Gamma Bhc (Lindane)	--	--	0.00097 U	--	--	0.00075 U	--	--	--	--	--	--	--	--
Heptachlor	--	--	0.0014 U	--	--	0.0011 U	--	--	--	--	--	--	--	--
Heptachlor Epoxide	--	--	0.0021 U	--	--	0.0016 U	--	--	--	--	--	--	--	--
Methoxychlor	--	--	0.0023 U	--	--	0.0018 U	--	--	--	--	--	--	--	--
P,P'-DDD	--	--	0.0014 U	--	--	0.0011 U	--	--	--	--	--	--	--	--
P,P'-DDE	--	--	0.0016 U	--	--	0.0012 U	--	--	--	--	--	--	--	--
P,P'-DDT	--	--	0.0011 U	--	--	0.00087 U	--	--	--	--	--	--	--	--
Toxaphene	--	--	0.032 U	--	--	0.025 U	--	--	--	--	--	--	--	--
trans-Chlordane	--	--	0.0023 U	--	--	0.0018 U	--	--	--	--	--	--	--	--
POLYCHLORINATED BIPHENYLS (mg/kg)														
PCB-1016 (Aroclor 1016)	0.0094 U	0.0095 U	0.014 U	0.012 U	0.011 U	0.011 U	0.01 U	0.011 U	0.01 U	0.01 U	0.0094 U	--	--	--
PCB-1221 (Aroclor 1221)	0.0094 U	0.0095 U	0.014 U	0.012 U	0.011 U	0.011 U	0.01 U	0.011 U	0.01 U	0.01 U	0.0094 U	--	--	--
PCB-1232 (Aroclor 1232)	0.0094 U	0.0095 U	0.014 U	0.012 U	0.011 U	0.011 U	0.01 U	0.011 U	0.01 U	0.01 U	0.0094 U	--	--	--
PCB-1242 (Aroclor 1242)	0.0094 U	0.0095 U	0.014 U	0.012 U	0.011 U	0.011 U	0.01 U	0.011 U	0.01 U	0.01 U	0.0094 U	--	--	--
PCB-1248 (Aroclor 1248)	0.0094 U	0.0095 U	0.014 U	0.012 U	0.011 U	0.011 U	0.01 U	0.011 U	0.01 U	0.01 U	0.0094 U	--	--	--
PCB-1254 (Aroclor 1254)	0.0097 U	0.0098 U	0.015 U	0.012 U	0.011 U	0.012 U	0.011 U	0.011 U	0.011 U	0.011 U	0.0097 U	--	--	--

Table E-28
Summary of Data Used in Risk Assessment
South Percolation Pond Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-115	CFSB-115	CFSB-116	CFSB-116	CFSB-116	CFSB-118	CFSB-118	CFSB-118	CFSB-119	CFSB-119	CFSB-119	CFSB-142	CFSB-142	CFSB-142
Sample Lab IDs	460-119512-5	460-119512-6	460-117573-1	460-117573-2	460-117573-3	460-117506-4	460-117506-5	460-117506-6	460-116987-7	460-116987-8	460-116987-9	460-144400-5	460-144400-6	460-144400-7
Sample Name	CFSB-115-SO-0.5-2	CFSB-115-SO-2-4	CFSB-116-SO-0-0.5	CFSB-116-SO-0.5-2	CFSB-116-SO-10-12	CFSB-118-SO-0-0.5	CFSB-118-SO-0.5-2	CFSB-118-SO-10-12	CFSB-119-SO-0-0.5	CFSB-119-SO-0.5-2	CFSB-119-SO-10-12	CFSB-142-SO-0-0.5	CFSB-142-SO-0.5-2	CFSB-142-SO-2-4
Sample Depth	0.5-2 ft	2-4 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	2-4 ft
Chemical	8/31/2016	8/31/2016	7/22/2016	7/22/2016	7/22/2016	7/21/2016	7/21/2016	7/21/2016	7/12/2016	7/12/2016	7/12/2016	11/2/2017	11/2/2017	11/2/2017
PCB-1260 (Aroclor 1260)	0.0097 U	0.0098 U	0.015 U	0.012 U	0.011 U	0.012 U	0.011 U	0.011 U	0.011 U	0.011 U	0.0097 U	--	--	--
PCB-1262 (Aroclor 1262)	0.0097 U	0.0098 U	0.015 U	0.012 U	0.011 U	0.012 U	0.011 U	0.011 U	0.011 U	0.011 U	0.0097 U	--	--	--
PCB-1268 (Aroclor 1268)	0.0097 U	0.0098 U	0.015 U	0.012 U	0.011 U	0.012 U	0.011 U	0.011 U	0.011 U	0.011 U	0.0097 U	--	--	--
Polychlorinated Biphenyl (PCBs)	0.0097 U	0.0098 U	0.015 U	0.012 U	0.011 U	0.012 U	0.011 U	0.011 U	0.011 U	0.011 U	0.0097 U	--	--	--
SEMIVOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,2,4,5-Tetrachlorobenzene	0.026 U	0.026 U	0.04 U	0.032 U	0.03 U	0.031 U	0.028 U	0.03 U	0.029 U	0.029 U	0.026 U	0.027 U	0.028 U	0.029 U
1,4-Dioxane (P-Dioxane)	0.093 U	0.094 U	0.14 U	0.12 U	0.11 U	0.11 U	0.1 U	0.11 U	0.1 U	0.1 U	0.093 U	0.097 U	0.1 U	0.1 U
2,3,4,6-Tetrachlorophenol	0.033 U	0.033 U	0.05 U	0.041 U	0.038 U	0.039 U	0.036 U	0.038 U	0.036 UJ	0.036 UJ	0.033 UJ	0.034 U	0.036 U	0.036 U
2,4,5-Trichlorophenol	0.035 U	0.035 U	0.053 U	0.043 U	0.04 U	0.041 U	0.038 U	0.04 U	0.038 U	0.038 U	0.035 U	0.036 U	0.038 U	0.038 U
2,4,6-Trichlorophenol	0.0099 U	0.01 U	0.015 U	0.012 U	0.011 U	0.012 U	0.011 U	0.011 U	0.011 U	0.011 U	0.0099 U	0.01 U	0.011 U	0.011 U
2,4-Dichlorophenol	0.0082 U	0.0083 U	0.013 U	0.01 U	0.0094 U	0.0098 U	0.009 U	0.0095 U	0.0091 U	0.009 U	0.0082 U	0.0085 U	0.009 U	0.0091 U
2,4-Dimethylphenol	0.076 U	0.077 U	0.12 U	0.095 U	0.088 U	0.091 U	0.084 U	0.088 U	0.085 U	0.084 U	0.077 U	0.08 U	0.084 U	0.084 U
2,4-Dinitrophenol	0.26 U	0.27 U	0.4 U	0.33 U	0.3 U	0.31 U	0.29 U	0.3 U	0.29 U	0.29 U	0.26 U	0.27 U	0.29 U	0.29 U
2,4-Dinitrotoluene	0.014 U	0.014 U	0.021 U	0.017 U	0.016 U	0.016 U	0.015 U	0.016 U	0.015 U	0.015 U	0.014 U	0.014 U	0.015 U	0.015 U
2,6-Dinitrotoluene	0.018 U	0.019 U	0.028 U	0.023 U	0.021 U	0.022 U	0.02 U	0.021 U	0.021 U	0.02 U	0.019 U	0.019 U	0.02 U	0.02 U
2-Chloronaphthalene	0.0079 U	0.008 U	0.012 U	0.0098 U	0.0091 U	0.0094 U	0.0086 U	0.0091 U	0.0088 U	0.0087 U	0.0079 U	0.0082 U	0.0087 U	0.0087 U
2-Chlorophenol	0.0088 U	0.0089 U	0.014 U	0.011 U	0.01 U	0.011 U	0.0097 U	0.01 U	0.0098 U	0.0097 U	0.0089 U	0.0092 U	0.0097 U	0.0097 U
2-Methylnaphthalene	0.0077 U	0.0077 U	0.012 U	0.0096 U	0.0088 U	0.0092 U	0.013 J	0.029 J	0.0085 U	0.0085 U	0.0077 U	0.008 U	0.0084 U	0.0085 U
2-Methylphenol (O-Cresol)	0.015 U	0.015 U	0.023 U	0.019 U	0.017 U	0.018 U	0.017 U	0.017 U	0.017 U	0.017 U	0.015 U	0.016 U	0.017 U	0.017 U
2-Nitroaniline	0.011 U	0.012 U	0.018 U	0.014 U	0.013 U	0.014 U	0.013 U	0.013 U	0.013 U	0.013 U	0.012 U	0.012 U	0.013 U	0.013 U
2-Nitrophenol	0.012 U	0.012 U	0.018 U	0.015 U	0.013 U	0.014 U	0.013 U	0.013 U	0.013 U	0.013 U	0.012 U	0.012 U	0.013 U	0.013 U
3- And 4- Methylphenol (Total)	0.0092 U	0.0093 U	0.014 U	0.012 U	0.011 U	0.011 U	0.01 U	0.011 U	0.01 U	0.01 U	0.0093 U	0.0096 U	0.01 U	0.01 U
3,3'-Dichlorobenzidine	0.039 U	0.039 U	0.06 U	0.048 U	0.045 U	0.046 U	0.042 U	0.045 U	0.043 U	0.043 U	0.039 U	0.04 U	0.043 U	0.043 U
3-Nitroaniline	0.01 U	0.01 U	0.016 U	0.013 U	0.012 U	0.012 U	0.011 U	0.012 U	0.011 U	0.011 U	0.01 U	0.011 U	0.011 U	0.011 U
4,6-Dinitro-2-Methylphenol	0.093 U	0.094 U	0.14 U	0.12 U	0.11 U	0.11 U	0.1 U	0.11 U	0.1 U	0.1 U	0.093 U	0.096 U	0.1 U	0.1 U
4-Bromophenyl Phenyl Ether	0.011 U	0.011 U	0.017 U	0.014 U	0.013 U	0.013 U	0.012 U	0.013 U	0.012 U	0.012 U	0.011 U	0.011 U	0.012 U	0.012 U
4-Chloro-3-Methylphenol	0.015 U	0.015 U	0.023 U	0.019 U	0.017 U	0.018 U	0.016 U	0.017 U	0.017 U	0.016 U	0.015 U	0.016 U	0.016 U	0.016 U
4-Chloroaniline	0.0089 U	0.009 U	0.014 U	0.011 U	0.01 U	0.011 U	0.0098 U	0.01 U	0.0099 U	0.0099 U	0.009 U	0.0093 U	0.0098 U	0.0099 U
4-Chlorophenyl Phenyl Ether	0.01 U	0.011 U	0.016 U	0.013 U	0.012 U	0.012 U	0.011 U	0.012 U	0.012 U	0.011 U	0.01 U	0.011 U	0.011 U	0.011 U
4-Nitroaniline	0.013 U	0.013 U	0.02 U	0.016 U	0.015 U	0.016 U	0.014 U	0.015 U	0.015 U	0.014 U	0.013 U	0.014 U	0.014 U	0.015 U
4-Nitrophenol	0.17 U	0.17 U	0.26 U	0.21 U	0.19 U	0.2 U	0.18 U	0.19 U	0.19 U	0.18 U	0.17 U	0.17 U	0.18 U	0.18 U
Acenaphthene	0.0084 U	0.0085 U	0.013 U	0.01 U	0.0097 U	0.01 U	0.0092 U	0.0097 U	0.0093 U	0.0093 U	0.0085 U	0.0088 U	0.0092 U	0.0093 U
Acenaphthylene	0.0089 U	0.009 U	0.014 U	0.011 U	0.01 U	0.011 U	0.0098 U	0.01 U	0.0099 U	0.0099 U	0.009 U	0.0093 U	0.0098 U	0.0099 U
Acetophenone	0.0076 U	0.0076 U	0.012 U	0.0094 U	0.0087 U	0.009 U	0.0083 U	0.0087 U	0.011 J	0.0083 U	0.0076 U	0.0079 U	0.0083 U	0.0084 U
Anthracene	0.033 U	0.033 U	0.051 U	0.041 U	0.038 U	0.039 U	0.036 U	0.038 U	0.037 U	0.036 U	0.033 U	0.034 U	0.036 U	0.036 U
Atrazine	0.015 U	0.016 U	0.024 U	0.019 U	0.018 U	0.018 U	0.017 U	0.018 U	0.017 U	0.017 U	0.016 U	0.016 U	0.017 U	0.017 U
Benzaldehyde	0.026 U	0.027 U	0.041 U	0.033 U	0.03 U	0.032 U	0.029 U	0.031 U	0.088 J	0.029 U	0.027 U	0.028 U	0.029 U	0.029 U
Benzo(A)Anthracene	0.052	0.029 U	0.11	0.036 U	0.033 U	0.035 U	0.032 U	0.033 U	0.13	0.032 U	0.029 U	0.038	0.069	0.05
Benzo(A)Pyrene	0.06	0.025 J	0.15	0.013 U	0.012 U	0.013 U	0.018 J	0.012 U	0.18	0.024 J	0.019 J	0.062	0.093	0.069
Benzo(B)Fluoranthene	0.13	0.055	0.25	0.017 U	0.019 J	0.016 U	0.029 J	0.016 U	0.35	0.036 J	0.028 J	0.11	0.17	0.11
Benzo(G,H,I)Perylene	0.087 J	0.03 J	0.2 J	0.025 U	0.023 U	0.024 U	0.022 U	0.023 U	0.24 J	0.022 U	0.02 U	0.049 J	0.072 J	0.046 J
Benzo(K)Fluoranthene	0.049	0.016 J	0.083	0.019 U	0.017 U	0.018 U	0.017 U	0.017 U	0.1	0.017 U	0.015 U	0.042	0.057	0.045
Benzyl Butyl Phthalate	0.011 U	0.011 U	0.016 U	0.013 U	0.012 U	0.013 U	0.012 U	0.012 U	0.012 U	0.012 U	0.011 U	0.011 U	0.012 U	0.012 U
Biphenyl (Diphenyl)	0.03 U	0.03 U	0.046 U	0.037 U	0.034 U	0.035 U	0.032 U	0.034 U	0.033 U	0.033 U	0.03 U	0.031 U	0.033 U	0.033 U
Bis(2-Chloroethoxy) Methane	0.011 U	0.011 U	0.017 U	0.013 U	0.012 U	0.013 U	0.012 U	0.013 U	0.012 U	0.012 U	0.011 U	0.011 U	0.012 U	0.012 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.0082 U	0.0083 U	0.017 J	0.01 U	0.0094 U	0.0098 U	0.009 U	0.0095 U	0.0091 U	0.009 U	0.0082 U	0.0085 U	0.009 U	0.0091 U
Bis(2-Chloroisopropyl) Ether	0.014 U	0.014 U	0.022 U	0.018 U	0.016 U	0.017 U	0.016 U	0.017 U	0.016 UJ	0.016 UJ	0.014 UJ	0.015 U	0.016 U	0.016 U
Bis(2-Ethylhexyl) Phthalate	0.014 U	0.014 U	0.021 U	0.017 U	0.016 U	0.016 U	0.015 U	0.016 U	0.015 U	0.015 U	0.014 U	0.014 U	0.015 U	0.015 U
Caprolactam	0.025 U	0.025 U	0.038 U	0.031 U	0.029 U	0.03 U	0.027 U	0.029 U	0.028 U	0.046 J	0.025 U	0.026 U	0.027 U	0.028 U
Carbazole	0.0086 U	0.0087 U	0.016 J	0.011 U	0.0099 U	0.01 U	0.0094 U	0.01 U	0.024 J	0.0095 U	0.0087 U	0.009 U	0.011 J	0.0095 U
Chrysene	0.087 J	0.037 J	0.17 J	0.012 U	0.011 U	0.011 U	0.026 J	0.011 U	0.23 J	0.026 J	0.019 J	0.057 J	0.11 J	0.07 J
Dibenz(A,H)Anthracene	0.018 U	0.018 U	0.05 J	0.023 U	0.021 U	0.022 U	0.02 U	0.021 U	0.051	0.02 U	0.018 U	0.019 U	0.042	0.02 U
Dibenzofuran	0.011 U	0.011 U	0.016 U	0.013 U	0.012 U	0.013 U	0.012 U	0.012 U	0.012 U	0.012 U	0.011 U	0.011 U	0.012 U	0.012 U
Diethyl Phthalate	0.0099 U	0.01 U	0.015 U	0.012 U	0.011 U	0.012 U	0.011 U	0.011 U	0.011 U	0.011 U	0.0099 U	0.01 U	0.011 U	0.011 U
Dimethyl Phthalate	0.01 U	0.01 U	0.015 U	0.013 U	0.012 U	0.012 U	0.011 U	0.012 U	0.011 U	0.011 U	0.01 U	0.011 U	0.011 U	0.011 U
Di-N-Butyl Phthalate	0.01 U	0.011 U	0.016 U	0.013 U	0.012 U	0.012 U	0.011 U	0.012 U	0.012 U	0.034 J	0.016 J	0.011 U	0.011 U	0.011 U
Di-N-Octylphthalate	0.018 U	0.018 U	0.027 U	0.022 U	0.02 U	0.021 U	0.019 U	0.02 U	0.02 U	0.019 U	0.018 U	0.018 U	0.019 U	0.019 U
Fluoranthene	0.091 J	0.035 J	0.16 J	0.013 U	0.012 U	0.012 U	0.033 J	0.012 U	0.21 J	0.026 J	0.019 J	0.053 J	0.1 J	0.077 J
Fluorene	0.0076 U	0.0076 U	0.012 U	0.0094 U	0.0087 U	0.009 U	0.0083 U	0.0087 U	0.0084 U	0.0083 U	0.0076 U	0.0079 U	0.0083 U	0.0084 U

Table E-28
Summary of Data Used in Risk Assessment
South Percolation Pond Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-115	CFSB-115	CFSB-116	CFSB-116	CFSB-116	CFSB-118	CFSB-118	CFSB-118	CFSB-119	CFSB-119	CFSB-119	CFSB-142	CFSB-142	CFSB-142
Sample Lab IDs	460-119512-5	460-119512-6	460-117573-1	460-117573-2	460-117573-3	460-117506-4	460-117506-5	460-117506-6	460-116987-7	460-116987-8	460-116987-9	460-144400-5	460-144400-6	460-144400-7
Sample Name	CFSB-115-SO-0.5-2	CFSB-115-SO-2-4	CFSB-116-SO-0-0.5	CFSB-116-SO-0.5-2	CFSB-116-SO-10-12	CFSB-118-SO-0-0.5	CFSB-118-SO-0.5-2	CFSB-118-SO-10-12	CFSB-119-SO-0-0.5	CFSB-119-SO-0.5-2	CFSB-119-SO-10-12	CFSB-142-SO-0-0.5	CFSB-142-SO-0.5-2	CFSB-142-SO-2-4
Sample Depth	0.5-2 ft	2-4 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	2-4 ft
Chemical	8/31/2016	8/31/2016	7/22/2016	7/22/2016	7/22/2016	7/21/2016	7/21/2016	7/21/2016	7/12/2016	7/12/2016	7/12/2016	11/2/2017	11/2/2017	11/2/2017
Hexachlorobenzene	0.014 U	0.014 U	0.022 U	0.018 U	0.016 U	0.017 U	0.015 U	0.016 U	0.016 UJ	0.016 UJ	0.014 UJ	0.015 U	0.015 U	0.016 U
Hexachlorobutadiene	0.0098 U	0.0099 U	0.015 U	0.012 U	0.011 U	0.012 U	0.011 U	0.011 U	0.011 UJ	0.011 UJ	0.0098 UJ	0.01 U	0.011 U	0.011 U
Hexachlorocyclopentadiene	0.022 U	0.022 U	0.033 U	0.027 U	0.025 U	0.026 U	0.024 U	0.025 U	0.024 U	0.024 U	0.022 U	0.023 UJ	0.024 UJ	0.024 UJ
Hexachloroethane	0.013 U	0.013 U	0.02 U	0.016 U	0.015 U	0.015 U	0.014 U	0.015 U	0.014 U	0.014 U	0.013 U	0.013 U	0.014 U	0.014 U
Indeno(1,2,3-C,D)Pyrene	0.093	0.027 J	0.23	0.029 U	0.027 U	0.028 U	0.025 U	0.027 U	0.22	0.025 U	0.023 U	0.08	0.11	0.079
Isophorone	0.0095 J	0.0075 U	0.011 U	0.0093 U	0.0086 U	0.0089 U	0.0082 U	0.0086 U	0.0083 U	0.0082 U	0.0075 U	0.0078 U	0.0082 U	0.0082 U
Naphthalene	0.0088 U	0.0089 U	0.015 J	0.011 U	0.01 U	0.011 U	0.0097 U	0.01 U	0.0098 U	0.0097 U	0.0089 U	0.0092 U	0.0097 U	0.0097 U
Nitrobenzene	0.011 U	0.011 U	0.017 U	0.014 U	0.013 U	0.013 U	0.012 U	0.013 U	0.012 U	0.012 U	0.011 U	0.011 U	0.012 U	0.012 U
N-Nitrosodi-N-Propylamine	0.012 U	0.012 U	0.018 UJ	0.015 U	0.013 U	0.014 U	0.013 U	0.013 U	0.013 U	0.013 U	0.012 U	0.012 U	0.013 U	0.013 U
N-Nitrosodiphenylamine	0.032 U	0.032 U	0.048 U	0.039 U	0.036 U	0.038 U	0.035 U	0.036 U	0.035 U	0.035 U	0.032 U	0.033 U	0.035 U	0.035 U
Pentachlorophenol	0.042 U	0.042 U	0.065 U	0.052 U	0.048 U	0.05 U	0.046 U	0.049 U	0.047 UJ	0.046 UJ	0.042 UJ	0.044 U	0.046 U	0.046 U
Phenanthrene	0.053 J	0.019 J	0.089 J	0.012 U	0.011 U	0.011 U	0.013 J	0.011 U	0.1 J	0.021 J	0.013 J	0.025 J	0.046 J	0.031 J
Phenol	0.011 U	0.011 U	0.017 U	0.014 U	0.013 U	0.014 U	0.012 U	0.013 U	0.013 U	0.013 U	0.011 U	0.012 U	0.012 U	0.013 U
Pyrene	0.091 J	0.032 J	0.17 J	0.02 U	0.018 U	0.019 U	0.032 J	0.018 U	0.29 J+	0.033 J+	0.025 J+	0.064 J	0.12 J	0.079 J
VOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,1,1-Trichloroethane	0.00037 U	0.00033 U	--	0.00045 U	0.0003 U	--	0.00039 U	0.00044 U	--	0.00046 U	0.00032 U	--	0.00023 U	0.00023 U
1,1,2,2-Tetrachloroethane	0.00016 U	0.00015 U	--	0.0002 U	0.00013 U	--	0.00018 U	0.0002 U	--	0.0002 U	0.00014 U	--	0.00021 U	0.00021 U
1,1,2-Trichloro-1,2,2-Trifluoroethane	0.00043 U	0.00039 U	--	0.00052 U	0.00035 U	--	0.00046 U	0.00051 UJ	--	0.00053 UJ	0.00037 U	--	0.00029 U	0.0003 U
1,1,2-Trichloroethane	0.00027 U	0.00025 U	--	0.00033 U	0.00022 U	--	0.00029 U	0.00032 U	--	0.00034 U	0.00023 U	--	0.00017 U	0.00018 U
1,1-Dichloroethane	0.00033 U	0.0003 U	--	0.00041 U	0.00027 U	--	0.00035 U	0.00039 U	--	0.00041 U	0.00028 U	--	0.0002 U	0.00021 U
1,1-Dichloroethene	0.0004 U	0.00036 U	--	0.00049 U	0.00032 U	--	0.00042 U	0.00047 U	--	0.00049 U	0.00034 U	--	0.00022 U	0.00022 U
1,2,3-Trichlorobenzene	0.00011 U	0.000097 U	--	0.00013 U	0.000087 U	--	0.00011 U	0.00013 U	--	0.00013 U	0.000092 U	--	0.00018 U	0.00018 U
1,2,4-Trichlorobenzene	0.00031 U	0.00028 U	--	0.00038 U	0.00025 U	--	0.00033 U	0.00037 U	--	0.00038 U	0.00027 U	--	0.00009 U	0.000092 U
1,2-Dibromo-3-Chloropropane	0.00045 U	0.00041 U	--	0.00056 UJ	0.00037 UJ	--	0.00049 U	0.00054 U	--	0.00056 U	0.00039 U	--	0.00045 U	0.00046 U
1,2-Dibromoethane (Ethylene Dibromide)	0.00012 U	0.00011 U	--	0.00014 U	0.000095 U	--	0.00012 U	0.00014 U	--	0.00014 U	0.0001 U	--	0.00018 U	0.00018 U
1,2-Dichlorobenzene	0.00014 U	0.00012 U	--	0.00017 U	0.00011 U	--	0.00015 U	0.00016 U	--	0.00017 U	0.00012 U	--	0.00014 U	0.00014 U
1,2-Dichloroethane	0.00011 U	0.000097 U	--	0.00013 U	0.000087 U	--	0.00011 U	0.00013 U	--	0.00013 U	0.000092 U	--	0.00029 U	0.0003 U
1,2-Dichloropropane	0.00016 U	0.00015 U	--	0.0002 U	0.00013 U	--	0.00018 U	0.0002 U	--	0.0002 U	0.00014 U	--	0.00041 U	0.00042 U
1,3-Dichlorobenzene	0.00012 U	0.00011 U	--	0.00014 U	0.000095 U	--	0.00012 U	0.00014 U	--	0.00014 U	0.0001 U	--	0.00016 U	0.00016 U
1,4-Dichlorobenzene	0.00013 U	0.00011 U	--	0.00016 U	0.0001 U	--	0.00013 U	0.00015 U	--	0.00016 U	0.00011 U	--	0.000098 U	0.0001 U
2-Hexanone	0.00091 UJ	0.00083 UJ	--	0.0011 U	0.00074 U	--	0.00097 U	0.0011 U	--	0.0011 U	0.00078 U	--	0.00076 U	0.00078 U
Acetone	0.011	0.01	--	0.012	0.013	--	0.011	0.0095	--	0.16	0.033	--	0.035	0.027
Benzene	0.00027 J	0.00023 J	--	0.00047 J	0.00061 J	--	0.00024 J	0.00023 U	--	0.0022	0.00075 J	--	0.00071 J	0.00069 J
Bromochloromethane	0.00016 U	0.00015 U	--	0.0002 U	0.00013 U	--	0.00018 U	0.0002 U	--	0.0002 U	0.00014 U	--	0.00027 U	0.00028 U
Bromodichloromethane	0.00037 U	0.00033 U	--	0.00045 U	0.0003 U	--	0.00039 U	0.00044 U	--	0.00046 U	0.00032 U	--	0.00025 U	0.00026 U
Bromoform	0.00013 U	0.00011 U	--	0.00016 U	0.0001 U	--	0.00013 U	0.00015 U	--	0.00016 U	0.00011 U	--	0.00042 U	0.00042 U
Bromomethane	0.00031 U	0.00028 U	--	0.00038 U	0.00025 U	--	0.00033 U	0.00037 UJ	--	0.00038 UJ	0.00027 U	--	0.00046 U	0.00047 U
Carbon Disulfide	0.0034	0.0028	--	0.00075 J	0.0004 J	--	0.0077	0.0005 U	--	0.00099 J-	0.00036 U	--	0.00036 J	0.00027 U
Carbon Tetrachloride	0.00042 UJ	0.00038 UJ	--	0.00051 U	0.00034 U	--	0.00045 U	0.0005 U	--	0.00052 U	0.00036 U	--	0.00018 U	0.00018 U
Chlorobenzene	0.00014 U	0.00012 U	--	0.00017 U	0.00011 U	--	0.00015 U	0.00016 U	--	0.00017 U	0.00012 U	--	0.00017 U	0.00018 U
Chloroethane	0.00034 U	0.00031 U	--	0.00042 U	0.00028 U	--	0.00036 U	0.0004 U	--	0.00042 U	0.00029 U	--	0.00051 U	0.00052 U
Chloroform	0.0002 U	0.00018 U	--	0.00025 U	0.00017 U	--	0.00022 U	0.00024 U	--	0.00025 U	0.00017 U	--	0.00031 U	0.00032 U
Chloromethane	0.00037 U	0.00033 U	--	0.00045 U	0.0003 U	--	0.00039 U	0.00044 U	--	0.00046 U	0.00032 U	--	0.00043 U	0.00043 U
Cis-1,2-Dichloroethylene	0.00021 U	0.00019 U	--	0.00026 U	0.00017 U	--	0.00023 U	0.00025 U	--	0.00026 U	0.00018 U	--	0.00015 U	0.00015 U
Cis-1,3-Dichloropropene	0.00014 U	0.00013 U	--	0.00018 U	0.00012 U	--	0.00016 U	0.00017 U	--	0.00018 U	0.00012 U	--	0.00027 U	0.00027 U
Cyclohexane	0.00076 J	0.00074 J	--	0.00055 U	0.00036 U	--	0.00048 U	0.00053 U	--	0.0032 J-	0.0015	--	0.00086 J	0.00086 J
Dibromochloromethane	0.00014 U	0.00013 U	--	0.00018 U	0.00012 U	--	0.00016 U	0.00017 U	--	0.00018 U	0.00012 U	--	0.00019 U	0.00019 U
Dichlorodifluoromethane	0.00031 U	0.00028 U	--	0.00038 U	0.00025 U	--	0.00033 U	0.00037 UJ	--	0.00038 U	0.00027 U	--	0.00033 U	0.00034 U
Ethylbenzene	0.00017 U	0.00016 U	--	0.00021 U	0.00036 J	--	0.00019 U	0.00021 U	--	0.0012	0.00032 J	--	0.00019 U	0.00026 J
Isopropylbenzene (Cumene)	0.00016 U	0.00015 U	--	0.0002 U	0.00013 U	--	0.00018 U	0.0002 U	--	0.0002 U	0.00014 U	--	0.00012 U	0.00013 U
M,P-Xylene	0.0004 J	0.00037 J	--	0.00013 U	0.00067 J	--	0.00035 J	0.00043 J	--	0.0033	0.00092	--	0.00071 J	0.00079 J
Methyl Acetate	0.00087 U	0.00079 U	--	0.0011 U	0.00071 U	--	0.00093 U	0.001 U	--	0.36	0.00075 U	--	0.0042 U	0.0043 U
Methyl Ethyl Ketone (2-Butanone)	0.0012 J-	0.0015 J-	--	0.00092 U	0.00061 U	--	0.0008 U	0.0012 J	--	0.01	0.0034 J	--	0.0046 J	0.0031 J+
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	0.0021 UJ	0.002 UJ	--	0.0026 U	0.0018 U	--	0.0023 U	0.0026 U	--	0.0027 U	0.0018 U	--	0.00065 U	0.00066 U
Methylcyclohexane	0.00093 J	0.00089	--	0.0006 U	0.0015	--	0.00056 J+	0.00071 J	--	0.0056	0.0024	--	0.0016	0.0017
Methylene Chloride	0.00031 U	0.00028 U	--	0.00038 U	0.00025 U	--	0.00033 U	0.00037 U	--	0.00038 U	0.00027 U	--	0.00016 U	0.00016 U
O-Xylene (1,2-Dimethylbenzene)	0.00015 U	0.00014 U	--	0.00019 U	0.00024 J	--	0.00017 U	0.00018 U	--	0.0011 J	0.00028 J	--	0.00025 J	0.00026 J
Styrene	0.00014 U	0.00013 U	--	0.00018 U	0.00012 U	--	0.00016 U	0.00017 U	--	0.00018 U	0.00012 U	--	0.00012 U	0.00012 U
Tert-Butyl Methyl Ether	0.00016 U	0.00015 U	--	0.0002 U	0.00013 U	--	0.00018 U	0.0002 U	--	0.0002 U	0.00014 U	--	0.00012 U	0.00012 U

Table E-28
Summary of Data Used in Risk Assessment
South Percolation Pond Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-115	CFSB-115	CFSB-116	CFSB-116	CFSB-116	CFSB-118	CFSB-118	CFSB-118	CFSB-119	CFSB-119	CFSB-119	CFSB-142	CFSB-142	CFSB-142
Sample Lab IDs	460-119512-5	460-119512-6	460-117573-1	460-117573-2	460-117573-3	460-117506-4	460-117506-5	460-117506-6	460-116987-7	460-116987-8	460-116987-9	460-144400-5	460-144400-6	460-144400-7
Sample Name	CFSB-115-SO-0.5-2	CFSB-115-SO-2-4	CFSB-116-SO-0-0.5	CFSB-116-SO-0.5-2	CFSB-116-SO-10-12	CFSB-118-SO-0-0.5	CFSB-118-SO-0.5-2	CFSB-118-SO-10-12	CFSB-119-SO-0-0.5	CFSB-119-SO-0.5-2	CFSB-119-SO-10-12	CFSB-142-SO-0-0.5	CFSB-142-SO-0.5-2	CFSB-142-SO-2-4
Sample Depth	0.5-2 ft	2-4 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	2-4 ft
Chemical	8/31/2016	8/31/2016	7/22/2016	7/22/2016	7/22/2016	7/21/2016	7/21/2016	7/21/2016	7/12/2016	7/12/2016	7/12/2016	11/2/2017	11/2/2017	11/2/2017
Tetrachloroethylene (PCE)	0.00027 U	0.00025 U	--	0.00033 U	0.00022 U	--	0.00029 U	0.00032 U	--	0.00034 U	0.00023 U	--	0.00014 U	0.00014 U
Toluene	0.00081 J	0.00067 J	--	0.00069 J	0.0014	--	0.00061 J	0.00063 J	--	0.0069	0.002	--	0.0014	0.0016
Trans-1,2-Dichloroethene	0.00038 U	0.00034 U	--	0.00047 U	0.00031 U	--	0.0004 U	0.00045 U	--	0.00047 U	0.00032 U	--	0.00024 U	0.00025 U
Trans-1,3-Dichloropropene	0.000097 U	0.000088 U	--	0.00012 U	0.000079 U	--	0.0001 U	0.00012 U	--	0.00012 U	0.000083 U	--	0.00026 U	0.00027 U
Trichloroethylene (TCE)	0.00025 U	0.00023 U	--	0.00031 U	0.00021 U	--	0.00027 U	0.0003 U	--	0.00031 U	0.00022 U	--	0.00014 U	0.00014 U
Trichlorofluoromethane	0.00033 U	0.0003 U	--	0.00041 U	0.00027 U	--	0.00035 U	0.00039 UJ	--	0.00041 UJ	0.00028 U	--	0.0004 U	0.00041 U
Vinyl Chloride	0.00038 U	0.00034 U	--	0.00047 U	0.00031 U	--	0.0004 U	0.00045 U	--	0.00047 U	0.00032 U	--	0.00053 U	0.00054 U

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-28
Summary of Data Used in Risk Assessment
South Percolation Pond Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-143	CFSB-143	CFSB-143-DUP	CFSB-143	CFSB-144	CFSB-144	CFSB-144	CFSB-145	CFSB-145	CFSB-145	CFSB-146	CFSB-146	CFSB-146	CFSB-147
Sample Lab IDs	460-144400-8	460-144400-9	460-144400-11	460-144400-10	460-144400-17	460-144400-18	460-144400-19	460-144478-1	460-144478-2	460-144478-3	460-144478-4	460-144478-5	460-144478-6	460-144478-8
Sample Name	CFSB-143-SO-0-0.5	CFSB-143-SO-0.5-2	CFSB-DUP15-SO	CFSB-143-SO-2-4	CFSB-144-SO-0-0.5	CFSB-144-SO-0.5-2	CFSB-144-SO-2-4	CFSB-145-SO-0-0.5	CFSB-145-SO-0.5-2	CFSB-145-SO-2-4	CFSB-146-SO-0-0.5	CFSB-146-SO-0.5-2	CFSB-146-SO-2-4	CFSB-147-SO-0-0.5
Sample Depth	0-0.5 ft	0.5-2 ft	0.5-2 ft	2-4 ft	0-0.5 ft	0.5-2 ft	2-4 ft	0-0.5 ft	0.5-2 ft	2-4 ft	0-0.5 ft	0.5-2 ft	2-4 ft	0-0.5 ft
Chemical	11/2/2017	11/2/2017	11/2/2017	11/2/2017	11/3/2017	11/3/2017	11/3/2017	11/6/2017	11/6/2017	11/6/2017	11/6/2017	11/6/2017	11/6/2017	11/6/2017
GENERAL CHEMISTRY (mg/kg)														
Fluoride	17.1 J+	15.5 J+	14.3 J+	3.51 J+	19.5 J+	18.6 J+	21.6 J+	14.4 J+	16.9 J+	13.3 J+	14.7 J+	18.9 J+	18.4 J+	12.4 J+
Cyanide	0.24 J	0.17 J	0.2 J	0.091 J	1	0.54	1.1	0.07 U	0.06 U	0.064 U	0.064 U	0.067 U	0.069 U	0.067 U
Cyanide (Free)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
METALS (mg/kg)														
"Chromium, Hexavalent - Estimated"	0.294404	0.264964	0.270316	0.246229	0.286375	0.286375	0.29708	0.235523	0.2382	0.240876	0.190024	0.227494	0.208759	0.219465
"Chromium, Trivalent - Estimated"	10.7056	9.63504	9.82968	8.95377	10.4136	10.4136	10.8029	8.56448	8.6618	8.75912	6.90998	8.27251	7.59124	7.98054
Aluminum	9900	8860	8500	6940	9430	9310	9550	10600	8600	8060	7960	10100	9550	7810
Antimony	0.32 UJ	0.32 UJ	0.27 UJ	0.27 UJ	0.34 U	0.34 U	0.36 UJ	0.37 UJ	0.34 UJ	0.34 UJ	0.35 UJ	0.36 UJ	0.36 UJ	0.38 UJ
Arsenic	5.7	5.1	5.2	3.8	3.2	3.1	2.4	4.2	4.6	4.1	3.4	4	3.6	4
Barium	175	158	154	87.2	165	190	165	100	111	103	74.8	97.9	93.5	77.2
Beryllium	0.56	0.58	0.48	0.3 J	0.47	0.38 J	0.54	0.46	0.44	0.43	0.3 J	0.39 J	0.37 J	0.4 J
Cadmium	0.34 U	0.33 U	0.29 U	0.28 U	0.36 U	0.36 U	0.38 U	0.39 U	0.36 U	0.36 U	0.37 U	0.38 U	0.38 U	0.4 U
Calcium	21600	17700	16800	19400	22300	25500	22000	11800	14400	18500	12500	16300	23700	14600
Chromium, Total	11	9.9	10.1	9.2	10.7	10.7	11.1	8.8	8.9	9	7.1	8.5	7.8	8.2
Cobalt	6.7 J+	6.3 J+	6.2 J+	5 J+	6.3	6.6	6.3 J+	5.4	5.4	5.2	4	4.9	4.2	5
Copper	18.4	17.5	17.9	12.2	16.3	18.2	15.8	12.4 J	12.1 J	12.4 J	17.1 J	13.3 J	13.4 J	11.3 J
Iron	15300	14500	14400	12400	14800	15100	14800	13900	13300	12500	10300	12500	11300	12500
Lead	10.2 J+	9.1 J+	9 J+	6 J+	8.8	9.7	9.2 J+	9.6	7.9	7.1	10.1	12.9	8.4	7.3
Magnesium	12300	11300	10900	10200	12600	13300	13900	8970	9020	9540	7600	8590	8950	8940
Manganese	410	365	347	309	157	168	145	329 J	311 J	282 J	321 J	350 J	327 J	257 J
Mercury	0.026 J+	0.02 J+	0.02 J+	0.011 U	0.022	0.017 J	0.018 J+	0.012 J	0.017 J	0.013 J	0.021	0.021	0.02	0.014 J
Nickel	15.9	13.3	13	11.4	12.7	13.3	13.2	12.6	11.1	11.4	10	10.7	9.5	11.5
Potassium	1270	1060	924	653	983	954	993	933	866	819	663	720	680	776
Selenium	0.3 U	0.29 U	0.26 U	0.25 U	0.32 U	0.32 U	0.34 U	0.34 U	0.31 U	0.32 U	0.33 U	0.33 U	0.34 U	0.35 U
Silver	0.63 U	0.62 U	0.54 U	0.52 U	0.67 U	0.67 U	0.7 U	0.72 U	0.66 U	0.67 U	0.69 U	0.69 U	0.71 U	0.74 U
Sodium	97.3	71.6 J	70.7 J	44.9 J	158	140	90 J	50 U	45.6 U	91 J	47.5 U	48.2 U	49.2 U	51.2 U
Thallium	0.13 U	0.12 U	0.11 U	0.11 U	0.14 U	0.13 U	0.14 U	0.15 U	0.13 U	0.14 U	0.14 U	0.14 U	0.14 U	0.15 U
Vanadium	17.3 J+	17.1 J+	17.4 J+	11 J+	15.2	15.4	15.2 J+	14.1	14.5	12.5	7.9	8.5	7.8	13
Zinc	50.3 J+	43 J+	42.1 J+	32.7 J+	46.4	45.4	46.7 J+	42.1	37	42	35.7	41.1	34.8	35.2
PESTICIDES (mg/kg)														
Aldrin	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Alpha Bhc (Alpha Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Alpha Endosulfan	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Beta Bhc (Beta Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Beta Endosulfan	--	--	--	--	--	--	--	--	--	--	--	--	--	--
cis-Chlordane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Delta BHC (Delta Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dieldrin	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endosulfan Sulfate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin Aldehyde	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin Ketone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Gamma Bhc (Lindane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Heptachlor	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Heptachlor Epoxide	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methoxychlor	--	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDD	--	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDT	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Toxaphene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
trans-Chlordane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
POLYCHLORINATED BIPHENYLS (mg/kg)														
PCB-1016 (Aroclor 1016)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1221 (Aroclor 1221)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1232 (Aroclor 1232)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1242 (Aroclor 1242)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1248 (Aroclor 1248)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1254 (Aroclor 1254)	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Table E-28
Summary of Data Used in Risk Assessment
South Percolation Pond Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-143	CFSB-143	CFSB-143-DUP	CFSB-143	CFSB-144	CFSB-144	CFSB-144	CFSB-145	CFSB-145	CFSB-145	CFSB-146	CFSB-146	CFSB-146	CFSB-147
Sample Lab IDs	460-144400-8	460-144400-9	460-144400-11	460-144400-10	460-144400-17	460-144400-18	460-144400-19	460-144478-1	460-144478-2	460-144478-3	460-144478-4	460-144478-5	460-144478-6	460-144478-8
Sample Name	CFSB-143-SO-0-0.5	CFSB-143-SO-0.5-2	CFSB-DUP15-SO	CFSB-143-SO-2-4	CFSB-144-SO-0-0.5	CFSB-144-SO-0.5-2	CFSB-144-SO-2-4	CFSB-145-SO-0-0.5	CFSB-145-SO-0.5-2	CFSB-145-SO-2-4	CFSB-146-SO-0-0.5	CFSB-146-SO-0.5-2	CFSB-146-SO-2-4	CFSB-147-SO-0-0.5
Sample Depth	0-0.5 ft	0.5-2 ft	0.5-2 ft	2-4 ft	0-0.5 ft	0.5-2 ft	2-4 ft	0-0.5 ft	0.5-2 ft	2-4 ft	0-0.5 ft	0.5-2 ft	2-4 ft	0-0.5 ft
Chemical	11/2/2017	11/2/2017	11/2/2017	11/2/2017	11/3/2017	11/3/2017	11/3/2017	11/6/2017	11/6/2017	11/6/2017	11/6/2017	11/6/2017	11/6/2017	11/6/2017
PCB-1260 (Aroclor 1260)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1262 (Aroclor 1262)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1268 (Aroclor 1268)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Polychlorinated Biphenyl (PCBs)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SEMIVOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,2,4,5-Tetrachlorobenzene	0.031 U	0.029 U	0.027 U	0.026 U	0.033 U	0.032 U	0.035 U	0.027 U	0.026 U	0.026 U	0.028 U	0.027 U	0.027 U	0.028 U
1,4-Dioxane (P-Dioxane)	0.11 U	0.1 U	0.098 U	0.094 U	0.12 U	0.11 U	0.12 U	0.099 U	0.094 U	0.094 U	0.1 U	0.097 U	0.097 U	0.1 U
2,3,4,6-Tetrachlorophenol	0.039 U	0.037 U	0.035 U	0.033 U	0.041 U	0.04 U	0.044 UJ	0.035 U	0.033 U	0.033 U	0.035 U	0.034 U	0.034 U	0.036 U
2,4,5-Trichlorophenol	0.041 U	0.039 U	0.036 U	0.035 U	0.044 U	0.043 U	0.046 UJ	0.037 U	0.035 U	0.035 U	0.037 U	0.036 U	0.036 U	0.038 U
2,4,6-Trichlorophenol	0.012 U	0.011 U	0.01 U	0.01 U	0.013 U	0.012 U	0.013 UJ	0.01 U	0.0099 U	0.01 U	0.011 U	0.01 U	0.01 U	0.011 U
2,4-Dichlorophenol	0.0098 U	0.0092 U	0.0087 U	0.0083 U	0.01 U	0.01 U	0.011 UJ	0.0087 U	0.0083 U	0.0083 U	0.0088 U	0.0086 U	0.0086 U	0.009 U
2,4-Dimethylphenol	0.091 U	0.086 U	0.081 U	0.077 U	0.097 U	0.094 U	0.1 UJ	0.081 U	0.077 U	0.077 U	0.082 U	0.08 U	0.08 U	0.084 U
2,4-Dinitrophenol	0.31 U	0.3 U	0.28 U	0.27 UJ	0.33 U	0.32 U	0.35 UJ	0.28 UJ	0.26 U	0.27 U	0.28 U	0.27 U	0.27 U	0.29 U
2,4-Dinitrotoluene	0.016 U	0.015 U	0.015 U	0.014 U	0.017 U	0.017 U	0.018 UJ	0.015 U	0.014 U	0.014 U	0.015 U	0.014 U	0.014 U	0.015 U
2,6-Dinitrotoluene	0.022 U	0.021 U	0.02 U	0.019 U	0.023 U	0.023 U	0.025 UJ	0.02 U	0.019 U	0.019 U	0.02 U	0.019 U	0.019 U	0.02 U
2-Chloronaphthalene	0.0094 U	0.0089 U	0.0083 U	0.008 U	0.01 U	0.0097 U	0.011 U	0.0084 U	0.0079 U	0.008 U	0.0085 U	0.0082 U	0.0082 U	0.0087 U
2-Chlorophenol	0.011 U	0.0099 U	0.0093 U	0.0089 U	0.011 U	0.011 U	0.012 UJ	0.0094 U	0.0089 U	0.0089 U	0.0095 U	0.0092 U	0.0092 U	0.0097 U
2-Methylnaphthalene	0.0091 U	0.0086 U	0.0081 U	0.0078 U	0.0097 U	0.0095 U	0.01 UJ	0.0081 U	0.0077 U	0.0078 U	0.0083 U	0.008 U	0.008 U	0.0084 U
2-Methylphenol (O-Cresol)	0.018 U	0.017 U	0.016 U	0.015 U	0.019 U	0.019 U	0.02 UJ	0.016 U	0.015 U	0.015 U	0.016 U	0.016 U	0.016 U	0.017 U
2-Nitroaniline	0.014 U	0.013 U	0.012 U	0.012 U	0.015 U	0.014 U	0.015 U	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U	0.013 U
2-Nitrophenol	0.014 U	0.013 U	0.012 U	0.012 U	0.015 U	0.014 U	0.016 UJ	0.012 U	0.012 U	0.012 U	0.013 U	0.012 U	0.012 U	0.013 U
3- And 4- Methylphenol (Total)	0.011 U	0.01 U	0.0098 U	0.0094 U	0.012 U	0.011 U	0.012 UJ	0.0098 U	0.0093 U	0.0094 U	0.01 U	0.0097 U	0.0097 U	0.01 U
3,3'-Dichlorobenzidine	0.046 U	0.044 U	0.041 U	0.039 U	0.049 U	0.048 U	0.052 U	0.041 U	0.039 U	0.039 U	0.042 U	0.04 U	0.041 U	0.043 U
3-Nitroaniline	0.012 U	0.012 U	0.011 U	0.01 U	0.013 U	0.013 U	0.014 U	0.011 U	0.01 U	0.01 U	0.011 U	0.011 U	0.011 U	0.011 U
4,6-Dinitro-2-Methylphenol	0.11 U	0.1 U	0.098 U	0.094 UJ	0.12 U	0.11 U	0.12 UJ	0.098 UJ	0.093 U	0.094 U	0.1 U	0.097 U	0.097 U	0.1 U
4-Bromophenyl Phenyl Ether	0.013 U	0.012 U	0.012 U	0.011 U	0.014 U	0.013 U	0.015 U	0.012 U	0.011 U	0.011 U	0.012 U	0.011 U	0.011 U	0.012 U
4-Chloro-3-Methylphenol	0.018 U	0.017 U	0.016 U	0.015 U	0.019 U	0.018 U	0.02 UJ	0.016 U	0.015 U	0.015 U	0.016 U	0.016 U	0.016 U	0.016 U
4-Chloroaniline	0.011 U	0.01 U	0.0094 U	0.0091 U	0.011 U	0.011 U	0.012 U	0.0095 U	0.009 U	0.009 U	0.0096 U	0.0093 U	0.0093 U	0.0098 U
4-Chlorophenyl Phenyl Ether	0.012 U	0.012 U	0.011 U	0.011 U	0.013 U	0.013 U	0.014 UJ	0.011 U	0.01 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U
4-Nitroaniline	0.016 U	0.015 U	0.014 U	0.013 U	0.017 U	0.016 U	0.018 UJ	0.014 U	0.013 U	0.013 U	0.014 U	0.014 U	0.014 U	0.014 U
4-Nitrophenol	0.2 U	0.19 U	0.18 U	0.17 U	0.21 U	0.21 U	0.22 U	0.18 U	0.17 U	0.17 U	0.18 U	0.17 U	0.17 U	0.18 U
Acenaphthene	0.01 U	0.0095 U	0.0089 U	0.0085 U	0.011 U	0.01 U	0.011 U	0.0089 U	0.0085 U	0.0085 U	0.01 J	0.0088 U	0.0088 U	0.0092 U
Acenaphthylene	0.011 U	0.01 U	0.0094 U	0.0091 U	0.011 U	0.011 U	0.012 UJ	0.0095 U	0.009 U	0.009 U	0.0096 U	0.0093 U	0.0093 U	0.0098 U
Acetophenone	0.009 U	0.0085 U	0.008 U	0.0077 U	0.0096 U	0.0093 U	0.01 UJ	0.008 U	0.0076 U	0.0077 U	0.0082 U	0.0079 U	0.0079 U	0.0083 U
Anthracene	0.039 U	0.037 U	0.035 U	0.033 U	0.042 U	0.041 U	0.044 UJ	0.035 U	0.033 U	0.033 U	0.036 U	0.034 U	0.034 U	0.036 U
Atrazine	0.018 U	0.017 U	0.016 U	0.016 U	0.02 U	0.019 U	0.021 U	0.016 U	0.016 U	0.016 U	0.017 U	0.016 U	0.016 U	0.017 U
Benzaldehyde	0.032 U	0.03 U	0.028 U	0.027 U	0.055 J	0.033 U	0.036 U	0.028 U	0.027 U	0.027 U	0.029 U	0.028 U	0.028 U	0.029 U
Benzo(A)Anthracene	0.11	0.046	0.031 U	0.029 U	0.037 U	0.036 U	0.039 U	0.054	0.029 U	0.029 U	0.11	0.061	0.062	0.042
Benzo(A)Pyrene	0.15	0.068	0.049	0.032 J	0.013 U	0.013 U	0.11 J-	0.082	0.011 U	0.039	0.16	0.084	0.087	0.067 J
Benzo(B)Fluoranthene	0.25	0.13	0.09	0.048	0.017 U	0.017 U	0.2 J-	0.13	0.014 U	0.062	0.24	0.14	0.13	0.12 J
Benzo(G,H,I)Perylene	0.13 J	0.065 J	0.046 J	0.02 U	0.025 U	0.025 U	0.095 J	0.085 J	0.02 U	0.029 J	0.19 J	0.084 J	0.091 J	0.066 J
Benzo(K)Fluoranthene	0.091	0.051	0.032 J	0.019 J	0.019 U	0.019 U	0.074 J-	0.05	0.015 U	0.015 U	0.092	0.05	0.016 U	0.036 J
Benzyl Butyl Phthalate	0.013 U	0.012 U	0.011 U	0.011 U	0.014 U	0.013 U	0.014 U	0.011 U	0.011 U	0.011 U	0.012 U	0.011 U	0.011 U	0.012 U
Biphenyl (Diphenyl)	0.035 U	0.033 U	0.031 U	0.03 U	0.038 U	0.037 U	0.04 UJ	0.031 U	0.03 U	0.03 U	0.032 U	0.031 U	0.031 U	0.033 U
Bis(2-Chloroethoxy) Methane	0.013 U	0.012 U	0.011 U	0.011 U	0.014 U	0.013 U	0.015 UJ	0.011 U	0.011 U	0.011 U	0.012 U	0.011 U	0.011 U	0.012 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.0098 U	0.0092 U	0.0087 U	0.0083 U	0.01 U	0.01 U	0.011 UJ	0.0087 UJ	0.0083 U	0.0083 U	0.0088 U	0.0086 U	0.0086 U	0.009 U
Bis(2-Chloroisopropyl) Ether	0.017 U	0.016 U	0.015 U	0.014 U	0.018 U	0.018 U	0.019 U	0.015 U	0.014 U	0.014 U	0.015 U	0.015 U	0.015 U	0.016 U
Bis(2-Ethylhexyl) Phthalate	0.016 U	0.015 U	0.014 U	0.014 U	0.017 U	0.017 U	0.018 U	0.014 U	0.014 U	0.014 U	0.015 U	0.014 U	0.014 U	0.015 U
Caprolactam	0.03 U	0.028 U	0.026 U	0.025 U	0.032 U	0.031 U	0.034 U	0.027 U	0.025 U	0.025 U	0.027 U	0.026 U	0.026 U	0.027 U
Carbazole	0.015 J	0.0097 U	0.0091 U	0.0087 U	0.011 U	0.011 U	0.012 UJ	0.0094 J	0.0087 U	0.0087 U	0.016 J	0.009 U	0.009 U	0.0095 U
Chrysene	0.16 J	0.076 J	0.044 J	0.019 J	0.012 U	0.012 U	0.16 J-	0.078 J	0.012 J	0.03 J	0.15 J	0.077 J	0.079 J	0.056 J
Dibenz(A,H)Anthracene	0.055	0.02 U	0.019 U	0.018 U	0.023 U	0.022 U	0.055	0.019 U	0.018 U	0.018 U	0.053	0.04	0.041	0.02 U
Dibenzofuran	0.013 U	0.012 U	0.011 U	0.011 U	0.013 U	0.013 U	0.014 UJ	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.012 U
Diethyl Phthalate	0.012 U	0.011 U	0.01 U	0.01 U	0.013 U	0.012 U	0.013 UJ	0.01 U	0.0099 U	0.01 U	0.011 U	0.01 U	0.01 U	0.011 U
Dimethyl Phthalate	0.012 U	0.011 U	0.011 U	0.01 U	0.013 U	0.012 U	0.014 UJ	0.011 U	0.01 U	0.01 U	0.011 U	0.011 U	0.011 U	0.011 U
Di-N-Butyl Phthalate	0.012 U	0.012 U	0.011 U	0.011 U	0.013 U	0.013 U	0.014 U	0.011 U	0.01 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U
Di-N-Octylphthalate	0.021 U	0.02 U	0.019 U	0.018 U	0.022 U	0.022 U	0.024 U	0.019 U	0.018 U	0.018 U	0.019 U	0.018 U	0.018 U	0.019 U
Fluoranthene	0.14 J	0.059 J	0.033 J	0.018 J	0.013 U	0.013 U	0.081 J-	0.069 J	0.01 U	0.026 J	0.17 J	0.087 J	0.089 J	0.052 J
Fluorene	0.009 U	0.0085 U	0.008 U	0.0077 U	0.0096 U	0.0093 U	0.01 UJ	0.008 U	0.0076 U	0.0077 U	0.0082 U	0.0079 U	0.0079 U	0.0083 U

Table E-28
Summary of Data Used in Risk Assessment
South Percolation Pond Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-143	CFSB-143	CFSB-143-DUP	CFSB-143	CFSB-144	CFSB-144	CFSB-144	CFSB-145	CFSB-145	CFSB-145	CFSB-146	CFSB-146	CFSB-146	CFSB-147
Sample Lab IDs	460-144400-8	460-144400-9	460-144400-11	460-144400-10	460-144400-17	460-144400-18	460-144400-19	460-144478-1	460-144478-2	460-144478-3	460-144478-4	460-144478-5	460-144478-6	460-144478-8
Sample Name	CFSB-143-SO-0-0.5	CFSB-143-SO-0.5-2	CFSB-DUP15-SO	CFSB-143-SO-2-4	CFSB-144-SO-0-0.5	CFSB-144-SO-0.5-2	CFSB-144-SO-2-4	CFSB-145-SO-0-0.5	CFSB-145-SO-0.5-2	CFSB-145-SO-2-4	CFSB-146-SO-0-0.5	CFSB-146-SO-0.5-2	CFSB-146-SO-2-4	CFSB-147-SO-0-0.5
Sample Depth	0-0.5 ft	0.5-2 ft	0.5-2 ft	2-4 ft	0-0.5 ft	0.5-2 ft	2-4 ft	0-0.5 ft	0.5-2 ft	2-4 ft	0-0.5 ft	0.5-2 ft	2-4 ft	0-0.5 ft
Chemical	11/2/2017	11/2/2017	11/2/2017	11/2/2017	11/3/2017	11/3/2017	11/3/2017	11/6/2017	11/6/2017	11/6/2017	11/6/2017	11/6/2017	11/6/2017	11/6/2017
Hexachlorobenzene	0.017 U	0.016 U	0.015 U	0.014 U	0.018 U	0.017 U	0.019 U	0.015 U	0.014 U	0.014 U	0.015 U	0.015 U	0.015 U	0.015 U
Hexachlorobutadiene	0.012 U	0.011 U	0.01 U	0.0099 U	0.012 U	0.012 U	0.013 U	0.01 U	0.0098 U	0.0099 U	0.011 U	0.01 U	0.01 U	0.011 U
Hexachlorocyclopentadiene	0.026 UJ	0.024 UJ	0.023 UJ	0.022 UJ	0.027 UJ	0.027 UJ	0.029 UJ	0.023 UJ	0.022 UJ	0.022 UJ	0.023 UJ	0.023 UJ	0.023 UJ	0.024 UJ
Hexachloroethane	0.015 U	0.014 U	0.013 U	0.013 U	0.016 U	0.016 U	0.017 UJ	0.014 UJ	0.013 U	0.013 U	0.014 U	0.013 U	0.013 U	0.014 U
Indeno(1,2,3-C,D)Pyrene	0.18	0.092	0.075	0.036	0.029 U	0.028 U	0.15	0.11	0.031 J	0.051	0.23	0.12	0.13	0.1 J
Isophorone	0.0089 U	0.0084 U	0.0079 U	0.0076 U	0.0094 U	0.0092 U	0.01 UJ	0.0079 U	0.0075 U	0.0075 U	0.008 U	0.0078 U	0.0078 U	0.0082 U
Naphthalene	0.011 U	0.0099 U	0.0093 U	0.0089 U	0.011 U	0.011 U	0.012 UJ	0.0094 U	0.0089 U	0.0089 U	0.0095 U	0.0092 U	0.0092 U	0.0097 U
Nitrobenzene	0.013 U	0.012 U	0.012 U	0.011 U	0.014 U	0.013 U	0.015 UJ	0.012 U	0.011 U	0.011 U	0.012 U	0.011 U	0.011 U	0.012 U
N-Nitrosodi-N-Propylamine	0.014 U	0.013 U	0.012 U	0.012 U	0.015 U	0.014 U	0.016 UJ	0.012 U	0.012 U	0.012 U	0.013 U	0.012 U	0.012 U	0.013 U
N-Nitrosodiphenylamine	0.038 U	0.035 U	0.033 U	0.032 U	0.04 U	0.039 U	0.042 U	0.033 U	0.032 U	0.032 U	0.034 U	0.033 U	0.033 U	0.035 U
Pentachlorophenol	0.05 U	0.047 U	0.044 U	0.043 U	0.053 U	0.052 U	0.056 UJ	0.045 U	0.042 U	0.043 U	0.045 U	0.044 U	0.044 U	0.046 U
Phenanthrene	0.072 J	0.03 J	0.019 J	0.0096 J	0.012 U	0.011 U	0.045 J-	0.038 J	0.0093 U	0.014 J	0.11 J	0.051 J	0.053 J	0.025 J
Phenol	0.014 U	0.013 U	0.012 U	0.012 U	0.014 U	0.014 U	0.015 UJ	0.012 U	0.011 U	0.011 U	0.012 U	0.012 U	0.012 U	0.012 U
Pyrene	0.19 J	0.079 J	0.046 J	0.02 J	0.02 U	0.019 U	0.1 J	0.086 J	0.016 U	0.03 J	0.21 J	0.11 J	0.11 J	0.065 J
VOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,1,1-Trichloroethane	--	0.00029 U	0.00028 U	0.00021 U	--	0.00025 U	0.0003 U	--	0.00027 U	0.00024 U	--	0.00022 U	0.00022 U	--
1,1,2,2-Tetrachloroethane	--	0.00026 U	0.00026 U	0.00019 U	--	0.00023 U	0.00028 U	--	0.00024 U	0.00022 U	--	0.0002 U	0.0002 U	--
1,1,2-Trichloro-1,2,2-Trifluoroethane	--	0.00037 U	0.00036 U	0.00027 U	--	0.00033 U	0.00039 U	--	0.00034 U	0.00031 U	--	0.00028 U	0.00028 U	--
1,1,2-Trichloroethane	--	0.00022 U	0.00022 U	0.00016 U	--	0.00019 U	0.00023 U	--	0.0002 U	0.00019 U	--	0.00017 U	0.00017 U	--
1,1-Dichloroethane	--	0.00025 U	0.00025 U	0.00018 U	--	0.00022 U	0.00027 U	--	0.00023 U	0.00022 U	--	0.00019 U	0.00019 U	--
1,1-Dichloroethene	--	0.00028 U	0.00027 U	0.0002 U	--	0.00024 U	0.00029 U	--	0.00026 U	0.00023 U	--	0.00021 U	0.00021 U	--
1,2,3-Trichlorobenzene	--	0.00022 U	0.00022 U	0.00016 UJ	--	0.0002 U	0.00023 UJ	--	0.00021 U	0.00019 U	--	0.00017 U	0.00017 U	--
1,2,4-Trichlorobenzene	--	0.00011 U	0.00011 U	0.000082 UJ	--	0.0001 U	0.00012 UJ	--	0.0001 U	0.000096 U	--	0.000086 U	0.000086 U	--
1,2-Dibromo-3-Chloropropane	--	0.00057 U	0.00056 U	0.00041 U	--	0.0005 U	0.00059 U	--	0.00052 U	0.00048 U	--	0.00043 U	0.00043 U	--
1,2-Dibromoethane (Ethylene Dibromide)	--	0.00022 U	0.00022 U	0.00016 U	--	0.0002 U	0.00023 U	--	0.0002 U	0.00019 U	--	0.00017 U	0.00017 U	--
1,2-Dichlorobenzene	--	0.00018 U	0.00017 U	0.00013 UJ	--	0.00016 U	0.00019 UJ	--	0.00016 U	0.00015 U	--	0.00014 U	0.00013 U	--
1,2-Dichloroethane	--	0.00037 U	0.00036 U	0.00026 U	--	0.00032 U	0.00038 U	--	0.00034 U	0.00031 U	--	0.00028 U	0.00028 U	--
1,2-Dichloropropane	--	0.00052 U	0.00051 U	0.00038 U	--	0.00046 U	0.00054 U	--	0.00048 U	0.00044 U	--	0.0004 U	0.00039 U	--
1,3-Dichlorobenzene	--	0.0002 U	0.00019 U	0.00014 UJ	--	0.00017 U	0.0002 UJ	--	0.00018 U	0.00017 U	--	0.00015 U	0.00015 U	--
1,4-Dichlorobenzene	--	0.00012 U	0.00012 U	0.000089 UJ	--	0.00011 U	0.00013 UJ	--	0.00011 U	0.0001 U	--	0.000094 U	0.000093 U	--
2-Hexanone	--	0.00096 U	0.00094 U	0.0007 U	--	0.00085 U	0.001 U	--	0.00089 U	0.00081 U	--	0.00073 U	0.00072 U	--
Acetone	--	0.062 J	0.027 J	0.035 J-	--	0.042	0.024 J-	--	0.076	0.045	--	0.045	0.044	--
Benzene	--	0.0022 J	0.0013 J	0.00084 J	--	0.0014	0.0015	--	0.0012	0.002	--	0.00061 J	0.00058 J	--
Bromochloromethane	--	0.00035 U	0.00034 U	0.00025 U	--	0.00031 U	0.00036 U	--	0.00032 U	0.00029 U	--	0.00026 U	0.00026 U	--
Bromodichloromethane	--	0.00032 U	0.00031 U	0.00023 U	--	0.00028 U	0.00033 U	--	0.00029 U	0.00027 U	--	0.00024 U	0.00024 U	--
Bromoform	--	0.00052 U	0.00051 U	0.00038 U	--	0.00046 U	0.00055 U	--	0.00048 U	0.00044 U	--	0.0004 U	0.00039 U	--
Bromomethane	--	0.00058 U	0.00057 U	0.00042 U	--	0.00052 U	0.00061 U	--	0.00054 U	0.00049 U	--	0.00045 U	0.00044 U	--
Carbon Disulfide	--	0.0028 J	0.0013 J	0.00095	--	0.00032 J	0.00034 U	--	0.0011	0.0014	--	0.00065 J	0.00037 J	--
Carbon Tetrachloride	--	0.00022 U	0.00022 U	0.00016 U	--	0.0002 U	0.00023 U	--	0.00021 U	0.00019 U	--	0.00017 U	0.00017 U	--
Chlorobenzene	--	0.00022 U	0.00021 U	0.00016 U	--	0.00019 U	0.00023 UJ	--	0.0002 U	0.00018 U	--	0.00017 U	0.00016 U	--
Chloroethane	--	0.00064 U	0.00063 U	0.00047 U	--	0.00057 U	0.00067 U	--	0.00059 U	0.00055 U	--	0.00049 U	0.00049 U	--
Chloroform	--	0.00039 U	0.00039 U	0.00028 U	--	0.00035 U	0.00041 U	--	0.00036 U	0.00033 U	--	0.0003 U	0.0003 U	--
Chloromethane	--	0.00054 U	0.00053 U	0.00039 U	--	0.00047 U	0.00056 U	--	0.0005 U	0.00045 U	--	0.00041 U	0.0004 U	--
Cis-1,2-Dichloroethylene	--	0.00019 U	0.00018 U	0.00014 U	--	0.00017 U	0.0002 U	--	0.00017 U	0.00016 U	--	0.00014 U	0.00014 U	--
Cis-1,3-Dichloropropene	--	0.00034 U	0.00033 U	0.00024 U	--	0.0003 U	0.00035 U	--	0.00031 U	0.00029 U	--	0.00026 U	0.00025 U	--
Cyclohexane	--	0.0042 J	0.0025 J	0.0012	--	0.0019	0.0025	--	0.0026	0.0042	--	0.00047 J	0.00046 J	--
Dibromochloromethane	--	0.00024 U	0.00023 U	0.00017 U	--	0.00021 U	0.00025 U	--	0.00022 U	0.0002 U	--	0.00018 U	0.00018 U	--
Dichlorodifluoromethane	--	0.00042 U	0.00041 U	0.0003 U	--	0.00037 U	0.00044 U	--	0.00038 U	0.00035 U	--	0.00032 U	0.00031 U	--
Ethylbenzene	--	0.00062 J	0.00037 J	0.00033 J	--	0.00037 J	0.00026 UJ	--	0.00056 J	0.00089 J	--	0.00019 U	0.00018 U	--
Isopropylbenzene (Cumene)	--	0.00016 U	0.00015 U	0.00011 U	--	0.00014 U	0.00016 UJ	--	0.00014 U	0.00013 U	--	0.00012 U	0.00012 U	--
M,P-Xylene	--	0.0018 J	0.00092 J	0.001	--	0.001 J	0.00098 J-	--	0.0015	0.0025	--	0.00031 J	0.00025 J	--
Methyl Acetate	--	0.0053 U	0.0052 U	0.0038 U	--	0.0047 U	0.048 J-	--	0.0049 U	0.0045 U	--	0.004 U	0.004 U	--
Methyl Ethyl Ketone (2-Butanone)	--	0.0062 J	0.0035 J	0.0038 J	--	0.0044 J	0.0036 J	--	0.0059	0.0039 J	--	0.0038 J	0.0043 J	--
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	--	0.00082 U	0.0008 U	0.00059 U	--	0.00072 U	0.00086 U	--	0.00076 U	0.00069 U	--	0.00062 U	0.00062 U	--
Methylcyclohexane	--	0.0076 J	0.0043 J	0.0022	--	0.0034	0.004 J-	--	0.0051	0.0087	--	0.00088 J	0.00084 J	--
Methylene Chloride	--	0.0002 U	0.0002 U	0.00015 U	--	0.00018 U	0.00021 U	--	0.00019 U	0.00017 U	--	0.00015 U	0.00015 U	--
O-Xylene (1,2-Dimethylbenzene)	--	0.00063 J	0.00031 J	0.00038 J	--	0.00034 J	0.00032 J-	--	0.00046 J	0.00082 J	--	0.00011 J	0.000088 U	--
Styrene	--	0.00015 U	0.00015 U	0.00011 U	--	0.00013 U	0.00016 UJ	--	0.00014 U	0.00013 U	--	0.00012 U	0.00011 U	--
Tert-Butyl Methyl Ether	--	0.00015 U	0.00015 U	0.00011 U	--	0.00014 U	0.00016 U	--	0.00014 U	0.00013 U	--	0.00012 U	0.00012 U	--

Table E-28
Summary of Data Used in Risk Assessment
South Percolation Pond Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-143	CFSB-143	CFSB-143-DUP	CFSB-143	CFSB-144	CFSB-144	CFSB-144	CFSB-145	CFSB-145	CFSB-145	CFSB-146	CFSB-146	CFSB-146	CFSB-147
Sample Lab IDs	460-144400-8	460-144400-9	460-144400-11	460-144400-10	460-144400-17	460-144400-18	460-144400-19	460-144478-1	460-144478-2	460-144478-3	460-144478-4	460-144478-5	460-144478-6	460-144478-8
Sample Name	CFSB-143-SO-0-0.5	CFSB-143-SO-0.5-2	CFSB-DUP15-SO	CFSB-143-SO-2-4	CFSB-144-SO-0-0.5	CFSB-144-SO-0.5-2	CFSB-144-SO-2-4	CFSB-145-SO-0-0.5	CFSB-145-SO-0.5-2	CFSB-145-SO-2-4	CFSB-146-SO-0-0.5	CFSB-146-SO-0.5-2	CFSB-146-SO-2-4	CFSB-147-SO-0-0.5
Sample Depth	0-0.5 ft	0.5-2 ft	0.5-2 ft	2-4 ft	0-0.5 ft	0.5-2 ft	2-4 ft	0-0.5 ft	0.5-2 ft	2-4 ft	0-0.5 ft	0.5-2 ft	2-4 ft	0-0.5 ft
Chemical	11/2/2017	11/2/2017	11/2/2017	11/2/2017	11/3/2017	11/3/2017	11/3/2017	11/6/2017	11/6/2017	11/6/2017	11/6/2017	11/6/2017	11/6/2017	11/6/2017
Tetrachloroethylene (PCE)	--	0.00018 U	0.00017 U	0.00013 U	--	0.00016 U	0.00018 U	--	0.00016 U	0.00015 U	--	0.00013 U	0.00013 U	--
Toluene	--	0.004 J	0.0023 J	0.0018	--	0.0024	0.0022	--	0.0031	0.005	--	0.0013	0.00099	--
Trans-1,2-Dichloroethene	--	0.0003 U	0.0003 U	0.00022 U	--	0.00027 U	0.00032 U	--	0.00028 U	0.00026 U	--	0.00023 U	0.00023 U	--
Trans-1,3-Dichloropropene	--	0.00033 U	0.00032 U	0.00024 U	--	0.00029 U	0.00034 U	--	0.0003 U	0.00028 U	--	0.00025 U	0.00025 U	--
Trichloroethylene (TCE)	--	0.00018 U	0.00017 U	0.00013 U	--	0.00016 U	0.00019 U	--	0.00016 U	0.00015 U	--	0.00014 U	0.00013 U	--
Trichlorofluoromethane	--	0.0005 U	0.00049 U	0.00036 U	--	0.00044 U	0.00052 U	--	0.00046 U	0.00042 U	--	0.00038 U	0.00038 U	--
Vinyl Chloride	--	0.00067 U	0.00066 U	0.00049 U	--	0.00059 U	0.0007 U	--	0.00062 U	0.00057 U	--	0.00051 U	0.00051 U	--

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-28
Summary of Data Used in Risk Assessment
South Percolation Pond Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-147-DUP	CFSB-147	CFSB-147	CFSB-148	CFSB-148	CFSB-148	CFSB-151	CFSB-151	CFSB-152	CFSB-152	CFSB-153	CFSB-153
Sample Lab IDs	460-144478-7	460-144478-9	460-144478-10	460-144478-11	460-144478-12	460-144478-13	200-40872-1, 460-144726-8	200-40872-2, 460-144726-9	200-40872-4, 460-144726-6	200-40872-5, 460-144726-7	200-40872-7, 460-144478-14	200-40872-8, 460-144478-15
Sample Name	CFSB-DUP16-SO	CFSB-147-SO-0.5-2	CFSB-147-SO-2-4	CFSB-148-SO-0-0.5	CFSB-148-SO-0.5-2	CFSB-148-SO-2-4	CFSB-151-SO-0-0.5	CFSB-151-SO-0.5-2	CFSB-152-SO-0-0.5	CFSB-152-SO-0.5-2	CFSB-153-SO-0-0.5	CFSB-153-SO-0.5-2
Sample Depth	0-0.5 ft	0.5-2 ft	2-4 ft	0-0.5 ft	0.5-2 ft	2-4 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft
Chemical	11/6/2017	11/6/2017	11/6/2017	11/6/2017	11/6/2017	11/6/2017	11/7/2017	11/7/2017	11/7/2017	11/7/2017	11/6/2017	11/6/2017
GENERAL CHEMISTRY (mg/kg)												
Fluoride	10.6 J+	12.4 J+	12.1 J+	12.3 J+	18.6 J+	27.5 J+	18.3 J+	12.4 J+	44.1 J+	24.7 J+	30.4 J+	31.4 J+
Cyanide	0.069 U	0.064 U	0.065 U	0.071 U	0.066 U	0.064 U	0.095 U	0.062 U	1.4	0.44	16.4	0.71
Cyanide (Free)	--	--	--	--	--	--	--	--	--	--	0.56 U	--
METALS (mg/kg)												
"Chromium, Hexavalent - Estimated"	0.224818	0.219465	0.208759	0.23017	0.214112	0.224818	0.305109	0.232847	0.374696	0.120438	0.877859	0.481752
"Chromium, Trivalent - Estimated"	8.17518	7.98054	7.59124	8.36983	7.78589	8.17518	11.0949	8.46715	13.6253	4.37956	31.9221	17.5182
Aluminum	7710	7560	7090	8450	7490	7740	11000	8100	10400	5740	16100	11600
Antimony	0.35 UJ	0.34 UJ	0.35 UJ	0.37 UJ	0.34 UJ	0.35 UJ	0.42 UJ	0.27 UJ	0.5 UJ	0.3 UJ	0.67 J-	0.54 UJ
Arsenic	3.6	4	4	4.5	4	3.7	1.8	1.6	3.7	2.4	2.9	2.7
Barium	82	98.6	92.5	118	85.4	132	227	152	706	172	380	260
Beryllium	0.38 J	0.44	0.39 J	0.46	0.47	0.52	0.36 J	0.39	0.37 J	0.19 J	0.79	0.62 J
Cadmium	0.37 U	0.36 U	0.37 U	0.39 U	0.36 U	0.37 U	0.45 U	0.28 U	1.1 J	0.32 U	2.5	1.5 J
Calcium	17700	22900	22700	13600	21300	26900	122000	26700	220000	22400	28700	24300
Chromium, Total	8.4	8.2	7.8	8.6	8	8.4	11.4	8.7	14	4.5	32.8	18
Cobalt	5.1	5	4.8	5.5	4.8	5.3	6.1	5	5.3	6.1	4	4.3
Copper	10.6 J	11 J	11.1 J	13.5 J	10.7 J	12.1 J	20.9	16	206	119	694 J	374 J
Iron	12700	12400	12100	13900	11700	11800	14200	11600	8960	16300	10500	10200
Lead	6.4	6.3	6	8.5	6.5	7	12.7	6.6	35.1	5.1	116	75.4
Magnesium	9290	9940	9520	8190	10200	11000	14800	7600	8360	3120	6830	7440
Manganese	268 J	262 J	260 J	388 J	261 J	290 J	226	106	96	72.4	69.4 J	80.1 J
Mercury	0.014 J	0.012 J	0.012 U	0.023	0.015 J	0.016 J	0.018 U	0.012 U	0.26	0.082	1.4	0.9
Nickel	10.5	10.3	10	10.9	9.5	9.7	14.9	11.1	24.5	9.5	53.9	26.6
Potassium	735	772	681	877	775	854	882	749	1140	614	845	736
Selenium	0.33 U	0.32 U	0.33 U	0.34 U	0.32 U	0.33 U	0.39 U	0.25 U	1.1 J	0.28 U	1.3 J	0.61 J
Silver	0.69 U	0.67 U	0.68 U	0.71 U	0.67 U	0.69 U	0.82 U	0.52 U	1.7	0.59 U	23.5	4.2
Sodium	47.5 U	46.3 U	47.3 U	49.4 U	46.1 U	48 U	57.1 U	40.3 J	280	270	184	111 J
Thallium	0.14 U	0.14 U	0.14 U	0.14 U	0.13 U	0.14 U	0.17 U	0.11 U	0.2 J	0.12 U	0.24 U	0.21 U
Vanadium	12.5	14.2	13.5	15.9	11.1	11.2	12.7	10	14.4	55.7	26.2	17.6
Zinc	35	33.6	33.4	47.9	32.3	32	63	41.3	225	37.1	351	266
PESTICIDES (mg/kg)												
Aldrin	--	--	--	--	--	--	--	--	--	--	--	--
Alpha Bhc (Alpha Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--
Alpha Endosulfan	--	--	--	--	--	--	--	--	--	--	--	--
Beta Bhc (Beta Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--
Beta Endosulfan	--	--	--	--	--	--	--	--	--	--	--	--
cis-Chlordane	--	--	--	--	--	--	--	--	--	--	--	--
Delta BHC (Delta Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--
Dieldrin	--	--	--	--	--	--	--	--	--	--	--	--
Endosulfan Sulfate	--	--	--	--	--	--	--	--	--	--	--	--
Endrin	--	--	--	--	--	--	--	--	--	--	--	--
Endrin Aldehyde	--	--	--	--	--	--	--	--	--	--	--	--
Endrin Ketone	--	--	--	--	--	--	--	--	--	--	--	--
Gamma Bhc (Lindane)	--	--	--	--	--	--	--	--	--	--	--	--
Heptachlor	--	--	--	--	--	--	--	--	--	--	--	--
Heptachlor Epoxide	--	--	--	--	--	--	--	--	--	--	--	--
Methoxychlor	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDD	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDE	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDT	--	--	--	--	--	--	--	--	--	--	--	--
Toxaphene	--	--	--	--	--	--	--	--	--	--	--	--
trans-Chlordane	--	--	--	--	--	--	--	--	--	--	--	--
POLYCHLORINATED BIPHENYLS (mg/kg)												
PCB-1016 (Aroclor 1016)	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1221 (Aroclor 1221)	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1232 (Aroclor 1232)	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1242 (Aroclor 1242)	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1248 (Aroclor 1248)	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1254 (Aroclor 1254)	--	--	--	--	--	--	--	--	--	--	--	--

Table E-28
Summary of Data Used in Risk Assessment
South Percolation Pond Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-147-DUP	CFSB-147	CFSB-147	CFSB-148	CFSB-148	CFSB-148	CFSB-151	CFSB-151	CFSB-152	CFSB-152	CFSB-153	CFSB-153
Sample Lab IDs	460-144478-7	460-144478-9	460-144478-10	460-144478-11	460-144478-12	460-144478-13	200-40872-1, 460-144726-8	200-40872-2, 460-144726-9	200-40872-4, 460-144726-6	200-40872-5, 460-144726-7	200-40872-7, 460-144478-14	200-40872-8, 460-144478-15
Sample Name	CFSB-DUP16-SO	CFSB-147-SO-0.5-2	CFSB-147-SO-2-4	CFSB-148-SO-0-0.5	CFSB-148-SO-0.5-2	CFSB-148-SO-2-4	CFSB-151-SO-0-0.5	CFSB-151-SO-0.5-2	CFSB-152-SO-0-0.5	CFSB-152-SO-0.5-2	CFSB-153-SO-0-0.5	CFSB-153-SO-0.5-2
Sample Depth	0-0.5 ft	0.5-2 ft	2-4 ft	0-0.5 ft	0.5-2 ft	2-4 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft
Chemical	11/6/2017	11/6/2017	11/6/2017	11/6/2017	11/6/2017	11/6/2017	11/7/2017	11/7/2017	11/7/2017	11/7/2017	11/6/2017	11/6/2017
PCB-1260 (Aroclor 1260)	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1262 (Aroclor 1262)	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1268 (Aroclor 1268)	--	--	--	--	--	--	--	--	--	--	--	--
Polychlorinated Biphenyl (PCBs)	--	--	--	--	--	--	--	--	--	--	--	--
SEMIVOLATILE ORGANIC COMPOUNDS (mg/kg)												
1,2,4,5-Tetrachlorobenzene	0.028 U	0.026 U	0.026 U	0.028 U	0.026 U	0.026 U	0.041 U	0.028 U	0.046 U	0.033 U	0.45 U	0.2 U
1,4-Dioxane (P-Dioxane)	0.1 U	0.093 U	0.094 U	0.099 U	0.093 U	0.094 U	0.15 U	0.1 U	0.16 U	0.12 U	1.6 U	0.73 U
2,3,4,6-Tetrachlorophenol	0.035 U	0.033 U	0.033 U	0.035 U	0.033 U	0.033 U	0.052 U	0.035 U	0.058 U	0.042 U	0.56 U	0.26 U
2,4,5-Trichlorophenol	0.037 U	0.035 U	0.035 U	0.037 U	0.035 U	0.035 U	0.055 U	0.037 U	0.061 U	0.044 U	0.6 U	0.27 U
2,4,6-Trichlorophenol	0.011 U	0.0099 U	0.01 U	0.011 U	0.0099 U	0.01 U	0.016 U	0.011 U	0.017 U	0.013 U	0.17 U	0.077 U
2,4-Dichlorophenol	0.0089 U	0.0082 U	0.0083 U	0.0088 U	0.0082 U	0.0083 U	0.013 U	0.0089 U	0.014 U	0.01 U	0.14 U	0.064 U
2,4-Dimethylphenol	0.083 U	0.077 U	0.077 U	0.082 U	0.076 U	0.077 U	0.12 UJ	0.083 UJ	0.13 UJ	0.097 UJ	1.3 U	0.6 U
2,4-Dinitrophenol	0.28 U	0.26 U	0.27 U	0.28 U	0.26 U	0.27 U	0.42 U	0.28 U	0.46 U	0.33 U	4.5 U	2.1 U
2,4-Dinitrotoluene	0.015 U	0.014 U	0.014 U	0.015 U	0.014 U	0.014 U	0.022 U	0.015 U	0.024 U	0.018 U	0.24 U	0.11 U
2,6-Dinitrotoluene	0.02 U	0.019 U	0.019 U	0.02 U	0.018 U	0.019 U	0.03 U	0.02 U	0.033 U	0.024 U	0.32 U	0.14 U
2-Chloronaphthalene	0.0085 U	0.0079 U	0.008 U	0.0084 U	0.0079 U	0.008 U	0.013 U	0.0085 U	0.014 U	0.01 U	0.14 U	0.062 U
2-Chlorophenol	0.0095 U	0.0088 U	0.0089 U	0.0094 U	0.0088 U	0.0089 U	0.014 U	0.0096 U	0.016 U	0.011 U	0.15 U	0.069 U
2-Methylnaphthalene	0.0083 U	0.0077 U	0.0078 U	0.0082 U	0.0077 U	0.0077 U	0.012 U	0.0083 U	0.014 U	0.0098 U	0.13 U	0.06 U
2-Methylphenol (O-Cresol)	0.016 U	0.015 U	0.015 U	0.016 U	0.015 U	0.015 U	0.024 U	0.016 U	0.027 U	0.019 U	0.26 U	0.12 U
2-Nitroaniline	0.012 U	0.011 U	0.012 U	0.012 U	0.011 U	0.012 U	0.018 U	0.012 U	0.02 U	0.015 U	0.2 U	0.09 U
2-Nitrophenol	0.013 U	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U	0.019 U	0.013 U	0.021 U	0.015 U	0.2 U	0.091 U
3- And 4- Methylphenol (Total)	0.01 U	0.0093 U	0.0094 U	0.0099 U	0.0092 U	0.0093 U	0.015 U	0.01 U	0.016 U	0.012 U	0.16 U	0.072 U
3,3'-Dichlorobenzidine	0.042 U	0.039 U	0.039 U	0.041 U	0.039 U	0.039 U	0.062 U	0.042 U	0.068 U	0.049 U	0.67 U	0.3 U
3-Nitroaniline	0.011 U	0.01 U	0.01 U	0.011 U	0.01 U	0.01 U	0.017 U	0.011 U	0.018 U	0.013 U	0.18 U	0.081 U
4,6-Dinitro-2-Methylphenol	0.1 U	0.093 U	0.094 U	0.099 U	0.093 U	0.094 U	0.15 U	0.1 U	0.16 U	0.12 U	1.6 U	0.73 U
4-Bromophenyl Phenyl Ether	0.012 U	0.011 U	0.011 U	0.012 U	0.011 U	0.011 U	0.018 U	0.012 U	0.019 U	0.014 U	0.19 U	0.086 U
4-Chloro-3-Methylphenol	0.016 U	0.015 U	0.015 U	0.016 U	0.015 U	0.015 U	0.024 U	0.016 U	0.026 U	0.019 U	0.26 U	0.12 U
4-Chloroaniline	0.0096 U	0.009 U	0.009 U	0.0096 U	0.0089 U	0.009 U	0.014 U	0.0097 U	0.016 U	0.011 U	1.9 J	0.89 J
4-Chlorophenyl Phenyl Ether	0.011 U	0.01 U	0.011 U	0.011 U	0.01 U	0.01 U	0.017 U	0.011 U	0.018 U	0.013 U	0.18 U	0.081 U
4-Nitroaniline	0.014 U	0.013 U	0.013 U	0.014 U	0.013 U	0.013 U	0.021 U	0.014 U	0.023 U	0.017 U	0.23 U	0.1 U
4-Nitrophenol	0.18 U	0.17 U	0.17 U	0.18 U	0.17 U	0.17 U	0.27 U	0.18 U	0.29 U	0.21 U	2.9 U	1.3 U
Acenaphthene	0.0091 U	0.0084 U	0.0085 U	0.009 U	0.0084 U	0.0085 U	0.013 U	0.0091 U	0.015 U	0.011 U	0.14 U	0.066 U
Acenaphthylene	0.0096 U	0.009 U	0.009 U	0.0096 U	0.0089 U	0.009 U	0.014 U	0.0097 U	0.016 U	0.011 U	0.15 U	0.07 U
Acetophenone	0.0082 U	0.0076 U	0.0077 U	0.0081 U	0.0076 U	0.0076 U	0.012 U	0.0082 U	0.013 U	0.0096 U	0.13 U	0.059 U
Anthracene	0.036 U	0.033 U	0.033 U	0.035 U	0.033 U	0.033 U	0.053 U	0.036 U	0.058 U	0.042 U	0.57 U	0.26 U
Atrazine	0.017 U	0.015 U	0.016 U	0.017 U	0.015 U	0.016 U	0.025 U	0.017 U	0.027 U	0.02 U	0.27 U	0.12 U
Benzaldehyde	0.029 U	0.027 U	0.027 U	0.028 U	0.026 U	0.027 U	0.042 U	0.029 U	0.047 U	0.034 U	0.46 U	0.21 U
Benzo(A)Anthracene	0.031 U	0.029 U	0.029 U	0.042	0.029 U	0.029 U	0.053 J	0.031 U	0.2	0.037 U	0.5 U	0.75
Benzo(A)Pyrene	0.011 UJ	0.011 U	0.011 U	0.06	0.01 U	0.011 U	0.059	0.034 J	0.019 U	0.013 U	2.8	4
Benzo(B)Fluoranthene	0.015 UJ	0.014 U	0.037	0.095	0.014 U	0.014 U	0.11	0.072	0.024 U	0.017 U	6.6	5
Benzo(G,H,I)Perylene	0.022 UJ	0.02 U	0.02 U	0.021 U	0.02 U	0.02 U	0.045 J	0.035 J	0.035 U	0.025 U	2.7 J	1.3 J
Benzo(K)Fluoranthene	0.016 UJ	0.015 U	0.015 U	0.016 U	0.015 U	0.015 U	0.046 J	0.027 J	0.14	0.088	0.26 U	0.12 U
Benzyl Butyl Phthalate	0.012 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.017 U	0.012 U	0.019 U	0.014 U	0.18 U	0.084 U
Biphenyl (Diphenyl)	0.032 U	0.03 U	0.03 U	0.032 U	0.03 U	0.03 U	0.048 U	0.032 U	0.052 U	0.038 U	0.51 U	0.23 U
Bis(2-Chloroethoxy) Methane	0.012 U	0.011 U	0.011 U	0.012 U	0.011 U	0.011 U	0.017 U	0.012 U	0.019 U	0.014 U	0.19 U	0.085 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.0089 U	0.0082 U	0.0083 U	0.0088 U	0.0082 U	0.0083 U	0.013 U	0.0089 U	0.014 U	0.01 U	0.14 U	0.064 U
Bis(2-Chloroisopropyl) Ether	0.015 U	0.014 U	0.014 U	0.015 U	0.014 U	0.014 U	0.023 U	0.015 U	0.025 U	0.018 U	0.25 U	0.11 U
Bis(2-Ethylhexyl) Phthalate	0.015 U	0.014 U	0.014 U	0.015 U	0.014 U	0.014 U	0.022 U	0.11 J	0.074 J	0.076 J	0.23 U	2.2 J
Caprolactam	0.027 U	0.025 U	0.025 U	0.027 U	0.025 U	0.025 U	0.04 U	0.027 U	0.044 U	0.032 U	0.43 U	0.2 U
Carbazole	0.0093 U	0.0086 U	0.0087 U	0.0092 U	0.0086 U	0.0087 U	0.014 U	0.0093 U	0.1 J	0.067 J	0.97 J	0.31 J
Chrysene	0.01 UJ	0.0095 U	0.014 J	0.048 J	0.0094 U	0.0095 U	0.067 J	0.036 J	0.34 J	0.2 J	2.6 J	1.8 J
Dibenz(A,H)Anthracene	0.02 U	0.018 U	0.018 U	0.019 U	0.018 U	0.018 U	0.029 U	0.02 U	0.032 U	0.023 U	0.31 U	0.44
Dibenzofuran	0.011 U	0.011 U	0.011 U	0.011 U	0.01 U	0.011 U	0.017 U	0.011 U	0.019 U	0.013 U	0.18 U	0.082 U
Diethyl Phthalate	0.011 U	0.0099 U	0.01 U	0.011 U	0.0099 U	0.01 U	0.016 U	0.011 U	0.017 U	0.013 U	0.17 U	0.077 U
Dimethyl Phthalate	0.011 U	0.01 U	0.01 U	0.011 U	0.01 U	0.01 U	0.016 U	0.011 U	0.018 U	0.013 U	0.17 U	0.079 U
Di-N-Butyl Phthalate	0.011 U	0.01 U	0.011 U	0.011 U	0.01 U	0.01 U	0.017 U	0.011 U	0.018 U	0.013 U	0.18 U	0.081 U
Di-N-Octylphthalate	0.019 U	0.018 U	0.018 U	0.019 U	0.018 U	0.018 U	0.028 U	0.019 U	0.031 U	0.022 U	0.3 U	0.14 U
Fluoranthene	0.011 UJ	0.01 U	0.014 J	0.053 J	0.01 U	0.01 U	0.094 J	0.047 J	0.31 J	0.19 J	1.3 J	0.86 J
Fluorene	0.0082 U	0.0076 U	0.0077 U	0.0081 U	0.0076 U	0.0076 U	0.012 U	0.0082 U	0.013 U	0.0096 U	0.13 U	0.059 U

Table E-28
Summary of Data Used in Risk Assessment
South Percolation Pond Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-147-DUP	CFSB-147	CFSB-147	CFSB-148	CFSB-148	CFSB-148	CFSB-151	CFSB-151	CFSB-152	CFSB-152	CFSB-153	CFSB-153
Sample Lab IDs	460-144478-7	460-144478-9	460-144478-10	460-144478-11	460-144478-12	460-144478-13	200-40872-1, 460-144726-8	200-40872-2, 460-144726-9	200-40872-4, 460-144726-6	200-40872-5, 460-144726-7	200-40872-7, 460-144478-14	200-40872-8, 460-144478-15
Sample Name	CFSB-DUP16-SO	CFSB-147-SO-0.5-2	CFSB-147-SO-2-4	CFSB-148-SO-0-0.5	CFSB-148-SO-0.5-2	CFSB-148-SO-2-4	CFSB-151-SO-0-0.5	CFSB-151-SO-0.5-2	CFSB-152-SO-0-0.5	CFSB-152-SO-0.5-2	CFSB-153-SO-0-0.5	CFSB-153-SO-0.5-2
Sample Depth	0-0.5 ft	0.5-2 ft	2-4 ft	0-0.5 ft	0.5-2 ft	2-4 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft
Chemical	11/6/2017	11/6/2017	11/6/2017	11/6/2017	11/6/2017	11/6/2017	11/7/2017	11/7/2017	11/7/2017	11/7/2017	11/6/2017	11/6/2017
Hexachlorobenzene	0.015 U	0.014 U	0.014 U	0.015 U	0.014 U	0.014 U	0.023 U	0.015 U	0.025 U	0.018 U	0.24 U	0.11 U
Hexachlorobutadiene	0.011 U	0.0098 U	0.0099 U	0.01 U	0.0098 U	0.0099 U	0.016 U	0.011 U	0.017 U	0.012 U	0.17 U	0.077 U
Hexachlorocyclopentadiene	0.023 UJ	0.022 UJ	0.022 UJ	0.023 UJ	0.022 UJ	0.022 UJ	0.035 UJ	0.023 UJ	0.038 UJ	0.028 UJ	0.37 UJ	0.17 UJ
Hexachloroethane	0.014 U	0.013 U	0.013 U	0.014 U	0.013 U	0.013 U	0.02 U	0.014 U	0.022 U	0.016 U	0.22 U	0.1 U
Indeno(1,2,3-C,D)Pyrene	0.025 UJ	0.023 U	0.036	0.072	0.023 U	0.023 U	0.06	0.044	0.041 U	0.029 U	3.1	2.2
Isophorone	0.0081 U	0.0075 U	0.0076 U	0.008 U	0.0074 U	0.0075 U	0.012 U	0.0081 U	0.013 U	0.0095 U	0.13 U	0.058 U
Naphthalene	0.0095 U	0.0088 U	0.0089 U	0.0094 U	0.0088 U	0.0089 U	0.014 U	0.0096 U	0.016 U	0.011 U	0.15 U	0.069 U
Nitrobenzene	0.012 U	0.011 U	0.011 U	0.012 U	0.011 U	0.011 U	0.018 U	0.012 U	0.019 U	0.014 U	0.19 U	0.086 U
N-Nitrosodi-N-Propylamine	0.013 U	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U	0.019 U	0.013 U	0.021 U	0.015 U	0.2 U	0.091 U
N-Nitrosodiphenylamine	0.034 U	0.032 U	0.032 U	0.034 U	0.031 U	0.032 U	0.051 U	0.034 U	0.056 U	0.04 U	0.54 U	0.25 U
Pentachlorophenol	0.045 U	0.042 U	0.043 U	0.045 U	0.042 U	0.042 U	0.067 U	0.045 U	0.074 U	0.053 U	0.72 U	0.33 U
Phenanthrene	0.01 UJ	0.0093 U	0.0094 U	0.032 J	0.0092 U	0.0093 U	0.047 J	0.023 J	0.13 J	0.089 J	0.55 J	0.28 J
Phenol	0.012 U	0.011 U	0.011 U	0.012 U	0.011 U	0.011 U	0.018 U	0.012 U	0.02 U	0.014 U	0.2 U	0.089 U
Pyrene	0.017 UJ	0.016 U	0.018 J	0.063 J	0.016 U	0.016 U	0.09 J	0.043 J	0.25 J	0.14 J	1.3 J	0.93 J
VOLATILE ORGANIC COMPOUNDS (mg/kg)												
1,1,1-Trichloroethane	--	0.00024 U	0.00024 U	--	0.00025 U	0.00027 U	--	0.00021 U	--	0.00026 U	--	0.00036 U
1,1,2,2-Tetrachloroethane	--	0.00022 U	0.00022 U	--	0.00023 U	0.00025 U	--	0.0002 U	--	0.00024 U	--	0.00033 UJ
1,1,2-Trichloro-1,2,2-Trifluoroethane	--	0.00031 U	0.00031 U	--	0.00033 U	0.00035 U	--	0.00028 U	--	0.00034 U	--	0.00046 U
1,1,2-Trichloroethane	--	0.00018 U	0.00019 U	--	0.00019 U	0.0002 U	--	0.00016 U	--	0.0002 U	--	0.00027 U
1,1-Dichloroethane	--	0.00021 U	0.00022 U	--	0.00022 U	0.00024 U	--	0.00019 U	--	0.00023 U	--	0.00031 U
1,1-Dichloroethene	--	0.00023 U	0.00024 U	--	0.00024 U	0.00026 U	--	0.00021 U	--	0.00025 U	--	0.00034 U
1,2,3-Trichlorobenzene	--	0.00018 U	0.00019 U	--	0.0002 U	0.00021 U	--	0.00017 U	--	0.0002 U	--	0.00028 UJ
1,2,4-Trichlorobenzene	--	0.000094 U	0.000096 U	--	0.0001 U	0.00011 U	--	0.000084 U	--	0.0001 U	--	0.00014 UJ
1,2-Dibromo-3-Chloropropane	--	0.00047 U	0.00048 U	--	0.0005 U	0.00053 U	--	0.00042 UJ	--	0.00052 UJ	--	0.0007 UJ
1,2-Dibromoethane (Ethylene Dibromide)	--	0.00018 U	0.00019 U	--	0.00019 U	0.00021 U	--	0.00016 U	--	0.0002 U	--	0.00027 U
1,2-Dichlorobenzene	--	0.00015 U	0.00015 U	--	0.00016 U	0.00017 U	--	0.00013 U	--	0.00016 U	--	0.00022 UJ
1,2-Dichloroethane	--	0.0003 U	0.00031 U	--	0.00032 U	0.00034 U	--	0.00027 U	--	0.00033 U	--	0.00045 U
1,2-Dichloropropane	--	0.00043 U	0.00044 U	--	0.00046 U	0.00049 U	--	0.00039 U	--	0.00048 U	--	0.00064 U
1,3-Dichlorobenzene	--	0.00016 U	0.00017 U	--	0.00017 U	0.00018 U	--	0.00015 U	--	0.00018 U	--	0.00024 UJ
1,4-Dichlorobenzene	--	0.0001 U	0.0001 U	--	0.00011 U	0.00011 U	--	0.000092 U	--	0.00011 U	--	0.00074 J+
2-Hexanone	--	0.00079 U	0.00082 U	--	0.00084 U	0.0009 U	--	0.00071 U	--	0.00088 U	--	0.0012 U
Acetone	--	0.038	0.037	--	0.037	0.021	--	0.036	--	0.059	--	0.063
Benzene	--	0.0022	0.0023	--	0.0022	0.0038	--	0.0005 J	--	0.00031 J	--	0.0011 J
Bromochloromethane	--	0.00029 U	0.00029 U	--	0.0003 U	0.00032 U	--	0.00026 U	--	0.00032 U	--	0.00043 U
Bromodichloromethane	--	0.00026 U	0.00027 U	--	0.00028 U	0.0003 U	--	0.00024 U	--	0.00029 U	--	0.00039 U
Bromoform	--	0.00043 U	0.00044 U	--	0.00046 U	0.00049 U	--	0.00039 U	--	0.00048 U	--	0.00065 U
Bromomethane	--	0.00048 U	0.0005 U	--	0.00051 U	0.00054 U	--	0.00043 U	--	0.00053 U	--	0.00072 U
Carbon Disulfide	--	0.0015	0.0013	--	0.0038	0.0012	--	0.014	--	0.0021	--	0.0034
Carbon Tetrachloride	--	0.00018 U	0.00019 U	--	0.0002 U	0.00021 U	--	0.00017 U	--	0.0002 U	--	0.00028 U
Chlorobenzene	--	0.00018 U	0.00019 U	--	0.00019 U	0.0002 U	--	0.00016 U	--	0.0002 U	--	0.00027 U
Chloroethane	--	0.00053 U	0.00055 U	--	0.00056 U	0.0006 U	--	0.00048 U	--	0.00059 U	--	0.0008 U
Chloroform	--	0.00032 U	0.00033 U	--	0.00035 U	0.00037 U	--	0.00029 U	--	0.00036 U	--	0.00049 U
Chloromethane	--	0.00044 U	0.00045 U	--	0.00047 U	0.0005 U	--	0.0004 U	--	0.00049 U	--	0.00066 U
Cis-1,2-Dichloroethylene	--	0.00015 U	0.00016 U	--	0.00016 U	0.00017 U	--	0.00014 U	--	0.00017 U	--	0.00023 U
Cis-1,3-Dichloropropene	--	0.00028 U	0.00029 U	--	0.0003 U	0.00031 U	--	0.00025 UJ	--	0.00031 UJ	--	0.00042 U
Cyclohexane	--	0.0039	0.005	--	0.005	0.0052	--	0.00066 J	--	0.00025 U	--	0.00085 J
Dibromochloromethane	--	0.0002 U	0.0002 U	--	0.00021 U	0.00022 U	--	0.00018 U	--	0.00022 U	--	0.0003 U
Dichlorodifluoromethane	--	0.00034 U	0.00035 U	--	0.00037 U	0.00039 U	--	0.00031 U	--	0.00038 U	--	0.00052 U
Ethylbenzene	--	0.00092 J	0.0014	--	0.0011	0.0012	--	0.00019 J	--	0.00022 U	--	0.00041 J
Isopropylbenzene (Cumene)	--	0.00013 U	0.00016 J	--	0.00014 U	0.00014 U	--	0.00012 U	--	0.00014 U	--	0.00019 U
M,P-Xylene	--	0.0023	0.0037	--	0.0028	0.0028	--	0.00049 J	--	0.00025 J	--	0.00095 J
Methyl Acetate	--	0.0044 U	0.0045 U	--	0.0047 U	0.0049 U	--	0.0039 UJ	--	0.0048 UJ	--	0.0066 U
Methyl Ethyl Ketone (2-Butanone)	--	0.0037 J	0.004 J	--	0.004 J	0.0026 J	--	0.0061	--	0.0077	--	0.0094
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	--	0.00068 U	0.00069 U	--	0.00072 U	0.00076 U	--	0.00061 U	--	0.00075 U	--	0.001 U
Methylcyclohexane	--	0.0083	0.011	--	0.011	0.01	--	0.0012	--	0.00027 J	--	0.0013 J
Methylene Chloride	--	0.00017 U	0.00017 U	--	0.00018 U	0.00019 U	--	0.00015 U	--	0.00018 U	--	0.00025 U
O-Xylene (1,2-Dimethylbenzene)	--	0.00077 J	0.0012	--	0.00083 J	0.0009 J	--	0.00014 J	--	0.00011 U	--	0.00035 J
Styrene	--	0.00013 U	0.00013 U	--	0.00013 U	0.00014 U	--	0.00011 U	--	0.00014 U	--	0.00019 U
Tert-Butyl Methyl Ether	--	0.00013 U	0.00013 U	--	0.00014 U	0.00014 U	--	0.00011 U	--	0.00014 U	--	0.00019 U

Table E-28
Summary of Data Used in Risk Assessment
South Percolation Pond Area Soil (0-12 ft-bgs) - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-147-DUP	CFSB-147	CFSB-147	CFSB-148	CFSB-148	CFSB-148	CFSB-151	CFSB-151	CFSB-152	CFSB-152	CFSB-153	CFSB-153
Sample Lab IDs	460-144478-7	460-144478-9	460-144478-10	460-144478-11	460-144478-12	460-144478-13	200-40872-1, 460-144726-8	200-40872-2, 460-144726-9	200-40872-4, 460-144726-6	200-40872-5, 460-144726-7	200-40872-7, 460-144478-14	200-40872-8, 460-144478-15
Sample Name	CFSB-DUP16-SO	CFSB-147-SO-0.5-2	CFSB-147-SO-2-4	CFSB-148-SO-0-0.5	CFSB-148-SO-0.5-2	CFSB-148-SO-2-4	CFSB-151-SO-0-0.5	CFSB-151-SO-0.5-2	CFSB-152-SO-0-0.5	CFSB-152-SO-0.5-2	CFSB-153-SO-0-0.5	CFSB-153-SO-0.5-2
Sample Depth	0-0.5 ft	0.5-2 ft	2-4 ft	0-0.5 ft	0.5-2 ft	2-4 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft
Chemical	11/6/2017	11/6/2017	11/6/2017	11/6/2017	11/6/2017	11/6/2017	11/7/2017	11/7/2017	11/7/2017	11/7/2017	11/6/2017	11/6/2017
Tetrachloroethylene (PCE)	--	0.00015 U	0.00015 U	--	0.00015 U	0.00016 U	--	0.00013 U	--	0.00016 U	--	0.00022 U
Toluene	--	0.005	0.0073	--	0.006	0.0068	--	0.00099	--	0.0007 U	--	0.0022
Trans-1,2-Dichloroethene	--	0.00025 U	0.00026 U	--	0.00027 U	0.00028 U	--	0.00023 U	--	0.00028 U	--	0.00037 U
Trans-1,3-Dichloropropene	--	0.00027 U	0.00028 U	--	0.00029 U	0.00031 U	--	0.00024 UJ	--	0.0003 UJ	--	0.00041 U
Trichloroethylene (TCE)	--	0.00015 U	0.00015 U	--	0.00016 U	0.00017 U	--	0.00013 U	--	0.00016 U	--	0.00022 U
Trichlorofluoromethane	--	0.00041 U	0.00042 U	--	0.00044 U	0.00047 U	--	0.00037 U	--	0.00046 U	--	0.00062 U
Vinyl Chloride	--	0.00056 U	0.00057 U	--	0.00059 U	0.00063 U	--	0.0005 U	--	0.00062 U	--	0.00083 U

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-29
Summary of Data Used in Risk Assessment
South Percolation Pond Area (surface water) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Chemical	CFSWP-018 460-114944-1 CFSWP-018-SW 6/6/2016	CFSWP-018 460-124639-5 CFSWP-018-SW 12/1/2016	CFSWP-018 460-130874-3 CFSWP-018-SW 4/3/2017	CFSWP-018 460-135444-1 CFSWP-018-SW 6/15/2017	CFSWP-018 460-158910-1 CFSWP-018-SW 6/21/2018	CFSWP-018 460-167097-1 CFSWP-018-SW 10/17/2018	CFSWP-019 460-114944-2 CFSWP-019-SW 6/6/2016	CFSWP-019 460-124639-6 CFSWP-019-SW 12/1/2016	CFSWP-019 460-130874-4 CFSWP-019-SW 4/3/2017	CFSWP-019 460-135444-2 CFSWP-019-SW 6/15/2017	CFSWP-019 460-144576-1 CFSWP-019-SW 11/7/2017	CFSWP-019 460-158910-2 CFSWP-019-SW 6/21/2018	CFSWP-019 460-167026-6 CFSWP-019-SW 10/16/2018	CFSWP-020 460-114944-3 CFSWP-020-SW 6/6/2016
GENERAL CHEMISTRY (µg/L)														
Fluoride	--	--	--	1860	--	--	--	--	--	304	--	--	--	--
Cyanide	--	--	--	68.2	--	--	--	--	--	2 U	2 U	--	--	--
Cyanide (Free)	--	--	--	--	--	--	--	--	--	--	2.5 J	--	--	--
Cyanide	4 U	2 U	2 U	77.2	139	--	4 U	2 U	2 U	2 U	4.3 J	3.6 J	--	12.5
Cyanide (Free)	--	--	--	--	1.5 UJ	2.4 J	--	--	--	--	2.3 J	2.7 J-	2.8 J	--
METALS (µg/L)														
Aluminum	--	--	--	18.2 U	15 U	288	--	--	--	18.2 U	2360	15 U	198	--
Antimony	--	--	--	0.62 U	0.62 U	0.62 U	--	--	--	0.62 U	0.62 U	0.62 U	0.62 U	--
Arsenic	--	--	--	0.64 U	0.77 U	1.1 J	--	--	--	0.64 U	1.7 J	0.77 U	1.3 J	--
Barium	--	--	--	194	183	148	--	--	--	248	527	265	127	--
Beryllium	--	--	--	0.24 U	0.26 U	0.26 U	--	--	--	0.24 U	0.24 U	0.26 U	0.26 U	--
Cadmium	--	--	--	0.71 U	0.61 U	0.61 U	--	--	--	0.71 U	0.71 U	0.61 U	0.61 U	--
Calcium	--	--	--	49400	52300	49000	--	--	--	37800	147000	41700	38900	--
Chromium, Total	--	--	--	1.3 U	1.3 U	1.3 U	--	--	--	1.3 U	1.5 J	1.3 U	1.3 U	--
Cobalt	--	--	--	1.3 U	1.3 U	1.3 U	--	--	--	1.3 U	1.3 U	1.3 U	1.3 U	--
Copper	--	--	--	1.4 U	1.9 J	5.9	--	--	--	1.4 U	33.4	1.9 U	4.4	--
Iron	--	--	--	60.5 J	59.4 J	132	--	--	--	42.4 U	768	45.7 U	127	--
Lead	--	--	--	0.38 U	0.37 U	0.86 J	--	--	--	0.38 U	5.2	0.37 U	0.44 J	--
Magnesium	--	--	--	14800	15600	15700	--	--	--	12700	21900	13800	19400	--
Manganese	--	--	--	2.5 U	2.7 U	4.8 J	--	--	--	2.5 U	56.7	2.7 U	6.4 J	--
Mercury	--	--	--	0.17 U	0.12 U	0.12 U	--	--	--	0.17 U	0.17 U	0.12 U	0.12 U	--
Nickel	--	--	--	1.4 U	1.3 U	1.6 J	--	--	--	1.4 U	4.2	1.3 U	1.8 J	--
Potassium	--	--	--	970	1040	2100	--	--	--	752	9310	764	2830	--
Selenium	--	--	--	0.73 U	0.69 U	0.69 U	--	--	--	0.73 U	0.73 U	0.69 U	0.69 U	--
Silver	--	--	--	1.3 U	1.4 U	1.4 U	--	--	--	1.3 U	1.3 U	1.4 U	1.4 U	--
Sodium	--	--	--	23500	33800	41500	--	--	--	3670	49000	7870	51200	--
Thallium	--	--	--	0.26 U	0.24 U	0.24 U	--	--	--	0.26 U	0.26 U	0.24 U	0.24 U	--
Vanadium	--	--	--	1.9 U	1.2 U	1.2 U	--	--	--	1.9 U	1.9 U	1.2 U	1.2 U	--
Zinc	--	--	--	7 U	5.4 U	7.7 J	--	--	--	7 U	58.8	5.4 U	5.4 U	--
Aluminum	13.5 U	583	60.7	285	289	1240	18.7 J	61.7	24.5 J	18.2 U	4330	46.3	853	15.3 J
Antimony	0.76 U	0.62 U	0.62 U	0.62 U	0.62 U	0.69 J	0.76 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.92 J	0.76 U
Arsenic	0.71 J	0.64 U	0.64 U	0.64 U	0.77 U	1.4 J	0.71 U	0.64 U	0.64 U	0.64 U	1.9 J	0.77 U	1.3 J	0.71 U
Barium	268	225	237	237	186	262	265	156	244	250	713	273	213	305
Beryllium	0.29 U	0.24 U	0.24 U	0.24 U	0.26 U	0.26 U	0.29 U	0.24 U	0.24 U	0.24 U	0.24 U	0.26 U	0.26 U	0.29 U
Cadmium	0.72 U	0.71 U	0.71 U	0.71 U	0.61 U	0.61 U	0.72 U	0.71 U	0.71 U	0.71 U	0.71 U	0.61 U	0.66 J	0.72 U
Calcium	48300	77000	46300	62400	51100	95100	49100	51000	45600	38000	200000	40600	67600	45500
Chromium, Total	3.9 J	1.3 U	1.3 U	1.3 U	1.3 U	2.2 J	1.8 J	1.3 U	4.3	1.3 U	5.9	1.3 U	1.8 J	1.5 U
Cobalt	1.5 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.5 U	1.3 U	1.3 U	1.3 U	2.6 J	1.3 U	1.3 U	1.5 U
Copper	2 J	9.8	1.9 J	5.3	5	20.1	3.3 J	1.6 J	1.8 J	1.4 U	75.9	1.9 U	19.6	1.8 J
Iron	109 J	449	48.9 J	268	405	675	110 J	134	111 J	42.4 U	2790	62.8 J	692	49.1 U
Lead	0.44 U	1.7	0.38 U	0.99 J	0.89 J	4.7	0.44 U	0.38 U	0.38 U	0.38 U	8.3	0.37 U	1.9	0.44 U
Magnesium	16200	17200	13900	16300	14700	14900	16200	16500	14000	13300	22200	14800	19700	15600
Manganese	5.7 J	8.3	2.5 U	3.4 J	6.3 J	11.1	4.4 J	9.3	3.4 J	2.5 U	75.8	4.4 J	19.8	3 U
Mercury	0.14 U	0.17 U	0.17 U	0.17 U	0.12 U	0.12 U	0.14 U	0.17 U	0.17 U	0.17 U	0.17 U	0.12 U	0.12 U	0.14 U
Nickel	1.6 U	1.6 J	1.4 U	1.4 U	1.3 U	3.6 J	1.6 U	1.4 U	1.4 U	1.4 U	10.7	1.3 U	3.4 J	1.6 U
Potassium	797	600	700	1060	1070	2030	910	641	678	769	9100 J+	803	3350	818
Selenium	0.79 U	0.73 U	0.73 U	0.73 U	0.69 U	1 J	0.79 U	0.73 U	0.73 U	0.73 U	1 J	0.69 U	0.69 U	0.79 U
Silver	1.5 U	1.3 U	1.3 U	1.3 U	1.4 U	1.4 U	1.5 U	1.3 U	1.3 U	1.3 U	1.3 U	1.4 U	1.4 U	1.5 U
Sodium	5660	9290	4600	25800	33100	37900	5840	8710	4630	4330	45900	8610	51300	5150
Thallium	0.31 U	0.26 U	0.26 U	0.26 U	0.24 U	0.24 U	0.31 U	0.26 U	0.26 U	0.26 U	0.26 U	0.24 U	0.24 U	0.31 U
Vanadium	2.1 J	1.9 U	1.9 U	1.9 U	1.2 U	1.2 U	2.1 J	1.9 U	1.9 U	1.9 U	3.6 J	1.2 U	1.6 J	2.1 J
Zinc	6.5 U	18.2	7 U	15.2 J	9.4 J	37.4	6.5 U	7 U	7 U	7 U	86.3	5.4 U	25.5	6.5 U
PESTICIDES (µg/L)														
Aldrin	0.004 U	--	--	--	--	--	0.004 U	--	--	--	--	--	--	0.004 U
Alpha Bhc (Alpha Hexachlorocyclohexane)	0.006 U	--	--	--	--	--	0.006 U	--	--	--	--	--	--	0.006 U
Alpha Endosulfan	0.005 U	--	--	--	--	--	0.005 U	--	--	--	--	--	--	0.005 U
Beta Bhc (Beta Hexachlorocyclohexane)	0.005 U	--	--	--	--	--	0.005 U	--	--	--	--	--	--	0.005 U
Beta Endosulfan	0.004 U	--	--	--	--	--	0.004 U	--	--	--	--	--	--	0.004 U
cis-Chlordane	0.004 U	--	--	--	--	--	0.004 U	--	--	--	--	--	--	0.004 U
Delta BHC (Delta Hexachlorocyclohexane)	0.006 U	--	--	--	--	--	0.006 U	--	--	--	--	--	--	0.006 U

Table E-29
Summary of Data Used in Risk Assessment
South Percolation Pond Area (surface water) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Chemical	CFSWP-018 460-114944-1 CFSWP-018-SW 6/6/2016	CFSWP-018 460-124639-5 CFSWP-018-SW 12/1/2016	CFSWP-018 460-130874-3 CFSWP-018-SW 4/3/2017	CFSWP-018 460-135444-1 CFSWP-018-SW 6/15/2017	CFSWP-018 460-158910-1 CFSWP-018-SW 6/21/2018	CFSWP-018 460-167097-1 CFSWP-018-SW 10/17/2018	CFSWP-019 460-114944-2 CFSWP-019-SW 6/6/2016	CFSWP-019 460-124639-6 CFSWP-019-SW 12/1/2016	CFSWP-019 460-130874-4 CFSWP-019-SW 4/3/2017	CFSWP-019 460-135444-2 CFSWP-019-SW 6/15/2017	CFSWP-019 460-144576-1 CFSWP-019-SW 11/7/2017	CFSWP-019 460-158910-2 CFSWP-019-SW 6/21/2018	CFSWP-019 460-167026-6 CFSWP-019-SW 10/16/2018	CFSWP-020 460-114944-3 CFSWP-020-SW 6/6/2016
Dieldrin	0.004 U	--	--	--	--	--	0.004 U	--	--	--	--	--	--	0.004 U
Endosulfan Sulfate	0.005 U	--	--	--	--	--	0.005 U	--	--	--	--	--	--	0.005 U
Endrin	0.004 U	--	--	--	--	--	0.004 U	--	--	--	--	--	--	0.004 U
Endrin Aldehyde	0.004 U	--	--	--	--	--	0.004 U	--	--	--	--	--	--	0.004 U
Endrin Ketone	0.004 U	--	--	--	--	--	0.004 U	--	--	--	--	--	--	0.004 U
Gamma Bhc (Lindane)	0.004 U	--	--	--	--	--	0.004 U	--	--	--	--	--	--	0.004 U
Heptachlor	0.004 U	--	--	--	--	--	0.004 U	--	--	--	--	--	--	0.004 U
Heptachlor Epoxide	0.004 U	--	--	--	--	--	0.004 U	--	--	--	--	--	--	0.004 U
Methoxychlor	0.004 U	--	--	--	--	--	0.004 U	--	--	--	--	--	--	0.004 U
P,P'-DDD	0.005 U	--	--	--	--	--	0.005 U	--	--	--	--	--	--	0.005 U
P,P'-DDE	0.004 U	--	--	--	--	--	0.004 U	--	--	--	--	--	--	0.004 U
P,P'-DDT	0.004 U	--	--	--	--	--	0.004 U	--	--	--	--	--	--	0.004 U
Toxaphene	0.06 U	--	--	--	--	--	0.06 U	--	--	--	--	--	--	0.06 U
trans-Chlordane	0.005 U	--	--	--	--	--	0.005 U	--	--	--	--	--	--	0.005 U
POLYCHLORINATED BIPHENYLS (µg/L)														
PCB-1016 (Aroclor 1016)	0.098 U	--	--	--	--	--	0.098 U	--	--	--	--	--	--	0.098 U
PCB-1221 (Aroclor 1221)	0.098 U	--	--	--	--	--	0.098 U	--	--	--	--	--	--	0.098 U
PCB-1232 (Aroclor 1232)	0.098 U	--	--	--	--	--	0.098 U	--	--	--	--	--	--	0.098 U
PCB-1242 (Aroclor 1242)	0.098 U	--	--	--	--	--	0.098 U	--	--	--	--	--	--	0.098 U
PCB-1248 (Aroclor 1248)	0.098 U	--	--	--	--	--	0.098 U	--	--	--	--	--	--	0.098 U
PCB-1254 (Aroclor 1254)	0.084 U	--	--	--	--	--	0.084 U	--	--	--	--	--	--	0.084 U
PCB-1260 (Aroclor 1260)	0.084 U	--	--	--	--	--	0.084 U	--	--	--	--	--	--	0.084 U
PCB-1262 (Aroclor 1262)	0.084 U	--	--	--	--	--	0.084 U	--	--	--	--	--	--	0.084 U
PCB-1268 (Aroclor 1268)	0.084 U	--	--	--	--	--	0.084 U	--	--	--	--	--	--	0.084 U
Polychlorinated Biphenyl (PCBs)	0.098 U	--	--	--	--	--	0.098 U	--	--	--	--	--	--	0.098 U
SEMIVOLATILE ORGANIC COMPOUNDS (µg/L)														
1,2,4,5-Tetrachlorobenzene	0.45 U	--	--	--	--	--	0.43 U	--	--	--	0.43 U	--	--	0.47 U
1,4-Dioxane (P-Dioxane)	3.2 U	--	--	--	--	--	3.1 U	--	--	--	3.1 U	--	--	3.4 U
2,3,4,6-Tetrachlorophenol	0.72 U	--	--	--	--	--	0.69 U	--	--	--	0.69 U	--	--	0.75 U
2,4,5-Trichlorophenol	0.51 U	--	--	--	--	--	0.49 U	--	--	--	0.49 U	--	--	0.53 U
2,4,6-Trichlorophenol	0.55 U	--	--	--	--	--	0.53 U	--	--	--	0.53 U	--	--	0.58 U
2,4-Dichlorophenol	0.66 U	--	--	--	--	--	0.63 U	--	--	--	0.63 U	--	--	0.68 U
2,4-Dimethylphenol	0.95 U	--	--	--	--	--	0.91 U	--	--	--	0.91 U	--	--	0.99 U
2,4-Dinitrophenol	2.5 U	--	--	--	--	--	2.4 U	--	--	--	2.4 U	--	--	2.6 U
2,4-Dinitrotoluene	1.1 U	--	--	--	--	--	1 U	--	--	--	1 U	--	--	1.1 U
2,6-Dinitrotoluene	0.92 U	--	--	--	--	--	0.88 U	--	--	--	0.88 U	--	--	0.96 U
2-Chloronaphthalene	0.64 U	--	--	--	--	--	0.61 U	--	--	--	0.61 U	--	--	0.66 U
2-Chlorophenol	0.77 U	--	--	--	--	--	0.74 U	--	--	--	0.74 U	--	--	0.8 U
2-Methylnaphthalene	0.92 U	--	--	--	--	--	0.88 U	--	--	--	0.88 U	--	--	0.96 U
2-Methylphenol (O-Cresol)	1.3 U	--	--	--	--	--	1.3 U	--	--	--	1.3 U	--	--	1.4 U
2-Nitroaniline	0.68 U	--	--	--	--	--	0.65 U	--	--	--	0.65 U	--	--	0.71 U
2-Nitrophenol	0.61 U	--	--	--	--	--	0.59 U	--	--	--	0.59 U	--	--	0.64 U
3- And 4- Methylphenol (Total)	0.92 U	--	--	--	--	--	0.88 U	--	--	--	0.88 U	--	--	0.96 U
3,3'-Dichlorobenzidine	1.1 U	--	--	--	--	--	1 U	--	--	--	1 UJ	--	--	1.1 U
3-Nitroaniline	0.85 U	--	--	--	--	--	0.82 U	--	--	--	0.82 UJ	--	--	0.89 U
4,6-Dinitro-2-Methylphenol	2.1 U	--	--	--	--	--	2 U	--	--	--	2 UJ	--	--	2.2 U
4-Bromophenyl Phenyl Ether	1.1 U	--	--	--	--	--	1 U	--	--	--	1 U	--	--	1.1 U
4-Chloro-3-Methylphenol	0.79 U	--	--	--	--	--	0.76 U	--	--	--	0.76 U	--	--	0.83 U
4-Chloroaniline	0.76 U	--	--	--	--	--	0.73 U	--	--	--	0.73 U	--	--	0.79 U
4-Chlorophenyl Phenyl Ether	1 U	--	--	--	--	--	0.96 U	--	--	--	0.96 U	--	--	1 U
4-Nitroaniline	0.5 U	--	--	--	--	--	0.48 U	--	--	--	0.48 U	--	--	0.52 U
4-Nitrophenol	4.8 U	--	--	--	--	--	4.7 U	--	--	--	4.7 U	--	--	5.1 U
Acenaphthene	0.92 U	--	--	--	--	--	0.88 U	--	--	--	0.88 U	--	--	0.96 U
Acenaphthylene	0.68 U	--	--	--	--	--	0.65 U	--	--	--	0.65 U	--	--	0.71 U
Acetophenone	1.1 U	--	--	--	--	--	1 U	--	--	--	1 U	--	--	1.1 U
Anthracene	0.59 U	--	--	--	--	--	0.57 U	--	--	--	0.57 U	--	--	0.62 U
Atrazine	0.8 U	--	--	--	--	--	0.77 U	--	--	--	0.77 U	--	--	0.84 U
Benzaldehyde	0.9 U	--	--	--	--	--	0.86 U	--	--	--	0.86 U	--	--	0.93 U
Benzo(A)Anthracene	0.57 U	--	--	--	--	--	0.55 U	--	--	--	0.55 U	--	--	0.6 U
Benzo(A)Pyrene	0.17 U	--	--	--	--	--	0.16 U	--	--	--	0.16 U	--	--	0.17 U
Benzo(B)Fluoranthene	0.46 U	--	--	--	--	--	0.44 U	--	--	--	0.44 U	--	--	0.48 U

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Summary of Data Used in Risk Assessment
South Percolation Pond Area (surface water) - Current/Future
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Benzo(G,H,I)Perylene	0.78 U	--	--	--	--	--	0.75 U	--	--	--	0.75 U	--	--	0.82 U
Benzo(K)Fluoranthene	0.19 U	--	--	--	--	--	0.18 U	--	--	--	0.18 U	--	--	0.2 U
Benzyl Butyl Phthalate	0.63 U	--	--	--	--	--	0.6 U	--	--	--	0.6 U	--	--	0.65 U
Biphenyl (Diphenyl)	0.66 U	--	--	--	--	--	0.63 U	--	--	--	0.63 U	--	--	0.68 U
Bis(2-Chloroethoxy) Methane	0.72 U	--	--	--	--	--	0.69 U	--	--	--	0.69 UJ	--	--	0.75 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.13 U	--	--	--	--	--	0.12 U	--	--	--	0.12 U	--	--	0.13 U
Bis(2-Chloroisopropyl) Ether	0.97 U	--	--	--	--	--	0.93 U	--	--	--	0.93 U	--	--	1 U
Bis(2-Ethylhexyl) Phthalate	0.75 U	--	--	--	--	--	0.72 U	--	--	--	0.72 U	--	--	0.78 U
Caprolactam	1.1 U	--	--	--	--	--	1.1 U	--	--	--	1.1 UJ	--	--	1.1 U
Carbazole	0.89 U	--	--	--	--	--	0.85 U	--	--	--	0.85 U	--	--	0.92 U
Chrysene	0.7 U	--	--	--	--	--	0.67 U	--	--	--	0.67 U	--	--	0.73 U
Dibenz(A,H)Anthracene	0.094 U	--	--	--	--	--	0.09 U	--	--	--	0.09 U	--	--	0.098 U
Dibenzofuran	0.89 U	--	--	--	--	--	0.85 U	--	--	--	0.85 U	--	--	0.92 U
Diethyl Phthalate	1 U	--	--	--	--	--	1 U	--	--	--	1 U	--	--	1.1 U
Dimethyl Phthalate	1 U	--	--	--	--	--	0.98 U	--	--	--	0.98 U	--	--	1.1 U
Di-N-Butyl Phthalate	0.85 U	--	--	--	--	--	0.82 U	--	--	--	0.82 U	--	--	0.89 U
Di-N-Octylphthalate	0.72 U	--	--	--	--	--	0.69 U	--	--	--	0.69 U	--	--	0.75 U
Fluoranthene	0.75 U	--	--	--	--	--	0.72 U	--	--	--	0.72 U	--	--	0.78 U
Fluorene	0.83 U	--	--	--	--	--	0.8 U	--	--	--	0.8 U	--	--	0.87 U
Hexachlorobenzene	0.49 U	--	--	--	--	--	0.47 U	--	--	--	0.47 U	--	--	0.51 U
Hexachlorobutadiene	0.79 U	--	--	--	--	--	0.76 U	--	--	--	0.76 U	--	--	0.83 U
Hexachlorocyclopentadiene	0.64 U	--	--	--	--	--	0.61 U	--	--	--	0.61 UJ	--	--	0.66 U
Hexachloroethane	0.094 U	--	--	--	--	--	0.09 U	--	--	--	0.26 J	--	--	0.098 U
Indeno(1,2,3-C,D)Pyrene	0.22 U	--	--	--	--	--	0.21 U	--	--	--	0.21 U	--	--	0.23 U
Isophorone	0.7 U	--	--	--	--	--	0.67 U	--	--	--	0.67 U	--	--	0.73 U
Naphthalene	0.83 U	--	--	--	--	--	0.8 U	--	--	--	0.8 U	--	--	0.87 U
Nitrobenzene	0.51 U	--	--	--	--	--	0.49 U	--	--	--	0.49 U	--	--	0.53 U
N-Nitrosodi-N-Propylamine	0.86 U	--	--	--	--	--	0.83 U	--	--	--	0.83 U	--	--	0.9 U
N-Nitrosodiphenylamine	0.77 U	--	--	--	--	--	0.74 U	--	--	--	0.74 U	--	--	0.8 U
Pentachlorophenol	2.3 U	--	--	--	--	--	2.2 U	--	--	--	2.2 U	--	--	2.4 U
Phenanthrene	0.68 U	--	--	--	--	--	0.65 U	--	--	--	0.65 U	--	--	0.71 U
Phenol	0.43 U	--	--	--	--	--	0.41 U	--	--	--	0.41 U	--	--	0.45 U
Pyrene	0.86 U	--	--	--	--	--	0.83 U	--	--	--	0.83 U	--	--	0.9 U
VOLATILE ORGANIC COMPOUNDS (µg/L)														
1,1,1-Trichloroethane	0.28 U	--	--	--	--	--	0.28 U	--	--	--	0.28 U	--	--	0.28 U
1,1,2,2-Tetrachloroethane	0.19 U	--	--	--	--	--	0.19 U	--	--	--	0.19 U	--	--	0.19 U
1,1,2-Trichloro-1,2,2-Trifluoroethane	0.34 U	--	--	--	--	--	0.34 U	--	--	--	0.34 U	--	--	0.34 U
1,1,2-Trichloroethane	0.08 U	--	--	--	--	--	0.08 U	--	--	--	0.08 U	--	--	0.08 U
1,1-Dichloroethane	0.24 U	--	--	--	--	--	0.24 U	--	--	--	0.24 U	--	--	0.24 U
1,1-Dichloroethene	0.34 U	--	--	--	--	--	0.34 U	--	--	--	0.34 U	--	--	0.34 U
1,2,3-Trichlorobenzene	0.35 U	--	--	--	--	--	0.35 U	--	--	--	0.35 U	--	--	0.35 U
1,2,4-Trichlorobenzene	0.27 U	--	--	--	--	--	0.27 U	--	--	--	0.27 U	--	--	0.27 U
1,2-Dibromo-3-Chloropropane	0.23 U	--	--	--	--	--	0.23 U	--	--	--	0.23 U	--	--	0.23 U
1,2-Dibromoethane (Ethylene Dibromide)	0.19 U	--	--	--	--	--	0.19 U	--	--	--	0.19 U	--	--	0.19 U
1,2-Dichlorobenzene	0.22 U	--	--	--	--	--	0.22 U	--	--	--	0.22 U	--	--	0.22 U
1,2-Dichloroethane	0.25 U	--	--	--	--	--	0.25 U	--	--	--	0.25 U	--	--	0.25 U
1,2-Dichloropropane	0.18 U	--	--	--	--	--	0.18 U	--	--	--	0.18 U	--	--	0.18 U
1,3-Dichlorobenzene	0.33 U	--	--	--	--	--	0.33 U	--	--	--	0.33 U	--	--	0.33 U
1,4-Dichlorobenzene	0.33 U	--	--	--	--	--	0.33 U	--	--	--	0.33 U	--	--	0.33 U
2-Hexanone	0.72 U	--	--	--	--	--	0.72 U	--	--	--	0.72 U	--	--	0.72 U
Acetone	1.1 U	--	--	--	--	--	1.1 U	--	--	--	1.1 U	--	--	1.1 U
Benzene	0.09 U	--	--	--	--	--	0.09 U	--	--	--	0.09 U	--	--	0.09 U
Bromochloromethane	0.3 U	--	--	--	--	--	0.3 U	--	--	--	0.3 U	--	--	0.3 U
Bromodichloromethane	0.15 U	--	--	--	--	--	0.15 U	--	--	--	0.15 U	--	--	0.15 U
Bromoform	0.18 U	--	--	--	--	--	0.18 U	--	--	--	0.18 U	--	--	0.18 U
Bromomethane	0.18 UJ	--	--	--	--	--	0.18 UJ	--	--	--	0.18 UJ	--	--	0.18 UJ
Carbon Disulfide	0.22 U	--	--	--	--	--	0.22 U	--	--	--	0.22 U	--	--	0.22 U
Carbon Tetrachloride	0.33 U	--	--	--	--	--	0.33 U	--	--	--	0.33 U	--	--	0.33 U
Chlorobenzene	0.24 U	--	--	--	--	--	0.24 U	--	--	--	0.24 U	--	--	0.24 U
Chloroethane	0.37 U	--	--	--	--	--	0.37 U	--	--	--	0.37 U	--	--	0.37 U
Chloroform	0.22 U	--	--	--	--	--	0.22 U	--	--	--	0.22 U	--	--	0.22 U

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Chloromethane	0.22 U	--	--	--	--	--	0.22 U	--	--	--	0.22 U	--	--	0.22 U
Cis-1,2-Dichloroethylene	0.26 U	--	--	--	--	--	0.26 U	--	--	--	0.26 U	--	--	0.26 U
Cis-1,3-Dichloropropene	0.16 U	--	--	--	--	--	0.16 U	--	--	--	0.16 U	--	--	0.16 U
Cyclohexane	0.26 U	--	--	--	--	--	0.26 U	--	--	--	0.26 U	--	--	0.26 U
Dibromochloromethane	0.22 U	--	--	--	--	--	0.22 U	--	--	--	0.22 U	--	--	0.22 U
Dichlorodifluoromethane	0.14 U	--	--	--	--	--	0.14 U	--	--	--	0.14 U	--	--	0.14 U
Ethylbenzene	0.3 U	--	--	--	--	--	0.3 U	--	--	--	0.3 U	--	--	0.3 U
Isopropylbenzene (Cumene)	0.32 U	--	--	--	--	--	0.32 U	--	--	--	0.32 UJ	--	--	0.32 U
M,P-Xylene	0.28 U	--	--	--	--	--	0.28 U	--	--	--	0.28 U	--	--	0.28 U
Methyl Acetate	0.58 U	--	--	--	--	--	0.58 U	--	--	--	0.58 U	--	--	0.58 U
Methyl Ethyl Ketone (2-Butanone)	2.2 U	--	--	--	--	--	2.2 U	--	--	--	2.2 U	--	--	2.2 U
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	0.63 U	--	--	--	--	--	0.63 U	--	--	--	0.63 U	--	--	0.63 U
Methylcyclohexane	0.22 U	--	--	--	--	--	0.22 U	--	--	--	0.22 U	--	--	0.22 U
Methylene Chloride	0.47 J	--	--	--	--	--	0.21 U	--	--	--	0.21 U	--	--	0.9 J
O-Xylene (1,2-Dimethylbenzene)	0.32 U	--	--	--	--	--	0.32 U	--	--	--	0.32 U	--	--	0.32 U
Styrene	0.17 U	--	--	--	--	--	0.17 U	--	--	--	0.17 U	--	--	0.17 U
Tert-Butyl Methyl Ether	0.13 U	--	--	--	--	--	0.13 U	--	--	--	0.13 U	--	--	0.13 U
Tetrachloroethylene (PCE)	0.12 U	--	--	--	--	--	0.12 U	--	--	--	0.12 U	--	--	0.12 U
Toluene	0.25 U	--	--	--	--	--	0.25 U	--	--	--	0.25 U	--	--	0.25 U
Trans-1,2-Dichloroethene	0.18 U	--	--	--	--	--	0.18 U	--	--	--	0.18 U	--	--	0.18 U
Trans-1,3-Dichloropropene	0.19 U	--	--	--	--	--	0.19 U	--	--	--	0.19 U	--	--	0.19 U
Trichloroethylene (TCE)	0.22 U	--	--	--	--	--	0.22 U	--	--	--	0.22 U	--	--	0.22 U
Trichlorofluoromethane	0.15 U	--	--	--	--	--	0.15 U	--	--	--	0.15 U	--	--	0.15 U
Vinyl Chloride	0.06 U	--	--	--	--	--	0.06 U	--	--	--	0.06 U	--	--	0.06 U

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

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GENERAL CHEMISTRY (µg/L)														
Fluoride	--	--	289	--	--	--	--	--	--	--	--	--	--	--
Cyanide	--	--	5.3 J	58.8	--	--	104	--	--	9.9 J	--	--	26.6	--
Cyanide (Free)	--	--	1.7 J	4.9 J	--	--	26.1	--	--	1.8 J	--	--	2.2 J	--
Cyanide	16.4	11.3	2 U	57.2	9.9 J	--	113	630	--	13.7	273	--	98.6	283
Cyanide (Free)	--	9	2.1 J	1.8 J	4.9 J-	1.5 U	26.1	21.7 J	14.4	3.4 J	14.3 J-	1.5 U	4.4 J	8.8 J-
METALS (µg/L)														
Aluminum	--	--	18.2 U	265	15 U	326	245	43.4 J	15 U	614	55.4	594	586	15 U
Antimony	--	--	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U
Arsenic	--	--	0.64 U	0.64 U	0.77 U	2.9	0.72 J	0.77 U	0.77 U	5.5	0.84 J	5.3	3.9	0.77 U
Barium	--	--	270	334	257	119	130	168	117	401	218	217	333	236
Beryllium	--	--	0.24 U	0.24 U	0.26 U	0.26 U	0.24 U	0.26 U	0.26 U	0.24 U	0.26 U	0.26 U	0.24 U	0.26 U
Cadmium	--	--	0.71 U	0.71 U	0.61 U	0.61 U	0.71 U	0.61 U	0.61 U	0.71 U	0.61 U	0.61 U	0.71 U	0.61 U
Calcium	--	--	39800	58400	39200	18900	39400	55400	37200	82100	56600	41100	64600	59600
Chromium, Total	--	--	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
Cobalt	--	--	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.4 J	1.4 J	1.8 J	1.3 U	1.3 U	1.5 J	1.3 U
Copper	--	--	1.4 U	3.6 J	1.9 U	3.1 J	1.8 J	1.9 U	1.9 U	1.4 J	1.9 U	1.9 U	1.6 J	1.9 U
Iron	--	--	42.4 U	139	45.7 U	709	296	222	53.4 J	10200	103 J	3240	2160	113 J
Lead	--	--	0.38 U	0.63 J	0.37 U	0.74 J	0.49 J	0.37 U	0.37 U	0.8 J	0.37 U	0.76 J	1.1 J	0.37 U
Magnesium	--	--	13200	18300	12500	18000	15200	15300	16700	21800	14800	18800	19300	15300
Manganese	--	--	4.5 J	6.1 J	10.9	61.4	22.7	17.7 J	4.2 J	2420	132	1300	583	138
Mercury	--	--	0.17 U	0.17 U	0.12 U	0.12 U	0.17 U	0.12 U	0.12 U	0.17 U	0.12 U	0.12 U	0.17 U	0.12 U
Nickel	--	--	1.4 U	1.4 U	1.3 U	1.3 U	1.4 U	1.3 U	1.3 U	2.2 J	1.3 U	1.7 J	1.6 J	1.3 U
Potassium	--	--	619	849	637	836	2500	823	960	4750	845	2860	4240	816
Selenium	--	--	0.73 U	0.73 U	0.69 U	0.69 U	0.73 U	0.69 U	0.69 U	0.73 U	0.69 U	0.69 U	0.73 U	0.69 U
Silver	--	--	1.3 U	1.3 U	1.4 U	1.4 U	1.3 U	1.4 U	1.4 U	1.3 U	1.4 U	1.4 U	1.3 U	1.4 U
Sodium	--	--	3860	6810	3920	7690	39900	50700	52600	24600	29000	37600	31300	32100
Thallium	--	--	0.26 U	0.26 U	0.24 U	0.24 U	0.26 U	0.24 U	0.24 U	0.26 U	0.24 U	0.24 U	0.26 U	0.24 U
Vanadium	--	--	1.9 U	1.9 U	1.2 U	1.2 U	1.9 U	1.2 U	1.2 U	1.9 U	1.2 U	1.2 U	1.9 U	1.2 U
Zinc	--	--	7 U	7 U	5.4 U	5.4 U	8.3 J	5.4 U	5.4 U	13.5 J	5.4 U	5.4 U	7 U	5.4 U
Aluminum	615	18.2 U	18.2 U	24500	27.4 J	2310	11800	1300 J	109	888	237	709	32000	69.5
Antimony	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U
Arsenic	0.64 U	0.64 U	0.64 U	4.4	0.77 U	4	4.6	0.77 UJ	0.77 U	5.6	0.88 J	7.2	18.5	1.4 J
Barium	424	239	275	2710	255	172	347	178	122	424	247	285	1230	254
Beryllium	0.24 U	0.24 U	0.24 U	1.5	0.26 U	0.26 U	0.62 J	0.26 U	0.26 U	0.24 U	0.26 U	0.26 U	2	0.26 U
Cadmium	0.71 U	0.71 U	0.71 U	1 J	0.61 U	0.61 U	0.71 U	0.61 U	0.61 U	0.71 U	0.61 U	0.61 U	0.9 J	0.61 U
Calcium	73300	38700	41100	506000	36500	25200	72800	53900	38800	86800	63500	49800	219000	63300
Chromium, Total	1.3 U	1.3 U	1.3 U	27.2	1.3 U	2.8 J	13.1	1.6 J	1.3 U	1.3 U	1.3 U	1.3 U	36.4	1.3 U
Cobalt	1.3 U	1.3 U	1.3 U	15.5	1.3 U	1.5 J	8.8	1.9 J	1.4 J	2.4 J	1.3 U	1.5 J	22.7	1.3 U
Copper	4	1.4 U	1.4 U	183	1.9 U	12.9	24.7	3.3 J	2.8 J	3.1 J	2.1 J	15.9	67.7	1.9 U
Iron	451	43.1 J	42.4 U	22500	63.5 J	3150	15900	1690 J	196	13000	578	4970	52100	964
Lead	0.91 J	0.38 U	0.38 U	35.2	0.37 U	2.4	12.5	1.2 J	0.53 J	0.88 J	0.37 U	0.77 J	38.5	0.37 U
Magnesium	16500	12600	14000	47800	13000	18200	31500	16500	17000	27100	18200	19700	63900	16700
Manganese	10.1	5.3 J	5.3 J	337	18	128	321	40.5 J	6.1 J	2570	149	2180	1450	223
Mercury	0.17 U	0.17 U	0.17 U	0.26	0.12 U	0.12 U	0.17 U	0.12 U	0.12 U	0.17 U	0.12 U	0.12 U	0.19 J	0.12 U
Nickel	1.4 U	1.4 U	1.4 U	51.7	1.3 U	3.9 J	16.8	1.8 J	1.3 U	3.1 J	1.3 U	1.9 J	47	1.3 U
Potassium	894	656	652	3570 J+	653	1350	4240	1140 J	868	4800	1070	2520	7320	862
Selenium	0.73 U	0.73 U	0.73 U	2 J	0.69 U	0.69 U	0.73 U	0.69 U	0.69 U	0.73 U	0.69 U	0.69 U	0.96 J	0.69 U
Silver	1.3 U	1.3 U	1.3 U	1.3 U	1.4 U	1.4 U	1.3 U	1.4 U	1.4 U	1.3 U	1.4 U	1.4 U	1.3 U	1.4 U
Sodium	4860	4080	4570	7010	4550	7500	45600	51400 J	53600	30000	36700	39300	29500	33600
Thallium	0.26 U	0.26 U	0.26 U	0.33 J	0.24 U	0.24 U	0.26 U	0.24 U	0.24 U	0.26 U	0.24 U	0.24 U	0.32 J	0.24 U
Vanadium	1.9 U	1.9 U	1.9 U	24.8	1.2 U	3.5 J	17.2	1.8 J	1.2 U	1.9 U	1.2 U	1.2 U	46.8	1.2 U
Zinc	7 U	7 U	7 U	179	5.4 U	12.1 J	76.3	8.6 J	5.4 U	16.5	5.4 U	5.4 U	192	5.4 U
PESTICIDES (µg/L)														
Aldrin	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Alpha Bhc (Alpha Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Alpha Endosulfan	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Beta Bhc (Beta Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Beta Endosulfan	--	--	--	--	--	--	--	--	--	--	--	--	--	--
cis-Chlordane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Delta BHC (Delta Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--

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Dieldrin	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endosulfan Sulfate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin Aldehyde	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin Ketone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Gamma Bhc (Lindane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Heptachlor	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Heptachlor Epoxide	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methoxychlor	--	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDD	--	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDT	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Toxaphene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
trans-Chlordane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
POLYCHLORINATED BIPHENYLS (µg/L)														
PCB-1016 (Aroclor 1016)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1221 (Aroclor 1221)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1232 (Aroclor 1232)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1242 (Aroclor 1242)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1248 (Aroclor 1248)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1254 (Aroclor 1254)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1260 (Aroclor 1260)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1262 (Aroclor 1262)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1268 (Aroclor 1268)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Polychlorinated Biphenyl (PCBs)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SEMIVOLATILE ORGANIC COMPOUNDS (µg/L)														
1,2,4,5-Tetrachlorobenzene	--	--	--	0.43 U	--	--	0.43 U	--	--	0.43 U	--	--	0.43 U	--
1,4-Dioxane (P-Dioxane)	--	--	--	3.1 U	--	--	3.1 U	--	--	3.1 U	--	--	3.1 U	--
2,3,4,6-Tetrachlorophenol	--	--	--	0.69 U	--	--	0.69 U	--	--	0.69 U	--	--	0.69 U	--
2,4,5-Trichlorophenol	--	--	--	0.49 U	--	--	0.49 U	--	--	0.49 U	--	--	0.49 U	--
2,4,6-Trichlorophenol	--	--	--	0.53 U	--	--	0.53 U	--	--	0.53 U	--	--	0.53 U	--
2,4-Dichlorophenol	--	--	--	0.63 U	--	--	0.63 U	--	--	0.63 U	--	--	0.63 U	--
2,4-Dimethylphenol	--	--	--	0.91 U	--	--	0.91 U	--	--	0.91 U	--	--	0.91 U	--
2,4-Dinitrophenol	--	--	--	2.4 U	--	--	2.4 U	--	--	2.4 U	--	--	2.4 U	--
2,4-Dinitrotoluene	--	--	--	1 U	--	--	1 U	--	--	1 U	--	--	1 U	--
2,6-Dinitrotoluene	--	--	--	0.88 U	--	--	0.88 U	--	--	0.88 U	--	--	0.88 U	--
2-Chloronaphthalene	--	--	--	0.61 U	--	--	0.61 U	--	--	0.61 U	--	--	0.61 U	--
2-Chlorophenol	--	--	--	0.74 U	--	--	0.74 U	--	--	0.74 U	--	--	0.74 U	--
2-Methylnaphthalene	--	--	--	0.88 U	--	--	0.88 U	--	--	0.88 U	--	--	0.88 U	--
2-Methylphenol (O-Cresol)	--	--	--	1.3 U	--	--	1.3 U	--	--	2.7 J	--	--	1.3 U	--
2-Nitroaniline	--	--	--	0.65 U	--	--	0.65 U	--	--	0.65 U	--	--	0.65 U	--
2-Nitrophenol	--	--	--	0.59 U	--	--	0.59 U	--	--	0.59 U	--	--	0.59 U	--
3- And 4- Methylphenol (Total)	--	--	--	0.88 U	--	--	0.88 U	--	--	7.5 J	--	--	0.88 U	--
3,3'-Dichlorobenzidine	--	--	--	1 U	--	--	1 U	--	--	1 U	--	--	1 U	--
3-Nitroaniline	--	--	--	0.82 U	--	--	0.82 UJ	--	--	0.82 UJ	--	--	0.82 UJ	--
4,6-Dinitro-2-Methylphenol	--	--	--	2 U	--	--	2 U	--	--	2 U	--	--	2 U	--
4-Bromophenyl Phenyl Ether	--	--	--	1 U	--	--	1 U	--	--	1 U	--	--	1 U	--
4-Chloro-3-Methylphenol	--	--	--	0.76 U	--	--	0.76 U	--	--	0.76 U	--	--	0.76 U	--
4-Chloroaniline	--	--	--	0.73 U	--	--	0.73 UJ	--	--	0.73 UJ	--	--	0.73 UJ	--
4-Chlorophenyl Phenyl Ether	--	--	--	0.96 U	--	--	0.96 U	--	--	0.96 U	--	--	0.96 U	--
4-Nitroaniline	--	--	--	0.48 U	--	--	0.48 U	--	--	0.48 U	--	--	0.48 U	--
4-Nitrophenol	--	--	--	4.7 U	--	--	4.7 UJ	--	--	4.7 UJ	--	--	4.7 UJ	--
Acenaphthene	--	--	--	0.88 U	--	--	0.88 U	--	--	0.88 U	--	--	0.88 U	--
Acenaphthylene	--	--	--	0.65 U	--	--	0.65 U	--	--	0.65 U	--	--	0.65 U	--
Acetophenone	--	--	--	1 U	--	--	1 U	--	--	1 U	--	--	1 U	--
Anthracene	--	--	--	0.57 U	--	--	0.57 U	--	--	0.57 U	--	--	0.57 U	--
Atrazine	--	--	--	0.77 U	--	--	0.77 U	--	--	0.77 U	--	--	0.77 U	--
Benzaldehyde	--	--	--	0.86 U	--	--	0.86 U	--	--	2.3 J	--	--	0.86 U	--
Benzo(A)Anthracene	--	--	--	0.55 U	--	--	0.55 U	--	--	0.55 U	--	--	0.55 U	--
Benzo(A)Pyrene	--	--	--	0.36 J	--	--	0.16 U	--	--	0.16 U	--	--	0.16 U	--
Benzo(B)Fluoranthene	--	--	--	0.53 J	--	--	0.44 U	--	--	0.44 U	--	--	0.44 U	--

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Benzo(G,H,I)Perylene	--	--	--	0.75 U	--	--	0.75 U	--	--	0.75 U	--	--	0.75 U	--
Benzo(K)Fluoranthene	--	--	--	0.18 U	--	--	0.18 U	--	--	0.18 U	--	--	0.18 U	--
Benzyl Butyl Phthalate	--	--	--	0.6 U	--	--	0.6 U	--	--	0.6 U	--	--	0.6 U	--
Biphenyl (Diphenyl)	--	--	--	0.63 U	--	--	0.63 U	--	--	0.63 U	--	--	0.63 U	--
Bis(2-Chloroethoxy) Methane	--	--	--	0.69 U	--	--	0.69 U	--	--	0.69 U	--	--	0.69 U	--
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	--	--	--	0.12 U	--	--	0.12 U	--	--	0.12 U	--	--	0.12 U	--
Bis(2-Chloroisopropyl) Ether	--	--	--	0.93 U	--	--	0.93 U	--	--	0.93 U	--	--	0.93 U	--
Bis(2-Ethylhexyl) Phthalate	--	--	--	0.72 U	--	--	0.72 U	--	--	0.72 U	--	--	0.72 U	--
Caprolactam	--	--	--	1.1 U	--	--	1.1 U	--	--	1.1 U	--	--	1.1 U	--
Carbazole	--	--	--	0.85 U	--	--	1.9 J	--	--	2.9 J	--	--	0.85 U	--
Chrysene	--	--	--	0.67 U	--	--	0.67 U	--	--	0.67 U	--	--	0.67 U	--
Dibenz(A,H)Anthracene	--	--	--	0.09 U	--	--	0.09 U	--	--	0.09 U	--	--	0.09 U	--
Dibenzofuran	--	--	--	0.85 U	--	--	0.85 U	--	--	0.85 U	--	--	0.85 U	--
Diethyl Phthalate	--	--	--	1 U	--	--	1 U	--	--	1 U	--	--	1 U	--
Dimethyl Phthalate	--	--	--	0.98 U	--	--	0.98 U	--	--	0.98 U	--	--	0.98 U	--
Di-N-Butyl Phthalate	--	--	--	0.82 U	--	--	0.82 U	--	--	0.82 U	--	--	0.82 U	--
Di-N-Octylphthalate	--	--	--	1.4 J	--	--	0.69 U	--	--	0.69 U	--	--	0.69 U	--
Fluoranthene	--	--	--	0.72 U	--	--	3.7 J	--	--	2.5 J	--	--	1 J	--
Fluorene	--	--	--	0.8 U	--	--	0.8 U	--	--	0.8 U	--	--	0.8 U	--
Hexachlorobenzene	--	--	--	0.47 U	--	--	0.47 U	--	--	0.47 U	--	--	0.47 U	--
Hexachlorobutadiene	--	--	--	0.76 U	--	--	0.76 U	--	--	0.76 U	--	--	0.76 U	--
Hexachlorocyclopentadiene	--	--	--	0.61 UJ	--	--	0.61 UJ	--	--	0.61 UJ	--	--	0.61 UJ	--
Hexachloroethane	--	--	--	0.09 U	--	--	0.09 U	--	--	0.09 U	--	--	0.09 U	--
Indeno(1,2,3-C,D)Pyrene	--	--	--	0.28 J	--	--	0.21 U	--	--	0.21 U	--	--	0.21 U	--
Isophorone	--	--	--	0.67 U	--	--	0.67 U	--	--	0.67 U	--	--	0.67 U	--
Naphthalene	--	--	--	0.8 U	--	--	0.8 U	--	--	0.8 U	--	--	0.8 U	--
Nitrobenzene	--	--	--	0.49 U	--	--	0.49 U	--	--	0.49 U	--	--	0.49 U	--
N-Nitrosodi-N-Propylamine	--	--	--	0.83 U	--	--	0.83 U	--	--	0.83 U	--	--	0.83 U	--
N-Nitrosodiphenylamine	--	--	--	0.74 U	--	--	0.74 U	--	--	0.74 U	--	--	0.74 U	--
Pentachlorophenol	--	--	--	2.2 U	--	--	2.2 U	--	--	2.2 U	--	--	2.2 U	--
Phenanthrene	--	--	--	0.65 U	--	--	1.9 J	--	--	1.8 J	--	--	0.65 U	--
Phenol	--	--	--	0.41 U	--	--	0.41 U	--	--	5.2 J	--	--	0.8 J	--
Pyrene	--	--	--	0.83 U	--	--	1.8 J	--	--	1.4 J	--	--	0.83 U	--
VOLATILE ORGANIC COMPOUNDS (µg/L)														
1,1,1-Trichloroethane	--	--	--	0.28 U	--	--	0.28 U	--	--	0.28 U	--	--	0.28 U	--
1,1,2,2-Tetrachloroethane	--	--	--	0.19 U	--	--	0.19 U	--	--	0.19 U	--	--	0.19 U	--
1,1,2-Trichloro-1,2,2-Trifluoroethane	--	--	--	0.34 U	--	--	0.34 U	--	--	0.34 U	--	--	0.34 U	--
1,1,2-Trichloroethane	--	--	--	0.08 U	--	--	0.08 U	--	--	0.08 U	--	--	0.08 U	--
1,1-Dichloroethane	--	--	--	0.24 U	--	--	0.24 U	--	--	0.24 U	--	--	0.24 U	--
1,1-Dichloroethene	--	--	--	0.34 U	--	--	0.34 U	--	--	0.34 U	--	--	0.34 U	--
1,2,3-Trichlorobenzene	--	--	--	0.35 U	--	--	0.35 U	--	--	0.35 U	--	--	0.35 U	--
1,2,4-Trichlorobenzene	--	--	--	0.27 U	--	--	0.27 U	--	--	0.27 U	--	--	0.27 U	--
1,2-Dibromo-3-Chloropropane	--	--	--	0.23 U	--	--	0.23 U	--	--	0.23 U	--	--	0.23 U	--
1,2-Dibromoethane (Ethylene Dibromide)	--	--	--	0.19 U	--	--	0.19 U	--	--	0.19 U	--	--	0.19 U	--
1,2-Dichlorobenzene	--	--	--	0.22 U	--	--	0.22 U	--	--	0.22 U	--	--	0.22 U	--
1,2-Dichloroethane	--	--	--	0.25 U	--	--	0.25 U	--	--	0.25 U	--	--	0.25 U	--
1,2-Dichloropropane	--	--	--	0.18 U	--	--	0.18 U	--	--	0.18 U	--	--	0.18 U	--
1,3-Dichlorobenzene	--	--	--	0.33 U	--	--	0.33 U	--	--	0.33 U	--	--	0.33 U	--
1,4-Dichlorobenzene	--	--	--	0.33 U	--	--	0.33 U	--	--	0.33 U	--	--	0.33 U	--
2-Hexanone	--	--	--	0.72 U	--	--	0.72 U	--	--	0.72 U	--	--	0.72 U	--
Acetone	--	--	--	1.1 U	--	--	1.1 U	--	--	15	--	--	7.1	--
Benzene	--	--	--	0.09 U	--	--	0.09 U	--	--	0.09 U	--	--	0.09 U	--
Bromochloromethane	--	--	--	0.3 U	--	--	0.3 U	--	--	0.3 U	--	--	0.3 U	--
Bromodichloromethane	--	--	--	0.15 U	--	--	0.15 U	--	--	0.15 U	--	--	0.15 U	--
Bromoform	--	--	--	0.18 U	--	--	0.18 U	--	--	0.18 U	--	--	0.18 U	--
Bromomethane	--	--	--	0.18 UJ	--	--	0.18 UJ	--	--	0.18 UJ	--	--	0.18 UJ	--
Carbon Disulfide	--	--	--	0.22 U	--	--	0.22 U	--	--	0.22 U	--	--	0.22 U	--
Carbon Tetrachloride	--	--	--	0.33 U	--	--	0.33 U	--	--	0.33 U	--	--	0.33 U	--
Chlorobenzene	--	--	--	0.24 U	--	--	0.24 U	--	--	0.24 U	--	--	0.24 U	--
Chloroethane	--	--	--	0.37 U	--	--	0.37 U	--	--	0.37 U	--	--	0.37 U	--
Chloroform	--	--	--	0.22 U	--	--	0.22 U	--	--	0.22 U	--	--	0.22 U	--

Table E-29
Summary of Data Used in Risk Assessment
South Percolation Pond Area (surface water) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Chemical	CFSWP-020 460-124639-7 CFSWP-020-SW 12/1/2016	CFSWP-020 460-129875-6 CFSWP-020-SW 3/16/2017	CFSWP-020 460-135444-3 CFSWP-020-SW 6/15/2017	CFSWP-020 460-144576-2 CFSWP-020-SW 11/7/2017	CFSWP-020 460-158910-3 CFSWP-020-SW 6/21/2018	CFSWP-020 460-166739-2 CFSWP-020-SW 10/11/2018	CFSWP-030 460-144395-1 CFSWP-030-SW 11/3/2017	CFSWP-030 460-159043-3 CFSWP-030-SW 6/22/2018	CFSWP-030 460-167253-2 CFSWP-030-SW 10/18/2018	CFSWP-031 460-144395-2 CFSWP-031-SW 11/3/2017	CFSWP-031 460-159043-5 CFSWP-031-SW 6/22/2018	CFSWP-031 460-167253-1 CFSWP-031-SW 10/18/2018	CFSWP-032 460-144395-4 CFSWP-032-SW 11/3/2017	CFSWP-032 460-159043-1 CFSWP-032-SW 6/22/2018
Chloromethane	--	--	--	0.22 U	--	--	0.22 U	--	--	0.22 U	--	--	0.22 U	--
Cis-1,2-Dichloroethylene	--	--	--	0.26 U	--	--	0.26 U	--	--	0.26 U	--	--	0.26 U	--
Cis-1,3-Dichloropropene	--	--	--	0.16 U	--	--	0.16 U	--	--	0.16 U	--	--	0.16 U	--
Cyclohexane	--	--	--	0.26 U	--	--	0.26 U	--	--	0.26 U	--	--	0.26 U	--
Dibromochloromethane	--	--	--	0.22 U	--	--	0.22 U	--	--	0.22 U	--	--	0.22 U	--
Dichlorodifluoromethane	--	--	--	0.14 U	--	--	0.14 UJ	--	--	0.14 UJ	--	--	0.14 UJ	--
Ethylbenzene	--	--	--	0.3 U	--	--	0.3 U	--	--	0.3 U	--	--	0.3 U	--
Isopropylbenzene (Cumene)	--	--	--	0.32 UJ	--	--	0.32 U	--	--	0.32 U	--	--	0.32 U	--
M,P-Xylene	--	--	--	0.28 U	--	--	0.28 U	--	--	0.28 U	--	--	0.28 U	--
Methyl Acetate	--	--	--	0.58 U	--	--	0.58 U	--	--	0.58 U	--	--	0.58 U	--
Methyl Ethyl Ketone (2-Butanone)	--	--	--	2.2 U	--	--	2.2 U	--	--	2.2 U	--	--	2.2 U	--
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	--	--	--	0.63 U	--	--	0.63 U	--	--	0.63 U	--	--	0.63 U	--
Methylcyclohexane	--	--	--	0.22 U	--	--	0.22 U	--	--	0.22 U	--	--	0.22 U	--
Methylene Chloride	--	--	--	0.21 U	--	--	0.21 U	--	--	0.21 U	--	--	0.21 U	--
O-Xylene (1,2-Dimethylbenzene)	--	--	--	0.32 U	--	--	0.32 U	--	--	0.32 U	--	--	0.32 U	--
Styrene	--	--	--	0.17 U	--	--	0.17 U	--	--	1	--	--	0.17 U	--
Tert-Butyl Methyl Ether	--	--	--	0.13 U	--	--	0.13 U	--	--	0.13 U	--	--	0.13 U	--
Tetrachloroethylene (PCE)	--	--	--	0.12 U	--	--	0.12 U	--	--	0.12 U	--	--	0.12 U	--
Toluene	--	--	--	0.25 U	--	--	0.25 U	--	--	3	--	--	0.82 J	--
Trans-1,2-Dichloroethene	--	--	--	0.18 U	--	--	0.18 U	--	--	0.18 U	--	--	0.18 U	--
Trans-1,3-Dichloropropene	--	--	--	0.19 U	--	--	0.19 U	--	--	0.19 U	--	--	0.19 U	--
Trichloroethylene (TCE)	--	--	--	0.22 U	--	--	0.22 U	--	--	0.22 U	--	--	0.22 U	--
Trichlorofluoromethane	--	--	--	0.15 U	--	--	0.15 U	--	--	0.15 U	--	--	0.15 U	--
Vinyl Chloride	--	--	--	0.06 U	--	--	0.06 U	--	--	0.06 U	--	--	0.06 U	--

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-29
Summary of Data Used in Risk Assessment
South Percolation Pond Area (surface water) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Chemical	CFSWP-032 460-167097-2 CFSWP-032-SW 10/17/2018	CFSWP-058 460-158910-4 CFSWP-058-SW 6/21/2018	CFSWP-058 460-166739-3 CFSWP-058-SW 10/11/2018	CFSWP-059 460-159043-8 CFSWP-059-SW 6/22/2018	CFSWP-059-DUP 460-159043-4 CFSWP-DUP12-SW 6/22/2018	CFSWP-059 460-166739-5 CFSWP-059-SW 10/11/2018	CFSWP-060 460-159043-7 CFSWP-060-SW 6/22/2018	CFSWP-060 460-167026-5 CFSWP-060-SW 10/16/2018
GENERAL CHEMISTRY (µg/L)								
Fluoride	--	--	--	--	--	--	--	--
Cyanide	--	--	--	--	--	--	--	--
Cyanide (Free)	--	--	--	--	--	--	--	--
Cyanide	--	9.6 J	--	8.2 J	690 J	--	9.2 J	--
Cyanide (Free)	3.5 J	5.2 J-	10	5.9 J-	9.6 J	1.5 U	5.9 J-	2.7 J
METALS (µg/L)								
Aluminum	238	15 U	752	42.6	30.3 J	54.1	15 U	58.3
Antimony	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U
Arsenic	2.6	0.77 U	1.8 J	0.77 U	0.77 U	0.77 U	0.77 U	0.77 U
Barium	255	261	452	267	168	257	263	234
Beryllium	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U
Cadmium	0.61 U	0.61 U	0.61 U	0.61 U	0.61 U	0.61 U	0.61 U	0.61 U
Calcium	52900	39200	76700	40300	55700	36200	39500	32900
Chromium, Total	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
Cobalt	1.3 U	1.3 U	1.3 U	1.3 U	1.3 J	1.3 U	1.3 U	1.3 U
Copper	1.9 U	1.9 U	4.7	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U
Iron	861	45.7 U	1430	45.7 U	224	55.3 J	45.7 U	59.7 J
Lead	0.5 J	0.37 U	2.5	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U
Magnesium	18000	12700	20000	13500	15200	18400	12600	16500
Manganese	217	9.6	243	7.4 J	26.7 J	2.7 U	5.3 J	2.7 U
Mercury	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U
Nickel	1.3 U	1.3 U	1.3 J	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
Potassium	2500	660	1060	642	841	1120	618	992
Selenium	0.69 U	0.69 U	0.69 U	0.69 U	0.69 U	0.69 U	0.69 U	0.69 U
Silver	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U
Sodium	35600	4010	7940	4540	49900	8320	4160	7240
Thallium	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U
Vanadium	1.2 U	1.2 U	1.3 J	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U
Zinc	5.4 U	5.4 U	7 J	5.4 U	5.4 U	5.4 U	5.4 U	5.4 U
Aluminum	189	75 J+	1970	46.2 J+	3660 J	689	497	196
Antimony	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	1.1 J
Arsenic	3.5	0.77 U	1.2 J	0.77 U	1.7 J	0.77 U	0.77 U	0.77 U
Barium	260	263	358	286	223	283	264	272
Beryllium	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U
Cadmium	0.61 U	0.61 U	0.61 U	0.61 U	0.61 U	0.61 U	0.61 U	0.61 U
Calcium	53300	37400	59600	43100	61900	44000	38200	38400
Chromium, Total	1.3 U	1.3 U	2.4 J	1.3 U	4 J	1.3 U	1.3 U	1.3 U
Cobalt	1.3 U	1.3 U	1.3 U	1.3 U	3.1 J	1.3 U	1.3 U	1.3 U
Copper	2.7 J	1.9 U	10.5	1.9 U	6.1 J	7.7	3.3 J	1.9 J
Iron	1440	121	2950	87.1 J	4000 J	772	735	211
Lead	0.4 J	0.37 U	2.1	0.37 U	2.7 J	0.88 J	0.58 J	0.37 U
Magnesium	17000	13400	19100	15100	19500	17400	13400	18600
Manganese	247	19.9	194	20.3	93.9 J	14.9	40.5	3.2 J
Mercury	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U
Nickel	1.3 U	1.3 U	3.3 J	1.3 U	4.3 J	1.9 J	1.3 U	1.3 U
Potassium	2360	701	1380	720	1760 J	1240	766	1170
Selenium	0.69 U	0.69 U	0.69 U	0.69 U	0.69 U	0.69 U	0.69 U	0.69 U
Silver	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U
Sodium	35000	4730 J+	8100	5170 J+	55300 J	8090	4590	8640
Thallium	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U
Vanadium	1.2 U	1.2 U	2.7 J	1.2 U	4.7 J	1.2 U	1.2 U	1.2 U
Zinc	5.4 U	5.4 U	10.8 J	5.4 U	18.6 J	7.8 J	8.7 J	5.4 U
PESTICIDES (µg/L)								
Aldrin	--	--	--	--	--	--	--	--
Alpha Bhc (Alpha Hexachlorocyclohexane)	--	--	--	--	--	--	--	--
Alpha Endosulfan	--	--	--	--	--	--	--	--
Beta Bhc (Beta Hexachlorocyclohexane)	--	--	--	--	--	--	--	--
Beta Endosulfan	--	--	--	--	--	--	--	--
cis-Chlordane	--	--	--	--	--	--	--	--
Delta BHC (Delta Hexachlorocyclohexane)	--	--	--	--	--	--	--	--

Table E-29
Summary of Data Used in Risk Assessment
South Percolation Pond Area (surface water) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Chemical	CFSWP-032 460-167097-2 CFSWP-032-SW 10/17/2018	CFSWP-058 460-158910-4 CFSWP-058-SW 6/21/2018	CFSWP-058 460-166739-3 CFSWP-058-SW 10/11/2018	CFSWP-059 460-159043-8 CFSWP-059-SW 6/22/2018	CFSWP-059-DUP 460-159043-4 CFSWP-DUP12-SW 6/22/2018	CFSWP-059 460-166739-5 CFSWP-059-SW 10/11/2018	CFSWP-060 460-159043-7 CFSWP-060-SW 6/22/2018	CFSWP-060 460-167026-5 CFSWP-060-SW 10/16/2018
Dieldrin	--	--	--	--	--	--	--	--
Endosulfan Sulfate	--	--	--	--	--	--	--	--
Endrin	--	--	--	--	--	--	--	--
Endrin Aldehyde	--	--	--	--	--	--	--	--
Endrin Ketone	--	--	--	--	--	--	--	--
Gamma Bhc (Lindane)	--	--	--	--	--	--	--	--
Heptachlor	--	--	--	--	--	--	--	--
Heptachlor Epoxide	--	--	--	--	--	--	--	--
Methoxychlor	--	--	--	--	--	--	--	--
P,P'-DDD	--	--	--	--	--	--	--	--
P,P'-DDE	--	--	--	--	--	--	--	--
P,P'-DDT	--	--	--	--	--	--	--	--
Toxaphene	--	--	--	--	--	--	--	--
trans-Chlordane	--	--	--	--	--	--	--	--
POLYCHLORINATED BIPHENYLS (µg/L)								
PCB-1016 (Aroclor 1016)	--	--	--	--	--	--	--	--
PCB-1221 (Aroclor 1221)	--	--	--	--	--	--	--	--
PCB-1232 (Aroclor 1232)	--	--	--	--	--	--	--	--
PCB-1242 (Aroclor 1242)	--	--	--	--	--	--	--	--
PCB-1248 (Aroclor 1248)	--	--	--	--	--	--	--	--
PCB-1254 (Aroclor 1254)	--	--	--	--	--	--	--	--
PCB-1260 (Aroclor 1260)	--	--	--	--	--	--	--	--
PCB-1262 (Aroclor 1262)	--	--	--	--	--	--	--	--
PCB-1268 (Aroclor 1268)	--	--	--	--	--	--	--	--
Polychlorinated Biphenyl (PCBs)	--	--	--	--	--	--	--	--
SEMIVOLATILE ORGANIC COMPOUNDS (µg/L)								
1,2,4,5-Tetrachlorobenzene	--	--	--	--	--	--	--	--
1,4-Dioxane (P-Dioxane)	--	--	--	--	--	--	--	--
2,3,4,6-Tetrachlorophenol	--	--	--	--	--	--	--	--
2,4,5-Trichlorophenol	--	--	--	--	--	--	--	--
2,4,6-Trichlorophenol	--	--	--	--	--	--	--	--
2,4-Dichlorophenol	--	--	--	--	--	--	--	--
2,4-Dimethylphenol	--	--	--	--	--	--	--	--
2,4-Dinitrophenol	--	--	--	--	--	--	--	--
2,4-Dinitrotoluene	--	--	--	--	--	--	--	--
2,6-Dinitrotoluene	--	--	--	--	--	--	--	--
2-Chloronaphthalene	--	--	--	--	--	--	--	--
2-Chlorophenol	--	--	--	--	--	--	--	--
2-Methylnaphthalene	--	--	--	--	--	--	--	--
2-Methylphenol (O-Cresol)	--	--	--	--	--	--	--	--
2-Nitroaniline	--	--	--	--	--	--	--	--
2-Nitrophenol	--	--	--	--	--	--	--	--
3- And 4- Methylphenol (Total)	--	--	--	--	--	--	--	--
3,3'-Dichlorobenzidine	--	--	--	--	--	--	--	--
3-Nitroaniline	--	--	--	--	--	--	--	--
4,6-Dinitro-2-Methylphenol	--	--	--	--	--	--	--	--
4-Bromophenyl Phenyl Ether	--	--	--	--	--	--	--	--
4-Chloro-3-Methylphenol	--	--	--	--	--	--	--	--
4-Chloroaniline	--	--	--	--	--	--	--	--
4-Chlorophenyl Phenyl Ether	--	--	--	--	--	--	--	--
4-Nitroaniline	--	--	--	--	--	--	--	--
4-Nitrophenol	--	--	--	--	--	--	--	--
Acenaphthene	--	--	--	--	--	--	--	--
Acenaphthylene	--	--	--	--	--	--	--	--
Acetophenone	--	--	--	--	--	--	--	--
Anthracene	--	--	--	--	--	--	--	--
Atrazine	--	--	--	--	--	--	--	--
Benzaldehyde	--	--	--	--	--	--	--	--
Benzo(A)Anthracene	--	--	--	--	--	--	--	--
Benzo(A)Pyrene	--	--	--	--	--	--	--	--
Benzo(B)Fluoranthene	--	--	--	--	--	--	--	--

Table E-29
Summary of Data Used in Risk Assessment
South Percolation Pond Area (surface water) - Current/Future
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Sample Location ID Sample Lab IDs Sample Name Chemical	CFSWP-032 460-167097-2 CFSWP-032-SW 10/17/2018	CFSWP-058 460-158910-4 CFSWP-058-SW 6/21/2018	CFSWP-058 460-166739-3 CFSWP-058-SW 10/11/2018	CFSWP-059 460-159043-8 CFSWP-059-SW 6/22/2018	CFSWP-059-DUP 460-159043-4 CFSWP-DUP12-SW 6/22/2018	CFSWP-059 460-166739-5 CFSWP-059-SW 10/11/2018	CFSWP-060 460-159043-7 CFSWP-060-SW 6/22/2018	CFSWP-060 460-167026-5 CFSWP-060-SW 10/16/2018
Benzo(G,H,I)Perylene	--	--	--	--	--	--	--	--
Benzo(K)Fluoranthene	--	--	--	--	--	--	--	--
Benzyl Butyl Phthalate	--	--	--	--	--	--	--	--
Biphenyl (Diphenyl)	--	--	--	--	--	--	--	--
Bis(2-Chloroethoxy) Methane	--	--	--	--	--	--	--	--
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	--	--	--	--	--	--	--	--
Bis(2-Chloroisopropyl) Ether	--	--	--	--	--	--	--	--
Bis(2-Ethylhexyl) Phthalate	--	--	--	--	--	--	--	--
Caprolactam	--	--	--	--	--	--	--	--
Carbazole	--	--	--	--	--	--	--	--
Chrysene	--	--	--	--	--	--	--	--
Dibenz(A,H)Anthracene	--	--	--	--	--	--	--	--
Dibenzofuran	--	--	--	--	--	--	--	--
Diethyl Phthalate	--	--	--	--	--	--	--	--
Dimethyl Phthalate	--	--	--	--	--	--	--	--
Di-N-Butyl Phthalate	--	--	--	--	--	--	--	--
Di-N-Octylphthalate	--	--	--	--	--	--	--	--
Fluoranthene	--	--	--	--	--	--	--	--
Fluorene	--	--	--	--	--	--	--	--
Hexachlorobenzene	--	--	--	--	--	--	--	--
Hexachlorobutadiene	--	--	--	--	--	--	--	--
Hexachlorocyclopentadiene	--	--	--	--	--	--	--	--
Hexachloroethane	--	--	--	--	--	--	--	--
Indeno(1,2,3-C,D)Pyrene	--	--	--	--	--	--	--	--
Isophorone	--	--	--	--	--	--	--	--
Naphthalene	--	--	--	--	--	--	--	--
Nitrobenzene	--	--	--	--	--	--	--	--
N-Nitrosodi-N-Propylamine	--	--	--	--	--	--	--	--
N-Nitrosodiphenylamine	--	--	--	--	--	--	--	--
Pentachlorophenol	--	--	--	--	--	--	--	--
Phenanthrene	--	--	--	--	--	--	--	--
Phenol	--	--	--	--	--	--	--	--
Pyrene	--	--	--	--	--	--	--	--
VOLATILE ORGANIC COMPOUNDS (µg/L)								
1,1,1-Trichloroethane	--	--	--	--	--	--	--	--
1,1,2,2-Tetrachloroethane	--	--	--	--	--	--	--	--
1,1,2-Trichloro-1,2,2-Trifluoroethane	--	--	--	--	--	--	--	--
1,1,2-Trichloroethane	--	--	--	--	--	--	--	--
1,1-Dichloroethane	--	--	--	--	--	--	--	--
1,1-Dichloroethene	--	--	--	--	--	--	--	--
1,2,3-Trichlorobenzene	--	--	--	--	--	--	--	--
1,2,4-Trichlorobenzene	--	--	--	--	--	--	--	--
1,2-Dibromo-3-Chloropropane	--	--	--	--	--	--	--	--
1,2-Dibromoethane (Ethylene Dibromide)	--	--	--	--	--	--	--	--
1,2-Dichlorobenzene	--	--	--	--	--	--	--	--
1,2-Dichloroethane	--	--	--	--	--	--	--	--
1,2-Dichloropropane	--	--	--	--	--	--	--	--
1,3-Dichlorobenzene	--	--	--	--	--	--	--	--
1,4-Dichlorobenzene	--	--	--	--	--	--	--	--
2-Hexanone	--	--	--	--	--	--	--	--
Acetone	--	--	--	--	--	--	--	--
Benzene	--	--	--	--	--	--	--	--
Bromochloromethane	--	--	--	--	--	--	--	--
Bromodichloromethane	--	--	--	--	--	--	--	--
Bromoform	--	--	--	--	--	--	--	--
Bromomethane	--	--	--	--	--	--	--	--
Carbon Disulfide	--	--	--	--	--	--	--	--
Carbon Tetrachloride	--	--	--	--	--	--	--	--
Chlorobenzene	--	--	--	--	--	--	--	--
Chloroethane	--	--	--	--	--	--	--	--
Chloroform	--	--	--	--	--	--	--	--

Table E-29
Summary of Data Used in Risk Assessment
South Percolation Pond Area (surface water) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Chemical	CFSWP-032 460-167097-2 CFSWP-032-SW 10/17/2018	CFSWP-058 460-158910-4 CFSWP-058-SW 6/21/2018	CFSWP-058 460-166739-3 CFSWP-058-SW 10/11/2018	CFSWP-059 460-159043-8 CFSWP-059-SW 6/22/2018	CFSWP-059-DUP 460-159043-4 CFSWP-DUP12-SW 6/22/2018	CFSWP-059 460-166739-5 CFSWP-059-SW 10/11/2018	CFSWP-060 460-159043-7 CFSWP-060-SW 6/22/2018	CFSWP-060 460-167026-5 CFSWP-060-SW 10/16/2018
Chloromethane	--	--	--	--	--	--	--	--
Cis-1,2-Dichloroethylene	--	--	--	--	--	--	--	--
Cis-1,3-Dichloropropene	--	--	--	--	--	--	--	--
Cyclohexane	--	--	--	--	--	--	--	--
Dibromochloromethane	--	--	--	--	--	--	--	--
Dichlorodifluoromethane	--	--	--	--	--	--	--	--
Ethylbenzene	--	--	--	--	--	--	--	--
Isopropylbenzene (Cumene)	--	--	--	--	--	--	--	--
M,P-Xylene	--	--	--	--	--	--	--	--
Methyl Acetate	--	--	--	--	--	--	--	--
Methyl Ethyl Ketone (2-Butanone)	--	--	--	--	--	--	--	--
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	--	--	--	--	--	--	--	--
Methylcyclohexane	--	--	--	--	--	--	--	--
Methylene Chloride	--	--	--	--	--	--	--	--
O-Xylene (1,2-Dimethylbenzene)	--	--	--	--	--	--	--	--
Styrene	--	--	--	--	--	--	--	--
Tert-Butyl Methyl Ether	--	--	--	--	--	--	--	--
Tetrachloroethylene (PCE)	--	--	--	--	--	--	--	--
Toluene	--	--	--	--	--	--	--	--
Trans-1,2-Dichloroethene	--	--	--	--	--	--	--	--
Trans-1,3-Dichloropropene	--	--	--	--	--	--	--	--
Trichloroethylene (TCE)	--	--	--	--	--	--	--	--
Trichlorofluoromethane	--	--	--	--	--	--	--	--
Vinyl Chloride	--	--	--	--	--	--	--	--

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-30
Summary of Data Used in Risk Assessment
South Percolation Pond Area (sediment) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-149	CFSB-150	CFSDP-018	CFSDP-018	CFSDP-018 180-83167-1, 180-83168-1, 200-45776-1, 460-167103-1	CFSDP-019	CFSDP-019	CFSDP-019 180-83120-2, 180-83121-1, 200-45749-2, 460-167042-2	CFSDP-020	CFSDP-020	CFSDP-020 180-82974-1, 200-45698-1, 460-166770-1	CFSDP-030	CFSDP-030 180-83255-2, 200-45807-2, 460-167262-2	CFSDP-031
Sample Lab IDs	460-144726-2	460-144726-1	200-35201-13, 460-119830-3	460-144726-3	CFSDP-018-SD	200-35201-14, 460-119830-4	460-144726-4	CFSDP-019-SD	200-35201-15, 460-119830-5	460-144726-5	CFSDP-020-SD	460-144400-13	CFSDP-030-SD	460-144400-14
Sample Name	CFSB-149-SD-0-0.5	CFSB-150-SD-0-0.5	CFSDP-018-SD	CFSDP-018-SD	10/17/2018	CFSDP-019-SD	CFSDP-019-SD	10/16/2018	CFSDP-020-SD	CFSDP-020-SD	10/11/2018	CFSDP-030-SD	10/18/2018	CFSDP-031-SD
Chemical	11/7/2017	11/7/2017	9/7/2016	11/7/2017		9/7/2016	11/7/2017		9/7/2016	11/7/2017		11/3/2017		11/3/2017
GENERAL CHEMISTRY (mg/kg)														
Fluoride	19.5 J+	22.6 J+	19.1	74 J+	18.7	29.4	93.7 J+	15.8	5.3	34.9 J+	0.31 U	20.8 J+	5.98	22.2 J+
Cyanide	0.1 U	0.13 U	1.3 J-	8.5	2.2	0.27 J-	0.64 J	0.43 J	0.29 J-	0.69 J	0.77	1.7	0.91	0.41
Cyanide (Free)	--	0.89 J	--	--	--	--	--	--	--	--	--	0.45 U	--	--
METALS (mg/kg)														
Aluminum	13300	9310	5420	5470	3800	2360	8000	4320	9710	12900	7120	8090	11700 J	9130
Antimony	0.48 UJ	0.52 UJ	0.6 UJ	0.99 UJ	0.78 U	0.64 UJ	1.1 UJ	0.75 U	0.4 UJ	0.82 UJ	0.48 U	0.39 UJ	0.43 UJ	0.37 U
Arsenic	2.5	1.2 J	1 J	1.9 J	1 J	0.65 U	1.3 J	0.82 J	1.3	1.9 J	2.6	2.6	6.1	3.9
Barium	234	693	758	762	700	476	969	711	548	744	579	126	194	136
Beryllium	0.67	0.34 J	0.18 J	0.3 U	0.43 U	0.2 U	0.32 U	0.41 U	0.45 J	0.61 J	0.45 J	0.47	0.74	0.39 J
Cadmium	0.51 U	0.55 U	0.64 U	1 U	0.95 J	0.68 U	1.1 U	0.86 U	0.42 U	0.86 U	0.55 U	0.41 U	0.49 U	0.39 U
Calcium	42800	181000	273000	261000	289000	166000	302000	274000	133000	165000	147000	17000	41600 J	17300
Chromium, Total	13.9	8	8.3	8.7	7.3	3.3 J	8.6	5.3	9.7	12.1	8.2	9.2	13.4	10.1
Cobalt	7.2	4.1	1.4 J	2 J	1.6 U	1.4 J	3.6 J	2.1 J	4.6	6.2	4	5.7 J+	7.6	6.2
Copper	32.7	31.8	79.1	131	73.6	42.3	143	66.4	26	67.8	20.9	14.9	18.6	15.3
Iron	15300	7780	2620	2660	2020	1490	3940	2400	9400	10200	8070	12900	19100 J	15000
Lead	10.7	8.9	17	22.3	17	5.8	13.4	9.2	8.6	12.5	7.7	7.7 J+	10.3	8
Magnesium	16200	8080	5410	4440	4170	3470	6080	5210	9270	12100	8950	11000	14400 J	12100
Manganese	153	91.3	28.4	20.5	18.1	27.5	38.4	51.4	97.2	107	213	137	252 J-	208
Mercury	0.022 J	0.023 J	0.11	0.28	0.098	0.035 J	0.093	0.034 J	0.016 J	0.031 U	0.021 J	0.015 J+	0.019 U	0.016 J
Nickel	18.6	14.4	12.3	17.8	12.6	5.4	20.3	9	15	25	11.8	11.6	15.4	12.7
Potassium	1790	892	506	411	228 J	272	665	445	979	1470	880	815	1560	877
Selenium	0.45 U	0.48 U	0.57 J	0.97 J	0.78 U	0.6 U	0.98 U	0.75 J	0.37 U	0.76 U	0.47 U	0.36 U	0.42 U	0.34 U
Silver	0.94 U	1 U	1.2 U	1.9 U	1.7 U	1.3 U	2.1 U	1.6 U	0.77 U	1.6 U	1 U	0.76 U	0.9 U	0.71 U
Sodium	86.6 J	126 J	410	268 J	423	284	429	434	166	141 J	105 J	101 J	189	93.7 J
Thallium	0.19 U	0.2 U	0.24 U	0.39 U	0.33 U	0.25 U	0.42 U	0.32 U	0.16 U	0.32 U	0.2 U	0.15 U	0.18 U	0.14 U
Vanadium	19.4	13	4.6	6.2	4.4 J	2.3 J	6.1 J	3.3 J	15.3	13.6	9.6	13.4 J+	18.8	16.2
Zinc	56.4	45.8	89.4	174	172	50.6	140	78.7	44.7	67	38.1	37.2 J+	55	41.4
METALS SEM|Simultaneously Extracted Metals (mg/kg)														
SEM/AVS	--	--	--	--	0.341	--	--	0.606	--	--	--	--	--	--
METALS|AVS/SEM (mg/kg)														
Cadmium	--	--	--	--	0.0031 J	--	--	0.0022 J	--	--	--	--	--	--
Copper	--	--	--	--	0.71	--	--	0.9	--	--	--	--	--	--
Lead	--	--	--	--	0.044	--	--	0.024	--	--	--	--	--	--
Mercury	--	--	--	--	0.000028 U	--	--	0.000029 U	--	--	--	--	--	--
Nickel	--	--	--	--	0.065	--	--	0.0046 U	--	--	--	--	--	--
Sulfide	--	--	--	--	7.1	--	--	3.2	--	--	--	--	--	--
Zinc	--	--	--	--	1.6 J	--	--	0.9	--	--	--	--	--	--
PESTICIDES (mg/kg)														
Aldrin	--	--	0.0015 U	--	--	0.0019 U	--	--	0.0013 U	--	--	--	--	--
Alpha Bhc (Alpha Hexachlorocyclohexane)	--	--	0.0011 U	--	--	0.0015 U	--	--	0.00096 U	--	--	--	--	--
Alpha Endosulfan	--	--	0.0017 U	--	--	0.0022 U	--	--	0.0015 U	--	--	--	--	--
Beta Bhc (Beta Hexachlorocyclohexane)	--	--	0.0012 U	--	--	0.0016 U	--	--	0.001 U	--	--	--	--	--
Beta Endosulfan	--	--	0.0019 U	--	--	0.0025 U	--	--	0.0016 U	--	--	--	--	--
cis-Chlordane	--	--	0.002 U	--	--	0.0026 U	--	--	0.0017 U	--	--	--	--	--
Delta BHC (Delta Hexachlorocyclohexane)	--	--	0.0013 U	--	--	0.0017 U	--	--	0.0011 U	--	--	--	--	--
Dieldrin	--	--	0.0016 U	--	--	0.0021 U	--	--	0.0014 U	--	--	--	--	--
Endosulfan Sulfate	--	--	0.0014 U	--	--	0.0019 U	--	--	0.0012 U	--	--	--	--	--
Endrin	--	--	0.0016 U	--	--	0.002 U	--	--	0.0013 U	--	--	--	--	--
Endrin Aldehyde	--	--	0.0015 U	--	--	0.002 U	--	--	0.0013 U	--	--	--	--	--
Endrin Ketone	--	--	0.0017 U	--	--	0.0022 U	--	--	0.0015 U	--	--	--	--	--
Gamma Bhc (Lindane)	--	--	0.0011 U	--	--	0.0014 U	--	--	0.00094 U	--	--	--	--	--
Heptachlor	--	--	0.0016 U	--	--	0.0021 U	--	--	0.0013 U	--	--	--	--	--
Heptachlor Epoxide	--	--	0.0024 U	--	--	0.0031 U	--	--	0.0021 U	--	--	--	--	--
Methoxychlor	--	--	0.0026 U	--	--	0.0034 U	--	--	0.0022 U	--	--	--	--	--
P,P'-DDD	--	--	0.0016 U	--	--	0.0021 U	--	--	0.0014 U	--	--	--	--	--
P,P'-DDE	--	--	0.0018 U	--	--	0.0023 U	--	--	0.0015 U	--	--	--	--	--
P,P'-DDT	--	--	0.0013 U	--	--	0.0017 U	--	--	0.0011 U	--	--	--	--	--

Table E-30
Summary of Data Used in Risk Assessment
South Percolation Pond Area (sediment) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-149	CFSB-150	CFSDP-018	CFSDP-018	CFSDP-018	CFSDP-019	CFSDP-019	CFSDP-019	CFSDP-020	CFSDP-020	CFSDP-020	CFSDP-030	CFSDP-030	CFSDP-031
Sample Lab IDs	460-144726-2	460-144726-1	200-35201-13, 460-119830-3	460-144726-3	180-83167-1, 180-83168-1, 200-45776-1, 460-167103-1	200-35201-14, 460-119830-4	460-144726-4	180-83120-2, 180-83121-1, 200-45749-2, 460-167042-2	200-35201-15, 460-119830-5	460-144726-5	180-82974-1, 200-45698-1, 460-166770-1	460-144400-13	180-83255-2, 200-45807-2, 460-167262-2	460-144400-14
Sample Name	CFSB-149-SD-0-0.5	CFSB-150-SD-0-0.5	CFSDP-018-SD	CFSDP-018-SD	CFSDP-018-SD	CFSDP-019-SD	CFSDP-019-SD	CFSDP-019-SD	CFSDP-020-SD	CFSDP-020-SD	CFSDP-020-SD	CFSDP-030-SD	CFSDP-030-SD	CFSDP-031-SD
Chemical	11/7/2017	11/7/2017	9/7/2016	11/7/2017	10/17/2018	9/7/2016	11/7/2017	10/16/2018	9/7/2016	11/7/2017	10/11/2018	11/3/2017	10/18/2018	11/3/2017
Toxaphene	--	--	0.036 U	--	--	0.047 U	--	--	0.031 U	--	--	--	--	--
trans-Chlordane	--	--	0.0027 U	--	--	0.0035 U	--	--	0.0023 U	--	--	--	--	--
POLYCHLORINATED BIPHENYLS (mg/kg)														
PCB-1016 (Aroclor 1016)	--	--	0.016 U	--	--	0.021 U	--	--	0.014 U	--	--	--	--	--
PCB-1221 (Aroclor 1221)	--	--	0.016 U	--	--	0.021 U	--	--	0.014 U	--	--	--	--	--
PCB-1232 (Aroclor 1232)	--	--	0.016 U	--	--	0.021 U	--	--	0.014 U	--	--	--	--	--
PCB-1242 (Aroclor 1242)	--	--	0.016 U	--	--	0.021 U	--	--	0.014 U	--	--	--	--	--
PCB-1248 (Aroclor 1248)	--	--	0.016 U	--	--	0.021 U	--	--	0.014 U	--	--	--	--	--
PCB-1254 (Aroclor 1254)	--	--	0.017 U	--	--	0.022 U	--	--	0.014 U	--	--	--	--	--
PCB-1260 (Aroclor 1260)	--	--	0.017 U	--	--	0.022 U	--	--	0.014 U	--	--	--	--	--
PCB-1262 (Aroclor 1262)	--	--	0.017 U	--	--	0.022 U	--	--	0.014 U	--	--	--	--	--
PCB-1268 (Aroclor 1268)	--	--	0.017 U	--	--	0.022 U	--	--	0.014 U	--	--	--	--	--
Polychlorinated Biphenyl (PCBs)	--	--	0.017 U	--	--	0.022 U	--	--	0.014 U	--	--	--	--	--
SEMIVOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,2,4,5-Tetrachlorobenzene	0.044 U	0.051 U	0.045 U	0.089 U	--	0.12 U	0.11 U	--	0.077 U	0.075 U	--	0.036 U	--	0.037 U
1,4-Dioxane (P-Dioxane)	0.16 U	0.18 U	0.16 U	0.32 U	--	0.42 U	0.39 U	--	0.28 U	0.27 U	--	0.13 U	--	0.13 U
2,3,4,6-Tetrachlorophenol	0.055 U	0.064 U	0.057 U	0.11 U	--	0.15 U	0.14 UJ	--	0.097 U	0.095 U	--	0.045 U	--	0.047 U
2,4,5-Trichlorophenol	0.058 U	0.068 U	0.06 U	0.12 U	--	0.16 U	0.15 U	--	0.1 U	0.1 U	--	0.048 U	--	0.049 U
2,4,6-Trichlorophenol	0.017 U	0.019 U	0.017 U	0.034 U	--	0.045 U	0.041 U	--	0.029 U	0.029 U	--	0.014 U	--	0.014 U
2,4-Dichlorophenol	0.014 U	0.016 U	0.014 U	0.028 U	--	0.037 U	0.034 U	--	0.024 U	0.024 U	--	0.011 U	--	0.012 U
2,4-Dimethylphenol	0.13 UJ	0.15 UJ	0.13 U	0.26 UJ	--	0.35 U	0.32 UJ	--	0.23 U	0.22 UJ	--	0.11 U	--	0.11 U
2,4-Dinitrophenol	0.44 U	0.51 U	0.46 U	0.91 U	--	1.2 U	1.1 UJ	--	0.78 U	0.76 U	--	0.36 U	--	0.37 U
2,4-Dinitrotoluene	0.023 U	0.027 U	0.024 U	0.048 U	--	0.063 U	0.058 U	--	0.041 U	0.04 U	--	0.019 U	--	0.02 U
2,6-Dinitrotoluene	0.031 U	0.036 U	0.032 U	0.064 U	--	0.084 U	0.078 U	--	0.055 U	0.054 U	--	0.026 U	--	0.026 U
2-Chloronaphthalene	0.013 U	0.015 U	0.014 U	0.027 U	--	0.036 U	0.033 U	--	0.023 U	0.023 U	--	0.011 U	--	0.011 U
2-Chlorophenol	0.015 U	0.017 U	0.015 U	0.031 U	--	0.04 U	0.037 UJ	--	0.026 U	0.026 U	--	0.012 U	--	0.013 U
2-Methylnaphthalene	0.013 U	0.015 U	0.013 U	0.027 U	--	0.035 U	0.032 U	--	0.023 U	0.022 U	--	0.011 U	--	0.011 U
2-Methylphenol (O-Cresol)	0.026 U	0.03 U	0.026 U	0.052 U	--	0.069 U	0.064 U	--	0.045 U	0.044 U	--	0.021 U	--	0.022 U
2-Nitroaniline	0.019 U	0.022 U	0.02 U	0.04 U	--	0.052 U	0.048 U	--	0.034 U	0.033 U	--	0.016 U	--	0.016 U
2-Nitrophenol	0.02 U	0.023 U	0.02 U	0.04 U	--	0.053 U	0.049 UJ	--	0.035 U	0.034 U	--	0.016 U	--	0.017 U
3- And 4- Methylphenol (Total)	0.016 U	0.018 U	0.016 U	0.13 J	--	0.042 U	0.039 U	--	0.028 U	0.027 U	--	0.013 U	--	0.013 U
3,3'-Dichlorobenzidine	0.066 U	0.076 U	0.068 U	0.13 U	--	0.18 U	0.16 U	--	0.12 U	0.11 U	--	0.053 U	--	0.055 U
3-Nitroaniline	0.017 U	0.02 U	0.018 U	0.036 U	--	0.047 U	0.043 U	--	0.031 U	0.03 U	--	0.014 U	--	0.015 U
4,6-Dinitro-2-Methylphenol	0.16 U	0.18 U	0.16 U	0.32 U	--	0.42 U	0.39 UJ	--	0.28 U	0.27 U	--	0.13 U	--	0.13 U
4-Bromophenyl Phenyl Ether	0.018 U	0.021 U	0.019 U	0.038 U	--	0.05 U	0.046 U	--	0.033 U	0.032 U	--	0.015 U	--	0.016 U
4-Chloro-3-Methylphenol	0.025 U	0.029 U	0.026 U	0.052 U	--	0.068 U	0.063 U	--	0.044 U	0.043 U	--	0.021 U	--	0.021 U
4-Chloroaniline	0.015 U	0.018 U	0.016 U	0.031 U	--	0.041 U	0.038 U	--	0.027 U	0.026 U	--	0.012 U	--	0.013 U
4-Chlorophenyl Phenyl Ether	0.018 U	0.02 U	0.018 U	0.036 U	--	0.047 U	0.044 U	--	0.031 U	0.03 U	--	0.014 U	--	0.015 U
4-Nitroaniline	0.022 U	0.026 U	0.023 U	0.045 U	--	0.06 U	0.055 U	--	0.039 U	0.038 U	--	0.018 U	--	0.019 U
4-Nitrophenol	0.28 U	0.33 U	0.29 U	0.58 U	--	0.76 U	0.7 U	--	0.5 U	0.48 U	--	0.23 U	--	0.24 U
Acenaphthene	0.014 U	0.016 U	0.015 U	0.029 U	--	0.038 U	0.035 U	--	0.025 U	0.024 U	--	0.012 U	--	0.012 U
Acenaphthylene	0.015 U	0.018 U	0.016 U	0.031 U	--	0.041 U	0.038 U	--	0.027 U	0.026 U	--	0.012 U	--	0.013 U
Acetophenone	0.013 U	0.015 U	0.013 U	0.026 U	--	0.034 U	0.032 U	--	0.023 U	0.022 U	--	0.01 U	--	0.011 U
Anthracene	0.056 U	0.065 U	0.058 U	0.11 U	--	0.15 U	0.14 U	--	0.098 U	0.096 U	--	0.046 U	--	0.047 U
Atrazine	0.026 U	0.03 U	0.027 U	0.053 U	--	0.07 U	0.065 U	--	0.046 U	0.045 U	--	0.021 U	--	0.022 U
Benzaldehyde	0.045 U	0.052 U	0.046 U	0.092 U	--	0.12 U	0.11 U	--	0.079 U	0.077 U	--	0.037 U	--	0.038 U
Benzo(A)Anthracene	0.083	0.2	0.21	0.51	--	0.16	0.31	--	0.15	0.31	--	0.066	--	0.041 U
Benzo(A)Pyrene	0.11	0.31	0.26	0.86	--	0.19	0.48	--	0.19	0.48	--	0.091	--	0.015 U
Benzo(B)Fluoranthene	0.2	0.55	0.37	1.9	--	0.27	0.76 J-	--	0.28	0.71	--	0.16	--	0.053
Benzo(G,H,I)Perylene	0.12 J	0.43 J	0.51 J	0.91 J	--	0.28 J	0.65 J	--	0.27 J	0.61 J	--	0.084 J	--	0.028 U
Benzo(K)Fluoranthene	0.076	0.19	0.17	0.64	--	0.086 J	0.22 J-	--	0.11	0.26	--	0.054	--	0.022 U
Benzyl Butyl Phthalate	0.018 U	0.021 U	0.019 U	0.037 U	--	0.049 U	0.045 U	--	0.032 U	0.031 U	--	0.015 U	--	0.015 U
Biphenyl (Diphenyl)	0.05 U	0.058 U	0.052 U	0.1 U	--	0.13 U	0.12 U	--	0.088 U	0.086 U	--	0.041 U	--	0.042 U
Bis(2-Chloroethoxy) Methane	0.018 U	0.021 U	0.019 U	0.037 U	--	0.049 U	0.045 U	--	0.032 U	0.031 U	--	0.015 U	--	0.015 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.014 U	0.016 U	0.014 U	0.028 U	--	0.037 U	0.034 U	--	0.024 U	0.024 U	--	0.011 U	--	0.012 U
Bis(2-Chloroisopropyl) Ether	0.024 U	0.028 U	0.025 U	0.049 U	--	0.065 U	0.06 U	--	0.043 U	0.041 U	--	0.02 U	--	0.02 U
Bis(2-Ethylhexyl) Phthalate	0.023 U	0.027 U	0.024 U	0.52 J	--	0.062 U	0.057 U	--	0.04 U	0.039 U	--	0.019 U	--	0.019 U
Caprolactam	0.042 U	0.049 U	0.044 U	0.087 U	--	0.11 U	0.11 U	--	0.075 U	0.072 U	--	0.034 U	--	0.036 U

Table E-30
Summary of Data Used in Risk Assessment
South Percolation Pond Area (sediment) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-149	CFSB-150	CFSDP-018	CFSDP-018	CFSDP-018	CFSDP-019	CFSDP-019	CFSDP-019	CFSDP-020	CFSDP-020	CFSDP-020	CFSDP-030	CFSDP-030	CFSDP-031
Sample Lab IDs	460-144726-2	460-144726-1	200-35201-13, 460-119830-3	460-144726-3	180-83167-1, 180-83168-1, 200-45776-1, 460-167103-1	200-35201-14, 460-119830-4	460-144726-4	180-83120-2, 180-83121-1, 200-45749-2, 460-167042-2	200-35201-15, 460-119830-5	460-144726-5	180-82974-1, 200-45698-1, 460-166770-1	460-144400-13	180-83255-2, 200-45807-2, 460-167262-2	460-144400-14
Sample Name	CFSB-149-SD-0-0.5	CFSB-150-SD-0-0.5	CFSDP-018-SD	CFSDP-018-SD	CFSDP-018-SD	CFSDP-019-SD	CFSDP-019-SD	CFSDP-019-SD	CFSDP-020-SD	CFSDP-020-SD	CFSDP-020-SD	CFSDP-030-SD	CFSDP-030-SD	CFSDP-031-SD
Chemical	11/7/2017	11/7/2017	9/7/2016	11/7/2017	10/17/2018	9/7/2016	11/7/2017	10/16/2018	9/7/2016	11/7/2017	10/11/2018	11/3/2017	10/18/2018	11/3/2017
Carbazole	0.015 U	0.017 U	0.052 J	0.16 J	--	0.039 U	0.07 J	--	0.029 J	0.025 U	--	0.012 U	--	0.012 U
Chrysene	0.14 J	0.34 J	0.33 J	1.4	--	0.23 J	0.52 J	--	0.23 J	0.47 J	--	0.11 J	--	0.028 J
Dibenz(A,H)Anthracene	0.031 U	0.14	0.084	0.28	--	0.082 U	0.076 U	--	0.055 J	0.19	--	0.05	--	0.026 U
Dibenzofuran	0.018 U	0.021 U	0.018 U	0.036 U	--	0.048 U	0.044 U	--	0.031 U	0.03 U	--	0.014 U	--	0.015 U
Diethyl Phthalate	0.017 U	0.019 U	0.017 U	0.034 U	--	0.045 U	0.041 U	--	0.029 U	0.029 U	--	0.014 U	--	0.014 U
Dimethyl Phthalate	0.017 U	0.02 U	0.018 U	0.035 U	--	0.046 U	0.042 U	--	0.03 U	0.029 U	--	0.014 U	--	0.014 U
Di-N-Butyl Phthalate	0.018 U	0.02 U	0.018 U	0.036 U	--	0.047 U	0.044 U	--	0.031 U	0.03 U	--	0.024 J	--	0.015 U
Di-N-Octylphthalate	0.03 U	0.035 U	0.031 U	0.061 U	--	0.08 U	0.074 UJ	--	0.053 U	0.051 U	--	0.024 U	--	0.025 U
Fluoranthene	0.12 J	0.28 J	0.3 J	1 J	--	0.23 J	0.41 J	--	0.21 J	0.44 J	--	0.082 J	--	0.028 J
Fluorene	0.013 U	0.015 U	0.013 U	0.026 U	--	0.034 U	0.032 U	--	0.023 U	0.022 U	--	0.01 U	--	0.011 U
Hexachlorobenzene	0.024 U	0.028 U	0.025 U	0.049 U	--	0.064 U	0.059 U	--	0.042 U	0.041 U	--	0.019 U	--	0.02 U
Hexachlorobutadiene	0.017 U	0.019 U	0.017 U	0.034 U	--	0.044 U	0.041 U	--	0.029 U	0.028 U	--	0.013 U	--	0.014 U
Hexachlorocyclopentadiene	0.037 UJ	0.042 UJ	0.038 U	0.075 UJ	--	0.098 U	0.091 UR	--	0.065 U	0.063 UJ	--	0.03 UJ	--	0.031 UJ
Hexachloroethane	0.022 U	0.025 U	0.022 U	0.044 U	--	0.058 U	0.053 UJ	--	0.038 U	0.037 U	--	0.018 U	--	0.018 U
Indeno(1,2,3-C,D)Pyrene	0.14	0.57	0.36	1.2	--	0.26	0.82	--	0.25	0.8	--	0.12	--	0.033 U
Isophorone	0.013 U	0.015 U	0.013 U	0.026 U	--	0.034 U	0.031 U	--	0.022 U	0.022 U	--	0.01 U	--	0.011 U
Naphthalene	0.015 U	0.017 U	0.015 U	0.031 U	--	0.04 U	0.037 UJ	--	0.026 U	0.026 U	--	0.012 U	--	0.013 U
Nitrobenzene	0.018 U	0.021 U	0.019 U	0.038 U	--	0.05 U	0.046 UJ	--	0.033 U	0.032 U	--	0.015 U	--	0.016 U
N-Nitrosodi-N-Propylamine	0.02 U	0.023 U	0.02 U	0.04 U	--	0.053 U	0.049 U	--	0.035 U	0.034 U	--	0.016 U	--	0.017 U
N-Nitrosodiphenylamine	0.053 U	0.062 U	0.055 U	0.11 U	--	0.14 U	0.13 U	--	0.094 U	0.091 U	--	0.043 U	--	0.045 U
Pentachlorophenol	0.071 U	0.082 U	0.074 U	0.15 U	--	0.19 U	0.18 UJ	--	0.13 U	0.12 U	--	0.058 U	--	0.06 U
Phenanthrene	0.062 J	0.15 J	0.13 J	0.24 J	--	0.11 J	0.22 J	--	0.11 J	0.23 J	--	0.044 J	--	0.014 J
Phenol	0.019 U	0.022 U	0.02 U	0.039 U	--	0.052 U	0.048 U	--	0.034 U	0.033 U	--	0.016 U	--	0.016 U
Pyrene	0.14 J	0.26 J	0.35 J	0.055 U	--	0.25 J	0.35 J-	--	0.29 J	0.42 J	--	0.098 J	--	0.031 J
SEMIVOLATILE ORGANIC COMPOUNDS|LOW LEVEL (mg/kg)														
1,2,4,5-Tetrachlorobenzene	--	--	--	--	0.068 U	--	--	0.024 U	--	--	0.016 U	--	0.0043 U	--
1,4-Dioxane (P-Dioxane)	--	--	--	--	0.49 U	--	--	0.17 U	--	--	0.12 U	--	0.031 U	--
2,3,4,6-Tetrachlorophenol	--	--	--	--	0.65 U	--	--	0.23 U	--	--	0.15 U	--	0.041 U	--
2,4,5-Trichlorophenol	--	--	--	--	0.11 U	--	--	0.039 U	--	--	0.026 U	--	0.007 U	--
2,4,6-Trichlorophenol	--	--	--	--	0.086 U	--	--	0.03 U	--	--	0.02 U	--	0.0054 U	--
2,4-Dichlorophenol	--	--	--	--	0.12 U	--	--	0.043 U	--	--	0.029 U	--	0.0076 U	--
2,4-Dimethylphenol	--	--	--	--	0.098 U	--	--	0.034 U	--	--	0.023 U	--	0.0061 U	--
2,4-Dinitrophenol	--	--	--	--	4.2 U	--	--	1.5 U	--	--	1 U	--	0.27 U	--
2,4-Dinitrotoluene	--	--	--	--	0.078 U	--	--	0.027 U	--	--	0.018 U	--	0.0049 U	--
2,6-Dinitrotoluene	--	--	--	--	0.097 U	--	--	0.034 U	--	--	0.023 U	--	0.0061 U	--
2-Chloronaphthalene	--	--	--	--	0.072 U	--	--	0.025 U	--	--	0.017 U	--	0.0045 U	--
2-Chlorophenol	--	--	--	--	0.073 U	--	--	0.026 U	--	--	0.017 U	--	0.0046 U	--
2-Methylnaphthalene	--	--	--	--	0.075 U	--	--	0.026 U	--	--	0.018 U	--	0.0047 U	--
2-Methylphenol (O-Cresol)	--	--	--	--	0.45 U	--	--	0.16 U	--	--	0.11 U	--	0.028 U	--
2-Nitroaniline	--	--	--	--	0.71 U	--	--	0.25 U	--	--	0.17 U	--	0.045 U	--
2-Nitrophenol	--	--	--	--	0.09 U	--	--	0.031 U	--	--	0.021 U	--	0.0056 U	--
3,3'-Dichlorobenzidine	--	--	--	--	1.5 U	--	--	0.51 U	--	--	0.35 U	--	0.092 U	--
3-Nitroaniline	--	--	--	--	0.4 U	--	--	0.14 U	--	--	0.094 U	--	0.025 U	--
4,6-Dinitro-2-Methylphenol	--	--	--	--	2.7 U	--	--	0.95 U	--	--	0.64 U	--	0.17 U	--
4-Bromophenyl Phenyl Ether	--	--	--	--	0.11 U	--	--	0.039 U	--	--	0.026 U	--	0.0069 U	--
4-Chloro-3-Methylphenol	--	--	--	--	0.074 U	--	--	0.026 U	--	--	0.017 U	--	0.0046 U	--
4-Chloroaniline	--	--	--	--	0.13 J	--	--	0.018 U	--	--	0.012 U	--	0.0033 U	--
4-Chlorophenyl Phenyl Ether	--	--	--	--	0.095 U	--	--	0.033 U	--	--	0.022 U	--	0.006 U	--
4-Nitroaniline	--	--	--	--	0.076 U	--	--	0.027 U	--	--	0.018 U	--	0.0048 U	--
4-Nitrophenol	--	--	--	--	1.1 U	--	--	0.39 U	--	--	0.26 U	--	0.069 U	--
Acenaphthene	--	--	--	--	0.09 U	--	--	0.032 U	--	--	0.021 U	--	0.0057 U	--
Acenaphthylene	--	--	--	--	0.069 U	--	--	0.024 U	--	--	0.016 U	--	0.0043 U	--
Acetophenone	--	--	--	--	0.085 U	--	--	0.03 U	--	--	0.02 U	--	0.0053 U	--
Anthracene	--	--	--	--	0.096 J	--	--	0.03 J	--	--	0.021 J	--	0.0051 U	--
Atrazine	--	--	--	--	0.69 UJ	--	--	0.24 UJ	--	--	0.16 UJ	--	0.043 UJ	--
Benzaldehyde	--	--	--	--	0.19 UR	--	--	0.068 UR	--	--	0.046 UR	--	0.019 J	--
Benzo(A)Anthracene	--	--	--	--	0.57	--	--	0.16	--	--	0.15	--	0.021	--
Benzo(A)Pyrene	--	--	--	--	0.78	--	--	0.21	--	--	0.23	--	0.024	--

Table E-30
Summary of Data Used in Risk Assessment
South Percolation Pond Area (sediment) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-149	CFSB-150	CFSDP-018	CFSDP-018	CFSDP-018	CFSDP-019	CFSDP-019	CFSDP-019	CFSDP-020	CFSDP-020	CFSDP-020	CFSDP-030	CFSDP-030	CFSDP-031
Sample Lab IDs	460-144726-2	460-144726-1	200-35201-13, 460-119830-3	460-144726-3	180-83167-1, 180-83168-1, 200-45776-1, 460-167103-1	200-35201-14, 460-119830-4	460-144726-4	180-83120-2, 180-83121-1, 200-45749-2, 460-167042-2	200-35201-15, 460-119830-5	460-144726-5	180-82974-1, 200-45698-1, 460-166770-1	460-144400-13	180-83255-2, 200-45807-2, 460-167262-2	460-144400-14
Sample Name	CFSB-149-SD-0-0.5	CFSB-150-SD-0-0.5	CFSDP-018-SD	CFSDP-018-SD	CFSDP-018-SD	CFSDP-019-SD	CFSDP-019-SD	CFSDP-019-SD	CFSDP-020-SD	CFSDP-020-SD	CFSDP-020-SD	CFSDP-030-SD	CFSDP-030-SD	CFSDP-031-SD
Chemical	11/7/2017	11/7/2017	9/7/2016	11/7/2017	10/17/2018	9/7/2016	11/7/2017	10/16/2018	9/7/2016	11/7/2017	10/11/2018	11/3/2017	10/18/2018	11/3/2017
Benzo(B)Fluoranthene	--	--	--	--	1.4	--	--	0.33	--	--	0.3	--	0.046	--
Benzo(G,H,I)Perylene	--	--	--	--	1.2	--	--	0.28	--	--	0.2	--	0.026	--
Benzo(K)Fluoranthene	--	--	--	--	0.61	--	--	0.092 J	--	--	0.14	--	0.016 J	--
Benzyl Butyl Phthalate	--	--	--	--	1.1 U	--	--	0.38 U	--	--	0.26 U	--	0.068 U	--
Biphenyl (Diphenyl)	--	--	--	--	0.066 U	--	--	0.023 U	--	--	0.016 U	--	0.0041 U	--
Bis(2-Chloroethoxy) Methane	--	--	--	--	0.075 U	--	--	0.026 U	--	--	0.018 U	--	0.0047 U	--
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	--	--	--	--	0.057 U	--	--	0.02 U	--	--	0.013 U	--	0.0036 U	--
Bis(2-Chloroisopropyl) Ether	--	--	--	--	0.12 U	--	--	0.041 U	--	--	0.028 U	--	0.0073 U	--
Bis(2-Ethylhexyl) Phthalate	--	--	--	--	1.7 U	--	--	0.59 U	--	--	0.4 U	--	0.11 U	--
Caprolactam	--	--	--	--	1 U	--	--	0.36 U	--	--	0.24 U	--	0.064 U	--
Carbazole	--	--	--	--	0.24 J	--	--	0.041 J	--	--	0.031 J	--	0.0091 J	--
Chrysene	--	--	--	--	1.4	--	--	0.25	--	--	0.25	--	0.052	--
Dibenz(A,H)Anthracene	--	--	--	--	0.21 J	--	--	0.058 J	--	--	0.045 J	--	0.0061 J	--
Dibenzofuran	--	--	--	--	0.069 U	--	--	0.024 U	--	--	0.016 U	--	0.0043 U	--
Diethyl Phthalate	--	--	--	--	0.47 U	--	--	0.16 U	--	--	0.11 U	--	0.03 U	--
Dimethyl Phthalate	--	--	--	--	0.057 U	--	--	0.02 U	--	--	0.013 U	--	0.0036 U	--
Di-N-Butyl Phthalate	--	--	--	--	0.69 U	--	--	0.24 U	--	--	0.16 U	--	0.043 U	--
Di-N-Octylphthalate	--	--	--	--	0.91 U	--	--	0.32 U	--	--	0.22 U	--	0.057 U	--
Fluoranthene	--	--	--	--	1.1	--	--	0.3	--	--	0.3	--	0.057	--
Fluorene	--	--	--	--	0.062 U	--	--	0.022 U	--	--	0.015 U	--	0.0039 U	--
Hexachlorobenzene	--	--	--	--	0.11 U	--	--	0.04 U	--	--	0.027 U	--	0.0071 U	--
Hexachlorobutadiene	--	--	--	--	0.092 U	--	--	0.032 U	--	--	0.022 U	--	0.0058 U	--
Hexachlorocyclopentadiene	--	--	--	--	0.08 U	--	--	0.028 U	--	--	0.019 U	--	0.005 UJ	--
Hexachloroethane	--	--	--	--	0.081 U	--	--	0.028 U	--	--	0.019 U	--	0.0051 U	--
Indeno(1,2,3-C,D)Pyrene	--	--	--	--	0.95	--	--	0.19	--	--	0.17	--	0.021	--
Isophorone	--	--	--	--	0.08 U	--	--	0.028 U	--	--	0.019 U	--	0.005 U	--
Naphthalene	--	--	--	--	0.061 U	--	--	0.021 U	--	--	0.014 U	--	0.0038 U	--
Nitrobenzene	--	--	--	--	0.57 U	--	--	0.2 U	--	--	0.14 U	--	0.036 U	--
N-Nitrosodi-N-Propylamine	--	--	--	--	0.11 U	--	--	0.037 U	--	--	0.025 U	--	0.0067 U	--
N-Nitrosodiphenylamine	--	--	--	--	0.52 U	--	--	0.18 U	--	--	0.12 U	--	0.033 U	--
Pentachlorophenol	--	--	--	--	2.5 U	--	--	0.88 U	--	--	0.59 U	--	0.16 U	--
Phenanthrene	--	--	--	--	0.37	--	--	0.14	--	--	0.13	--	0.018 J	--
Phenol	--	--	--	--	0.47 U	--	--	0.17 U	--	--	0.11 U	--	0.03 U	--
Pyrene	--	--	--	--	0.78	--	--	0.24	--	--	0.25	--	0.043	--
VOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,1,1-Trichloroethane	0.00043 U	0.00076 U	--	0.00099 U	--	--	0.0019 U	--	--	0.00086 U	--	0.00028 U	--	0.00027 U
1,1,2,2-Tetrachloroethane	0.0004 U	0.0007 U	--	0.00091 U	--	--	0.0017 UJ	--	--	0.00079 U	--	0.00026 U	--	0.00025 U
1,1,2-Trichloro-1,2,2-Trifluoroethane	0.00056 U	0.00099 U	--	0.0013 U	--	--	0.0024 U	--	--	0.0011 U	--	0.00036 U	--	0.00035 U
1,1,2-Trichloroethane	0.00033 U	0.00058 U	--	0.00075 U	--	--	0.0014 UJ	--	--	0.00066 U	--	0.00021 U	--	0.00021 U
1,1-Dichloroethane	0.00038 U	0.00067 U	--	0.00087 U	--	--	0.0017 U	--	--	0.00076 U	--	0.00025 U	--	0.00024 U
1,1-Dichloroethene	0.00042 U	0.00074 U	--	0.00095 U	--	--	0.0018 U	--	--	0.00083 U	--	0.00027 U	--	0.00027 U
1,2,3-Trichlorobenzene	0.00034 U	0.00059 U	--	0.00077 U	--	--	0.0015 UJ	--	--	0.00067 U	--	0.00022 U	--	0.00021 U
1,2,4-Trichlorobenzene	0.00017 U	0.0003 U	--	0.00039 U	--	--	0.00074 UJ	--	--	0.00034 U	--	0.00011 U	--	0.00011 U
1,2-Dibromo-3-Chloropropane	0.00086 UJ	0.0015 UJ	--	0.0019 UJ	--	--	0.0037 UJ	--	--	0.0017 UJ	--	0.00055 U	--	0.00054 U
1,2-Dibromoethane (Ethylene Dibromide)	0.00034 U	0.00059 U	--	0.00076 U	--	--	0.0014 UJ	--	--	0.00066 U	--	0.00022 U	--	0.00021 U
1,2-Dichlorobenzene	0.00027 U	0.00047 U	--	0.00061 U	--	--	0.0012 UJ	--	--	0.00053 U	--	0.00017 U	--	0.00017 U
1,2-Dichloroethane	0.00055 U	0.00097 U	--	0.0013 U	--	--	0.0024 U	--	--	0.0011 U	--	0.00036 U	--	0.00035 U
1,2-Dichloropropane	0.00079 U	0.0014 U	--	0.0018 U	--	--	0.0034 UJ	--	--	0.0016 U	--	0.00051 U	--	0.0005 U
1,3-Dichlorobenzene	0.0003 U	0.00052 U	--	0.00067 U	--	--	0.0013 UJ	--	--	0.00059 U	--	0.00019 U	--	0.00019 U
1,4-Dichlorobenzene	0.00019 U	0.00033 U	--	0.00042 U	--	--	0.0008 UJ	--	--	0.00037 U	--	0.00012 U	--	0.00012 U
2-Hexanone	0.0015 U	0.0026 U	--	0.0033 U	--	--	0.0063 U	--	--	0.0029 U	--	0.00094 U	--	0.00092 U
Acetone	0.17	0.15	--	0.29	--	--	0.15	--	--	0.075	--	0.027	--	0.04
Benzene	0.0021	0.00085 U	--	0.0011 U	--	--	0.0021 U	--	--	0.00095 U	--	0.0017	--	0.0016
Bromochloromethane	0.00052 U	0.00092 U	--	0.0012 U	--	--	0.0023 U	--	--	0.001 U	--	0.00034 U	--	0.00033 U
Bromodichloromethane	0.00048 U	0.00084 U	--	0.0011 U	--	--	0.0021 U	--	--	0.00095 U	--	0.00031 U	--	0.0003 U
Bromoform	0.00079 U	0.0014 U	--	0.0018 U	--	--	0.0034 U	--	--	0.0016 U	--	0.00051 U	--	0.0005 U
Bromomethane	0.00088 U	0.0016 U	--	0.002 U	--	--	0.0038 U	--	--	0.0017 U	--	0.00057 U	--	0.00056 U

Table E-30
Summary of Data Used in Risk Assessment
South Percolation Pond Area (sediment) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-149	CFSB-150	CFSDP-018	CFSDP-018	CFSDP-018 180-83167-1, 180-83168-1, 200-45776-1, 460-167103-1	CFSDP-019	CFSDP-019	CFSDP-019 180-83120-2, 180-83121-1, 200-45749-2, 460-167042-2	CFSDP-020	CFSDP-020	CFSDP-020 180-82974-1, 200-45698-1, 460-166770-1	CFSDP-030	CFSDP-030 180-83255-2, 200-45807-2, 460-167262-2	CFSDP-031
Sample Lab IDs	460-144726-2	CFSB-150-SD-0-0.5 460-144726-1	200-35201-13, 460-119830-3	460-144726-3		200-35201-14, 460-119830-4	460-144726-4		200-35201-15, 460-119830-5	460-144726-5		460-144400-13		460-144400-14
Sample Name	CFSB-149-SD-0-0.5		CFSDP-018-SD	CFSDP-018-SD	CFSDP-018-SD	CFSDP-019-SD	CFSDP-019-SD	CFSDP-019-SD	CFSDP-020-SD	CFSDP-020-SD	CFSDP-020-SD	CFSDP-030-SD	CFSDP-030-SD	CFSDP-031-SD
Chemical	11/7/2017	11/7/2017	9/7/2016	11/7/2017	10/17/2018	9/7/2016	11/7/2017	10/16/2018	9/7/2016	11/7/2017	10/11/2018	11/3/2017	10/18/2018	11/3/2017
Carbon Disulfide	0.011	0.0029 J	--	0.005	--	--	0.0053 J	--	--	0.0013 J	--	0.0022	--	0.0015
Carbon Tetrachloride	0.00034 U	0.00059 U	--	0.00077 U	--	--	0.0015 U	--	--	0.00067 U	--	0.00022 U	--	0.00021 U
Chlorobenzene	0.00033 U	0.00058 U	--	0.00075 U	--	--	0.0014 UJ	--	--	0.00065 U	--	0.00021 U	--	0.00021 U
Chloroethane	0.00097 U	0.0017 U	--	0.0022 U	--	--	0.0042 U	--	--	0.0019 U	--	0.00063 U	--	0.00062 U
Chloroform	0.00059 U	0.001 U	--	0.0013 U	--	--	0.0026 U	--	--	0.0012 U	--	0.00038 U	--	0.00038 U
Chloromethane	0.00081 U	0.0014 U	--	0.0018 U	--	--	0.0035 U	--	--	0.0016 U	--	0.00052 U	--	0.00051 U
Cis-1,2-Dichloroethylene	0.00028 U	0.0005 U	--	0.00064 U	--	--	0.0012 U	--	--	0.00056 U	--	0.00018 U	--	0.00018 U
Cis-1,3-Dichloropropene	0.00051 UJ	0.00089 UJ	--	0.0012 UJ	--	--	0.0022 UJ	--	--	0.001 UJ	--	0.00033 U	--	0.00032 U
Cyclohexane	0.0046	0.00072 U	--	0.00093 U	--	--	0.0018 UJ	--	--	0.00093 J	--	0.0032	--	0.0026
Dibromochloromethane	0.00036 U	0.00064 U	--	0.00082 U	--	--	0.0016 U	--	--	0.00071 U	--	0.00023 U	--	0.00023 U
Dichlorodifluoromethane	0.00063 U	0.0011 U	--	0.0014 U	--	--	0.0027 U	--	--	0.0012 U	--	0.00041 U	--	0.0004 U
Ethylbenzene	0.0013 J	0.00065 U	--	0.00084 U	--	--	0.0016 UJ	--	--	0.00073 U	--	0.00053 J	--	0.0022
Isopropylbenzene (Cumene)	0.00023 U	0.00041 U	--	0.00053 U	--	--	0.001 UJ	--	--	0.00046 U	--	0.00015 U	--	0.00015 U
M,P-Xylene	0.0033	0.00057 U	--	0.00074 U	--	--	0.0014 UJ	--	--	0.00077 J	--	0.0014	--	0.0011 J
Methyl Acetate	0.008 UJ	0.014 UJ	--	0.018 UJ	--	--	0.035 UJ	--	--	0.016 UJ	--	0.0052 U	--	0.0051 U
Methyl Ethyl Ketone (2-Butanone)	0.053	0.016	--	0.08	--	--	0.03 J	--	--	0.013 J	--	0.0047 J+	--	0.0058 J+
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	0.0012 U	0.0022 U	--	0.0028 U	--	--	0.0053 U	--	--	0.0024 U	--	0.0008 U	--	0.00078 U
Methylcyclohexane	0.0081	0.00052 U	--	0.00068 U	--	--	0.0013 UJ	--	--	0.0014 J	--	0.006	--	0.0045
Methylene Chloride	0.0003 U	0.00053 U	--	0.001 J	--	--	0.0013 U	--	--	0.0006 U	--	0.0002 U	--	0.00019 U
O-Xylene (1,2-Dimethylbenzene)	0.0011 J	0.00031 U	--	0.0004 U	--	--	0.00076 UJ	--	--	0.00035 U	--	0.00045 J	--	0.00034 J
Styrene	0.00023 U	0.0004 U	--	0.00052 U	--	--	0.00099 UJ	--	--	0.00045 U	--	0.00015 U	--	0.00015 U
Tert-Butyl Methyl Ether	0.00023 U	0.00041 U	--	0.00053 U	--	--	0.001 U	--	--	0.00046 U	--	0.00015 U	--	0.00015 U
Tetrachloroethylene (PCE)	0.00027 U	0.00047 U	--	0.0006 U	--	--	0.0012 UJ	--	--	0.00053 U	--	0.00017 U	--	0.00017 U
Toluene	0.0062	0.002 U	--	0.0027 J	--	--	0.005 UJ	--	--	0.0023 U	--	0.0031	--	0.0053
Trans-1,2-Dichloroethene	0.00046 U	0.00081 U	--	0.001 U	--	--	0.002 U	--	--	0.00091 U	--	0.0003 U	--	0.00029 U
Trans-1,3-Dichloropropene	0.0005 UJ	0.00087 UJ	--	0.0011 UJ	--	--	0.0021 UJ	--	--	0.00098 UJ	--	0.00032 U	--	0.00031 U
Trichloroethylene (TCE)	0.00027 U	0.00047 U	--	0.00061 U	--	--	0.0012 U	--	--	0.00053 U	--	0.00017 U	--	0.00017 U
Trichlorofluoromethane	0.00076 U	0.0013 U	--	0.0017 U	--	--	0.0033 U	--	--	0.0015 U	--	0.00049 U	--	0.00048 U
Vinyl Chloride	0.001 U	0.0018 U	--	0.0023 U	--	--	0.0044 U	--	--	0.002 U	--	0.00066 U	--	0.00064 U

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-30
Summary of Data Used in Risk Assessment
South Percolation Pond Area (sediment) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSDP-031	CFSDP-032	CFSDP-032	CFSDP-058	CFSDP-059	CFSDP-060
Sample Lab IDs	180-83255-1, 180-83256-1, 200-45807-1, 460-167262-1	460-144400-15	180-83167-2, 180-83168-2, 200-45776-2, 460-167103-2	180-82974-2, 200-45698-2, 460-166770-2	180-82974-4, 200-45698-3, 460-166770-4	180-83120-1, 200-45749-1, 460-167042-1
Sample Name	CFSDP-031-SD	CFSDP-032-SD	CFSDP-032-SD	CFSDP-058-SD	CFSDP-059-SD	CFSDP-060-SD
Chemical	10/18/2018	11/3/2017	10/17/2018	10/11/2018	10/11/2018	10/16/2018
GENERAL CHEMISTRY (mg/kg)						
Fluoride	9.89	17.2 J+	1.91	0.31 U	0.35 U	0.37 U
Cyanide	0.67	0.58	0.65	1	0.26 J	0.14 J
Cyanide (Free)	--	--	--	--	--	--
METALS (mg/kg)						
Aluminum	9420 J	8980	7890	8510	6420	8240
Antimony	0.43 UJ	0.36 U	0.31 U	0.49 U	0.51 U	0.6 U
Arsenic	4.5	3.3	3.2	2.5	1.1 J	1.5 J
Barium	172	85.7	94.1	321	572	879
Beryllium	0.73	0.27 J	0.36 J	0.5 J	0.28 U	0.33 U
Cadmium	0.49 U	0.38 U	0.36 U	0.56 U	0.58 U	0.69 U
Calcium	22800 J	14700	12400	69200	124000	194000
Chromium, Total	10.7	9.8	9	9.3	7	8.7
Cobalt	5.8	5.9	5.5	5.3	4	4.1
Copper	17.2	10.6	13.4	24.3	29.2	37.1
Iron	13800 J	15400	13500	11400	6180	7340
Lead	8.6	6.9	6.8	7.9	7.1	9.4
Magnesium	11300 J	11400	9740	10400	8550	10100
Manganese	211 J-	153	127	184	84.4	132
Mercury	0.021 U	0.015 U	0.014 U	0.02 U	0.021 J	0.023 U
Nickel	12.6	11.8	11.4	13.9	13	14.7
Potassium	1350	702	670	1060	719	1080
Selenium	0.42 U	0.33 U	0.31 U	0.49 U	0.5 U	0.59 U
Silver	0.9 U	0.7 U	0.66 U	1 U	1.1 U	1.3 U
Sodium	192	55.4 J	79.2 J	90.9 J	54.4 U	139 J
Thallium	0.18 U	0.14 U	0.13 U	0.21 U	0.22 U	0.25 U
Vanadium	15.6	13.9	12.6	14.9	8.7	9.7
Zinc	50.3	41.8	44.1	45.1	44	49
METALS SEM|Simultaneously Extracted Metals (mg/kg)						
SEM/AVS	0.425	--	0.562	--	--	--
METALS|AVS/SEM (mg/kg)						
Cadmium	0.0011 J	--	0.00049 J	--	--	--
Copper	0.19	--	0.11	--	--	--
Lead	0.032	--	0.024	--	--	--
Mercury	0.000014 U	--	0.000012 U	--	--	--
Nickel	0.073	--	0.045	--	--	--
Sulfide	1.3	--	0.61 J	--	--	--
Zinc	0.27 J	--	0.16 J	--	--	--
PESTICIDES (mg/kg)						
Aldrin	--	--	--	--	--	--
Alpha Bhc (Alpha Hexachlorocyclohexane)	--	--	--	--	--	--
Alpha Endosulfan	--	--	--	--	--	--
Beta Bhc (Beta Hexachlorocyclohexane)	--	--	--	--	--	--
Beta Endosulfan	--	--	--	--	--	--
cis-Chlordane	--	--	--	--	--	--
Delta BHC (Delta Hexachlorocyclohexane)	--	--	--	--	--	--
Dieldrin	--	--	--	--	--	--
Endosulfan Sulfate	--	--	--	--	--	--
Endrin	--	--	--	--	--	--
Endrin Aldehyde	--	--	--	--	--	--
Endrin Ketone	--	--	--	--	--	--
Gamma Bhc (Lindane)	--	--	--	--	--	--
Heptachlor	--	--	--	--	--	--
Heptachlor Epoxide	--	--	--	--	--	--
Methoxychlor	--	--	--	--	--	--
P,P'-DDD	--	--	--	--	--	--
P,P'-DDE	--	--	--	--	--	--
P,P'-DDT	--	--	--	--	--	--

Table E-30
Summary of Data Used in Risk Assessment
South Percolation Pond Area (sediment) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSDP-031	CFSDP-032	CFSDP-032	CFSDP-058	CFSDP-059	CFSDP-060
Sample Lab IDs	180-83255-1, 180-83256-1, 200-45807-1, 460-167262-1	460-144400-15	180-83167-2, 180-83168-2, 200-45776-2, 460-167103-2	180-82974-2, 200-45698-2, 460-166770-2	180-82974-4, 200-45698-3, 460-166770-4	180-83120-1, 200-45749-1, 460-167042-1
Sample Name	CFSDP-031-SD	CFSDP-032-SD	CFSDP-032-SD	CFSDP-058-SD	CFSDP-059-SD	CFSDP-060-SD
Chemical	10/18/2018	11/3/2017	10/17/2018	10/11/2018	10/11/2018	10/16/2018
Toxaphene	--	--	--	--	--	--
trans-Chlordane	--	--	--	--	--	--
POLYCHLORINATED BIPHENYLS (mg/kg)						
PCB-1016 (Aroclor 1016)	--	--	--	--	--	--
PCB-1221 (Aroclor 1221)	--	--	--	--	--	--
PCB-1232 (Aroclor 1232)	--	--	--	--	--	--
PCB-1242 (Aroclor 1242)	--	--	--	--	--	--
PCB-1248 (Aroclor 1248)	--	--	--	--	--	--
PCB-1254 (Aroclor 1254)	--	--	--	--	--	--
PCB-1260 (Aroclor 1260)	--	--	--	--	--	--
PCB-1262 (Aroclor 1262)	--	--	--	--	--	--
PCB-1268 (Aroclor 1268)	--	--	--	--	--	--
Polychlorinated Biphenyl (PCBs)	--	--	--	--	--	--
SEMIVOLATILE ORGANIC COMPOUNDS (mg/kg)						
1,2,4,5-Tetrachlorobenzene	--	0.035 U	--	--	--	--
1,4-Dioxane (P-Dioxane)	--	0.12 U	--	--	--	--
2,3,4,6-Tetrachlorophenol	--	0.044 U	--	--	--	--
2,4,5-Trichlorophenol	--	0.046 U	--	--	--	--
2,4,6-Trichlorophenol	--	0.013 U	--	--	--	--
2,4-Dichlorophenol	--	0.011 U	--	--	--	--
2,4-Dimethylphenol	--	0.1 U	--	--	--	--
2,4-Dinitrophenol	--	0.35 U	--	--	--	--
2,4-Dinitrotoluene	--	0.018 U	--	--	--	--
2,6-Dinitrotoluene	--	0.025 U	--	--	--	--
2-Chloronaphthalene	--	0.011 U	--	--	--	--
2-Chlorophenol	--	0.012 U	--	--	--	--
2-Methylnaphthalene	--	0.01 U	--	--	--	--
2-Methylphenol (O-Cresol)	--	0.02 U	--	--	--	--
2-Nitroaniline	--	0.015 U	--	--	--	--
2-Nitrophenol	--	0.016 U	--	--	--	--
3- And 4- Methylphenol (Total)	--	0.012 U	--	--	--	--
3,3'-Dichlorobenzidine	--	0.052 U	--	--	--	--
3-Nitroaniline	--	0.014 U	--	--	--	--
4,6-Dinitro-2-Methylphenol	--	0.12 U	--	--	--	--
4-Bromophenyl Phenyl Ether	--	0.015 U	--	--	--	--
4-Chloro-3-Methylphenol	--	0.02 U	--	--	--	--
4-Chloroaniline	--	0.012 U	--	--	--	--
4-Chlorophenyl Phenyl Ether	--	0.014 U	--	--	--	--
4-Nitroaniline	--	0.018 U	--	--	--	--
4-Nitrophenol	--	0.22 U	--	--	--	--
Acenaphthene	--	0.011 U	--	--	--	--
Acenaphthylene	--	0.012 U	--	--	--	--
Acetophenone	--	0.01 U	--	--	--	--
Anthracene	--	0.044 U	--	--	--	--
Atrazine	--	0.021 U	--	--	--	--
Benzaldehyde	--	0.036 U	--	--	--	--
Benzo(A)Anthracene	--	0.039 U	--	--	--	--
Benzo(A)Pyrene	--	0.014 U	--	--	--	--
Benzo(B)Fluoranthene	--	0.042 J	--	--	--	--
Benzo(G,H,I)Perylene	--	0.027 U	--	--	--	--
Benzo(K)Fluoranthene	--	0.02 U	--	--	--	--
Benzyl Butyl Phthalate	--	0.014 U	--	--	--	--
Biphenyl (Diphenyl)	--	0.04 U	--	--	--	--
Bis(2-Chloroethoxy) Methane	--	0.015 U	--	--	--	--
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	--	0.011 U	--	--	--	--
Bis(2-Chloroisopropyl) Ether	--	0.019 U	--	--	--	--
Bis(2-Ethylhexyl) Phthalate	--	0.018 U	--	--	--	--
Caprolactam	--	0.034 U	--	--	--	--

Table E-30
Summary of Data Used in Risk Assessment
South Percolation Pond Area (sediment) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSDP-031	CFSDP-032	CFSDP-032	CFSDP-058	CFSDP-059	CFSDP-060
Sample Lab IDs	180-83255-1, 180-83256-1, 200-45807-1, 460-167262-1	460-144400-15	180-83167-2, 180-83168-2, 200-45776-2, 460-167103-2	180-82974-2, 200-45698-2, 460-166770-2	180-82974-4, 200-45698-3, 460-166770-4	180-83120-1, 200-45749-1, 460-167042-1
Sample Name	CFSDP-031-SD	CFSDP-032-SD	CFSDP-032-SD	CFSDP-058-SD	CFSDP-059-SD	CFSDP-060-SD
Chemical	10/18/2018	11/3/2017	10/17/2018	10/11/2018	10/11/2018	10/16/2018
Carbazole	--	0.012 U	--	--	--	--
Chrysene	--	0.019 J	--	--	--	--
Dibenz(A,H)Anthracene	--	0.024 U	--	--	--	--
Dibenzofuran	--	0.014 U	--	--	--	--
Diethyl Phthalate	--	0.013 U	--	--	--	--
Dimethyl Phthalate	--	0.014 U	--	--	--	--
Di-N-Butyl Phthalate	--	0.014 U	--	--	--	--
Di-N-Octylphthalate	--	0.024 U	--	--	--	--
Fluoranthene	--	0.025 J	--	--	--	--
Fluorene	--	0.01 U	--	--	--	--
Hexachlorobenzene	--	0.019 U	--	--	--	--
Hexachlorobutadiene	--	0.013 U	--	--	--	--
Hexachlorocyclopentadiene	--	0.029 UJ	--	--	--	--
Hexachloroethane	--	0.017 U	--	--	--	--
Indeno(1,2,3-C,D)Pyrene	--	0.031 U	--	--	--	--
Isophorone	--	0.01 U	--	--	--	--
Naphthalene	--	0.012 U	--	--	--	--
Nitrobenzene	--	0.015 U	--	--	--	--
N-Nitrosodi-N-Propylamine	--	0.016 U	--	--	--	--
N-Nitrosodiphenylamine	--	0.042 U	--	--	--	--
Pentachlorophenol	--	0.056 U	--	--	--	--
Phenanthrene	--	0.012 U	--	--	--	--
Phenol	--	0.015 U	--	--	--	--
Pyrene	--	0.027 J	--	--	--	--
SEMIVOLATILE ORGANIC COMPOUNDS|LOW LEVEL (mg/kg)						
1,2,4,5-Tetrachlorobenzene	0.0053 U	--	0.005 U	0.013 U	0.0092 U	0.017 U
1,4-Dioxane (P-Dioxane)	0.038 U	--	0.036 U	0.097 U	0.066 U	0.12 U
2,3,4,6-Tetrachlorophenol	0.051 U	--	0.048 U	0.13 U	0.088 U	0.16 U
2,4,5-Trichlorophenol	0.0088 U	--	0.0083 U	0.022 U	0.015 U	0.028 U
2,4,6-Trichlorophenol	0.0068 U	--	0.0064 U	0.017 U	0.012 U	0.022 U
2,4-Dichlorophenol	0.0095 U	--	0.009 U	0.024 U	0.016 U	0.031 U
2,4-Dimethylphenol	0.0077 U	--	0.0072 U	0.019 U	0.013 U	0.025 U
2,4-Dinitrophenol	0.33 U	--	0.31 U	0.84 U	0.57 U	1.1 U
2,4-Dinitrotoluene	0.0061 U	--	0.0058 U	0.015 U	0.011 U	0.02 U
2,6-Dinitrotoluene	0.0076 U	--	0.0072 U	0.019 U	0.013 U	0.024 U
2-Chloronaphthalene	0.0057 U	--	0.0053 U	0.014 U	0.0097 U	0.018 U
2-Chlorophenol	0.0057 U	--	0.0054 U	0.014 U	0.0099 U	0.018 U
2-Methylnaphthalene	0.0059 U	--	0.0056 U	0.015 U	0.01 U	0.019 U
2-Methylphenol (O-Cresol)	0.035 U	--	0.033 U	0.089 U	0.061 U	0.11 U
2-Nitroaniline	0.056 U	--	0.053 U	0.14 U	0.097 U	0.18 U
2-Nitrophenol	0.0071 U	--	0.0066 U	0.018 U	0.012 U	0.023 U
3,3'-Dichlorobenzidine	0.12 U	--	0.11 U	0.29 U	0.2 U	0.37 U
3-Nitroaniline	0.031 U	--	0.029 U	0.079 U	0.054 U	0.1 U
4,6-Dinitro-2-Methylphenol	0.21 U	--	0.2 U	0.54 U	0.37 U	0.68 U
4-Bromophenyl Phenyl Ether	0.0087 U	--	0.0081 U	0.022 U	0.015 U	0.028 U
4-Chloro-3-Methylphenol	0.0058 U	--	0.0055 U	0.015 U	0.01 U	0.019 U
4-Chloroaniline	0.0041 U	--	0.0039 U	0.01 U	0.0071 U	0.013 U
4-Chlorophenyl Phenyl Ether	0.0075 U	--	0.007 U	0.019 U	0.013 U	0.024 U
4-Nitroaniline	0.006 U	--	0.0056 U	0.015 U	0.01 U	0.019 U
4-Nitrophenol	0.087 U	--	0.081 U	0.22 U	0.15 U	0.28 U
Acenaphthene	0.0071 U	--	0.0067 U	0.018 U	0.012 J	0.023 U
Acenaphthylene	0.0054 U	--	0.0051 U	0.014 U	0.0093 U	0.017 U
Acetophenone	0.0085 J	--	0.0063 U	0.017 U	0.012 U	0.021 U
Anthracene	0.0096 J	--	0.006 U	0.016 U	0.024 J	0.036 J
Atrazine	0.054 UJ	--	0.051 UJ	0.14 UJ	0.093 UJ	0.17 UJ
Benzaldehyde	0.062 J	--	0.044 J	0.039 UR	0.026 UR	0.049 UR
Benzo(A)Anthracene	0.074	--	0.013 J	0.11	0.16	0.21
Benzo(A)Pyrene	0.036	--	0.013 J	0.17	0.24	0.37

Table E-30
Summary of Data Used in Risk Assessment
South Percolation Pond Area (sediment) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSDP-031	CFSDP-032	CFSDP-032	CFSDP-058	CFSDP-059	CFSDP-060
Sample Lab IDs	180-83255-1, 180-83256-1, 200-45807-1, 460-167262-1	460-144400-15	180-83167-2, 180-83168-2, 200-45776-2, 460-167103-2	180-82974-2, 200-45698-2, 460-166770-2	180-82974-4, 200-45698-3, 460-166770-4	180-83120-1, 200-45749-1, 460-167042-1
Sample Name	CFSDP-031-SD	CFSDP-032-SD	CFSDP-032-SD	CFSDP-058-SD	CFSDP-059-SD	CFSDP-060-SD
Chemical	10/18/2018	11/3/2017	10/17/2018	10/11/2018	10/11/2018	10/16/2018
Benzo(B)Fluoranthene	0.16	--	0.03	0.31	0.37	0.65
Benzo(G,H,I)Perylene	0.059	--	0.016 J	0.18	0.23	0.49
Benzo(K)Fluoranthene	0.073	--	0.007 U	0.12	0.11	0.24
Benzyl Butyl Phthalate	0.085 U	--	0.08 U	0.21 U	0.15 U	0.27 U
Biphenyl (Diphenyl)	0.0052 U	--	0.0049 U	0.013 U	0.0089 U	0.017 U
Bis(2-Chloroethoxy) Methane	0.0059 U	--	0.0055 U	0.015 U	0.01 U	0.019 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.0045 U	--	0.0042 U	0.011 U	0.0077 U	0.014 U
Bis(2-Chloroisopropyl) Ether	0.0092 U	--	0.0086 U	0.023 U	0.016 U	0.029 U
Bis(2-Ethylhexyl) Phthalate	0.13 U	--	0.12 U	0.33 U	0.23 U	0.42 U
Caprolactam	0.081 U	--	0.076 U	0.2 U	0.14 U	0.26 U
Carbazole	0.039	--	0.0062 J	0.025 J	0.033 J	0.051 J
Chrysene	0.28	--	0.03	0.25	0.29	0.41
Dibenz(A,H)Anthracene	0.012 J	--	0.0052 U	0.037 J	0.046	0.11
Dibenzofuran	0.0054 U	--	0.0051 U	0.014 U	0.0093 U	0.017 U
Diethyl Phthalate	0.037 U	--	0.035 U	0.093 U	0.064 U	0.12 U
Dimethyl Phthalate	0.0045 U	--	0.0042 U	0.011 U	0.0077 U	0.014 U
Di-N-Butyl Phthalate	0.054 U	--	0.051 U	0.14 U	0.093 U	0.17 U
Di-N-Octylphthalate	0.072 U	--	0.067 U	0.18 U	0.12 U	0.23 U
Fluoranthene	0.3	--	0.031	0.21	0.3	0.35
Fluorene	0.0048 U	--	0.0046 U	0.012 U	0.0087 J	0.016 U
Hexachlorobenzene	0.0089 U	--	0.0083 U	0.022 U	0.015 U	0.028 U
Hexachlorobutadiene	0.0072 U	--	0.0068 U	0.018 U	0.012 U	0.023 U
Hexachlorocyclopentadiene	0.0063 UJ	--	0.0059 UJ	0.016 U	0.011 U	0.02 U
Hexachloroethane	0.0064 U	--	0.006 U	0.016 U	0.011 U	0.02 U
Indeno(1,2,3-C,D)Pyrene	0.049	--	0.011 J	0.14	0.18	0.35
Isophorone	0.0063 U	--	0.0059 U	0.016 U	0.011 U	0.02 U
Naphthalene	0.0048 U	--	0.0045 U	0.012 U	0.0083 U	0.015 U
Nitrobenzene	0.045 U	--	0.042 U	0.11 U	0.078 U	0.14 U
N-Nitrosodi-N-Propylamine	0.0084 U	--	0.0079 U	0.021 U	0.014 U	0.027 U
N-Nitrosodiphenylamine	0.041 U	--	0.039 U	0.1 U	0.071 U	0.13 U
Pentachlorophenol	0.2 U	--	0.19 U	0.5 U	0.34 U	0.64 U
Phenanthrene	0.047	--	0.011 J	0.09	0.13	0.17
Phenol	0.037 U	--	0.043 J	0.094 U	0.064 U	0.12 U
Pyrene	0.21	--	0.026	0.17	0.25	0.3
VOLATILE ORGANIC COMPOUNDS (mg/kg)						
1,1,1-Trichloroethane	--	0.00028 U	--	--	--	--
1,1,2,2-Tetrachloroethane	--	0.00026 U	--	--	--	--
1,1,2-Trichloro-1,2,2-Trifluoroethane	--	0.00036 U	--	--	--	--
1,1,2-Trichloroethane	--	0.00021 U	--	--	--	--
1,1-Dichloroethane	--	0.00025 U	--	--	--	--
1,1-Dichloroethene	--	0.00027 U	--	--	--	--
1,2,3-Trichlorobenzene	--	0.00022 U	--	--	--	--
1,2,4-Trichlorobenzene	--	0.00011 U	--	--	--	--
1,2-Dibromo-3-Chloropropane	--	0.00055 U	--	--	--	--
1,2-Dibromoethane (Ethylene Dibromide)	--	0.00022 U	--	--	--	--
1,2-Dichlorobenzene	--	0.00017 U	--	--	--	--
1,2-Dichloroethane	--	0.00036 U	--	--	--	--
1,2-Dichloropropane	--	0.00051 U	--	--	--	--
1,3-Dichlorobenzene	--	0.00019 U	--	--	--	--
1,4-Dichlorobenzene	--	0.00012 U	--	--	--	--
2-Hexanone	--	0.00094 U	--	--	--	--
Acetone	--	0.039	--	--	--	--
Benzene	--	0.0011 J	--	--	--	--
Bromochloromethane	--	0.00034 U	--	--	--	--
Bromodichloromethane	--	0.00031 U	--	--	--	--
Bromoform	--	0.00051 U	--	--	--	--
Bromomethane	--	0.00057 U	--	--	--	--

Table E-30
Summary of Data Used in Risk Assessment
South Percolation Pond Area (sediment) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSDP-031	CFSDP-032	CFSDP-032	CFSDP-058	CFSDP-059	CFSDP-060
Sample Lab IDs	180-83255-1, 180-83256-1, 200-45807-1, 460-167262-1	460-144400-15	180-83167-2, 180-83168-2, 200-45776-2, 460-167103-2	180-82974-2, 200-45698-2, 460-166770-2	180-82974-4, 200-45698-3, 460-166770-4	180-83120-1, 200-45749-1, 460-167042-1
Sample Name	CFSDP-031-SD	CFSDP-032-SD	CFSDP-032-SD	CFSDP-058-SD	CFSDP-059-SD	CFSDP-060-SD
Chemical	10/18/2018	11/3/2017	10/17/2018	10/11/2018	10/11/2018	10/16/2018
Carbon Disulfide	--	0.0026	--	--	--	--
Carbon Tetrachloride	--	0.00022 U	--	--	--	--
Chlorobenzene	--	0.00021 U	--	--	--	--
Chloroethane	--	0.00063 U	--	--	--	--
Chloroform	--	0.00038 U	--	--	--	--
Chloromethane	--	0.00052 U	--	--	--	--
Cis-1,2-Dichloroethylene	--	0.00018 U	--	--	--	--
Cis-1,3-Dichloropropene	--	0.00033 U	--	--	--	--
Cyclohexane	--	0.0017	--	--	--	--
Dibromochloromethane	--	0.00023 U	--	--	--	--
Dichlorodifluoromethane	--	0.00041 U	--	--	--	--
Ethylbenzene	--	0.00038 J	--	--	--	--
Isopropylbenzene (Cumene)	--	0.00015 U	--	--	--	--
M,P-Xylene	--	0.0008 J	--	--	--	--
Methyl Acetate	--	0.0052 U	--	--	--	--
Methyl Ethyl Ketone (2-Butanone)	--	0.0043 J+	--	--	--	--
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	--	0.0008 U	--	--	--	--
Methylcyclohexane	--	0.0028	--	--	--	--
Methylene Chloride	--	0.0002 U	--	--	--	--
O-Xylene (1,2-Dimethylbenzene)	--	0.00026 J	--	--	--	--
Styrene	--	0.00015 U	--	--	--	--
Tert-Butyl Methyl Ether	--	0.00015 U	--	--	--	--
Tetrachloroethylene (PCE)	--	0.00017 U	--	--	--	--
Toluene	--	0.0032	--	--	--	--
Trans-1,2-Dichloroethene	--	0.0003 U	--	--	--	--
Trans-1,3-Dichloropropene	--	0.00032 U	--	--	--	--
Trichloroethylene (TCE)	--	0.00017 U	--	--	--	--
Trichlorofluoromethane	--	0.00049 U	--	--	--	--
Vinyl Chloride	--	0.00066 U	--	--	--	--

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-31
Summary of Data Used in Risk Assessment
Flathead River Area (surface water) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSWP-001	CFSWP-001	CFSWP-001	CFSWP-001	CFSWP-001	CFSWP-001	CFSWP-002	CFSWP-002	CFSWP-002	CFSWP-002	CFSWP-002	CFSWP-002-DUP	CFSWP-002	CFSWP-006
Sample Lab IDs	460-120379-1	460-124726-1	460-130969-1	460-135338-1	460-157849-1	460-166217-6	460-120379-2	460-124726-2	460-130969-2	460-135338-2	460-157849-2	460-157849-10	460-166217-4	460-119967-4
Sample Name	CFSWP-001-SW	CFSWP-001-SW	CFSWP-001-SW	CFSWP-001-SW	CFSWP-001-SW	CFSWP-001-SW	CFSWP-002-SW	CFSWP-002-SW	CFSWP-002-SW	CFSWP-002-SW	CFSWP-002-SW	CFSWP-DUP9-SW	CFSWP-002-SW	CFSWP-006-SW
Chemical	9/16/2016	12/2/2016	4/4/2017	6/14/2017	6/7/2018	10/5/2018	9/16/2016	12/2/2016	4/4/2017	6/14/2017	6/7/2018	6/7/2018	10/5/2018	9/9/2016
GENERAL CHEMISTRY (µg/L)														
Fluoride	--	--	--	118 J+	--	--	--	--	--	109 J+	--	--	--	--
Cyanide	--	--	--	2 U	--	--	--	--	--	2 U	--	--	--	--
Cyanide (Free)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cyanide	2 U	2 U	2 U	2 U	2 U	--	2 U	2 U	2 U	2 U	2 U	2 U	--	3.2 J
Cyanide (Free)	--	--	--	--	1.5 UJ	1.5 U	--	--	--	--	1.5 J-	1.5 UJ	1.5 U	--
METALS (µg/L)														
Aluminum	--	--	--	18.2 U	34.8 J	15 U	--	--	--	18.2 U	15 U	15 U	15 U	--
Antimony	--	--	--	0.62 U	0.62 U	0.62 U	--	--	--	0.62 U	0.62 U	0.62 U	0.62 U	--
Arsenic	--	--	--	0.64 U	0.77 U	0.77 U	--	--	--	0.64 U	0.77 U	0.77 U	0.77 U	--
Barium	--	--	--	70.7	72	139	--	--	--	64.4	69.8	67.2	104	--
Beryllium	--	--	--	0.24 U	0.26 U	0.26 U	--	--	--	0.24 U	0.26 U	0.26 U	0.26 U	--
Cadmium	--	--	--	0.71 U	0.61 U	0.61 U	--	--	--	0.71 U	0.61 U	0.61 U	0.61 U	--
Calcium	--	--	--	19700	19800	49800	--	--	--	18400	19500	18600	25100	--
Chromium, Total	--	--	--	1.3 U	1.3 U	1.3 U	--	--	--	1.3 U	1.3 U	1.3 U	1.3 U	--
Cobalt	--	--	--	1.3 U	1.3 U	1.3 U	--	--	--	1.3 U	1.3 U	1.3 U	1.3 U	--
Copper	--	--	--	1.4 U	1.9 U	1.9 U	--	--	--	1.4 U	1.9 U	1.9 U	1.9 U	--
Iron	--	--	--	42.4 U	45.7 U	45.7 U	--	--	--	42.4 U	45.7 U	45.7 U	45.7 U	--
Lead	--	--	--	0.38 U	0.37 U	0.37 U	--	--	--	0.38 U	0.37 U	0.37 U	0.37 U	--
Magnesium	--	--	--	4890	4790	12100	--	--	--	4520	4660	4530	6540	--
Manganese	--	--	--	2.5 U	4.6 J	2.7 U	--	--	--	2.5 U	3.2 J	3 J	3.2 J	--
Mercury	--	--	--	0.17 U	0.12 U	0.12 U	--	--	--	0.17 U	0.12 U	0.12 U	0.12 U	--
Nickel	--	--	--	1.4 U	1.3 U	1.3 J	--	--	--	1.4 U	1.3 U	1.3 U	1.3 U	--
Potassium	--	--	--	257	306	662	--	--	--	246	270	277	346	--
Selenium	--	--	--	0.73 U	0.69 U	0.69 U	--	--	--	0.73 U	0.69 U	0.69 U	0.69 U	--
Silver	--	--	--	1.3 U	1.4 U	1.4 U	--	--	--	1.3 U	1.4 U	1.4 U	1.4 U	--
Sodium	--	--	--	706	677	5300	--	--	--	583	639	626	889	--
Thallium	--	--	--	0.26 U	0.24 U	0.24 U	--	--	--	0.26 U	0.24 U	0.24 U	0.24 U	--
Vanadium	--	--	--	1.9 U	1.2 U	1.2 U	--	--	--	1.9 U	1.2 U	1.2 U	1.2 U	--
Zinc	--	--	--	7 U	5.4 U	6.8 J	--	--	--	7 U	5.4 U	5.4 U	5.4 U	--
Aluminum	23.7 J	25.6 J	103	824	383	925	28.8 J	23.7 J	139	18.2 U	324	412	27.2 J	19.9 J
Antimony	0.62 U	0.62 U	0.64 J	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U
Arsenic	0.64 U	0.64 U	0.64 U	0.64 U	0.77 U	0.77 U	0.64 U	0.64 U	0.64 U	0.64 U	0.77 U	0.77 U	0.77 U	0.64 U
Barium	107	102	98.4	83.4	79.3	139	102	101	97.2	68.3	76.4	79.6	113	105
Beryllium	0.24 U	0.24 U	0.24 U	0.24 U	0.26 U	0.26 U	0.24 U	0.24 U	0.24 U	0.24 U	0.26 U	0.26 U	0.26 U	0.24 U
Cadmium	0.71 U	0.71 U	0.71 U	0.71 U	0.61 U	0.61 U	0.71 U	0.71 U	0.71 U	0.71 U	0.61 U	0.61 U	0.61 U	0.71 U
Calcium	24200	25300	23600	20800	20600	46700	23200	24300	23700	18900	19600	20600	25400	24200
Chromium, Total	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.5 J	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
Cobalt	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
Copper	1.4 U	1.4 U	1.4 U	1.4 U	1.9 U	4.7	1.4 U	1.4 U	1.4 U	1.4 U	1.9 U	1.9 U	1.9 U	1.4 U
Iron	42.4 U	42.4 U	204	870	491	1150	42.4 U	42.4 U	137	42.4 U	360	483	45.7 U	42.4 U
Lead	0.38 U	0.38 U	0.38 U	0.57 J	0.37 U	0.96 J	0.38 U	0.38 U	0.38 U	0.38 U	0.37 U	0.37 U	0.37 U	0.38 U
Magnesium	6320	7060	6060	5770	5520	12300	6030	6750	6150	5040	5270	5630	7350	6630
Manganese	2.5 U	2.5 U	4.3 J	24.9	17	42.5	2.5 U	2.5 U	4.5 J	2.5 U	12.9	16.2	2.7 U	2.5 U
Mercury	0.17 U	0.17 U	0.17 U	0.17 U	0.12 U	0.12 U	0.17 U	0.17 U	0.17 U	0.17 U	0.12 U	0.12 U	0.12 U	0.17 U
Nickel	1.4 U	1.4 U	1.4 U	1.4 U	1.3 U	1.6 J	1.4 U	1.4 U	1.4 U	1.4 U	1.3 U	1.3 U	1.3 U	1.4 U
Potassium	330	341	368	557	391	882	306	319	396	257	360	413	395	328
Selenium	0.73 U	0.73 U	0.73 U	0.73 U	0.69 U	0.69 U	0.73 U	0.73 U	0.73 U	0.73 U	0.69 U	0.69 U	0.69 U	0.73 U
Silver	1.3 U	1.3 U	1.3 U	1.3 U	1.4 U	1.4 U	1.3 U	1.3 U	1.3 U	1.3 U	1.4 U	1.4 U	1.4 U	1.3 U
Sodium	1070	1200	1010	815	831	5250	1030	1060	1030	712	776	810	1120	1030
Thallium	0.26 U	0.26 U	0.26 U	0.26 U	0.24 U	0.24 U	0.26 U	0.26 U	0.26 U	0.26 U	0.24 U	0.24 U	0.24 U	0.26 U
Vanadium	1.9 U	1.9 U	1.9 U	1.9 U	1.2 U	1.4 J	1.9 U	1.9 U	1.9 U	1.9 U	1.2 U	1.2 U	1.2 U	1.9 U
Zinc	7 U	7 U	7 U	8.8 J	5.4 U	6.1 J	7 U	7 U	7 U	7 U	5.4 U	5.4 U	5.4 U	7 U
SEMIVOLATILE ORGANIC COMPOUNDS (µg/L)														
1,2,4,5-Tetrachlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,4-Dioxane (P-Dioxane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,3,4,6-Tetrachlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4,5-Trichlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4,6-Trichlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Table E-31
Summary of Data Used in Risk Assessment
Flathead River Area (surface water) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSWP-001	CFSWP-001	CFSWP-001	CFSWP-001	CFSWP-001	CFSWP-001	CFSWP-002	CFSWP-002	CFSWP-002	CFSWP-002	CFSWP-002	CFSWP-002-DUP	CFSWP-002	CFSWP-006
Sample Lab IDs	460-120379-1	460-124726-1	460-130969-1	460-135338-1	460-157849-1	460-166217-6	460-120379-2	460-124726-2	460-130969-2	460-135338-2	460-157849-2	460-157849-10	460-166217-4	460-119967-4
Sample Name Chemical	CFSWP-001-SW 9/16/2016	CFSWP-001-SW 12/2/2016	CFSWP-001-SW 4/4/2017	CFSWP-001-SW 6/14/2017	CFSWP-001-SW 6/7/2018	CFSWP-001-SW 10/5/2018	CFSWP-002-SW 9/16/2016	CFSWP-002-SW 12/2/2016	CFSWP-002-SW 4/4/2017	CFSWP-002-SW 6/14/2017	CFSWP-002-SW 6/7/2018	CFSWP-DUP9-SW 6/7/2018	CFSWP-002-SW 10/5/2018	CFSWP-006-SW 9/9/2016
2,4-Dichlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4-Dimethylphenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4-Dinitrophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4-Dinitrotoluene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,6-Dinitrotoluene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Chloronaphthalene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Chlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Methylnaphthalene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Methylphenol (O-Cresol)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Nitroaniline	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Nitrophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3- And 4- Methylphenol (Total)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3,3'-Dichlorobenzidine	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3-Nitroaniline	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4,6-Dinitro-2-Methylphenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Bromophenyl Phenyl Ether	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Chloro-3-Methylphenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Chloroaniline	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Chlorophenyl Phenyl Ether	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Nitroaniline	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Nitrophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acenaphthene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acenaphthylene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acetophenone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Anthracene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Atrazine	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzaldehyde	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(A)Anthracene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(A)Pyrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(B)Fluoranthene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(G,H,I)Perylene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(K)Fluoranthene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzyl Butyl Phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Biphenyl (Diphenyl)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bis(2-Chloroethoxy) Methane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bis(2-Chloroisopropyl) Ether	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bis(2-Ethylhexyl) Phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Caprolactam	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Carbazole	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chrysene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibenz(A,H)Anthracene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibenzofuran	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Diethyl Phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dimethyl Phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Di-N-Butyl Phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Di-N-Octylphthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Fluoranthene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Fluorene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorobutadiene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorocyclopentadiene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Indeno(1,2,3-C,D)Pyrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Isophorone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Naphthalene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Nitrobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
N-Nitrosodi-N-Propylamine	--	--	--	--	--	--	--	--	--	--	--	--	--	--
N-Nitrosodiphenylamine	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Table E-31
Summary of Data Used in Risk Assessment
Flathead River Area (surface water) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSWP-001	CFSWP-001	CFSWP-001	CFSWP-001	CFSWP-001	CFSWP-001	CFSWP-002	CFSWP-002	CFSWP-002	CFSWP-002	CFSWP-002	CFSWP-002-DUP	CFSWP-002	CFSWP-006
Sample Lab IDs	460-120379-1	460-124726-1	460-130969-1	460-135338-1	460-157849-1	460-166217-6	460-120379-2	460-124726-2	460-130969-2	460-135338-2	460-157849-2	460-157849-10	460-166217-4	460-119967-4
Sample Name Chemical	CFSWP-001-SW 9/16/2016	CFSWP-001-SW 12/2/2016	CFSWP-001-SW 4/4/2017	CFSWP-001-SW 6/14/2017	CFSWP-001-SW 6/7/2018	CFSWP-001-SW 10/5/2018	CFSWP-002-SW 9/16/2016	CFSWP-002-SW 12/2/2016	CFSWP-002-SW 4/4/2017	CFSWP-002-SW 6/14/2017	CFSWP-002-SW 6/7/2018	CFSWP-DUP9-SW 6/7/2018	CFSWP-002-SW 10/5/2018	CFSWP-006-SW 9/9/2016
Pentachlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Phenanthrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Phenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Pyrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SEMIVOLATILE ORGANIC COMPOUNDS|LOW LEVEL (µg/L)														
1,2,4,5-Tetrachlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,4-Dioxane (P-Dioxane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,3,4,6-Tetrachlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4,5-Trichlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4,6-Trichlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4-Dichlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4-Dimethylphenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4-Dinitrophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4-Dinitrotoluene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,6-Dinitrotoluene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Chloronaphthalene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Chlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Methylnaphthalene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Methylphenol (O-Cresol)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Nitroaniline	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Nitrophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3,3'-Dichlorobenzidine	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3-Nitroaniline	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4,6-Dinitro-2-Methylphenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Bromophenyl Phenyl Ether	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Chloro-3-Methylphenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Chloroaniline	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Chlorophenyl Phenyl Ether	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Nitroaniline	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Nitrophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acenaphthene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acenaphthylene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acetophenone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Anthracene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Atrazine	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzaldehyde	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(A)Anthracene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(A)Pyrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(B)Fluoranthene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(G,H,I)Perylene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(K)Fluoranthene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzyl Butyl Phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Biphenyl (Diphenyl)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bis(2-Chloroethoxy) Methane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bis(2-Chloroisopropyl) Ether	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bis(2-Ethylhexyl) Phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Caprolactam	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Carbazole	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chrysene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibenz(A,H)Anthracene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibenzofuran	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Diethyl Phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dimethyl Phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Di-N-Butyl Phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Di-N-Octylphthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Fluoranthene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Fluorene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Table E-31
Summary of Data Used in Risk Assessment
Flathead River Area (surface water) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSWP-001	CFSWP-001	CFSWP-001	CFSWP-001	CFSWP-001	CFSWP-001	CFSWP-002	CFSWP-002	CFSWP-002	CFSWP-002	CFSWP-002	CFSWP-002-DUP	CFSWP-002	CFSWP-006
Sample Lab IDs	460-120379-1	460-124726-1	460-130969-1	460-135338-1	460-157849-1	460-166217-6	460-120379-2	460-124726-2	460-130969-2	460-135338-2	460-157849-2	460-157849-10	460-166217-4	460-119967-4
Sample Name Chemical	CFSWP-001-SW 9/16/2016	CFSWP-001-SW 12/2/2016	CFSWP-001-SW 4/4/2017	CFSWP-001-SW 6/14/2017	CFSWP-001-SW 6/7/2018	CFSWP-001-SW 10/5/2018	CFSWP-002-SW 9/16/2016	CFSWP-002-SW 12/2/2016	CFSWP-002-SW 4/4/2017	CFSWP-002-SW 6/14/2017	CFSWP-002-SW 6/7/2018	CFSWP-DUP9-SW 6/7/2018	CFSWP-002-SW 10/5/2018	CFSWP-006-SW 9/9/2016
Hexachlorobutadiene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorocyclopentadiene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Indeno(1,2,3-C,D)Pyrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Isophorone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Naphthalene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Nitrobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
N-Nitrosodi-N-Propylamine	--	--	--	--	--	--	--	--	--	--	--	--	--	--
N-Nitrosodiphenylamine	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Pentachlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Phenanthrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Phenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Pyrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SEMIVOLATILE ORGANIC COMPOUNDS-SIM (µg/L)														
Acenaphthene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acenaphthylene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Anthracene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(A)Anthracene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(A)Pyrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(B)Fluoranthene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(G,H,I)Perylene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(K)Fluoranthene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo[E]Pyrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
C1-Chrysenes	--	--	--	--	--	--	--	--	--	--	--	--	--	--
C1-Fluoranthenes/Pyrenes	--	--	--	--	--	--	--	--	--	--	--	--	--	--
C1-Fluorenes	--	--	--	--	--	--	--	--	--	--	--	--	--	--
C1-Naphthalenes	--	--	--	--	--	--	--	--	--	--	--	--	--	--
C1-Phenanthrenes/Anthracenes	--	--	--	--	--	--	--	--	--	--	--	--	--	--
C2-Chrysenes	--	--	--	--	--	--	--	--	--	--	--	--	--	--
C2-Fluorenes	--	--	--	--	--	--	--	--	--	--	--	--	--	--
C2-Naphthalenes	--	--	--	--	--	--	--	--	--	--	--	--	--	--
C2-Phenanthrenes/Anthracenes	--	--	--	--	--	--	--	--	--	--	--	--	--	--
C3-Chrysenes	--	--	--	--	--	--	--	--	--	--	--	--	--	--
C3-Fluorenes	--	--	--	--	--	--	--	--	--	--	--	--	--	--
C3-Naphthalenes	--	--	--	--	--	--	--	--	--	--	--	--	--	--
C3-Phenanthrenes/Anthracenes	--	--	--	--	--	--	--	--	--	--	--	--	--	--
C4 Chrysenes	--	--	--	--	--	--	--	--	--	--	--	--	--	--
C4-Naphthalenes	--	--	--	--	--	--	--	--	--	--	--	--	--	--
C4-Phenanthrenes/Anthracenes	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chrysene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibenz(A,H)Anthracene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Fluoranthene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Fluorene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Indeno(1,2,3-C,D)Pyrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Naphthalene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Perylene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Phenanthrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Pyrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
VOLATILE ORGANIC COMPOUNDS (µg/L)														
1,1,1-Trichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,2,2-Tetrachloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,2-Trichloro-1,2,2-Trifluoroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,2-Trichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1-Dichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1-Dichloroethene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,3-Trichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,4-Trichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dibromo-3-Chloropropane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dibromoethane (Ethylene Dibromide)	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Table E-31
Summary of Data Used in Risk Assessment
Flathead River Area (surface water) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSWP-001	CFSWP-001	CFSWP-001	CFSWP-001	CFSWP-001	CFSWP-001	CFSWP-002	CFSWP-002	CFSWP-002	CFSWP-002	CFSWP-002	CFSWP-002-DUP	CFSWP-002	CFSWP-006
Sample Lab IDs	460-120379-1	460-124726-1	460-130969-1	460-135338-1	460-157849-1	460-166217-6	460-120379-2	460-124726-2	460-130969-2	460-135338-2	460-157849-2	460-157849-10	460-166217-4	460-119967-4
Sample Name Chemical	CFSWP-001-SW 9/16/2016	CFSWP-001-SW 12/2/2016	CFSWP-001-SW 4/4/2017	CFSWP-001-SW 6/14/2017	CFSWP-001-SW 6/7/2018	CFSWP-001-SW 10/5/2018	CFSWP-002-SW 9/16/2016	CFSWP-002-SW 12/2/2016	CFSWP-002-SW 4/4/2017	CFSWP-002-SW 6/14/2017	CFSWP-002-SW 6/7/2018	CFSWP-DUP9-SW 6/7/2018	CFSWP-002-SW 10/5/2018	CFSWP-006-SW 9/9/2016
1,2-Dichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichloropropane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,3-Dichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,4-Dichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Hexanone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acetone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromochloromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromodichloromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromoform	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromomethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Carbon Disulfide	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Carbon Tetrachloride	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chloroform	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chloromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cis-1,2-Dichloroethylene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cis-1,3-Dichloropropene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cyclohexane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibromochloromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dichlorodifluoromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Ethylbenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Isopropylbenzene (Cumene)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
M,P-Xylene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methyl Acetate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methyl Ethyl Ketone (2-Butanone)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methylcyclohexane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methylene Chloride	--	--	--	--	--	--	--	--	--	--	--	--	--	--
O-Xylene (1,2-Dimethylbenzene)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Styrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Tert-Butyl Methyl Ether	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Tetrachloroethylene (PCE)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Toluene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Trans-1,2-Dichloroethene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Trans-1,3-Dichloropropene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Trichloroethylene (TCE)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Trichlorofluoromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Vinyl Chloride	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-31
Summary of Data Used in Risk Assessment
Flathead River Area (surface water) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSWP-006	CFSWP-006	CFSWP-006	CFSWP-006	CFSWP-006	CFSWP-006-DUP	CFSWP-007	CFSWP-007	CFSWP-007	CFSWP-007	CFSWP-007	CFSWP-007	CFSWP-008	CFSWP-008
Sample Lab IDs	460-124639-4	460-129875-4	460-135338-6	460-157703-6	460-166152-1	460-166152-6	460-120379-3	460-124726-3	460-129875-5	460-135338-7	460-157849-3	460-166046-4	460-120379-4	460-124726-4
Sample Name	CFSWP-006-SW	CFSWP-006-SW	CFSWP-006-SW	CFSWP-006-SW	CFSWP-006-SW	CFSWP-DUP13-SW	CFSWP-007-SW	CFSWP-007-SW	CFSWP-007-SW	CFSWP-007-SW	CFSWP-007-SW	CFSWP-007-SW	CFSWP-008-SW	CFSWP-008-SW
Chemical	12/1/2016	3/16/2017	6/14/2017	6/6/2018	10/4/2018	10/4/2018	9/16/2016	12/2/2016	3/16/2017	6/14/2017	6/7/2018	10/3/2018	9/16/2016	12/2/2016
GENERAL CHEMISTRY (µg/L)														
Fluoride	--	--	119 J+	--	--	--	--	--	--	118 J+	--	--	--	--
Cyanide	--	--	2 U	--	--	--	--	--	--	2 U	--	--	--	--
Cyanide (Free)	--	--	1.6 J	--	--	--	--	--	--	--	--	--	--	--
Cyanide	2 U	2 U	2 U	2 UJ	--	--	2 U	2 U	2 U	2 U	2 U	--	2 U	2 U
Cyanide (Free)	--	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U	--	--	--	--	1.5 UJ	1.5 U	--	--
METALS (µg/L)														
Aluminum	--	--	18.2 U	15 U	15 U	15 U	--	--	--	18.2 U	23.7 J	15 U	--	--
Antimony	--	--	0.62 U	0.62 U	0.62 U	0.62 U	--	--	--	0.62 U	0.62 U	0.62 U	--	--
Arsenic	--	--	0.64 U	0.77 U	0.77 U	0.77 U	--	--	--	0.64 U	0.77 U	0.77 U	--	--
Barium	--	--	64.9	64.9	103	113	--	--	--	64	69.3	88.2	--	--
Beryllium	--	--	0.24 U	0.26 U	0.26 U	0.26 U	--	--	--	0.24 U	0.26 U	0.26 U	--	--
Cadmium	--	--	0.71 U	0.61 U	0.61 U	0.61 U	--	--	--	0.71 U	0.61 U	0.61 U	--	--
Calcium	--	--	18200	17900	23700	23500	--	--	--	18300	18800	21500 J	--	--
Chromium, Total	--	--	1.3 U	1.3 U	1.3 U	1.3 U	--	--	--	1.3 U	1.3 U	1.3 U	--	--
Cobalt	--	--	1.3 U	1.3 U	1.3 U	1.3 U	--	--	--	1.3 U	1.3 U	1.3 U	--	--
Copper	--	--	3 J	1.9 U	1.9 U	1.9 U	--	--	--	1.4 U	1.9 U	1.9 U	--	--
Iron	--	--	42.4 U	45.7 U	45.7 U	45.7 U	--	--	--	42.4 U	45.7 U	45.7 U	--	--
Lead	--	--	0.38 U	0.37 U	0.37 U	0.37 U	--	--	--	0.38 U	0.37 U	0.37 U	--	--
Magnesium	--	--	4520	4300	6170	6780	--	--	--	4460	4550	5200	--	--
Manganese	--	--	2.5 U	2.7 U	2.7 U	2.7 U	--	--	--	2.5 U	3.4 J	2.7 U	--	--
Mercury	--	--	0.17 U	0.12 U	0.12 U	0.12 U	--	--	--	0.17 U	0.12 U	0.12 U	--	--
Nickel	--	--	1.4 U	1.3 U	1.3 U	1.3 U	--	--	--	1.4 U	1.3 U	1.3 U	--	--
Potassium	--	--	240	301	353	395	--	--	--	255	278	293	--	--
Selenium	--	--	0.73 U	0.69 U	0.69 U	0.69 U	--	--	--	0.73 U	0.69 U	0.69 U	--	--
Silver	--	--	1.3 U	1.4 U	1.4 U	1.4 U	--	--	--	1.3 U	1.4 U	1.4 U	--	--
Sodium	--	--	562	571	860	954	--	--	--	574	618	690	--	--
Thallium	--	--	0.26 U	0.24 U	0.24 U	0.24 U	--	--	--	0.26 U	0.24 U	0.24 U	--	--
Vanadium	--	--	1.9 U	1.2 U	1.2 U	1.2 U	--	--	--	1.9 U	1.2 U	1.2 U	--	--
Zinc	--	--	7 U	5.4 U	5.4 U	5.4 U	--	--	--	7 U	5.4 U	5.4 U	--	--
Aluminum	29.8 J	1540	1000	398	53.9	42.5	28.9 J	54.5	1460	879	647	22.9 J	33.9 J	31 J
Antimony	0.62 U	0.66 J	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U
Arsenic	0.64 U	0.88 J	0.64 U	0.77 U	0.77 U	0.77 U	0.64 U	0.64 U	0.84 J	0.64 U	0.77 U	0.77 U	0.64 U	0.64 U
Barium	99.7	103	82.7	74.9	102	105	102	102	102	81.9	86.2	104	103	103
Beryllium	0.24 U	0.24 U	0.24 U	0.26 U	0.26 U	0.26 U	0.24 U	0.24 U	0.24 U	0.24 U	0.26 U	0.26 U	0.24 U	0.24 U
Cadmium	0.71 U	0.71 U	0.71 U	0.61 U	0.61 U	0.61 U	0.71 U	0.71 U	0.71 U	0.71 U	0.61 U	0.61 U	0.71 U	0.71 U
Calcium	24500	22000	19700	20100	23900	24300	23100	24500	21700	19300	21400	24400	23200	25400
Chromium, Total	1.3 U	2 J	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	2 J	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
Cobalt	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
Copper	1.4 U	2.2 J	1.7 J	1.9 U	6.5 J	1.9 UJ	1.4 U	1.4 U	3.4 J	1.4 J	1.9 U	2.1 J	1.4 U	1.4 U
Iron	42.4 U	1600	1210	474	45.7 U	45.7 U	42.4 U	42.4 U	1640	1090	824	45.7 U	42.4 U	42.4 U
Lead	0.38 U	1.2	0.7 J	0.37 U	0.37 U	0.37 U	0.38 U	0.38 U	1.2	0.68 J	0.52 J	0.37 U	0.38 U	0.38 U
Magnesium	6750	6300	5620	5490	6330	6390	6010	6780	6280	5500	5960	6460	6050	7110
Manganese	2.5 U	51.9	32.6	15.3	2.7 U	2.7 U	2.5 U	3.9 J	52	31.8	24.1	2.7 U	2.5 U	2.5 U
Mercury	0.17 U	0.17 U	0.17 U	0.12 U	0.12 U	0.12 U	0.17 U	0.17 U	0.17 U	0.17 U	0.12 U	0.12 U	0.17 U	0.17 U
Nickel	1.4 U	1.4 U	1.4 U	1.3 U	1.3 U	1.3 U	1.4 U	1.4 U	1.4 J	1.4 U	1.3 U	1.3 U	1.4 U	1.4 U
Potassium	315	775	605	392	366	355	311	313	748	547	477	353	317	309
Selenium	0.73 U	0.73 U	0.73 U	0.69 U	0.69 U	0.69 U	0.73 U	0.73 U	0.73 U	0.73 U	0.69 U	0.69 U	0.73 U	0.73 U
Silver	1.3 U	1.3 U	1.3 U	1.4 U	1.4 U	1.4 U	1.3 U	1.3 U	1.3 U	1.3 U	1.4 U	1.4 U	1.3 U	1.3 U
Sodium	1150	1030	710	787	866	884	951	1040	1030	677	803	885	958	1140
Thallium	0.26 U	0.26 U	0.26 U	0.24 U	0.24 U	0.24 U	0.26 U	0.26 U	0.26 U	0.26 U	0.24 U	0.24 U	0.26 U	0.26 U
Vanadium	1.9 U	1.9 J	1.9 U	1.2 U	1.2 U	1.2 U	1.9 U	1.9 U	1.9 U	1.9 U	1.2 J	1.2 U	1.9 U	1.9 U
Zinc	7 U	7 U	7 U	5.4 U	5.4 U	5.4 U	7 U	7 U	7 U	7 U	5.4 U	5.4 U	7 U	7 U
SEMIVOLATILE ORGANIC COMPOUNDS (µg/L)														
1,2,4,5-Tetrachlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,4-Dioxane (P-Dioxane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,3,4,6-Tetrachlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4,5-Trichlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4,6-Trichlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Table E-31
Summary of Data Used in Risk Assessment
Flathead River Area (surface water) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSWP-006	CFSWP-006	CFSWP-006	CFSWP-006	CFSWP-006	CFSWP-006-DUP	CFSWP-007	CFSWP-007	CFSWP-007	CFSWP-007	CFSWP-007	CFSWP-007	CFSWP-008	CFSWP-008
Sample Lab IDs	460-124639-4	460-129875-4	460-135338-6	460-157703-6	460-166152-1	460-166152-6	460-120379-3	460-124726-3	460-129875-5	460-135338-7	460-157849-3	460-166046-4	460-120379-4	460-124726-4
Sample Name	CFSWP-006-SW	CFSWP-006-SW	CFSWP-006-SW	CFSWP-006-SW	CFSWP-006-SW	CFSWP-DUP13-SW	CFSWP-007-SW	CFSWP-007-SW	CFSWP-007-SW	CFSWP-007-SW	CFSWP-007-SW	CFSWP-007-SW	CFSWP-008-SW	CFSWP-008-SW
Chemical	12/1/2016	3/16/2017	6/14/2017	6/6/2018	10/4/2018	10/4/2018	9/16/2016	12/2/2016	3/16/2017	6/14/2017	6/7/2018	10/3/2018	9/16/2016	12/2/2016
2,4-Dichlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4-Dimethylphenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4-Dinitrophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4-Dinitrotoluene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,6-Dinitrotoluene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Chloronaphthalene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Chlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Methylnaphthalene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Methylphenol (O-Cresol)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Nitroaniline	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Nitrophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3- And 4- Methylphenol (Total)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3,3'-Dichlorobenzidine	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3-Nitroaniline	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4,6-Dinitro-2-Methylphenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Bromophenyl Phenyl Ether	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Chloro-3-Methylphenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Chloroaniline	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Chlorophenyl Phenyl Ether	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Nitroaniline	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Nitrophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acenaphthene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acenaphthylene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acetophenone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Anthracene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Atrazine	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzaldehyde	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(A)Anthracene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(A)Pyrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(B)Fluoranthene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(G,H,I)Perylene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(K)Fluoranthene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzyl Butyl Phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Biphenyl (Diphenyl)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bis(2-Chloroethoxy) Methane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bis(2-Chloroisopropyl) Ether	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bis(2-Ethylhexyl) Phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Caprolactam	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Carbazole	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chrysene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibenz(A,H)Anthracene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibenzofuran	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Diethyl Phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dimethyl Phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Di-N-Butyl Phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Di-N-Octylphthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Fluoranthene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Fluorene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorobutadiene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorocyclopentadiene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Indeno(1,2,3-C,D)Pyrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Isophorone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Naphthalene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Nitrobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
N-Nitrosodi-N-Propylamine	--	--	--	--	--	--	--	--	--	--	--	--	--	--
N-Nitrosodiphenylamine	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Table E-31
Summary of Data Used in Risk Assessment
Flathead River Area (surface water) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSWP-006	CFSWP-006	CFSWP-006	CFSWP-006	CFSWP-006	CFSWP-006-DUP	CFSWP-007	CFSWP-007	CFSWP-007	CFSWP-007	CFSWP-007	CFSWP-007	CFSWP-008	CFSWP-008
Sample Lab IDs	460-124639-4	460-129875-4	460-135338-6	460-157703-6	460-166152-1	460-166152-6	460-120379-3	460-124726-3	460-129875-5	460-135338-7	460-157849-3	460-166046-4	460-120379-4	460-124726-4
Sample Name	CFSWP-006-SW	CFSWP-006-SW	CFSWP-006-SW	CFSWP-006-SW	CFSWP-006-SW	CFSWP-DUP13-SW	CFSWP-007-SW	CFSWP-007-SW	CFSWP-007-SW	CFSWP-007-SW	CFSWP-007-SW	CFSWP-007-SW	CFSWP-008-SW	CFSWP-008-SW
Chemical	12/1/2016	3/16/2017	6/14/2017	6/6/2018	10/4/2018	10/4/2018	9/16/2016	12/2/2016	3/16/2017	6/14/2017	6/7/2018	10/3/2018	9/16/2016	12/2/2016
Pentachlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Phenanthrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Phenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Pyrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SEMIVOLATILE ORGANIC COMPOUNDS|LOW LEVEL (µg/L)														
1,2,4,5-Tetrachlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,4-Dioxane (P-Dioxane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,3,4,6-Tetrachlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4,5-Trichlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4,6-Trichlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4-Dichlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4-Dimethylphenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4-Dinitrophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4-Dinitrotoluene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,6-Dinitrotoluene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Chloronaphthalene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Chlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Methylnaphthalene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Methylphenol (O-Cresol)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Nitroaniline	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Nitrophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3,3'-Dichlorobenzidine	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3-Nitroaniline	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4,6-Dinitro-2-Methylphenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Bromophenyl Phenyl Ether	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Chloro-3-Methylphenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Chloroaniline	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Chlorophenyl Phenyl Ether	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Nitroaniline	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Nitrophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acenaphthene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acenaphthylene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acetophenone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Anthracene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Atrazine	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzaldehyde	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(A)Anthracene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(A)Pyrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(B)Fluoranthene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(G,H,I)Perylene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(K)Fluoranthene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzyl Butyl Phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Biphenyl (Diphenyl)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bis(2-Chloroethoxy) Methane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bis(2-Chloroisopropyl) Ether	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bis(2-Ethylhexyl) Phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Caprolactam	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Carbazole	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chrysene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibenz(A,H)Anthracene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibenzofuran	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Diethyl Phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dimethyl Phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Di-N-Butyl Phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Di-N-Octylphthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Fluoranthene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Fluorene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Table E-31
Summary of Data Used in Risk Assessment
Flathead River Area (surface water) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSWP-006	CFSWP-006	CFSWP-006	CFSWP-006	CFSWP-006	CFSWP-006-DUP	CFSWP-007	CFSWP-007	CFSWP-007	CFSWP-007	CFSWP-007	CFSWP-007	CFSWP-008	CFSWP-008
Sample Lab IDs	460-124639-4	460-129875-4	460-135338-6	460-157703-6	460-166152-1	460-166152-6	460-120379-3	460-124726-3	460-129875-5	460-135338-7	460-157849-3	460-166046-4	460-120379-4	460-124726-4
Sample Name	CFSWP-006-SW	CFSWP-006-SW	CFSWP-006-SW	CFSWP-006-SW	CFSWP-006-SW	CFSWP-DUP13-SW	CFSWP-007-SW	CFSWP-007-SW	CFSWP-007-SW	CFSWP-007-SW	CFSWP-007-SW	CFSWP-007-SW	CFSWP-008-SW	CFSWP-008-SW
Chemical	12/1/2016	3/16/2017	6/14/2017	6/6/2018	10/4/2018	10/4/2018	9/16/2016	12/2/2016	3/16/2017	6/14/2017	6/7/2018	10/3/2018	9/16/2016	12/2/2016
Hexachlorobutadiene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorocyclopentadiene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Indeno(1,2,3-C,D)Pyrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Isophorone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Naphthalene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Nitrobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
N-Nitrosodi-N-Propylamine	--	--	--	--	--	--	--	--	--	--	--	--	--	--
N-Nitrosodiphenylamine	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Pentachlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Phenanthrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Phenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Pyrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SEMIVOLATILE ORGANIC COMPOUNDS-SIM (µg/L)														
Acenaphthene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acenaphthylene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Anthracene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(A)Anthracene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(A)Pyrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(B)Fluoranthene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(G,H,I)Perylene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(K)Fluoranthene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo[E]Pyrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
C1-Chrysenes	--	--	--	--	--	--	--	--	--	--	--	--	--	--
C1-Fluoranthenes/Pyrenes	--	--	--	--	--	--	--	--	--	--	--	--	--	--
C1-Fluorenes	--	--	--	--	--	--	--	--	--	--	--	--	--	--
C1-Naphthalenes	--	--	--	--	--	--	--	--	--	--	--	--	--	--
C1-Phenanthrenes/Anthracenes	--	--	--	--	--	--	--	--	--	--	--	--	--	--
C2-Chrysenes	--	--	--	--	--	--	--	--	--	--	--	--	--	--
C2-Fluorenes	--	--	--	--	--	--	--	--	--	--	--	--	--	--
C2-Naphthalenes	--	--	--	--	--	--	--	--	--	--	--	--	--	--
C2-Phenanthrenes/Anthracenes	--	--	--	--	--	--	--	--	--	--	--	--	--	--
C3-Chrysenes	--	--	--	--	--	--	--	--	--	--	--	--	--	--
C3-Fluorenes	--	--	--	--	--	--	--	--	--	--	--	--	--	--
C3-Naphthalenes	--	--	--	--	--	--	--	--	--	--	--	--	--	--
C3-Phenanthrenes/Anthracenes	--	--	--	--	--	--	--	--	--	--	--	--	--	--
C4 Chrysenes	--	--	--	--	--	--	--	--	--	--	--	--	--	--
C4-Naphthalenes	--	--	--	--	--	--	--	--	--	--	--	--	--	--
C4-Phenanthrenes/Anthracenes	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chrysene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibenz(A,H)Anthracene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Fluoranthene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Fluorene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Indeno(1,2,3-C,D)Pyrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Naphthalene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Perylene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Phenanthrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Pyrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
VOLATILE ORGANIC COMPOUNDS (µg/L)														
1,1,1-Trichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,2,2-Tetrachloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,2-Trichloro-1,2,2-Trifluoroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,2-Trichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1-Dichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1-Dichloroethene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,3-Trichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,4-Trichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dibromo-3-Chloropropane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dibromoethane (Ethylene Dibromide)	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Table E-31
Summary of Data Used in Risk Assessment
Flathead River Area (surface water) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSWP-006	CFSWP-006	CFSWP-006	CFSWP-006	CFSWP-006	CFSWP-006-DUP	CFSWP-007	CFSWP-007	CFSWP-007	CFSWP-007	CFSWP-007	CFSWP-007	CFSWP-008	CFSWP-008
Sample Lab IDs	460-124639-4	460-129875-4	460-135338-6	460-157703-6	460-166152-1	460-166152-6	460-120379-3	460-124726-3	460-129875-5	460-135338-7	460-157849-3	460-166046-4	460-120379-4	460-124726-4
Sample Name	CFSWP-006-SW	CFSWP-006-SW	CFSWP-006-SW	CFSWP-006-SW	CFSWP-006-SW	CFSWP-DUP13-SW	CFSWP-007-SW	CFSWP-007-SW	CFSWP-007-SW	CFSWP-007-SW	CFSWP-007-SW	CFSWP-007-SW	CFSWP-008-SW	CFSWP-008-SW
Chemical	12/1/2016	3/16/2017	6/14/2017	6/6/2018	10/4/2018	10/4/2018	9/16/2016	12/2/2016	3/16/2017	6/14/2017	6/7/2018	10/3/2018	9/16/2016	12/2/2016
1,2-Dichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichloropropane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,3-Dichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,4-Dichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Hexanone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acetone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromochloromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromodichloromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromoform	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromomethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Carbon Disulfide	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Carbon Tetrachloride	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chloroform	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chloromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cis-1,2-Dichloroethylene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cis-1,3-Dichloropropene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cyclohexane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibromochloromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dichlorodifluoromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Ethylbenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Isopropylbenzene (Cumene)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
M,P-Xylene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methyl Acetate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methyl Ethyl Ketone (2-Butanone)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methylcyclohexane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methylene Chloride	--	--	--	--	--	--	--	--	--	--	--	--	--	--
O-Xylene (1,2-Dimethylbenzene)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Styrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Tert-Butyl Methyl Ether	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Tetrachloroethylene (PCE)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Toluene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Trans-1,2-Dichloroethene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Trans-1,3-Dichloropropene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Trichloroethylene (TCE)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Trichlorofluoromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Vinyl Chloride	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-31
Summary of Data Used in Risk Assessment
Flathead River Area (surface water) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSWP-008	CFSWP-008	CFSWP-008	CFSWP-008	CFSWP-017	CFSWP-017	CFSWP-017	CFSWP-017	CFSWP-017	CFSWP-017	CFSWP-026	CFSWP-026	CFSWP-026 180-82744-2, 200-45626-2, 460-166217-2	CFSWP-033
Sample Lab IDs	460-130969-3	460-135338-8	460-157849-4	460-166046-2	460-120379-5	460-124726-5	460-130969-4	460-135338-9	460-157849-5	460-166046-1	460-144086-4	460-157849-6		460-144395-3
Sample Name Chemical	CFSWP-008-SW 4/4/2017	CFSWP-008-SW 6/14/2017	CFSWP-008-SW 6/7/2018	CFSWP-008-SW 10/3/2018	CFSWP-017-SW 9/16/2016	CFSWP-017-SW 12/2/2016	CFSWP-017-SW 4/4/2017	CFSWP-017-SW 6/14/2017	CFSWP-017-SW 6/7/2018	CFSWP-017-SW 10/3/2018	CFSWP-026-SW 10/31/2017	CFSWP-026-SW 6/7/2018	CFSWP-026-SW 10/5/2018	CFSWP-033-SW 11/3/2017
GENERAL CHEMISTRY (µg/L)														
Fluoride	--	117 J+	--	--	--	--	--	119 J+	--	--	--	--	--	--
Cyanide	--	2 U	--	--	--	--	--	2 U	--	--	22.7	--	--	91.4
Cyanide (Free)	--	--	--	--	--	--	--	--	--	--	1.6 J	--	--	3.4 J
Cyanide	2 U	2 U	2 U	--	2 U	2 U	2 U	2 U	2 U	--	17.8	2 U	--	95.8
Cyanide (Free)	--	--	1.5 UJ	1.5 U	--	--	--	--	1.5 UJ	1.5 U	2 J	1.7 J-	1.8 J	3.4 J
METALS (µg/L)														
Aluminum	--	18.2 U	28.5 J	15 U	--	--	--	18.2 U	20.9 J	15 U	18.2 U	15 U	15 U	50.4
Antimony	--	0.62 U	0.62 U	0.62 U	--	--	--	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U
Arsenic	--	0.64 U	0.77 U	0.77 U	--	--	--	0.64 U	0.77 U	0.77 U	0.64 U	0.77 U	0.77 U	1 J
Barium	--	63.7	70.4	91.1	--	--	--	63.6	70.4	140	115	73.3	107	340
Beryllium	--	0.24 U	0.26 U	0.26 U	--	--	--	0.24 U	0.26 U	0.26 U	0.24 U	0.26 U	0.26 U	0.24 U
Cadmium	--	0.71 U	0.61 U	0.61 U	--	--	--	0.71 U	0.61 U	0.61 U	0.71 U	0.61 U	0.61 U	0.71 U
Calcium	--	18200	19200	22400 J	--	--	--	18600	19200	28300 J	28800	20500	26600	66500
Chromium, Total	--	1.3 U	1.3 U	1.3 U	--	--	--	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
Cobalt	--	1.3 U	1.3 U	1.3 U	--	--	--	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
Copper	--	1.4 U	1.9 U	1.9 U	--	--	--	1.4 U	1.9 U	1.9 U	1.4 U	1.9 U	1.9 U	1.4 U
Iron	--	42.4 U	45.7 U	45.7 U	--	--	--	42.4 U	45.7 U	45.7 U	42.4 U	45.7 U	45.7 U	1250
Lead	--	0.38 U	0.37 U	0.37 U	--	--	--	0.38 U	0.37 U	0.37 U	0.38 U	0.37 U	0.37 U	0.38 U
Magnesium	--	4510	4640	5530	--	--	--	4560	4610	7560	7060	4990	7240	15400
Manganese	--	2.5 U	6.2 J	2.7 U	--	--	--	2.5 J	4.9 J	6 J	5.4 J	3.7 J	5.3 J	675
Mercury	--	0.17 U	0.12 U	0.12 U	--	--	--	0.17 U	0.12 U	0.12 U	0.17 U	0.12 U	0.12 U	0.17 U
Nickel	--	1.4 U	1.3 U	1.3 U	--	--	--	1.4 U	1.3 U	1.3 U	1.4 U	1.3 U	1.3 U	1.4 U
Potassium	--	237	275	315	--	--	--	256	276	338	415	294	395	1840
Selenium	--	0.73 U	0.69 U	0.69 U	--	--	--	0.73 U	0.69 U	0.69 U	0.73 U	0.69 U	0.69 U	0.73 U
Silver	--	1.3 U	1.4 U	1.4 U	--	--	--	1.3 U	1.4 U	1.4 U	1.3 U	1.4 U	1.4 U	1.3 U
Sodium	--	570	623	739	--	--	--	576	617	1130	169000	1060	2910	23200
Thallium	--	0.26 U	0.24 U	0.24 U	--	--	--	0.26 U	0.24 U	0.24 U	0.26 U	0.24 U	0.24 U	0.26 U
Vanadium	--	1.9 U	1.2 U	1.2 U	--	--	--	1.9 U	1.2 U	1.2 U	1.9 U	1.2 U	1.2 U	1.9 U
Zinc	--	7 U	5.4 U	5.4 U	--	--	--	7 U	5.4 U	5.4 U	7 U	5.4 U	5.4 U	7 U
Aluminum	133	18.2 U	454	15 U	33.2 J	26.3 J	138	26.6 J	436	38.5 J	41.1	395	232	5090
Antimony	0.64 J	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U
Arsenic	0.64 U	0.64 U	0.77 U	0.77 U	0.64 U	0.64 U	0.64 U	0.64 U	0.77 U	0.77 U	0.64 U	0.77 U	0.77 U	4.4
Barium	98.6	62.8	78.8	104	190	103	94.4	63.4	78.9	185	119	80.2	113	466
Beryllium	0.24 U	0.24 U	0.26 U	0.26 U	0.24 U	0.24 U	0.24 U	0.24 U	0.26 U	0.26 U	0.24 U	0.26 U	0.26 U	0.27 J
Cadmium	0.71 U	0.71 U	0.61 U	0.61 U	0.71 U	0.71 U	0.71 U	0.71 U	0.61 U	0.61 U	0.71 U	0.61 U	0.61 U	0.71 U
Calcium	24400	17600	20200	24100	33800	25400	23900	17700	20000	34200	27700	20700	26800	78300
Chromium, Total	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	5.5
Cobalt	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	3.9 J
Copper	1.4 U	1.4 U	1.9 U	2.3 J	1.4 U	1.4 U	1.4 U	1.4 U	1.9 U	7.3	2 J	1.9 U	7.5	13.8
Iron	127	42.4 U	550	45.7 U	63.1 J	42.4 U	128	42.4 U	535	45.7 U	77.4 J	478	228	11100
Lead	0.38 U	0.38 U	0.59 J	0.37 U	0.38 U	0.38 U	0.38 U	0.38 U	0.37 U	0.37 U	0.38 U	0.37 U	0.46 J	5.6
Magnesium	6300	4670	5550	6470	9260	7090	6230	4780	5480	10000	7870	5680	7300	22100
Manganese	4.6 J	2.5 U	19.5	2.7 U	21.8	2.5 U	4.2 J	2.6 J	17.4	7.8 J	8.7	17.3	11.4	869
Mercury	0.17 U	0.17 U	0.12 U	0.12 U	0.17 U	0.17 U	0.17 U	0.17 U	0.12 U	0.12 U	0.17 U	0.12 U	0.12 U	0.17 U
Nickel	1.4 U	1.4 U	1.3 U	1.3 U	1.4 U	1.4 U	1.4 U	1.4 U	1.3 U	1.3 U	1.4 U	1.3 U	1.3 U	7.6
Potassium	378	242	402	344	439	314	367	247	396	438	439	380	434	2650
Selenium	0.73 U	0.73 U	0.69 U	0.69 U	0.73 U	0.73 U	0.73 U	0.73 U	0.69 U	0.69 U	0.73 U	0.69 U	0.69 U	0.73 U
Silver	1.3 U	1.3 U	1.4 U	1.4 U	1.3 U	1.3 U	1.3 U	1.3 U	1.4 U	1.4 U	1.3 U	1.4 U	1.4 U	1.3 U
Sodium	1080	666	773	897	1580	1100	1080	692	752	1500	3650	1220	2770	25300
Thallium	0.26 U	0.26 U	0.24 U	0.24 U	0.26 U	0.26 U	0.26 U	0.26 U	0.24 U	0.24 U	0.26 U	0.24 U	0.24 U	0.26 U
Vanadium	1.9 U	1.9 U	1.2 U	1.2 U	1.9 U	1.9 U	1.9 U	1.9 U	1.2 U	1.2 U	1.9 U	1.2 U	1.2 U	7.9
Zinc	7 U	7 U	5.4 U	5.4 U	7 U	7 U	7 U	7 U	5.4 U	5.4 U	8.5 J	5.4 U	5.4 U	36.2
SEMIVOLATILE ORGANIC COMPOUNDS (µg/L)														
1,2,4,5-Tetrachlorobenzene	--	--	--	--	--	--	--	--	--	--	0.44 U	--	--	0.43 U
1,4-Dioxane (P-Dioxane)	--	--	--	--	--	--	--	--	--	--	3.2 U	--	--	3.1 U
2,3,4,6-Tetrachlorophenol	--	--	--	--	--	--	--	--	--	--	0.7 U	--	--	0.69 U
2,4,5-Trichlorophenol	--	--	--	--	--	--	--	--	--	--	0.5 U	--	--	0.49 U
2,4,6-Trichlorophenol	--	--	--	--	--	--	--	--	--	--	0.54 U	--	--	0.53 U

Table E-31
Summary of Data Used in Risk Assessment
Flathead River Area (surface water) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSWP-008	CFSWP-008	CFSWP-008	CFSWP-008	CFSWP-017	CFSWP-017	CFSWP-017	CFSWP-017	CFSWP-017	CFSWP-017	CFSWP-026	CFSWP-026	CFSWP-026 180-82744-2, 200-45626-2, 460-166217-2	CFSWP-033
Sample Lab IDs	460-130969-3	460-135338-8	460-157849-4	460-166046-2	460-120379-5	460-124726-5	460-130969-4	460-135338-9	460-157849-5	460-166046-1	460-144086-4	460-157849-6		460-144395-3
Sample Name Chemical	CFSWP-008-SW 4/4/2017	CFSWP-008-SW 6/14/2017	CFSWP-008-SW 6/7/2018	CFSWP-008-SW 10/3/2018	CFSWP-017-SW 9/16/2016	CFSWP-017-SW 12/2/2016	CFSWP-017-SW 4/4/2017	CFSWP-017-SW 6/14/2017	CFSWP-017-SW 6/7/2018	CFSWP-017-SW 10/3/2018	CFSWP-026-SW 10/31/2017	CFSWP-026-SW 6/7/2018	CFSWP-026-SW 10/5/2018	CFSWP-033-SW 11/3/2017
2,4-Dichlorophenol	--	--	--	--	--	--	--	--	--	--	0.64 U	--	--	0.63 U
2,4-Dimethylphenol	--	--	--	--	--	--	--	--	--	--	0.93 U	--	--	0.91 U
2,4-Dinitrophenol	--	--	--	--	--	--	--	--	--	--	2.4 UJ	--	--	2.4 U
2,4-Dinitrotoluene	--	--	--	--	--	--	--	--	--	--	1.1 U	--	--	1 U
2,6-Dinitrotoluene	--	--	--	--	--	--	--	--	--	--	0.9 U	--	--	0.88 U
2-Chloronaphthalene	--	--	--	--	--	--	--	--	--	--	0.62 U	--	--	0.61 U
2-Chlorophenol	--	--	--	--	--	--	--	--	--	--	0.76 U	--	--	0.74 U
2-Methylnaphthalene	--	--	--	--	--	--	--	--	--	--	0.9 U	--	--	0.88 U
2-Methylphenol (O-Cresol)	--	--	--	--	--	--	--	--	--	--	1.3 U	--	--	1.3 U
2-Nitroaniline	--	--	--	--	--	--	--	--	--	--	0.66 U	--	--	0.65 U
2-Nitrophenol	--	--	--	--	--	--	--	--	--	--	0.6 U	--	--	0.59 U
3- And 4- Methylphenol (Total)	--	--	--	--	--	--	--	--	--	--	0.9 U	--	--	0.88 U
3,3'-Dichlorobenzidine	--	--	--	--	--	--	--	--	--	--	1.1 U	--	--	1 U
3-Nitroaniline	--	--	--	--	--	--	--	--	--	--	0.84 U	--	--	0.82 UJ
4,6-Dinitro-2-Methylphenol	--	--	--	--	--	--	--	--	--	--	2.1 U	--	--	2 U
4-Bromophenyl Phenyl Ether	--	--	--	--	--	--	--	--	--	--	1 U	--	--	1 U
4-Chloro-3-Methylphenol	--	--	--	--	--	--	--	--	--	--	0.78 U	--	--	0.76 U
4-Chloroaniline	--	--	--	--	--	--	--	--	--	--	0.74 U	--	--	0.73 UJ
4-Chlorophenyl Phenyl Ether	--	--	--	--	--	--	--	--	--	--	0.98 U	--	--	0.96 U
4-Nitroaniline	--	--	--	--	--	--	--	--	--	--	0.49 U	--	--	0.48 U
4-Nitrophenol	--	--	--	--	--	--	--	--	--	--	4.7 U	--	--	4.7 UJ
Acenaphthene	--	--	--	--	--	--	--	--	--	--	0.9 U	--	--	0.88 U
Acenaphthylene	--	--	--	--	--	--	--	--	--	--	0.66 U	--	--	0.65 U
Acetophenone	--	--	--	--	--	--	--	--	--	--	1.1 U	--	--	1 U
Anthracene	--	--	--	--	--	--	--	--	--	--	0.58 U	--	--	0.57 U
Atrazine	--	--	--	--	--	--	--	--	--	--	0.79 U	--	--	0.77 U
Benzaldehyde	--	--	--	--	--	--	--	--	--	--	0.88 U	--	--	0.86 U
Benzo(A)Anthracene	--	--	--	--	--	--	--	--	--	--	0.63 J	--	--	0.55 U
Benzo(A)Pyrene	--	--	--	--	--	--	--	--	--	--	0.25 J	--	--	0.16 U
Benzo(B)Fluoranthene	--	--	--	--	--	--	--	--	--	--	0.7 J	--	--	0.44 U
Benzo(G,H,I)Perylene	--	--	--	--	--	--	--	--	--	--	0.77 U	--	--	0.75 U
Benzo(K)Fluoranthene	--	--	--	--	--	--	--	--	--	--	0.46 J	--	--	0.18 U
Benzyl Butyl Phthalate	--	--	--	--	--	--	--	--	--	--	0.61 U	--	--	0.6 U
Biphenyl (Diphenyl)	--	--	--	--	--	--	--	--	--	--	0.64 U	--	--	0.63 U
Bis(2-Chloroethoxy) Methane	--	--	--	--	--	--	--	--	--	--	0.7 U	--	--	0.69 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	--	--	--	--	--	--	--	--	--	--	0.12 U	--	--	0.12 U
Bis(2-Chloroisopropyl) Ether	--	--	--	--	--	--	--	--	--	--	0.95 U	--	--	0.93 U
Bis(2-Ethylhexyl) Phthalate	--	--	--	--	--	--	--	--	--	--	0.73 U	--	--	0.72 U
Caprolactam	--	--	--	--	--	--	--	--	--	--	1.1 U	--	--	1.1 U
Carbazole	--	--	--	--	--	--	--	--	--	--	0.87 U	--	--	0.85 U
Chrysene	--	--	--	--	--	--	--	--	--	--	1.2 J	--	--	0.67 U
Dibenz(A,H)Anthracene	--	--	--	--	--	--	--	--	--	--	0.092 U	--	--	0.09 U
Dibenzofuran	--	--	--	--	--	--	--	--	--	--	0.87 U	--	--	0.85 U
Diethyl Phthalate	--	--	--	--	--	--	--	--	--	--	1 U	--	--	1 U
Dimethyl Phthalate	--	--	--	--	--	--	--	--	--	--	1 U	--	--	0.98 U
Di-N-Butyl Phthalate	--	--	--	--	--	--	--	--	--	--	0.84 U	--	--	0.82 U
Di-N-Octylphthalate	--	--	--	--	--	--	--	--	--	--	0.7 U	--	--	0.69 U
Fluoranthene	--	--	--	--	--	--	--	--	--	--	2.1 J	--	--	1.1 J
Fluorene	--	--	--	--	--	--	--	--	--	--	0.82 U	--	--	0.8 U
Hexachlorobenzene	--	--	--	--	--	--	--	--	--	--	0.48 U	--	--	0.47 U
Hexachlorobutadiene	--	--	--	--	--	--	--	--	--	--	0.78 U	--	--	0.76 U
Hexachlorocyclopentadiene	--	--	--	--	--	--	--	--	--	--	0.62 UJ	--	--	0.61 UJ
Hexachloroethane	--	--	--	--	--	--	--	--	--	--	0.092 U	--	--	0.09 U
Indeno(1,2,3-C,D)Pyrene	--	--	--	--	--	--	--	--	--	--	0.21 U	--	--	0.21 U
Isophorone	--	--	--	--	--	--	--	--	--	--	0.68 U	--	--	0.67 U
Naphthalene	--	--	--	--	--	--	--	--	--	--	0.82 U	--	--	0.8 U
Nitrobenzene	--	--	--	--	--	--	--	--	--	--	0.5 U	--	--	0.49 U
N-Nitrosodi-N-Propylamine	--	--	--	--	--	--	--	--	--	--	0.85 UJ	--	--	0.83 U
N-Nitrosodiphenylamine	--	--	--	--	--	--	--	--	--	--	0.76 U	--	--	0.74 U

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Columbia Falls, Montana

Sample Location ID	CFSWP-008	CFSWP-008	CFSWP-008	CFSWP-008	CFSWP-017	CFSWP-017	CFSWP-017	CFSWP-017	CFSWP-017	CFSWP-017	CFSWP-026	CFSWP-026	CFSWP-026 180-82744-2, 200-45626-2, 460-166217-2	CFSWP-033
Sample Lab IDs	460-130969-3	460-135338-8	460-157849-4	460-166046-2	460-120379-5	460-124726-5	460-130969-4	460-135338-9	460-157849-5	460-166046-1	460-144086-4	460-157849-6		460-144395-3
Sample Name Chemical	CFSWP-008-SW 4/4/2017	CFSWP-008-SW 6/14/2017	CFSWP-008-SW 6/7/2018	CFSWP-008-SW 10/3/2018	CFSWP-017-SW 9/16/2016	CFSWP-017-SW 12/2/2016	CFSWP-017-SW 4/4/2017	CFSWP-017-SW 6/14/2017	CFSWP-017-SW 6/7/2018	CFSWP-017-SW 10/3/2018	CFSWP-026-SW 10/31/2017	CFSWP-026-SW 6/7/2018	CFSWP-026-SW 10/5/2018	CFSWP-033-SW 11/3/2017
Pentachlorophenol	--	--	--	--	--	--	--	--	--	--	2.2 U	--	--	2.2 U
Phenanthrene	--	--	--	--	--	--	--	--	--	--	1.2 J	--	--	0.65 U
Phenol	--	--	--	--	--	--	--	--	--	--	0.42 U	--	--	0.41 U
Pyrene	--	--	--	--	--	--	--	--	--	--	1.6 J	--	--	0.83 U
SEMIVOLATILE ORGANIC COMPOUNDS|LOW LEVEL (µg/L)														
1,2,4,5-Tetrachlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	0.048 U	--
1,4-Dioxane (P-Dioxane)	--	--	--	--	--	--	--	--	--	--	--	--	0.18 U	--
2,3,4,6-Tetrachlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	0.042 U	--
2,4,5-Trichlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	0.056 U	--
2,4,6-Trichlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	0.063 U	--
2,4-Dichlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	0.047 U	--
2,4-Dimethylphenol	--	--	--	--	--	--	--	--	--	--	--	--	0.038 U	--
2,4-Dinitrophenol	--	--	--	--	--	--	--	--	--	--	--	--	1.4 U	--
2,4-Dinitrotoluene	--	--	--	--	--	--	--	--	--	--	--	--	0.047 U	--
2,6-Dinitrotoluene	--	--	--	--	--	--	--	--	--	--	--	--	0.056 U	--
2-Chloronaphthalene	--	--	--	--	--	--	--	--	--	--	--	--	0.055 U	--
2-Chlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	0.059 U	--
2-Methylnaphthalene	--	--	--	--	--	--	--	--	--	--	--	--	0.057 U	--
2-Methylphenol (O-Cresol)	--	--	--	--	--	--	--	--	--	--	--	--	0.1 U	--
2-Nitroaniline	--	--	--	--	--	--	--	--	--	--	--	--	0.19 U	--
2-Nitrophenol	--	--	--	--	--	--	--	--	--	--	--	--	0.056 U	--
3,3'-Dichlorobenzidine	--	--	--	--	--	--	--	--	--	--	--	--	0.54 U	--
3-Nitroaniline	--	--	--	--	--	--	--	--	--	--	--	--	0.062 U	--
4,6-Dinitro-2-Methylphenol	--	--	--	--	--	--	--	--	--	--	--	--	1.4 U	--
4-Bromophenyl Phenyl Ether	--	--	--	--	--	--	--	--	--	--	--	--	0.058 U	--
4-Chloro-3-Methylphenol	--	--	--	--	--	--	--	--	--	--	--	--	0.056 U	--
4-Chloroaniline	--	--	--	--	--	--	--	--	--	--	--	--	0.041 U	--
4-Chlorophenyl Phenyl Ether	--	--	--	--	--	--	--	--	--	--	--	--	0.056 U	--
4-Nitroaniline	--	--	--	--	--	--	--	--	--	--	--	--	0.054 U	--
4-Nitrophenol	--	--	--	--	--	--	--	--	--	--	--	--	0.13 U	--
Acenaphthene	--	--	--	--	--	--	--	--	--	--	--	--	0.06 U	--
Acenaphthylene	--	--	--	--	--	--	--	--	--	--	--	--	0.06 U	--
Acetophenone	--	--	--	--	--	--	--	--	--	--	--	--	0.057 U	--
Anthracene	--	--	--	--	--	--	--	--	--	--	--	--	0.045 U	--
Atrazine	--	--	--	--	--	--	--	--	--	--	--	--	0.17 U	--
Benzaldehyde	--	--	--	--	--	--	--	--	--	--	--	--	0.1 U	--
Benzo(A)Anthracene	--	--	--	--	--	--	--	--	--	--	--	--	0.076 J	--
Benzo(A)Pyrene	--	--	--	--	--	--	--	--	--	--	--	--	0.049 U	--
Benzo(B)Fluoranthene	--	--	--	--	--	--	--	--	--	--	--	--	0.12 J	--
Benzo(G,H,I)Perylene	--	--	--	--	--	--	--	--	--	--	--	--	0.064 U	--
Benzo(K)Fluoranthene	--	--	--	--	--	--	--	--	--	--	--	--	0.081 U	--
Benzyl Butyl Phthalate	--	--	--	--	--	--	--	--	--	--	--	--	0.56 J	--
Biphenyl (Diphenyl)	--	--	--	--	--	--	--	--	--	--	--	--	0.055 U	--
Bis(2-Chloroethoxy) Methane	--	--	--	--	--	--	--	--	--	--	--	--	0.062 U	--
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	--	--	--	--	--	--	--	--	--	--	--	--	0.037 U	--
Bis(2-Chloroisopropyl) Ether	--	--	--	--	--	--	--	--	--	--	--	--	0.054 U	--
Bis(2-Ethylhexyl) Phthalate	--	--	--	--	--	--	--	--	--	--	--	--	4.3 U	--
Caprolactam	--	--	--	--	--	--	--	--	--	--	--	--	0.8 J	--
Carbazole	--	--	--	--	--	--	--	--	--	--	--	--	0.047 U	--
Chrysene	--	--	--	--	--	--	--	--	--	--	--	--	0.16 J	--
Dibenz(A,H)Anthracene	--	--	--	--	--	--	--	--	--	--	--	--	0.067 U	--
Dibenzofuran	--	--	--	--	--	--	--	--	--	--	--	--	0.068 U	--
Diethyl Phthalate	--	--	--	--	--	--	--	--	--	--	--	--	0.53 U	--
Dimethyl Phthalate	--	--	--	--	--	--	--	--	--	--	--	--	0.052 U	--
Di-N-Butyl Phthalate	--	--	--	--	--	--	--	--	--	--	--	--	0.69 U	--
Di-N-Octylphthalate	--	--	--	--	--	--	--	--	--	--	--	--	0.63 U	--
Fluoranthene	--	--	--	--	--	--	--	--	--	--	--	--	0.2	--
Fluorene	--	--	--	--	--	--	--	--	--	--	--	--	0.064 U	--
Hexachlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	0.052 U	--

Table E-31
Summary of Data Used in Risk Assessment
Flathead River Area (surface water) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSWP-008	CFSWP-008	CFSWP-008	CFSWP-008	CFSWP-017	CFSWP-017	CFSWP-017	CFSWP-017	CFSWP-017	CFSWP-017	CFSWP-026	CFSWP-026	CFSWP-026 180-82744-2, 200-45626-2, 460-166217-2	CFSWP-033
Sample Lab IDs	460-130969-3	460-135338-8	460-157849-4	460-166046-2	460-120379-5	460-124726-5	460-130969-4	460-135338-9	460-157849-5	460-166046-1	460-144086-4	460-157849-6		460-144395-3
Sample Name Chemical	CFSWP-008-SW 4/4/2017	CFSWP-008-SW 6/14/2017	CFSWP-008-SW 6/7/2018	CFSWP-008-SW 10/3/2018	CFSWP-017-SW 9/16/2016	CFSWP-017-SW 12/2/2016	CFSWP-017-SW 4/4/2017	CFSWP-017-SW 6/14/2017	CFSWP-017-SW 6/7/2018	CFSWP-017-SW 10/3/2018	CFSWP-026-SW 10/31/2017	CFSWP-026-SW 6/7/2018	CFSWP-026-SW 10/5/2018	CFSWP-033-SW 11/3/2017
Hexachlorobutadiene	--	--	--	--	--	--	--	--	--	--	--	--	0.064 U	--
Hexachlorocyclopentadiene	--	--	--	--	--	--	--	--	--	--	--	--	0.46 U	--
Hexachloroethane	--	--	--	--	--	--	--	--	--	--	--	--	0.057 U	--
Indeno(1,2,3-C,D)Pyrene	--	--	--	--	--	--	--	--	--	--	--	--	0.079 U	--
Isophorone	--	--	--	--	--	--	--	--	--	--	--	--	0.05 U	--
Naphthalene	--	--	--	--	--	--	--	--	--	--	--	--	0.055 U	--
Nitrobenzene	--	--	--	--	--	--	--	--	--	--	--	--	0.15 U	--
N-Nitrosodi-N-Propylamine	--	--	--	--	--	--	--	--	--	--	--	--	0.066 U	--
N-Nitrosodiphenylamine	--	--	--	--	--	--	--	--	--	--	--	--	0.11 U	--
Pentachlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	0.22 U	--
Phenanthrene	--	--	--	--	--	--	--	--	--	--	--	--	0.065 J	--
Phenol	--	--	--	--	--	--	--	--	--	--	--	--	0.091 U	--
Pyrene	--	--	--	--	--	--	--	--	--	--	--	--	0.16 J	--
SEMIVOLATILE ORGANIC COMPOUNDS-SIM (µg/L)														
Acenaphthene	--	--	--	--	--	--	--	--	--	--	--	--	0.0048 UJ	--
Acenaphthylene	--	--	--	--	--	--	--	--	--	--	--	--	0.0047 UJ	--
Anthracene	--	--	--	--	--	--	--	--	--	--	--	--	0.0074 J	--
Benzo(A)Anthracene	--	--	--	--	--	--	--	--	--	--	--	--	0.071	--
Benzo(A)Pyrene	--	--	--	--	--	--	--	--	--	--	--	--	0.041	--
Benzo(B)Fluoranthene	--	--	--	--	--	--	--	--	--	--	--	--	0.1	--
Benzo(G,H,I)Perylene	--	--	--	--	--	--	--	--	--	--	--	--	0.044	--
Benzo(K)Fluoranthene	--	--	--	--	--	--	--	--	--	--	--	--	0.095	--
Benzo[E]Pyrene	--	--	--	--	--	--	--	--	--	--	--	--	0.065	--
C1-Chrysenes	--	--	--	--	--	--	--	--	--	--	--	--	0.028 J	--
C1-Fluoranthenes/Pyrenes	--	--	--	--	--	--	--	--	--	--	--	--	0.063 J	--
C1-Fluorenes	--	--	--	--	--	--	--	--	--	--	--	--	0.019 U	--
C1-Naphthalenes	--	--	--	--	--	--	--	--	--	--	--	--	0.019 U	--
C1-Phenanthrenes/Anthracenes	--	--	--	--	--	--	--	--	--	--	--	--	0.019 U	--
C2-Chrysenes	--	--	--	--	--	--	--	--	--	--	--	--	0.019 U	--
C2-Fluorenes	--	--	--	--	--	--	--	--	--	--	--	--	0.019 U	--
C2-Naphthalenes	--	--	--	--	--	--	--	--	--	--	--	--	0.019 U	--
C2-Phenanthrenes/Anthracenes	--	--	--	--	--	--	--	--	--	--	--	--	0.019 U	--
C3-Chrysenes	--	--	--	--	--	--	--	--	--	--	--	--	0.019 U	--
C3-Fluorenes	--	--	--	--	--	--	--	--	--	--	--	--	0.019 U	--
C3-Naphthalenes	--	--	--	--	--	--	--	--	--	--	--	--	0.019 U	--
C3-Phenanthrenes/Anthracenes	--	--	--	--	--	--	--	--	--	--	--	--	0.019 U	--
C4 Chrysenes	--	--	--	--	--	--	--	--	--	--	--	--	0.019 U	--
C4-Naphthalenes	--	--	--	--	--	--	--	--	--	--	--	--	0.019 U	--
C4-Phenanthrenes/Anthracenes	--	--	--	--	--	--	--	--	--	--	--	--	0.019 U	--
Chrysene	--	--	--	--	--	--	--	--	--	--	--	--	0.18	--
Dibenz(A,H)Anthracene	--	--	--	--	--	--	--	--	--	--	--	--	0.015 J	--
Fluoranthene	--	--	--	--	--	--	--	--	--	--	--	--	0.2 J+	--
Fluorene	--	--	--	--	--	--	--	--	--	--	--	--	0.0055 UJ	--
Indeno(1,2,3-C,D)Pyrene	--	--	--	--	--	--	--	--	--	--	--	--	0.04	--
Naphthalene	--	--	--	--	--	--	--	--	--	--	--	--	0.0035 UJ	--
Perylene	--	--	--	--	--	--	--	--	--	--	--	--	0.011 J	--
Phenanthrene	--	--	--	--	--	--	--	--	--	--	--	--	0.024 J-	--
Pyrene	--	--	--	--	--	--	--	--	--	--	--	--	0.18	--
VOLATILE ORGANIC COMPOUNDS (µg/L)														
1,1,1-Trichloroethane	--	--	--	--	--	--	--	--	--	--	0.28 U	--	--	0.28 U
1,1,2,2-Tetrachloroethane	--	--	--	--	--	--	--	--	--	--	0.19 U	--	--	0.19 U
1,1,2-Trichloro-1,2,2-Trifluoroethane	--	--	--	--	--	--	--	--	--	--	0.34 U	--	--	0.34 U
1,1,2-Trichloroethane	--	--	--	--	--	--	--	--	--	--	0.08 U	--	--	0.08 U
1,1-Dichloroethane	--	--	--	--	--	--	--	--	--	--	0.24 U	--	--	0.24 U
1,1-Dichloroethene	--	--	--	--	--	--	--	--	--	--	0.34 U	--	--	0.34 U
1,2,3-Trichlorobenzene	--	--	--	--	--	--	--	--	--	--	0.35 U	--	--	0.35 U
1,2,4-Trichlorobenzene	--	--	--	--	--	--	--	--	--	--	0.27 U	--	--	0.27 U
1,2-Dibromo-3-Chloropropane	--	--	--	--	--	--	--	--	--	--	0.23 U	--	--	0.23 U
1,2-Dibromoethane (Ethylene Dibromide)	--	--	--	--	--	--	--	--	--	--	0.19 U	--	--	0.19 U

Table E-31
Summary of Data Used in Risk Assessment
Flathead River Area (surface water) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSWP-008	CFSWP-008	CFSWP-008	CFSWP-008	CFSWP-017	CFSWP-017	CFSWP-017	CFSWP-017	CFSWP-017	CFSWP-017	CFSWP-026	CFSWP-026	CFSWP-026 180-82744-2, 200-45626-2, 460-166217-2	CFSWP-033
Sample Lab IDs	460-130969-3	460-135338-8	460-157849-4	460-166046-2	460-120379-5	460-124726-5	460-130969-4	460-135338-9	460-157849-5	460-166046-1	460-144086-4	460-157849-6		460-144395-3
Sample Name Chemical	CFSWP-008-SW 4/4/2017	CFSWP-008-SW 6/14/2017	CFSWP-008-SW 6/7/2018	CFSWP-008-SW 10/3/2018	CFSWP-017-SW 9/16/2016	CFSWP-017-SW 12/2/2016	CFSWP-017-SW 4/4/2017	CFSWP-017-SW 6/14/2017	CFSWP-017-SW 6/7/2018	CFSWP-017-SW 10/3/2018	CFSWP-026-SW 10/31/2017	CFSWP-026-SW 6/7/2018	CFSWP-026-SW 10/5/2018	CFSWP-033-SW 11/3/2017
1,2-Dichlorobenzene	--	--	--	--	--	--	--	--	--	--	0.22 U	--	--	0.22 U
1,2-Dichloroethane	--	--	--	--	--	--	--	--	--	--	0.25 U	--	--	0.25 U
1,2-Dichloropropane	--	--	--	--	--	--	--	--	--	--	0.18 U	--	--	0.18 U
1,3-Dichlorobenzene	--	--	--	--	--	--	--	--	--	--	0.33 U	--	--	0.33 U
1,4-Dichlorobenzene	--	--	--	--	--	--	--	--	--	--	0.33 U	--	--	0.33 U
2-Hexanone	--	--	--	--	--	--	--	--	--	--	0.72 U	--	--	0.72 U
Acetone	--	--	--	--	--	--	--	--	--	--	1.1 U	--	--	1.1 U
Benzene	--	--	--	--	--	--	--	--	--	--	0.09 U	--	--	0.09 U
Bromochloromethane	--	--	--	--	--	--	--	--	--	--	0.3 U	--	--	0.3 U
Bromodichloromethane	--	--	--	--	--	--	--	--	--	--	0.15 U	--	--	0.15 U
Bromoform	--	--	--	--	--	--	--	--	--	--	0.18 UJ	--	--	0.18 U
Bromomethane	--	--	--	--	--	--	--	--	--	--	0.18 U	--	--	0.18 UJ
Carbon Disulfide	--	--	--	--	--	--	--	--	--	--	0.22 UJ	--	--	0.22 U
Carbon Tetrachloride	--	--	--	--	--	--	--	--	--	--	0.33 U	--	--	0.33 U
Chlorobenzene	--	--	--	--	--	--	--	--	--	--	0.24 U	--	--	0.24 U
Chloroethane	--	--	--	--	--	--	--	--	--	--	0.37 U	--	--	0.37 U
Chloroform	--	--	--	--	--	--	--	--	--	--	0.22 U	--	--	0.22 U
Chloromethane	--	--	--	--	--	--	--	--	--	--	0.22 U	--	--	0.22 U
Cis-1,2-Dichloroethylene	--	--	--	--	--	--	--	--	--	--	0.26 U	--	--	0.26 U
Cis-1,3-Dichloropropene	--	--	--	--	--	--	--	--	--	--	0.16 U	--	--	0.16 U
Cyclohexane	--	--	--	--	--	--	--	--	--	--	0.26 U	--	--	0.26 U
Dibromochloromethane	--	--	--	--	--	--	--	--	--	--	0.22 U	--	--	0.22 U
Dichlorodifluoromethane	--	--	--	--	--	--	--	--	--	--	0.14 U	--	--	0.14 UJ
Ethylbenzene	--	--	--	--	--	--	--	--	--	--	0.3 U	--	--	0.3 U
Isopropylbenzene (Cumene)	--	--	--	--	--	--	--	--	--	--	0.32 U	--	--	0.32 U
M,P-Xylene	--	--	--	--	--	--	--	--	--	--	0.28 U	--	--	0.28 U
Methyl Acetate	--	--	--	--	--	--	--	--	--	--	0.58 U	--	--	0.58 U
Methyl Ethyl Ketone (2-Butanone)	--	--	--	--	--	--	--	--	--	--	2.2 U	--	--	2.2 U
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	--	--	--	--	--	--	--	--	--	--	0.63 U	--	--	0.63 U
Methylcyclohexane	--	--	--	--	--	--	--	--	--	--	0.22 U	--	--	0.22 U
Methylene Chloride	--	--	--	--	--	--	--	--	--	--	0.21 U	--	--	0.21 U
O-Xylene (1,2-Dimethylbenzene)	--	--	--	--	--	--	--	--	--	--	0.32 U	--	--	0.32 U
Styrene	--	--	--	--	--	--	--	--	--	--	0.17 U	--	--	0.17 U
Tert-Butyl Methyl Ether	--	--	--	--	--	--	--	--	--	--	0.13 U	--	--	0.13 U
Tetrachloroethylene (PCE)	--	--	--	--	--	--	--	--	--	--	0.12 U	--	--	0.12 U
Toluene	--	--	--	--	--	--	--	--	--	--	0.25 U	--	--	0.25 U
Trans-1,2-Dichloroethene	--	--	--	--	--	--	--	--	--	--	0.18 U	--	--	0.18 U
Trans-1,3-Dichloropropene	--	--	--	--	--	--	--	--	--	--	0.19 U	--	--	0.19 U
Trichloroethylene (TCE)	--	--	--	--	--	--	--	--	--	--	0.22 U	--	--	0.22 U
Trichlorofluoromethane	--	--	--	--	--	--	--	--	--	--	0.15 U	--	--	0.15 U
Vinyl Chloride	--	--	--	--	--	--	--	--	--	--	0.06 U	--	--	0.06 U

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-31
Summary of Data Used in Risk Assessment
Flathead River Area (surface water) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSWP-033	CFSWP-033	CFSWP-034	CFSWP-034	CFSWP-035	CFSWP-035	CFSWP-036	CFSWP-036	CFSWP-037	CFSWP-037	CFSWP-038	CFSWP-038
Sample Lab IDs	460-159043-6	460-167097-3	460-157849-7	460-166217-5	460-157849-8	180-82744-3, 200-45626-3, 460-166217-3	460-157703-9	460-166152-2	460-157703-10	460-166046-5	460-157849-9	460-166046-3
Sample Name Chemical	CFSWP-033-SW 6/22/2018	CFSWP-033-SW 10/17/2018	CFSWP-034-SW 6/7/2018	CFSWP-034-SW 10/5/2018	CFSWP-035-SW 6/7/2018	CFSWP-035-SW 10/5/2018	CFSWP-036-SW 6/6/2018	CFSWP-036-SW 10/4/2018	CFSWP-037-SW 6/6/2018	CFSWP-037-SW 10/3/2018	CFSWP-038-SW 6/7/2018	CFSWP-038-SW 10/3/2018
GENERAL CHEMISTRY (µg/L)												
Fluoride	--	--	--	--	--	--	--	--	--	--	--	--
Cyanide	--	--	--	--	--	--	--	--	--	--	--	--
Cyanide (Free)	--	--	--	--	--	--	--	--	--	--	--	--
Cyanide	285	--	2 U	--	2 U	--	2 UJ	--	2 UJ	--	2 U	--
Cyanide (Free)	56.4 J-	3.7 J	1.5 J-	1.5 U	1.5 UJ	1.5 U	1.8 J	1.5 U	1.5 J	1.5 U	1.5 UJ	1.5 U
METALS (µg/L)												
Aluminum	15 U	242	15 U	15 U	44.8	15 U	23.1 J	15 U	15 U	15 U	15 U	15 U
Antimony	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U
Arsenic	0.77 U	3.2	0.77 U	0.77 U	0.77 U	0.77 U	0.77 U	0.77 U	0.77 U	0.77 U	0.77 U	0.77 U
Barium	220	288	67.3	101	73.5	103	67.6	101	65.7	84.8	67.2	88.5
Beryllium	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U
Cadmium	0.61 U	0.61 U	0.61 U	0.61 U	0.61 U	0.61 U	0.61 U	0.61 U	0.61 U	0.61 U	0.61 U	0.61 U
Calcium	56000	63200	18900	24100	19600	24400	18300	23400	17800	20900 J	18400	22000 J
Chromium, Total	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
Cobalt	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
Copper	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U
Iron	48.7 J	1660	45.7 U	45.7 U	45.7 U	45.7 U	45.7 U	45.7 U	45.7 U	45.7 U	45.7 U	45.7 U
Lead	0.37 U	0.43 J	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U
Magnesium	14800	24600	4530	6210	4730	6370	4410	6140	4310	5060	4430	5490
Manganese	86	1260	2.7 U	2.7 U	6.4 J	2.7 U	2.7 U	2.7 U	2.7 U	2.7 U	2.7 U	2.7 U
Mercury	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U
Nickel	1.3 U	1.3 J	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
Potassium	858	5490	268	341	286	343	292	365	285	280	279	310
Selenium	0.69 U	0.69 U	0.69 U	0.69 U	0.69 U	0.69 U	0.69 U	0.69 U	0.69 U	0.69 U	0.69 U	0.69 U
Silver	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U
Sodium	27800	32200	622	871	715	892	604	959	554	653	601	721
Thallium	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U
Vanadium	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U
Zinc	5.4 U	5.4 U	5.4 U	5.9 J	5.4 U	5.4 U	5.4 U	5.4 U	5.4 U	5.4 U	5.4 U	5.4 U
Aluminum	444	66	363	23 J	331	31.2 J	539	39.8 J	349 J+	17.5 J	359	15 U
Antimony	0.62 U	0.78 J	0.62 U	0.64 J	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U
Arsenic	0.77 U	4.9	0.77 U	0.77 U	0.77 U	0.77 U	0.77 U	0.77 U	0.77 U	0.77 U	0.77 U	0.77 U
Barium	241	283	78.9	103	76.1	103	80.8	102	75.3	104	75	111
Beryllium	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U
Cadmium	0.61 U	0.61 U	0.61 U	0.61 U	0.61 U	0.61 U	0.61 U	0.61 U	0.61 U	0.61 U	0.61 U	0.61 U
Calcium	62800	61900	20100	25300	20100	23900	20900	24200	19900	24200	19400	24900
Chromium, Total	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
Cobalt	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
Copper	2.4 J	3.8 J	1.9 U	7.5	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U
Iron	841	2860	434	45.7 U	357	45.7 U	703	45.7 U	396	45.7 U	405	45.7 U
Lead	0.37 J	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U	0.43 J	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U
Magnesium	18300	24200	5440	6800	5430	6510	5760	6520	5440	6370	5260	6540
Manganese	83.2	1140	14.7	2.7 U	12.8	2.7 U	21.5	2.7 U	13.4	2.7 U	12.7	2.7 U
Mercury	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U
Nickel	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
Potassium	1160	5270	379	352	362	352	434	371	371	354	364	365
Selenium	0.69 U	0.69 U	0.69 U	0.69 U	0.69 U	0.69 U	0.69 U	0.69 U	0.69 U	0.69 U	0.69 U	0.69 U
Silver	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U
Sodium	37800	32700	790	1030	860	894	803	937	753 J+	888	741	900
Thallium	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U
Vanadium	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U
Zinc	5.4 U	5.4 U	5.4 U	5.4 U	5.4 U	5.4 U	5.4 U	5.4 U	5.4 U	5.4 U	5.4 U	5.4 U
SEMIVOLATILE ORGANIC COMPOUNDS (µg/L)												
1,2,4,5-Tetrachlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--
1,4-Dioxane (P-Dioxane)	--	--	--	--	--	--	--	--	--	--	--	--
2,3,4,6-Tetrachlorophenol	--	--	--	--	--	--	--	--	--	--	--	--
2,4,5-Trichlorophenol	--	--	--	--	--	--	--	--	--	--	--	--
2,4,6-Trichlorophenol	--	--	--	--	--	--	--	--	--	--	--	--

Table E-31
Summary of Data Used in Risk Assessment
Flathead River Area (surface water) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSWP-033	CFSWP-033	CFSWP-034	CFSWP-034	CFSWP-035	CFSWP-035	CFSWP-036	CFSWP-036	CFSWP-037	CFSWP-037	CFSWP-038	CFSWP-038
Sample Lab IDs	460-159043-6	460-167097-3	460-157849-7	460-166217-5	460-157849-8	180-82744-3, 200-45626-3, 460-166217-3	460-157703-9	460-166152-2	460-157703-10	460-166046-5	460-157849-9	460-166046-3
Sample Name Chemical	CFSWP-033-SW 6/22/2018	CFSWP-033-SW 10/17/2018	CFSWP-034-SW 6/7/2018	CFSWP-034-SW 10/5/2018	CFSWP-035-SW 6/7/2018	CFSWP-035-SW 10/5/2018	CFSWP-036-SW 6/6/2018	CFSWP-036-SW 10/4/2018	CFSWP-037-SW 6/6/2018	CFSWP-037-SW 10/3/2018	CFSWP-038-SW 6/7/2018	CFSWP-038-SW 10/3/2018
2,4-Dichlorophenol	--	--	--	--	--	--	--	--	--	--	--	--
2,4-Dimethylphenol	--	--	--	--	--	--	--	--	--	--	--	--
2,4-Dinitrophenol	--	--	--	--	--	--	--	--	--	--	--	--
2,4-Dinitrotoluene	--	--	--	--	--	--	--	--	--	--	--	--
2,6-Dinitrotoluene	--	--	--	--	--	--	--	--	--	--	--	--
2-Chloronaphthalene	--	--	--	--	--	--	--	--	--	--	--	--
2-Chlorophenol	--	--	--	--	--	--	--	--	--	--	--	--
2-Methylnaphthalene	--	--	--	--	--	--	--	--	--	--	--	--
2-Methylphenol (O-Cresol)	--	--	--	--	--	--	--	--	--	--	--	--
2-Nitroaniline	--	--	--	--	--	--	--	--	--	--	--	--
2-Nitrophenol	--	--	--	--	--	--	--	--	--	--	--	--
3- And 4- Methylphenol (Total)	--	--	--	--	--	--	--	--	--	--	--	--
3,3'-Dichlorobenzidine	--	--	--	--	--	--	--	--	--	--	--	--
3-Nitroaniline	--	--	--	--	--	--	--	--	--	--	--	--
4,6-Dinitro-2-Methylphenol	--	--	--	--	--	--	--	--	--	--	--	--
4-Bromophenyl Phenyl Ether	--	--	--	--	--	--	--	--	--	--	--	--
4-Chloro-3-Methylphenol	--	--	--	--	--	--	--	--	--	--	--	--
4-Chloroaniline	--	--	--	--	--	--	--	--	--	--	--	--
4-Chlorophenyl Phenyl Ether	--	--	--	--	--	--	--	--	--	--	--	--
4-Nitroaniline	--	--	--	--	--	--	--	--	--	--	--	--
4-Nitrophenol	--	--	--	--	--	--	--	--	--	--	--	--
Acenaphthene	--	--	--	--	--	--	--	--	--	--	--	--
Acenaphthylene	--	--	--	--	--	--	--	--	--	--	--	--
Acetophenone	--	--	--	--	--	--	--	--	--	--	--	--
Anthracene	--	--	--	--	--	--	--	--	--	--	--	--
Atrazine	--	--	--	--	--	--	--	--	--	--	--	--
Benzaldehyde	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(A)Anthracene	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(A)Pyrene	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(B)Fluoranthene	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(G,H,I)Perylene	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(K)Fluoranthene	--	--	--	--	--	--	--	--	--	--	--	--
Benzyl Butyl Phthalate	--	--	--	--	--	--	--	--	--	--	--	--
Biphenyl (Diphenyl)	--	--	--	--	--	--	--	--	--	--	--	--
Bis(2-Chloroethoxy) Methane	--	--	--	--	--	--	--	--	--	--	--	--
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	--	--	--	--	--	--	--	--	--	--	--	--
Bis(2-Chloroisopropyl) Ether	--	--	--	--	--	--	--	--	--	--	--	--
Bis(2-Ethylhexyl) Phthalate	--	--	--	--	--	--	--	--	--	--	--	--
Caprolactam	--	--	--	--	--	--	--	--	--	--	--	--
Carbazole	--	--	--	--	--	--	--	--	--	--	--	--
Chrysene	--	--	--	--	--	--	--	--	--	--	--	--
Dibenz(A,H)Anthracene	--	--	--	--	--	--	--	--	--	--	--	--
Dibenzofuran	--	--	--	--	--	--	--	--	--	--	--	--
Diethyl Phthalate	--	--	--	--	--	--	--	--	--	--	--	--
Dimethyl Phthalate	--	--	--	--	--	--	--	--	--	--	--	--
Di-N-Butyl Phthalate	--	--	--	--	--	--	--	--	--	--	--	--
Di-N-Octylphthalate	--	--	--	--	--	--	--	--	--	--	--	--
Fluoranthene	--	--	--	--	--	--	--	--	--	--	--	--
Fluorene	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorobutadiene	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorocyclopentadiene	--	--	--	--	--	--	--	--	--	--	--	--
Hexachloroethane	--	--	--	--	--	--	--	--	--	--	--	--
Indeno(1,2,3-C,D)Pyrene	--	--	--	--	--	--	--	--	--	--	--	--
Isophorone	--	--	--	--	--	--	--	--	--	--	--	--
Naphthalene	--	--	--	--	--	--	--	--	--	--	--	--
Nitrobenzene	--	--	--	--	--	--	--	--	--	--	--	--
N-Nitrosodi-N-Propylamine	--	--	--	--	--	--	--	--	--	--	--	--
N-Nitrosodiphenylamine	--	--	--	--	--	--	--	--	--	--	--	--

Table E-31
Summary of Data Used in Risk Assessment
Flathead River Area (surface water) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSWP-033	CFSWP-033	CFSWP-034	CFSWP-034	CFSWP-035	CFSWP-035	CFSWP-036	CFSWP-036	CFSWP-037	CFSWP-037	CFSWP-038	CFSWP-038
Sample Lab IDs	460-159043-6	460-167097-3	460-157849-7	460-166217-5	460-157849-8	180-82744-3, 200-45626-3, 460-166217-3	460-157703-9	460-166152-2	460-157703-10	460-166046-5	460-157849-9	460-166046-3
Sample Name Chemical	CFSWP-033-SW 6/22/2018	CFSWP-033-SW 10/17/2018	CFSWP-034-SW 6/7/2018	CFSWP-034-SW 10/5/2018	CFSWP-035-SW 6/7/2018	CFSWP-035-SW 10/5/2018	CFSWP-036-SW 6/6/2018	CFSWP-036-SW 10/4/2018	CFSWP-037-SW 6/6/2018	CFSWP-037-SW 10/3/2018	CFSWP-038-SW 6/7/2018	CFSWP-038-SW 10/3/2018
Pentachlorophenol	--	--	--	--	--	--	--	--	--	--	--	--
Phenanthrene	--	--	--	--	--	--	--	--	--	--	--	--
Phenol	--	--	--	--	--	--	--	--	--	--	--	--
Pyrene	--	--	--	--	--	--	--	--	--	--	--	--
SEMIVOLATILE ORGANIC COMPOUNDS|LOW LEVEL (µg/L)												
1,2,4,5-Tetrachlorobenzene	--	--	--	--	--	0.048 U	--	--	--	--	--	--
1,4-Dioxane (P-Dioxane)	--	--	--	--	--	0.18 U	--	--	--	--	--	--
2,3,4,6-Tetrachlorophenol	--	--	--	--	--	0.042 U	--	--	--	--	--	--
2,4,5-Trichlorophenol	--	--	--	--	--	0.056 U	--	--	--	--	--	--
2,4,6-Trichlorophenol	--	--	--	--	--	0.063 U	--	--	--	--	--	--
2,4-Dichlorophenol	--	--	--	--	--	0.047 U	--	--	--	--	--	--
2,4-Dimethylphenol	--	--	--	--	--	0.038 U	--	--	--	--	--	--
2,4-Dinitrophenol	--	--	--	--	--	1.4 U	--	--	--	--	--	--
2,4-Dinitrotoluene	--	--	--	--	--	0.047 U	--	--	--	--	--	--
2,6-Dinitrotoluene	--	--	--	--	--	0.056 U	--	--	--	--	--	--
2-Chloronaphthalene	--	--	--	--	--	0.055 U	--	--	--	--	--	--
2-Chlorophenol	--	--	--	--	--	0.059 U	--	--	--	--	--	--
2-Methylnaphthalene	--	--	--	--	--	0.057 U	--	--	--	--	--	--
2-Methylphenol (O-Cresol)	--	--	--	--	--	0.1 U	--	--	--	--	--	--
2-Nitroaniline	--	--	--	--	--	0.19 U	--	--	--	--	--	--
2-Nitrophenol	--	--	--	--	--	0.056 U	--	--	--	--	--	--
3,3'-Dichlorobenzidine	--	--	--	--	--	0.54 U	--	--	--	--	--	--
3-Nitroaniline	--	--	--	--	--	0.062 U	--	--	--	--	--	--
4,6-Dinitro-2-Methylphenol	--	--	--	--	--	1.4 U	--	--	--	--	--	--
4-Bromophenyl Phenyl Ether	--	--	--	--	--	0.058 U	--	--	--	--	--	--
4-Chloro-3-Methylphenol	--	--	--	--	--	0.056 U	--	--	--	--	--	--
4-Chloroaniline	--	--	--	--	--	0.041 U	--	--	--	--	--	--
4-Chlorophenyl Phenyl Ether	--	--	--	--	--	0.056 U	--	--	--	--	--	--
4-Nitroaniline	--	--	--	--	--	0.054 U	--	--	--	--	--	--
4-Nitrophenol	--	--	--	--	--	0.13 U	--	--	--	--	--	--
Acenaphthene	--	--	--	--	--	0.06 U	--	--	--	--	--	--
Acenaphthylene	--	--	--	--	--	0.06 U	--	--	--	--	--	--
Acetophenone	--	--	--	--	--	0.057 U	--	--	--	--	--	--
Anthracene	--	--	--	--	--	0.045 U	--	--	--	--	--	--
Atrazine	--	--	--	--	--	0.17 U	--	--	--	--	--	--
Benzaldehyde	--	--	--	--	--	0.1 U	--	--	--	--	--	--
Benzo(A)Anthracene	--	--	--	--	--	0.069 U	--	--	--	--	--	--
Benzo(A)Pyrene	--	--	--	--	--	0.049 U	--	--	--	--	--	--
Benzo(B)Fluoranthene	--	--	--	--	--	0.09 U	--	--	--	--	--	--
Benzo(G,H,I)Perylene	--	--	--	--	--	0.064 U	--	--	--	--	--	--
Benzo(K)Fluoranthene	--	--	--	--	--	0.081 U	--	--	--	--	--	--
Benzyl Butyl Phthalate	--	--	--	--	--	0.73 J	--	--	--	--	--	--
Biphenyl (Diphenyl)	--	--	--	--	--	0.055 U	--	--	--	--	--	--
Bis(2-Chloroethoxy) Methane	--	--	--	--	--	0.062 U	--	--	--	--	--	--
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	--	--	--	--	--	0.037 U	--	--	--	--	--	--
Bis(2-Chloroisopropyl) Ether	--	--	--	--	--	0.054 U	--	--	--	--	--	--
Bis(2-Ethylhexyl) Phthalate	--	--	--	--	--	22	--	--	--	--	--	--
Caprolactam	--	--	--	--	--	1.1 J	--	--	--	--	--	--
Carbazole	--	--	--	--	--	0.047 U	--	--	--	--	--	--
Chrysene	--	--	--	--	--	0.075 U	--	--	--	--	--	--
Dibenz(A,H)Anthracene	--	--	--	--	--	0.067 U	--	--	--	--	--	--
Dibenzofuran	--	--	--	--	--	0.068 U	--	--	--	--	--	--
Diethyl Phthalate	--	--	--	--	--	0.53 U	--	--	--	--	--	--
Dimethyl Phthalate	--	--	--	--	--	0.052 U	--	--	--	--	--	--
Di-N-Butyl Phthalate	--	--	--	--	--	0.69 U	--	--	--	--	--	--
Di-N-Octylphthalate	--	--	--	--	--	0.63 U	--	--	--	--	--	--
Fluoranthene	--	--	--	--	--	0.056 U	--	--	--	--	--	--
Fluorene	--	--	--	--	--	0.064 U	--	--	--	--	--	--
Hexachlorobenzene	--	--	--	--	--	0.052 U	--	--	--	--	--	--

Table E-31
Summary of Data Used in Risk Assessment
Flathead River Area (surface water) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSWP-033	CFSWP-033	CFSWP-034	CFSWP-034	CFSWP-035	CFSWP-035	CFSWP-036	CFSWP-036	CFSWP-037	CFSWP-037	CFSWP-038	CFSWP-038
Sample Lab IDs	460-159043-6	460-167097-3	460-157849-7	460-166217-5	460-157849-8	180-82744-3, 200-45626-3, 460-166217-3	460-157703-9	460-166152-2	460-157703-10	460-166046-5	460-157849-9	460-166046-3
Sample Name Chemical	CFSWP-033-SW 6/22/2018	CFSWP-033-SW 10/17/2018	CFSWP-034-SW 6/7/2018	CFSWP-034-SW 10/5/2018	CFSWP-035-SW 6/7/2018	CFSWP-035-SW 10/5/2018	CFSWP-036-SW 6/6/2018	CFSWP-036-SW 10/4/2018	CFSWP-037-SW 6/6/2018	CFSWP-037-SW 10/3/2018	CFSWP-038-SW 6/7/2018	CFSWP-038-SW 10/3/2018
Hexachlorobutadiene	--	--	--	--	--	0.064 U	--	--	--	--	--	--
Hexachlorocyclopentadiene	--	--	--	--	--	0.46 U	--	--	--	--	--	--
Hexachloroethane	--	--	--	--	--	0.057 U	--	--	--	--	--	--
Indeno(1,2,3-C,D)Pyrene	--	--	--	--	--	0.079 U	--	--	--	--	--	--
Isophorone	--	--	--	--	--	0.05 U	--	--	--	--	--	--
Naphthalene	--	--	--	--	--	0.055 U	--	--	--	--	--	--
Nitrobenzene	--	--	--	--	--	0.15 U	--	--	--	--	--	--
N-Nitrosodi-N-Propylamine	--	--	--	--	--	0.066 U	--	--	--	--	--	--
N-Nitrosodiphenylamine	--	--	--	--	--	0.11 U	--	--	--	--	--	--
Pentachlorophenol	--	--	--	--	--	0.22 U	--	--	--	--	--	--
Phenanthrene	--	--	--	--	--	0.051 U	--	--	--	--	--	--
Phenol	--	--	--	--	--	0.091 U	--	--	--	--	--	--
Pyrene	--	--	--	--	--	0.05 U	--	--	--	--	--	--
SEMIVOLATILE ORGANIC COMPOUNDS-SIM (µg/L)												
Acenaphthene	--	--	--	--	--	0.0048 UJ	--	--	--	--	--	--
Acenaphthylene	--	--	--	--	--	0.0047 UJ	--	--	--	--	--	--
Anthracene	--	--	--	--	--	0.0045 U	--	--	--	--	--	--
Benzo(A)Anthracene	--	--	--	--	--	0.0028 U	--	--	--	--	--	--
Benzo(A)Pyrene	--	--	--	--	--	0.0024 U	--	--	--	--	--	--
Benzo(B)Fluoranthene	--	--	--	--	--	0.0042 U	--	--	--	--	--	--
Benzo(G,H,I)Perylene	--	--	--	--	--	0.0039 U	--	--	--	--	--	--
Benzo(K)Fluoranthene	--	--	--	--	--	0.0075 U	--	--	--	--	--	--
Benzo[E]Pyrene	--	--	--	--	--	0.0025 U	--	--	--	--	--	--
C1-Chrysenes	--	--	--	--	--	0.019 U	--	--	--	--	--	--
C1-Fluoranthenes/Pyrenes	--	--	--	--	--	0.019 U	--	--	--	--	--	--
C1-Fluorenes	--	--	--	--	--	0.019 U	--	--	--	--	--	--
C1-Naphthalenes	--	--	--	--	--	0.019 U	--	--	--	--	--	--
C1-Phenanthrenes/Anthracenes	--	--	--	--	--	0.019 U	--	--	--	--	--	--
C2-Chrysenes	--	--	--	--	--	0.019 U	--	--	--	--	--	--
C2-Fluorenes	--	--	--	--	--	0.019 U	--	--	--	--	--	--
C2-Naphthalenes	--	--	--	--	--	0.019 U	--	--	--	--	--	--
C2-Phenanthrenes/Anthracenes	--	--	--	--	--	0.019 U	--	--	--	--	--	--
C3-Chrysenes	--	--	--	--	--	0.019 U	--	--	--	--	--	--
C3-Fluorenes	--	--	--	--	--	0.019 U	--	--	--	--	--	--
C3-Naphthalenes	--	--	--	--	--	0.019 U	--	--	--	--	--	--
C3-Phenanthrenes/Anthracenes	--	--	--	--	--	0.019 U	--	--	--	--	--	--
C4 Chrysenes	--	--	--	--	--	0.019 U	--	--	--	--	--	--
C4-Naphthalenes	--	--	--	--	--	0.019 U	--	--	--	--	--	--
C4-Phenanthrenes/Anthracenes	--	--	--	--	--	0.019 U	--	--	--	--	--	--
Chrysene	--	--	--	--	--	0.0043 U	--	--	--	--	--	--
Dibenz(A,H)Anthracene	--	--	--	--	--	0.005 U	--	--	--	--	--	--
Fluoranthene	--	--	--	--	--	0.0074 U	--	--	--	--	--	--
Fluorene	--	--	--	--	--	0.0055 UJ	--	--	--	--	--	--
Indeno(1,2,3-C,D)Pyrene	--	--	--	--	--	0.0026 U	--	--	--	--	--	--
Naphthalene	--	--	--	--	--	0.0035 UJ	--	--	--	--	--	--
Perylene	--	--	--	--	--	0.0018 U	--	--	--	--	--	--
Phenanthrene	--	--	--	--	--	0.0068 UJ	--	--	--	--	--	--
Pyrene	--	--	--	--	--	0.006 U	--	--	--	--	--	--
VOLATILE ORGANIC COMPOUNDS (µg/L)												
1,1,1-Trichloroethane	--	--	--	--	--	--	--	--	--	--	--	--
1,1,2,2-Tetrachloroethane	--	--	--	--	--	--	--	--	--	--	--	--
1,1,2-Trichloro-1,2,2-Trifluoroethane	--	--	--	--	--	--	--	--	--	--	--	--
1,1,2-Trichloroethane	--	--	--	--	--	--	--	--	--	--	--	--
1,1-Dichloroethane	--	--	--	--	--	--	--	--	--	--	--	--
1,1-Dichloroethene	--	--	--	--	--	--	--	--	--	--	--	--
1,2,3-Trichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--
1,2,4-Trichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dibromo-3-Chloropropane	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dibromoethane (Ethylene Dibromide)	--	--	--	--	--	--	--	--	--	--	--	--

Table E-31
Summary of Data Used in Risk Assessment
Flathead River Area (surface water) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSWP-033	CFSWP-033	CFSWP-034	CFSWP-034	CFSWP-035	CFSWP-035	CFSWP-036	CFSWP-036	CFSWP-037	CFSWP-037	CFSWP-038	CFSWP-038
Sample Lab IDs	460-159043-6	460-167097-3	460-157849-7	460-166217-5	460-157849-8	180-82744-3, 200-45626-3, 460-166217-3	460-157703-9	460-166152-2	460-157703-10	460-166046-5	460-157849-9	460-166046-3
Sample Name	CFSWP-033-SW	CFSWP-033-SW	CFSWP-034-SW	CFSWP-034-SW	CFSWP-035-SW	CFSWP-035-SW	CFSWP-036-SW	CFSWP-036-SW	CFSWP-037-SW	CFSWP-037-SW	CFSWP-038-SW	CFSWP-038-SW
Chemical	6/22/2018	10/17/2018	6/7/2018	10/5/2018	6/7/2018	10/5/2018	6/6/2018	10/4/2018	6/6/2018	10/3/2018	6/7/2018	10/3/2018
1,2-Dichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichloroethane	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichloropropane	--	--	--	--	--	--	--	--	--	--	--	--
1,3-Dichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--
1,4-Dichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--
2-Hexanone	--	--	--	--	--	--	--	--	--	--	--	--
Acetone	--	--	--	--	--	--	--	--	--	--	--	--
Benzene	--	--	--	--	--	--	--	--	--	--	--	--
Bromochloromethane	--	--	--	--	--	--	--	--	--	--	--	--
Bromodichloromethane	--	--	--	--	--	--	--	--	--	--	--	--
Bromoform	--	--	--	--	--	--	--	--	--	--	--	--
Bromomethane	--	--	--	--	--	--	--	--	--	--	--	--
Carbon Disulfide	--	--	--	--	--	--	--	--	--	--	--	--
Carbon Tetrachloride	--	--	--	--	--	--	--	--	--	--	--	--
Chlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--
Chloroethane	--	--	--	--	--	--	--	--	--	--	--	--
Chloroform	--	--	--	--	--	--	--	--	--	--	--	--
Chloromethane	--	--	--	--	--	--	--	--	--	--	--	--
Cis-1,2-Dichloroethylene	--	--	--	--	--	--	--	--	--	--	--	--
Cis-1,3-Dichloropropene	--	--	--	--	--	--	--	--	--	--	--	--
Cyclohexane	--	--	--	--	--	--	--	--	--	--	--	--
Dibromochloromethane	--	--	--	--	--	--	--	--	--	--	--	--
Dichlorodifluoromethane	--	--	--	--	--	--	--	--	--	--	--	--
Ethylbenzene	--	--	--	--	--	--	--	--	--	--	--	--
Isopropylbenzene (Cumene)	--	--	--	--	--	--	--	--	--	--	--	--
M,P-Xylene	--	--	--	--	--	--	--	--	--	--	--	--
Methyl Acetate	--	--	--	--	--	--	--	--	--	--	--	--
Methyl Ethyl Ketone (2-Butanone)	--	--	--	--	--	--	--	--	--	--	--	--
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	--	--	--	--	--	--	--	--	--	--	--	--
Methylcyclohexane	--	--	--	--	--	--	--	--	--	--	--	--
Methylene Chloride	--	--	--	--	--	--	--	--	--	--	--	--
O-Xylene (1,2-Dimethylbenzene)	--	--	--	--	--	--	--	--	--	--	--	--
Styrene	--	--	--	--	--	--	--	--	--	--	--	--
Tert-Butyl Methyl Ether	--	--	--	--	--	--	--	--	--	--	--	--
Tetrachloroethylene (PCE)	--	--	--	--	--	--	--	--	--	--	--	--
Toluene	--	--	--	--	--	--	--	--	--	--	--	--
Trans-1,2-Dichloroethene	--	--	--	--	--	--	--	--	--	--	--	--
Trans-1,3-Dichloropropene	--	--	--	--	--	--	--	--	--	--	--	--
Trichloroethylene (TCE)	--	--	--	--	--	--	--	--	--	--	--	--
Trichlorofluoromethane	--	--	--	--	--	--	--	--	--	--	--	--
Vinyl Chloride	--	--	--	--	--	--	--	--	--	--	--	--

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-32
Summary of Data Used in Risk Assessment
Flathead River Area (sediment) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSDP-001	CFSDP-001	CFSDP-002	CFSDP-002	CFSDP-002	CFSDP-006	CFSDP-006	CFSDP-006	CFSDP-007	CFSDP-007	CFSDP-008	CFSDP-008	CFSDP-017	CFSDP-017
Sample Lab IDs Sample Name Chemical	200-35201-16, 460-119897-1 CFSDP-001-SO 9/8/2016	180-82746-6, 200-45621-6, 460-166239-6 CFSDP-001-SD 10/5/2018	460-119897-2 CFSDP-002-SO 9/8/2016	200-35302-1 CFSDP-002-SO 9/16/2016	180-82746-4, 200-45621-4, 460-166239-4 CFSDP-002-SD 10/5/2018	460-119996-4 CFSDP-006-SD 9/9/2016	200-35201-23 CFSDP-006-SO 9/9/2016	180-82692-1, 200-45608-1, 460-166286-1 CFSDP-006-SD 10/4/2018	200-35201-17, 460-119897-3 CFSDP-007-SO 9/8/2016	180-82623-4, 200-45561-4, 460-166049-4 CFSDP-007-SD 10/3/2018	200-35201-18, 460-119897-4 CFSDP-008-SO 9/8/2016	180-82623-2, 200-45561-2, 460-166049-2 CFSDP-008-SD 10/3/2018	200-35201-19, 460-119897-5 CFSDP-017-SO 9/8/2016	180-82623-1, 200-45561-1, 460-166049-1 CFSDP-017-SD 10/3/2018
GENERAL CHEMISTRY (mg/kg)														
Fluoride	0.78 J	0.22 UJ	0.36 J	--	0.23 UJ	1.23 J+	--	0.19 UJ	1.69	0.21 U	0.65 J	0.17 U	0.83 J	0.2 U
Cyanide	0.035 U	0.087 J	0.033 U	--	0.097 U	0.032 U	--	0.077 U	0.067 J	0.091 U	0.036 U	0.071 U	0.038 U	0.078 U
METALS (mg/kg)														
Aluminum	8420	7480	6570	--	6070	7750	--	6520	8460	7060	8140	5750	8010	7450
Antimony	0.33 UJ	0.37 UJ	0.31 UJ	--	0.45 UJ	0.3 UJ	--	0.37 UJ	0.32 UJ	0.39 U	0.39 UJ	0.28 U	0.34 UJ	0.39 U
Arsenic	4.3	3.5	4.4	--	2.7	3.7	--	2.8	3.9	3.3	3.5	3.6	3.6	4.2
Barium	82.6	54.5	38	--	87.2	80.8	--	52.3	146	47.1 J+	114	52 J+	104	81.4 J+
Beryllium	0.38 J	0.4 J	0.28 J	--	0.34 J	0.35 J	--	0.35 J	0.49	0.21 U	0.39 J	0.22 J	0.34 J	0.22 J
Cadmium	0.35 U	0.42 U	0.33 U	--	0.51 U	0.32 U	--	0.43 U	0.33 U	0.44 U	0.41 U	0.32 U	0.36 U	0.44 U
Calcium	17700	13900	28000	--	13400	11800	--	8330	11700	8180 J	13600	8620 J	15200	13000 J
Chromium, Total	10	8.3	7.7	--	7.2	9.6	--	7.4	10.5	7.8	10.2	6.5	9.8	8.9
Cobalt	6	5	4.8	--	4.1	5.4	--	4.4	6	4.9	5.6	4.3	5.8	5.6
Copper	11.2	9.3	11	--	7.7	9.4	--	7.2	12.8	9.6	9.5	9.3	10.2	11.8
Iron	14500	12800	10800	--	10600	15200	--	10800	15100	13100	14300	11600	14500	14700
Lead	6.8	5.7	6.2	--	5.2	5.6	--	4.3	7	5.4 J	5.6	4.8 J	6	6.9 J
Magnesium	11200	9690	9790	--	8300	9590	--	7950	11000	9010	11100	7010	10500	9620
Manganese	286	208	297	--	129	234	--	174	264	181 J	219	194 J	225	197 J
Mercury	0.013 U	0.013 U	0.013 U	--	0.023 J	0.013 U	--	0.012 U	0.015 U	0.013 U	0.015 U	0.011 U	0.014 U	0.012 U
Nickel	12.1	9.8	9.8	--	8.4	11.3	--	9.2	13	9.9	11.6	8.6	12.1	11.1
Potassium	657	601	390	--	605	617	--	485	813	383	790	279	709	476
Selenium	0.31 U	0.36 U	0.29 U	--	0.44 U	0.28 U	--	0.37 U	0.29 U	0.38 U	0.36 U	0.28 U	0.32 U	0.38 U
Silver	0.64 U	0.78 U	0.6 U	--	0.94 U	0.59 U	--	0.79 U	0.62 U	0.82 U	0.76 U	0.59 U	0.67 U	0.82 U
Sodium	45.1 J	39.3 U	41.7 U	--	47.8 U	40.8 U	--	39.8 U	42.8 U	41.4 U	52.8 U	30.1 U	46.6 U	41.4 U
Thallium	0.13 U	0.16 U	0.12 U	--	0.19 U	0.12 U	--	0.16 U	0.13 U	0.17 U	0.15 U	0.12 U	0.14 U	0.17 U
Vanadium	12	15.4	7.5	--	17.9	25.5	--	13.6	22.3	9.8	20.4	11.9	20.9	17.6
Zinc	38.1	36.1	35	--	28.7	38.4	--	31.1	38.2	34.9	37.1	29.3	37	38.4
METALS SEM|Simultaneously Extracted Metals (mg/kg)														
SEM/AVS	--	--	--	--	--	--	--	--	--	--	--	--	--	--
METALS|AVS/SEM (mg/kg)														
Cadmium	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Copper	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Lead	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Mercury	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Nickel	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Sulfide	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Zinc	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PESTICIDES (mg/kg)														
Aldrin	0.0011 U	--	0.00098 U	--	--	0.00098 U	--	--	0.0011 U	--	0.0012 U	--	0.0011 U	--
Alpha Bhc (Alpha Hexachlorocyclohexane)	0.00083 U	--	0.00074 U	--	--	0.00074 U	--	--	0.00084 U	--	0.00087 U	--	0.00082 U	--
Alpha Endosulfan	0.0013 U	--	0.0011 U	--	--	0.0011 U	--	--	0.0013 U	--	0.0013 U	--	0.0013 U	--
Beta Bhc (Beta Hexachlorocyclohexane)	0.00089 U	--	0.00078 U	--	--	0.00079 U	--	--	0.00089 U	--	0.00093 U	--	0.00088 U	--
Beta Endosulfan	0.0014 U	--	0.0013 U	--	--	0.0013 U	--	--	0.0014 U	--	0.0015 U	--	0.0014 U	--
cis-Chlordane	0.0015 U	--	0.0013 U	--	--	0.0013 U	--	--	0.0015 U	--	0.0016 U	--	0.0015 U	--
Delta BHC (Delta Hexachlorocyclohexane)	0.001 U	--	0.00088 U	--	--	0.00088 U	--	--	0.001 U	--	0.001 U	--	0.00099 U	--
Dieldrin	0.0012 U	--	0.0011 U	--	--	0.0011 U	--	--	0.0012 U	--	0.0012 U	--	0.0012 U	--
Endosulfan Sulfate	0.0011 U	--	0.00094 U	--	--	0.00094 U	--	--	0.0011 U	--	0.0011 U	--	0.0011 U	--
Endrin	0.0012 U	--	0.001 U	--	--	0.001 U	--	--	0.0012 U	--	0.0012 U	--	0.0011 U	--
Endrin Aldehyde	0.0011 U	--	0.001 U	--	--	0.001 U	--	--	0.0011 U	--	0.0012 U	--	0.0011 U	--
Endrin Ketone	0.0013 U	--	0.0011 U	--	--	0.0011 U	--	--	0.0013 U	--	0.0013 U	--	0.0013 U	--
Gamma Bhc (Lindane)	0.00082 U	--	0.00072 U	--	--	0.00072 U	--	--	0.00082 U	--	0.00085 U	--	0.00081 U	--
Heptachlor	0.0012 U	--	0.001 U	--	--	0.001 U	--	--	0.0012 U	--	0.0012 U	--	0.0012 U	--
Heptachlor Epoxide	0.0018 U	--	0.0016 U	--	--	0.0016 U	--	--	0.0018 U	--	0.0019 U	--	0.0018 U	--
Methoxychlor	0.0019 U	--	0.0017 U	--	--	0.0017 U	--	--	0.0019 U	--	0.002 U	--	0.0019 U	--
P,P'-DDD	0.0012 U	--	0.0011 U	--	--	0.0011 U	--	--	0.0012 U	--	0.0013 U	--	0.0012 U	--
P,P'-DDE	0.0013 U	--	0.0012 U	--	--	0.0012 U	--	--	0.0013 U	--	0.0014 U	--	0.0013 U	--
P,P'-DDT	0.00094 U	--	0.00083 U	--	--	0.00083 U	--	--	0.00095 U	--	0.00098 U	--	0.00093 U	--
Toxaphene	0.027 U	--	0.024 U	--	--	0.024 U	--	--	0.027 U	--	0.028 U	--	0.026 U	--

Table E-32
Summary of Data Used in Risk Assessment
Flathead River Area (sediment) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Chemical	CFSDP-001 200-35201-16, 460-119897-1 CFSDP-001-SO 9/8/2016	CFSDP-001 180-82746-6, 200-45621-6, 460-166239-6 CFSDP-001-SD 10/5/2018	CFSDP-002 460-119897-2 CFSDP-002-SO 9/8/2016	CFSDP-002 200-35302-1 CFSDP-002-SO 9/16/2016	CFSDP-002 180-82746-4, 200-45621-4, 460-166239-4 CFSDP-002-SD 10/5/2018	CFSDP-006 460-119996-4 CFSDP-006-SD 9/9/2016	CFSDP-006 200-35201-23 CFSDP-006-SO 9/9/2016	CFSDP-006 180-82692-1, 200-45608-1, 460-166286-1 CFSDP-006-SD 10/4/2018	CFSDP-007 200-35201-17, 460-119897-3 CFSDP-007-SO 9/8/2016	CFSDP-007 180-82623-4, 200-45561-4, 460-166049-4 CFSDP-007-SD 10/3/2018	CFSDP-008 200-35201-18, 460-119897-4 CFSDP-008-SO 9/8/2016	CFSDP-008 180-82623-2, 200-45561-2, 460-166049-2 CFSDP-008-SD 10/3/2018	CFSDP-017 200-35201-19, 460-119897-5 CFSDP-017-SO 9/8/2016	CFSDP-017 180-82623-1, 200-45561-1, 460-166049-1 CFSDP-017-SD 10/3/2018
trans-Chlordane	0.002 U	--	0.0018 U	--	--	0.0018 U	--	--	0.002 U	--	0.0021 U	--	0.002 U	--
POLYCHLORINATED BIPHENYLS (mg/kg)														
PCB-1016 (Aroclor 1016)	0.012 U	--	0.011 U	--	--	0.011 U	--	--	0.012 U	--	0.013 U	--	0.012 U	--
PCB-1221 (Aroclor 1221)	0.012 U	--	0.011 U	--	--	0.011 U	--	--	0.012 U	--	0.013 U	--	0.012 U	--
PCB-1232 (Aroclor 1232)	0.012 U	--	0.011 U	--	--	0.011 U	--	--	0.012 U	--	0.013 U	--	0.012 U	--
PCB-1242 (Aroclor 1242)	0.012 U	--	0.011 U	--	--	0.011 U	--	--	0.012 U	--	0.013 U	--	0.012 U	--
PCB-1248 (Aroclor 1248)	0.012 U	--	0.011 U	--	--	0.011 U	--	--	0.012 U	--	0.013 U	--	0.012 U	--
PCB-1254 (Aroclor 1254)	0.013 U	--	0.011 U	--	--	0.011 U	--	--	0.013 U	--	0.013 U	--	0.012 U	--
PCB-1260 (Aroclor 1260)	0.013 U	--	0.011 U	--	--	0.011 U	--	--	0.013 U	--	0.013 U	--	0.012 U	--
PCB-1262 (Aroclor 1262)	0.013 U	--	0.011 U	--	--	0.011 U	--	--	0.013 U	--	0.013 U	--	0.012 U	--
PCB-1268 (Aroclor 1268)	0.013 U	--	0.011 U	--	--	0.011 U	--	--	0.013 U	--	0.013 U	--	0.012 U	--
Polychlorinated Biphenyl (PCBs)	0.013 U	--	0.011 U	--	--	0.011 U	--	--	0.013 U	--	0.013 U	--	0.012 U	--
SEMIVOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,2,4,5-Tetrachlorobenzene	0.034 U	--	0.03 U	--	--	0.03 U	--	--	0.034 U	--	0.035 U	--	0.033 U	--
1,4-Dioxane (P-Dioxane)	0.12 U	--	0.11 U	--	--	0.11 U	--	--	0.12 U	--	0.13 U	--	0.12 U	--
2,3,4,6-Tetrachlorophenol	0.042 U	--	0.038 U	--	--	0.037 U	--	--	0.043 U	--	0.044 U	--	0.042 U	--
2,4,5-Trichlorophenol	0.045 U	--	0.04 U	--	--	0.04 U	--	--	0.045 U	--	0.047 U	--	0.044 U	--
2,4,6-Trichlorophenol	0.013 U	--	0.011 U	--	--	0.011 U	--	--	0.013 U	--	0.013 U	--	0.013 U	--
2,4-Dichlorophenol	0.011 U	--	0.0094 U	--	--	0.0094 U	--	--	0.011 U	--	0.011 U	--	0.011 U	--
2,4-Dimethylphenol	0.099 U	--	0.088 U	--	--	0.088 U	--	--	0.1 U	--	0.1 U	--	0.098 U	--
2,4-Dinitrophenol	0.34 U	--	0.3 U	--	--	0.3 U	--	--	0.34 U	--	0.36 U	--	0.34 U	--
2,4-Dinitrotoluene	0.018 U	--	0.016 U	--	--	0.016 U	--	--	0.018 U	--	0.019 U	--	0.018 U	--
2,6-Dinitrotoluene	0.024 U	--	0.021 U	--	--	0.021 U	--	--	0.024 U	--	0.025 U	--	0.024 U	--
2-Chloronaphthalene	0.01 U	--	0.009 U	--	--	0.009 U	--	--	0.01 U	--	0.011 U	--	0.01 U	--
2-Chlorophenol	0.011 U	--	0.01 U	--	--	0.01 U	--	--	0.012 U	--	0.012 U	--	0.011 U	--
2-Methylnaphthalene	0.0099 U	--	0.0088 U	--	--	0.0088 U	--	--	0.01 U	--	0.01 U	--	0.0098 U	--
2-Methylphenol (O-Cresol)	0.02 U	--	0.017 U	--	--	0.017 U	--	--	0.02 U	--	0.02 U	--	0.019 U	--
2-Nitroaniline	0.015 U	--	0.013 U	--	--	0.013 U	--	--	0.015 U	--	0.015 U	--	0.015 U	--
2-Nitrophenol	0.015 U	--	0.013 U	--	--	0.013 U	--	--	0.015 U	--	0.016 U	--	0.015 U	--
3- And 4- Methylphenol (Total)	0.012 U	--	0.011 U	--	--	0.011 U	--	--	0.012 U	--	0.035 J	--	0.012 U	--
3,3'-Dichlorobenzidine	0.05 U	--	0.045 U	--	--	0.044 U	--	--	0.051 U	--	0.052 U	--	0.05 U	--
3-Nitroaniline	0.013 U	--	0.012 U	--	--	0.012 U	--	--	0.013 U	--	0.014 U	--	0.013 U	--
4,6-Dinitro-2-Methylphenol	0.12 U	--	0.11 U	--	--	0.11 U	--	--	0.12 U	--	0.13 U	--	0.12 U	--
4-Bromophenyl Phenyl Ether	0.014 U	--	0.013 U	--	--	0.013 U	--	--	0.014 U	--	0.015 U	--	0.014 U	--
4-Chloro-3-Methylphenol	0.019 U	--	0.017 U	--	--	0.017 U	--	--	0.019 U	--	0.02 U	--	0.019 U	--
4-Chloroaniline	0.012 U	--	0.01 U	--	--	0.01 U	--	--	0.012 U	--	0.012 U	--	0.011 U	--
4-Chlorophenyl Phenyl Ether	0.013 U	--	0.012 U	--	--	0.012 U	--	--	0.014 U	--	0.014 U	--	0.013 U	--
4-Nitroaniline	0.017 U	--	0.015 U	--	--	0.015 U	--	--	0.017 U	--	0.018 U	--	0.017 U	--
4-Nitrophenol	0.22 U	--	0.19 U	--	--	0.19 U	--	--	0.22 U	--	0.23 U	--	0.21 U	--
Acenaphthene	0.011 U	--	0.0096 U	--	--	0.0096 U	--	--	0.011 U	--	0.011 U	--	0.011 U	--
Acenaphthylene	0.012 U	--	0.01 U	--	--	0.01 U	--	--	0.012 U	--	0.012 U	--	0.011 U	--
Acetophenone	0.0098 U	--	0.0087 U	--	--	0.0087 U	--	--	0.0099 U	--	0.01 U	--	0.0097 U	--
Anthracene	0.043 U	--	0.038 U	--	--	0.038 U	--	--	0.043 U	--	0.045 U	--	0.042 U	--
Atrazine	0.02 U	--	0.018 U	--	--	0.018 U	--	--	0.02 U	--	0.021 U	--	0.02 U	--
Benzaldehyde	0.034 U	--	0.03 U	--	--	0.03 U	--	--	0.035 U	--	0.036 U	--	0.034 U	--
Benzo(A)Anthracene	0.038 U	--	0.033 U	--	--	0.033 U	--	--	0.038 U	--	0.039 U	--	0.037 U	--
Benzo(A)Pyrene	0.014 U	--	0.012 U	--	--	0.012 U	--	--	0.014 U	--	0.014 U	--	0.013 U	--
Benzo(B)Fluoranthene	0.018 U	--	0.016 U	--	--	0.016 U	--	--	0.018 U	--	0.018 U	--	0.017 U	--
Benzo(G,H,I)Perylene	0.026 U	--	0.023 U	--	--	0.023 U	--	--	0.026 U	--	0.027 U	--	0.026 U	--
Benzo(K)Fluoranthene	0.02 U	--	0.017 U	--	--	0.017 U	--	--	0.02 U	--	0.02 U	--	0.019 U	--
Benzyl Butyl Phthalate	0.014 U	--	0.012 U	--	--	0.012 U	--	--	0.014 U	--	0.014 U	--	0.014 U	--
Biphenyl (Diphenyl)	0.038 U	--	0.034 U	--	--	0.034 U	--	--	0.039 U	--	0.04 U	--	0.038 U	--
Bis(2-Chloroethoxy) Methane	0.014 U	--	0.012 U	--	--	0.012 U	--	--	0.014 U	--	0.015 U	--	0.014 U	--
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.011 U	--	0.0094 U	--	--	0.0094 U	--	--	0.011 U	--	0.011 U	--	0.011 U	--
Bis(2-Chloroisopropyl) Ether	0.019 U	--	0.016 U	--	--	0.016 U	--	--	0.019 U	--	0.019 U	--	0.018 U	--
Bis(2-Ethylhexyl) Phthalate	0.032 J	--	0.016 U	--	--	0.016 U	--	--	0.018 J	--	0.018 U	--	0.017 U	--
Caprolactam	0.032 U	--	0.029 U	--	--	0.029 U	--	--	0.033 U	--	0.034 U	--	0.032 U	--
Carbazole	0.011 U	--	0.0099 U	--	--	0.0099 U	--	--	0.011 U	--	0.012 U	--	0.011 U	--

Table E-32
Summary of Data Used in Risk Assessment
Flathead River Area (sediment) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSDP-001	CFSDP-001	CFSDP-002	CFSDP-002	CFSDP-002	CFSDP-006	CFSDP-006	CFSDP-006	CFSDP-007	CFSDP-007	CFSDP-008	CFSDP-008	CFSDP-017	CFSDP-017
Sample Lab IDs Sample Name Chemical	200-35201-16, 460-119897-1 CFSDP-001-SO 9/8/2016	180-82746-6, 200-45621-6, 460-166239-6 CFSDP-001-SD 10/5/2018	460-119897-2 CFSDP-002-SO 9/8/2016	200-35302-1 CFSDP-002-SO 9/16/2016	180-82746-4, 200-45621-4, 460-166239-4 CFSDP-002-SD 10/5/2018	460-119996-4 CFSDP-006-SD 9/9/2016	200-35201-23 CFSDP-006-SO 9/9/2016	180-82692-1, 200-45608-1, 460-166286-1 CFSDP-006-SD 10/4/2018	200-35201-17, 460-119897-3 CFSDP-007-SO 9/8/2016	180-82623-4, 200-45561-4, 460-166049-4 CFSDP-007-SD 10/3/2018	200-35201-18, 460-119897-4 CFSDP-008-SO 9/8/2016	180-82623-2, 200-45561-2, 460-166049-2 CFSDP-008-SD 10/3/2018	200-35201-19, 460-119897-5 CFSDP-017-SO 9/8/2016	180-82623-1, 200-45561-1, 460-166049-1 CFSDP-017-SD 10/3/2018
Chrysene	0.012 U	--	0.011 U	--	--	0.011 U	--	--	0.012 U	--	0.013 U	--	0.012 U	--
Dibenz(A,H)Anthracene	0.023 U	--	0.021 U	--	--	0.021 U	--	--	0.024 U	--	0.024 U	--	0.023 U	--
Dibenzofuran	0.014 U	--	0.012 U	--	--	0.012 U	--	--	0.014 U	--	0.014 U	--	0.013 U	--
Diethyl Phthalate	0.013 U	--	0.011 U	--	--	0.011 U	--	--	0.013 U	--	0.013 U	--	0.013 U	--
Dimethyl Phthalate	0.013 U	--	0.012 U	--	--	0.012 U	--	--	0.013 U	--	0.014 U	--	0.013 U	--
Di-N-Butyl Phthalate	0.013 U	--	0.012 U	--	--	0.012 U	--	--	0.014 U	--	0.014 U	--	0.013 U	--
Di-N-Octylphthalate	0.023 U	--	0.02 U	--	--	0.02 U	--	--	0.023 U	--	0.024 U	--	0.023 U	--
Fluoranthene	0.013 U	--	0.012 U	--	--	0.012 U	--	--	0.013 U	--	0.014 U	--	0.013 U	--
Fluorene	0.0098 U	--	0.0087 U	--	--	0.0087 U	--	--	0.0099 U	--	0.01 U	--	0.0097 U	--
Hexachlorobenzene	0.018 U	--	0.016 U	--	--	0.016 U	--	--	0.018 U	--	0.019 U	--	0.018 U	--
Hexachlorobutadiene	0.013 U	--	0.011 U	--	--	0.011 U	--	--	0.013 U	--	0.013 U	--	0.013 U	--
Hexachlorocyclopentadiene	0.028 U	--	0.025 U	--	--	0.025 U	--	--	0.028 U	--	0.029 U	--	0.028 U	--
Hexachloroethane	0.016 U	--	0.015 U	--	--	0.015 U	--	--	0.017 U	--	0.017 U	--	0.016 U	--
Indeno(1,2,3-C,D)Pyrene	0.03 U	--	0.027 U	--	--	0.027 U	--	--	0.03 U	--	0.031 U	--	0.03 U	--
Isophorone	0.0097 U	--	0.0086 U	--	--	0.0086 U	--	--	0.0097 U	--	0.01 U	--	0.0096 U	--
Naphthalene	0.011 U	--	0.01 U	--	--	0.01 U	--	--	0.012 U	--	0.012 U	--	0.011 U	--
Nitrobenzene	0.014 U	--	0.013 U	--	--	0.013 U	--	--	0.014 U	--	0.015 U	--	0.014 U	--
N-Nitrosodi-N-Propylamine	0.015 U	--	0.013 U	--	--	0.013 U	--	--	0.015 U	--	0.016 U	--	0.015 U	--
N-Nitrosodiphenylamine	0.041 U	--	0.036 U	--	--	0.036 U	--	--	0.041 U	--	0.043 U	--	0.04 U	--
Pentachlorophenol	0.055 U	--	0.048 U	--	--	0.048 U	--	--	0.055 U	--	0.057 U	--	0.054 U	--
Phenanthrene	0.012 U	--	0.011 U	--	--	0.011 U	--	--	0.012 U	--	0.013 U	--	0.012 U	--
Phenol	0.015 U	--	0.013 U	--	--	0.013 U	--	--	0.015 U	--	0.015 U	--	0.015 U	--
Pyrene	0.02 U	--	0.018 U	--	--	0.018 U	--	--	0.021 U	--	0.021 U	--	0.02 U	--
SEMIVOLATILE ORGANIC COMPOUNDS|LOW LEVEL (mg/kg)														
1,2,4,5-Tetrachlorobenzene	--	0.0019 U	--	--	0.0021 U	--	--	0.00087 U	--	0.00097 U	--	0.0017 U	--	0.0019 U
1,4-Dioxane (P-Dioxane)	--	0.014 U	--	--	0.015 U	--	--	0.0063 U	--	0.007 U	--	0.012 U	--	0.014 U
2,3,4,6-Tetrachlorophenol	--	0.019 U	--	--	0.021 U	--	--	0.0084 U	--	0.0094 U	--	0.016 U	--	0.018 U
2,4,5-Trichlorophenol	--	0.0032 U	--	--	0.0035 U	--	--	0.0014 U	--	0.0016 U	--	0.0027 U	--	0.0031 U
2,4,6-Trichlorophenol	--	0.0025 U	--	--	0.0027 U	--	--	0.0011 U	--	0.0012 U	--	0.0021 U	--	0.0024 U
2,4-Dichlorophenol	--	0.0035 U	--	--	0.0038 U	--	--	0.0016 U	--	0.0017 U	--	0.003 U	--	0.0034 U
2,4-Dimethylphenol	--	0.0028 U	--	--	0.0031 U	--	--	0.0013 U	--	0.0014 U	--	0.0024 U	--	0.0028 U
2,4-Dinitrophenol	--	0.12 U	--	--	0.13 U	--	--	0.054 U	--	0.061 U	--	0.1 U	--	0.12 U
2,4-Dinitrotoluene	--	0.0022 U	--	--	0.0025 U	--	--	0.001 U	--	0.0011 U	--	0.0019 U	--	0.0022 U
2,6-Dinitrotoluene	--	0.0028 U	--	--	0.0031 U	--	--	0.0012 U	--	0.0014 U	--	0.0024 U	--	0.0027 U
2-Chloronaphthalene	--	0.0021 U	--	--	0.0023 U	--	--	0.00093 U	--	0.001 U	--	0.0018 U	--	0.002 U
2-Chlorophenol	--	0.0021 U	--	--	0.0023 U	--	--	0.00094 U	--	0.001 U	--	0.0018 U	--	0.0021 U
2-Methylnaphthalene	--	0.0021 U	--	--	0.0024 U	--	--	0.00097 U	--	0.0011 U	--	0.0018 U	--	0.0021 U
2-Methylphenol (O-Cresol)	--	0.013 U	--	--	0.014 U	--	--	0.0058 U	--	0.0065 U	--	0.011 U	--	0.013 U
2-Nitroaniline	--	0.02 U	--	--	0.023 U	--	--	0.0092 U	--	0.01 U	--	0.018 U	--	0.02 U
2-Nitrophenol	--	0.0026 U	--	--	0.0028 U	--	--	0.0012 U	--	0.0013 U	--	0.0022 U	--	0.0025 U
3,3'-Dichlorobenzidine	--	0.042 U	--	--	0.046 U	--	--	0.019 U	--	0.021 U	--	0.036 U	--	0.041 U
3-Nitroaniline	--	0.011 U	--	--	0.013 U	--	--	0.0051 U	--	0.0057 U	--	0.0098 U	--	0.011 U
4,6-Dinitro-2-Methylphenol	--	0.077 U	--	--	0.085 U	--	--	0.035 U	--	0.039 U	--	0.066 U	--	0.076 U
4-Bromophenyl Phenyl Ether	--	0.0031 U	--	--	0.0035 U	--	--	0.0014 U	--	0.0016 U	--	0.0027 U	--	0.0031 U
4-Chloro-3-Methylphenol	--	0.0021 U	--	--	0.0023 U	--	--	0.00095 U	--	0.0011 U	--	0.0018 U	--	0.0021 U
4-Chloroaniline	--	0.0015 U	--	--	0.0016 U	--	--	0.00067 U	--	0.00075 U	--	0.0013 U	--	0.0015 U
4-Chlorophenyl Phenyl Ether	--	0.0027 U	--	--	0.003 U	--	--	0.0012 U	--	0.0014 U	--	0.0023 U	--	0.0027 U
4-Nitroaniline	--	0.0022 U	--	--	0.0024 U	--	--	0.00098 U	--	0.0011 U	--	0.0019 U	--	0.0021 U
4-Nitrophenol	--	0.031 U	--	--	0.035 U	--	--	0.014 U	--	0.016 U	--	0.027 U	--	0.031 U
Acenaphthene	--	0.0026 U	--	--	0.0028 U	--	--	0.0012 U	--	0.0013 U	--	0.0022 U	--	0.0025 U
Acenaphthylene	--	0.002 U	--	--	0.0022 U	--	--	0.00088 U	--	0.00099 U	--	0.0017 U	--	0.0019 U
Acetophenone	--	0.0024 U	--	--	0.0027 U	--	--	0.0011 U	--	0.0012 U	--	0.0021 U	--	0.0024 U
Anthracene	--	0.0023 U	--	--	0.0026 U	--	--	0.001 U	--	0.0012 U	--	0.002 U	--	0.0023 U
Atrazine	--	0.02 U	--	--	0.022 U	--	--	0.0088 UJ	--	0.0099 UJ	--	0.017 UJ	--	0.019 UJ
Benzaldehyde	--	0.0056 UR	--	--	0.0098 J	--	--	0.0025 UR	--	0.0028 UR	--	0.0048 UR	--	0.0055 UR
Benzo(A)Anthracene	--	0.0017 U	--	--	0.0038 J	--	--	0.0016 J	--	0.00095 J	--	0.0015 U	--	0.0017 U
Benzo(A)Pyrene	--	0.0019 U	--	--	0.0023 J	--	--	0.0014 J	--	0.00098 U	--	0.0017 U	--	0.0019 U
Benzo(B)Fluoranthene	--	0.0022 U	--	--	0.0071 J	--	--	0.0038 J	--	0.0014 J	--	0.0019 U	--	0.0024 J

Table E-32
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Flathead River Area (sediment) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSDP-001	CFSDP-001	CFSDP-002	CFSDP-002	CFSDP-002	CFSDP-006	CFSDP-006	CFSDP-006	CFSDP-007	CFSDP-007	CFSDP-008	CFSDP-008	CFSDP-017	CFSDP-017
Sample Lab IDs Sample Name Chemical	200-35201-16, 460-119897-1 CFSDP-001-SO 9/8/2016	180-82746-6, 200-45621-6, 460-166239-6 CFSDP-001-SD 10/5/2018	460-119897-2 CFSDP-002-SO 9/8/2016	200-35302-1 CFSDP-002-SO 9/16/2016	180-82746-4, 200-45621-4, 460-166239-4 CFSDP-002-SD 10/5/2018	460-119996-4 CFSDP-006-SD 9/9/2016	200-35201-23 CFSDP-006-SO 9/9/2016	180-82692-1, 200-45608-1, 460-166286-1 CFSDP-006-SD 10/4/2018	200-35201-17, 460-119897-3 CFSDP-007-SO 9/8/2016	180-82623-4, 200-45561-4, 460-166049-4 CFSDP-007-SD 10/3/2018	200-35201-18, 460-119897-4 CFSDP-008-SO 9/8/2016	180-82623-2, 200-45561-2, 460-166049-2 CFSDP-008-SD 10/3/2018	200-35201-19, 460-119897-5 CFSDP-017-SO 9/8/2016	180-82623-1, 200-45561-1, 460-166049-1 CFSDP-017-SD 10/3/2018
Benzo(G,H,I)Perylene	--	0.0019 U	--	--	0.0043 J	--	--	0.0019 J	--	0.001 J	--	0.0017 U	--	0.0019 U
Benzo(K)Fluoranthene	--	0.0027 U	--	--	0.0039 J	--	--	0.0015 J	--	0.0014 U	--	0.0023 U	--	0.0026 U
Benzyl Butyl Phthalate	--	0.031 U	--	--	0.034 U	--	--	0.014 U	--	0.016 U	--	0.027 U	--	0.03 U
Biphenyl (Diphenyl)	--	0.0019 U	--	--	0.0021 U	--	--	0.00085 U	--	0.00095 U	--	0.0016 U	--	0.0019 U
Bis(2-Chloroethoxy) Methane	--	0.0021 U	--	--	0.0024 U	--	--	0.00096 U	--	0.0011 U	--	0.0018 U	--	0.0021 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	--	0.0016 U	--	--	0.0018 U	--	--	0.00073 U	--	0.00082 U	--	0.0014 U	--	0.0016 U
Bis(2-Chloroisopropyl) Ether	--	0.0033 U	--	--	0.0037 U	--	--	0.0015 U	--	0.0017 U	--	0.0029 U	--	0.0033 U
Bis(2-Ethylhexyl) Phthalate	--	0.048 U	--	--	0.053 U	--	--	0.022 U	--	0.024 U	--	0.041 U	--	0.047 U
Caprolactam	--	0.029 U	--	--	0.032 U	--	--	0.013 U	--	0.015 U	--	0.025 U	--	0.029 U
Carbazole	--	0.0021 U	--	--	0.0041 J	--	--	0.00095 U	--	0.0011 U	--	0.0018 U	--	0.0021 U
Chrysene	--	0.0041 J	--	--	0.0099	--	--	0.0041	--	0.0014 J	--	0.0015 U	--	0.003 J
Dibenz(A,H)Anthracene	--	0.002 UJ	--	--	0.0022 UJ	--	--	0.0009 U	--	0.001 U	--	0.0017 U	--	0.002 U
Dibenzofuran	--	0.002 U	--	--	0.0022 U	--	--	0.00088 U	--	0.00099 U	--	0.0017 U	--	0.0019 U
Diethyl Phthalate	--	0.013 U	--	--	0.015 U	--	--	0.0061 U	--	0.0068 U	--	0.012 U	--	0.013 U
Dimethyl Phthalate	--	0.0016 U	--	--	0.0018 U	--	--	0.00073 U	--	0.00082 U	--	0.0014 U	--	0.0016 U
Di-N-Butyl Phthalate	--	0.02 U	--	--	0.022 U	--	--	0.0088 U	--	0.0099 U	--	0.017 U	--	0.019 U
Di-N-Octylphthalate	--	0.026 U	--	--	0.029 U	--	--	0.012 U	--	0.013 U	--	0.022 U	--	0.026 U
Fluoranthene	--	0.004 J	--	--	0.015	--	--	0.0049	--	0.0021 J	--	0.002 U	--	0.0047 J
Fluorene	--	0.0018 U	--	--	0.0019 U	--	--	0.00079 U	--	0.00089 U	--	0.0015 U	--	0.0017 U
Hexachlorobenzene	--	0.0032 U	--	--	0.0036 U	--	--	0.0015 U	--	0.0016 U	--	0.0028 U	--	0.0032 U
Hexachlorobutadiene	--	0.0026 U	--	--	0.0029 U	--	--	0.0012 U	--	0.0013 U	--	0.0023 U	--	0.0026 U
Hexachlorocyclopentadiene	--	0.0023 U	--	--	0.0025 U	--	--	0.001 U	--	0.0011 U	--	0.002 U	--	0.0022 U
Hexachloroethane	--	0.0023 U	--	--	0.0026 U	--	--	0.001 U	--	0.0012 U	--	0.002 U	--	0.0023 U
Indeno(1,2,3-C,D)Pyrene	--	0.0018 U	--	--	0.0028 J	--	--	0.0016 J	--	0.00098 J	--	0.0016 U	--	0.0018 U
Isophorone	--	0.0023 U	--	--	0.0025 U	--	--	0.001 U	--	0.0011 U	--	0.002 U	--	0.0022 U
Naphthalene	--	0.0017 U	--	--	0.0019 U	--	--	0.00079 U	--	0.00088 U	--	0.0015 U	--	0.0017 U
Nitrobenzene	--	0.016 U	--	--	0.018 U	--	--	0.0074 U	--	0.0082 U	--	0.014 U	--	0.016 U
N-Nitrosodi-N-Propylamine	--	0.003 U	--	--	0.0034 U	--	--	0.0014 U	--	0.0015 U	--	0.0026 U	--	0.003 U
N-Nitrosodiphenylamine	--	0.015 U	--	--	0.016 U	--	--	0.0067 U	--	0.0075 U	--	0.013 U	--	0.015 U
Pentachlorophenol	--	0.072 U	--	--	0.08 U	--	--	0.032 U	--	0.036 U	--	0.062 U	--	0.071 U
Phenanthrene	--	0.0039 J	--	--	0.01	--	--	0.0022 J	--	0.0019 J	--	0.0021 U	--	0.0032 J
Phenol	--	0.014 U	--	--	0.015 U	--	--	0.0061 U	--	0.0068 U	--	0.012 U	--	0.013 U
Pyrene	--	0.0028 J	--	--	0.0093 J	--	--	0.0039 J	--	0.0014 J	--	0.0018 U	--	0.0032 J
SEMIVOLATILE ORGANIC COMPOUNDS-SIM (mg/kg)														
Acenaphthene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acenaphthylene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Anthracene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(A)Anthracene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(A)Pyrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(B)Fluoranthene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(G,H,I)Perylene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(K)Fluoranthene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo[E]Pyrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
C1-Chrysenes	--	--	--	--	--	--	--	--	--	--	--	--	--	--
C1-Fluoranthenes/Pyrenes	--	--	--	--	--	--	--	--	--	--	--	--	--	--
C1-Fluorenes	--	--	--	--	--	--	--	--	--	--	--	--	--	--
C1-Naphthalenes	--	--	--	--	--	--	--	--	--	--	--	--	--	--
C1-Phenanthrenes/Anthracenes	--	--	--	--	--	--	--	--	--	--	--	--	--	--
C2-Chrysenes	--	--	--	--	--	--	--	--	--	--	--	--	--	--
C2-Fluorenes	--	--	--	--	--	--	--	--	--	--	--	--	--	--
C2-Naphthalenes	--	--	--	--	--	--	--	--	--	--	--	--	--	--
C2-Phenanthrenes/Anthracenes	--	--	--	--	--	--	--	--	--	--	--	--	--	--
C3-Chrysenes	--	--	--	--	--	--	--	--	--	--	--	--	--	--
C3-Fluorenes	--	--	--	--	--	--	--	--	--	--	--	--	--	--
C3-Naphthalenes	--	--	--	--	--	--	--	--	--	--	--	--	--	--
C3-Phenanthrenes/Anthracenes	--	--	--	--	--	--	--	--	--	--	--	--	--	--
C4 Chrysenes	--	--	--	--	--	--	--	--	--	--	--	--	--	--
C4-Naphthalenes	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Table E-32
Summary of Data Used in Risk Assessment
Flathead River Area (sediment) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSDP-001	CFSDP-001	CFSDP-002	CFSDP-002	CFSDP-002	CFSDP-006	CFSDP-006	CFSDP-006	CFSDP-007	CFSDP-007	CFSDP-008	CFSDP-008	CFSDP-017	CFSDP-017
Sample Lab IDs Sample Name Chemical	200-35201-16, 460-119897-1 CFSDP-001-SO 9/8/2016	180-82746-6, 200-45621-6, 460-166239-6 CFSDP-001-SD 10/5/2018	460-119897-2 CFSDP-002-SO 9/8/2016	200-35302-1 CFSDP-002-SO 9/16/2016	180-82746-4, 200-45621-4, 460-166239-4 CFSDP-002-SD 10/5/2018	460-119996-4 CFSDP-006-SD 9/9/2016	200-35201-23 CFSDP-006-SO 9/9/2016	180-82692-1, 200-45608-1, 460-166286-1 CFSDP-006-SD 10/4/2018	200-35201-17, 460-119897-3 CFSDP-007-SO 9/8/2016	180-82623-4, 200-45561-4, 460-166049-4 CFSDP-007-SD 10/3/2018	200-35201-18, 460-119897-4 CFSDP-008-SO 9/8/2016	180-82623-2, 200-45561-2, 460-166049-2 CFSDP-008-SD 10/3/2018	200-35201-19, 460-119897-5 CFSDP-017-SO 9/8/2016	180-82623-1, 200-45561-1, 460-166049-1 CFSDP-017-SD 10/3/2018
C4-Phenanthrenes/Anthracenes	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chrysene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibenz(A,H)Anthracene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Fluoranthene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Fluorene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Indeno(1,2,3-C,D)Pyrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Naphthalene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Perylene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Phenanthrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Pyrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
VOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,1,1-Trichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,2,2-Tetrachloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,2-Trichloro-1,2,2-Trifluoroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,2-Trichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1-Dichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1-Dichloroethene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,3-Trichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,4-Trichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dibromo-3-Chloropropane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dibromoethane (Ethylene Dibromide)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichloropropane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,3-Dichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,4-Dichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Hexanone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acetone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromochloromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromodichloromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromoform	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromomethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Carbon Disulfide	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Carbon Tetrachloride	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chloroform	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chloromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cis-1,2-Dichloroethylene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cis-1,3-Dichloropropene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cyclohexane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibromochloromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dichlorodifluoromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Ethylbenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Isopropylbenzene (Cumene)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
M,P-Xylene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methyl Acetate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methyl Ethyl Ketone (2-Butanone)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methylcyclohexane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methylene Chloride	--	--	--	--	--	--	--	--	--	--	--	--	--	--
O-Xylene (1,2-Dimethylbenzene)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Styrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Tert-Butyl Methyl Ether	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Tetrachloroethylene (PCE)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Toluene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Trans-1,2-Dichloroethene	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Table E-32
Summary of Data Used in Risk Assessment
Flathead River Area (sediment) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSDP-001	CFSDP-001	CFSDP-002	CFSDP-002	CFSDP-002	CFSDP-006	CFSDP-006	CFSDP-006	CFSDP-007	CFSDP-007	CFSDP-008	CFSDP-008	CFSDP-017	CFSDP-017
Sample Lab IDs Sample Name Chemical	200-35201-16, 460-119897-1 CFSDP-001-SO 9/8/2016	180-82746-6, 200-45621-6, 460-166239-6 CFSDP-001-SD 10/5/2018	460-119897-2 CFSDP-002-SO 9/8/2016	200-35302-1 CFSDP-002-SO 9/16/2016	180-82746-4, 200-45621-4, 460-166239-4 CFSDP-002-SD 10/5/2018	460-119996-4 CFSDP-006-SD 9/9/2016	200-35201-23 CFSDP-006-SO 9/9/2016	180-82692-1, 200-45608-1, 460-166286-1 CFSDP-006-SD 10/4/2018	200-35201-17, 460-119897-3 CFSDP-007-SO 9/8/2016	180-82623-4, 200-45561-4, 460-166049-4 CFSDP-007-SD 10/3/2018	200-35201-18, 460-119897-4 CFSDP-008-SO 9/8/2016	180-82623-2, 200-45561-2, 460-166049-2 CFSDP-008-SD 10/3/2018	200-35201-19, 460-119897-5 CFSDP-017-SO 9/8/2016	180-82623-1, 200-45561-1, 460-166049-1 CFSDP-017-SD 10/3/2018
Trans-1,3-Dichloropropene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Trichloroethylene (TCE)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Trichlorofluoromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Vinyl Chloride	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-32
Summary of Data Used in Risk Assessment
Flathead River Area (sediment) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSDP-026	CFSDP-026	CFSDP-033	CFSDP-033	CFSDP-034	CFSDP-035	CFSDP-036	CFSDP-037	CFSDP-038
Sample Lab IDs	460-144087-8	180-82745-2, 180-82746-2, 200-45621-2, 200-45622-2, 460-166239-2	460-144400-16	180-83167-3, 180-83168-3, 200-45776-3, 460-167103-3	180-82746-5, 200-45621-5, 460-166239-5	180-82745-3, 180-82746-3, 200-45621-3, 200-45622-3, 460-166239-3	180-82692-2, 200-45608-2, 460-166286-2	180-82623-5, 200-45561-5, 460-166049-5	180-82623-3, 200-45561-3, 460-166049-3
Sample Name	CFSDP-026-SD	CFSDP-026-SD	CFSDP-033-SD	CFSDP-033-SD	CFSDP-034-SD	CFSDP-035-SD	CFSDP-036-SD	CFSDP-037-SD	CFSDP-038-SD
Chemical	10/31/2017	10/5/2018	11/3/2017	10/17/2018	10/5/2018	10/5/2018	10/4/2018	10/3/2018	10/3/2018
GENERAL CHEMISTRY (mg/kg)									
Fluoride	69.2 J+	4.07 J-	19.2 J+	3.01	0.18 UJ	0.2 UJ	2.93 J-	0.2 U	0.21 U
Cyanide	0.82	2.7	1.2	0.27 J	0.074 U	0.088 U	0.067 U	0.084 U	0.087 U
METALS (mg/kg)									
Aluminum	9110	12000	11800	8710	6160	7090	6980	7990	6880
Antimony	0.44 U	0.39 UJ	0.39 U	0.35 U	0.35 UJ	0.36 UJ	0.3 UJ	0.33 U	0.37 U
Arsenic	3.7	3.8	3.7	2.5	3.1	3.2	2.9	3.7	3.4
Barium	72.9	114	208	123	45.4	51.9	62.1	55.4 J+	51.5 J+
Beryllium	0.35 J	0.46 J	0.51	0.41 J	0.33 J	0.37 J	0.34 J	0.35 J	0.32 J
Cadmium	0.47 U	0.45 U	0.42 U	0.4 U	0.4 U	0.41 U	0.34 U	0.38 U	0.42 U
Calcium	16800	16700	16900	22400	14700	31400	17700	11700 J	7390 J
Chromium, Total	9.7	9.8	13.3	10	7	7.5	7.3	9.1	8.3
Cobalt	5.6	5.2	7.7	5.9	4.2	4.6	4.3	5.4	5.1
Copper	11.7	17.1	20.7	16.1	7.4	9	9.2	10.1	10.6
Iron	14700	11900	18300	12600	10000	11800	10700	14500	14200
Lead	7.1	11.7	11.6	8.5	4.3	5.4	5	6 J	5.4 J
Magnesium	10700	9950	15000	11600	8200	10400	8740	9450	9150
Manganese	166	138	177	163	215	232	199	226 J	174 J
Mercury	0.015 U	0.02 J	0.019 J	0.014 U	0.011 U	0.018 J	0.01 U	0.012 U	0.014 U
Nickel	13.1	18.5	16.1	12.5	8.4	9.4	9.3	11.2	10.2
Potassium	668	816	1140	1080	476	527	493	401	315
Selenium	0.41 U	0.39 U	0.37 U	0.35 U	0.34 U	0.35 U	0.3 U	0.32 U	0.37 U
Silver	0.86 U	0.83 U	0.77 U	0.74 U	0.73 U	0.75 U	0.63 U	0.69 U	0.78 U
Sodium	99.7 J	58.1 J	94.9 J	100 J	42.9 J	38.1 U	32 U	35.1 U	39.4 U
Thallium	0.17 U	0.17 U	0.16 U	0.15 U	0.15 U	0.15 U	0.13 U	0.14 U	0.16 U
Vanadium	17.5	16.1	24.2	14.8	14.1	14.8	8.4	10.3	21.6
Zinc	52.1	58.4	53.9	43.2	29.9	33.5	31.7	39.5	36.3
METALS SEM|Simultaneously Extracted Metals (mg/kg)									
SEM/AVS	--	0.307	--	0.474	--	QL_ERROR U	--	--	--
METALS|AVS/SEM (mg/kg)									
Cadmium	--	0.0011 J	--	0.00097 J	--	0.0011 J	--	--	--
Copper	--	0.12	--	0.16	--	0.11	--	--	--
Lead	--	0.036	--	0.032	--	0.027	--	--	--
Mercury	--	0.000013 U	--	0.000012 U	--	0.00001 U	--	--	--
Nickel	--	0.071	--	0.065	--	0.066	--	--	--
Sulfide	--	1.7	--	1	--	0.19 U	--	--	--
Zinc	--	0.28 J	--	0.22 J	--	0.2 J	--	--	--
PESTICIDES (mg/kg)									
Aldrin	--	--	--	--	--	--	--	--	--
Alpha Bhc (Alpha Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--
Alpha Endosulfan	--	--	--	--	--	--	--	--	--
Beta Bhc (Beta Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--
Beta Endosulfan	--	--	--	--	--	--	--	--	--
cis-Chlordane	--	--	--	--	--	--	--	--	--
Delta BHC (Delta Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--
Dieldrin	--	--	--	--	--	--	--	--	--
Endosulfan Sulfate	--	--	--	--	--	--	--	--	--
Endrin	--	--	--	--	--	--	--	--	--
Endrin Aldehyde	--	--	--	--	--	--	--	--	--
Endrin Ketone	--	--	--	--	--	--	--	--	--
Gamma Bhc (Lindane)	--	--	--	--	--	--	--	--	--
Heptachlor	--	--	--	--	--	--	--	--	--
Heptachlor Epoxide	--	--	--	--	--	--	--	--	--
Methoxychlor	--	--	--	--	--	--	--	--	--
P,P'-DDD	--	--	--	--	--	--	--	--	--
P,P'-DDE	--	--	--	--	--	--	--	--	--
P,P'-DDT	--	--	--	--	--	--	--	--	--
Toxaphene	--	--	--	--	--	--	--	--	--

Table E-32
Summary of Data Used in Risk Assessment
Flathead River Area (sediment) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSDP-026	CFSDP-026	CFSDP-033	CFSDP-033	CFSDP-034	CFSDP-035	CFSDP-036	CFSDP-037	CFSDP-038
Sample Lab IDs	460-144087-8	180-82745-2, 180-82746-2, 200-45621-2, 200-45622-2, 460-166239-2	460-144400-16	180-83167-3, 180-83168-3, 200-45776-3, 460-167103-3	180-82746-5, 200-45621-5, 460-166239-5	180-82745-3, 180-82746-3, 200-45621-3, 200-45622-3, 460-166239-3	180-82692-2, 200-45608-2, 460-166286-2	180-82623-5, 200-45561-5, 460-166049-5	180-82623-3, 200-45561-3, 460-166049-3
Sample Name	CFSDP-026-SD	CFSDP-026-SD	CFSDP-033-SD	CFSDP-033-SD	CFSDP-034-SD	CFSDP-035-SD	CFSDP-036-SD	CFSDP-037-SD	CFSDP-038-SD
Chemical	10/31/2017	10/5/2018	11/3/2017	10/17/2018	10/5/2018	10/5/2018	10/4/2018	10/3/2018	10/3/2018
trans-Chlordane	--	--	--	--	--	--	--	--	--
POLYCHLORINATED BIPHENYLS (mg/kg)									
PCB-1016 (Aroclor 1016)	--	--	--	--	--	--	--	--	--
PCB-1221 (Aroclor 1221)	--	--	--	--	--	--	--	--	--
PCB-1232 (Aroclor 1232)	--	--	--	--	--	--	--	--	--
PCB-1242 (Aroclor 1242)	--	--	--	--	--	--	--	--	--
PCB-1248 (Aroclor 1248)	--	--	--	--	--	--	--	--	--
PCB-1254 (Aroclor 1254)	--	--	--	--	--	--	--	--	--
PCB-1260 (Aroclor 1260)	--	--	--	--	--	--	--	--	--
PCB-1262 (Aroclor 1262)	--	--	--	--	--	--	--	--	--
PCB-1268 (Aroclor 1268)	--	--	--	--	--	--	--	--	--
Polychlorinated Biphenyl (PCBs)	--	--	--	--	--	--	--	--	--
SEMIVOLATILE ORGANIC COMPOUNDS (mg/kg)									
1,2,4,5-Tetrachlorobenzene	0.035 U	--	0.038 U	--	--	--	--	--	--
1,4-Dioxane (P-Dioxane)	0.13 U	--	0.14 U	--	--	--	--	--	--
2,3,4,6-Tetrachlorophenol	0.045 U	--	0.049 U	--	--	--	--	--	--
2,4,5-Trichlorophenol	0.047 U	--	0.051 U	--	--	--	--	--	--
2,4,6-Trichlorophenol	0.014 U	--	0.015 U	--	--	--	--	--	--
2,4-Dichlorophenol	0.011 U	--	0.012 U	--	--	--	--	--	--
2,4-Dimethylphenol	0.1 UJ	--	0.11 U	--	--	--	--	--	--
2,4-Dinitrophenol	0.36 U	--	0.39 U	--	--	--	--	--	--
2,4-Dinitrotoluene	0.019 U	--	0.02 U	--	--	--	--	--	--
2,6-Dinitrotoluene	0.025 U	--	0.028 U	--	--	--	--	--	--
2-Chloronaphthalene	0.011 U	--	0.012 U	--	--	--	--	--	--
2-Chlorophenol	0.012 U	--	0.013 U	--	--	--	--	--	--
2-Methylnaphthalene	0.011 U	--	0.011 U	--	--	--	--	--	--
2-Methylphenol (O-Cresol)	0.021 U	--	0.023 U	--	--	--	--	--	--
2-Nitroaniline	0.016 U	--	0.017 U	--	--	--	--	--	--
2-Nitrophenol	0.016 U	--	0.017 U	--	--	--	--	--	--
3- And 4- Methylphenol (Total)	0.013 U	--	0.014 U	--	--	--	--	--	--
3,3'-Dichlorobenzidine	0.053 U	--	0.058 U	--	--	--	--	--	--
3-Nitroaniline	0.014 U	--	0.015 U	--	--	--	--	--	--
4,6-Dinitro-2-Methylphenol	0.13 U	--	0.14 U	--	--	--	--	--	--
4-Bromophenyl Phenyl Ether	0.015 U	--	0.016 U	--	--	--	--	--	--
4-Chloro-3-Methylphenol	0.02 U	--	0.022 U	--	--	--	--	--	--
4-Chloroaniline	0.012 U	--	0.013 U	--	--	--	--	--	--
4-Chlorophenyl Phenyl Ether	0.014 U	--	0.015 U	--	--	--	--	--	--
4-Nitroaniline	0.018 U	--	0.02 U	--	--	--	--	--	--
4-Nitrophenol	0.23 U	--	0.25 U	--	--	--	--	--	--
Acenaphthene	0.012 U	--	0.013 U	--	--	--	--	--	--
Acenaphthylene	0.012 U	--	0.013 U	--	--	--	--	--	--
Acetophenone	0.01 U	--	0.011 U	--	--	--	--	--	--
Anthracene	0.045 U	--	0.049 U	--	--	--	--	--	--
Atrazine	0.021 U	--	0.023 U	--	--	--	--	--	--
Benzaldehyde	0.036 U	--	0.039 U	--	--	--	--	--	--
Benzo(A)Anthracene	0.13	--	0.043 U	--	--	--	--	--	--
Benzo(A)Pyrene	0.014 U	--	0.08	--	--	--	--	--	--
Benzo(B)Fluoranthene	0.27	--	0.2	--	--	--	--	--	--
Benzo(G,H,I)Perylene	0.05 J+	--	0.075 J	--	--	--	--	--	--
Benzo(K)Fluoranthene	0.088	--	0.023 U	--	--	--	--	--	--
Benzyl Butyl Phthalate	0.015 U	--	0.016 U	--	--	--	--	--	--
Biphenyl (Diphenyl)	0.041 U	--	0.044 U	--	--	--	--	--	--
Bis(2-Chloroethoxy) Methane	0.015 U	--	0.016 U	--	--	--	--	--	--
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.011 U	--	0.012 U	--	--	--	--	--	--
Bis(2-Chloroisopropyl) Ether	0.02 U	--	0.021 U	--	--	--	--	--	--
Bis(2-Ethylhexyl) Phthalate	0.019 U	--	0.02 U	--	--	--	--	--	--
Caprolactam	0.034 U	--	0.037 U	--	--	--	--	--	--
Carbazole	0.012 U	--	0.013 U	--	--	--	--	--	--

Table E-32
Summary of Data Used in Risk Assessment
Flathead River Area (sediment) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSDP-026	CFSDP-026	CFSDP-033	CFSDP-033	CFSDP-034	CFSDP-035	CFSDP-036	CFSDP-037	CFSDP-038
Sample Lab IDs	460-144087-8	180-82745-2, 180-82746-2, 200-45621-2, 200-45622-2, 460-166239-2	460-144400-16	180-83167-3, 180-83168-3, 200-45776-3, 460-167103-3	180-82746-5, 200-45621-5, 460-166239-5	180-82745-3, 180-82746-3, 200-45621-3, 200-45622-3, 460-166239-3	180-82692-2, 200-45608-2, 460-166286-2	180-82623-5, 200-45561-5, 460-166049-5	180-82623-3, 200-45561-3, 460-166049-3
Sample Name	CFSDP-026-SD	CFSDP-026-SD	CFSDP-033-SD	CFSDP-033-SD	CFSDP-034-SD	CFSDP-035-SD	CFSDP-036-SD	CFSDP-037-SD	CFSDP-038-SD
Chemical	10/31/2017	10/5/2018	11/3/2017	10/17/2018	10/5/2018	10/5/2018	10/4/2018	10/3/2018	10/3/2018
Chrysene	0.3 J	--	0.1 J	--	--	--	--	--	--
Dibenz(A,H)Anthracene	0.025 U	--	0.027 U	--	--	--	--	--	--
Dibenzofuran	0.014 U	--	0.016 U	--	--	--	--	--	--
Diethyl Phthalate	0.014 U	--	0.015 U	--	--	--	--	--	--
Dimethyl Phthalate	0.014 U	--	0.015 U	--	--	--	--	--	--
Di-N-Butyl Phthalate	0.014 U	--	0.015 U	--	--	--	--	--	--
Di-N-Octylphthalate	0.024 U	--	0.026 U	--	--	--	--	--	--
Fluoranthene	0.37 J	--	0.024 J	--	--	--	--	--	--
Fluorene	0.01 U	--	0.011 U	--	--	--	--	--	--
Hexachlorobenzene	0.019 U	--	0.021 U	--	--	--	--	--	--
Hexachlorobutadiene	0.013 U	--	0.015 U	--	--	--	--	--	--
Hexachlorocyclopentadiene	0.03 UJ	--	0.032 UJ	--	--	--	--	--	--
Hexachloroethane	0.017 U	--	0.019 U	--	--	--	--	--	--
Indeno(1,2,3-C,D)Pyrene	0.032 U	--	0.12	--	--	--	--	--	--
Isophorone	0.01 U	--	0.011 U	--	--	--	--	--	--
Naphthalene	0.012 U	--	0.013 U	--	--	--	--	--	--
Nitrobenzene	0.015 U	--	0.016 U	--	--	--	--	--	--
N-Nitrosodi-N-Propylamine	0.016 U	--	0.017 U	--	--	--	--	--	--
N-Nitrosodiphenylamine	0.043 U	--	0.047 U	--	--	--	--	--	--
Pentachlorophenol	0.058 U	--	0.063 U	--	--	--	--	--	--
Phenanthrene	0.053 J	--	0.014 U	--	--	--	--	--	--
Phenol	0.016 U	--	0.017 U	--	--	--	--	--	--
Pyrene	0.39 J	--	0.035 J	--	--	--	--	--	--
SEMIVOLATILE ORGANIC COMPOUNDS|LOW LEVEL (mg/kg)									
1,2,4,5-Tetrachlorobenzene	--	0.012 U	--	0.0023 U	0.00079 U	0.015 U	0.0015 U	0.0018 U	0.00091 U
1,4-Dioxane (P-Dioxane)	--	0.087 U	--	0.017 U	0.0057 U	0.11 U	0.011 U	0.013 U	0.0066 U
2,3,4,6-Tetrachlorophenol	--	0.12 U	--	0.022 U	0.0076 U	0.15 U	0.014 UJ	0.017 U	0.0088 U
2,4,5-Trichlorophenol	--	0.02 U	--	0.0038 U	0.0013 U	0.025 U	0.0025 U	0.003 U	0.0015 U
2,4,6-Trichlorophenol	--	0.015 U	--	0.003 U	0.001 U	0.019 U	0.0019 U	0.0023 U	0.0012 U
2,4-Dichlorophenol	--	0.022 U	--	0.0042 U	0.0014 U	0.027 U	0.0027 U	0.0032 U	0.0016 U
2,4-Dimethylphenol	--	0.017 U	--	0.0034 U	0.0011 U	0.022 U	0.0022 U	0.0026 U	0.0013 U
2,4-Dinitrophenol	--	0.75 U	--	0.15 U	0.049 U	0.95 U	0.093 U	0.11 U	0.057 U
2,4-Dinitrotoluene	--	0.014 U	--	0.0027 U	0.00091 U	0.017 U	0.0017 U	0.0021 U	0.0011 U
2,6-Dinitrotoluene	--	0.017 U	--	0.0033 U	0.0011 U	0.022 U	0.0021 U	0.0026 U	0.0013 U
2-Chloronaphthalene	--	0.013 U	--	0.0025 U	0.00084 U	0.016 U	0.0016 U	0.0019 U	0.00097 U
2-Chlorophenol	--	0.013 U	--	0.0025 U	0.00085 U	0.016 U	0.0016 U	0.0019 U	0.00098 U
2-Methylnaphthalene	--	0.013 U	--	0.0026 U	0.00088 U	0.017 U	0.0017 U	0.002 U	0.001 U
2-Methylphenol (O-Cresol)	--	0.08 U	--	0.015 U	0.0052 U	0.1 U	0.0099 U	0.012 U	0.0061 U
2-Nitroaniline	--	0.13 U	--	0.025 U	0.0083 U	0.16 U	0.016 U	0.019 U	0.0096 U
2-Nitrophenol	--	0.016 U	--	0.0031 U	0.001 U	0.02 U	0.002 U	0.0024 U	0.0012 U
3,3'-Dichlorobenzidine	--	0.26 U	--	0.05 U	0.017 U	0.33 U	0.032 U	0.039 U	0.02 U
3-Nitroaniline	--	0.071 U	--	0.014 U	0.0046 U	0.089 U	0.0088 U	0.011 U	0.0054 U
4,6-Dinitro-2-Methylphenol	--	0.48 U	--	0.093 U	0.032 U	0.61 U	0.06 U	0.072 U	0.037 U
4-Bromophenyl Phenyl Ether	--	0.02 U	--	0.0038 U	0.0013 U	0.025 U	0.0024 U	0.0029 U	0.0015 U
4-Chloro-3-Methylphenol	--	0.013 U	--	0.0025 U	0.00086 U	0.017 U	0.0016 UJ	0.002 U	0.001 U
4-Chloroaniline	--	0.0093 U	--	0.0018 U	0.00061 U	0.012 U	0.0011 U	0.0014 U	0.0007 U
4-Chlorophenyl Phenyl Ether	--	0.017 U	--	0.0033 U	0.0011 U	0.021 U	0.0021 U	0.0025 U	0.0013 U
4-Nitroaniline	--	0.014 U	--	0.0026 U	0.00089 U	0.017 U	0.0017 U	0.002 U	0.001 U
4-Nitrophenol	--	0.2 U	--	0.038 U	0.013 U	0.25 U	0.024 UJ	0.029 U	0.015 U
Acenaphthene	--	0.034 J	--	0.0031 U	0.0011 U	0.032 J	0.002 U	0.0024 U	0.0012 U
Acenaphthylene	--	0.012 U	--	0.0024 U	0.0008 U	0.015 U	0.0015 U	0.0018 U	0.00093 U
Acetophenone	--	0.015 U	--	0.0029 U	0.00099 U	0.019 U	0.0019 U	0.0023 U	0.0011 U
Anthracene	--	0.19	--	0.0028 U	0.0012 J	0.18	0.0086	0.0022 U	0.0011 U
Atrazine	--	0.12 UJ	--	0.024 UJ	0.008 U	0.15 U	0.015 UJ	0.018 UJ	0.0093 UJ
Benzaldehyde	--	0.035 UR	--	0.0067 UR	0.0023 UR	0.044 UR	0.0043 UR	0.0052 UR	0.0026 UR
Benzo(A)Anthracene	--	2	--	0.011	0.0053	1.4	0.07	0.0016 U	0.0011 J
Benzo(A)Pyrene	--	1.2	--	0.013	0.0042	0.99	0.044	0.0018 U	0.00092 U
Benzo(B)Fluoranthene	--	5	--	0.021	0.014	4.6	0.24	0.0021 U	0.0012 J

Table E-32
Summary of Data Used in Risk Assessment
Flathead River Area (sediment) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Chemical	CFSDP-026 460-144087-8 CFSDP-026-SD 10/31/2017	CFSDP-026 180-82745-2, 180-82746-2, 200-45621-2, 200-45622-2, 460-166239-2 CFSDP-026-SD 10/5/2018	CFSDP-033 460-144400-16 CFSDP-033-SD 11/3/2017	CFSDP-033 180-83167-3, 180-83168-3, 200-45776-3, 460-167103-3 CFSDP-033-SD 10/17/2018	CFSDP-034 180-82746-5, 200-45621-5, 460-166239-5 CFSDP-034-SD 10/5/2018	CFSDP-035 180-82745-3, 180-82746-3, 200-45621-3, 200-45622-3, 460-166239-3 CFSDP-035-SD 10/5/2018	CFSDP-036 180-82692-2, 200-45608-2, 460-166286-2 CFSDP-036-SD 10/4/2018	CFSDP-037 180-82623-5, 200-45561-5, 460-166049-5 CFSDP-037-SD 10/3/2018	CFSDP-038 180-82623-3, 200-45561-3, 460-166049-3 CFSDP-038-SD 10/3/2018
Benzo(G,H,I)Perylene	--	1.9	--	0.011	0.0059	1.7	0.087	0.0018 U	0.00098 J
Benzo(K)Fluoranthene	--	1.5	--	0.0075 J	0.0041	1.4	0.072	0.0025 U	0.0013 U
Benzyl Butyl Phthalate	--	0.19 U	--	0.037 U	0.013 U	0.24 U	0.024 U	0.029 U	0.015 U
Biphenyl (Diphenyl)	--	0.012 U	--	0.0023 U	0.00077 U	0.015 U	0.0015 U	0.0018 U	0.00089 U
Bis(2-Chloroethoxy) Methane	--	0.013 U	--	0.0026 U	0.00087 U	0.017 U	0.0016 U	0.002 U	0.001 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	--	0.01 U	--	0.002 U	0.00066 U	0.013 U	0.0013 U	0.0015 U	0.00077 U
Bis(2-Chloroisopropyl) Ether	--	0.021 U	--	0.004 U	0.0014 U	0.026 U	0.0026 U	0.0031 U	0.0016 U
Bis(2-Ethylhexyl) Phthalate	--	0.3 U	--	0.058 U	0.02 U	0.38 U	0.037 U	0.045 U	0.023 U
Caprolactam	--	0.18 U	--	0.035 U	0.012 U	0.23 U	0.023 U	0.027 U	0.014 U
Carbazole	--	0.68	--	0.0031 J	0.0028 J	0.59	0.048	0.002 U	0.00099 U
Chrysene	--	6.3	--	0.021	0.019	5.7	0.3	0.0016 U	0.0013 J
Dibenz(A,H)Anthracene	--	0.49	--	0.0032 J	0.0013 J-	0.49 J-	0.026	0.0019 U	0.00094 U
Dibenzofuran	--	0.014 J	--	0.0024 U	0.00082 J	0.015 U	0.0015 U	0.0018 U	0.00093 U
Diethyl Phthalate	--	0.084 U	--	0.016 U	0.0055 U	0.11 U	0.01 U	0.013 U	0.0063 U
Dimethyl Phthalate	--	0.01 U	--	0.002 U	0.00066 U	0.013 U	0.0013 U	0.0015 U	0.00077 U
Di-N-Butyl Phthalate	--	0.12 U	--	0.024 U	0.008 U	0.15 U	0.015 U	0.018 U	0.0093 U
Di-N-Octylphthalate	--	0.16 U	--	0.031 U	0.011 U	0.2 U	0.02 U	0.024 U	0.012 U
Fluoranthene	--	6.2	--	0.023	0.014	3.9	0.37	0.0022 U	0.0011 J
Fluorene	--	0.027 J	--	0.0021 U	0.00072 U	0.023 J	0.0014 U	0.0016 U	0.00083 U
Hexachlorobenzene	--	0.02 U	--	0.0039 U	0.0013 U	0.025 U	0.0025 U	0.003 U	0.0015 U
Hexachlorobutadiene	--	0.016 U	--	0.0032 U	0.0011 U	0.021 U	0.002 U	0.0024 U	0.0012 U
Hexachlorocyclopentadiene	--	0.014 U	--	0.0027 UJ	0.00093 U	0.018 U	0.0018 U	0.0021 U	0.0011 U
Hexachloroethane	--	0.014 U	--	0.0028 U	0.00094 U	0.018 U	0.0018 U	0.0022 U	0.0011 U
Indeno(1,2,3-C,D)Pyrene	--	1.6	--	0.0095 J	0.005	1.5	0.072	0.0017 U	0.00086 U
Isophorone	--	0.014 U	--	0.0027 U	0.00093 U	0.018 U	0.0018 U	0.0021 U	0.0011 U
Naphthalene	--	0.011 J	--	0.0021 U	0.00071 U	0.014 U	0.0013 U	0.0016 U	0.00082 U
Nitrobenzene	--	0.1 U	--	0.02 U	0.0067 U	0.13 U	0.013 U	0.015 U	0.0077 U
N-Nitrosodi-N-Propylamine	--	0.019 U	--	0.0037 U	0.0012 U	0.024 U	0.0023 U	0.0028 U	0.0014 U
N-Nitrosodiphenylamine	--	0.093 U	--	0.018 U	0.0061 U	0.12 U	0.011 U	0.014 U	0.007 U
Pentachlorophenol	--	0.45 U	--	0.087 U	0.029 U	0.56 U	0.056 UJ	0.067 U	0.034 U
Phenanthrene	--	0.74	--	0.01 J	0.0056	0.57	0.038	0.0022 U	0.0019 J
Phenol	--	0.084 U	--	0.016 U	0.0055 U	0.11 U	0.01 U	0.013 U	0.0064 U
Pyrene	--	4.4	--	0.019	0.0084	2.8	0.21	0.002 U	0.001 U
SEMIVOLATILE ORGANIC COMPOUNDS-SIM (mg/kg)									
Acenaphthene	--	0.023 J	--	--	--	0.0014 J	--	--	--
Acenaphthylene	--	0.023 U	--	--	--	0.002 U	--	--	--
Anthracene	--	0.11	--	--	--	0.0055 J	--	--	--
Benzo(A)Anthracene	--	1.4	--	--	--	0.07	--	--	--
Benzo(A)Pyrene	--	0.59	--	--	--	0.043	--	--	--
Benzo(B)Fluoranthene	--	2.7 J	--	--	--	0.18 J	--	--	--
Benzo(G,H,I)Perylene	--	0.67 J	--	--	--	0.056 J	--	--	--
Benzo(K)Fluoranthene	--	1.9 J	--	--	--	0.12 J	--	--	--
Benzo[E]Pyrene	--	1.5 J	--	--	--	0.1 J	--	--	--
C1-Chrysenes	--	0.76 J	--	--	--	0.035 J	--	--	--
C1-Fluoranthenes/Pyrenes	--	1.4 J	--	--	--	0.057 J	--	--	--
C1-Fluorenes	--	0.092 U	--	--	--	0.0079 U	--	--	--
C1-Naphthalenes	--	0.092 U	--	--	--	0.0079 U	--	--	--
C1-Phenanthrenes/Anthracenes	--	0.33 J	--	--	--	0.016 J	--	--	--
C2-Chrysenes	--	0.17 J	--	--	--	0.0085 J	--	--	--
C2-Fluorenes	--	0.092 U	--	--	--	0.0079 U	--	--	--
C2-Naphthalenes	--	0.092 U	--	--	--	0.0079 U	--	--	--
C2-Phenanthrenes/Anthracenes	--	0.22 J	--	--	--	0.0088 J	--	--	--
C3-Chrysenes	--	0.092 U	--	--	--	0.0079 U	--	--	--
C3-Fluorenes	--	0.092 U	--	--	--	0.0079 U	--	--	--
C3-Naphthalenes	--	0.092 U	--	--	--	0.0079 U	--	--	--
C3-Phenanthrenes/Anthracenes	--	0.092 U	--	--	--	0.0079 U	--	--	--
C4 Chrysenes	--	0.092 U	--	--	--	0.0079 U	--	--	--
C4-Naphthalenes	--	0.092 U	--	--	--	0.0079 U	--	--	--

Table E-32
Summary of Data Used in Risk Assessment
Flathead River Area (sediment) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSDP-026	CFSDP-026	CFSDP-033	CFSDP-033	CFSDP-034	CFSDP-035	CFSDP-036	CFSDP-037	CFSDP-038
Sample Lab IDs	460-144087-8	180-82745-2, 180-82746-2, 200-45621-2, 200-45622-2, 460-166239-2	460-144400-16	180-83167-3, 180-83168-3, 200-45776-3, 460-167103-3	180-82746-5, 200-45621-5, 460-166239-5	180-82745-3, 180-82746-3, 200-45621-3, 200-45622-3, 460-166239-3	180-82692-2, 200-45608-2, 460-166286-2	180-82623-5, 200-45561-5, 460-166049-5	180-82623-3, 200-45561-3, 460-166049-3
Sample Name	CFSDP-026-SD	CFSDP-026-SD	CFSDP-033-SD	CFSDP-033-SD	CFSDP-034-SD	CFSDP-035-SD	CFSDP-036-SD	CFSDP-037-SD	CFSDP-038-SD
Chemical	10/31/2017	10/5/2018	11/3/2017	10/17/2018	10/5/2018	10/5/2018	10/4/2018	10/3/2018	10/3/2018
C4-Phenanthrenes/Anthracenes	--	0.092 U	--	--	--	0.0079 U	--	--	--
Chrysene	--	4.3	--	--	--	0.26	--	--	--
Dibenz(A,H)Anthracene	--	0.23 J	--	--	--	0.018 J	--	--	--
Fluoranthene	--	4.2	--	--	--	0.19	--	--	--
Fluorene	--	0.034 U	--	--	--	0.0029 U	--	--	--
Indeno(1,2,3-C,D)Pyrene	--	0.72 J	--	--	--	0.057 J	--	--	--
Naphthalene	--	0.036 U	--	--	--	0.0031 U	--	--	--
Perylene	--	0.17	--	--	--	0.012	--	--	--
Phenanthrene	--	0.44	--	--	--	0.026	--	--	--
Pyrene	--	3.5	--	--	--	0.16	--	--	--
VOLATILE ORGANIC COMPOUNDS (mg/kg)									
1,1,1-Trichloroethane	0.00027 U	--	0.00027 U	--	--	--	--	--	--
1,1,2,2-Tetrachloroethane	0.00025 U	--	0.00025 U	--	--	--	--	--	--
1,1,2-Trichloro-1,2,2-Trifluoroethane	0.00035 U	--	0.00036 U	--	--	--	--	--	--
1,1,2-Trichloroethane	0.00021 U	--	0.00021 U	--	--	--	--	--	--
1,1-Dichloroethane	0.00024 U	--	0.00024 U	--	--	--	--	--	--
1,1-Dichloroethene	0.00026 U	--	0.00027 U	--	--	--	--	--	--
1,2,3-Trichlorobenzene	0.00021 U	--	0.00021 U	--	--	--	--	--	--
1,2,4-Trichlorobenzene	0.00011 U	--	0.00011 U	--	--	--	--	--	--
1,2-Dibromo-3-Chloropropane	0.00054 U	--	0.00054 U	--	--	--	--	--	--
1,2-Dibromoethane (Ethylene Dibromide)	0.00021 U	--	0.00021 U	--	--	--	--	--	--
1,2-Dichlorobenzene	0.00017 U	--	0.00017 U	--	--	--	--	--	--
1,2-Dichloroethane	0.00035 U	--	0.00035 U	--	--	--	--	--	--
1,2-Dichloropropane	0.0005 U	--	0.0005 U	--	--	--	--	--	--
1,3-Dichlorobenzene	0.00019 U	--	0.00019 U	--	--	--	--	--	--
1,4-Dichlorobenzene	0.00012 U	--	0.00012 U	--	--	--	--	--	--
2-Hexanone	0.00091 U	--	0.00092 U	--	--	--	--	--	--
Acetone	0.018	--	0.023	--	--	--	--	--	--
Benzene	0.0015	--	0.0015	--	--	--	--	--	--
Bromochloromethane	0.00033 U	--	0.00033 U	--	--	--	--	--	--
Bromodichloromethane	0.0003 U	--	0.0003 U	--	--	--	--	--	--
Bromoform	0.0005 U	--	0.0005 U	--	--	--	--	--	--
Bromomethane	0.00056 U	--	0.00056 U	--	--	--	--	--	--
Carbon Disulfide	0.0015	--	0.0011 J	--	--	--	--	--	--
Carbon Tetrachloride	0.00021 U	--	0.00021 U	--	--	--	--	--	--
Chlorobenzene	0.00021 U	--	0.00021 U	--	--	--	--	--	--
Chloroethane	0.00061 U	--	0.00062 U	--	--	--	--	--	--
Chloroform	0.00037 U	--	0.00038 U	--	--	--	--	--	--
Chloromethane	0.00051 UJ	--	0.00051 U	--	--	--	--	--	--
Cis-1,2-Dichloroethylene	0.00018 U	--	0.00018 U	--	--	--	--	--	--
Cis-1,3-Dichloropropene	0.00032 U	--	0.00032 U	--	--	--	--	--	--
Cyclohexane	0.0019	--	0.0028	--	--	--	--	--	--
Dibromochloromethane	0.00023 U	--	0.00023 U	--	--	--	--	--	--
Dichlorodifluoromethane	0.0004 U	--	0.0004 U	--	--	--	--	--	--
Ethylbenzene	0.00061 J	--	0.00026 J	--	--	--	--	--	--
Isopropylbenzene (Cumene)	0.00015 U	--	0.00015 U	--	--	--	--	--	--
M,P-Xylene	0.0018	--	0.00098 J	--	--	--	--	--	--
Methyl Acetate	0.005 U	--	0.0051 U	--	--	--	--	--	--
Methyl Ethyl Ketone (2-Butanone)	0.0025 J	--	0.0042 J+	--	--	--	--	--	--
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	0.00078 U	--	0.00078 U	--	--	--	--	--	--
Methylcyclohexane	0.0038	--	0.0046	--	--	--	--	--	--
Methylene Chloride	0.00019 U	--	0.00019 U	--	--	--	--	--	--
O-Xylene (1,2-Dimethylbenzene)	0.00064 J	--	0.0003 J	--	--	--	--	--	--
Styrene	0.00014 U	--	0.00015 U	--	--	--	--	--	--
Tert-Butyl Methyl Ether	0.00015 U	--	0.00015 U	--	--	--	--	--	--
Tetrachloroethylene (PCE)	0.00017 U	--	0.00017 U	--	--	--	--	--	--
Toluene	0.0036	--	0.0023	--	--	--	--	--	--
Trans-1,2-Dichloroethene	0.00029 U	--	0.00029 U	--	--	--	--	--	--

Table E-32
Summary of Data Used in Risk Assessment
Flathead River Area (sediment) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSDP-026	CFSDP-026	CFSDP-033	CFSDP-033	CFSDP-034	CFSDP-035	CFSDP-036	CFSDP-037	CFSDP-038
Sample Lab IDs	460-144087-8	180-82745-2, 180-82746-2, 200-45621-2, 200-45622-2, 460-166239-2	460-144400-16	180-83167-3, 180-83168-3, 200-45776-3, 460-167103-3	180-82746-5, 200-45621-5, 460-166239-5	180-82745-3, 180-82746-3, 200-45621-3, 200-45622-3, 460-166239-3	180-82692-2, 200-45608-2, 460-166286-2	180-82623-5, 200-45561-5, 460-166049-5	180-82623-3, 200-45561-3, 460-166049-3
Sample Name	CFSDP-026-SD	CFSDP-026-SD	CFSDP-033-SD	CFSDP-033-SD	CFSDP-034-SD	CFSDP-035-SD	CFSDP-036-SD	CFSDP-037-SD	CFSDP-038-SD
Chemical	10/31/2017	10/5/2018	11/3/2017	10/17/2018	10/5/2018	10/5/2018	10/4/2018	10/3/2018	10/3/2018
Trans-1,3-Dichloropropene	0.00031 U	--	0.00031 U	--	--	--	--	--	--
Trichloroethylene (TCE)	0.00017 U	--	0.00017 U	--	--	--	--	--	--
Trichlorofluoromethane	0.00048 U	--	0.00048 U	--	--	--	--	--	--
Vinyl Chloride	0.00064 U	--	0.00064 U	--	--	--	--	--	--

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-33
Summary of Data Used in Risk Assessment
Backwater Seep Sampling Area Soil (0-0.5 ft-bgs) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Sample Depth Chemical	CFSB-134 460-144087-11 CFSB-134-SO-0-0.5 0-0.5 ft 10/31/2017	CFSB-135 460-144087-13 CFSB-135-SO-0-0.5 0-0.5 ft 10/31/2017	CFSB-136 460-144087-15 CFSB-136-SO-0-0.5 0-0.5 2 10/31/2017	CFSB-137 460-144170-9 CFSB-137-SO-0-0.5 0-0.5 ft 11/1/2017	CFSB-138 460-144170-4 CFSB-138-SO-0-0.5 0-0.5 ft 11/1/2017	CFSB-139 460-144087-1 CFSB-139-SO-0-0.5 0-0.5 2 10/31/2017	CFSB-140 460-144087-3 CFSB-140-SO-0-0.5 0-0.5 ft 10/31/2017	CFSB-141 460-144170-7 CFSB-141-SO-0-0.5 0-0.5 ft 11/1/2017
GENERAL CHEMISTRY (mg/kg)								
Fluoride	25.7 J+	22.2 J+	14.5 J+	17 J+	32.7 J+	15.3 J+	12.8 J+	16.4 J+
Cyanide	1.6	1.4	1.9	0.96	0.16 J	0.071 U	0.077 U	0.14 J
Cyanide (Free)	0.42 U	0.43 U	0.42 U	0.4 U	0.4 U	--	--	--
METALS (mg/kg)								
"Chromium, Hexavalent - Estimated"	0.307786	0.294404	0.254258	0.281022	0.283698	0.29708	0.275669	0.331873
"Chromium, Trivalent - Estimated"	11.1922	10.7056	9.24574	10.219	10.3163	10.8029	10.0243	12.0681
Aluminum	9760	9650	8270	9160	10600	9490	8790	10800
Antimony	0.47 U	0.46 U	0.42 U	0.34 UJ	0.37 UJ	0.4 U	0.42 U	0.37 UJ
Arsenic	4.9	5.4	4.4	4.6	5.1	5.3	5	5.4
Barium	194	153	153	159	236	162	190	212
Beryllium	0.63	0.45 J	0.36 J	0.49	0.55	0.6	0.54	0.6
Cadmium	0.5 U	0.49 U	0.45 U	0.36 U	0.39 U	0.43 U	0.44 U	0.39 U
Calcium	35100	23900	18700	21800	18000	23000	25900	29500
Chromium, Total	11.5	11	9.5	10.5	10.6	11.1	10.3	12.4
Cobalt	6.9	7	6	6.3	6.8	7	6.5	7.6
Copper	19	15.9	15.3	15.2	22.7	19	18.1	18.3
Iron	15200	16600	13000	14900	14900	16300	14200	17600
Lead	10.4	8.8	9.1	8.9	11.8	9.8	9.7	10.8
Magnesium	12300	13300	10400	12000	11800	12700	12100	14800
Manganese	249	295	288	304	379	366	389	467
Mercury	0.02 J	0.018 J	0.015 J	0.02 J	0.023	0.021	0.023	0.024
Nickel	13.9	14.1	11.5	12.9	16.4	14.2	12.9	15.3
Potassium	1080	1110	929	1070 J+	1210 J+	940	1090	1290 J+
Selenium	0.44 U	0.43 U	0.39 U	0.32 U	0.34 U	0.37 U	0.39 U	0.35 U
Silver	0.92 U	0.9 U	0.82 U	0.66 U	0.71 U	0.79 U	0.81 U	0.73 U
Sodium	249	187	160	224	61 J	64.6 J	68.3 J	72.9 J
Thallium	0.19 U	0.18 U	0.17 U	0.13 U	0.14 U	0.16 U	0.16 U	0.15 U
Vanadium	14.3	15.3	11.2	14.3	16.6	14.8	12.8	16.5
Zinc	48.8	51	42.2	45.1	46.7	50	48.1	56.3
SEMIVOLATILE ORGANIC COMPOUNDS (mg/kg)								
1,2,4,5-Tetrachlorobenzene	0.035 U	0.035 U	0.034 U	0.034 U	0.033 U	0.03 U	0.031 U	0.036 U
1,4-Dioxane (P-Dioxane)	0.13 U	0.13 U	0.12 U	0.12 U	0.12 U	0.11 U	0.11 U	0.13 U
2,3,4,6-Tetrachlorophenol	0.045 U	0.045 U	0.043 U	0.042 U	0.042 U	0.038 U	0.04 U	0.046 U
2,4,5-Trichlorophenol	0.047 U	0.047 U	0.045 U	0.045 U	0.044 U	0.04 U	0.042 U	0.048 U
2,4,6-Trichlorophenol	0.014 U	0.014 U	0.013 U	0.013 U	0.013 U	0.011 U	0.012 U	0.014 U
2,4-Dichlorophenol	0.011 U	0.011 U	0.011 U	0.011 U	0.01 U	0.0095 U	0.0099 U	0.011 U
2,4-Dimethylphenol	0.1 UJ	0.1 UJ	0.1 UJ	0.099 U	0.097 U	0.088 UJ	0.092 UJ	0.11 U
2,4-Dinitrophenol	0.36 U	0.36 U	0.34 U	0.34 U	0.33 U	0.3 U	0.32 U	0.37 U
2,4-Dinitrotoluene	0.019 U	0.019 U	0.018 U	0.018 U	0.017 U	0.016 U	0.017 U	0.019 U
2,6-Dinitrotoluene	0.025 U	0.025 U	0.024 U	0.024 U	0.024 U	0.021 U	0.022 U	0.026 U

Table E-33
Summary of Data Used in Risk Assessment
Backwater Seep Sampling Area Soil (0-0.5 ft-bgs) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Sample Depth Chemical	CFSB-134 460-144087-11 CFSB-134-SO-0-0.5 0-0.5 ft 10/31/2017	CFSB-135 460-144087-13 CFSB-135-SO-0-0.5 0-0.5 ft 10/31/2017	CFSB-136 460-144087-15 CFSB-136-SO-0-0.5 0-0.5 2 10/31/2017	CFSB-137 460-144170-9 CFSB-137-SO-0-0.5 0-0.5 ft 11/1/2017	CFSB-138 460-144170-4 CFSB-138-SO-0-0.5 0-0.5 ft 11/1/2017	CFSB-139 460-144087-1 CFSB-139-SO-0-0.5 0-0.5 2 10/31/2017	CFSB-140 460-144087-3 CFSB-140-SO-0-0.5 0-0.5 ft 10/31/2017	CFSB-141 460-144170-7 CFSB-141-SO-0-0.5 0-0.5 ft 11/1/2017
2-Chloronaphthalene	0.011 U	0.011 U	0.01 U	0.01 U	0.01 U	0.0091 U	0.0095 U	0.011 U
2-Chlorophenol	0.012 U	0.012 U	0.012 U	0.011 U	0.011 U	0.01 U	0.011 U	0.012 U
2-Methylnaphthalene	0.011 U	0.011 U	0.01 U	0.039 J	0.48	0.0089 U	0.0093 U	0.21 J
2-Methylphenol (O-Cresol)	0.021 U	0.021 U	0.02 U	0.02 U	0.019 U	0.017 U	0.018 U	0.021 U
2-Nitroaniline	0.016 U	0.016 U	0.015 U	0.015 U	0.015 U	0.013 U	0.014 U	0.016 U
2-Nitrophenol	0.016 U	0.016 U	0.015 U	0.015 U	0.015 U	0.013 U	0.014 U	0.016 U
3- And 4- Methylphenol (Total)	0.013 U	0.013 U	0.012 U	0.012 U	0.012 U	0.011 U	0.011 U	0.013 U
3,3'-Dichlorobenzidine	0.053 U	0.053 U	0.051 U	0.05 U	0.049 U	0.045 U	0.047 U	0.054 U
3-Nitroaniline	0.014 U	0.014 U	0.013 U	0.013 U	0.013 U	0.012 U	0.012 U	0.014 U
4,6-Dinitro-2-Methylphenol	0.13 U	0.13 U	0.12 U	0.12 U	0.12 U	0.11 U	0.11 U	0.13 U
4-Bromophenyl Phenyl Ether	0.015 U	0.015 U	0.014 U	0.014 U	0.014 U	0.013 U	0.013 U	0.015 U
4-Chloro-3-Methylphenol	0.02 U	0.02 U	0.02 U	0.019 U	0.019 U	0.017 U	0.018 U	0.021 U
4-Chloroaniline	0.012 U	0.012 U	0.012 U	0.012 U	0.011 U	0.01 U	0.011 U	0.012 U
4-Chlorophenyl Phenyl Ether	0.014 U	0.014 U	0.014 U	0.013 U	0.013 U	0.012 U	0.013 U	0.014 U
4-Nitroaniline	0.018 U	0.018 U	0.017 U	0.017 U	0.017 U	0.015 UJ	0.016 U	0.018 U
4-Nitrophenol	0.23 U	0.23 U	0.22 U	0.22 UJ	0.21 UJ	0.19 U	0.2 U	0.23 UJ
Acenaphthene	0.012 U	0.012 U	0.011 U	0.011 U	0.021 J	0.0097 U	0.01 U	0.012 U
Acenaphthylene	0.012 U	0.012 U	0.012 U	0.012 U	0.1 J	0.01 U	0.011 U	0.051 J
Acetophenone	0.01 U	0.01 U	0.0099 U	0.0098 U	0.0096 U	0.0087 U	0.0091 U	0.011 U
Anthracene	0.045 U	0.045 U	0.043 U	0.043 U	0.042 U	0.038 U	0.04 U	0.046 U
Atrazine	0.021 U	0.021 U	0.02 U	0.02 U	0.02 U	0.018 U	0.019 U	0.022 U
Benzaldehyde	0.036 U	0.036 U	0.035 U	0.034 U	0.034 U	0.031 U	0.032 U	0.037 U
Benzo(A)Anthracene	0.049	0.04 U	0.091	0.038 U	0.037 U	0.034 U	0.035 U	0.04 U
Benzo(A)Pyrene	0.033 J	0.014 U	0.014 U	0.036 J	0.013 U	0.012 U	0.013 U	0.015 U
Benzo(B)Fluoranthene	0.12	0.045 J	0.18	0.071	0.4	0.016 U	0.016 U	0.073
Benzo(G,H,I)Perylene	0.052 J+	0.027 U	0.051 J+	0.026 U	0.21 J+	0.023 U	0.024 U	0.028 U
Benzo(K)Fluoranthene	0.037 J	0.021 U	0.061	0.02 U	0.019 U	0.017 U	0.018 U	0.021 U
Benzyl Butyl Phthalate	0.015 U	0.015 U	0.014 U	0.014 U	0.014 U	0.012 U	0.013 U	0.015 U
Biphenyl (Diphenyl)	0.041 U	0.041 U	0.039 U	0.038 U	0.05 J	0.034 U	0.036 U	0.041 U
Bis(2-Chloroethoxy) Methane	0.015 U	0.015 U	0.014 U	0.014 U	0.014 U	0.013 U	0.013 U	0.015 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.011 U	0.011 U	0.011 U	0.011 U	0.01 U	0.0095 U	0.0099 U	0.011 U
Bis(2-Chloroisopropyl) Ether	0.02 U	0.02 U	0.019 U	0.019 U	0.018 U	0.017 U	0.017 U	0.02 U
Bis(2-Ethylhexyl) Phthalate	0.019 U	0.019 U	0.018 U	0.018 U	0.017 U	0.016 U	0.016 U	0.019 U
Caprolactam	0.034 U	0.034 U	0.033 U	0.032 U	0.032 U	0.029 U	0.03 U	0.035 U
Carbazole	0.012 U	0.012 U	0.023 J	0.011 U	0.011 U	0.01 U	0.01 U	0.012 U
Chrysene	0.12 J	0.05 J	0.23 J	0.067 J	0.34 J	0.011 U	0.011 U	0.059 J
Dibenz(A,H)Anthracene	0.025 U	0.025 U	0.024 U	0.023 U	0.069 J+	0.021 U	0.022 U	0.025 U
Dibenzofuran	0.014 U	0.014 U	0.014 U	0.014 U	0.02 J	0.012 U	0.013 U	0.015 U
Diethyl Phthalate	0.014 U	0.014 U	0.013 U	0.013 U	0.013 U	0.011 U	0.012 U	0.014 U
Dimethyl Phthalate	0.014 U	0.014 U	0.013 U	0.013 U	0.013 U	0.012 U	0.012 U	0.014 U
Di-N-Butyl Phthalate	0.014 U	0.014 U	0.014 U	0.013 U	0.013 U	0.012 U	0.013 U	0.014 U

Table E-33
Summary of Data Used in Risk Assessment
Backwater Seep Sampling Area Soil (0-0.5 ft-bgs) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Sample Depth Chemical	CFSB-134 460-144087-11 CFSB-134-SO-0-0.5 0-0.5 ft 10/31/2017	CFSB-135 460-144087-13 CFSB-135-SO-0-0.5 0-0.5 ft 10/31/2017	CFSB-136 460-144087-15 CFSB-136-SO-0-0.5 0-0.5 2 10/31/2017	CFSB-137 460-144170-9 CFSB-137-SO-0-0.5 0-0.5 ft 11/1/2017	CFSB-138 460-144170-4 CFSB-138-SO-0-0.5 0-0.5 ft 11/1/2017	CFSB-139 460-144087-1 CFSB-139-SO-0-0.5 0-0.5 2 10/31/2017	CFSB-140 460-144087-3 CFSB-140-SO-0-0.5 0-0.5 ft 10/31/2017	CFSB-141 460-144170-7 CFSB-141-SO-0-0.5 0-0.5 ft 11/1/2017
Di-N-Octylphthalate	0.024 U	0.024 U	0.023 U	0.023 U	0.022 U	0.02 U	0.021 U	0.025 U
Fluoranthene	0.083 J	0.046 J	0.26 J	0.055 J	0.3 J	0.02 J	0.019 J	0.046 J
Fluorene	0.01 U	0.01 U	0.0099 U	0.0098 U	0.04 J	0.0087 U	0.0091 U	0.011 U
Hexachlorobenzene	0.019 U	0.019 U	0.018 U	0.018 U	0.018 U	0.016 U	0.017 U	0.02 U
Hexachlorobutadiene	0.013 U	0.013 U	0.013 U	0.013 U	0.012 U	0.011 U	0.012 U	0.014 U
Hexachlorocyclopentadiene	0.03 UJ	0.03 UJ	0.028 UJ	0.028 UJ	0.028 UJ	0.025 UJ	0.026 UJ	0.03 UJ
Hexachloroethane	0.017 U	0.017 U	0.017 U	0.016 U	0.016 U	0.015 U	0.015 U	0.018 U
Indeno(1,2,3-C,D)Pyrene	0.057 J+	0.032 U	0.054 J+	0.047	0.31	0.027 U	0.028 U	0.04 J
Isophorone	0.01 U	0.01 U	0.0098 U	0.0097 U	0.0095 U	0.0086 U	0.009 U	0.01 U
Naphthalene	0.012 U	0.012 U	0.012 U	0.067 J	0.81	0.01 U	0.011 U	0.36 J
Nitrobenzene	0.015 U	0.015 U	0.014 U	0.014 U	0.014 U	0.013 U	0.013 U	0.015 U
N-Nitrosodi-N-Propylamine	0.016 U	0.016 U	0.015 U	0.015 U	0.015 U	0.013 U	0.014 U	0.016 U
N-Nitrosodiphenylamine	0.043 U	0.043 U	0.041 U	0.041 U	0.04 U	0.036 U	0.038 U	0.044 U
Pentachlorophenol	0.058 U	0.058 U	0.055 U	0.055 U	0.053 U	0.049 U	0.051 U	0.059 U
Phenanthrene	0.029 J	0.013 U	0.046 J	0.012 U	0.16 J	0.011 U	0.011 U	0.03 J
Phenol	0.016 U	0.016 U	0.015 U	0.015 U	0.014 U	0.013 U	0.014 U	0.016 U
Pyrene	0.087 J	0.045 J	0.26 J	0.037 J	0.26 J	0.018 U	0.019 U	0.03 J

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-34
Summary of Data Used in Risk Assessment
Backwater Seep Sampling Area Soil (0-2 ft-bgs) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Sample Depth Chemical	CFSB-134 460-144087-11 CFSB-134-SO-0-0.5 0-0.5 ft 10/31/2017	CFSB-134 460-144087-12 CFSB-134-SO-0.5-2 0.5-2 ft 10/31/2017	CFSB-135 460-144087-13 CFSB-135-SO-0-0.5 0-0.5 ft 10/31/2017	CFSB-135 460-144087-14 CFSB-135-SO-0.5-2 0.5-2 ft 10/31/2017	CFSB-136 460-144087-15 CFSB-136-SO-0-0.5 0-0.5 2 10/31/2017	CFSB-136 460-144087-16 CFSB-136-SO-0.5-2 0.5-2 ft 10/31/2017	CFSB-137 460-144170-9 CFSB-137-SO-0-0.5 0-0.5 ft 11/1/2017	CFSB-137 460-144170-10 CFSB-137-SO-0.5-2 0.5-2 ft 11/1/2017	CFSB-137 460-144400-1 CFSB-137-SO-0.5-2 0.5-2 ft 11/2/2017	CFSB-138 460-144170-4 CFSB-138-SO-0-0.5 0-0.5 ft 11/1/2017	CFSB-138 460-144170-5 CFSB-138-SO-0.5-2 0.5-2 ft 11/1/2017	CFSB-138-DUP 460-144170-6 CFSB-DUP14-SO 0.5-2 ft 11/1/2017	CFSB-139 460-144087-1 CFSB-139-SO-0-0.5 0-0.5 2 10/31/2017	CFSB-139 460-144087-2 CFSB-139-SO-0.5-2 0.5-2 ft 10/31/2017
GENERAL CHEMISTRY (mg/kg)														
Fluoride	25.7 J+	21.7 J+	22.2 J+	22.9 J+	14.5 J+	15.4 J+	17 J+	16.7 J+	--	32.7 J+	19.3 J	33.5 J	15.3 J+	12 J+
Cyanide	1.6	2	1.4	1.4	1.9	3.7	0.96	0.52	--	0.16 J	2.1	2.7	0.071 U	0.069 U
Cyanide (Free)	0.42 U	--	0.43 U	--	0.42 U	--	0.4 U	--	--	0.4 U	--	--	--	--
METALS (mg/kg)														
"Chromium, Hexavalent - Estimated"	0.307786	0.272993	0.294404	0.305109	0.254258	0.283698	0.281022	0.278345	--	0.283698	0.227494	0.33455	0.29708	0.299757
"Chromium, Trivalent - Estimated"	11.1922	9.92701	10.7056	11.0949	9.24574	10.3163	10.219	10.1217	--	10.3163	8.27251	12.1655	10.8029	10.9002
Aluminum	9760	8640	9650	9660	8270	9080	9160	9060	--	10600	7330	10500	9490	9560
Antimony	0.47 U	0.42 U	0.46 U	0.46 U	0.42 U	0.48 U	0.34 UJ	0.37 UJ	--	0.37 UJ	0.37 UJ	0.39 UJ	0.4 U	0.34 U
Arsenic	4.9	4.3	5.4	4.2	4.4	3.7	4.6	4.5	--	5.1	1.9	2.8	5.3	5.6
Barium	194	125	153	168	153	131	159	144	--	236	161	98.2	162	130
Beryllium	0.63	0.42 J	0.45 J	0.48 J	0.36 J	0.52 J	0.49	0.45	--	0.55	0.37 J	0.54	0.6	0.52
Cadmium	0.5 U	0.45 U	0.49 U	0.49 U	0.45 U	0.5 U	0.36 U	0.39 U	--	0.39 U	0.39 U	0.41 U	0.43 U	0.36 U
Calcium	35100	18400	23900	20900	18700	18400	21800	20500	--	18000	12400	11800	23000	18900
Chromium, Total	11.5	10.2	11	11.4	9.5	10.6	10.5	10.4	--	10.6	8.5	12.5	11.1	11.2
Cobalt	6.9	6.8	7	6.7	6	6.1	6.3	6.3	--	6.8	4.1	6.2	7	7
Copper	19	14.4	15.9	17.5	15.3	15.1	15.2	14.9	--	22.7	15.1	14.9	19	18.1
Iron	15200	15500	16600	15400	13000	14900	14900	15300	--	14900	9160	15300	16300	16800
Lead	10.4	7.7	8.8	9.1	9.1	8.6	8.9	8.3	--	11.8	9	9.4	9.8	9
Magnesium	12300	12500	13300	13400	10400	12200	12000	12200	--	11800	8020 J	13600 J	12700	12100
Manganese	249	191	295	159	288	153	304	278	--	379	76.4	111	366	352
Mercury	0.02 J	0.02 J	0.018 J	0.024	0.015 J	0.021 J	0.02 J	0.015 J	--	0.023	0.027	0.03	0.021	0.013 J
Nickel	13.9	13.1	14.1	14.2	11.5	12.8	12.9	12.8	--	16.4	9.2	13.4	14.2	14.3
Potassium	1080	802	1110	986	929	843	1070 J+	834 J+	--	1210 J+	991 J+	1020 J+	940	768
Selenium	0.44 U	0.39 U	0.43 U	0.43 U	0.39 U	0.44 U	0.32 U	0.34 U	--	0.34 U	0.65 J	0.44 J	0.37 U	0.32 U
Silver	0.92 U	0.82 U	0.9 U	0.9 U	0.82 U	0.93 U	0.66 U	0.72 U	--	0.71 U	0.72 U	0.76 U	0.79 U	0.67 U
Sodium	249	101 J	187	120 J	160	114 J	224	101 J	--	61 J	140	107 J	64.6 J	51.2 J
Thallium	0.19 U	0.17 U	0.18 U	0.18 U	0.17 U	0.19 U	0.13 U	0.14 U	--	0.14 U	0.15 U	0.15 U	0.16 U	0.14 U
Vanadium	14.3	16.3	15.3	17	11.2	16.1	14.3	15.6	--	16.6	11	17.2	14.8	14.3
Zinc	48.8	43.4	51	47.8	42.2	45.2	45.1	42.1	--	46.7	28.8	45.7	50	46.8
SEMIVOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,2,4,5-Tetrachlorobenzene	0.035 U	0.033 U	0.035 U	0.034 U	0.034 U	0.037 U	0.034 U	0.034 U	--	0.033 U	0.033 U	0.038 U	0.03 U	0.027 U
1,4-Dioxane (P-Dioxane)	0.13 U	0.12 U	0.13 U	0.12 U	0.12 U	0.13 U	0.12 U	0.12 U	--	0.12 U	0.12 U	0.14 U	0.11 U	0.097 U
2,3,4,6-Tetrachlorophenol	0.045 U	0.042 U	0.045 U	0.043 U	0.043 U	0.047 U	0.042 U	0.043 U	--	0.042 U	0.042 U	0.048 U	0.038 U	0.034 U
2,4,5-Trichlorophenol	0.047 U	0.044 U	0.047 U	0.046 U	0.045 U	0.049 U	0.045 U	0.045 U	--	0.044 U	0.044 U	0.051 U	0.04 U	0.036 U
2,4,6-Trichlorophenol	0.014 U	0.013 U	0.014 U	0.013 U	0.013 U	0.014 U	0.013 U	0.013 U	--	0.013 U	0.013 U	0.015 U	0.011 U	0.01 U
2,4-Dichlorophenol	0.011 U	0.01 U	0.011 U	0.011 U	0.011 U	0.012 U	0.011 U	0.011 U	--	0.01 U	0.01 U	0.012 U	0.0095 U	0.0086 U
2,4-Dimethylphenol	0.1 UJ	0.097 UJ	0.1 UJ	0.1 UJ	0.1 UJ	0.11 UJ	0.099 U	0.1 U	--	0.097 U	0.097 U	0.11 U	0.088 UJ	0.08 UJ
2,4-Dinitrophenol	0.36 U	0.33 U	0.36 U	0.35 U	0.34 U	0.38 U	0.34 U	0.34 U	--	0.33 U	0.33 UJ	0.39 U	0.3 U	0.27 U
2,4-Dinitrotoluene	0.019 U	0.018 U	0.019 U	0.018 U	0.018 U	0.02 U	0.018 U	0.018 U	--	0.017 U	0.018 U	0.02 U	0.016 U	0.014 U
2,6-Dinitrotoluene	0.025 U	0.024 U	0.025 U	0.024 U	0.024 U	0.026 U	0.024 U	0.024 U	--	0.024 U	0.024 U	0.027 U	0.021 U	0.019 U
2-Chloronaphthalene	0.011 U	0.01 U	0.011 U	0.01 U	0.01 U	0.011 U	0.01 U	0.01 U	--	0.01 U	0.01 U	0.012 U	0.0091 U	0.0082 U
2-Chlorophenol	0.012 U	0.011 U	0.012 U	0.012 U	0.012 U	0.013 U	0.011 U	0.012 U	--	0.011 U	0.011 U	0.013 U	0.01 U	0.0092 U
2-Methylnaphthalene	0.011 U	0.0098 U	0.011 U	0.01 U	0.01 U	0.011 U	0.039 J	0.024 J	--	0.48	0.03 J	0.024 J	0.0089 U	0.008 U
2-Methylphenol (O-Cresol)	0.021 U	0.019 U	0.021 U	0.02 U	0.02 U	0.022 U	0.02 U	0.02 U	--	0.019 U	0.019 UJ	0.022 U	0.017 U	0.016 U
2-Nitroaniline	0.016 U	0.015 U	0.016 U	0.015 U	0.015 U	0.016 U	0.015 U	0.015 U	--	0.015 U	0.015 U	0.017 U	0.013 U	0.012 U
2-Nitrophenol	0.016 U	0.015 U	0.016 U	0.015 U	0.015 U	0.017 U	0.015 U	0.015 U	--	0.015 U	0.015 U	0.017 U	0.013 U	0.012 U
3- And 4- Methylphenol (Total)	0.013 U	0.012 U	0.013 U	0.012 U	0.012 U	0.013 U	0.012 U	0.012 U	--	0.012 U	0.012 UJ	0.014 U	0.011 U	0.0097 U
3,3'-Dichlorobenzidine	0.053 U	0.049 U	0.053 U	0.051 U	0.051 U	0.055 U	0.05 U	0.051 U	--	0.049 U	0.049 U	0.057 U	0.045 U	0.04 U
3-Nitroaniline	0.014 U	0.013 U	0.014 U	0.014 U	0.013 U	0.015 U	0.013 U	0.013 U	--	0.013 U	0.013 U	0.015 U	0.012 U	0.011 U
4,6-Dinitro-2-Methylphenol	0.13 U	0.12 U	0.13 U	0.12 U	0.12 U	0.13 U	0.12 U	0.12 U	--	0.12 U	0.12 UJ	0.14 U	0.11 U	0.097 U
4-Bromophenyl Phenyl Ether	0.015 U	0.014 U	0.015 U	0.014 U	0.014 U	0.016 U	0.014 U	0.014 U	--	0.014 U	0.014 U	0.016 U	0.013 U	0.011 U
4-Chloro-3-Methylphenol	0.02 U	0.019 U	0.02 U	0.02 U	0.02 U	0.021 U	0.019 U	0.019 U	--	0.019 U	0.019 U	0.022 U	0.017 U	0.016 U
4-Chloroaniline	0.012 U	0.011 U	0.012 U	0.012 U	0.012 U	0.013 U	0.012 U	0.012 U	--	0.011 U	0.011 U	0.013 U	0.01 U	0.0093 U
4-Chlorophenyl Phenyl Ether	0.014 U	0.013 U	0.014 U	0.014 U	0.014 U	0.015 U	0.013 U	0.014 U	--	0.013 U	0.013 U	0.015 U	0.012 U	0.011 U
4-Nitroaniline	0.018 U	0.017 U	0.018 U	0.017 U	0.017 U	0.019 U	0.017 U	0.017 U	--	0.017 U	0.017 U	0.019 U	0.015 UJ	0.014 UJ
4-Nitrophenol	0.23 U	0.21 U	0.23 U	0.22 U	0.22 U	0.24 U	0.22 UJ	0.22 UJ	--	0.21 UJ	0.21 UJ	0.25 UJ	0.19 U	0.17 U
Acenaphthene	0.012 U	0.011 U	0.012 U	0.011 U	0.011 U	0.012 U	0.011 U	0.011 U	--	0.021 J	0.011 U	0.012 U	0.0097 U	0.0088 U
Acenaphthylene	0.012 U	0.011 U	0.012 U	0.012 U	0.012 U	0.013 U	0.012 U	0.012 U	--	0.1 J	0.011 U	0.013 U	0.01 U	0.0093 U
Acetophenone	0.01 U	0.0096 U	0.01 U	0.01 U	0.0099 U	0.011 U	0.0098 U	0.0099 U	--	0.0096 U	0.0096 U	0.011 U	0.0087 U	0.0079 U

Table E-34
Summary of Data Used in Risk Assessment
Backwater Seep Sampling Area Soil (0-2 ft-bgs) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Sample Depth Chemical	CFSB-134 460-144087-11 CFSB-134-SO-0-0.5 0-0.5 ft 10/31/2017	CFSB-134 460-144087-12 CFSB-134-SO-0.5-2 0.5-2 ft 10/31/2017	CFSB-135 460-144087-13 CFSB-135-SO-0-0.5 0-0.5 ft 10/31/2017	CFSB-135 460-144087-14 CFSB-135-SO-0.5-2 0.5-2 ft 10/31/2017	CFSB-136 460-144087-15 CFSB-136-SO-0-0.5 0-0.5 2 10/31/2017	CFSB-136 460-144087-16 CFSB-136-SO-0.5-2 0.5-2 ft 10/31/2017	CFSB-137 460-144170-9 CFSB-137-SO-0-0.5 0-0.5 ft 11/1/2017	CFSB-137 460-144170-10 CFSB-137-SO-0.5-2 0.5-2 ft 11/1/2017	CFSB-137 460-144400-1 CFSB-137-SO-0.5-2 0.5-2 ft 11/2/2017	CFSB-138 460-144170-4 CFSB-138-SO-0-0.5 0-0.5 ft 11/1/2017	CFSB-138 460-144170-5 CFSB-138-SO-0.5-2 0.5-2 ft 11/1/2017	CFSB-138-DUP 460-144170-6 CFSB-DUP14-SO 0.5-2 ft 11/1/2017	CFSB-139 460-144087-1 CFSB-139-SO-0-0.5 0-0.5 2 10/31/2017	CFSB-139 460-144087-2 CFSB-139-SO-0.5-2 0.5-2 ft 10/31/2017
Anthracene	0.045 U	0.042 U	0.045 U	0.044 U	0.043 U	0.047 U	0.043 U	0.043 U	--	0.042 U	0.042 U	0.049 U	0.038 U	0.034 U
Atrazine	0.021 U	0.02 U	0.021 U	0.02 U	0.02 U	0.022 U	0.02 U	0.02 U	--	0.02 U	0.02 U	0.023 U	0.018 U	0.016 U
Benzaldehyde	0.036 U	0.034 U	0.036 U	0.035 U	0.035 U	0.038 U	0.034 U	0.035 U	--	0.034 U	0.034 U	0.039 U	0.031 U	0.028 U
Benzo(A)Anthracene	0.049	0.037 U	0.04 U	0.038 U	0.091	0.041 U	0.038 U	0.038 U	--	0.037 U	0.037 U	0.043 U	0.034 U	0.03 U
Benzo(A)Pyrene	0.033 J	0.013 U	0.014 U	0.027 J	0.014 U	0.015 U	0.036 J	0.014 U	--	0.013 U	0.013 U	0.015 U	0.012 U	0.011 U
Benzo(B)Fluoranthene	0.12	0.079	0.045 J	0.07	0.18	0.019 U	0.071	0.018 U	--	0.4	0.048 J	0.02 UJ	0.016 U	0.014 U
Benzo(G,H,I)Perylene	0.052 J+	0.025 U	0.027 U	0.026 U	0.051 J+	0.029 U	0.026 U	0.026 U	--	0.21 J+	0.025 UJ	0.029 U	0.023 U	0.021 U
Benzo(K)Fluoranthene	0.037 J	0.025 J	0.021 U	0.02 U	0.061	0.022 U	0.02 U	0.02 U	--	0.019 U	0.019 UJ	0.022 U	0.017 U	0.016 U
Benzyl Butyl Phthalate	0.015 U	0.014 U	0.015 U	0.014 U	0.014 U	0.015 U	0.014 U	0.014 U	--	0.014 U	0.014 U	0.016 U	0.012 U	0.011 U
Biphenyl (Diphenyl)	0.041 U	0.038 U	0.041 U	0.039 U	0.039 U	0.042 U	0.038 U	0.039 U	--	0.05 J	0.038 U	0.044 U	0.034 U	0.031 U
Bis(2-Chloroethoxy) Methane	0.015 U	0.014 U	0.015 U	0.014 U	0.014 U	0.015 U	0.014 U	0.014 U	--	0.014 U	0.014 U	0.016 U	0.013 U	0.011 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.011 U	0.01 U	0.011 U	0.011 U	0.011 U	0.012 U	0.011 U	0.011 U	--	0.01 U	0.01 UJ	0.012 U	0.0095 U	0.0086 U
Bis(2-Chloroisopropyl) Ether	0.02 U	0.018 U	0.02 U	0.019 U	0.019 U	0.02 U	0.019 U	0.019 U	--	0.018 U	0.018 U	0.021 U	0.017 U	0.015 U
Bis(2-Ethylhexyl) Phthalate	0.019 U	0.017 U	0.019 U	0.018 U	0.018 U	0.019 U	0.018 U	0.018 U	--	0.017 U	0.017 U	0.02 U	0.016 U	0.014 U
Caprolactam	0.034 U	0.032 U	0.034 U	0.033 U	0.033 U	0.036 U	0.032 U	0.033 U	--	0.032 U	0.032 U	0.037 U	0.029 U	0.026 U
Carbazole	0.012 U	0.011 U	0.012 U	0.011 U	0.023 J	0.012 U	0.011 U	0.011 U	--	0.011 U	0.011 U	0.013 U	0.01 U	0.009 U
Chrysene	0.12 J	0.071 J	0.05 J	0.068 J	0.23 J	0.014 U	0.067 J	0.012 U	--	0.34 J	0.023 J-	0.014 U	0.011 U	0.0099 U
Dibenz(A,H)Anthracene	0.025 U	0.023 U	0.025 U	0.024 U	0.024 U	0.026 U	0.023 U	0.024 U	--	0.069 J+	0.023 U	0.027 U	0.021 U	0.019 U
Dibenzofuran	0.014 U	0.013 U	0.014 U	0.014 U	0.014 U	0.015 U	0.014 U	0.014 U	--	0.02 J	0.013 U	0.015 U	0.012 U	0.011 U
Diethyl Phthalate	0.014 U	0.013 U	0.014 U	0.013 U	0.013 U	0.014 U	0.013 U	0.013 U	--	0.013 U	0.013 U	0.015 U	0.011 U	0.01 U
Dimethyl Phthalate	0.014 U	0.013 U	0.014 U	0.013 U	0.013 U	0.014 U	0.013 U	0.013 U	--	0.013 U	0.013 U	0.015 U	0.012 U	0.011 U
Di-N-Butyl Phthalate	0.014 U	0.013 U	0.014 U	0.014 U	0.014 U	0.015 U	0.013 U	0.014 U	--	0.013 U	0.013 U	0.015 U	0.012 U	0.011 U
Di-N-Octylphthalate	0.024 U	0.023 U	0.024 U	0.023 U	0.023 U	0.025 U	0.023 U	0.023 U	--	0.022 U	0.023 U	0.026 U	0.02 U	0.018 U
Fluoranthene	0.083 J	0.046 J	0.046 J	0.073 J	0.26 J	0.015 U	0.055 J	0.013 U	--	0.3 J	0.033 J	0.015 UJ	0.02 J	0.011 U
Fluorene	0.01 U	0.0096 U	0.01 U	0.01 U	0.0099 U	0.011 U	0.0098 U	0.0099 U	--	0.04 J	0.0096 U	0.011 U	0.0087 U	0.0079 U
Hexachlorobenzene	0.019 U	0.018 U	0.019 U	0.019 U	0.018 U	0.02 U	0.018 U	0.018 U	--	0.018 U	0.018 U	0.021 U	0.016 U	0.015 U
Hexachlorobutadiene	0.013 U	0.012 U	0.013 U	0.013 U	0.013 U	0.014 U	0.013 U	0.013 U	--	0.012 U	0.012 U	0.014 U	0.011 U	0.01 U
Hexachlorocyclopentadiene	0.03 UJ	0.028 UJ	0.03 UJ	0.029 UJ	0.028 UJ	0.031 UJ	0.028 UJ	0.028 UJ	--	0.028 UJ	0.028 UJ	0.032 UJ	0.025 UJ	0.023 UJ
Hexachloroethane	0.017 U	0.016 U	0.017 U	0.017 U	0.017 U	0.018 U	0.016 U	0.017 U	--	0.016 U	0.016 UJ	0.019 U	0.015 U	0.013 U
Indeno(1,2,3-C,D)Pyrene	0.057 J+	0.029 U	0.032 U	0.031 U	0.054 J+	0.033 U	0.047	0.03 U	--	0.31	0.029 U	0.034 U	0.027 U	0.024 U
Isophorone	0.01 U	0.0095 U	0.01 U	0.0098 U	0.0098 U	0.011 U	0.0097 U	0.0097 U	--	0.0095 U	0.0095 U	0.011 U	0.0086 U	0.0078 U
Naphthalene	0.012 U	0.011 U	0.012 U	0.012 U	0.012 U	0.013 U	0.067 J	0.04 J	--	0.81	0.043 J-	0.037 J	0.01 U	0.0092 U
Nitrobenzene	0.015 U	0.014 U	0.015 U	0.014 U	0.014 U	0.016 U	0.014 U	0.014 U	--	0.014 U	0.014 U	0.016 U	0.013 U	0.011 U
N-Nitrosodi-N-Propylamine	0.016 U	0.015 U	0.016 U	0.015 U	0.015 U	0.017 U	0.015 U	0.015 U	--	0.015 U	0.015 U	0.017 U	0.013 U	0.012 U
N-Nitrosodiphenylamine	0.043 U	0.04 U	0.043 U	0.042 U	0.041 U	0.045 U	0.041 U	0.041 U	--	0.04 U	0.04 U	0.046 U	0.036 U	0.033 U
Pentachlorophenol	0.058 U	0.054 U	0.058 U	0.055 U	0.055 U	0.06 U	0.055 U	0.055 U	--	0.053 U	0.054 U	0.062 U	0.049 U	0.044 U
Phenanthrene	0.029 J	0.012 U	0.013 U	0.022 J	0.046 J	0.013 U	0.012 U	0.012 U	--	0.16 J	0.027 J	0.014 UJ	0.011 U	0.0097 U
Phenol	0.016 U	0.014 U	0.016 U	0.015 U	0.015 U	0.016 U	0.015 U	0.015 U	--	0.014 U	0.014 U	0.017 U	0.013 U	0.012 U
Pyrene	0.087 J	0.05 J	0.045 J	0.071 J	0.26 J	0.023 U	0.037 J	0.021 U	--	0.26 J	0.02 UJ	0.023 U	0.018 U	0.016 U
VOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,1,1-Trichloroethane	--	0.00028 U	--	0.00033 U	--	0.00033 U	--	--	0.0004 U	--	0.0004 U	0.00051 U	--	0.00029 U
1,1,2,2-Tetrachloroethane	--	0.00026 U	--	0.0003 U	--	0.0003 U	--	--	0.00037 U	--	0.00037 U	0.00047 U	--	0.00027 U
1,1,2-Trichloro-1,2,2-Trifluoroethane	--	0.00036 U	--	0.00042 U	--	0.00042 U	--	--	0.00052 U	--	0.00051 U	0.00066 U	--	0.00038 U
1,1,2-Trichloroethane	--	0.00021 U	--	0.00025 U	--	0.00025 U	--	--	0.00031 U	--	0.0003 U	0.00039 U	--	0.00022 U
1,1-Dichloroethane	--	0.00025 U	--	0.00029 U	--	0.00029 U	--	--	0.00036 U	--	0.00035 U	0.00045 U	--	0.00026 U
1,1-Dichloroethene	--	0.00027 U	--	0.00032 U	--	0.00032 U	--	--	0.00039 U	--	0.00038 U	0.00049 U	--	0.00028 U
1,2,3-Trichlorobenzene	--	0.00022 U	--	0.00026 U	--	0.00025 U	--	--	0.00031 U	--	0.00031 U	0.0004 U	--	0.00023 U
1,2,4-Trichlorobenzene	--	0.00011 U	--	0.00013 U	--	0.00013 U	--	--	0.00016 U	--	0.00016 U	0.0002 U	--	0.00012 U
1,2-Dibromo-3-Chloropropane	--	0.00055 U	--	0.00065 U	--	0.00065 U	--	--	0.0008 U	--	0.00079 U	0.001 U	--	0.00058 U
1,2-Dibromoethane (Ethylene Dibromide)	--	0.00022 U	--	0.00025 U	--	0.00025 U	--	--	0.00031 U	--	0.00031 U	0.00039 U	--	0.00023 U
1,2-Dichlorobenzene	--	0.00017 U	--	0.0002 U	--	0.0002 U	--	--	0.00025 U	--	0.00025 U	0.00031 U	--	0.00018 U
1,2-Dichloroethane	--	0.00036 U	--	0.00042 U	--	0.00042 U	--	--	0.00051 U	--	0.00051 U	0.00065 U	--	0.00037 U
1,2-Dichloropropane	--	0.00051 U	--	0.0006 U	--	0.0006 U	--	--	0.00073 U	--	0.00072 U	0.00093 U	--	0.00053 U
1,3-Dichlorobenzene	--	0.00019 U	--	0.00022 U	--	0.00022 U	--	--	0.00028 U	--	0.00027 U	0.00035 U	--	0.0002 U
1,4-Dichlorobenzene	--	0.00012 U	--	0.00014 U	--	0.00014 U	--	--	0.00017 U	--	0.00017 U	0.00022 U	--	0.00013 U
2-Hexanone	--	0.00094 U	--	0.0011 U	--	0.0011 U	--	--	0.0014 U	--	0.0013 U	0.0017 U	--	0.00098 U
Acetone	--	0.034	--	0.03	--	0.047	--	--	0.05	--	0.083	0.056	--	0.044
Benzene	--	0.0017	--	0.0019	--	0.00085 J	--	--	0.0017	--	0.00076 J	0.00084 J	--	0.0013
Bromochloromethane	--	0.00034 U	--	0.0004 U	--	0.0004 U	--	--	0.00049 U	--	0.00048 U	0.00061 U	--	0.00035 U
Bromodichloromethane	--	0.00031 U	--	0.00036 U	--	0.00036 U	--	--	0.00045 U	--	0.00044 U	0.00056 U	--	0.00032 U

Table E-34
Summary of Data Used in Risk Assessment
Backwater Seep Sampling Area Soil (0-2 ft-bgs) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Sample Depth Chemical	CFSB-134 460-144087-11 CFSB-134-SO-0-0.5 0-0.5 ft 10/31/2017	CFSB-134 460-144087-12 CFSB-134-SO-0.5-2 0.5-2 ft 10/31/2017	CFSB-135 460-144087-13 CFSB-135-SO-0-0.5 0-0.5 ft 10/31/2017	CFSB-135 460-144087-14 CFSB-135-SO-0.5-2 0.5-2 ft 10/31/2017	CFSB-136 460-144087-15 CFSB-136-SO-0-0.5 0-0.5 2 10/31/2017	CFSB-136 460-144087-16 CFSB-136-SO-0.5-2 0.5-2 ft 10/31/2017	CFSB-137 460-144170-9 CFSB-137-SO-0-0.5 0-0.5 ft 11/1/2017	CFSB-137 460-144170-10 CFSB-137-SO-0.5-2 0.5-2 ft 11/1/2017	CFSB-137 460-144400-1 CFSB-137-SO-0.5-2 0.5-2 ft 11/2/2017	CFSB-138 460-144170-4 CFSB-138-SO-0-0.5 0-0.5 ft 11/1/2017	CFSB-138 460-144170-5 CFSB-138-SO-0.5-2 0.5-2 ft 11/1/2017	CFSB-138-DUP 460-144170-6 CFSB-DUP14-SO 0.5-2 ft 11/1/2017	CFSB-139 460-144087-1 CFSB-139-SO-0-0.5 0-0.5 2 10/31/2017	CFSB-139 460-144087-2 CFSB-139-SO-0.5-2 0.5-2 ft 10/31/2017
Bromoform	--	0.00051 U	--	0.0006 U	--	0.0006 U	--	--	0.00074 U	--	0.00073 U	0.00093 U	--	0.00053 U
Bromomethane	--	0.00057 U	--	0.00067 U	--	0.00067 U	--	--	0.00082 U	--	0.00081 U	0.001 U	--	0.00059 U
Carbon Disulfide	--	0.0011 J	--	0.0011 J	--	0.00054 J	--	--	0.00095 J	--	0.00046 U	0.00058 U	--	0.002
Carbon Tetrachloride	--	0.00022 U	--	0.00026 U	--	0.00025 U	--	--	0.00031 U	--	0.00031 U	0.0004 U	--	0.00023 U
Chlorobenzene	--	0.00021 U	--	0.00025 U	--	0.00025 U	--	--	0.00031 U	--	0.0003 U	0.00039 U	--	0.00022 U
Chloroethane	--	0.00063 U	--	0.00074 U	--	0.00073 U	--	--	0.00091 U	--	0.00089 U	0.0011 U	--	0.00065 U
Chloroform	--	0.00038 U	--	0.00045 U	--	0.00045 U	--	--	0.00055 U	--	0.00055 U	0.0007 U	--	0.0004 U
Chloromethane	--	0.00052 UJ	--	0.00061 UJ	--	0.00061 UJ	--	--	0.00076 U	--	0.00074 UJ	0.00095 UJ	--	0.00055 UJ
Cis-1,2-Dichloroethylene	--	0.00018 U	--	0.00021 U	--	0.00021 U	--	--	0.00026 U	--	0.00026 U	0.00033 U	--	0.00019 U
Cis-1,3-Dichloropropene	--	0.00033 U	--	0.00038 U	--	0.00038 U	--	--	0.00047 U	--	0.00047 U	0.0006 U	--	0.00034 U
Cyclohexane	--	0.003	--	0.0025	--	0.00051 J	--	--	0.0031	--	0.00088 J	0.0013 J	--	0.0018
Dibromochloromethane	--	0.00023 U	--	0.00027 U	--	0.00027 U	--	--	0.00034 U	--	0.00033 U	0.00042 U	--	0.00024 U
Dichlorodifluoromethane	--	0.00041 U	--	0.00048 U	--	0.00048 U	--	--	0.00059 U	--	0.00058 U	0.00074 U	--	0.00042 U
Ethylbenzene	--	0.00047 J	--	0.0006 J	--	0.0004 J	--	--	0.0005 J	--	0.00034 U	0.00044 U	--	0.00038 J
Isopropylbenzene (Cumene)	--	0.00015 U	--	0.00018 U	--	0.00018 U	--	--	0.00022 U	--	0.00022 U	0.00028 U	--	0.00016 U
M,P-Xylene	--	0.0013	--	0.0019	--	0.0012 J	--	--	0.0013 J	--	0.0006 J	0.00077 J	--	0.0009 J
Methyl Acetate	--	0.0052 U	--	0.0061 U	--	0.011	--	--	0.0075 U	--	0.6 J	0.0094 UJ	--	0.0054 U
Methyl Ethyl Ketone (2-Butanone)	--	0.0037 J	--	0.0041 J	--	0.0043 J	--	--	0.006 J+	--	0.013	0.0096 J	--	0.0041 J
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	--	0.0008 U	--	0.00094 U	--	0.00093 U	--	--	0.0012 U	--	0.0011 U	0.0015 U	--	0.00083 U
Methylcyclohexane	--	0.0054	--	0.0049	--	0.0012 J	--	--	0.0048	--	0.0018	0.0023	--	0.0037
Methylene Chloride	--	0.0002 U	--	0.00023 U	--	0.0027	--	--	0.00028 U	--	0.00045 J	0.00036 U	--	0.0002 U
O-Xylene (1,2-Dimethylbenzene)	--	0.00037 J	--	0.00058 J	--	0.00038 J	--	--	0.00041 J	--	0.00021 J	0.00021 U	--	0.00028 J
Styrene	--	0.00015 U	--	0.00017 U	--	0.00017 U	--	--	0.00021 U	--	0.00021 U	0.00027 U	--	0.00015 U
Tert-Butyl Methyl Ether	--	0.00015 U	--	0.00018 U	--	0.00018 U	--	--	0.00022 U	--	0.00021 U	0.00027 U	--	0.00016 U
Tetrachloroethylene (PCE)	--	0.00017 U	--	0.0002 U	--	0.0002 U	--	--	0.00025 U	--	0.0004 J	0.00031 U	--	0.00018 U
Toluene	--	0.0029	--	0.004	--	0.0023	--	--	0.0029	--	0.0012 J	0.0016 J	--	0.0023
Trans-1,2-Dichloroethene	--	0.0003 U	--	0.00035 U	--	0.00035 U	--	--	0.00043 U	--	0.00042 U	0.00054 U	--	0.00031 U
Trans-1,3-Dichloropropene	--	0.00032 U	--	0.00037 U	--	0.00037 U	--	--	0.00046 U	--	0.00046 U	0.00058 U	--	0.00033 U
Trichloroethylene (TCE)	--	0.00017 U	--	0.0002 U	--	0.0002 U	--	--	0.00025 U	--	0.00025 U	0.00031 U	--	0.00018 U
Trichlorofluoromethane	--	0.00049 U	--	0.00057 U	--	0.00057 U	--	--	0.00071 U	--	0.00069 U	0.00089 U	--	0.00051 U
Vinyl Chloride	--	0.00066 U	--	0.00077 U	--	0.00077 U	--	--	0.00095 U	--	0.00093 U	0.0012 U	--	0.00068 U

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-34
Summary of Data Used in Risk Assessment
Backwater Seep Sampling Area Soil (0-2 ft-bgs) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Sample Depth Chemical	CFSB-140 460-144087-3 CFSB-140-SO-0-0.5 0-0.5 ft 10/31/2017	CFSB-140 460-144087-4 CFSB-140-SO-0.5-2 0.5-2 ft 10/31/2017	CFSB-141 460-144170-7 CFSB-141-SO-0-0.5 0-0.5 ft 11/1/2017	CFSB-141 460-144170-8 CFSB-141-SO-0.5-2 0.5-2 ft 11/1/2017	CFSB-141 460-144400-4 CFSB-141-SO-0.5-2 0.5-2 ft 11/2/2017
GENERAL CHEMISTRY (mg/kg)					
Fluoride	12.8 J+	14.9 J+	16.4 J+	1.58 J+	--
Cyanide	0.077 U	0.071 U	0.14 J	0.079 J	--
Cyanide (Free)	--	--	--	--	--
METALS (mg/kg)					
"Chromium, Hexavalent - Estimated"	0.275669	0.275669	0.331873	0.262287	--
"Chromium, Trivalent - Estimated"	10.0243	10.0243	12.0681	9.53771	--
Aluminum	8790	8900	10800	8520	--
Antimony	0.42 U	0.38 U	0.37 UJ	0.31 UJ	--
Arsenic	5	4.7	5.4	4.9	--
Barium	190	130	212	153	--
Beryllium	0.54	0.39 J	0.6	0.46	--
Cadmium	0.44 U	0.4 U	0.39 U	0.33 U	--
Calcium	25900	18600	29500	20400	--
Chromium, Total	10.3	10.3	12.4	9.8	--
Cobalt	6.5	6.4	7.6	6	--
Copper	18.1	16.3	18.3	14.3	--
Iron	14200	15100	17600	14600	--
Lead	9.7	8.1	10.8	7.8	--
Magnesium	12100	11500	14800	11700	--
Manganese	389	306	467	330	--
Mercury	0.023	0.012 J	0.024	0.015 J	--
Nickel	12.9	13.1	15.3	12.2	--
Potassium	1090	835	1290 J+	802 J+	--
Selenium	0.39 U	0.35 U	0.35 U	0.29 U	--
Silver	0.81 U	0.74 U	0.73 U	0.61 U	--
Sodium	68.3 J	55.9 J	72.9 J	52 J	--
Thallium	0.16 U	0.15 U	0.15 U	0.12 U	--
Vanadium	12.8	13.5	16.5	14.7	--
Zinc	48.1	44.6	56.3	39.2	--
SEMIVOLATILE ORGANIC COMPOUNDS (mg/kg)					
1,2,4,5-Tetrachlorobenzene	0.031 U	0.028 U	0.036 U	0.029 U	--
1,4-Dioxane (P-Dioxane)	0.11 U	0.1 U	0.13 U	0.1 U	--
2,3,4,6-Tetrachlorophenol	0.04 U	0.035 U	0.046 U	0.037 U	--
2,4,5-Trichlorophenol	0.042 U	0.037 U	0.048 U	0.039 U	--
2,4,6-Trichlorophenol	0.012 U	0.011 U	0.014 U	0.011 U	--
2,4-Dichlorophenol	0.0099 U	0.0088 U	0.011 U	0.0092 U	--
2,4-Dimethylphenol	0.092 UJ	0.082 UJ	0.11 U	0.086 U	--
2,4-Dinitrophenol	0.32 U	0.28 U	0.37 U	0.29 U	--
2,4-Dinitrotoluene	0.017 U	0.015 U	0.019 U	0.015 U	--
2,6-Dinitrotoluene	0.022 U	0.02 U	0.026 U	0.021 U	--
2-Chloronaphthalene	0.0095 U	0.0085 U	0.011 U	0.0088 U	--
2-Chlorophenol	0.011 U	0.0095 U	0.012 U	0.0099 U	--
2-Methylnaphthalene	0.0093 U	0.0083 U	0.21 J	0.16 J	--
2-Methylphenol (O-Cresol)	0.018 U	0.016 U	0.021 U	0.017 U	--
2-Nitroaniline	0.014 U	0.012 U	0.016 U	0.013 U	--
2-Nitrophenol	0.014 U	0.013 U	0.016 U	0.013 U	--
3- And 4- Methylphenol (Total)	0.011 U	0.0099 U	0.013 U	0.01 U	--
3,3'-Dichlorobenzidine	0.047 U	0.042 U	0.054 U	0.043 U	--
3-Nitroaniline	0.012 U	0.011 U	0.014 U	0.012 U	--
4,6-Dinitro-2-Methylphenol	0.11 U	0.1 U	0.13 U	0.1 U	--
4-Bromophenyl Phenyl Ether	0.013 U	0.012 U	0.015 U	0.012 U	--
4-Chloro-3-Methylphenol	0.018 U	0.016 U	0.021 U	0.017 U	--
4-Chloroaniline	0.011 U	0.0096 U	0.012 U	0.01 U	--
4-Chlorophenyl Phenyl Ether	0.013 U	0.011 U	0.014 U	0.012 U	--
4-Nitroaniline	0.016 U	0.014 UJ	0.018 U	0.015 U	--
4-Nitrophenol	0.2 U	0.18 U	0.23 UJ	0.19 UJ	--
Acenaphthene	0.01 U	0.009 U	0.012 U	0.0094 U	--
Acenaphthylene	0.011 U	0.0096 U	0.051 J	0.024 J	--
Acetophenone	0.0091 U	0.0081 U	0.011 U	0.0085 U	--

Table E-34
Summary of Data Used in Risk Assessment
Backwater Seep Sampling Area Soil (0-2 ft-bgs) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Sample Depth Chemical	CFSB-140 460-144087-3 CFSB-140-SO-0-0.5 0-0.5 ft 10/31/2017	CFSB-140 460-144087-4 CFSB-140-SO-0.5-2 0.5-2 ft 10/31/2017	CFSB-141 460-144170-7 CFSB-141-SO-0-0.5 0-0.5 ft 11/1/2017	CFSB-141 460-144170-8 CFSB-141-SO-0.5-2 0.5-2 ft 11/1/2017	CFSB-141 460-144400-4 CFSB-141-SO-0.5-2 0.5-2 ft 11/2/2017
Anthracene	0.04 U	0.036 U	0.046 U	0.037 U	--
Atrazine	0.019 U	0.017 U	0.022 U	0.017 U	--
Benzaldehyde	0.032 U	0.028 U	0.037 U	0.03 U	--
Benzo(A)Anthracene	0.035 U	0.031 U	0.04 U	0.032 U	--
Benzo(A)Pyrene	0.013 U	0.011 U	0.015 U	0.012 U	--
Benzo(B)Fluoranthene	0.016 U	0.015 U	0.073	0.015 U	--
Benzo(G,H,I)Perylene	0.024 U	0.021 U	0.028 U	0.022 U	--
Benzo(K)Fluoranthene	0.018 U	0.016 U	0.021 U	0.017 U	--
Benzyl Butyl Phthalate	0.013 U	0.012 U	0.015 U	0.012 U	--
Biphenyl (Diphenyl)	0.036 U	0.032 U	0.041 U	0.033 U	--
Bis(2-Chloroethoxy) Methane	0.013 U	0.012 U	0.015 U	0.012 U	--
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.0099 U	0.0088 U	0.011 U	0.0092 U	--
Bis(2-Chloroisopropyl) Ether	0.017 U	0.015 U	0.02 U	0.016 U	--
Bis(2-Ethylhexyl) Phthalate	0.016 U	0.015 U	0.019 U	0.015 U	--
Caprolactam	0.03 U	0.027 U	0.035 U	0.028 U	--
Carbazole	0.01 U	0.0093 U	0.012 U	0.0096 U	--
Chrysene	0.011 U	0.027 J	0.059 J	0.011 U	--
Dibenz(A,H)Anthracene	0.022 U	0.019 U	0.025 U	0.02 U	--
Dibenzofuran	0.013 U	0.011 U	0.015 U	0.012 U	--
Diethyl Phthalate	0.012 U	0.011 U	0.014 U	0.011 U	--
Dimethyl Phthalate	0.012 U	0.011 U	0.014 U	0.011 U	--
Di-N-Butyl Phthalate	0.013 U	0.011 U	0.014 U	0.012 U	--
Di-N-Octylphthalate	0.021 U	0.019 U	0.025 U	0.02 U	--
Fluoranthene	0.019 J	0.04 J	0.046 J	0.012 U	--
Fluorene	0.0091 U	0.0081 U	0.011 U	0.0085 U	--
Hexachlorobenzene	0.017 U	0.015 U	0.02 U	0.016 U	--
Hexachlorobutadiene	0.012 U	0.011 U	0.014 U	0.011 U	--
Hexachlorocyclopentadiene	0.026 UJ	0.023 UJ	0.03 UJ	0.024 UJ	--
Hexachloroethane	0.015 U	0.014 U	0.018 U	0.014 U	--
Indeno(1,2,3-C,D)Pyrene	0.028 U	0.025 U	0.04 J	0.026 U	--
Isophorone	0.009 U	0.008 U	0.01 U	0.0084 U	--
Naphthalene	0.011 U	0.0095 U	0.36 J	0.36 J	--
Nitrobenzene	0.013 U	0.012 U	0.015 U	0.012 U	--
N-Nitrosodi-N-Propylamine	0.014 U	0.013 U	0.016 U	0.013 U	--
N-Nitrosodiphenylamine	0.038 U	0.034 U	0.044 U	0.035 U	--
Pentachlorophenol	0.051 U	0.045 U	0.059 U	0.047 U	--
Phenanthrene	0.011 U	0.0099 U	0.03 J	0.01 U	--
Phenol	0.014 U	0.012 U	0.016 U	0.013 U	--
Pyrene	0.019 U	0.017 U	0.03 J	0.018 U	--
VOLATILE ORGANIC COMPOUNDS (mg/kg)					
1,1,1-Trichloroethane	--	0.00034 U	--	--	0.00029 U
1,1,2,2-Tetrachloroethane	--	0.00031 U	--	--	0.00027 U
1,1,2-Trichloro-1,2,2-Trifluoroethane	--	0.00043 U	--	--	0.00037 U
1,1,2-Trichloroethane	--	0.00026 U	--	--	0.00022 U
1,1-Dichloroethane	--	0.0003 U	--	--	0.00026 U
1,1-Dichloroethene	--	0.00032 U	--	--	0.00028 U
1,2,3-Trichlorobenzene	--	0.00026 U	--	--	0.00022 U
1,2,4-Trichlorobenzene	--	0.00013 U	--	--	0.00011 U
1,2-Dibromo-3-Chloropropane	--	0.00066 U	--	--	0.00057 U
1,2-Dibromoethane (Ethylene Dibromide)	--	0.00026 U	--	--	0.00022 U
1,2-Dichlorobenzene	--	0.00021 U	--	--	0.00018 U
1,2-Dichloroethane	--	0.00043 U	--	--	0.00037 U
1,2-Dichloropropane	--	0.00061 U	--	--	0.00052 U
1,3-Dichlorobenzene	--	0.00023 U	--	--	0.0002 U
1,4-Dichlorobenzene	--	0.00014 U	--	--	0.00012 U
2-Hexanone	--	0.0011 U	--	--	0.00097 U
Acetone	--	0.043	--	--	0.041
Benzene	--	0.0016	--	--	0.0018
Bromochloromethane	--	0.00041 U	--	--	0.00035 U
Bromodichloromethane	--	0.00037 U	--	--	0.00032 U

Table E-34
Summary of Data Used in Risk Assessment
Backwater Seep Sampling Area Soil (0-2 ft-bgs) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Sample Depth Chemical	CFSB-140 460-144087-3 CFSB-140-SO-0-0.5 0-0.5 ft 10/31/2017	CFSB-140 460-144087-4 CFSB-140-SO-0.5-2 0.5-2 ft 10/31/2017	CFSB-141 460-144170-7 CFSB-141-SO-0-0.5 0-0.5 ft 11/1/2017	CFSB-141 460-144170-8 CFSB-141-SO-0.5-2 0.5-2 ft 11/1/2017	CFSB-141 460-144400-4 CFSB-141-SO-0.5-2 0.5-2 ft 11/2/2017
Bromoform	--	0.00061 U	--	--	0.00053 U
Bromomethane	--	0.00068 U	--	--	0.00059 U
Carbon Disulfide	--	0.0023	--	--	0.0018
Carbon Tetrachloride	--	0.00026 U	--	--	0.00022 U
Chlorobenzene	--	0.00026 U	--	--	0.00022 U
Chloroethane	--	0.00075 U	--	--	0.00065 U
Chloroform	--	0.00046 U	--	--	0.0004 U
Chloromethane	--	0.00063 UJ	--	--	0.00054 U
Cis-1,2-Dichloroethylene	--	0.00022 U	--	--	0.00019 U
Cis-1,3-Dichloropropene	--	0.00039 U	--	--	0.00034 U
Cyclohexane	--	0.0023	--	--	0.0026
Dibromochloromethane	--	0.00028 U	--	--	0.00024 U
Dichlorodifluoromethane	--	0.00049 U	--	--	0.00042 U
Ethylbenzene	--	0.0005 J	--	--	0.00054 J
Isopropylbenzene (Cumene)	--	0.00018 U	--	--	0.00016 U
M,P-Xylene	--	0.0012 J	--	--	0.0012
Methyl Acetate	--	0.0062 U	--	--	0.0053 U
Methyl Ethyl Ketone (2-Butanone)	--	0.0043 J	--	--	0.0046 J
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	--	0.00096 U	--	--	0.00082 U
Methylcyclohexane	--	0.0043	--	--	0.0052
Methylene Chloride	--	0.00031 J	--	--	0.0002 U
O-Xylene (1,2-Dimethylbenzene)	--	0.00038 J	--	--	0.00039 J
Styrene	--	0.00018 U	--	--	0.00015 U
Tert-Butyl Methyl Ether	--	0.00018 U	--	--	0.00016 U
Tetrachloroethylene (PCE)	--	0.00021 U	--	--	0.00018 U
Toluene	--	0.0033	--	--	0.003
Trans-1,2-Dichloroethene	--	0.00036 U	--	--	0.00031 U
Trans-1,3-Dichloropropene	--	0.00038 U	--	--	0.00033 U
Trichloroethylene (TCE)	--	0.00021 U	--	--	0.00018 U
Trichlorofluoromethane	--	0.00059 U	--	--	0.0005 U
Vinyl Chloride	--	0.00079 U	--	--	0.00068 U

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-35
Summary of Data Used in Risk Assessment
Backwater Seep Sampling Area (surface water) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSWP-003	CFSWP-003	CFSWP-003	CFSWP-003	CFSWP-003	CFSWP-003	CFSWP-003	CFSWP-004	CFSWP-004	CFSWP-004	CFSWP-004	CFSWP-004	CFSWP-004	CFSWP-004
Sample Lab IDs	460-119967-1	460-124639-1	460-129875-1	460-135338-3	460-144086-1	460-157703-3	460-166152-4	460-119967-2	460-124639-2	460-129875-2	460-135338-4	460-144086-2	460-157703-4	460-166152-3
Sample Name Chemical	CFSWP-003-SW 9/9/2016	CFSWP-003-SW 12/1/2016	CFSWP-003-SW 3/16/2017	CFSWP-003-SW 6/14/2017	CFSWP-003-SW 10/31/2017	CFSWP-003-SW 6/6/2018	CFSWP-003-SW 10/4/2018	CFSWP-004-SW 9/9/2016	CFSWP-004-SW 12/1/2016	CFSWP-004-SW 3/16/2017	CFSWP-004-SW 6/14/2017	CFSWP-004-SW 10/31/2017	CFSWP-004-SW 6/6/2018	CFSWP-004-SW 10/4/2018
GENERAL CHEMISTRY (µg/L)														
Fluoride	--	--	--	185 J+	--	--	--	--	--	--	167 J+	--	--	--
Cyanide	--	--	--	12.5	88.3	--	--	--	--	--	11.7	328	--	--
Cyanide (Free)	--	--	--	5.4	12.5	--	--	--	--	--	5.6	20.3	--	--
Cyanide	18.8	36.2	7.7 J	9.5 J	74.6	36.9 J+	--	209	178	21.3	11.5	323	76.6 J+	--
Cyanide (Free)	--	--	1.5 U	3.5 J	12.5	27.4	43.7	--	--	6.4	4.1 J	21.5	35	87
METALS (µg/L)														
Aluminum	--	--	--	18.2 U	18.2 U	15 U	17.1 J	--	--	--	18.2 U	18.2 U	39.1 J	15 U
Antimony	--	--	--	0.62 U	0.62 U	0.62 U	0.62 U	--	--	--	0.62 U	0.62 U	0.62 U	0.62 U
Arsenic	--	--	--	0.64 U	0.64 U	0.77 U	0.77 U	--	--	--	0.64 U	0.64 U	0.77 U	0.77 U
Barium	--	--	--	70.2	127	77.2	132	--	--	--	67.7	191	91.7	174
Beryllium	--	--	--	0.24 U	0.24 U	0.26 U	0.26 U	--	--	--	0.24 U	0.24 U	0.26 U	0.26 U
Cadmium	--	--	--	0.71 U	0.71 U	0.61 U	0.61 U	--	--	--	0.71 U	0.71 U	0.61 U	0.61 U
Calcium	--	--	--	20500	33300	21800	37400	--	--	--	19900	59100	25200	58100
Chromium, Total	--	--	--	1.3 U	1.3 U	1.3 U	1.3 U	--	--	--	1.3 U	1.3 U	1.3 U	1.3 U
Cobalt	--	--	--	1.3 U	1.3 U	1.3 U	1.3 U	--	--	--	1.3 U	1.3 U	1.3 U	1.3 U
Copper	--	--	--	26.4	1.4 U	1.9 U	1.9 U	--	--	--	1.4 U	1.4 U	1.9 U	1.9 U
Iron	--	--	--	164	56.7 J	45.7 U	69.7 J	--	--	--	42.4 U	150	60.8 J	134
Lead	--	--	--	0.38 U	0.38 U	0.37 U	0.37 U	--	--	--	0.38 U	0.38 U	0.37 U	0.37 U
Magnesium	--	--	--	5150	8410	5340	10300	--	--	--	4990	15700	6330	17200
Manganese	--	--	--	12.5	22.7	26.9	37	--	--	--	8.2	63.7	59.6	30.7
Mercury	--	--	--	0.17 U	0.17 U	0.12 U	0.12 U	--	--	--	0.17 U	0.17 U	0.12 U	0.12 U
Nickel	--	--	--	32.2	1.4 U	1.3 U	1.3 U	--	--	--	1.4 U	1.4 U	1.3 U	1.3 U
Potassium	--	--	--	286	507	339	565	--	--	--	268	974	439	924
Selenium	--	--	--	0.73 U	0.73 U	0.69 U	0.69 U	--	--	--	0.73 U	0.73 U	0.69 U	0.69 U
Silver	--	--	--	1.3 U	1.3 U	1.4 U	1.4 U	--	--	--	1.3 U	1.3 U	1.4 U	1.4 U
Sodium	--	--	--	2160	8780	2940	15100	--	--	--	1850	32700	6720	42900
Thallium	--	--	--	0.26 U	0.26 U	0.24 U	0.24 U	--	--	--	0.26 U	0.26 U	0.24 U	0.24 U
Vanadium	--	--	--	1.9 U	1.9 U	1.2 U	1.2 U	--	--	--	1.9 U	1.9 U	1.2 U	1.2 U
Zinc	--	--	--	7 U	7 U	5.4 U	5.4 U	--	--	--	7 U	7 U	5.4 U	5.4 U
Aluminum	63.5	172	794	746	800	279	233	522	53.3	625	619	1180	139	861
Antimony	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U
Arsenic	0.64 U	0.64 U	0.64 U	0.64 U	0.66 J	0.77 U	0.77 U	0.78 J	0.64 U	0.64 U	0.64 U	0.95 J	0.77 U	0.77 U
Barium	117	118	99.3	85.8	154	85.1	138	197	173	103	81.3	216	102	183
Beryllium	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.26 U	0.26 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.26 U	0.26 U
Cadmium	0.71 U	0.71 U	0.71 U	0.71 U	0.71 U	0.61 U	0.61 U	0.71 U	0.71 U	0.71 U	0.71 U	0.71 U	0.61 U	0.61 U
Calcium	27700	30000	23200	21900	32700	23800	37800	60700	52400	26200	21000	58000	28400	56700
Chromium, Total	1.3 U	1.3 U	1.3 J	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 J	1.3 U	1.6 J	1.3 U	1.3 U
Cobalt	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 J	1.3 U	1.3 U	1.3 U	1.7 J	1.3 U	1.3 J
Copper	1.4 U	1.4 U	1.4 U	1.4 U	4.3	1.9 U	1.9 U	1.5 J	1.8 J	1.4 U	1.4 U	12.3	1.9 U	4.4
Iron	135	294	868	802	1110	368	319	827	238	611	629	1620	238	1080
Lead	0.38 U	0.38 U	0.63 J	0.5 J	1 J	0.37 U	0.37 U	0.48 J	2.9	0.55 J	0.38 J	1.6	0.37 U	0.83 J
Magnesium	7650	8430	6350	6080	9610	6500	10900	18200	15100	7110	5880	17900	7880	16900
Manganese	10.9	30.4	25.6	31.1	44.9	43.4	38.8	57.1	57.9	24	23.9	77.4	73	51.2
Mercury	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.12 U	0.12 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.12 U	0.12 U
Nickel	1.4 U	1.4 U	1.4 U	1.4 U	1.6 J	1.3 U	1.3 U	1.4 U	1.4 U	1.4 U	1.4 U	2.2 J	1.3 U	1.3 U
Potassium	398	476	580	551	696	424	624	1120	833	581	495	1200	433	1160
Selenium	0.73 U	0.73 U	0.73 U	0.73 U	0.73 U	0.69 U	0.69 U	0.73 U	0.73 U	0.73 U	0.73 U	0.73 U	0.69 U	0.69 U
Silver	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.4 U	1.4 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.4 U	1.4 U
Sodium	3780	5990	2050	2050	8210	4200	15700	36400	26100	4780	2060	34900	8200	39000
Thallium	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.24 U	0.24 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.24 U	0.24 U
Vanadium	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.2 U	1.2 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.2 U	1.2 J
Zinc	7 U	7 U	7 U	7 U	9.3 J	5.4 U	5.4 U	7 U	7 U	7 U	7 U	19.1	5.4 U	5.4 U
SEMIVOLATILE ORGANIC COMPOUNDS (µg/L)														
1,2,4,5-Tetrachlorobenzene	--	--	--	--	0.44 U	--	--	--	--	--	--	0.44 U	--	--
1,4-Dioxane (P-Dioxane)	--	--	--	--	3.2 U	--	--	--	--	--	--	3.2 U	--	--
2,3,4,6-Tetrachlorophenol	--	--	--	--	0.7 U	--	--	--	--	--	--	0.7 U	--	--
2,4,5-Trichlorophenol	--	--	--	--	0.5 U	--	--	--	--	--	--	0.5 U	--	--
2,4,6-Trichlorophenol	--	--	--	--	0.54 U	--	--	--	--	--	--	0.54 U	--	--

Table E-35
Summary of Data Used in Risk Assessment
Backwater Seep Sampling Area (surface water) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSWP-003	CFSWP-003	CFSWP-003	CFSWP-003	CFSWP-003	CFSWP-003	CFSWP-003	CFSWP-004	CFSWP-004	CFSWP-004	CFSWP-004	CFSWP-004	CFSWP-004	CFSWP-004
Sample Lab IDs	460-119967-1	460-124639-1	460-129875-1	460-135338-3	460-144086-1	460-157703-3	460-166152-4	460-119967-2	460-124639-2	460-129875-2	460-135338-4	460-144086-2	460-157703-4	460-166152-3
Sample Name Chemical	CFSWP-003-SW 9/9/2016	CFSWP-003-SW 12/1/2016	CFSWP-003-SW 3/16/2017	CFSWP-003-SW 6/14/2017	CFSWP-003-SW 10/31/2017	CFSWP-003-SW 6/6/2018	CFSWP-003-SW 10/4/2018	CFSWP-004-SW 9/9/2016	CFSWP-004-SW 12/1/2016	CFSWP-004-SW 3/16/2017	CFSWP-004-SW 6/14/2017	CFSWP-004-SW 10/31/2017	CFSWP-004-SW 6/6/2018	CFSWP-004-SW 10/4/2018
2,4-Dichlorophenol	--	--	--	--	0.64 U	--	--	--	--	--	--	0.64 U	--	--
2,4-Dimethylphenol	--	--	--	--	0.93 U	--	--	--	--	--	--	0.93 U	--	--
2,4-Dinitrophenol	--	--	--	--	2.4 UJ	--	--	--	--	--	--	2.4 UJ	--	--
2,4-Dinitrotoluene	--	--	--	--	1.1 U	--	--	--	--	--	--	1.1 U	--	--
2,6-Dinitrotoluene	--	--	--	--	0.9 U	--	--	--	--	--	--	0.9 U	--	--
2-Chloronaphthalene	--	--	--	--	0.62 U	--	--	--	--	--	--	0.62 U	--	--
2-Chlorophenol	--	--	--	--	0.76 U	--	--	--	--	--	--	0.76 U	--	--
2-Methylnaphthalene	--	--	--	--	0.9 U	--	--	--	--	--	--	0.9 U	--	--
2-Methylphenol (O-Cresol)	--	--	--	--	1.3 U	--	--	--	--	--	--	1.3 U	--	--
2-Nitroaniline	--	--	--	--	0.66 U	--	--	--	--	--	--	0.66 U	--	--
2-Nitrophenol	--	--	--	--	0.6 U	--	--	--	--	--	--	0.6 U	--	--
3- And 4- Methylphenol (Total)	--	--	--	--	0.9 U	--	--	--	--	--	--	0.9 U	--	--
3,3'-Dichlorobenzidine	--	--	--	--	1.1 U	--	--	--	--	--	--	1.1 U	--	--
3-Nitroaniline	--	--	--	--	0.84 U	--	--	--	--	--	--	0.84 U	--	--
4,6-Dinitro-2-Methylphenol	--	--	--	--	2.1 U	--	--	--	--	--	--	2.1 U	--	--
4-Bromophenyl Phenyl Ether	--	--	--	--	1 U	--	--	--	--	--	--	1 U	--	--
4-Chloro-3-Methylphenol	--	--	--	--	0.78 U	--	--	--	--	--	--	0.78 U	--	--
4-Chloroaniline	--	--	--	--	0.74 U	--	--	--	--	--	--	0.74 U	--	--
4-Chlorophenyl Phenyl Ether	--	--	--	--	0.98 U	--	--	--	--	--	--	0.98 U	--	--
4-Nitroaniline	--	--	--	--	0.49 U	--	--	--	--	--	--	0.49 U	--	--
4-Nitrophenol	--	--	--	--	4.7 U	--	--	--	--	--	--	4.7 U	--	--
Acenaphthene	--	--	--	--	0.9 U	--	--	--	--	--	--	0.9 U	--	--
Acenaphthylene	--	--	--	--	0.66 U	--	--	--	--	--	--	0.66 U	--	--
Acetophenone	--	--	--	--	1.1 U	--	--	--	--	--	--	1.1 U	--	--
Anthracene	--	--	--	--	0.58 U	--	--	--	--	--	--	0.58 U	--	--
Atrazine	--	--	--	--	0.79 U	--	--	--	--	--	--	0.79 U	--	--
Benzaldehyde	--	--	--	--	0.88 U	--	--	--	--	--	--	0.88 U	--	--
Benzo(A)Anthracene	--	--	--	--	0.56 U	--	--	--	--	--	--	0.56 U	--	--
Benzo(A)Pyrene	--	--	--	--	0.16 U	--	--	--	--	--	--	0.16 U	--	--
Benzo(B)Fluoranthene	--	--	--	--	0.45 U	--	--	--	--	--	--	0.45 U	--	--
Benzo(G,H,I)Perylene	--	--	--	--	0.77 U	--	--	--	--	--	--	0.77 U	--	--
Benzo(K)Fluoranthene	--	--	--	--	0.18 U	--	--	--	--	--	--	0.18 U	--	--
Benzyl Butyl Phthalate	--	--	--	--	0.61 U	--	--	--	--	--	--	0.61 U	--	--
Biphenyl (Diphenyl)	--	--	--	--	0.64 U	--	--	--	--	--	--	0.64 U	--	--
Bis(2-Chloroethoxy) Methane	--	--	--	--	0.7 U	--	--	--	--	--	--	0.7 U	--	--
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	--	--	--	--	0.12 U	--	--	--	--	--	--	0.12 U	--	--
Bis(2-Chloroisopropyl) Ether	--	--	--	--	0.95 U	--	--	--	--	--	--	0.95 U	--	--
Bis(2-Ethylhexyl) Phthalate	--	--	--	--	1.2 J	--	--	--	--	--	--	0.73 U	--	--
Caprolactam	--	--	--	--	1.1 U	--	--	--	--	--	--	1.1 U	--	--
Carbazole	--	--	--	--	0.87 U	--	--	--	--	--	--	0.87 U	--	--
Chrysene	--	--	--	--	0.68 U	--	--	--	--	--	--	0.68 U	--	--
Dibenz(A,H)Anthracene	--	--	--	--	0.092 U	--	--	--	--	--	--	0.092 U	--	--
Dibenzofuran	--	--	--	--	0.87 U	--	--	--	--	--	--	0.87 U	--	--
Diethyl Phthalate	--	--	--	--	1 U	--	--	--	--	--	--	1 U	--	--
Dimethyl Phthalate	--	--	--	--	1 U	--	--	--	--	--	--	1 U	--	--
Di-N-Butyl Phthalate	--	--	--	--	0.84 U	--	--	--	--	--	--	0.84 U	--	--
Di-N-Octylphthalate	--	--	--	--	0.7 U	--	--	--	--	--	--	0.7 U	--	--
Fluoranthene	--	--	--	--	0.73 U	--	--	--	--	--	--	0.73 U	--	--
Fluorene	--	--	--	--	0.82 U	--	--	--	--	--	--	0.82 U	--	--
Hexachlorobenzene	--	--	--	--	0.48 U	--	--	--	--	--	--	0.48 U	--	--
Hexachlorobutadiene	--	--	--	--	0.78 U	--	--	--	--	--	--	0.78 U	--	--
Hexachlorocyclopentadiene	--	--	--	--	0.62 UJ	--	--	--	--	--	--	0.62 UJ	--	--
Hexachloroethane	--	--	--	--	0.092 U	--	--	--	--	--	--	0.092 U	--	--
Indeno(1,2,3-C,D)Pyrene	--	--	--	--	0.21 U	--	--	--	--	--	--	0.21 U	--	--
Isophorone	--	--	--	--	0.68 U	--	--	--	--	--	--	0.68 U	--	--
Naphthalene	--	--	--	--	0.82 U	--	--	--	--	--	--	0.82 U	--	--
Nitrobenzene	--	--	--	--	0.5 U	--	--	--	--	--	--	0.5 U	--	--
N-Nitrosodi-N-Propylamine	--	--	--	--	0.85 UJ	--	--	--	--	--	--	0.85 UJ	--	--
N-Nitrosodiphenylamine	--	--	--	--	0.76 U	--	--	--	--	--	--	0.76 U	--	--

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Sample Location ID	CFSWP-003	CFSWP-003	CFSWP-003	CFSWP-003	CFSWP-003	CFSWP-003	CFSWP-003	CFSWP-004	CFSWP-004	CFSWP-004	CFSWP-004	CFSWP-004	CFSWP-004	CFSWP-004
Sample Lab IDs	460-119967-1	460-124639-1	460-129875-1	460-135338-3	460-144086-1	460-157703-3	460-166152-4	460-119967-2	460-124639-2	460-129875-2	460-135338-4	460-144086-2	460-157703-4	460-166152-3
Sample Name Chemical	CFSWP-003-SW 9/9/2016	CFSWP-003-SW 12/1/2016	CFSWP-003-SW 3/16/2017	CFSWP-003-SW 6/14/2017	CFSWP-003-SW 10/31/2017	CFSWP-003-SW 6/6/2018	CFSWP-003-SW 10/4/2018	CFSWP-004-SW 9/9/2016	CFSWP-004-SW 12/1/2016	CFSWP-004-SW 3/16/2017	CFSWP-004-SW 6/14/2017	CFSWP-004-SW 10/31/2017	CFSWP-004-SW 6/6/2018	CFSWP-004-SW 10/4/2018
Pentachlorophenol	--	--	--	--	2.2 U	--	--	--	--	--	--	2.2 U	--	--
Phenanthrene	--	--	--	--	0.66 U	--	--	--	--	--	--	0.66 U	--	--
Phenol	--	--	--	--	0.42 U	--	--	--	--	--	--	0.42 U	--	--
Pyrene	--	--	--	--	0.85 U	--	--	--	--	--	--	0.85 U	--	--
SEMIVOLATILE ORGANIC COMPOUNDS|LOW LEVEL (µg/L)														
1,2,4,5-Tetrachlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,4-Dioxane (P-Dioxane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,3,4,6-Tetrachlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4,5-Trichlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4,6-Trichlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4-Dichlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4-Dimethylphenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4-Dinitrophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4-Dinitrotoluene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,6-Dinitrotoluene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Chloronaphthalene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Chlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Methylnaphthalene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Methylphenol (O-Cresol)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Nitroaniline	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Nitrophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3,3'-Dichlorobenzidine	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3-Nitroaniline	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4,6-Dinitro-2-Methylphenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Bromophenyl Phenyl Ether	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Chloro-3-Methylphenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Chloroaniline	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Chlorophenyl Phenyl Ether	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Nitroaniline	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Nitrophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acenaphthene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acenaphthylene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acetophenone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Anthracene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Atrazine	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzaldehyde	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(A)Anthracene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(A)Pyrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(B)Fluoranthene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(G,H,I)Perylene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(K)Fluoranthene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzyl Butyl Phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Biphenyl (Diphenyl)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bis(2-Chloroethoxy) Methane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bis(2-Chloroisopropyl) Ether	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bis(2-Ethylhexyl) Phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Caprolactam	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Carbazole	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chrysene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibenz(A,H)Anthracene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibenzofuran	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Diethyl Phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dimethyl Phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Di-N-Butyl Phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Di-N-Octylphthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Fluoranthene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Fluorene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Table E-35
Summary of Data Used in Risk Assessment
Backwater Seep Sampling Area (surface water) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSWP-003	CFSWP-003	CFSWP-003	CFSWP-003	CFSWP-003	CFSWP-003	CFSWP-003	CFSWP-004	CFSWP-004	CFSWP-004	CFSWP-004	CFSWP-004	CFSWP-004	CFSWP-004
Sample Lab IDs	460-119967-1	460-124639-1	460-129875-1	460-135338-3	460-144086-1	460-157703-3	460-166152-4	460-119967-2	460-124639-2	460-129875-2	460-135338-4	460-144086-2	460-157703-4	460-166152-3
Sample Name Chemical	CFSWP-003-SW 9/9/2016	CFSWP-003-SW 12/1/2016	CFSWP-003-SW 3/16/2017	CFSWP-003-SW 6/14/2017	CFSWP-003-SW 10/31/2017	CFSWP-003-SW 6/6/2018	CFSWP-003-SW 10/4/2018	CFSWP-004-SW 9/9/2016	CFSWP-004-SW 12/1/2016	CFSWP-004-SW 3/16/2017	CFSWP-004-SW 6/14/2017	CFSWP-004-SW 10/31/2017	CFSWP-004-SW 6/6/2018	CFSWP-004-SW 10/4/2018
Hexachlorobutadiene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorocyclopentadiene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Indeno(1,2,3-C,D)Pyrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Isophorone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Naphthalene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Nitrobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
N-Nitrosodi-N-Propylamine	--	--	--	--	--	--	--	--	--	--	--	--	--	--
N-Nitrosodiphenylamine	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Pentachlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Phenanthrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Phenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Pyrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SEMIVOLATILE ORGANIC COMPOUNDS-SIM (µg/L)														
Acenaphthene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acenaphthylene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Anthracene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(A)Anthracene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(A)Pyrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(B)Fluoranthene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(G,H,I)Perylene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(K)Fluoranthene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo[E]Pyrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
C1-Chrysenes	--	--	--	--	--	--	--	--	--	--	--	--	--	--
C1-Fluoranthenes/Pyrenes	--	--	--	--	--	--	--	--	--	--	--	--	--	--
C1-Fluorenes	--	--	--	--	--	--	--	--	--	--	--	--	--	--
C1-Naphthalenes	--	--	--	--	--	--	--	--	--	--	--	--	--	--
C1-Phenanthrenes/Anthracenes	--	--	--	--	--	--	--	--	--	--	--	--	--	--
C2-Chrysenes	--	--	--	--	--	--	--	--	--	--	--	--	--	--
C2-Fluorenes	--	--	--	--	--	--	--	--	--	--	--	--	--	--
C2-Naphthalenes	--	--	--	--	--	--	--	--	--	--	--	--	--	--
C2-Phenanthrenes/Anthracenes	--	--	--	--	--	--	--	--	--	--	--	--	--	--
C3-Chrysenes	--	--	--	--	--	--	--	--	--	--	--	--	--	--
C3-Fluorenes	--	--	--	--	--	--	--	--	--	--	--	--	--	--
C3-Naphthalenes	--	--	--	--	--	--	--	--	--	--	--	--	--	--
C3-Phenanthrenes/Anthracenes	--	--	--	--	--	--	--	--	--	--	--	--	--	--
C4 Chrysenes	--	--	--	--	--	--	--	--	--	--	--	--	--	--
C4-Naphthalenes	--	--	--	--	--	--	--	--	--	--	--	--	--	--
C4-Phenanthrenes/Anthracenes	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chrysene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibenz(A,H)Anthracene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Fluoranthene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Fluorene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Indeno(1,2,3-C,D)Pyrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Naphthalene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Perylene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Phenanthrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Pyrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
VOLATILE ORGANIC COMPOUNDS (µg/L)														
1,1,1-Trichloroethane	--	--	--	--	0.28 U	--	--	--	--	--	--	0.28 U	--	--
1,1,2,2-Tetrachloroethane	--	--	--	--	0.19 U	--	--	--	--	--	--	0.19 U	--	--
1,1,2-Trichloro-1,2,2-Trifluoroethane	--	--	--	--	0.34 U	--	--	--	--	--	--	0.34 U	--	--
1,1,2-Trichloroethane	--	--	--	--	0.08 U	--	--	--	--	--	--	0.08 U	--	--
1,1-Dichloroethane	--	--	--	--	0.24 U	--	--	--	--	--	--	0.24 U	--	--
1,1-Dichloroethene	--	--	--	--	0.34 U	--	--	--	--	--	--	0.34 U	--	--
1,2,3-Trichlorobenzene	--	--	--	--	0.35 U	--	--	--	--	--	--	0.35 U	--	--
1,2,4-Trichlorobenzene	--	--	--	--	0.27 U	--	--	--	--	--	--	0.27 U	--	--
1,2-Dibromo-3-Chloropropane	--	--	--	--	0.23 U	--	--	--	--	--	--	0.23 U	--	--
1,2-Dibromoethane (Ethylene Dibromide)	--	--	--	--	0.19 U	--	--	--	--	--	--	0.19 U	--	--

Table E-35
Summary of Data Used in Risk Assessment
Backwater Seep Sampling Area (surface water) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSWP-003	CFSWP-003	CFSWP-003	CFSWP-003	CFSWP-003	CFSWP-003	CFSWP-003	CFSWP-004	CFSWP-004	CFSWP-004	CFSWP-004	CFSWP-004	CFSWP-004	CFSWP-004
Sample Lab IDs	460-119967-1	460-124639-1	460-129875-1	460-135338-3	460-144086-1	460-157703-3	460-166152-4	460-119967-2	460-124639-2	460-129875-2	460-135338-4	460-144086-2	460-157703-4	460-166152-3
Sample Name Chemical	CFSWP-003-SW 9/9/2016	CFSWP-003-SW 12/1/2016	CFSWP-003-SW 3/16/2017	CFSWP-003-SW 6/14/2017	CFSWP-003-SW 10/31/2017	CFSWP-003-SW 6/6/2018	CFSWP-003-SW 10/4/2018	CFSWP-004-SW 9/9/2016	CFSWP-004-SW 12/1/2016	CFSWP-004-SW 3/16/2017	CFSWP-004-SW 6/14/2017	CFSWP-004-SW 10/31/2017	CFSWP-004-SW 6/6/2018	CFSWP-004-SW 10/4/2018
1,2-Dichlorobenzene	--	--	--	--	0.22 U	--	--	--	--	--	--	0.22 U	--	--
1,2-Dichloroethane	--	--	--	--	0.25 U	--	--	--	--	--	--	0.25 U	--	--
1,2-Dichloropropane	--	--	--	--	0.18 U	--	--	--	--	--	--	0.18 U	--	--
1,3-Dichlorobenzene	--	--	--	--	0.33 U	--	--	--	--	--	--	0.33 U	--	--
1,4-Dichlorobenzene	--	--	--	--	0.33 U	--	--	--	--	--	--	0.33 U	--	--
2-Hexanone	--	--	--	--	0.72 U	--	--	--	--	--	--	0.72 U	--	--
Acetone	--	--	--	--	1.1 U	--	--	--	--	--	--	1.1 U	--	--
Benzene	--	--	--	--	0.09 U	--	--	--	--	--	--	0.09 U	--	--
Bromochloromethane	--	--	--	--	0.3 U	--	--	--	--	--	--	0.3 U	--	--
Bromodichloromethane	--	--	--	--	0.15 U	--	--	--	--	--	--	0.15 U	--	--
Bromoform	--	--	--	--	0.18 UJ	--	--	--	--	--	--	0.18 UJ	--	--
Bromomethane	--	--	--	--	0.18 U	--	--	--	--	--	--	0.18 U	--	--
Carbon Disulfide	--	--	--	--	0.22 UJ	--	--	--	--	--	--	0.22 UJ	--	--
Carbon Tetrachloride	--	--	--	--	0.33 U	--	--	--	--	--	--	0.33 U	--	--
Chlorobenzene	--	--	--	--	0.24 U	--	--	--	--	--	--	0.24 U	--	--
Chloroethane	--	--	--	--	0.37 U	--	--	--	--	--	--	0.37 U	--	--
Chloroform	--	--	--	--	0.22 U	--	--	--	--	--	--	0.22 U	--	--
Chloromethane	--	--	--	--	0.22 U	--	--	--	--	--	--	0.22 U	--	--
Cis-1,2-Dichloroethylene	--	--	--	--	0.26 U	--	--	--	--	--	--	0.26 U	--	--
Cis-1,3-Dichloropropene	--	--	--	--	0.16 U	--	--	--	--	--	--	0.16 U	--	--
Cyclohexane	--	--	--	--	0.26 U	--	--	--	--	--	--	0.26 U	--	--
Dibromochloromethane	--	--	--	--	0.22 U	--	--	--	--	--	--	0.22 U	--	--
Dichlorodifluoromethane	--	--	--	--	0.14 U	--	--	--	--	--	--	0.14 U	--	--
Ethylbenzene	--	--	--	--	0.3 U	--	--	--	--	--	--	0.3 U	--	--
Isopropylbenzene (Cumene)	--	--	--	--	0.32 U	--	--	--	--	--	--	0.32 U	--	--
M,P-Xylene	--	--	--	--	0.28 U	--	--	--	--	--	--	0.28 U	--	--
Methyl Acetate	--	--	--	--	0.58 U	--	--	--	--	--	--	0.58 U	--	--
Methyl Ethyl Ketone (2-Butanone)	--	--	--	--	2.2 U	--	--	--	--	--	--	2.2 U	--	--
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	--	--	--	--	0.63 U	--	--	--	--	--	--	0.63 U	--	--
Methylcyclohexane	--	--	--	--	0.22 U	--	--	--	--	--	--	0.22 U	--	--
Methylene Chloride	--	--	--	--	0.21 U	--	--	--	--	--	--	0.21 U	--	--
O-Xylene (1,2-Dimethylbenzene)	--	--	--	--	0.32 U	--	--	--	--	--	--	0.32 U	--	--
Styrene	--	--	--	--	0.17 U	--	--	--	--	--	--	0.17 U	--	--
Tert-Butyl Methyl Ether	--	--	--	--	0.13 U	--	--	--	--	--	--	0.13 U	--	--
Tetrachloroethylene (PCE)	--	--	--	--	0.12 U	--	--	--	--	--	--	0.12 U	--	--
Toluene	--	--	--	--	0.25 U	--	--	--	--	--	--	0.25 U	--	--
Trans-1,2-Dichloroethene	--	--	--	--	0.18 U	--	--	--	--	--	--	0.18 U	--	--
Trans-1,3-Dichloropropene	--	--	--	--	0.19 U	--	--	--	--	--	--	0.19 U	--	--
Trichloroethylene (TCE)	--	--	--	--	0.22 U	--	--	--	--	--	--	0.22 U	--	--
Trichlorofluoromethane	--	--	--	--	0.15 U	--	--	--	--	--	--	0.15 U	--	--
Vinyl Chloride	--	--	--	--	0.06 U	--	--	--	--	--	--	0.06 U	--	--

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-35
Summary of Data Used in Risk Assessment
Backwater Seep Sampling Area (surface water) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSWP-005	CFSWP-005	CFSWP-005	CFSWP-005	CFSWP-005	CFSWP-005-DUP	CFSWP-005	CFSWP-005	CFSWP-027	CFSWP-027	CFSWP-027	CFSWP-028	CFSWP-028	CFSWP-028
Sample Lab IDs	460-119967-3	460-124639-3	460-129875-3	460-135338-5	460-144175-1	460-144175-2	460-157703-5	180-83254-2, 200-45806-6, 460-167253-4	460-144086-5	460-157703-7	180-82744-1, 200-45626-1, 460-166217-1	460-144086-3	460-157703-8	180-82694-1, 200-45610-1, 460-166152-5
Sample Name	CFSWP-005-SW 9/9/2016	CFSWP-005-SW 12/1/2016	CFSWP-005-SW 3/16/2017	CFSWP-005-SW 6/14/2017	CFSWP-005-SW 11/1/2017	CFSWP-DUP8-SW 11/1/2017	CFSWP-005-SW 6/6/2018	CFSWP-005-SW 10/18/2018	CFSWP-027-SW 10/31/2017	CFSWP-027-SW 6/6/2018	CFSWP-027-SW 10/5/2018	CFSWP-028-SW 10/31/2017	CFSWP-028-SW 6/6/2018	CFSWP-028-SW 10/4/2018
Chemical														
GENERAL CHEMISTRY (µg/L)														
Fluoride	--	--	--	558 J+	--	--	--	--	--	--	--	--	--	--
Cyanide	--	--	--	162	303	300	--	--	23.2	--	--	27.3	--	--
Cyanide (Free)	--	--	--	42.2	5.3	4.8 J	--	--	2.6 J	--	--	5.7	--	--
Cyanide	213	192	24.7	197	327	329	88 J+	--	25.7	2 UJ	--	24.1	2 UJ	--
Cyanide (Free)	--	--	8	45.6	5.3	4.8 J	23.8	139	3.2 J	1.5 U	2.9 J	6.1	1.5 J	14.1
METALS (µg/L)														
Aluminum	--	--	--	18.2 U	18.2 U	18.2 U	27.4 J	21.4 J	18.2 U	44.1	15 U	18.2 U	15 U	75.3
Antimony	--	--	--	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U
Arsenic	--	--	--	0.64 U	0.64 U	0.64 U	0.77 U	0.77 U	0.64 U	0.77 U	0.77 U	0.64 U	0.77 U	0.77 U
Barium	--	--	--	98.3	191	200	105	177	115	62.5	110	114	64.9	115
Beryllium	--	--	--	0.24 U	0.24 U	0.24 U	0.26 U	0.26 U	0.24 U	0.26 U	0.26 U	0.24 U	0.26 U	0.26 U
Cadmium	--	--	--	0.71 U	0.71 U	0.71 U	0.61 U	0.61 U	0.71 U	0.61 U	0.61 U	0.71 U	0.61 U	0.61 U
Calcium	--	--	--	32700	61900	63000	28800	60700	27900	17300	28000	28300	18100	28500
Chromium, Total	--	--	--	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
Cobalt	--	--	--	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
Copper	--	--	--	1.4 U	1.4 U	1.4 U	1.9 U	1.9 U	1.4 U	1.9 U	1.9 U	1.4 U	1.9 U	1.9 U
Iron	--	--	--	56 J	106 J	99.9 J	45.8 J	131	42.4 U	45.7 U	45.7 U	42.4 U	45.7 U	111 J
Lead	--	--	--	0.38 U	0.38 U	0.38 U	0.37 U	0.37 U	0.38 U	0.37 U	0.37 U	0.38 U	0.37 U	0.37 U
Magnesium	--	--	--	8770	17300	17200	7350	16500	6970	4170	7550	6980	4350	7650
Manganese	--	--	--	27.1	2.5 U	2.5 U	56.4	33.7	6 J	5.9 J	7.5 J	7.3 J	3.6 J	13.2
Mercury	--	--	--	0.17 U	0.17 U	0.17 U	0.12 U	0.12 U	0.17 U	0.12 U	0.12 U	0.17 U	0.12 U	0.12 U
Nickel	--	--	--	1.4 U	1.4 U	1.4 U	1.3 U	1.3 U	1.4 U	1.3 U	1.3 U	1.4 U	1.3 U	1.3 U
Potassium	--	--	--	521	1040	1040	454	1020	393	314	405	406	296	420
Selenium	--	--	--	0.73 U	0.73 U	0.73 U	0.69 U	0.69 U	0.73 U	0.69 U	0.69 U	0.73 U	0.69 U	0.69 U
Silver	--	--	--	1.3 U	1.3 U	1.3 U	1.4 U	1.4 U	1.3 U	1.4 U	1.4 U	1.3 U	1.4 U	1.4 U
Sodium	--	--	--	14300	34900	36800	8430	39800	3460	685	4270	25500	908	4970
Thallium	--	--	--	0.26 U	0.26 U	0.26 U	0.24 U	0.24 U	0.26 U	0.24 U	0.24 U	0.26 U	0.24 U	0.24 U
Vanadium	--	--	--	1.9 U	1.9 U	1.9 U	1.2 U	1.2 U	1.9 U	1.2 U	1.2 U	1.9 U	1.2 U	1.2 U
Zinc	--	--	--	7 U	7 U	7 U	5.4 U	5.4 U	7 U	5.4 U	5.8 J	7 U	5.4 U	5.4 U
Aluminum	143	94.3	521	553	33.9 J	23.6 J	221	15 U	154	410	59.5	617	410	15 U
Antimony	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U
Arsenic	0.64 U	0.64 U	0.64 U	0.64 U	0.64 U	0.64 U	0.77 U	0.77 U	0.64 U	0.77 U	0.77 U	0.64 U	0.77 U	0.77 U
Barium	192	179	107	116	192	196	109	176	123	79	115	134	80.2	112
Beryllium	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.26 U	0.26 U	0.24 U	0.26 U	0.26 U	0.24 U	0.26 U	0.26 U
Cadmium	0.71 U	0.71 U	0.71 U	0.71 U	0.71 U	0.71 U	0.61 U	0.61 U	0.71 U	0.61 U	0.61 U	0.71 U	0.61 U	0.61 U
Calcium	60200	62600	27900	37000	59700	61300	29900	60400	29400	20300	28800	29800	20800	27800
Chromium, Total	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
Cobalt	1.3 U	1.3 J	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
Copper	1.6 J	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.9 U	1.9 U	1.4 U	1.9 U	10.2	1.9 J	1.9 U	2.6 J
Iron	256	266	502	704	188	181	332	145	224	443	62.4 J	875	468	45.7 U
Lead	0.38 U	0.38 U	0.41 J	0.39 J	0.38 U	0.38 U	0.37 U	0.37 U	0.38 U	0.37 U	0.37 U	0.74 J	0.37 U	0.37 U
Magnesium	17800	17900	7370	10800	17500	17800	8480	16700	8490	5600	7860	8620	5680	7660
Manganese	15.7	212	24.1	43.2	2.5 U	2.5 U	66.1	30.2	13.4	16.4	8.7	31	15.9	9.5
Mercury	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.12 U	0.12 U	0.17 U	0.12 U	0.12 U	0.17 U	0.12 U	0.12 U
Nickel	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.3 U	1.3 U	1.4 U	1.3 U	1.3 U	1.4 U	1.3 U	1.3 U
Potassium	1020	1060	561	762	973	1000	487	966	453	404	433	561	407	404
Selenium	0.73 U	0.73 U	0.73 U	0.73 U	0.73 U	0.73 U	0.69 U	0.69 U	0.73 U	0.69 U	0.69 U	0.73 U	0.69 U	0.69 U
Silver	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.4 U	1.4 U	1.3 U	1.4 U	1.4 U	1.3 U	1.4 U	1.4 U
Sodium	36900	35600	5240	18200	37200	37700	9420	40700	5460	1150	4300	4420	1280	4810
Thallium	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.24 U	0.24 U	0.26 U	0.24 U	0.24 U	0.26 U	0.24 U	0.24 U
Vanadium	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.2 U	1.2 U	1.9 U	1.2 U	1.2 U	1.9 U	1.2 U	1.2 U
Zinc	19.9	7 U	7 U	7 U	7 U	7 U	5.4 U	5.4 U	12.6 J	5.4 U	5.4 U	8.1 J	5.4 U	5.4 U
SEMIVOLATILE ORGANIC COMPOUNDS (µg/L)														
1,2,4,5-Tetrachlorobenzene	--	--	--	--	0.43 U	0.43 U	--	--	0.45 U	--	--	0.44 U	--	--
1,4-Dioxane (P-Dioxane)	--	--	--	--	3.1 U	3.1 U	--	--	3.2 U	--	--	3.2 U	--	--
2,3,4,6-Tetrachlorophenol	--	--	--	--	0.69 U	0.69 U	--	--	0.72 U	--	--	0.7 U	--	--
2,4,5-Trichlorophenol	--	--	--	--	0.49 U	0.49 U	--	--	0.51 U	--	--	0.5 U	--	--
2,4,6-Trichlorophenol	--	--	--	--	0.53 U	0.53 U	--	--	0.55 U	--	--	0.54 U	--	--

Table E-35
Summary of Data Used in Risk Assessment
Backwater Seep Sampling Area (surface water) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSWP-005	CFSWP-005	CFSWP-005	CFSWP-005	CFSWP-005	CFSWP-005-DUP	CFSWP-005	CFSWP-005	CFSWP-027	CFSWP-027	CFSWP-027	CFSWP-028	CFSWP-028	CFSWP-028
Sample Lab IDs	460-119967-3	460-124639-3	460-129875-3	460-135338-5	460-144175-1	460-144175-2	460-157703-5	180-83254-2, 200-45806-6, 460-167253-4	460-144086-5	460-157703-7	180-82744-1, 200-45626-1, 460-166217-1	460-144086-3	460-157703-8	180-82694-1, 200-45610-1, 460-166152-5
Sample Name	CFSWP-005-SW 9/9/2016	CFSWP-005-SW 12/1/2016	CFSWP-005-SW 3/16/2017	CFSWP-005-SW 6/14/2017	CFSWP-005-SW 11/1/2017	CFSWP-DUP8-SW 11/1/2017	CFSWP-005-SW 6/6/2018	CFSWP-005-SW 10/18/2018	CFSWP-027-SW 10/31/2017	CFSWP-027-SW 6/6/2018	CFSWP-027-SW 10/5/2018	CFSWP-028-SW 10/31/2017	CFSWP-028-SW 6/6/2018	CFSWP-028-SW 10/4/2018
Chemical														
2,4-Dichlorophenol	--	--	--	--	0.63 U	0.63 U	--	--	0.66 U	--	--	0.64 U	--	--
2,4-Dimethylphenol	--	--	--	--	0.91 U	0.91 U	--	--	0.95 U	--	--	0.93 U	--	--
2,4-Dinitrophenol	--	--	--	--	2.4 U	2.4 U	--	--	2.5 UJ	--	--	2.4 UJ	--	--
2,4-Dinitrotoluene	--	--	--	--	1 U	1 U	--	--	1.1 U	--	--	1.1 U	--	--
2,6-Dinitrotoluene	--	--	--	--	0.88 U	0.88 U	--	--	0.92 U	--	--	0.9 U	--	--
2-Chloronaphthalene	--	--	--	--	0.61 U	0.61 U	--	--	0.64 U	--	--	0.62 U	--	--
2-Chlorophenol	--	--	--	--	0.74 U	0.74 U	--	--	0.77 U	--	--	0.76 U	--	--
2-Methylnaphthalene	--	--	--	--	0.88 U	0.88 U	--	--	0.92 U	--	--	0.9 U	--	--
2-Methylphenol (O-Cresol)	--	--	--	--	1.3 U	1.3 U	--	--	1.3 U	--	--	1.3 U	--	--
2-Nitroaniline	--	--	--	--	0.65 U	0.65 U	--	--	0.68 U	--	--	0.66 U	--	--
2-Nitrophenol	--	--	--	--	0.59 U	0.59 U	--	--	0.61 U	--	--	0.6 U	--	--
3- And 4- Methylphenol (Total)	--	--	--	--	0.88 U	0.88 U	--	--	0.92 U	--	--	0.9 U	--	--
3,3'-Dichlorobenzidine	--	--	--	--	1 U	1 U	--	--	1.1 U	--	--	1.1 U	--	--
3-Nitroaniline	--	--	--	--	0.82 U	0.82 U	--	--	0.85 U	--	--	0.84 U	--	--
4,6-Dinitro-2-Methylphenol	--	--	--	--	2 U	2 U	--	--	2.1 U	--	--	2.1 U	--	--
4-Bromophenyl Phenyl Ether	--	--	--	--	1 U	1 U	--	--	1.1 U	--	--	1 U	--	--
4-Chloro-3-Methylphenol	--	--	--	--	0.76 U	0.76 U	--	--	0.79 U	--	--	0.78 U	--	--
4-Chloroaniline	--	--	--	--	0.73 U	0.73 U	--	--	0.76 U	--	--	0.74 U	--	--
4-Chlorophenyl Phenyl Ether	--	--	--	--	0.96 U	0.96 U	--	--	1 U	--	--	0.98 U	--	--
4-Nitroaniline	--	--	--	--	0.48 U	0.48 U	--	--	0.5 U	--	--	0.49 U	--	--
4-Nitrophenol	--	--	--	--	4.7 U	4.7 U	--	--	4.8 U	--	--	4.7 U	--	--
Acenaphthene	--	--	--	--	0.88 U	0.88 U	--	--	0.92 U	--	--	0.9 U	--	--
Acenaphthylene	--	--	--	--	0.65 U	0.65 U	--	--	0.68 U	--	--	0.66 U	--	--
Acetophenone	--	--	--	--	1 U	1 U	--	--	1.1 U	--	--	1.1 U	--	--
Anthracene	--	--	--	--	0.57 U	0.57 U	--	--	0.59 U	--	--	0.58 U	--	--
Atrazine	--	--	--	--	0.77 U	0.77 U	--	--	0.8 U	--	--	0.79 U	--	--
Benzaldehyde	--	--	--	--	0.86 U	0.86 U	--	--	0.9 U	--	--	0.88 U	--	--
Benzo(A)Anthracene	--	--	--	--	0.55 U	0.55 U	--	--	0.57 U	--	--	0.56 U	--	--
Benzo(A)Pyrene	--	--	--	--	0.16 U	0.16 U	--	--	0.17 U	--	--	0.16 U	--	--
Benzo(B)Fluoranthene	--	--	--	--	0.44 U	0.44 U	--	--	0.46 U	--	--	0.45 U	--	--
Benzo(G,H,I)Perylene	--	--	--	--	0.75 U	0.75 U	--	--	0.78 U	--	--	0.77 U	--	--
Benzo(K)Fluoranthene	--	--	--	--	0.18 U	0.18 U	--	--	0.19 U	--	--	0.18 U	--	--
Benzyl Butyl Phthalate	--	--	--	--	0.6 U	0.6 U	--	--	0.63 U	--	--	0.61 U	--	--
Biphenyl (Diphenyl)	--	--	--	--	0.63 U	0.63 U	--	--	0.66 U	--	--	0.64 U	--	--
Bis(2-Chloroethoxy) Methane	--	--	--	--	0.69 U	0.69 U	--	--	0.72 U	--	--	0.7 U	--	--
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	--	--	--	--	0.12 U	0.12 U	--	--	0.13 U	--	--	0.12 U	--	--
Bis(2-Chloroisopropyl) Ether	--	--	--	--	0.93 U	0.93 U	--	--	0.97 U	--	--	0.95 U	--	--
Bis(2-Ethylhexyl) Phthalate	--	--	--	--	0.72 U	0.72 U	--	--	0.75 U	--	--	0.73 U	--	--
Caprolactam	--	--	--	--	1.1 U	1.1 U	--	--	1.1 U	--	--	1.1 U	--	--
Carbazole	--	--	--	--	0.85 U	0.85 U	--	--	0.89 U	--	--	0.87 U	--	--
Chrysene	--	--	--	--	0.67 U	0.67 U	--	--	0.7 U	--	--	0.68 U	--	--
Dibenz(A,H)Anthracene	--	--	--	--	0.09 U	0.09 U	--	--	0.094 U	--	--	0.092 U	--	--
Dibenzofuran	--	--	--	--	0.85 U	0.85 U	--	--	0.89 U	--	--	0.87 U	--	--
Diethyl Phthalate	--	--	--	--	1 U	1 U	--	--	1 U	--	--	1 U	--	--
Dimethyl Phthalate	--	--	--	--	0.98 U	0.98 U	--	--	1 U	--	--	1 U	--	--
Di-N-Butyl Phthalate	--	--	--	--	0.82 U	0.82 U	--	--	0.85 U	--	--	0.84 U	--	--
Di-N-Octylphthalate	--	--	--	--	0.69 U	0.69 U	--	--	0.72 U	--	--	0.7 U	--	--
Fluoranthene	--	--	--	--	0.72 U	0.72 U	--	--	0.75 U	--	--	0.73 U	--	--
Fluorene	--	--	--	--	0.8 U	0.8 U	--	--	0.83 U	--	--	0.82 U	--	--
Hexachlorobenzene	--	--	--	--	0.47 U	0.47 U	--	--	0.49 U	--	--	0.48 U	--	--
Hexachlorobutadiene	--	--	--	--	0.76 UJ	0.76 UJ	--	--	0.79 U	--	--	0.78 U	--	--
Hexachlorocyclopentadiene	--	--	--	--	0.61 UJ	0.61 UJ	--	--	0.64 UJ	--	--	0.62 UJ	--	--
Hexachloroethane	--	--	--	--	0.09 U	0.09 U	--	--	0.094 U	--	--	0.092 U	--	--
Indeno(1,2,3-C,D)Pyrene	--	--	--	--	0.21 U	0.21 U	--	--	0.22 U	--	--	0.21 U	--	--
Isophorone	--	--	--	--	0.67 U	0.67 U	--	--	0.7 U	--	--	0.68 U	--	--
Naphthalene	--	--	--	--	0.8 U	0.8 U	--	--	0.83 U	--	--	0.82 U	--	--
Nitrobenzene	--	--	--	--	0.49 U	0.49 U	--	--	0.51 U	--	--	0.5 U	--	--
N-Nitrosodi-N-Propylamine	--	--	--	--	0.83 U	0.83 U	--	--	0.86 UJ	--	--	0.85 UJ	--	--
N-Nitrosodiphenylamine	--	--	--	--	0.74 U	0.74 U	--	--	0.77 U	--	--	0.76 U	--	--

Table E-35
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Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSWP-005	CFSWP-005	CFSWP-005	CFSWP-005	CFSWP-005	CFSWP-005-DUP	CFSWP-005	CFSWP-005	CFSWP-027	CFSWP-027	CFSWP-027	CFSWP-028	CFSWP-028	CFSWP-028
Sample Lab IDs	460-119967-3	460-124639-3	460-129875-3	460-135338-5	460-144175-1	460-144175-2	460-157703-5	180-83254-2, 200-45806-6, 460-167253-4	460-144086-5	460-157703-7	180-82744-1, 200-45626-1, 460-166217-1	460-144086-3	460-157703-8	180-82694-1, 200-45610-1, 460-166152-5
Sample Name	CFSWP-005-SW 9/9/2016	CFSWP-005-SW 12/1/2016	CFSWP-005-SW 3/16/2017	CFSWP-005-SW 6/14/2017	CFSWP-005-SW 11/1/2017	CFSWP-DUP8-SW 11/1/2017	CFSWP-005-SW 6/6/2018	CFSWP-005-SW 10/18/2018	CFSWP-027-SW 10/31/2017	CFSWP-027-SW 6/6/2018	CFSWP-027-SW 10/5/2018	CFSWP-028-SW 10/31/2017	CFSWP-028-SW 6/6/2018	CFSWP-028-SW 10/4/2018
Chemical														
Pentachlorophenol	--	--	--	--	2.2 U	2.2 U	--	--	2.3 U	--	--	2.2 U	--	--
Phenanthrene	--	--	--	--	0.65 U	0.65 U	--	--	0.68 U	--	--	0.66 U	--	--
Phenol	--	--	--	--	0.41 U	0.41 U	--	--	0.43 U	--	--	0.42 U	--	--
Pyrene	--	--	--	--	0.83 U	0.83 U	--	--	0.86 U	--	--	0.85 U	--	--
SEMIVOLATILE ORGANIC COMPOUNDS|LOW LEVEL (µg/L)														
1,2,4,5-Tetrachlorobenzene	--	--	--	--	--	--	--	0.048 U	--	--	0.048 U	--	--	0.048 U
1,4-Dioxane (P-Dioxane)	--	--	--	--	--	--	--	0.18 U	--	--	0.18 U	--	--	0.18 U
2,3,4,6-Tetrachlorophenol	--	--	--	--	--	--	--	0.042 U	--	--	0.042 U	--	--	0.042 U
2,4,5-Trichlorophenol	--	--	--	--	--	--	--	0.056 U	--	--	0.056 U	--	--	0.056 U
2,4,6-Trichlorophenol	--	--	--	--	--	--	--	0.063 U	--	--	0.063 U	--	--	0.063 U
2,4-Dichlorophenol	--	--	--	--	--	--	--	0.047 U	--	--	0.047 U	--	--	0.047 U
2,4-Dimethylphenol	--	--	--	--	--	--	--	0.038 U	--	--	0.038 U	--	--	0.038 U
2,4-Dinitrophenol	--	--	--	--	--	--	--	1.4 U	--	--	1.4 U	--	--	1.4 U
2,4-Dinitrotoluene	--	--	--	--	--	--	--	0.047 U	--	--	0.047 U	--	--	0.047 U
2,6-Dinitrotoluene	--	--	--	--	--	--	--	0.056 U	--	--	0.056 U	--	--	0.056 U
2-Chloronaphthalene	--	--	--	--	--	--	--	0.055 U	--	--	0.055 U	--	--	0.055 U
2-Chlorophenol	--	--	--	--	--	--	--	0.059 U	--	--	0.059 U	--	--	0.059 U
2-Methylnaphthalene	--	--	--	--	--	--	--	0.057 U	--	--	0.057 U	--	--	0.057 U
2-Methylphenol (O-Cresol)	--	--	--	--	--	--	--	0.1 U	--	--	0.1 U	--	--	0.1 U
2-Nitroaniline	--	--	--	--	--	--	--	0.19 U	--	--	0.19 U	--	--	0.19 U
2-Nitrophenol	--	--	--	--	--	--	--	0.056 U	--	--	0.056 U	--	--	0.056 U
3,3'-Dichlorobenzidine	--	--	--	--	--	--	--	0.54 U	--	--	0.54 UJ	--	--	0.54 U
3-Nitroaniline	--	--	--	--	--	--	--	0.062 U	--	--	0.062 U	--	--	0.062 U
4,6-Dinitro-2-Methylphenol	--	--	--	--	--	--	--	1.4 U	--	--	1.4 U	--	--	1.4 U
4-Bromophenyl Phenyl Ether	--	--	--	--	--	--	--	0.058 U	--	--	0.058 U	--	--	0.058 U
4-Chloro-3-Methylphenol	--	--	--	--	--	--	--	0.056 U	--	--	0.056 U	--	--	0.056 U
4-Chloroaniline	--	--	--	--	--	--	--	0.041 U	--	--	0.041 U	--	--	0.041 U
4-Chlorophenyl Phenyl Ether	--	--	--	--	--	--	--	0.056 U	--	--	0.056 U	--	--	0.056 U
4-Nitroaniline	--	--	--	--	--	--	--	0.054 U	--	--	0.054 U	--	--	0.054 U
4-Nitrophenol	--	--	--	--	--	--	--	0.13 U	--	--	0.13 U	--	--	0.13 U
Acenaphthene	--	--	--	--	--	--	--	0.06 U	--	--	0.06 U	--	--	0.06 U
Acenaphthylene	--	--	--	--	--	--	--	0.06 U	--	--	0.06 U	--	--	0.06 U
Acetophenone	--	--	--	--	--	--	--	0.057 U	--	--	0.057 U	--	--	0.057 U
Anthracene	--	--	--	--	--	--	--	0.045 U	--	--	0.045 U	--	--	0.045 U
Atrazine	--	--	--	--	--	--	--	0.17 U	--	--	0.17 U	--	--	0.17 U
Benzaldehyde	--	--	--	--	--	--	--	0.1 U	--	--	0.1 U	--	--	0.1 U
Benzo(A)Anthracene	--	--	--	--	--	--	--	0.069 U	--	--	0.069 U	--	--	0.069 U
Benzo(A)Pyrene	--	--	--	--	--	--	--	0.049 U	--	--	0.049 U	--	--	0.049 U
Benzo(B)Fluoranthene	--	--	--	--	--	--	--	0.09 U	--	--	0.09 U	--	--	0.09 U
Benzo(G,H,I)Perylene	--	--	--	--	--	--	--	0.064 U	--	--	0.064 U	--	--	0.064 U
Benzo(K)Fluoranthene	--	--	--	--	--	--	--	0.081 U	--	--	0.081 U	--	--	0.081 U
Benzyl Butyl Phthalate	--	--	--	--	--	--	--	0.43 U	--	--	0.86 J	--	--	0.43 U
Biphenyl (Diphenyl)	--	--	--	--	--	--	--	0.055 U	--	--	0.055 U	--	--	0.055 U
Bis(2-Chloroethoxy) Methane	--	--	--	--	--	--	--	0.062 U	--	--	0.062 U	--	--	0.062 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	--	--	--	--	--	--	--	0.037 U	--	--	0.037 U	--	--	0.037 U
Bis(2-Chloroisopropyl) Ether	--	--	--	--	--	--	--	0.054 U	--	--	0.054 U	--	--	0.054 U
Bis(2-Ethylhexyl) Phthalate	--	--	--	--	--	--	--	4.3 U	--	--	8.6 J+	--	--	4.6 J
Caprolactam	--	--	--	--	--	--	--	0.44 U	--	--	0.98 J	--	--	0.6 J
Carbazole	--	--	--	--	--	--	--	0.047 U	--	--	0.047 U	--	--	0.047 U
Chrysene	--	--	--	--	--	--	--	0.075 U	--	--	0.075 U	--	--	0.075 U
Dibenz(A,H)Anthracene	--	--	--	--	--	--	--	0.067 U	--	--	0.067 U	--	--	0.067 U
Dibenzofuran	--	--	--	--	--	--	--	0.068 U	--	--	0.068 U	--	--	0.068 U
Diethyl Phthalate	--	--	--	--	--	--	--	0.53 U	--	--	0.53 U	--	--	0.53 U
Dimethyl Phthalate	--	--	--	--	--	--	--	0.052 U	--	--	0.052 U	--	--	0.052 U
Di-N-Butyl Phthalate	--	--	--	--	--	--	--	0.69 U	--	--	0.69 U	--	--	0.69 U
Di-N-Octylphthalate	--	--	--	--	--	--	--	0.63 U	--	--	0.63 U	--	--	0.63 U
Fluoranthene	--	--	--	--	--	--	--	0.056 U	--	--	0.056 U	--	--	0.056 U
Fluorene	--	--	--	--	--	--	--	0.064 U	--	--	0.064 U	--	--	0.064 U
Hexachlorobenzene	--	--	--	--	--	--	--	0.052 U	--	--	0.052 U	--	--	0.052 U

Table E-35
Summary of Data Used in Risk Assessment
Backwater Seep Sampling Area (surface water) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSWP-005	CFSWP-005	CFSWP-005	CFSWP-005	CFSWP-005	CFSWP-005-DUP	CFSWP-005	CFSWP-005	CFSWP-027	CFSWP-027	CFSWP-027	CFSWP-028	CFSWP-028	CFSWP-028
Sample Lab IDs	460-119967-3	460-124639-3	460-129875-3	460-135338-5	460-144175-1	460-144175-2	460-157703-5	180-83254-2, 200-45806-6, 460-167253-4	460-144086-5	460-157703-7	180-82744-1, 200-45626-1, 460-166217-1	460-144086-3	460-157703-8	180-82694-1, 200-45610-1, 460-166152-5
Sample Name	CFSWP-005-SW	CFSWP-005-SW	CFSWP-005-SW	CFSWP-005-SW	CFSWP-005-SW	CFSWP-DUP8-SW	CFSWP-005-SW	CFSWP-005-SW	CFSWP-027-SW	CFSWP-027-SW	CFSWP-027-SW	CFSWP-028-SW	CFSWP-028-SW	CFSWP-028-SW
Chemical	9/9/2016	12/1/2016	3/16/2017	6/14/2017	11/1/2017	11/1/2017	6/6/2018	10/18/2018	10/31/2017	6/6/2018	10/5/2018	10/31/2017	6/6/2018	10/4/2018
Hexachlorobutadiene	--	--	--	--	--	--	--	0.064 U	--	--	0.064 U	--	--	0.064 U
Hexachlorocyclopentadiene	--	--	--	--	--	--	--	0.46 U	--	--	0.46 UJ	--	--	0.46 U
Hexachloroethane	--	--	--	--	--	--	--	0.057 U	--	--	0.057 UJ	--	--	0.057 U
Indeno(1,2,3-C,D)Pyrene	--	--	--	--	--	--	--	0.079 U	--	--	0.079 U	--	--	0.079 U
Isophorone	--	--	--	--	--	--	--	0.05 U	--	--	0.05 U	--	--	0.05 U
Naphthalene	--	--	--	--	--	--	--	0.055 U	--	--	0.055 U	--	--	0.055 U
Nitrobenzene	--	--	--	--	--	--	--	0.15 U	--	--	0.15 U	--	--	0.15 U
N-Nitrosodi-N-Propylamine	--	--	--	--	--	--	--	0.066 U	--	--	0.066 U	--	--	0.066 U
N-Nitrosodiphenylamine	--	--	--	--	--	--	--	0.11 U	--	--	0.11 U	--	--	0.11 U
Pentachlorophenol	--	--	--	--	--	--	--	0.22 U	--	--	0.22 U	--	--	0.22 U
Phenanthrene	--	--	--	--	--	--	--	0.051 U	--	--	0.071 J	--	--	0.057 J
Phenol	--	--	--	--	--	--	--	0.091 U	--	--	0.091 U	--	--	0.091 U
Pyrene	--	--	--	--	--	--	--	0.05 U	--	--	0.05 U	--	--	0.05 U
SEMIVOLATILE ORGANIC COMPOUNDS-SIM (µg/L)														
Acenaphthene	--	--	--	--	--	--	--	0.0048 UJ	--	--	0.005 UJ	--	--	0.0048 UJ
Acenaphthylene	--	--	--	--	--	--	--	0.0047 UJ	--	--	0.0049 UJ	--	--	0.0047 UJ
Anthracene	--	--	--	--	--	--	--	0.0045 UJ	--	--	0.0047 UJ	--	--	0.0045 U
Benzo(A)Anthracene	--	--	--	--	--	--	--	0.0028 UJ	--	--	0.0029 UJ	--	--	0.0048 J
Benzo(A)Pyrene	--	--	--	--	--	--	--	0.0024 UJ	--	--	0.0024 UJ	--	--	0.0024 U
Benzo(B)Fluoranthene	--	--	--	--	--	--	--	0.0042 UJ	--	--	0.0043 UJ	--	--	0.0056 J
Benzo(G,H,I)Perylene	--	--	--	--	--	--	--	0.0039 UJ	--	--	0.004 UJ	--	--	0.0039 U
Benzo(K)Fluoranthene	--	--	--	--	--	--	--	0.0075 UJ	--	--	0.0077 UJ	--	--	0.0075 U
Benzo[E]Pyrene	--	--	--	--	--	--	--	0.0025 UJ	--	--	0.0025 UJ	--	--	0.004 J
C1-Chrysenes	--	--	--	--	--	--	--	0.019 UJ	--	--	0.019 UJ	--	--	0.019 U
C1-Fluoranthenes/Pyrenes	--	--	--	--	--	--	--	0.019 UJ	--	--	0.019 UJ	--	--	0.019 U
C1-Fluorenes	--	--	--	--	--	--	--	0.019 UJ	--	--	0.019 UJ	--	--	0.019 U
C1-Naphthalenes	--	--	--	--	--	--	--	0.019 UJ	--	--	0.019 UJ	--	--	0.019 U
C1-Phenanthrenes/Anthracenes	--	--	--	--	--	--	--	0.019 UJ	--	--	0.019 UJ	--	--	0.019 U
C2-Chrysenes	--	--	--	--	--	--	--	0.019 UJ	--	--	0.019 UJ	--	--	0.019 U
C2-Fluorenes	--	--	--	--	--	--	--	0.019 UJ	--	--	0.019 UJ	--	--	0.019 U
C2-Naphthalenes	--	--	--	--	--	--	--	0.019 UJ	--	--	0.019 UJ	--	--	0.019 U
C2-Phenanthrenes/Anthracenes	--	--	--	--	--	--	--	0.019 UJ	--	--	0.019 UJ	--	--	0.019 U
C3-Chrysenes	--	--	--	--	--	--	--	0.019 UJ	--	--	0.019 UJ	--	--	0.019 U
C3-Fluorenes	--	--	--	--	--	--	--	0.019 UJ	--	--	0.019 UJ	--	--	0.019 U
C3-Naphthalenes	--	--	--	--	--	--	--	0.019 UJ	--	--	0.019 UJ	--	--	0.019 U
C3-Phenanthrenes/Anthracenes	--	--	--	--	--	--	--	0.019 UJ	--	--	0.019 UJ	--	--	0.019 U
C4 Chrysenes	--	--	--	--	--	--	--	0.019 UJ	--	--	0.019 UJ	--	--	0.019 U
C4-Naphthalenes	--	--	--	--	--	--	--	0.019 UJ	--	--	0.019 UJ	--	--	0.019 U
C4-Phenanthrenes/Anthracenes	--	--	--	--	--	--	--	0.019 UJ	--	--	0.019 UJ	--	--	0.019 U
Chrysene	--	--	--	--	--	--	--	0.0043 UJ	--	--	0.011 J-	--	--	0.013 J
Dibenz(A,H)Anthracene	--	--	--	--	--	--	--	0.005 UJ	--	--	0.0051 UJ	--	--	0.005 U
Fluoranthene	--	--	--	--	--	--	--	0.0074 UJ	--	--	0.0077 J	--	--	0.041 J+
Fluorene	--	--	--	--	--	--	--	0.0055 UJ	--	--	0.0056 UJ	--	--	0.0055 UJ
Indeno(1,2,3-C,D)Pyrene	--	--	--	--	--	--	--	0.0026 UJ	--	--	0.0027 UJ	--	--	0.0026 U
Naphthalene	--	--	--	--	--	--	--	0.0035 UJ	--	--	0.0036 UJ	--	--	0.004 J-
Perylene	--	--	--	--	--	--	--	0.0018 UJ	--	--	0.0018 UJ	--	--	0.0018 U
Phenanthrene	--	--	--	--	--	--	--	0.0068 UJ	--	--	0.007 UJ	--	--	0.0068 UJ
Pyrene	--	--	--	--	--	--	--	0.006 UJ	--	--	0.0069 J-	--	--	0.025
VOLATILE ORGANIC COMPOUNDS (µg/L)														
1,1,1-Trichloroethane	--	--	--	--	0.28 U	0.28 U	--	--	0.28 U	--	--	0.28 U	--	--
1,1,2,2-Tetrachloroethane	--	--	--	--	0.19 U	0.19 U	--	--	0.19 U	--	--	0.19 U	--	--
1,1,2-Trichloro-1,2,2-Trifluoroethane	--	--	--	--	0.34 U	0.34 U	--	--	0.34 U	--	--	0.34 U	--	--
1,1,2-Trichloroethane	--	--	--	--	0.08 U	0.08 U	--	--	0.08 U	--	--	0.08 U	--	--
1,1-Dichloroethane	--	--	--	--	0.24 U	0.24 U	--	--	0.24 U	--	--	0.24 U	--	--
1,1-Dichloroethene	--	--	--	--	0.34 U	0.34 U	--	--	0.34 U	--	--	0.34 U	--	--
1,2,3-Trichlorobenzene	--	--	--	--	0.35 U	0.35 U	--	--	0.35 U	--	--	0.35 U	--	--
1,2,4-Trichlorobenzene	--	--	--	--	0.27 U	0.27 U	--	--	0.27 U	--	--	0.27 U	--	--
1,2-Dibromo-3-Chloropropane	--	--	--	--	0.23 U	0.23 U	--	--	0.23 U	--	--	0.23 U	--	--
1,2-Dibromoethane (Ethylene Dibromide)	--	--	--	--	0.19 U	0.19 U	--	--	0.19 U	--	--	0.19 U	--	--

Table E-35
Summary of Data Used in Risk Assessment
Backwater Seep Sampling Area (surface water) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSWP-005	CFSWP-005	CFSWP-005	CFSWP-005	CFSWP-005	CFSWP-005-DUP	CFSWP-005	CFSWP-005	CFSWP-027	CFSWP-027	CFSWP-027	CFSWP-028	CFSWP-028	CFSWP-028
Sample Lab IDs	460-119967-3	460-124639-3	460-129875-3	460-135338-5	460-144175-1	460-144175-2	460-157703-5	180-83254-2, 200-45806-6, 460-167253-4	460-144086-5	460-157703-7	180-82744-1, 200-45626-1, 460-166217-1	460-144086-3	460-157703-8	180-82694-1, 200-45610-1, 460-166152-5
Sample Name	CFSWP-005-SW 9/9/2016	CFSWP-005-SW 12/1/2016	CFSWP-005-SW 3/16/2017	CFSWP-005-SW 6/14/2017	CFSWP-005-SW 11/1/2017	CFSWP-DUP8-SW 11/1/2017	CFSWP-005-SW 6/6/2018	CFSWP-005-SW 10/18/2018	CFSWP-027-SW 10/31/2017	CFSWP-027-SW 6/6/2018	CFSWP-027-SW 10/5/2018	CFSWP-028-SW 10/31/2017	CFSWP-028-SW 6/6/2018	CFSWP-028-SW 10/4/2018
Chemical														
1,2-Dichlorobenzene	--	--	--	--	0.22 U	0.22 U	--	--	0.22 U	--	--	0.22 U	--	--
1,2-Dichloroethane	--	--	--	--	0.25 U	0.25 U	--	--	0.25 U	--	--	0.25 U	--	--
1,2-Dichloropropane	--	--	--	--	0.18 U	0.18 U	--	--	0.18 U	--	--	0.18 U	--	--
1,3-Dichlorobenzene	--	--	--	--	0.33 U	0.33 U	--	--	0.33 U	--	--	0.33 U	--	--
1,4-Dichlorobenzene	--	--	--	--	0.33 U	0.33 U	--	--	0.33 U	--	--	0.33 U	--	--
2-Hexanone	--	--	--	--	0.72 U	0.72 U	--	--	0.72 U	--	--	0.72 U	--	--
Acetone	--	--	--	--	1.1 U	1.1 U	--	--	1.1 U	--	--	1.1 U	--	--
Benzene	--	--	--	--	0.09 U	0.09 U	--	--	0.09 U	--	--	0.09 U	--	--
Bromochloromethane	--	--	--	--	0.3 U	0.3 U	--	--	0.3 U	--	--	0.3 U	--	--
Bromodichloromethane	--	--	--	--	0.15 U	0.15 U	--	--	0.15 U	--	--	0.15 U	--	--
Bromoform	--	--	--	--	0.18 UJ	0.18 UJ	--	--	0.18 UJ	--	--	0.18 UJ	--	--
Bromomethane	--	--	--	--	0.18 U	0.18 U	--	--	0.18 U	--	--	0.18 U	--	--
Carbon Disulfide	--	--	--	--	0.22 UJ	0.22 UJ	--	--	0.22 UJ	--	--	0.22 UJ	--	--
Carbon Tetrachloride	--	--	--	--	0.33 U	0.33 U	--	--	0.33 U	--	--	0.33 U	--	--
Chlorobenzene	--	--	--	--	0.24 U	0.24 U	--	--	0.24 U	--	--	0.24 U	--	--
Chloroethane	--	--	--	--	0.37 U	0.37 U	--	--	0.37 U	--	--	0.37 U	--	--
Chloroform	--	--	--	--	0.22 U	0.22 U	--	--	0.22 U	--	--	0.22 U	--	--
Chloromethane	--	--	--	--	0.22 U	0.22 U	--	--	0.22 U	--	--	0.22 U	--	--
Cis-1,2-Dichloroethylene	--	--	--	--	0.26 U	0.26 U	--	--	0.26 U	--	--	0.26 U	--	--
Cis-1,3-Dichloropropene	--	--	--	--	0.16 U	0.16 U	--	--	0.16 U	--	--	0.16 U	--	--
Cyclohexane	--	--	--	--	0.26 U	0.26 U	--	--	0.26 U	--	--	0.26 U	--	--
Dibromochloromethane	--	--	--	--	0.22 U	0.22 U	--	--	0.22 U	--	--	0.22 U	--	--
Dichlorodifluoromethane	--	--	--	--	0.14 U	0.14 U	--	--	0.14 U	--	--	0.14 U	--	--
Ethylbenzene	--	--	--	--	0.3 U	0.3 U	--	--	0.3 U	--	--	0.3 U	--	--
Isopropylbenzene (Cumene)	--	--	--	--	0.32 U	0.32 U	--	--	0.32 U	--	--	0.32 U	--	--
M,P-Xylene	--	--	--	--	0.28 U	0.28 U	--	--	0.28 U	--	--	0.28 U	--	--
Methyl Acetate	--	--	--	--	0.58 U	0.58 U	--	--	0.58 U	--	--	0.58 U	--	--
Methyl Ethyl Ketone (2-Butanone)	--	--	--	--	2.2 U	2.2 U	--	--	2.2 U	--	--	2.2 U	--	--
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	--	--	--	--	0.63 U	0.63 U	--	--	0.63 U	--	--	0.63 U	--	--
Methylcyclohexane	--	--	--	--	0.22 U	0.22 U	--	--	0.22 U	--	--	0.22 U	--	--
Methylene Chloride	--	--	--	--	0.21 U	0.21 U	--	--	0.21 U	--	--	0.21 U	--	--
O-Xylene (1,2-Dimethylbenzene)	--	--	--	--	0.32 U	0.32 U	--	--	0.32 U	--	--	0.32 U	--	--
Styrene	--	--	--	--	0.17 U	0.17 U	--	--	0.17 U	--	--	0.17 U	--	--
Tert-Butyl Methyl Ether	--	--	--	--	0.13 U	0.13 U	--	--	0.13 U	--	--	0.13 U	--	--
Tetrachloroethylene (PCE)	--	--	--	--	0.12 U	0.12 U	--	--	0.12 U	--	--	0.12 U	--	--
Toluene	--	--	--	--	0.25 U	0.25 U	--	--	0.25 U	--	--	0.25 U	--	--
Trans-1,2-Dichloroethene	--	--	--	--	0.18 U	0.18 U	--	--	0.18 U	--	--	0.18 U	--	--
Trans-1,3-Dichloropropene	--	--	--	--	0.19 U	0.19 U	--	--	0.19 U	--	--	0.19 U	--	--
Trichloroethylene (TCE)	--	--	--	--	0.22 U	0.22 U	--	--	0.22 U	--	--	0.22 U	--	--
Trichlorofluoromethane	--	--	--	--	0.15 U	0.15 U	--	--	0.15 U	--	--	0.15 U	--	--
Vinyl Chloride	--	--	--	--	0.06 U	0.06 U	--	--	0.06 U	--	--	0.06 U	--	--

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-35
Summary of Data Used in Risk Assessment
Backwater Seep Sampling Area (surface water) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSWP-029	CFSWP-029	CFSWP-029
Sample Lab IDs	460-144175-3	460-159043-2	180-83254-1, 200-45806-5, 460-167253-3
Sample Name Chemical	CFSWP-029-SW 11/1/2017	CFSWP-029-SW 6/22/2018	CFSWP-029-SW 10/18/2018
GENERAL CHEMISTRY (µg/L)			
Fluoride	--	--	--
Cyanide	245	--	--
Cyanide (Free)	63.5	--	--
Cyanide	253	363	--
Cyanide (Free)	65.1	39.8 J-	140
METALS (µg/L)			
Aluminum	18.2 U	26.1 J	33.3 J
Antimony	0.62 U	0.62 U	0.62 U
Arsenic	0.64 U	0.83 J	0.77 U
Barium	174	201	160
Beryllium	0.24 U	0.26 U	0.26 U
Cadmium	0.71 U	0.61 U	0.61 U
Calcium	65700	57200	62800
Chromium, Total	1.3 U	1.3 U	1.3 U
Cobalt	1.4 J	1.3 U	1.4 J
Copper	1.4 U	1.9 U	1.9 U
Iron	74.7 J	99.3 J	205
Lead	0.38 U	0.37 U	0.37 U
Magnesium	17100	15000	17300
Manganese	367	98.8	315
Mercury	0.17 U	0.12 U	0.12 U
Nickel	1.4 U	1.3 U	1.3 U
Potassium	1110	838	1260
Selenium	0.73 U	0.69 U	0.69 U
Silver	1.3 U	1.4 U	1.4 U
Sodium	35800	33700	42100
Thallium	0.26 U	0.24 U	0.24 U
Vanadium	1.9 U	1.2 U	1.2 U
Zinc	7 U	5.4 U	5.4 U
Aluminum	383	537	53.1
Antimony	0.62 U	0.62 U	0.62 U
Arsenic	0.64 U	0.99 J	0.77 U
Barium	182	218	180
Beryllium	0.24 U	0.26 U	0.26 U
Cadmium	0.71 U	0.61 U	0.61 U
Calcium	64900	62400	63400
Chromium, Total	1.3 U	1.3 U	1.3 U
Cobalt	1.7 J	1.4 J	1.6 J
Copper	1.4 U	1.9 U	5.3
Iron	655	1050	242
Lead	0.41 J	0.44 J	0.37 U
Magnesium	18200	18200	18500
Manganese	405	130	370
Mercury	0.17 U	0.12 U	0.12 U
Nickel	1.4 U	1.3 U	1.3 U
Potassium	1150	1080	1170
Selenium	0.73 U	0.69 U	0.69 U
Silver	1.3 U	1.4 U	1.4 U
Sodium	37200	40400	44700
Thallium	0.26 U	0.24 U	0.24 U
Vanadium	1.9 U	1.2 U	1.2 U
Zinc	8.1 J	5.4 U	5.4 U
SEMIVOLATILE ORGANIC COMPOUNDS (µg/L)			
1,2,4,5-Tetrachlorobenzene	0.43 U	--	--
1,4-Dioxane (P-Dioxane)	3.1 U	--	--
2,3,4,6-Tetrachlorophenol	0.69 U	--	--
2,4,5-Trichlorophenol	0.49 U	--	--
2,4,6-Trichlorophenol	0.53 U	--	--

Table E-35
Summary of Data Used in Risk Assessment
Backwater Seep Sampling Area (surface water) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Chemical	CFSWP-029 460-144175-3 CFSWP-029-SW 11/1/2017	CFSWP-029 460-159043-2 CFSWP-029-SW 6/22/2018	CFSWP-029 180-83254-1, 200-45806-5, 460-167253-3 CFSWP-029-SW 10/18/2018
2,4-Dichlorophenol	0.63 U	--	--
2,4-Dimethylphenol	0.91 U	--	--
2,4-Dinitrophenol	2.4 U	--	--
2,4-Dinitrotoluene	1 U	--	--
2,6-Dinitrotoluene	0.88 U	--	--
2-Chloronaphthalene	0.61 U	--	--
2-Chlorophenol	0.74 U	--	--
2-Methylnaphthalene	0.88 U	--	--
2-Methylphenol (O-Cresol)	1.3 U	--	--
2-Nitroaniline	0.65 U	--	--
2-Nitrophenol	0.59 U	--	--
3- And 4- Methylphenol (Total)	0.88 U	--	--
3,3'-Dichlorobenzidine	1 U	--	--
3-Nitroaniline	0.82 U	--	--
4,6-Dinitro-2-Methylphenol	2 U	--	--
4-Bromophenyl Phenyl Ether	1 U	--	--
4-Chloro-3-Methylphenol	0.76 U	--	--
4-Chloroaniline	0.73 U	--	--
4-Chlorophenyl Phenyl Ether	0.96 U	--	--
4-Nitroaniline	0.48 U	--	--
4-Nitrophenol	4.7 U	--	--
Acenaphthene	0.88 U	--	--
Acenaphthylene	0.65 U	--	--
Acetophenone	1 U	--	--
Anthracene	0.57 U	--	--
Atrazine	0.77 U	--	--
Benzaldehyde	0.86 U	--	--
Benzo(A)Anthracene	0.55 U	--	--
Benzo(A)Pyrene	0.16 U	--	--
Benzo(B)Fluoranthene	0.44 U	--	--
Benzo(G,H,I)Perylene	0.75 U	--	--
Benzo(K)Fluoranthene	0.18 U	--	--
Benzyl Butyl Phthalate	0.6 U	--	--
Biphenyl (Diphenyl)	0.63 U	--	--
Bis(2-Chloroethoxy) Methane	0.69 U	--	--
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.12 U	--	--
Bis(2-Chloroisopropyl) Ether	0.93 U	--	--
Bis(2-Ethylhexyl) Phthalate	0.72 U	--	--
Caprolactam	1.1 U	--	--
Carbazole	0.85 U	--	--
Chrysene	0.67 U	--	--
Dibenz(A,H)Anthracene	0.09 U	--	--
Dibenzofuran	0.85 U	--	--
Diethyl Phthalate	1 U	--	--
Dimethyl Phthalate	0.98 U	--	--
Di-N-Butyl Phthalate	0.82 U	--	--
Di-N-Octylphthalate	0.69 U	--	--
Fluoranthene	1.1 J	--	--
Fluorene	0.8 U	--	--
Hexachlorobenzene	0.47 U	--	--
Hexachlorobutadiene	0.76 UJ	--	--
Hexachlorocyclopentadiene	0.61 UJ	--	--
Hexachloroethane	0.09 U	--	--
Indeno(1,2,3-C,D)Pyrene	0.21 U	--	--
Isophorone	0.67 U	--	--
Naphthalene	0.8 U	--	--
Nitrobenzene	0.49 U	--	--
N-Nitrosodi-N-Propylamine	0.83 U	--	--
N-Nitrosodiphenylamine	0.74 U	--	--

Table E-35
Summary of Data Used in Risk Assessment
Backwater Seep Sampling Area (surface water) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Chemical	CFSWP-029 460-144175-3 CFSWP-029-SW 11/1/2017	CFSWP-029 460-159043-2 CFSWP-029-SW 6/22/2018	CFSWP-029 180-83254-1, 200-45806-5, 460-167253-3 CFSWP-029-SW 10/18/2018
Pentachlorophenol	2.2 U	--	--
Phenanthrene	0.65 U	--	--
Phenol	0.41 U	--	--
Pyrene	0.83 U	--	--
SEMIVOLATILE ORGANIC COMPOUNDS|LOW LEVEL (µg/L)			
1,2,4,5-Tetrachlorobenzene	--	--	0.048 U
1,4-Dioxane (P-Dioxane)	--	--	0.18 U
2,3,4,6-Tetrachlorophenol	--	--	0.042 U
2,4,5-Trichlorophenol	--	--	0.056 U
2,4,6-Trichlorophenol	--	--	0.063 U
2,4-Dichlorophenol	--	--	0.047 U
2,4-Dimethylphenol	--	--	0.038 U
2,4-Dinitrophenol	--	--	1.4 U
2,4-Dinitrotoluene	--	--	0.047 U
2,6-Dinitrotoluene	--	--	0.056 U
2-Chloronaphthalene	--	--	0.055 U
2-Chlorophenol	--	--	0.059 U
2-Methylnaphthalene	--	--	0.057 U
2-Methylphenol (O-Cresol)	--	--	0.1 U
2-Nitroaniline	--	--	0.19 U
2-Nitrophenol	--	--	0.056 U
3,3'-Dichlorobenzidine	--	--	0.54 U
3-Nitroaniline	--	--	0.062 U
4,6-Dinitro-2-Methylphenol	--	--	1.4 U
4-Bromophenyl Phenyl Ether	--	--	0.058 U
4-Chloro-3-Methylphenol	--	--	0.056 U
4-Chloroaniline	--	--	0.041 U
4-Chlorophenyl Phenyl Ether	--	--	0.056 U
4-Nitroaniline	--	--	0.054 U
4-Nitrophenol	--	--	0.13 U
Acenaphthene	--	--	0.06 U
Acenaphthylene	--	--	0.06 U
Acetophenone	--	--	0.057 U
Anthracene	--	--	0.045 U
Atrazine	--	--	0.17 U
Benzaldehyde	--	--	0.1 U
Benzo(A)Anthracene	--	--	0.069 U
Benzo(A)Pyrene	--	--	0.049 U
Benzo(B)Fluoranthene	--	--	0.09 U
Benzo(G,H,I)Perylene	--	--	0.064 U
Benzo(K)Fluoranthene	--	--	0.081 U
Benzyl Butyl Phthalate	--	--	0.43 U
Biphenyl (Diphenyl)	--	--	0.055 U
Bis(2-Chloroethoxy) Methane	--	--	0.062 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	--	--	0.037 U
Bis(2-Chloroisopropyl) Ether	--	--	0.054 U
Bis(2-Ethylhexyl) Phthalate	--	--	4.3 U
Caprolactam	--	--	0.97 J
Carbazole	--	--	0.047 U
Chrysene	--	--	0.075 U
Dibenz(A,H)Anthracene	--	--	0.067 U
Dibenzofuran	--	--	0.068 U
Diethyl Phthalate	--	--	0.53 U
Dimethyl Phthalate	--	--	0.052 U
Di-N-Butyl Phthalate	--	--	0.69 U
Di-N-Octylphthalate	--	--	0.63 U
Fluoranthene	--	--	0.15 J
Fluorene	--	--	0.064 U
Hexachlorobenzene	--	--	0.052 U

Table E-35
Summary of Data Used in Risk Assessment
Backwater Seep Sampling Area (surface water) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Chemical	CFSWP-029 460-144175-3 CFSWP-029-SW 11/1/2017	CFSWP-029 460-159043-2 CFSWP-029-SW 6/22/2018	CFSWP-029 180-83254-1, 200-45806-5, 460-167253-3 CFSWP-029-SW 10/18/2018
Hexachlorobutadiene	--	--	0.064 U
Hexachlorocyclopentadiene	--	--	0.46 U
Hexachloroethane	--	--	0.057 U
Indeno(1,2,3-C,D)Pyrene	--	--	0.079 U
Isophorone	--	--	0.05 U
Naphthalene	--	--	0.055 U
Nitrobenzene	--	--	0.15 U
N-Nitrosodi-N-Propylamine	--	--	0.066 U
N-Nitrosodiphenylamine	--	--	0.11 U
Pentachlorophenol	--	--	0.22 U
Phenanthrene	--	--	0.081 J
Phenol	--	--	0.091 U
Pyrene	--	--	0.098 J
SEMIVOLATILE ORGANIC COMPOUNDS-SIM (µg/L)			
Acenaphthene	--	--	0.0054 UJ
Acenaphthylene	--	--	0.0053 UJ
Anthracene	--	--	0.0061 J-
Benzo(A)Anthracene	--	--	0.043 J-
Benzo(A)Pyrene	--	--	0.022 J-
Benzo(B)Fluoranthene	--	--	0.081 J-
Benzo(G,H,I)Perylene	--	--	0.024 J-
Benzo(K)Fluoranthene	--	--	0.061 J-
Benzo[E]Pyrene	--	--	0.047 J-
C1-Chrysenes	--	--	0.022 J-
C1-Fluoranthenes/Pyrenes	--	--	0.046 J-
C1-Fluorenes	--	--	0.021 UJ
C1-Naphthalenes	--	--	0.021 UJ
C1-Phenanthrenes/Anthracenes	--	--	0.021 UJ
C2-Chrysenes	--	--	0.021 UJ
C2-Fluorenes	--	--	0.021 UJ
C2-Naphthalenes	--	--	0.021 UJ
C2-Phenanthrenes/Anthracenes	--	--	0.021 UJ
C3-Chrysenes	--	--	0.021 UJ
C3-Fluorenes	--	--	0.021 UJ
C3-Naphthalenes	--	--	0.021 UJ
C3-Phenanthrenes/Anthracenes	--	--	0.021 UJ
C4 Chrysenes	--	--	0.021 UJ
C4-Naphthalenes	--	--	0.021 UJ
C4-Phenanthrenes/Anthracenes	--	--	0.021 UJ
Chrysene	--	--	0.17 J-
Dibenz(A,H)Anthracene	--	--	0.0066 J-
Fluoranthene	--	--	0.21 J-
Fluorene	--	--	0.0062 UJ
Indeno(1,2,3-C,D)Pyrene	--	--	0.022 J-
Naphthalene	--	--	0.0039 UJ
Perylene	--	--	0.006 J-
Phenanthrene	--	--	0.034 J-
Pyrene	--	--	0.19 J
VOLATILE ORGANIC COMPOUNDS (µg/L)			
1,1,1-Trichloroethane	0.28 U	--	--
1,1,2,2-Tetrachloroethane	0.19 U	--	--
1,1,2-Trichloro-1,2,2-Trifluoroethane	0.34 U	--	--
1,1,2-Trichloroethane	0.08 U	--	--
1,1-Dichloroethane	0.24 U	--	--
1,1-Dichloroethene	0.34 U	--	--
1,2,3-Trichlorobenzene	0.35 UJ	--	--
1,2,4-Trichlorobenzene	0.27 U	--	--
1,2-Dibromo-3-Chloropropane	0.23 U	--	--
1,2-Dibromoethane (Ethylene Dibromide)	0.19 U	--	--

Table E-35
Summary of Data Used in Risk Assessment
Backwater Seep Sampling Area (surface water) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Chemical	CFSWP-029 460-144175-3 CFSWP-029-SW 11/1/2017	CFSWP-029 460-159043-2 CFSWP-029-SW 6/22/2018	CFSWP-029 180-83254-1, 200-45806-5, 460-167253-3 CFSWP-029-SW 10/18/2018
1,2-Dichlorobenzene	0.22 U	--	--
1,2-Dichloroethane	0.25 U	--	--
1,2-Dichloropropane	0.18 U	--	--
1,3-Dichlorobenzene	0.33 U	--	--
1,4-Dichlorobenzene	0.33 U	--	--
2-Hexanone	0.72 U	--	--
Acetone	1.1 U	--	--
Benzene	0.09 U	--	--
Bromochloromethane	0.3 U	--	--
Bromodichloromethane	0.15 U	--	--
Bromoform	0.18 UJ	--	--
Bromomethane	0.18 U	--	--
Carbon Disulfide	0.22 UJ	--	--
Carbon Tetrachloride	0.33 U	--	--
Chlorobenzene	0.24 U	--	--
Chloroethane	0.37 U	--	--
Chloroform	0.22 U	--	--
Chloromethane	0.22 U	--	--
Cis-1,2-Dichloroethylene	0.26 U	--	--
Cis-1,3-Dichloropropene	0.16 U	--	--
Cyclohexane	0.26 U	--	--
Dibromochloromethane	0.22 U	--	--
Dichlorodifluoromethane	0.14 U	--	--
Ethylbenzene	0.3 U	--	--
Isopropylbenzene (Cumene)	0.32 U	--	--
M,P-Xylene	0.28 U	--	--
Methyl Acetate	0.58 U	--	--
Methyl Ethyl Ketone (2-Butanone)	2.2 U	--	--
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	0.63 U	--	--
Methylcyclohexane	0.22 U	--	--
Methylene Chloride	0.21 U	--	--
O-Xylene (1,2-Dimethylbenzene)	0.32 U	--	--
Styrene	0.17 U	--	--
Tert-Butyl Methyl Ether	0.13 U	--	--
Tetrachloroethylene (PCE)	0.12 U	--	--
Toluene	0.25 U	--	--
Trans-1,2-Dichloroethene	0.18 U	--	--
Trans-1,3-Dichloropropene	0.19 U	--	--
Trichloroethylene (TCE)	0.22 U	--	--
Trichlorofluoromethane	0.15 U	--	--
Vinyl Chloride	0.06 U	--	--

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-36
Summary of Data Used in Risk Assessment
Backwater Seep Sampling Area (sediment) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSDP-003	CFSDP-003	CFSDP-003	CFSDP-004	CFSDP-004	CFSDP-004	CFSDP-005	CFSDP-005	CFSDP-005-DUP	CFSDP-005	CFSDP-005-DUP	CFSDP-005	CFSDP-027	CFSDP-027
Sample Lab IDs	200-35201-20, 460-119996-1	460-144087-6	180-82692-4, 200-45608-4, 460-166286-4	200-35201-21, 460-119996-2	460-144087-7	180-82692-3, 200-45608-3, 460-166286-3	200-35201-22, 460-119996-3	460-144170-2	460-144170-3	460-144400-2	460-144400-3	180-83255-4, 180-83256-3, 200-45806-9, 200-45807-4, 460-167262-4	460-144087-9	180-82745-1, 180-82746-1, 200-45621-1, 200-45622-1, 460-166239-1
Sample Name	CFSDP-003-SD	CFSDP-003-SD	CFSDP-003-SD	CFSDP-004-SD	CFSDP-004-SD	CFSDP-004-SD	CFSDP-005-SD	CFSDP-005-SD	CFSDP-DUP3-SD	CFSDP-005-SD	CFSDP-DUP3-SD	CFSDP-005-SD	CFSDP-027-SD	CFSDP-027-SD
Chemical	9/9/2016	10/31/2017	10/4/2018	9/9/2016	10/31/2017	10/4/2018	9/9/2016	11/1/2017	11/1/2017	11/2/2017	11/2/2017	10/18/2018	10/31/2017	10/5/2018
GENERAL CHEMISTRY (mg/kg)														
Fluoride	10.4 J+	24.8 J+	7.98 J-	8.57 J+	22.7 J+	2.23 J-	13.7 J+	20.5 J+	16.7 J+	--	--	3.15	21.8 J+	6.56 J-
Cyanide	3.2	0.44	8.3	2	1.1	1.3	1	0.35	0.3	--	--	1	1.2	0.66
Cyanide (Free)	--	0.48 U	--	--	0.5 U	--	--	0.42 U	0.42 U	--	--	--	0.45 U	--
METALS (mg/kg)														
Aluminum	8180	8590	8890	7820	8030	7410	7980	8440	9000	--	--	8540	8790	7580
Antimony	0.57 UJ	0.49 U	0.56 UJ	0.45 UJ	0.52 U	0.37 UJ	0.38 UJ	0.37 UJ	0.34 UJ	--	--	0.34 U	0.51 U	0.41 UJ
Arsenic	6	3.3	4.1	6.2	5.2	3.3	4.2	3.4	3.9	--	--	4.5	4.1	2.9
Barium	149	147	133	151	128	44.6	128	55.7	49	--	--	121	97.8	80
Beryllium	0.54 J	0.48 J	0.56 J	0.51 J	0.44 J	0.31 J	0.39 J	0.29 J	0.41	--	--	0.53	0.57 J	0.39 J
Cadmium	0.61 U	0.52 U	0.64 U	0.48 U	0.55 U	0.42 U	0.4 U	0.39 U	0.35 U	--	--	0.39 U	0.54 U	0.47 U
Calcium	24100	24500	21600	19700	18900	9390	16900	11700	9640	--	--	19900	16200	11200
Chromium, Total	9.6	10.1	9.4	9.4	9.5	8	9.3	9.3	9.9	--	--	10.2	10.2	7
Cobalt	5.5	6	4.9	5.2	5.7	4.6	5.2	5.5	5.8	--	--	6	6.4	4.1
Copper	13.6	15.4	13.3	13.8	14.8	6.9	13.1	9	9.1	--	--	14.5	13.7	8.6
Iron	14200	13800	11800	13800	13900	12000	13100	14700	15700	--	--	14600	15600	10000
Lead	9	8.3	8.1	8.5	9	4.7	8	6.1	6.1	--	--	8.3	9.2	5.7
Magnesium	9700	12100	9900	9720	10600	9180	9890	10200	10400	--	--	11400	11400	8100
Manganese	286	202	231	172	209	133	139	169	167	--	--	221	180	155
Mercury	0.024 J	0.019 J	0.032 J	0.042	0.017 U	0.013 U	0.019 J	0.014 U	0.08	--	--	0.022 J	0.018 U	0.013 J
Nickel	11.6	12.3	11.4	10.6	11.8	9.5	10.5	11.6	12.2	--	--	12.2	12.7	9.4
Potassium	1080	977	1160	968	848	551	853	584 J+	568 J+	--	--	860	741	611
Selenium	0.53 U	0.46 U	0.55 U	0.42 U	0.48 U	0.37 U	0.36 U	0.34 U	0.31 U	--	--	0.34 U	0.48 U	0.41 U
Silver	1.1 U	0.96 U	1.2 U	0.88 U	1 U	0.78 U	0.75 U	0.72 U	0.65 U	--	--	0.71 U	1 U	0.87 U
Sodium	148 J	124 J	107 J	106 J	122 J	39.9 J	80.7 J	55.6 J	53 J	--	--	108 J	83.9 J	43.9 U
Thallium	0.23 U	0.19 U	0.24 U	0.18 U	0.2 U	0.16 U	0.15 U	0.15 U	0.13 U	--	--	0.14 U	0.2 U	0.18 U
Vanadium	10.9	13.4	12.7	11.5	12.6	8.1	12	10	9.4	--	--	14.3	15.4	11.7
Zinc	48.8	43.4	38.8	38.9	41.4	33.7	38.6	39.6	41.9	--	--	42.5	45.2	33
METALS SEM|Simultaneously Extracted Metals (mg/kg)														
SEM/AVS	--	--	--	--	--	--	--	--	--	--	--	1.27	--	QL_ERROR U
METALS|AVS/SEM (mg/kg)														
Cadmium	--	--	--	--	--	--	--	--	--	--	--	0.00073 J	--	0.00055 J
Copper	--	--	--	--	--	--	--	--	--	--	--	0.12	--	0.093
Lead	--	--	--	--	--	--	--	--	--	--	--	0.029	--	0.025
Mercury	--	--	--	--	--	--	--	--	--	--	--	2.20E-05 J	--	0.000012 U
Nickel	--	--	--	--	--	--	--	--	--	--	--	0.052	--	0.043
Sulfide	--	--	--	--	--	--	--	--	--	--	--	0.29 J	--	0.22 U
Zinc	--	--	--	--	--	--	--	--	--	--	--	0.17 J	--	0.16 J
PESTICIDES (mg/kg)														
Aldrin	0.0017 U	--	--	0.0014 U	--	--	0.0013 U	--	--	--	--	--	--	--
Alpha Bhc (Alpha Hexachlorocyclohexane)	0.0013 U	--	--	0.001 U	--	--	0.00095 U	--	--	--	--	--	--	--
Alpha Endosulfan	0.002 U	--	--	0.0016 U	--	--	0.0014 U	--	--	--	--	--	--	--
Beta Bhc (Beta Hexachlorocyclohexane)	0.0014 U	--	--	0.0011 U	--	--	0.001 U	--	--	--	--	--	--	--
Beta Endosulfan	0.0022 U	--	--	0.0018 U	--	--	0.0016 U	--	--	--	--	--	--	--
cis-Chlordane	0.0023 U	--	--	0.0019 U	--	--	0.0017 U	--	--	--	--	--	--	--
Delta BHC (Delta Hexachlorocyclohexane)	0.0016 U	--	--	0.0012 U	--	--	0.0011 U	--	--	--	--	--	--	--
Dieldrin	0.0019 U	--	--	0.0015 U	--	--	0.0014 U	--	--	--	--	--	--	--
Endosulfan Sulfate	0.0017 U	--	--	0.0013 U	--	--	0.0012 U	--	--	--	--	--	--	--
Endrin	0.0018 U	--	--	0.0015 U	--	--	0.0013 U	--	--	--	--	--	--	--
Endrin Aldehyde	0.0018 U	--	--	0.0014 U	--	--	0.0013 U	--	--	--	--	--	--	--
Endrin Ketone	0.002 U	--	--	0.0016 U	--	--	0.0014 U	--	--	--	--	--	--	--
Gamma Bhc (Lindane)	0.0013 U	--	--	0.001 U	--	--	0.00093 U	--	--	--	--	--	--	--
Heptachlor	0.0018 U	--	--	0.0015 U	--	--	0.0013 U	--	--	--	--	--	--	--
Heptachlor Epoxide	0.0028 U	--	--	0.0022 U	--	--	0.002 U	--	--	--	--	--	--	--
Methoxychlor	0.003 U	--	--	0.0024 U	--	--	0.0022 U	--	--	--	--	--	--	--
P,P'-DDD	0.0019 U	--	--	0.0015 U	--	--	0.0014 U	--	--	--	--	--	--	--
P,P'-DDE	0.0021 U	--	--	0.0017 U	--	--	0.0015 U	--	--	--	--	--	--	--

Table E-36
Summary of Data Used in Risk Assessment
Backwater Seep Sampling Area (sediment) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Chemical	CFSDP-003 200-35201-20, 460-119996-1 CFSDP-003-SD 9/9/2016	CFSDP-003 460-144087-6 CFSDP-003-SD 10/31/2017	CFSDP-003 180-82692-4, 200-45608-4, 460-166286-4 CFSDP-003-SD 10/4/2018	CFSDP-004 200-35201-21, 460-119996-2 CFSDP-004-SD 9/9/2016	CFSDP-004 460-144087-7 CFSDP-004-SD 10/31/2017	CFSDP-004 180-82692-3, 200-45608-3, 460-166286-3 CFSDP-004-SD 10/4/2018	CFSDP-005 200-35201-22, 460-119996-3 CFSDP-005-SD 9/9/2016	CFSDP-005 460-144170-2 CFSDP-005-SD 11/1/2017	CFSDP-005-DUP 460-144170-3 CFSDP-DUP3-SD 11/1/2017	CFSDP-005 460-144400-2 CFSDP-005-SD 11/2/2017	CFSDP-005-DUP 460-144400-3 CFSDP-DUP3-SD 11/2/2017	CFSDP-005 180-83255-4, 180-83256-3, 200-45806-9, 200-45807-4, 460-167262-4 CFSDP-005-SD 10/18/2018	CFSDP-027 460-144087-9 CFSDP-027-SD 10/31/2017	CFSDP-027 180-82745-1, 180-82746-1, 200-45621-1, 200-45622-1, 460-166239-1 CFSDP-027-SD 10/5/2018
P,P'-DDT	0.0015 U	--	--	0.0012 U	--	--	0.0011 U	--	--	--	--	--	--	--
Toxaphene	0.042 U	--	--	0.033 U	--	--	0.03 U	--	--	--	--	--	--	--
trans-Chlordane	0.0031 U	--	--	0.0025 U	--	--	0.0023 U	--	--	--	--	--	--	--
POLYCHLORINATED BIPHENYLS (mg/kg)														
PCB-1016 (Aroclor 1016)	0.019 U	--	--	0.015 U	--	--	0.014 U	--	--	--	--	--	--	--
PCB-1221 (Aroclor 1221)	0.019 U	--	--	0.015 U	--	--	0.014 U	--	--	--	--	--	--	--
PCB-1232 (Aroclor 1232)	0.019 U	--	--	0.015 U	--	--	0.014 U	--	--	--	--	--	--	--
PCB-1242 (Aroclor 1242)	0.019 U	--	--	0.015 U	--	--	0.014 U	--	--	--	--	--	--	--
PCB-1248 (Aroclor 1248)	0.019 U	--	--	0.015 U	--	--	0.014 U	--	--	--	--	--	--	--
PCB-1254 (Aroclor 1254)	0.02 U	--	--	0.016 U	--	--	0.014 U	--	--	--	--	--	--	--
PCB-1260 (Aroclor 1260)	0.02 U	--	--	0.016 U	--	--	0.014 U	--	--	--	--	--	--	--
PCB-1262 (Aroclor 1262)	0.02 U	--	--	0.016 U	--	--	0.014 U	--	--	--	--	--	--	--
PCB-1268 (Aroclor 1268)	0.02 U	--	--	0.016 U	--	--	0.014 U	--	--	--	--	--	--	--
Polychlorinated Biphenyl (PCBs)	0.02 U	--	--	0.016 U	--	--	0.014 U	--	--	--	--	--	--	--
SEMIVOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,2,4,5-Tetrachlorobenzene	0.1 U	0.039 U	--	0.084 U	0.041 U	--	0.076 U	0.034 U	0.034 U	--	--	--	0.04 U	--
1,4-Dioxane (P-Dioxane)	0.38 UJ	0.14 U	--	0.3 UJ	0.15 U	--	0.27 UJ	0.12 U	0.12 U	--	--	--	0.14 U	--
2,3,4,6-Tetrachlorophenol	0.13 U	0.049 U	--	0.11 U	0.051 U	--	0.097 U	0.043 U	0.042 U	--	--	--	0.05 U	--
2,4,5-Trichlorophenol	0.14 U	0.052 U	--	0.11 U	0.054 U	--	0.1 U	0.045 U	0.045 U	--	--	--	0.053 U	--
2,4,6-Trichlorophenol	0.04 U	0.015 U	--	0.032 U	0.016 U	--	0.029 U	0.013 U	0.013 U	--	--	--	0.015 U	--
2,4-Dichlorophenol	0.033 U	0.012 U	--	0.027 U	0.013 U	--	0.024 U	0.011 U	0.011 U	--	--	--	0.013 U	--
2,4-Dimethylphenol	0.31 U	0.11 UJ	--	0.25 U	0.12 UJ	--	0.23 U	0.099 U	0.099 U	--	--	--	0.12 UJ	--
2,4-Dinitrophenol	1.1 U	0.39 U	--	0.85 U	0.41 U	--	0.78 U	0.34 U	0.34 U	--	--	--	0.41 U	--
2,4-Dinitrotoluene	0.056 U	0.021 U	--	0.045 U	0.022 U	--	0.041 U	0.018 U	0.018 U	--	--	--	0.021 U	--
2,6-Dinitrotoluene	0.075 U	0.028 U	--	0.06 U	0.029 U	--	0.055 U	0.024 U	0.024 U	--	--	--	0.029 U	--
2-Chloronaphthalene	0.032 U	0.012 U	--	0.026 U	0.012 U	--	0.023 U	0.01 U	0.01 U	--	--	--	0.012 U	--
2-Chlorophenol	0.036 U	0.013 U	--	0.029 U	0.014 U	--	0.026 U	0.011 U	0.011 U	--	--	--	0.014 U	--
2-Methylnaphthalene	0.031 U	0.011 U	--	0.025 U	0.012 U	--	0.023 U	0.01 U	0.0099 U	--	--	--	0.012 U	--
2-Methylphenol (O-Cresol)	0.061 U	0.023 U	--	0.049 U	0.024 U	--	0.045 U	0.02 U	0.02 U	--	--	--	0.023 U	--
2-Nitroaniline	0.046 U	0.017 U	--	0.037 U	0.018 U	--	0.034 U	0.015 U	0.015 U	--	--	--	0.018 U	--
2-Nitrophenol	0.047 U	0.017 U	--	0.038 U	0.018 U	--	0.034 U	0.015 U	0.015 U	--	--	--	0.018 U	--
3- And 4- Methylphenol (Total)	0.49 J	0.014 U	--	0.22 J	0.015 U	--	0.027 U	0.012 U	0.012 U	--	--	--	0.024 J	--
3,3'-Dichlorobenzidine	0.16 U	0.058 U	--	0.13 U	0.061 U	--	0.11 U	0.05 U	0.05 U	--	--	--	0.06 U	--
3-Nitroaniline	0.042 U	0.015 U	--	0.033 U	0.016 U	--	0.03 U	0.013 U	0.013 U	--	--	--	0.016 U	--
4,6-Dinitro-2-Methylphenol	0.38 U	0.14 U	--	0.3 U	0.15 U	--	0.27 U	0.12 U	0.12 U	--	--	--	0.14 U	--
4-Bromophenyl Phenyl Ether	0.044 U	0.016 U	--	0.036 U	0.017 U	--	0.032 U	0.014 U	0.014 U	--	--	--	0.017 U	--
4-Chloro-3-Methylphenol	0.06 U	0.022 U	--	0.048 U	0.023 U	--	0.044 U	0.019 U	0.019 U	--	--	--	0.023 U	--
4-Chloroaniline	0.036 U	0.013 U	--	0.029 U	0.014 U	--	0.026 U	0.012 U	0.012 U	--	--	--	0.014 U	--
4-Chlorophenyl Phenyl Ether	0.042 U	0.016 U	--	0.034 U	0.016 U	--	0.031 U	0.014 U	0.013 U	--	--	--	0.016 U	--
4-Nitroaniline	0.053 U	0.02 U	--	0.043 U	0.021 U	--	0.039 U	0.017 U	0.017 U	--	--	--	0.02 UJ	--
4-Nitrophenol	0.68 U	0.25 U	--	0.54 U	0.26 U	--	0.49 U	0.22 UJ	0.22 UJ	--	--	--	0.26 U	--
Acenaphthene	0.034 U	0.013 U	--	0.027 U	0.013 U	--	0.025 U	0.011 U	0.011 U	--	--	--	0.033 J	--
Acenaphthylene	0.036 U	0.013 U	--	0.029 U	0.014 U	--	0.026 U	0.012 U	0.012 U	--	--	--	0.014 U	--
Acetophenone	0.031 U	0.011 U	--	0.025 U	0.012 U	--	0.022 U	0.0098 U	0.0098 U	--	--	--	0.012 U	--
Anthracene	0.13 U	0.049 U	--	0.11 U	0.052 U	--	0.097 U	0.043 U	0.043 U	--	--	--	0.16 J	--
Atrazine	0.063 U	0.023 U	--	0.05 U	0.024 U	--	0.046 U	0.02 U	0.02 U	--	--	--	0.024 U	--
Benzaldehyde	0.11 U	0.04 U	--	0.086 U	0.042 U	--	0.078 U	0.034 U	0.034 U	--	--	--	0.041 U	--
Benzo(A)Anthracene	0.12 U	0.079	--	0.094 U	0.046 U	--	0.086 U	0.038 U	0.038 U	--	--	--	2.1	--
Benzo(A)Pyrene	0.1 J	0.016 U	--	0.034 U	0.017 U	--	0.031 U	0.038 J	0.014 UJ	--	--	--	0.87	--
Benzo(B)Fluoranthene	0.3	0.17	--	0.044 U	0.082	--	0.04 U	0.11 J	0.018 UJ	--	--	--	4.1	--
Benzo(G,H,I)Perylene	0.14 J	0.048 J+	--	0.065 U	0.031 U	--	0.059 U	0.026 U	0.026 U	--	--	--	1.2	--
Benzo(K)Fluoranthene	0.11 J	0.051 J	--	0.049 U	0.027 J	--	0.045 U	0.02 U	0.02 U	--	--	--	1.3	--
Benzyl Butyl Phthalate	0.043 U	0.016 U	--	0.035 U	0.017 U	--	0.032 U	0.014 U	0.014 U	--	--	--	0.044 J	--
Biphenyl (Diphenyl)	0.12 U	0.044 U	--	0.096 U	0.047 U	--	0.088 U	0.039 U	0.038 U	--	--	--	0.046 U	--
Bis(2-Chloroethoxy) Methane	0.044 U	0.016 U	--	0.035 U	0.017 U	--	0.032 U	0.014 U	0.014 U	--	--	--	0.017 U	--
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.033 U	0.012 U	--	0.027 U	0.013 U	--	0.024 U	0.011 U	0.011 U	--	--	--	0.013 U	--
Bis(2-Chloroisopropyl) Ether	0.058 U	0.021 U	--	0.046 U	0.022 U	--	0.042 U	0.019 U	0.019 U	--	--	--	0.022 U	--

Table E-36
Summary of Data Used in Risk Assessment
Backwater Seep Sampling Area (sediment) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSDP-003	CFSDP-003	CFSDP-003	CFSDP-004	CFSDP-004	CFSDP-004	CFSDP-005	CFSDP-005	CFSDP-005-DUP	CFSDP-005	CFSDP-005-DUP	CFSDP-005	CFSDP-027	CFSDP-027
Sample Lab IDs	200-35201-20, 460-119996-1	460-144087-6	180-82692-4, 200-45608-4, 460-166286-4	200-35201-21, 460-119996-2	460-144087-7	180-82692-3, 200-45608-3, 460-166286-3	200-35201-22, 460-119996-3	460-144170-2	460-144170-3	460-144400-2	460-144400-3	180-83255-4, 180-83256-3, 200-45806-9, 200-45807-4, 460-167262-4	460-144087-9	180-82745-1, 180-82746-1, 200-45621-1, 200-45622-1, 460-166239-1
Sample Name	CFSDP-003-SD	CFSDP-003-SD	CFSDP-003-SD	CFSDP-004-SD	CFSDP-004-SD	CFSDP-004-SD	CFSDP-005-SD	CFSDP-005-SD	CFSDP-DUP3-SD	CFSDP-005-SD	CFSDP-DUP3-SD	CFSDP-005-SD	CFSDP-027-SD	CFSDP-027-SD
Chemical	9/9/2016	10/31/2017	10/4/2018	9/9/2016	10/31/2017	10/4/2018	9/9/2016	11/1/2017	11/1/2017	11/2/2017	11/2/2017	10/18/2018	10/31/2017	10/5/2018
Bis(2-Ethylhexyl) Phthalate	0.055 U	0.02 U	--	0.044 U	0.021 U	--	0.04 U	0.018 U	0.018 U	--	--	--	0.26 J	--
Caprolactam	0.1 U	0.037 U	--	0.081 U	0.039 U	--	0.074 U	0.033 U	0.032 U	--	--	--	0.039 U	--
Carbazole	0.035 U	0.013 U	--	0.028 U	0.014 U	--	0.025 U	0.011 U	0.011 U	--	--	--	0.36 J	--
Chrysene	0.48 J	0.21 J	--	0.031 U	0.071 J	--	0.028 U	0.13 J	0.012 UJ	--	--	--	4.9	--
Dibenz(A,H)Anthracene	0.073 U	0.027 U	--	0.059 U	0.028 U	--	0.053 U	0.024 U	0.023 U	--	--	--	0.41	--
Dibenzofuran	0.043 U	0.016 U	--	0.034 U	0.017 U	--	0.031 U	0.014 U	0.014 U	--	--	--	0.021 J	--
Diethyl Phthalate	0.04 U	0.015 U	--	0.032 U	0.016 U	--	0.029 U	0.013 U	0.013 U	--	--	--	0.015 U	--
Dimethyl Phthalate	0.041 U	0.015 U	--	0.033 U	0.016 U	--	0.03 U	0.013 U	0.013 U	--	--	--	0.016 U	--
Di-N-Butyl Phthalate	0.042 U	0.016 U	--	0.034 U	0.016 U	--	0.031 U	0.014 U	0.013 U	--	--	--	0.016 U	--
Di-N-Octylphthalate	0.071 U	0.026 U	--	0.057 U	0.028 U	--	0.052 U	0.023 U	0.023 U	--	--	--	0.084 J	--
Fluoranthene	0.48 J	0.27 J	--	0.033 U	0.099 J	--	0.03 U	0.14 J	0.013 UJ	--	--	--	6.5	--
Fluorene	0.031 U	0.011 U	--	0.025 U	0.012 U	--	0.022 U	0.0098 U	0.0098 U	--	--	--	0.03 J	--
Hexachlorobenzene	0.057 U	0.021 U	--	0.046 U	0.022 U	--	0.042 U	0.018 U	0.018 U	--	--	--	0.022 U	--
Hexachlorobutadiene	0.04 U	0.015 U	--	0.032 U	0.015 U	--	0.029 U	0.013 U	0.013 U	--	--	--	0.015 U	--
Hexachlorocyclopentadiene	0.088 U	0.032 UJ	--	0.07 U	0.034 UJ	--	0.064 U	0.028 UJ	0.028 UJ	--	--	--	0.033 UJ	--
Hexachloroethane	0.051 U	0.019 U	--	0.041 U	0.02 U	--	0.038 U	0.017 U	0.016 U	--	--	--	0.02 U	--
Indeno(1,2,3-C,D)Pyrene	0.2	0.052 J+	--	0.075 U	0.036 U	--	0.068 U	0.052 J	0.03 UJ	--	--	--	1.5	--
Isophorone	0.03 U	0.011 U	--	0.024 U	0.012 U	--	0.022 U	0.0097 U	0.0097 U	--	--	--	0.012 U	--
Naphthalene	0.036 U	0.013 U	--	0.029 U	0.014 U	--	0.026 U	0.016 J	0.011 U	--	--	--	0.019 J	--
Nitrobenzene	0.044 U	0.016 U	--	0.036 U	0.017 U	--	0.032 U	0.014 U	0.014 U	--	--	--	0.017 U	--
N-Nitrosodi-N-Propylamine	0.047 U	0.017 U	--	0.038 U	0.018 U	--	0.034 U	0.015 U	0.015 U	--	--	--	0.018 U	--
N-Nitrosodiphenylamine	0.13 U	0.047 U	--	0.1 U	0.05 U	--	0.093 U	0.041 U	0.041 U	--	--	--	0.049 U	--
Pentachlorophenol	0.17 U	0.063 U	--	0.14 U	0.066 U	--	0.12 U	0.055 U	0.055 U	--	--	--	0.065 U	--
Phenanthrene	0.037 U	0.044 J	--	0.03 U	0.024 J	--	0.027 U	0.022 J	0.012 UJ	--	--	--	1	--
Phenol	0.046 U	0.017 U	--	0.037 U	0.018 U	--	0.034 U	0.015 U	0.015 U	--	--	--	0.018 U	--
Pyrene	0.31 J	0.27 J	--	0.051 U	0.09 J	--	0.047 U	0.1 J	0.02 UJ	--	--	--	6.8	--
SEMIVOLATILE ORGANIC COMPOUNDS|LOW LEVEL (mg/kg)														
1,2,4,5-Tetrachlorobenzene	--	--	0.016 U	--	--	0.0018 U	--	--	--	--	--	0.0031 U	--	0.0058 U
1,4-Dioxane (P-Dioxane)	--	--	0.11 U	--	--	0.013 U	--	--	--	--	--	0.023 U	--	0.042 U
2,3,4,6-Tetrachlorophenol	--	--	0.15 UJ	--	--	0.017 UJ	--	--	--	--	--	0.03 U	--	0.056 U
2,4,5-Trichlorophenol	--	--	0.026 U	--	--	0.003 U	--	--	--	--	--	0.0052 U	--	0.0095 U
2,4,6-Trichlorophenol	--	--	0.02 U	--	--	0.0023 U	--	--	--	--	--	0.004 U	--	0.0073 U
2,4-Dichlorophenol	--	--	0.028 U	--	--	0.0032 U	--	--	--	--	--	0.0056 U	--	0.01 U
2,4-Dimethylphenol	--	--	0.023 U	--	--	0.0026 U	--	--	--	--	--	0.0045 U	--	0.0083 U
2,4-Dinitrophenol	--	--	0.98 U	--	--	0.11 U	--	--	--	--	--	0.19 U	--	0.36 U
2,4-Dinitrotoluene	--	--	0.018 U	--	--	0.0021 U	--	--	--	--	--	0.0036 U	--	0.0066 U
2,6-Dinitrotoluene	--	--	0.022 U	--	--	0.0026 U	--	--	--	--	--	0.0045 U	--	0.0083 U
2-Chloronaphthalene	--	--	0.017 U	--	--	0.0019 U	--	--	--	--	--	0.0033 U	--	0.0061 U
2-Chlorophenol	--	--	0.017 U	--	--	0.0019 U	--	--	--	--	--	0.0034 U	--	0.0062 U
2-Methylnaphthalene	--	--	0.017 U	--	--	0.002 U	--	--	--	--	--	0.0035 U	--	0.0064 U
2-Methylphenol (O-Cresol)	--	--	0.1 U	--	--	0.012 U	--	--	--	--	--	0.021 U	--	0.038 U
2-Nitroaniline	--	--	0.17 U	--	--	0.019 U	--	--	--	--	--	0.033 U	--	0.061 U
2-Nitrophenol	--	--	0.021 U	--	--	0.0024 U	--	--	--	--	--	0.0041 U	--	0.0077 U
3,3'-Dichlorobenzidine	--	--	0.34 U	--	--	0.039 U	--	--	--	--	--	0.068 U	--	0.12 U
3-Nitroaniline	--	--	0.092 U	--	--	0.011 U	--	--	--	--	--	0.018 U	--	0.034 U
4,6-Dinitro-2-Methylphenol	--	--	0.63 U	--	--	0.072 U	--	--	--	--	--	0.12 U	--	0.23 U
4-Bromophenyl Phenyl Ether	--	--	0.025 U	--	--	0.0029 U	--	--	--	--	--	0.0051 U	--	0.0094 U
4-Chloro-3-Methylphenol	--	--	0.017 UJ	--	--	0.002 UJ	--	--	--	--	--	0.0034 U	--	0.0063 U
4-Chloroaniline	--	--	0.012 U	--	--	0.0014 U	--	--	--	--	--	0.0024 U	--	0.0044 U
4-Chlorophenyl Phenyl Ether	--	--	0.022 U	--	--	0.0025 U	--	--	--	--	--	0.0044 U	--	0.0081 U
4-Nitroaniline	--	--	0.018 U	--	--	0.002 U	--	--	--	--	--	0.0035 U	--	0.0065 U
4-Nitrophenol	--	--	0.25 UJ	--	--	0.029 UJ	--	--	--	--	--	0.051 U	--	0.094 U
Acenaphthene	--	--	0.021 U	--	--	0.0024 U	--	--	--	--	--	0.0042 U	--	0.015 J
Acenaphthylene	--	--	0.016 U	--	--	0.0018 U	--	--	--	--	--	0.0032 U	--	0.0058 U
Acetophenone	--	--	0.02 U	--	--	0.0023 U	--	--	--	--	--	0.0039 U	--	0.0073 U
Anthracene	--	--	0.075	--	--	0.0022 U	--	--	--	--	--	0.0062 J	--	0.061
Atrazine	--	--	0.16 UJ	--	--	0.018 UJ	--	--	--	--	--	0.032 UJ	--	0.058 UJ

Table E-36
Summary of Data Used in Risk Assessment
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Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSDP-003	CFSDP-003	CFSDP-003	CFSDP-004	CFSDP-004	CFSDP-004	CFSDP-005	CFSDP-005	CFSDP-005-DUP	CFSDP-005	CFSDP-005-DUP	CFSDP-005	CFSDP-027	CFSDP-027
Sample Lab IDs	200-35201-20, 460-119996-1	460-144087-6	180-82692-4, 200-45608-4, 460-166286-4	200-35201-21, 460-119996-2	460-144087-7	180-82692-3, 200-45608-3, 460-166286-3	200-35201-22, 460-119996-3	460-144170-2	460-144170-3	460-144400-2	460-144400-3	180-83255-4, 180-83256-3, 200-45806-9, 200-45807-4, 460-167262-4	460-144087-9	180-82745-1, 180-82746-1, 200-45621-1, 200-45622-1, 460-166239-1
Sample Name	CFSDP-003-SD	CFSDP-003-SD	CFSDP-003-SD	CFSDP-004-SD	CFSDP-004-SD	CFSDP-004-SD	CFSDP-005-SD	CFSDP-005-SD	CFSDP-DUP3-SD	CFSDP-005-SD	CFSDP-DUP3-SD	CFSDP-005-SD	CFSDP-027-SD	CFSDP-027-SD
Chemical	9/9/2016	10/31/2017	10/4/2018	9/9/2016	10/31/2017	10/4/2018	9/9/2016	11/1/2017	11/1/2017	11/2/2017	11/2/2017	10/18/2018	10/31/2017	10/5/2018
Benzaldehyde	--	--	0.045 UR	--	--	0.0052 UR	--	--	--	--	--	0.009 UR	--	0.02 J
Benzo(A)Anthracene	--	--	0.73	--	--	0.0076 J	--	--	--	--	--	0.052	--	0.59
Benzo(A)Pyrene	--	--	0.42	--	--	0.0018 U	--	--	--	--	--	0.03	--	0.4
Benzo(B)Fluoranthene	--	--	1.8	--	--	0.017	--	--	--	--	--	0.13	--	1.5
Benzo(G,H,I)Perylene	--	--	0.63	--	--	0.0065 J	--	--	--	--	--	0.042	--	0.56
Benzo(K)Fluoranthene	--	--	0.75	--	--	0.0079 J	--	--	--	--	--	0.054	--	0.58
Benzyl Butyl Phthalate	--	--	0.25 U	--	--	0.029 U	--	--	--	--	--	0.05 U	--	0.092 U
Biphenyl (Diphenyl)	--	--	0.015 U	--	--	0.0018 U	--	--	--	--	--	0.003 U	--	0.0056 U
Bis(2-Chloroethoxy) Methane	--	--	0.017 U	--	--	0.002 U	--	--	--	--	--	0.0034 U	--	0.0064 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	--	--	0.013 U	--	--	0.0015 U	--	--	--	--	--	0.0026 U	--	0.0048 U
Bis(2-Chloroisopropyl) Ether	--	--	0.027 U	--	--	0.0031 U	--	--	--	--	--	0.0054 U	--	0.0099 U
Bis(2-Ethylhexyl) Phthalate	--	--	0.39 U	--	--	0.045 U	--	--	--	--	--	0.077 U	--	0.14 U
Caprolactam	--	--	0.24 U	--	--	0.027 U	--	--	--	--	--	0.047 U	--	0.087 U
Carbazole	--	--	0.3	--	--	0.0041 J	--	--	--	--	--	0.02	--	0.19
Chrysene	--	--	2.7	--	--	0.025	--	--	--	--	--	0.19	--	1.8
Dibenz(A,H)Anthracene	--	--	0.2	--	--	0.0019 U	--	--	--	--	--	0.01 J	--	0.17
Dibenzofuran	--	--	0.016 U	--	--	0.0018 U	--	--	--	--	--	0.0032 U	--	0.006 J
Diethyl Phthalate	--	--	0.11 U	--	--	0.013 U	--	--	--	--	--	0.022 U	--	0.04 U
Dimethyl Phthalate	--	--	0.013 U	--	--	0.0015 U	--	--	--	--	--	0.0026 U	--	0.0048 U
Di-N-Butyl Phthalate	--	--	0.16 U	--	--	0.018 U	--	--	--	--	--	0.032 U	--	0.058 U
Di-N-Octylphthalate	--	--	0.21 U	--	--	0.024 U	--	--	--	--	--	0.042 U	--	0.078 U
Fluoranthene	--	--	1.5	--	--	0.025	--	--	--	--	--	0.16	--	1.6
Fluorene	--	--	0.014 U	--	--	0.0016 U	--	--	--	--	--	0.0028 U	--	0.0095 J
Hexachlorobenzene	--	--	0.026 U	--	--	0.003 U	--	--	--	--	--	0.0052 U	--	0.0096 U
Hexachlorobutadiene	--	--	0.021 U	--	--	0.0024 U	--	--	--	--	--	0.0042 U	--	0.0078 U
Hexachlorocyclopentadiene	--	--	0.018 U	--	--	0.0021 U	--	--	--	--	--	0.0037 UJ	--	0.0068 U
Hexachloroethane	--	--	0.019 U	--	--	0.0022 U	--	--	--	--	--	0.0037 U	--	0.0069 U
Indeno(1,2,3-C,D)Pyrene	--	--	0.56	--	--	0.0059 J	--	--	--	--	--	0.039	--	0.5
Isophorone	--	--	0.018 U	--	--	0.0021 U	--	--	--	--	--	0.0037 U	--	0.0068 U
Naphthalene	--	--	0.014 U	--	--	0.0016 U	--	--	--	--	--	0.0028 U	--	0.0053 J
Nitrobenzene	--	--	0.13 U	--	--	0.015 U	--	--	--	--	--	0.026 U	--	0.049 U
N-Nitrosodi-N-Propylamine	--	--	0.025 U	--	--	0.0028 U	--	--	--	--	--	0.0049 U	--	0.0091 U
N-Nitrosodiphenylamine	--	--	0.12 U	--	--	0.014 U	--	--	--	--	--	0.024 U	--	0.044 U
Pentachlorophenol	--	--	0.58 UJ	--	--	0.067 UJ	--	--	--	--	--	0.12 U	--	0.21 U
Phenanthrene	--	--	0.25	--	--	0.0048 J	--	--	--	--	--	0.023	--	0.25
Phenol	--	--	0.11 U	--	--	0.013 U	--	--	--	--	--	0.022 U	--	0.04 U
Pyrene	--	--	1.3	--	--	0.018	--	--	--	--	--	0.11	--	1.2
SEMIVOLATILE ORGANIC COMPOUNDS-SIM (mg/kg)														
Acenaphthene	--	--	--	--	--	--	--	--	--	--	--	0.0011 J	--	0.0031 J
Acenaphthylene	--	--	--	--	--	--	--	--	--	--	--	0.0013 U	--	0.0046 U
Anthracene	--	--	--	--	--	--	--	--	--	--	--	0.0056	--	0.013 J
Benzo(A)Anthracene	--	--	--	--	--	--	--	--	--	--	--	0.069	--	0.23
Benzo(A)Pyrene	--	--	--	--	--	--	--	--	--	--	--	0.028	--	0.11
Benzo(B)Fluoranthene	--	--	--	--	--	--	--	--	--	--	--	0.13	--	0.43 J
Benzo(G,H,I)Perylene	--	--	--	--	--	--	--	--	--	--	--	0.036	--	0.13 J
Benzo(K)Fluoranthene	--	--	--	--	--	--	--	--	--	--	--	0.11	--	0.34 J
Benzo[E]Pyrene	--	--	--	--	--	--	--	--	--	--	--	0.077	--	0.25 J
C1-Chrysenes	--	--	--	--	--	--	--	--	--	--	--	0.038 J	--	0.12 J
C1-Fluoranthenes/Pyrenes	--	--	--	--	--	--	--	--	--	--	--	0.067 J	--	0.2 J
C1-Fluorenes	--	--	--	--	--	--	--	--	--	--	--	0.0051 U	--	0.018 U
C1-Naphthalenes	--	--	--	--	--	--	--	--	--	--	--	0.0051 U	--	0.018 U
C1-Phenanthrenes/Anthracenes	--	--	--	--	--	--	--	--	--	--	--	0.017 J	--	0.044 J
C2-Chrysenes	--	--	--	--	--	--	--	--	--	--	--	0.0082 J	--	0.024 J
C2-Fluorenes	--	--	--	--	--	--	--	--	--	--	--	0.0051 U	--	0.018 U
C2-Naphthalenes	--	--	--	--	--	--	--	--	--	--	--	0.0051 U	--	0.018 U
C2-Phenanthrenes/Anthracenes	--	--	--	--	--	--	--	--	--	--	--	0.012 J	--	0.029 J
C3-Chrysenes	--	--	--	--	--	--	--	--	--	--	--	0.0051 U	--	0.018 U

Table E-36
Summary of Data Used in Risk Assessment
Backwater Seep Sampling Area (sediment) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Chemical	CFSDP-003 200-35201-20, 460-119996-1 CFSDP-003-SD 9/9/2016	CFSDP-003 460-144087-6 CFSDP-003-SD 10/31/2017	CFSDP-003 180-82692-4, 200-45608-4, 460-166286-4 CFSDP-003-SD 10/4/2018	CFSDP-004 200-35201-21, 460-119996-2 CFSDP-004-SD 9/9/2016	CFSDP-004 460-144087-7 CFSDP-004-SD 10/31/2017	CFSDP-004 180-82692-3, 200-45608-3, 460-166286-3 CFSDP-004-SD 10/4/2018	CFSDP-005 200-35201-22, 460-119996-3 CFSDP-005-SD 9/9/2016	CFSDP-005 460-144170-2 CFSDP-005-SD 11/1/2017	CFSDP-005-DUP 460-144170-3 CFSDP-DUP3-SD 11/1/2017	CFSDP-005 460-144400-2 CFSDP-005-SD 11/2/2017	CFSDP-005-DUP 460-144400-3 CFSDP-DUP3-SD 11/2/2017	CFSDP-005 180-83255-4, 180-83256-3, 200-45806-9, 200-45807-4, 460-167262-4 CFSDP-005-SD 10/18/2018	CFSDP-027 460-144087-9 CFSDP-027-SD 10/31/2017	CFSDP-027 180-82745-1, 180-82746-1, 200-45621-1, 200-45622-1, 460-166239-1 CFSDP-027-SD 10/5/2018
C3-Fluorenes	--	--	--	--	--	--	--	--	--	--	--	0.0051 U	--	0.018 U
C3-Naphthalenes	--	--	--	--	--	--	--	--	--	--	--	0.0051 J	--	0.018 U
C3-Phenanthrenes/Anthracenes	--	--	--	--	--	--	--	--	--	--	--	0.0053 J	--	0.018 U
C4 Chrysenes	--	--	--	--	--	--	--	--	--	--	--	0.0051 U	--	0.018 U
C4-Naphthalenes	--	--	--	--	--	--	--	--	--	--	--	0.0051 U	--	0.018 U
C4-Phenanthrenes/Anthracenes	--	--	--	--	--	--	--	--	--	--	--	0.0051 U	--	0.018 U
Chrysene	--	--	--	--	--	--	--	--	--	--	--	0.22	--	0.62
Dibenz(A,H)Anthracene	--	--	--	--	--	--	--	--	--	--	--	0.015	--	0.045 J
Fluoranthene	--	--	--	--	--	--	--	--	--	--	--	0.18	--	0.55
Fluorene	--	--	--	--	--	--	--	--	--	--	--	0.0019 U	--	0.0067 U
Indeno(1,2,3-C,D)Pyrene	--	--	--	--	--	--	--	--	--	--	--	0.04	--	0.14 J
Naphthalene	--	--	--	--	--	--	--	--	--	--	--	0.002 U	--	0.007 U
Perylene	--	--	--	--	--	--	--	--	--	--	--	0.012	--	0.035
Phenanthrene	--	--	--	--	--	--	--	--	--	--	--	0.026	--	0.065
Pyrene	--	--	--	--	--	--	--	--	--	--	--	0.18 J+	--	0.45
VOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,1,1-Trichloroethane	--	0.00033 U	--	--	0.00071 U	--	--	--	--	0.00026 U	0.00027 U	--	0.00032 U	--
1,1,2,2-Tetrachloroethane	--	0.0003 U	--	--	0.00065 U	--	--	--	--	0.00024 U	0.00025 U	--	0.0003 U	--
1,1,2-Trichloro-1,2,2-Trifluoroethane	--	0.00042 U	--	--	0.00092 U	--	--	--	--	0.00033 U	0.00035 U	--	0.00042 U	--
1,1,2-Trichloroethane	--	0.00025 U	--	--	0.00054 U	--	--	--	--	0.0002 U	0.00021 U	--	0.00025 U	--
1,1-Dichloroethane	--	0.00029 U	--	--	0.00063 U	--	--	--	--	0.00023 U	0.00024 U	--	0.00029 U	--
1,1-Dichloroethene	--	0.00031 U	--	--	0.00069 U	--	--	--	--	0.00025 U	0.00026 U	--	0.00031 U	--
1,2,3-Trichlorobenzene	--	0.00025 U	--	--	0.00055 U	--	--	--	--	0.0002 U	0.00021 U	--	0.00025 U	--
1,2,4-Trichlorobenzene	--	0.00013 U	--	--	0.00028 U	--	--	--	--	0.0001 U	0.00011 U	--	0.00013 U	--
1,2-Dibromo-3-Chloropropane	--	0.00064 U	--	--	0.0014 U	--	--	--	--	0.00051 U	0.00053 U	--	0.00064 U	--
1,2-Dibromoethane (Ethylene Dibromide)	--	0.00025 U	--	--	0.00055 U	--	--	--	--	0.0002 U	0.00021 U	--	0.00025 U	--
1,2-Dichlorobenzene	--	0.0002 U	--	--	0.00044 U	--	--	--	--	0.00016 U	0.00017 U	--	0.0002 U	--
1,2-Dichloroethane	--	0.00041 U	--	--	0.00091 U	--	--	--	--	0.00033 U	0.00034 U	--	0.00041 U	--
1,2-Dichloropropane	--	0.00059 U	--	--	0.0013 U	--	--	--	--	0.00047 U	0.00049 U	--	0.00059 U	--
1,3-Dichlorobenzene	--	0.00022 U	--	--	0.00049 U	--	--	--	--	0.00018 U	0.00018 U	--	0.00022 U	--
1,4-Dichlorobenzene	--	0.00014 U	--	--	0.00031 U	--	--	--	--	0.00011 U	0.00012 U	--	0.00014 U	--
2-Hexanone	--	0.0011 U	--	--	0.0024 U	--	--	--	--	0.00086 U	0.0009 U	--	0.0011 U	--
Acetone	--	0.053	--	--	0.089	--	--	--	--	0.02	0.021	--	0.033	--
Benzene	--	0.002	--	--	0.0035	--	--	--	--	0.00085 J	0.00091 J	--	0.0014	--
Bromochloromethane	--	0.00039 U	--	--	0.00086 U	--	--	--	--	0.00031 U	0.00032 U	--	0.00039 U	--
Bromodichloromethane	--	0.00036 U	--	--	0.00079 U	--	--	--	--	0.00028 U	0.0003 U	--	0.00036 U	--
Bromoform	--	0.00059 U	--	--	0.0013 U	--	--	--	--	0.00047 U	0.00049 U	--	0.00059 U	--
Bromomethane	--	0.00066 U	--	--	0.0014 U	--	--	--	--	0.00052 U	0.00055 U	--	0.00066 U	--
Carbon Disulfide	--	0.014	--	--	0.0048	--	--	--	--	0.00045 J	0.00058 J	--	0.0014	--
Carbon Tetrachloride	--	0.00025 U	--	--	0.00055 U	--	--	--	--	0.0002 U	0.00021 U	--	0.00025 U	--
Chlorobenzene	--	0.00025 U	--	--	0.00054 U	--	--	--	--	0.0002 U	0.0002 U	--	0.00025 U	--
Chloroethane	--	0.00073 U	--	--	0.0016 U	--	--	--	--	0.00058 U	0.0006 U	--	0.00072 U	--
Chloroform	--	0.00045 U	--	--	0.00098 U	--	--	--	--	0.00035 U	0.00037 U	--	0.00044 U	--
Chloromethane	--	0.00061 UJ	--	--	0.0013 UJ	--	--	--	--	0.00048 U	0.0005 U	--	0.0006 UJ	--
Cis-1,2-Dichloroethylene	--	0.00021 U	--	--	0.00046 U	--	--	--	--	0.00017 U	0.00018 U	--	0.00021 U	--
Cis-1,3-Dichloropropene	--	0.00038 U	--	--	0.00083 U	--	--	--	--	0.0003 U	0.00032 U	--	0.00038 U	--
Cyclohexane	--	0.0033	--	--	0.0039	--	--	--	--	0.0013	0.0011 J	--	0.0017	--
Dibromochloromethane	--	0.00027 U	--	--	0.00059 U	--	--	--	--	0.00021 U	0.00022 U	--	0.00027 U	--
Dichlorodifluoromethane	--	0.00047 U	--	--	0.001 U	--	--	--	--	0.00037 U	0.00039 U	--	0.00047 U	--
Ethylbenzene	--	0.00057 J	--	--	0.0016 J	--	--	--	--	0.00038 J	0.00034 J	--	0.00059 J	--
Isopropylbenzene (Cumene)	--	0.00018 U	--	--	0.00039 U	--	--	--	--	0.00014 U	0.00015 U	--	0.00017 U	--
M,P-Xylene	--	0.0016	--	--	0.0043	--	--	--	--	0.00065 J	0.00091 J	--	0.0013 J	--
Methyl Acetate	--	0.006 U	--	--	0.11	--	--	--	--	0.0048 U	0.005 U	--	0.006 U	--
Methyl Ethyl Ketone (2-Butanone)	--	0.013	--	--	0.012 J	--	--	--	--	0.0025 J+	0.0025 J	--	0.0033 J	--
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	--	0.00093 U	--	--	0.002 U	--	--	--	--	0.00073 U	0.00077 U	--	0.00092 U	--
Methylcyclohexane	--	0.0061	--	--	0.0085	--	--	--	--	0.0023	0.0021	--	0.0035	--
Methylene Chloride	--	0.00023 U	--	--	0.0011 J	--	--	--	--	0.00018 U	0.00019 U	--	0.00023 U	--

Table E-36
Summary of Data Used in Risk Assessment
Backwater Seep Sampling Area (sediment) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSDP-003	CFSDP-003	CFSDP-003	CFSDP-004	CFSDP-004	CFSDP-004	CFSDP-005	CFSDP-005	CFSDP-005-DUP	CFSDP-005	CFSDP-005-DUP	CFSDP-005	CFSDP-027	CFSDP-027
Sample Lab IDs	200-35201-20, 460-119996-1	460-144087-6	180-82692-4, 200-45608-4, 460-166286-4	200-35201-21, 460-119996-2	460-144087-7	180-82692-3, 200-45608-3, 460-166286-3	200-35201-22, 460-119996-3	460-144170-2	460-144170-3	460-144400-2	460-144400-3	180-83255-4, 180-83256-3, 200-45806-9, 200-45807-4, 460-167262-4	460-144087-9	180-82745-1, 180-82746-1, 200-45621-1, 200-45622-1, 460-166239-1
Sample Name	CFSDP-003-SD	CFSDP-003-SD	CFSDP-003-SD	CFSDP-004-SD	CFSDP-004-SD	CFSDP-004-SD	CFSDP-005-SD	CFSDP-005-SD	CFSDP-DUP3-SD	CFSDP-005-SD	CFSDP-DUP3-SD	CFSDP-005-SD	CFSDP-027-SD	CFSDP-027-SD
Chemical	9/9/2016	10/31/2017	10/4/2018	9/9/2016	10/31/2017	10/4/2018	9/9/2016	11/1/2017	11/1/2017	11/2/2017	11/2/2017	10/18/2018	10/31/2017	10/5/2018
O-Xylene (1,2-Dimethylbenzene)	--	0.00045 J	--	--	0.0012 J	--	--	--	--	0.00019 J	0.00031 J	--	0.00042 J	--
Styrene	--	0.00017 U	--	--	0.00038 U	--	--	--	--	0.00014 U	0.00014 U	--	0.00017 U	--
Tert-Butyl Methyl Ether	--	0.00017 U	--	--	0.00038 U	--	--	--	--	0.00014 U	0.00014 U	--	0.00017 U	--
Tetrachloroethylene (PCE)	--	0.0002 U	--	--	0.00044 U	--	--	--	--	0.00021 J	0.00017 U	--	0.0002 U	--
Toluene	--	0.004	--	--	0.011	--	--	--	--	0.0019	0.0019	--	0.0029	--
Trans-1,2-Dichloroethene	--	0.00034 U	--	--	0.00075 U	--	--	--	--	0.00027 U	0.00028 U	--	0.00034 U	--
Trans-1,3-Dichloropropene	--	0.00037 U	--	--	0.00081 U	--	--	--	--	0.00029 U	0.00031 U	--	0.00037 U	--
Trichloroethylene (TCE)	--	0.0002 U	--	--	0.00044 U	--	--	--	--	0.00016 U	0.00017 U	--	0.0002 U	--
Trichlorofluoromethane	--	0.00057 U	--	--	0.0012 U	--	--	--	--	0.00045 U	0.00047 U	--	0.00056 U	--
Vinyl Chloride	--	0.00076 U	--	--	0.0017 U	--	--	--	--	0.0006 U	0.00063 U	--	0.00076 U	--

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-36
Summary of Data Used in Risk Assessment
Backwater Seep Sampling Area (sediment) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSDP-028	CFSDP-028	CFSDP-029	CFSDP-029
Sample Lab IDs	460-144087-10	180-82692-5, 200-45608-5, 460-166286-5	460-144170-1	180-83255-3, 180-83256-2, 200-45806-8, 200-45807-3, 460-167262-3
Sample Name	CFSDP-028-SD	CFSDP-028-SD	CFSDP-029-SD	CFSDP-029-SD
Chemical	10/31/2017	10/4/2018	11/1/2017	10/18/2018
GENERAL CHEMISTRY (mg/kg)				
Fluoride	22.9 J+	7.92 J-	22.2 J+	2.98
Cyanide	1.9	1.1	0.8	0.96
Cyanide (Free)	--	--	--	--
METALS (mg/kg)				
Aluminum	7810	7750	8150	12200 J
Antimony	0.47 U	0.42 UJ	0.32 UJ	0.41 UJ
Arsenic	4.1	2.8	5.2	5.4
Barium	143	78.3	83.9	134
Beryllium	0.49 J	0.39 J	0.42	0.49 J
Cadmium	0.5 U	0.48 U	0.34 U	0.47 U
Calcium	20000	13800	15100	22400 J
Chromium, Total	9.2	8.3	9.3	13.6
Cobalt	5.8	4.8	5.7	6.9
Copper	15.3	9.1	10	14.9
Iron	12900	11600	15200	18800 J
Lead	8.1	9	7	8.9
Magnesium	10700	9960	10400	14400 J
Manganese	231	140	244	211 J-
Mercury	0.027	0.016 U	0.026	0.017 U
Nickel	11.5	10	11.5	14.6
Potassium	910	765	591 J+	1540
Selenium	0.44 U	0.41 U	0.3 U	0.4 U
Silver	0.93 U	0.88 U	0.62 U	0.86 U
Sodium	198	44.7 U	55.2 J	114 J
Thallium	0.19 U	0.18 U	0.18 J	0.17 U
Vanadium	12	14.7	11.8	21.5
Zinc	41.9	36.1	39.1	50.6
METALS SEM|Simultaneously Extracted Metals (mg/kg)				
SEM/AVS	--	1.84	--	QL_ERROR U
METALS|AVS/SEM (mg/kg)				
Cadmium	--	0.00084 J	--	0.00067 J
Copper	--	0.11	--	0.11
Lead	--	0.029	--	0.023
Mercury	--	0.000013 U	--	0.000013 U
Nickel	--	0.065	--	0.048
Sulfide	--	0.24 U	--	0.24 U
Zinc	--	0.25	--	0.16 J
PESTICIDES (mg/kg)				
Aldrin	--	--	--	--
Alpha Bhc (Alpha Hexachlorocyclohexane)	--	--	--	--
Alpha Endosulfan	--	--	--	--
Beta Bhc (Beta Hexachlorocyclohexane)	--	--	--	--
Beta Endosulfan	--	--	--	--
cis-Chlordane	--	--	--	--
Delta BHC (Delta Hexachlorocyclohexane)	--	--	--	--
Dieldrin	--	--	--	--
Endosulfan Sulfate	--	--	--	--
Endrin	--	--	--	--
Endrin Aldehyde	--	--	--	--
Endrin Ketone	--	--	--	--
Gamma Bhc (Lindane)	--	--	--	--
Heptachlor	--	--	--	--
Heptachlor Epoxide	--	--	--	--
Methoxychlor	--	--	--	--
P,P'-DDD	--	--	--	--
P,P'-DDE	--	--	--	--

Table E-36
Summary of Data Used in Risk Assessment
Backwater Seep Sampling Area (sediment) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Chemical	CFSDP-028 460-144087-10 CFSDP-028-SD 10/31/2017	CFSDP-028 180-82692-5, 200-45608-5, 460-166286-5 CFSDP-028-SD 10/4/2018	CFSDP-029 460-144170-1 CFSDP-029-SD 11/1/2017	CFSDP-029 180-83255-3, 180-83256-2, 200-45806-8, 200-45807-3, 460-167262-3 CFSDP-029-SD 10/18/2018
P,P'-DDT	--	--	--	--
Toxaphene	--	--	--	--
trans-Chlordane	--	--	--	--
POLYCHLORINATED BIPHENYLS (mg/kg)				
PCB-1016 (Aroclor 1016)	--	--	--	--
PCB-1221 (Aroclor 1221)	--	--	--	--
PCB-1232 (Aroclor 1232)	--	--	--	--
PCB-1242 (Aroclor 1242)	--	--	--	--
PCB-1248 (Aroclor 1248)	--	--	--	--
PCB-1254 (Aroclor 1254)	--	--	--	--
PCB-1260 (Aroclor 1260)	--	--	--	--
PCB-1262 (Aroclor 1262)	--	--	--	--
PCB-1268 (Aroclor 1268)	--	--	--	--
Polychlorinated Biphenyl (PCBs)	--	--	--	--
SEMIVOLATILE ORGANIC COMPOUNDS (mg/kg)				
1,2,4,5-Tetrachlorobenzene	0.036 U	--	0.031 U	--
1,4-Dioxane (P-Dioxane)	0.13 U	--	0.11 U	--
2,3,4,6-Tetrachlorophenol	0.045 U	--	0.039 U	--
2,4,5-Trichlorophenol	0.048 U	--	0.041 U	--
2,4,6-Trichlorophenol	0.014 U	--	0.012 U	--
2,4-Dichlorophenol	0.011 U	--	0.0098 U	--
2,4-Dimethylphenol	0.11 UJ	--	0.092 U	--
2,4-Dinitrophenol	0.37 U	--	0.31 U	--
2,4-Dinitrotoluene	0.019 U	--	0.016 U	--
2,6-Dinitrotoluene	0.026 U	--	0.022 U	--
2-Chloronaphthalene	0.011 U	--	0.0094 U	--
2-Chlorophenol	0.012 U	--	0.011 U	--
2-Methylnaphthalene	0.011 U	--	0.0092 U	--
2-Methylphenol (O-Cresol)	0.021 U	--	0.018 U	--
2-Nitroaniline	0.016 U	--	0.014 U	--
2-Nitrophenol	0.016 U	--	0.014 U	--
3- And 4- Methylphenol (Total)	0.013 U	--	0.011 U	--
3,3'-Dichlorobenzidine	0.054 U	--	0.046 U	--
3-Nitroaniline	0.014 U	--	0.012 U	--
4,6-Dinitro-2-Methylphenol	0.13 U	--	0.11 U	--
4-Bromophenyl Phenyl Ether	0.015 U	--	0.013 U	--
4-Chloro-3-Methylphenol	0.021 U	--	0.018 U	--
4-Chloroaniline	0.012 U	--	0.011 U	--
4-Chlorophenyl Phenyl Ether	0.014 U	--	0.012 U	--
4-Nitroaniline	0.018 U	--	0.016 U	--
4-Nitrophenol	0.23 U	--	0.2 UJ	--
Acenaphthene	0.012 U	--	0.01 U	--
Acenaphthylene	0.012 U	--	0.011 U	--
Acetophenone	0.011 U	--	0.0091 U	--
Anthracene	0.046 U	--	0.04 U	--
Atrazine	0.021 U	--	0.019 U	--
Benzaldehyde	0.085 J	--	0.032 U	--
Benzo(A)Anthracene	0.084	--	0.035 U	--
Benzo(A)Pyrene	0.055	--	0.071	--
Benzo(B)Fluoranthene	0.17	--	0.34	--
Benzo(G,H,I)Perylene	0.084 J+	--	0.047 J	--
Benzo(K)Fluoranthene	0.059	--	0.018 U	--
Benzyl Butyl Phthalate	0.015 U	--	0.013 U	--
Biphenyl (Diphenyl)	0.041 U	--	0.035 U	--
Bis(2-Chloroethoxy) Methane	0.015 U	--	0.013 U	--
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.011 U	--	0.0098 U	--
Bis(2-Chloroisopropyl) Ether	0.02 U	--	0.017 U	--

Table E-36
Summary of Data Used in Risk Assessment
Backwater Seep Sampling Area (sediment) - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Chemical	CFSDP-028 460-144087-10 CFSDP-028-SD 10/31/2017	CFSDP-028 180-82692-5, 200-45608-5, 460-166286-5 CFSDP-028-SD 10/4/2018	CFSDP-029 460-144170-1 CFSDP-029-SD 11/1/2017	CFSDP-029 180-83255-3, 180-83256-2, 200-45806-8, 200-45807-3, 460-167262-3 CFSDP-029-SD 10/18/2018
Bis(2-Ethylhexyl) Phthalate	0.019 U	--	0.016 U	--
Caprolactam	0.035 U	--	0.03 U	--
Carbazole	0.012 U	--	0.07 J	--
Chrysene	0.18 J	--	0.5	--
Dibenz(A,H)Anthracene	0.025 U	--	0.044	--
Dibenzofuran	0.015 U	--	0.013 U	--
Diethyl Phthalate	0.014 U	--	0.012 U	--
Dimethyl Phthalate	0.014 U	--	0.012 U	--
Di-N-Butyl Phthalate	0.014 U	--	0.012 U	--
Di-N-Octylphthalate	0.025 U	--	0.021 U	--
Fluoranthene	0.17 J	--	0.94	--
Fluorene	0.011 U	--	0.0091 U	--
Hexachlorobenzene	0.02 U	--	0.017 U	--
Hexachlorobutadiene	0.014 U	--	0.012 U	--
Hexachlorocyclopentadiene	0.03 UJ	--	0.026 UJ	--
Hexachloroethane	0.018 U	--	0.015 U	--
Indeno(1,2,3-C,D)Pyrene	0.092 J+	--	0.11	--
Isophorone	0.01 U	--	0.0089 U	--
Naphthalene	0.012 U	--	0.011 U	--
Nitrobenzene	0.015 U	--	0.013 U	--
N-Nitrosodi-N-Propylamine	0.016 U	--	0.014 U	--
N-Nitrosodiphenylamine	0.044 U	--	0.038 U	--
Pentachlorophenol	0.058 U	--	0.05 U	--
Phenanthrene	0.05 J	--	0.14 J	--
Phenol	0.016 U	--	0.014 U	--
Pyrene	0.18 J	--	0.52	--
SEMIVOLATILE ORGANIC COMPOUNDS|LOW LEVEL (mg/kg)				
1,2,4,5-Tetrachlorobenzene	--	0.0034 U	--	0.0021 U
1,4-Dioxane (P-Dioxane)	--	0.024 U	--	0.015 U
2,3,4,6-Tetrachlorophenol	--	0.033 UJ	--	0.021 U
2,4,5-Trichlorophenol	--	0.0056 U	--	0.0035 U
2,4,6-Trichlorophenol	--	0.0043 U	--	0.0027 U
2,4-Dichlorophenol	--	0.0061 U	--	0.0038 U
2,4-Dimethylphenol	--	0.0049 U	--	0.0031 U
2,4-Dinitrophenol	--	0.21 U	--	0.13 U
2,4-Dinitrotoluene	--	0.0039 U	--	0.0025 U
2,6-Dinitrotoluene	--	0.0048 U	--	0.0031 U
2-Chloronaphthalene	--	0.0036 U	--	0.0023 U
2-Chlorophenol	--	0.0036 U	--	0.0023 U
2-Methylnaphthalene	--	0.0038 U	--	0.0024 U
2-Methylphenol (O-Cresol)	--	0.022 U	--	0.014 U
2-Nitroaniline	--	0.036 U	--	0.023 U
2-Nitrophenol	--	0.0045 U	--	0.0028 U
3,3'-Dichlorobenzidine	--	0.073 U	--	0.046 UJ
3-Nitroaniline	--	0.02 U	--	0.013 U
4,6-Dinitro-2-Methylphenol	--	0.14 U	--	0.086 U
4-Bromophenyl Phenyl Ether	--	0.0055 U	--	0.0035 U
4-Chloro-3-Methylphenol	--	0.0037 UJ	--	0.0023 U
4-Chloroaniline	--	0.0026 U	--	0.0017 U
4-Chlorophenyl Phenyl Ether	--	0.0047 U	--	0.003 U
4-Nitroaniline	--	0.0038 U	--	0.0024 U
4-Nitrophenol	--	0.055 UJ	--	0.035 U
Acenaphthene	--	0.0095 J	--	0.0029 U
Acenaphthylene	--	0.0034 U	--	0.0022 U
Acetophenone	--	0.0088 J	--	0.0027 U
Anthracene	--	0.037	--	0.0026 U
Atrazine	--	0.034 UJ	--	0.022 UJ

Table E-36
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Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Chemical	CFSDP-028 460-144087-10 CFSDP-028-SD 10/31/2017	CFSDP-028 180-82692-5, 200-45608-5, 460-166286-5 CFSDP-028-SD 10/4/2018	CFSDP-029 460-144170-1 CFSDP-029-SD 11/1/2017	CFSDP-029 180-83255-3, 180-83256-2, 200-45806-8, 200-45807-3, 460-167262-3 CFSDP-029-SD 10/18/2018
Benzaldehyde	--	0.021 J	--	0.0062 UR
Benzo(A)Anthracene	--	0.34	--	0.021 J
Benzo(A)Pyrene	--	0.19	--	0.013
Benzo(B)Fluoranthene	--	0.74	--	0.045
Benzo(G,H,I)Perylene	--	0.29	--	0.013
Benzo(K)Fluoranthene	--	0.29	--	0.02 J
Benzyl Butyl Phthalate	--	0.054 U	--	0.034 U
Biphenyl (Diphenyl)	--	0.0033 U	--	0.0021 U
Bis(2-Chloroethoxy) Methane	--	0.0037 U	--	0.0024 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	--	0.0028 U	--	0.0018 U
Bis(2-Chloroisopropyl) Ether	--	0.0058 U	--	0.0037 U
Bis(2-Ethylhexyl) Phthalate	--	0.084 U	--	0.053 U
Caprolactam	--	0.051 U	--	0.032 U
Carbazole	--	0.14	--	0.0065 J
Chrysene	--	1.1	--	0.064 J
Dibenz(A,H)Anthracene	--	0.078	--	0.0037 J
Dibenzofuran	--	0.0046 J	--	0.0022 U
Diethyl Phthalate	--	0.023 U	--	0.015 U
Dimethyl Phthalate	--	0.0028 U	--	0.0018 U
Di-N-Butyl Phthalate	--	0.034 U	--	0.022 U
Di-N-Octylphthalate	--	0.046 U	--	0.029 U
Fluoranthene	--	1.3	--	0.052 J
Fluorene	--	0.0083 J	--	0.002 U
Hexachlorobenzene	--	0.0056 U	--	0.0036 U
Hexachlorobutadiene	--	0.0046 U	--	0.0029 U
Hexachlorocyclopentadiene	--	0.004 U	--	0.0025 UJ
Hexachloroethane	--	0.004 U	--	0.0026 U
Indeno(1,2,3-C,D)Pyrene	--	0.26	--	0.011
Isophorone	--	0.004 U	--	0.0025 U
Naphthalene	--	0.0055 J	--	0.0019 U
Nitrobenzene	--	0.029 U	--	0.018 U
N-Nitrosodi-N-Propylamine	--	0.0053 U	--	0.0034 U
N-Nitrosodiphenylamine	--	0.026 U	--	0.017 U
Pentachlorophenol	--	0.13 UJ	--	0.08 U
Phenanthrene	--	0.2	--	0.0089 J
Phenol	--	0.024 U	--	0.015 U
Pyrene	--	0.95	--	0.041
SEMIVOLATILE ORGANIC COMPOUNDS-SIM (mg/kg)				
Acenaphthene	--	0.0076 U	--	0.0004 J
Acenaphthylene	--	0.013 U	--	0.00051 U
Anthracene	--	0.048 J	--	0.0017 J
Benzo(A)Anthracene	--	0.32	--	0.018
Benzo(A)Pyrene	--	0.1	--	0.0089
Benzo(B)Fluoranthene	--	0.47 J	--	0.035
Benzo(G,H,I)Perylene	--	0.12 J	--	0.011
Benzo(K)Fluoranthene	--	0.36 J	--	0.024
Benzo[E]Pyrene	--	0.26 J	--	0.02
C1-Chrysenes	--	0.15 J	--	0.0092 J
C1-Fluoranthenes/Pyrenes	--	0.49 J	--	0.017 J
C1-Fluorenes	--	0.051 U	--	0.002 U
C1-Naphthalenes	--	0.051 U	--	0.002 U
C1-Phenanthrenes/Anthracenes	--	0.18 J	--	0.0053 J
C2-Chrysenes	--	0.051 U	--	0.0024 J
C2-Fluorenes	--	0.051 U	--	0.002 U
C2-Naphthalenes	--	0.051 U	--	0.002 U
C2-Phenanthrenes/Anthracenes	--	0.072 J	--	0.004 J
C3-Chrysenes	--	0.051 U	--	0.002 U

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Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Chemical	CFSDP-028 460-144087-10 CFSDP-028-SD 10/31/2017	CFSDP-028 180-82692-5, 200-45608-5, 460-166286-5 CFSDP-028-SD 10/4/2018	CFSDP-029 460-144170-1 CFSDP-029-SD 11/1/2017	CFSDP-029 180-83255-3, 180-83256-2, 200-45806-8, 200-45807-3, 460-167262-3 CFSDP-029-SD 10/18/2018
C3-Fluorenes	--	0.051 U	--	0.002 U
C3-Naphthalenes	--	0.051 U	--	0.0033 J
C3-Phenanthrenes/Anthracenes	--	0.051 U	--	0.0021 J
C4 Chrysenes	--	0.051 U	--	0.002 U
C4-Naphthalenes	--	0.051 U	--	0.002 U
C4-Phenanthrenes/Anthracenes	--	0.051 U	--	0.002 U
Chrysene	--	0.83	--	0.057 J+
Dibenz(A,H)Anthracene	--	0.043 J	--	0.0033
Fluoranthene	--	1.8	--	0.053
Fluorene	--	0.019 U	--	0.00075 U
Indeno(1,2,3-C,D)Pyrene	--	0.13 J	--	0.011
Naphthalene	--	0.02 U	--	0.00078 U
Perylene	--	0.033 J	--	0.004
Phenanthrene	--	0.47	--	0.0083
Pyrene	--	1	--	0.049 J+
VOLATILE ORGANIC COMPOUNDS (mg/kg)				
1,1,1-Trichloroethane	0.00031 U	--	0.00024 U	--
1,1,2,2-Tetrachloroethane	0.00029 U	--	0.00022 U	--
1,1,2-Trichloro-1,2,2-Trifluoroethane	0.0004 U	--	0.00031 U	--
1,1,2-Trichloroethane	0.00024 U	--	0.00018 U	--
1,1-Dichloroethane	0.00028 U	--	0.00021 U	--
1,1-Dichloroethene	0.0003 U	--	0.00023 U	--
1,2,3-Trichlorobenzene	0.00024 U	--	0.00018 U	--
1,2,4-Trichlorobenzene	0.00012 U	--	0.000094 U	--
1,2-Dibromo-3-Chloropropane	0.00062 U	--	0.00047 U	--
1,2-Dibromoethane (Ethylene Dibromide)	0.00024 U	--	0.00018 U	--
1,2-Dichlorobenzene	0.00019 U	--	0.00015 U	--
1,2-Dichloroethane	0.0004 U	--	0.0003 U	--
1,2-Dichloropropane	0.00057 U	--	0.00043 U	--
1,3-Dichlorobenzene	0.00021 U	--	0.00016 U	--
1,4-Dichlorobenzene	0.00013 U	--	0.0001 U	--
2-Hexanone	0.001 U	--	0.0008 U	--
Acetone	0.06	--	0.03	--
Benzene	0.0019	--	0.001	--
Bromochloromethane	0.00038 U	--	0.00029 U	--
Bromodichloromethane	0.00035 U	--	0.00026 U	--
Bromoform	0.00057 U	--	0.00043 U	--
Bromomethane	0.00064 U	--	0.00048 U	--
Carbon Disulfide	0.0029	--	0.00076 J	--
Carbon Tetrachloride	0.00024 U	--	0.00018 U	--
Chlorobenzene	0.00024 U	--	0.00018 U	--
Chloroethane	0.0007 U	--	0.00053 U	--
Chloroform	0.00043 U	--	0.00033 U	--
Chloromethane	0.00058 UJ	--	0.00044 UJ	--
Cis-1,2-Dichloroethylene	0.0002 U	--	0.00016 U	--
Cis-1,3-Dichloropropene	0.00037 U	--	0.00028 U	--
Cyclohexane	0.0031	--	0.0014	--
Dibromochloromethane	0.00026 U	--	0.0002 U	--
Dichlorodifluoromethane	0.00045 U	--	0.00034 U	--
Ethylbenzene	0.00049 J	--	0.00047 J	--
Isopropylbenzene (Cumene)	0.00017 U	--	0.00013 U	--
M,P-Xylene	0.0014	--	0.0014	--
Methyl Acetate	0.0058 U	--	0.0044 U	--
Methyl Ethyl Ketone (2-Butanone)	0.0063 J	--	0.0035 J	--
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	0.00089 U	--	0.00068 U	--
Methylcyclohexane	0.0051	--	0.0029	--
Methylene Chloride	0.00022 U	--	0.00017 U	--

Table E-36
Summary of Data Used in Risk Assessment
Backwater Seep Sampling Area (sediment) - Current/Future
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Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Chemical	CFSDP-028 460-144087-10 CFSDP-028-SD 10/31/2017	CFSDP-028 180-82692-5, 200-45608-5, 460-166286-5 CFSDP-028-SD 10/4/2018	CFSDP-029 460-144170-1 CFSDP-029-SD 11/1/2017	CFSDP-029 180-83255-3, 180-83256-2, 200-45806-8, 200-45807-3, 460-167262-3 CFSDP-029-SD 10/18/2018
O-Xylene (1,2-Dimethylbenzene)	0.00041 J	--	0.00044 J	--
Styrene	0.00017 U	--	0.00013 U	--
Tert-Butyl Methyl Ether	0.00017 U	--	0.00013 U	--
Tetrachloroethylene (PCE)	0.00019 U	--	0.00015 U	--
Toluene	0.0044	--	0.0026	--
Trans-1,2-Dichloroethene	0.00033 U	--	0.00025 U	--
Trans-1,3-Dichloropropene	0.00036 U	--	0.00027 U	--
Trichloroethylene (TCE)	0.00019 U	--	0.00015 U	--
Trichlorofluoromethane	0.00055 U	--	0.00041 U	--
Vinyl Chloride	0.00073 U	--	0.00056 U	--

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-37
Summary of Data Used in Risk Assessment
Groundwater Upper Hydrogeologic Unit Western Area - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-056B	CFMW-056B	CFMW-056B	CFMW-056B-DUP	CFMW-056B	CFMW-056B	CFMW-056B-DUP	CFMW-056B	CFMW-056B-DUP	CFMW-057b	CFMW-057b	CFMW-059	CFMW-059	CFMW-059
Sample Lab IDs	460-120143-5	460-125342-2	460-130088-1	460-130088-2	460-135884-10	460-158367-3	460-158367-5	460-167033-7	460-167033-8	180-78686-3, 460-158183-4	180-83122-1, 460-167033-4	460-120318-8	460-125342-1	460-130226-10
Sample Name	CFMW-056b-GW	CFMW-056b-GW	CFMW-0566-GW	CFMW-Dup7-GW	CFMW-056b-GW	CFMW-056b-GW	CFMW-DUP17-GW	CFMW-056b-GW	CFMW-DUP23-GW	CFMW-057B-GW	CFMW-057b-GW	CFMW-059-GW	CFMW-059-GW	CFMW-059-GW
Chemical	9/13/2016	12/12/2016	3/21/2017	3/21/2017	6/22/2017	6/14/2018	6/14/2018	10/16/2018	10/16/2018	6/12/2018	10/16/2018	9/15/2016	12/12/2016	3/23/2017
GENERAL CHEMISTRY (µg/L)														
Fluoride	--	--	--	--	188	--	--	--	--	--	--	--	--	--
Cyanide	--	--	--	--	2 U	2 U	2 U	2 U	2 U	2 J	2 U	--	--	--
Cyanide (Free)	--	--	--	--	--	1.5 U	1.5 U	1.5 U	1.8 J	1.5 U	1.5 U	--	--	--
Cyanide	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Cyanide (Free)	--	--	--	--	--	1.5 U	1.5 U	1.5 UJ	2.2 J	1.5 U	1.5 UJ	--	--	--
METALS (µg/L)														
Aluminum	18.2 U	18.2 U	18.2 U	18.2 U	18.2 U	15 U	15 U	15 U	15 U	15 U	15 U	18.2 U	18.2 U	18.2 U
Antimony	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U
Arsenic	0.64 U	0.64 U	0.64 U	0.64 U	0.64 U	0.77 U	0.77 U	0.77 U	0.77 U	0.77 U	0.77 U	0.64 U	0.64 U	0.64 U
Barium	132	132	123	124	149	148	147	127	124	112	104	140	154	146
Beryllium	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.24 U	0.24 U	0.24 U
Cadmium	0.71 U	0.71 U	0.71 U	0.71 U	0.71 U	0.61 U	0.61 U	0.61 U	0.61 U	0.61 U	0.61 U	0.71 U	0.71 U	0.71 U
Calcium	69000	64900	61300	61900	70800	72700	68700	63200	63800	62300	61900	69300	72100	68300
Chromium, Total	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
Cobalt	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
Copper	3.7 J	1.4 U	1.4 U	1.4 U	1.4 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.4 U	1.4 U	1.4 U
Iron	42.4 U	42.4 U	42.4 U	42.4 U	42.4 U	45.7 U	45.7 U	45.7 U	45.7 U	45.7 U	45.7 U	42.4 U	42.4 U	42.4 U
Lead	0.38 U	0.38 U	0.38 U	0.38 U	0.38 U	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U	0.38 U	0.38 U	0.38 U
Magnesium	17500	15400	15600	15700	17600	17700	16500	15600	15700	14100	13600	14100	14100	13900
Manganese	83.2	11.2	2.5 U	2.5 U	2.5 U	2.7 U	2.7 U	2.7 U	2.7 U	22.4	2.7 U	88.4	16.8	2.5 U
Mercury	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.17 U	0.17 U	0.17 U
Nickel	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.4 U	1.4 U	1.4 U
Potassium	925	771	692	700	824	842	761	729	708	694	566	1150	1000	1010
Selenium	0.73 U	0.73 U	0.73 U	0.73 U	0.73 U	0.69 U	0.69 U	0.69 U	0.69 U	0.69 U	0.69 U	0.73 U	0.73 U	0.73 U
Silver	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.3 U	1.3 U	1.3 U
Sodium	9450	7000	3490	3510	9500	8350	7930	4580	4660	2800	3180	20600	15200	18600
Thallium	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.26 U	0.26 U	0.26 U
Vanadium	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U	1.9 U	1.9 U	1.9 U
Zinc	7 U	7 U	7 U	7 U	7 U	33.5	32.3	5.4 U	5.4 U	54	5.4 U	7 U	7 U	7 U
Aluminum	--	--	--	--	18.2 U	168	173	82.8	80.9	348	17.4 J	--	--	--
Antimony	--	--	--	--	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.89 J	--	--	--
Arsenic	--	--	--	--	0.64 U	0.77 U	0.77 U	0.77 U	0.77 U	0.77 U	0.77 U	--	--	--
Barium	--	--	--	--	152	156	151	136	146	121	117	--	--	--
Beryllium	--	--	--	--	0.24 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	--	--	--
Cadmium	--	--	--	--	0.71 U	0.61 U	0.61 U	0.61 U	0.61 U	0.61 U	0.61 U	--	--	--
Calcium	--	--	--	--	69900	68200	66200	67000	72400	60200	67700	--	--	--
Chromium, Total	--	--	--	--	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	--	--	--
Cobalt	--	--	--	--	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	--	--	--
Copper	--	--	--	--	1.4 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	--	--	--
Iron	--	--	--	--	42.4 U	267	262	103 J	107 J	757	45.7 U	--	--	--
Lead	--	--	--	--	0.38 U	0.37 U	0.37 U	0.37 U	0.37 U	0.57 J	0.37 U	--	--	--
Magnesium	--	--	--	--	18500	17100	16300	16500	17700	13800	15000	--	--	--
Manganese	--	--	--	--	2.5 U	5.6 J	5.6 J	3 J	3.5 J	82.2	4.1 J	--	--	--
Mercury	--	--	--	--	0.17 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	--	--	--
Nickel	--	--	--	--	1.4 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	--	--	--
Potassium	--	--	--	--	806	777	765	798	877	846	625	--	--	--
Selenium	--	--	--	--	0.73 U	0.69 U	0.69 U	0.69 U	0.69 U	0.69 U	0.69 U	--	--	--
Silver	--	--	--	--	1.3 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	--	--	--
Sodium	--	--	--	--	9810	8440	8340	5640 J+	6050	3010	3980	--	--	--
Thallium	--	--	--	--	0.26 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	--	--	--
Vanadium	--	--	--	--	1.9 U	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U	--	--	--
Zinc	--	--	--	--	7 U	32.4	31.9	5.4 U	5.4 U	30.2	5.4 U	--	--	--
SEMIVOLATILE ORGANIC COMPOUNDS (µg/L)														
1,2,4,5-Tetrachlorobenzene	--	--	--	--	--	--	--	--	--	0.048 U	--	--	--	--
1,4-Dioxane (P-Dioxane)	--	--	--	--	--	--	--	--	--	0.18 U	--	--	--	--
2,3,4,6-Tetrachlorophenol	--	--	--	--	--	--	--	--	--	0.042 U	--	--	--	--
2,4,5-Trichlorophenol	--	--	--	--	--	--	--	--	--	0.056 U	--	--	--	--

Table E-37
Summary of Data Used in Risk Assessment
Groundwater Upper Hydrogeologic Unit Western Area - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-056B	CFMW-056B	CFMW-056B	CFMW-056B-DUP	CFMW-056B	CFMW-056B	CFMW-056B-DUP	CFMW-056B	CFMW-056B-DUP	CFMW-057b	CFMW-057b	CFMW-059	CFMW-059	CFMW-059
Sample Lab IDs	460-120143-5	460-125342-2	460-130088-1	460-130088-2	460-135884-10	460-158367-3	460-158367-5	460-167033-7	460-167033-8	180-78686-3, 460-158183-4	180-83122-1, 460-167033-4	460-120318-8	460-125342-1	460-130226-10
Sample Name	CFMW-056b-GW	CFMW-056b-GW	CFMW-0566-GW	CFMW-Dup7-GW	CFMW-056b-GW	CFMW-056b-GW	CFMW-DUP17-GW	CFMW-056b-GW	CFMW-DUP23-GW	CFMW-057B-GW	CFMW-057b-GW	CFMW-059-GW	CFMW-059-GW	CFMW-059-GW
Chemical	9/13/2016	12/12/2016	3/21/2017	3/21/2017	6/22/2017	6/14/2018	6/14/2018	10/16/2018	10/16/2018	6/12/2018	10/16/2018	9/15/2016	12/12/2016	3/23/2017
2,4,6-Trichlorophenol	--	--	--	--	--	--	--	--	--	0.063 U	--	--	--	--
2,4-Dichlorophenol	--	--	--	--	--	--	--	--	--	0.047 U	--	--	--	--
2,4-Dimethylphenol	--	--	--	--	--	--	--	--	--	0.038 U	--	--	--	--
2,4-Dinitrophenol	--	--	--	--	--	--	--	--	--	1.4 U	--	--	--	--
2,4-Dinitrotoluene	--	--	--	--	--	--	--	--	--	0.047 U	--	--	--	--
2,6-Dinitrotoluene	--	--	--	--	--	--	--	--	--	0.056 U	--	--	--	--
2-Chloronaphthalene	--	--	--	--	--	--	--	--	--	0.055 U	--	--	--	--
2-Chlorophenol	--	--	--	--	--	--	--	--	--	0.059 U	--	--	--	--
2-Methylnaphthalene	--	--	--	--	--	--	--	--	--	0.057 U	--	--	--	--
2-Methylphenol (O-Cresol)	--	--	--	--	--	--	--	--	--	0.1 U	--	--	--	--
2-Nitroaniline	--	--	--	--	--	--	--	--	--	0.19 U	--	--	--	--
2-Nitrophenol	--	--	--	--	--	--	--	--	--	0.056 U	--	--	--	--
3,3'-Dichlorobenzidine	--	--	--	--	--	--	--	--	--	0.54 U	--	--	--	--
3-Nitroaniline	--	--	--	--	--	--	--	--	--	0.062 U	--	--	--	--
4,6-Dinitro-2-Methylphenol	--	--	--	--	--	--	--	--	--	1.4 U	--	--	--	--
4-Bromophenyl Phenyl Ether	--	--	--	--	--	--	--	--	--	0.058 U	--	--	--	--
4-Chloro-3-Methylphenol	--	--	--	--	--	--	--	--	--	0.056 U	--	--	--	--
4-Chloroaniline	--	--	--	--	--	--	--	--	--	0.041 U	--	--	--	--
4-Chlorophenyl Phenyl Ether	--	--	--	--	--	--	--	--	--	0.056 U	--	--	--	--
4-Nitroaniline	--	--	--	--	--	--	--	--	--	0.054 U	--	--	--	--
4-Nitrophenol	--	--	--	--	--	--	--	--	--	0.13 U	--	--	--	--
Acenaphthene	--	--	--	--	--	--	--	--	--	0.06 U	--	--	--	--
Acenaphthylene	--	--	--	--	--	--	--	--	--	0.06 U	--	--	--	--
Acetophenone	--	--	--	--	--	--	--	--	--	0.057 U	--	--	--	--
Anthracene	--	--	--	--	--	--	--	--	--	0.045 U	--	--	--	--
Atrazine	--	--	--	--	--	--	--	--	--	0.17 UJ	--	--	--	--
Benzaldehyde	--	--	--	--	--	--	--	--	--	0.1 U	--	--	--	--
Benzo(A)Anthracene	--	--	--	--	--	--	--	--	--	0.069 U	--	--	--	--
Benzo(A)Pyrene	--	--	--	--	--	--	--	--	--	0.049 U	--	--	--	--
Benzo(B)Fluoranthene	--	--	--	--	--	--	--	--	--	0.09 U	--	--	--	--
Benzo(G,H,I)Perylene	--	--	--	--	--	--	--	--	--	0.064 U	--	--	--	--
Benzo(K)Fluoranthene	--	--	--	--	--	--	--	--	--	0.081 U	--	--	--	--
Benzyl Butyl Phthalate	--	--	--	--	--	--	--	--	--	0.45 J	--	--	--	--
Biphenyl (Diphenyl)	--	--	--	--	--	--	--	--	--	0.055 U	--	--	--	--
Bis(2-Chloroethoxy) Methane	--	--	--	--	--	--	--	--	--	0.062 U	--	--	--	--
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	--	--	--	--	--	--	--	--	--	0.037 U	--	--	--	--
Bis(2-Chloroisopropyl) Ether	--	--	--	--	--	--	--	--	--	0.054 U	--	--	--	--
Bis(2-Ethylhexyl) Phthalate	--	--	--	--	--	--	--	--	--	4.3 U	--	--	--	--
Caprolactam	--	--	--	--	--	--	--	--	--	0.57 J	--	--	--	--
Carbazole	--	--	--	--	--	--	--	--	--	0.047 U	--	--	--	--
Chrysene	--	--	--	--	--	--	--	--	--	0.075 U	--	--	--	--
Dibenz(A,H)Anthracene	--	--	--	--	--	--	--	--	--	0.067 U	--	--	--	--
Dibenzofuran	--	--	--	--	--	--	--	--	--	0.068 U	--	--	--	--
Diethyl Phthalate	--	--	--	--	--	--	--	--	--	0.53 U	--	--	--	--
Dimethyl Phthalate	--	--	--	--	--	--	--	--	--	0.052 U	--	--	--	--
Di-N-Butyl Phthalate	--	--	--	--	--	--	--	--	--	0.69 U	--	--	--	--
Di-N-Octylphthalate	--	--	--	--	--	--	--	--	--	0.63 U	--	--	--	--
Fluoranthene	--	--	--	--	--	--	--	--	--	0.056 U	--	--	--	--
Fluorene	--	--	--	--	--	--	--	--	--	0.064 U	--	--	--	--
Hexachlorobenzene	--	--	--	--	--	--	--	--	--	0.052 U	--	--	--	--
Hexachlorobutadiene	--	--	--	--	--	--	--	--	--	0.064 U	--	--	--	--
Hexachlorocyclopentadiene	--	--	--	--	--	--	--	--	--	0.46 U	--	--	--	--
Hexachloroethane	--	--	--	--	--	--	--	--	--	0.057 U	--	--	--	--
Indeno(1,2,3-C,D)Pyrene	--	--	--	--	--	--	--	--	--	0.079 U	--	--	--	--
Isophorone	--	--	--	--	--	--	--	--	--	0.05 U	--	--	--	--
Naphthalene	--	--	--	--	--	--	--	--	--	0.055 U	--	--	--	--
Nitrobenzene	--	--	--	--	--	--	--	--	--	0.15 U	--	--	--	--
N-Nitrosodi-N-Propylamine	--	--	--	--	--	--	--	--	--	0.066 U	--	--	--	--

Table E-37
Summary of Data Used in Risk Assessment
Groundwater Upper Hydrogeologic Unit Western Area - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Chemical	CFMW-056B 460-120143-5 CFMW-056b-GW 9/13/2016	CFMW-056B 460-125342-2 CFMW-056b-GW 12/12/2016	CFMW-056B 460-130088-1 CFMW-0566-GW 3/21/2017	CFMW-056B-DUP 460-130088-2 CFMW-Dup7-GW 3/21/2017	CFMW-056B 460-135884-10 CFMW-056b-GW 6/22/2017	CFMW-056B 460-158367-3 CFMW-056b-GW 6/14/2018	CFMW-056B-DUP 460-158367-5 CFMW-DUP17-GW 6/14/2018	CFMW-056B 460-167033-7 CFMW-056b-GW 10/16/2018	CFMW-056B-DUP 460-167033-8 CFMW-DUP23-GW 10/16/2018	CFMW-057b 180-78686-3, 460-158183-4 CFMW-057B-GW 6/12/2018	CFMW-057b 180-83122-1, 460-167033-4 CFMW-057b-GW 10/16/2018	CFMW-059 460-120318-8 CFMW-059-GW 9/15/2016	CFMW-059 460-125342-1 CFMW-059-GW 12/12/2016	CFMW-059 460-130226-10 CFMW-059-GW 3/23/2017
N-Nitrosodiphenylamine	--	--	--	--	--	--	--	--	--	0.11 U	--	--	--	--
Pentachlorophenol	--	--	--	--	--	--	--	--	--	0.22 U	--	--	--	--
Phenanthrene	--	--	--	--	--	--	--	--	--	0.051 U	--	--	--	--
Phenol	--	--	--	--	--	--	--	--	--	0.091 U	--	--	--	--
Pyrene	--	--	--	--	--	--	--	--	--	0.05 U	--	--	--	--
SEMIVOLATILE ORGANIC COMPOUNDS|LOW LEVEL (µg/L)														
1,2,4,5-Tetrachlorobenzene	--	--	--	--	--	--	--	--	--	--	0.048 U	--	--	--
1,4-Dioxane (P-Dioxane)	--	--	--	--	--	--	--	--	--	--	0.18 U	--	--	--
2,3,4,6-Tetrachlorophenol	--	--	--	--	--	--	--	--	--	--	0.042 U	--	--	--
2,4,5-Trichlorophenol	--	--	--	--	--	--	--	--	--	--	0.056 U	--	--	--
2,4,6-Trichlorophenol	--	--	--	--	--	--	--	--	--	--	0.063 U	--	--	--
2,4-Dichlorophenol	--	--	--	--	--	--	--	--	--	--	0.047 U	--	--	--
2,4-Dimethylphenol	--	--	--	--	--	--	--	--	--	--	0.038 U	--	--	--
2,4-Dinitrophenol	--	--	--	--	--	--	--	--	--	--	1.4 U	--	--	--
2,4-Dinitrotoluene	--	--	--	--	--	--	--	--	--	--	0.047 U	--	--	--
2,6-Dinitrotoluene	--	--	--	--	--	--	--	--	--	--	0.056 U	--	--	--
2-Chloronaphthalene	--	--	--	--	--	--	--	--	--	--	0.055 U	--	--	--
2-Chlorophenol	--	--	--	--	--	--	--	--	--	--	0.059 U	--	--	--
2-Methylnaphthalene	--	--	--	--	--	--	--	--	--	--	0.057 U	--	--	--
2-Methylphenol (O-Cresol)	--	--	--	--	--	--	--	--	--	--	0.1 U	--	--	--
2-Nitroaniline	--	--	--	--	--	--	--	--	--	--	0.19 U	--	--	--
2-Nitrophenol	--	--	--	--	--	--	--	--	--	--	0.056 U	--	--	--
3,3'-Dichlorobenzidine	--	--	--	--	--	--	--	--	--	--	0.54 U	--	--	--
3-Nitroaniline	--	--	--	--	--	--	--	--	--	--	0.062 U	--	--	--
4,6-Dinitro-2-Methylphenol	--	--	--	--	--	--	--	--	--	--	1.4 U	--	--	--
4-Bromophenyl Phenyl Ether	--	--	--	--	--	--	--	--	--	--	0.058 U	--	--	--
4-Chloro-3-Methylphenol	--	--	--	--	--	--	--	--	--	--	0.056 U	--	--	--
4-Chloroaniline	--	--	--	--	--	--	--	--	--	--	0.041 U	--	--	--
4-Chlorophenyl Phenyl Ether	--	--	--	--	--	--	--	--	--	--	0.056 U	--	--	--
4-Nitroaniline	--	--	--	--	--	--	--	--	--	--	0.054 U	--	--	--
4-Nitrophenol	--	--	--	--	--	--	--	--	--	--	0.13 U	--	--	--
Acenaphthene	--	--	--	--	--	--	--	--	--	--	0.06 U	--	--	--
Acenaphthylene	--	--	--	--	--	--	--	--	--	--	0.06 U	--	--	--
Acetophenone	--	--	--	--	--	--	--	--	--	--	0.057 U	--	--	--
Anthracene	--	--	--	--	--	--	--	--	--	--	0.045 U	--	--	--
Atrazine	--	--	--	--	--	--	--	--	--	--	0.17 U	--	--	--
Benzaldehyde	--	--	--	--	--	--	--	--	--	--	0.1 U	--	--	--
Benzo(A)Anthracene	--	--	--	--	--	--	--	--	--	--	0.069 U	--	--	--
Benzo(A)Pyrene	--	--	--	--	--	--	--	--	--	--	0.049 U	--	--	--
Benzo(B)Fluoranthene	--	--	--	--	--	--	--	--	--	--	0.09 U	--	--	--
Benzo(G,H,I)Perylene	--	--	--	--	--	--	--	--	--	--	0.064 U	--	--	--
Benzo(K)Fluoranthene	--	--	--	--	--	--	--	--	--	--	0.081 U	--	--	--
Benzyl Butyl Phthalate	--	--	--	--	--	--	--	--	--	--	0.43 U	--	--	--
Biphenyl (Diphenyl)	--	--	--	--	--	--	--	--	--	--	0.055 U	--	--	--
Bis(2-Chloroethoxy) Methane	--	--	--	--	--	--	--	--	--	--	0.062 U	--	--	--
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	--	--	--	--	--	--	--	--	--	--	0.037 U	--	--	--
Bis(2-Chloroisopropyl) Ether	--	--	--	--	--	--	--	--	--	--	0.054 U	--	--	--
Bis(2-Ethylhexyl) Phthalate	--	--	--	--	--	--	--	--	--	--	4.3 U	--	--	--
Caprolactam	--	--	--	--	--	--	--	--	--	--	0.44 U	--	--	--
Carbazole	--	--	--	--	--	--	--	--	--	--	0.047 U	--	--	--
Chrysene	--	--	--	--	--	--	--	--	--	--	0.075 U	--	--	--
Dibenz(A,H)Anthracene	--	--	--	--	--	--	--	--	--	--	0.067 U	--	--	--
Dibenzofuran	--	--	--	--	--	--	--	--	--	--	0.068 U	--	--	--
Diethyl Phthalate	--	--	--	--	--	--	--	--	--	--	0.53 U	--	--	--
Dimethyl Phthalate	--	--	--	--	--	--	--	--	--	--	0.052 U	--	--	--
Di-N-Butyl Phthalate	--	--	--	--	--	--	--	--	--	--	0.69 U	--	--	--
Di-N-Octylphthalate	--	--	--	--	--	--	--	--	--	--	0.63 U	--	--	--
Fluoranthene	--	--	--	--	--	--	--	--	--	--	0.056 U	--	--	--

Table E-37
Summary of Data Used in Risk Assessment
Groundwater Upper Hydrogeologic Unit Western Area - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Chemical	CFMW-056B 460-120143-5 CFMW-056b-GW 9/13/2016	CFMW-056B 460-125342-2 CFMW-056b-GW 12/12/2016	CFMW-056B 460-130088-1 CFMW-0566-GW 3/21/2017	CFMW-056B-DUP 460-130088-2 CFMW-Dup7-GW 3/21/2017	CFMW-056B 460-135884-10 CFMW-056b-GW 6/22/2017	CFMW-056B 460-158367-3 CFMW-056b-GW 6/14/2018	CFMW-056B-DUP 460-158367-5 CFMW-DUP17-GW 6/14/2018	CFMW-056B 460-167033-7 CFMW-056b-GW 10/16/2018	CFMW-056B-DUP 460-167033-8 CFMW-DUP23-GW 10/16/2018	CFMW-057b 180-78686-3, 460-158183-4 CFMW-057B-GW 6/12/2018	CFMW-057b 180-83122-1, 460-167033-4 CFMW-057b-GW 10/16/2018	CFMW-059 460-120318-8 CFMW-059-GW 9/15/2016	CFMW-059 460-125342-1 CFMW-059-GW 12/12/2016	CFMW-059 460-130226-10 CFMW-059-GW 3/23/2017
Fluorene	--	--	--	--	--	--	--	--	--	--	0.064 U	--	--	--
Hexachlorobenzene	--	--	--	--	--	--	--	--	--	--	0.052 U	--	--	--
Hexachlorobutadiene	--	--	--	--	--	--	--	--	--	--	0.064 U	--	--	--
Hexachlorocyclopentadiene	--	--	--	--	--	--	--	--	--	--	0.46 U	--	--	--
Hexachloroethane	--	--	--	--	--	--	--	--	--	--	0.057 U	--	--	--
Indeno(1,2,3-C,D)Pyrene	--	--	--	--	--	--	--	--	--	--	0.079 U	--	--	--
Isophorone	--	--	--	--	--	--	--	--	--	--	0.05 U	--	--	--
Naphthalene	--	--	--	--	--	--	--	--	--	--	0.055 U	--	--	--
Nitrobenzene	--	--	--	--	--	--	--	--	--	--	0.15 U	--	--	--
N-Nitrosodi-N-Propylamine	--	--	--	--	--	--	--	--	--	--	0.066 U	--	--	--
N-Nitrosodiphenylamine	--	--	--	--	--	--	--	--	--	--	0.11 U	--	--	--
Pentachlorophenol	--	--	--	--	--	--	--	--	--	--	0.22 U	--	--	--
Phenanthrene	--	--	--	--	--	--	--	--	--	--	0.06 J	--	--	--
Phenol	--	--	--	--	--	--	--	--	--	--	0.091 U	--	--	--
Pyrene	--	--	--	--	--	--	--	--	--	--	0.05 U	--	--	--
VOLATILE ORGANIC COMPOUNDS (µg/L)														
1,1,1-Trichloroethane	--	--	--	--	--	--	--	--	--	0.24 U	0.24 U	--	--	--
1,1,2,2-Tetrachloroethane	--	--	--	--	--	--	--	--	--	0.37 U	0.37 UJ	--	--	--
1,1,2-Trichloro-1,2,2-Trifluoroethane	--	--	--	--	--	--	--	--	--	0.31 U	0.31 U	--	--	--
1,1,2-Trichloroethane	--	--	--	--	--	--	--	--	--	0.43 U	0.43 U	--	--	--
1,1-Dichloroethane	--	--	--	--	--	--	--	--	--	0.26 U	0.26 U	--	--	--
1,1-Dichloroethene	--	--	--	--	--	--	--	--	--	0.12 U	0.12 U	--	--	--
1,2,3-Trichlorobenzene	--	--	--	--	--	--	--	--	--	0.36 U	0.36 U	--	--	--
1,2,4-Trichlorobenzene	--	--	--	--	--	--	--	--	--	0.37 U	0.37 U	--	--	--
1,2-Dibromo-3-Chloropropane	--	--	--	--	--	--	--	--	--	0.38 U	0.38 UJ	--	--	--
1,2-Dibromoethane (Ethylene Dibromide)	--	--	--	--	--	--	--	--	--	0.5 U	0.5 U	--	--	--
1,2-Dichlorobenzene	--	--	--	--	--	--	--	--	--	0.43 U	0.43 U	--	--	--
1,2-Dichloroethane	--	--	--	--	--	--	--	--	--	0.43 U	0.43 UJ	--	--	--
1,2-Dichloropropane	--	--	--	--	--	--	--	--	--	0.35 U	0.35 U	--	--	--
1,3-Dichlorobenzene	--	--	--	--	--	--	--	--	--	0.34 U	0.34 U	--	--	--
1,4-Dichlorobenzene	--	--	--	--	--	--	--	--	--	0.76 U	0.76 U	--	--	--
2-Hexanone	--	--	--	--	--	--	--	--	--	2.9 U	2.9 U	--	--	--
Acetone	--	--	--	--	--	--	--	--	--	5 U	5 U	--	--	--
Benzene	--	--	--	--	--	--	--	--	--	0.43 U	0.43 U	--	--	--
Bromochloromethane	--	--	--	--	--	--	--	--	--	0.41 U	0.41 U	--	--	--
Bromodichloromethane	--	--	--	--	--	--	--	--	--	0.34 U	0.34 U	--	--	--
Bromoform	--	--	--	--	--	--	--	--	--	0.54 U	0.54 U	--	--	--
Bromomethane	--	--	--	--	--	--	--	--	--	1 U	1 UJ	--	--	--
Carbon Disulfide	--	--	--	--	--	--	--	--	--	0.16 U	0.16 U	--	--	--
Carbon Tetrachloride	--	--	--	--	--	--	--	--	--	0.21 U	0.21 U	--	--	--
Chlorobenzene	--	--	--	--	--	--	--	--	--	0.38 U	0.38 U	--	--	--
Chloroethane	--	--	--	--	--	--	--	--	--	0.32 U	0.32 U	--	--	--
Chloroform	--	--	--	--	--	--	--	--	--	0.33 U	0.33 U	--	--	--
Chloromethane	--	--	--	--	--	--	--	--	--	0.14 U	0.14 UJ	--	--	--
Cis-1,2-Dichloroethylene	--	--	--	--	--	--	--	--	--	0.22 U	0.22 U	--	--	--
Cis-1,3-Dichloropropene	--	--	--	--	--	--	--	--	--	0.46 U	0.46 U	--	--	--
Cyclohexane	--	--	--	--	--	--	--	--	--	0.32 U	0.32 U	--	--	--
Dibromochloromethane	--	--	--	--	--	--	--	--	--	0.28 U	0.28 U	--	--	--
Dichlorodifluoromethane	--	--	--	--	--	--	--	--	--	0.12 U	0.12 UJ	--	--	--
Ethylbenzene	--	--	--	--	--	--	--	--	--	0.3 U	0.3 U	--	--	--
Isopropylbenzene (Cumene)	--	--	--	--	--	--	--	--	--	0.34 U	0.34 U	--	--	--
M,P-Xylene	--	--	--	--	--	--	--	--	--	0.3 U	0.3 U	--	--	--
Methyl Acetate	--	--	--	--	--	--	--	--	--	0.31 U	0.31 UJ	--	--	--
Methyl Ethyl Ketone (2-Butanone)	--	--	--	--	--	--	--	--	--	1.9 U	1.9 U	--	--	--
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	--	--	--	--	--	--	--	--	--	2.7 U	2.7 U	--	--	--
Methylcyclohexane	--	--	--	--	--	--	--	--	--	0.26 U	0.26 UJ	--	--	--
Methylene Chloride	--	--	--	--	--	--	--	--	--	0.32 U	0.32 U	--	--	--
O-Xylene (1,2-Dimethylbenzene)	--	--	--	--	--	--	--	--	--	0.36 U	0.36 U	--	--	--

Table E-37
Summary of Data Used in Risk Assessment
Groundwater Upper Hydrogeologic Unit Western Area - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-056B	CFMW-056B	CFMW-056B	CFMW-056B-DUP	CFMW-056B	CFMW-056B	CFMW-056B-DUP	CFMW-056B	CFMW-056B-DUP	CFMW-057b	CFMW-057b	CFMW-059	CFMW-059	CFMW-059
Sample Lab IDs	460-120143-5	460-125342-2	460-130088-1	460-130088-2	460-135884-10	460-158367-3	460-158367-5	460-167033-7	460-167033-8	180-78686-3, 460-158183-4	180-83122-1, 460-167033-4	460-120318-8	460-125342-1	460-130226-10
Sample Name	CFMW-056b-GW	CFMW-056b-GW	CFMW-0566-GW	CFMW-Dup7-GW	CFMW-056b-GW	CFMW-056b-GW	CFMW-DUP17-GW	CFMW-056b-GW	CFMW-DUP23-GW	CFMW-057B-GW	CFMW-057b-GW	CFMW-059-GW	CFMW-059-GW	CFMW-059-GW
Chemical	9/13/2016	12/12/2016	3/21/2017	3/21/2017	6/22/2017	6/14/2018	6/14/2018	10/16/2018	10/16/2018	6/12/2018	10/16/2018	9/15/2016	12/12/2016	3/23/2017
Styrene	--	--	--	--	--	--	--	--	--	0.42 U	0.42 U	--	--	--
Tert-Butyl Methyl Ether	--	--	--	--	--	--	--	--	--	0.47 U	0.47 UJ	--	--	--
Tetrachloroethylene (PCE)	--	--	--	--	--	--	--	--	--	0.25 U	0.25 U	--	--	--
Toluene	--	--	--	--	--	--	--	--	--	0.38 U	0.38 U	--	--	--
Trans-1,2-Dichloroethene	--	--	--	--	--	--	--	--	--	0.24 U	0.24 U	--	--	--
Trans-1,3-Dichloropropene	--	--	--	--	--	--	--	--	--	0.49 U	0.49 U	--	--	--
Trichloroethylene (TCE)	--	--	--	--	--	--	--	--	--	0.31 U	0.31 U	--	--	--
Trichlorofluoromethane	--	--	--	--	--	--	--	--	--	0.14 U	0.14 U	--	--	--
Vinyl Chloride	--	--	--	--	--	--	--	--	--	0.17 U	0.17 U	--	--	--

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-37
Summary of Data Used in Risk Assessment
Groundwater Upper Hydrogeologic Unit Western Area - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-059	CFMW-059	CFMW-059	CFMW-059	CFMW-065	CFMW-065	CFMW-068	CFMW-068	CFMW-069	CFMW-069	CFMW-071	CFMW-071
Sample Lab IDs	460-135818-11	460-158183-3	460-166506-6	460-166928-3	180-78788-1, 460-158367-1	180-83066-5, 460-166928-7	180-78686-2, 460-158183-2	180-82834-3, 460-166506-5	180-78788-2, 460-158367-2	180-83122-2, 460-167033-5	180-78686-1, 460-158183-1	180-82834-2, 460-166506-4
Sample Name	CFMW-059-GW	CFMW-059-GW	CFMW-059-GW	CFMW-59a-GW	CFMW-065-GW	CFMW-065-GW	CFMW-068-GW	CFMW-068-GW	CFMW-069-GW	CFMW-069-GW	CFMW-071-GW	CFMW-071-GW
Chemical	6/21/2017	6/12/2018	10/9/2018	10/15/2018	6/14/2018	10/15/2018	6/12/2018	10/9/2018	6/14/2018	10/16/2018	6/12/2018	10/9/2018
GENERAL CHEMISTRY (µg/L)												
Fluoride	96	--	--	--	--	--	--	--	--	--	--	--
Cyanide	2 U	2 UR	2 U	2 U	2 U	2 U	2 UR	2 U	2 U	2 U	18.9 J	18.1
Cyanide (Free)	--	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U
Cyanide	2 U	2 U	2 U	2 U	2 U	2 U	2.6 J	2 U	2 U	2 U	22.1	20.6
Cyanide (Free)	--	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U	1.7 J-	1.5 U	1.5 U
METALS (µg/L)												
Aluminum	18.2 U	15 U	20 J	21.5 J	15 U	15 U	15 U	15 U	15 U	15 U	20.2 J	15 U
Antimony	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U
Arsenic	0.64 U	0.77 U	0.77 U	3.5	0.77 U	0.77 U	0.77 U	0.77 U	0.77 U	0.77 U	0.77 U	0.77 U
Barium	145	148	148	163	220	235	120	119	112	112	130	152
Beryllium	0.24 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U
Cadmium	0.71 U	0.61 U	0.61 U	0.61 U	0.61 U	0.61 U	0.61 U	0.61 U	0.61 U	0.61 U	0.61 U	0.61 U
Calcium	55000	69300	71200	42900	69800	76600	71100	67500	64400	61200	59900	74400
Chromium, Total	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
Cobalt	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
Copper	1.4 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U
Iron	129	45.7 U	45.7 U	48.7 J	45.7 U	45.7 U	45.7 U	45.7 U	45.7 U	45.7 U	45.7 U	45.7 U
Lead	0.38 U	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U
Magnesium	14200	14200	14700	12300	15800	17200	17000	16700	14900	14600	15500	18200
Manganese	2.5 U	2.7 U	2.7 U	66.8	2.7 U	2.7 U	63	6.1 J	34.6	3.7 J	9.9	2.7 U
Mercury	0.17 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U
Nickel	1.4 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
Potassium	917	948	1050	2670	1030	964	967	746	679	558	3080	1000
Selenium	0.73 U	0.69 U	0.69 U	0.69 U	0.69 U	0.69 U	0.69 U	0.69 U	0.69 U	0.69 U	0.69 U	0.69 U
Silver	1.3 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U
Sodium	30600	11800	13700	4460	17200	18100	3440	2570	2570	2630	12900	5680
Thallium	0.26 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U
Vanadium	1.9 U	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U
Zinc	7 U	70.6	7.9 J	5.4 U	8.4 J	5.4 U	56.5	5.4 U	28.5	5.4 U	115	5.4 U
Aluminum	619	65.9	182	1060	15 J	114	16.9 J	17.8 J	99.8	43.5	37.8 J	44.1
Antimony	0.62 U	0.62 U	0.62 U	1.2 J	0.62 U	1.1 J	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U
Arsenic	0.64 U	0.77 U	0.77 U	3.2	0.77 U	0.77 U	0.77 U	0.77 U	0.77 U	0.77 U	0.77 U	0.77 U
Barium	158	149	149	174	214	261	119	121	116	123	145	153
Beryllium	0.24 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U
Cadmium	0.71 U	0.61 U	0.61 U	0.61 U	0.61 U	0.61 U	0.61 U	0.61 U	0.61 U	0.61 U	0.61 U	0.61 U
Calcium	68700	65900	75600	45400	63000	81000	68900	72100	60300	66700	62800	80900
Chromium, Total	1.3 U	1.3 U	1.3 U	2.5 J	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
Cobalt	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
Copper	2.1 J	1.9 U	3.8 J	2.2 J	1.9 U	1.9 U	1.9 U	1.9 J	1.9 U	1.9 U	1.9 U	1.9 U
Iron	940	90.1 J	236	1300	45.7 U	228	45.7 U	45.7 U	165	47.1 J	65.9 J	73.6 J
Lead	0.73 J	0.37 U	0.57 J	0.79 J	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U
Magnesium	15200	13600	15400	12400	14800	18200	17000	17100	14400	16500	16000	19100
Manganese	40.5	2.7 U	9	93.8	2.7 U	12.3	81.4	6.8 J	36.2	5.8 J	12.5	2.7 U
Mercury	0.17 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U
Nickel	1.4 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
Potassium	1230	1070	1130	2200	888	1050	1150	780	602	624	2650	1080
Selenium	0.73 U	0.69 U	0.69 U	0.69 U	0.69 U	0.69 U	0.69 U	0.69 U	0.69 U	0.69 U	0.69 U	0.69 U
Silver	1.3 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U
Sodium	21600	12100	14000	4430 J+	18900	19300	3930	3070	2840	3220	13400	6300
Thallium	0.26 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U
Vanadium	1.9 U	1.2 U	1.2 U	2.1 J	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U
Zinc	7 U	64.6	5.4 U	6.7 J	9.1 J	5.4 U	56.9	5.4 U	46.8	5.4 U	145	5.4 U
SEMIVOLATILE ORGANIC COMPOUNDS (µg/L)												
1,2,4,5-Tetrachlorobenzene	--	--	--	--	0.054 U	--	0.05 U	--	0.05 U	--	0.052 U	--
1,4-Dioxane (P-Dioxane)	--	--	--	--	0.2 U	--	0.19 U	--	0.19 U	--	0.19 U	--
2,3,4,6-Tetrachlorophenol	--	--	--	--	0.047 U	--	0.043 U	--	0.043 U	--	0.045 U	--
2,4,5-Trichlorophenol	--	--	--	--	0.064 U	--	0.059 U	--	0.059 U	--	0.061 U	--

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Summary of Data Used in Risk Assessment
Groundwater Upper Hydrogeologic Unit Western Area - Future
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Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Chemical	CFMW-059 460-135818-11 CFMW-059-GW 6/21/2017	CFMW-059 460-158183-3 CFMW-059-GW 6/12/2018	CFMW-059 460-166506-6 CFMW-059-GW 10/9/2018	CFMW-059 460-166928-3 CFMW-59a-GW 10/15/2018	CFMW-065 180-78788-1, 460-158367-1 CFMW-065-GW 6/14/2018	CFMW-065 180-83066-5, 460-166928-7 CFMW-065-GW 10/15/2018	CFMW-068 180-78686-2, 460-158183-2 CFMW-068-GW 6/12/2018	CFMW-068 180-82834-3, 460-166506-5 CFMW-068-GW 10/9/2018	CFMW-069 180-78788-2, 460-158367-2 CFMW-069-GW 6/14/2018	CFMW-069 180-83122-2, 460-167033-5 CFMW-069-GW 10/16/2018	CFMW-071 180-78686-1, 460-158183-1 CFMW-071-GW 6/12/2018	CFMW-071 180-82834-2, 460-166506-4 CFMW-071-GW 10/9/2018
2,4,6-Trichlorophenol	--	--	--	--	0.071 U	--	0.065 U	--	0.065 U	--	0.068 U	--
2,4-Dichlorophenol	--	--	--	--	0.053 U	--	0.049 U	--	0.049 U	--	0.051 U	--
2,4-Dimethylphenol	--	--	--	--	0.043 U	--	0.039 U	--	0.039 U	--	0.041 U	--
2,4-Dinitrophenol	--	--	--	--	1.6 U	--	1.5 U	--	1.5 U	--	1.5 U	--
2,4-Dinitrotoluene	--	--	--	--	0.053 U	--	0.049 U	--	0.049 U	--	0.051 U	--
2,6-Dinitrotoluene	--	--	--	--	0.063 U	--	0.058 U	--	0.058 U	--	0.06 U	--
2-Chloronaphthalene	--	--	--	--	0.061 U	--	0.057 U	--	0.057 U	--	0.059 U	--
2-Chlorophenol	--	--	--	--	0.067 U	--	0.062 U	--	0.062 U	--	0.064 U	--
2-Methylnaphthalene	--	--	--	--	0.065 U	--	0.06 U	--	0.06 U	--	0.062 U	--
2-Methylphenol (O-Cresol)	--	--	--	--	0.11 U	--	0.1 U	--	0.1 U	--	0.11 U	--
2-Nitroaniline	--	--	--	--	0.22 U	--	0.2 U	--	0.2 U	--	0.21 U	--
2-Nitrophenol	--	--	--	--	0.064 U	--	0.059 U	--	0.059 U	--	0.061 U	--
3,3'-Dichlorobenzidine	--	--	--	--	0.61 U	--	0.56 U	--	0.56 U	--	0.58 U	--
3-Nitroaniline	--	--	--	--	0.07 U	--	0.064 U	--	0.064 U	--	0.067 U	--
4,6-Dinitro-2-Methylphenol	--	--	--	--	1.5 U	--	1.4 U	--	1.4 U	--	1.5 U	--
4-Bromophenyl Phenyl Ether	--	--	--	--	0.066 U	--	0.061 U	--	0.061 U	--	0.063 U	--
4-Chloro-3-Methylphenol	--	--	--	--	0.064 U	--	0.059 U	--	0.059 U	--	0.061 U	--
4-Chloroaniline	--	--	--	--	0.046 U	--	0.042 U	--	0.042 U	--	0.044 U	--
4-Chlorophenyl Phenyl Ether	--	--	--	--	0.064 U	--	0.059 U	--	0.059 U	--	0.061 U	--
4-Nitroaniline	--	--	--	--	0.06 U	--	0.056 U	--	0.056 U	--	0.058 U	--
4-Nitrophenol	--	--	--	--	0.15 U	--	0.14 U	--	0.14 U	--	0.14 U	--
Acenaphthene	--	--	--	--	0.068 U	--	0.063 U	--	0.063 U	--	0.065 U	--
Acenaphthylene	--	--	--	--	0.068 U	--	0.063 U	--	0.063 U	--	0.065 U	--
Acetophenone	--	--	--	--	0.065 U	--	0.06 U	--	0.06 U	--	0.062 U	--
Anthracene	--	--	--	--	0.051 U	--	0.047 U	--	0.047 U	--	0.049 U	--
Atrazine	--	--	--	--	0.19 UJ	--	0.18 UJ	--	0.18 UJ	--	0.18 UJ	--
Benzaldehyde	--	--	--	--	0.12 U	--	0.11 U	--	0.11 U	--	0.11 U	--
Benzo(A)Anthracene	--	--	--	--	0.078 U	--	0.072 U	--	0.072 U	--	0.075 U	--
Benzo(A)Pyrene	--	--	--	--	0.055 U	--	0.051 U	--	0.051 U	--	0.053 U	--
Benzo(B)Fluoranthene	--	--	--	--	0.1 U	--	0.093 U	--	0.093 U	--	0.097 U	--
Benzo(G,H,I)Perylene	--	--	--	--	0.072 U	--	0.066 U	--	0.066 U	--	0.069 U	--
Benzo(K)Fluoranthene	--	--	--	--	0.092 U	--	0.085 U	--	0.085 U	--	0.088 U	--
Benzyl Butyl Phthalate	--	--	--	--	0.48 U	--	0.51 J	--	0.44 U	--	0.52 J	--
Biphenyl (Diphenyl)	--	--	--	--	0.061 U	--	0.057 U	--	0.057 U	--	0.059 U	--
Bis(2-Chloroethoxy) Methane	--	--	--	--	0.07 U	--	0.064 U	--	0.064 U	--	0.067 U	--
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	--	--	--	--	0.042 U	--	0.038 U	--	0.038 U	--	0.04 U	--
Bis(2-Chloroisopropyl) Ether	--	--	--	--	0.06 U	--	0.056 U	--	0.056 U	--	0.058 U	--
Bis(2-Ethylhexyl) Phthalate	--	--	--	--	4.8 U	--	4.4 U	--	4.4 U	--	4.6 U	--
Caprolactam	--	--	--	--	0.49 U	--	0.74 J	--	0.45 U	--	0.89 J	--
Carbazole	--	--	--	--	0.053 U	--	0.049 U	--	0.049 U	--	0.051 U	--
Chrysene	--	--	--	--	0.084 U	--	0.078 U	--	0.078 U	--	0.081 U	--
Dibenz(A,H)Anthracene	--	--	--	--	0.075 U	--	0.069 U	--	0.069 U	--	0.072 U	--
Dibenzofuran	--	--	--	--	0.076 U	--	0.07 U	--	0.07 U	--	0.073 U	--
Diethyl Phthalate	--	--	--	--	0.59 U	--	0.55 U	--	0.55 U	--	0.57 U	--
Dimethyl Phthalate	--	--	--	--	0.058 U	--	0.054 U	--	0.054 U	--	0.056 U	--
Di-N-Butyl Phthalate	--	--	--	--	0.77 U	--	0.71 U	--	0.71 U	--	0.74 U	--
Di-N-Octylphthalate	--	--	--	--	0.71 U	--	0.66 U	--	0.66 U	--	0.69 U	--
Fluoranthene	--	--	--	--	0.063 U	--	0.058 U	--	0.058 U	--	0.06 U	--
Fluorene	--	--	--	--	0.072 U	--	0.066 U	--	0.066 U	--	0.069 U	--
Hexachlorobenzene	--	--	--	--	0.058 U	--	0.054 U	--	0.054 U	--	0.056 U	--
Hexachlorobutadiene	--	--	--	--	0.072 U	--	0.066 U	--	0.066 U	--	0.069 U	--
Hexachlorocyclopentadiene	--	--	--	--	0.52 U	--	0.48 U	--	0.48 U	--	0.5 U	--
Hexachloroethane	--	--	--	--	0.065 U	--	0.06 U	--	0.06 U	--	0.062 U	--
Indeno(1,2,3-C,D)Pyrene	--	--	--	--	0.089 U	--	0.082 U	--	0.082 U	--	0.085 U	--
Isophorone	--	--	--	--	0.056 U	--	0.052 U	--	0.052 U	--	0.054 U	--
Naphthalene	--	--	--	--	0.18 J	--	0.057 U	--	0.057 U	--	0.059 U	--
Nitrobenzene	--	--	--	--	0.17 U	--	0.16 U	--	0.16 U	--	0.17 U	--
N-Nitrosodi-N-Propylamine	--	--	--	--	0.074 U	--	0.068 U	--	0.068 U	--	0.071 U	--

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Columbia Falls, Montana

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N-Nitrosodiphenylamine	--	--	--	--	0.12 U	--	0.11 U	--	0.11 U	--	0.12 U	--
Pentachlorophenol	--	--	--	--	0.25 U	--	0.23 U	--	0.23 U	--	0.24 U	--
Phenanthrene	--	--	--	--	0.057 U	--	0.053 U	--	0.053 U	--	0.055 U	--
Phenol	--	--	--	--	0.1 U	--	0.094 U	--	0.094 U	--	0.098 U	--
Pyrene	--	--	--	--	0.056 U	--	0.052 U	--	0.052 U	--	0.054 U	--
SEMIVOLATILE ORGANIC COMPOUNDS|LOW LEVEL (µg/L)												
1,2,4,5-Tetrachlorobenzene	--	--	--	--	--	0.048 U	--	0.05 U	--	0.052 U	--	0.052 U
1,4-Dioxane (P-Dioxane)	--	--	--	--	--	0.18 U	--	0.19 U	--	0.19 U	--	0.19 U
2,3,4,6-Tetrachlorophenol	--	--	--	--	--	0.042 U	--	0.043 U	--	0.045 U	--	0.045 U
2,4,5-Trichlorophenol	--	--	--	--	--	0.056 U	--	0.059 U	--	0.061 U	--	0.061 U
2,4,6-Trichlorophenol	--	--	--	--	--	0.063 U	--	0.065 U	--	0.068 U	--	0.068 U
2,4-Dichlorophenol	--	--	--	--	--	0.047 U	--	0.049 U	--	0.051 U	--	0.051 U
2,4-Dimethylphenol	--	--	--	--	--	0.038 U	--	0.039 U	--	0.041 U	--	0.041 U
2,4-Dinitrophenol	--	--	--	--	--	1.4 UJ	--	1.5 U	--	1.5 U	--	1.5 UJ
2,4-Dinitrotoluene	--	--	--	--	--	0.047 U	--	0.049 U	--	0.051 U	--	0.051 U
2,6-Dinitrotoluene	--	--	--	--	--	0.056 U	--	0.058 U	--	0.06 U	--	0.06 U
2-Chloronaphthalene	--	--	--	--	--	0.055 U	--	0.057 U	--	0.059 U	--	0.059 U
2-Chlorophenol	--	--	--	--	--	0.059 U	--	0.062 U	--	0.064 U	--	0.064 U
2-Methylnaphthalene	--	--	--	--	--	0.057 U	--	0.06 U	--	0.062 U	--	0.062 U
2-Methylphenol (O-Cresol)	--	--	--	--	--	0.1 U	--	0.1 U	--	0.11 U	--	0.11 U
2-Nitroaniline	--	--	--	--	--	0.19 U	--	0.2 U	--	0.21 U	--	0.21 U
2-Nitrophenol	--	--	--	--	--	0.056 U	--	0.059 U	--	0.061 U	--	0.061 U
3,3'-Dichlorobenzidine	--	--	--	--	--	0.54 U	--	0.56 U	--	0.58 U	--	0.58 U
3-Nitroaniline	--	--	--	--	--	0.062 U	--	0.064 U	--	0.067 U	--	0.067 U
4,6-Dinitro-2-Methylphenol	--	--	--	--	--	1.4 U	--	1.4 U	--	1.5 U	--	1.5 U
4-Bromophenyl Phenyl Ether	--	--	--	--	--	0.058 U	--	0.061 U	--	0.063 U	--	0.063 U
4-Chloro-3-Methylphenol	--	--	--	--	--	0.056 U	--	0.059 U	--	0.061 U	--	0.061 U
4-Chloroaniline	--	--	--	--	--	0.041 U	--	0.042 U	--	0.044 U	--	0.044 U
4-Chlorophenyl Phenyl Ether	--	--	--	--	--	0.056 U	--	0.059 U	--	0.061 U	--	0.061 U
4-Nitroaniline	--	--	--	--	--	0.054 U	--	0.056 U	--	0.058 U	--	0.058 U
4-Nitrophenol	--	--	--	--	--	0.13 U	--	0.14 U	--	0.14 U	--	0.14 U
Acenaphthene	--	--	--	--	--	0.06 U	--	0.063 U	--	0.065 U	--	0.065 U
Acenaphthylene	--	--	--	--	--	0.06 U	--	0.063 U	--	0.065 U	--	0.065 U
Acetophenone	--	--	--	--	--	0.057 U	--	0.06 U	--	0.062 U	--	0.062 U
Anthracene	--	--	--	--	--	0.045 U	--	0.047 U	--	0.049 U	--	0.049 U
Atrazine	--	--	--	--	--	0.17 U	--	0.18 U	--	0.18 U	--	0.18 U
Benzaldehyde	--	--	--	--	--	0.1 U	--	0.11 U	--	0.11 U	--	0.11 U
Benzo(A)Anthracene	--	--	--	--	--	0.069 U	--	0.072 U	--	0.075 U	--	0.075 U
Benzo(A)Pyrene	--	--	--	--	--	0.049 U	--	0.051 U	--	0.053 U	--	0.053 U
Benzo(B)Fluoranthene	--	--	--	--	--	0.09 U	--	0.093 U	--	0.097 U	--	0.097 U
Benzo(G,H,I)Perylene	--	--	--	--	--	0.064 U	--	0.066 U	--	0.069 U	--	0.069 U
Benzo(K)Fluoranthene	--	--	--	--	--	0.081 U	--	0.085 U	--	0.088 U	--	0.088 U
Benzyl Butyl Phthalate	--	--	--	--	--	0.43 U	--	0.44 J	--	0.46 U	--	1 U
Biphenyl (Diphenyl)	--	--	--	--	--	0.055 U	--	0.057 U	--	0.059 U	--	0.059 U
Bis(2-Chloroethoxy) Methane	--	--	--	--	--	0.062 U	--	0.064 U	--	0.067 U	--	0.067 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	--	--	--	--	--	0.037 U	--	0.038 U	--	0.04 U	--	0.04 U
Bis(2-Chloroisopropyl) Ether	--	--	--	--	--	0.054 U	--	0.056 U	--	0.058 U	--	0.058 U
Bis(2-Ethylhexyl) Phthalate	--	--	--	--	--	4.3 U	--	4.4 U	--	73 D	--	4.6 U
Caprolactam	--	--	--	--	--	0.44 U	--	0.45 U	--	0.47 U	--	0.52 J
Carbazole	--	--	--	--	--	0.047 U	--	0.049 U	--	0.051 U	--	0.051 U
Chrysene	--	--	--	--	--	0.075 U	--	0.078 U	--	0.081 U	--	0.081 U
Dibenz(A,H)Anthracene	--	--	--	--	--	0.067 U	--	0.069 U	--	0.072 U	--	0.072 U
Dibenzofuran	--	--	--	--	--	0.068 U	--	0.07 U	--	0.073 U	--	0.073 U
Diethyl Phthalate	--	--	--	--	--	0.53 U	--	0.55 U	--	0.57 U	--	0.57 U
Dimethyl Phthalate	--	--	--	--	--	0.052 U	--	0.054 U	--	0.056 U	--	0.056 U
Di-N-Butyl Phthalate	--	--	--	--	--	0.69 U	--	0.71 U	--	0.74 U	--	0.74 U
Di-N-Octylphthalate	--	--	--	--	--	0.63 U	--	0.66 U	--	0.69 U	--	1 U
Fluoranthene	--	--	--	--	--	0.056 U	--	0.058 U	--	0.06 U	--	0.06 U

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Fluorene	--	--	--	--	--	0.064 U	--	0.066 U	--	0.069 U	--	0.069 U
Hexachlorobenzene	--	--	--	--	--	0.052 U	--	0.054 U	--	0.056 U	--	0.056 U
Hexachlorobutadiene	--	--	--	--	--	0.064 U	--	0.066 U	--	0.069 U	--	0.069 U
Hexachlorocyclopentadiene	--	--	--	--	--	0.46 U	--	0.48 U	--	0.5 U	--	0.5 U
Hexachloroethane	--	--	--	--	--	0.057 U	--	0.06 U	--	0.062 U	--	0.062 U
Indeno(1,2,3-C,D)Pyrene	--	--	--	--	--	0.079 U	--	0.082 U	--	0.085 U	--	0.085 U
Isophorone	--	--	--	--	--	0.05 U	--	0.052 U	--	0.054 U	--	0.054 U
Naphthalene	--	--	--	--	--	0.055 U	--	0.057 U	--	0.059 U	--	0.059 U
Nitrobenzene	--	--	--	--	--	0.15 U	--	0.16 U	--	0.17 U	--	0.17 U
N-Nitrosodi-N-Propylamine	--	--	--	--	--	0.066 U	--	0.068 U	--	0.071 U	--	0.071 U
N-Nitrosodiphenylamine	--	--	--	--	--	0.11 U	--	0.11 U	--	0.12 U	--	0.12 U
Pentachlorophenol	--	--	--	--	--	0.22 U	--	0.23 U	--	0.24 U	--	0.24 UJ
Phenanthrene	--	--	--	--	--	0.051 U	--	0.056 J	--	0.055 U	--	0.19 U
Phenol	--	--	--	--	--	0.091 U	--	0.094 U	--	0.098 U	--	0.098 U
Pyrene	--	--	--	--	--	0.05 U	--	0.052 U	--	0.054 U	--	0.054 U
VOLATILE ORGANIC COMPOUNDS (µg/L)												
1,1,1-Trichloroethane	--	--	--	--	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U
1,1,2,2-Tetrachloroethane	--	--	--	--	0.37 UJ	0.37 UJ	0.37 U	0.37 U	0.37 UJ	0.37 UJ	0.37 U	0.37 U
1,1,2-Trichloro-1,2,2-Trifluoroethane	--	--	--	--	0.31 U	0.31 U	0.31 U	0.31 U	0.31 U	0.31 U	0.31 U	0.31 U
1,1,2-Trichloroethane	--	--	--	--	0.43 U	0.43 U	0.43 U	0.43 U	0.43 U	0.43 U	0.43 U	0.43 U
1,1-Dichloroethane	--	--	--	--	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U
1,1-Dichloroethene	--	--	--	--	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U
1,2,3-Trichlorobenzene	--	--	--	--	0.36 U	0.36 U	0.36 U	0.36 U	0.36 U	0.36 U	0.36 U	0.36 U
1,2,4-Trichlorobenzene	--	--	--	--	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U
1,2-Dibromo-3-Chloropropane	--	--	--	--	0.38 UJ	0.38 UJ	0.38 U	0.38 UJ	0.38 UJ	0.38 UJ	0.38 U	0.38 UJ
1,2-Dibromoethane (Ethylene Dibromide)	--	--	--	--	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,2-Dichlorobenzene	--	--	--	--	0.43 U	0.43 U	0.43 U	0.43 U	0.43 U	0.43 U	0.43 U	0.43 U
1,2-Dichloroethane	--	--	--	--	0.43 UJ	0.43 UJ	0.43 U	0.43 U	0.43 UJ	0.43 UJ	0.43 U	0.43 U
1,2-Dichloropropane	--	--	--	--	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U
1,3-Dichlorobenzene	--	--	--	--	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U
1,4-Dichlorobenzene	--	--	--	--	0.76 U	0.76 U	0.76 U	0.76 U	0.76 U	0.76 U	0.76 U	0.76 U
2-Hexanone	--	--	--	--	2.9 UJ	2.9 U	2.9 U	2.9 U	2.9 UJ	2.9 U	2.9 U	2.9 U
Acetone	--	--	--	--	5 UJ	5 U	5 U	5 U	5 UJ	5 U	6.1	5 U
Benzene	--	--	--	--	0.43 U	0.43 U	0.43 U	0.43 U	0.43 U	0.43 U	0.43 U	0.43 U
Bromochloromethane	--	--	--	--	0.41 U	0.41 U	0.41 U	0.41 U	0.41 U	0.41 U	0.41 U	0.41 U
Bromodichloromethane	--	--	--	--	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U
Bromoform	--	--	--	--	0.54 U	0.54 U	0.54 U	0.54 U	0.54 U	0.54 U	0.54 U	0.54 U
Bromomethane	--	--	--	--	1 U	1 UJ	1 U	1 U	1 U	1 UJ	1 U	1 U
Carbon Disulfide	--	--	--	--	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U
Carbon Tetrachloride	--	--	--	--	0.21 U	0.21 U	0.21 U	0.21 U	0.21 U	0.21 U	0.21 U	0.21 U
Chlorobenzene	--	--	--	--	0.38 U	0.38 U	0.38 U	0.38 U	0.38 U	0.38 U	0.38 U	0.38 U
Chloroethane	--	--	--	--	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U
Chloroform	--	--	--	--	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U
Chloromethane	--	--	--	--	0.14 U	0.14 UJ	0.14 U	0.14 U	0.14 U	0.14 UJ	0.14 U	0.14 U
Cis-1,2-Dichloroethylene	--	--	--	--	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U
Cis-1,3-Dichloropropene	--	--	--	--	0.46 UJ	0.46 U	0.46 U	0.46 U	0.46 UJ	0.46 U	0.46 U	0.46 U
Cyclohexane	--	--	--	--	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U
Dibromochloromethane	--	--	--	--	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U
Dichlorodifluoromethane	--	--	--	--	0.12 U	0.12 UJ	0.12 U	0.12 UJ	0.12 U	0.12 UJ	0.12 U	0.12 UJ
Ethylbenzene	--	--	--	--	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U
Isopropylbenzene (Cumene)	--	--	--	--	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U
M,P-Xylene	--	--	--	--	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U
Methyl Acetate	--	--	--	--	0.31 U	0.31 UJ	0.31 U	0.31 U	0.31 U	0.31 UJ	0.31 U	0.31 U
Methyl Ethyl Ketone (2-Butanone)	--	--	--	--	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	--	--	--	--	2.7 UJ	2.7 U	2.7 U	2.7 U	2.7 UJ	2.7 U	2.7 U	2.7 U
Methylcyclohexane	--	--	--	--	0.26 U	0.26 UJ	0.26 U	0.26 U	0.26 U	0.26 UJ	0.26 U	0.26 U
Methylene Chloride	--	--	--	--	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U
O-Xylene (1,2-Dimethylbenzene)	--	--	--	--	0.36 U	0.36 U	0.36 U	0.36 U	0.36 U	0.36 U	0.36 U	0.36 U

Table E-37
Summary of Data Used in Risk Assessment
Groundwater Upper Hydrogeologic Unit Western Area - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Chemical	CFMW-059 460-135818-11 CFMW-059-GW 6/21/2017	CFMW-059 460-158183-3 CFMW-059-GW 6/12/2018	CFMW-059 460-166506-6 CFMW-059-GW 10/9/2018	CFMW-059 460-166928-3 CFMW-59a-GW 10/15/2018	CFMW-065 180-78788-1, 460-158367-1 CFMW-065-GW 6/14/2018	CFMW-065 180-83066-5, 460-166928-7 CFMW-065-GW 10/15/2018	CFMW-068 180-78686-2, 460-158183-2 CFMW-068-GW 6/12/2018	CFMW-068 180-82834-3, 460-166506-5 CFMW-068-GW 10/9/2018	CFMW-069 180-78788-2, 460-158367-2 CFMW-069-GW 6/14/2018	CFMW-069 180-83122-2, 460-167033-5 CFMW-069-GW 10/16/2018	CFMW-071 180-78686-1, 460-158183-1 CFMW-071-GW 6/12/2018	CFMW-071 180-82834-2, 460-166506-4 CFMW-071-GW 10/9/2018
Styrene	--	--	--	--	0.42 U	0.42 U	0.42 U	0.42 U	0.42 U	0.42 U	0.42 U	0.42 U
Tert-Butyl Methyl Ether	--	--	--	--	0.47 U	0.47 UJ	0.47 U	0.47 U	0.47 U	0.47 UJ	0.47 U	0.47 U
Tetrachloroethylene (PCE)	--	--	--	--	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
Toluene	--	--	--	--	0.38 U	0.38 U	0.38 U	0.38 U	0.38 U	0.38 U	0.38 U	0.38 U
Trans-1,2-Dichloroethene	--	--	--	--	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U
Trans-1,3-Dichloropropene	--	--	--	--	0.49 UJ	0.49 U	0.49 U	0.49 U	0.49 UJ	0.49 U	0.49 U	0.49 U
Trichloroethylene (TCE)	--	--	--	--	0.31 U	0.31 U	0.31 U	0.31 U	0.31 U	0.31 U	0.31 U	0.31 U
Trichlorofluoromethane	--	--	--	--	0.14 U	0.14 U	0.14 U	0.14 U	0.14 U	0.14 U	0.14 U	0.14 U
Vinyl Chloride	--	--	--	--	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-38
Summary of Data Used in Risk Assessment
Groundwater Upper Hydrogeologic Unit Plume Area - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-002	CFMW-002	CFMW-002	CFMW-002	CFMW-010	CFMW-010	CFMW-010	CFMW-010	CFMW-010	CFMW-010	CFMW-011	CFMW-011	CFMW-011	CFMW-011
Sample Lab IDs	460-120053-1	460-130333-4	460-136178-9	460-158058-1	460-120053-2	460-125567-2	460-130333-5	460-136178-8	460-158058-2	460-166051-1	460-120143-13	460-125105-2	460-130410-7	460-136263-7
Sample Name Chemical	CFMW-002-GW 9/12/2016	CFMW-002-GW 3/24/2017	CFMW-002-GW 6/27/2017	CFMW-002-GW 6/11/2018	CFMW-010-GW 9/12/2016	CFMW-010-GW 12/15/2016	CFMW-010-GW 3/24/2017	CFMW-010-GW 6/27/2017	CFMW-010-GW 6/11/2018	CFMW-010-GW 10/3/2018	CFMW-011-GW 9/13/2016	CFMW-011-GW 12/8/2016	CFMW-011-GW 3/27/2017	CFMW-011-GW 6/28/2017
GENERAL CHEMISTRY (µg/L)														
Fluoride	--	--	5150 J+	--	--	--	--	6980 J+	--	--	--	--	--	298 J+
Cyanide	--	--	883	903	--	--	--	1120	605	200 U	--	--	--	125
Cyanide (Free)	--	--	47.9	6.7	--	--	--	56.8	4.8 J	78.3	--	--	--	3.3 J-
Cyanide	2060 J	1370	985	440 J-	7320 J	2120	1020	1190	615 J+	10800	80.7	132	235	125
Cyanide (Free)	--	306	119	4.8 J	--	--	33.1	117	7.3	135	--	--	7.4	6.6 J
METALS (µg/L)														
Aluminum	254	18.2 U	18.2 U	15 U	1850	18.2 U	18.2 U	18.2 U	15 U	29 J	18.2 U	18.2 U	18.2 U	18.2 U
Antimony	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U
Arsenic	0.96 J	1.1 J	0.81 J	1 J	5.2	6.8	3.9	2.5	1.2 J	3.9	0.64 U	0.64 U	0.64 U	0.64 U
Barium	243	318	184	172	239	107	139	126	154	281 J	186	209	238	181
Beryllium	0.24 U	0.24 U	0.24 U	0.26 U	0.24 U	0.24 U	0.24 U	0.24 U	0.26 U	0.26 U	0.24 U	0.24 U	0.24 U	0.24 U
Cadmium	0.71 U	0.71 U	0.71 U	0.61 U	0.71 U	0.71 U	0.71 U	0.71 U	0.61 U	0.61 U	0.71 U	0.71 U	0.71 U	0.71 U
Calcium	31800	37200	26400	25500	35500	14800	23100	26200	36600	42500 J	47600	52400	62300	44000
Chromium, Total	1.9 J	1.4 J	1.3 U	1.3 U	3.6 J	1.3 U	1.3 U	1.3 U	1.3 U	1.5 J	1.3 U	1.3 U	1.3 U	1.3 U
Cobalt	6.1	8.6	2 J	1.3 U	23.7	6.9	4.1	2.2 J	1.3 U	17.6	1.3 U	1.3 U	1.3 U	1.3 U
Copper	4.2	3.5 J	1.4 U	1.9 U	16.8	10	7.2	3.5 J	1.9 U	8.5	3.2 J	1.4 U	1.4 U	1.4 U
Iron	871	910	409	299	4710	844	769	506	203	2990	42.4 U	42.4 U	119 J	45.9 J
Lead	0.53 J	0.38 U	0.38 U	0.37 U	2.8	0.38 U	0.38 U	0.38 U	0.37 U	0.37 U	0.38 U	0.38 U	0.38 U	0.38 U
Magnesium	10900	13800	9180	9860	16500	9810	9070	10400	11600	27400 J	14100	16000	18000	11900
Manganese	26.8	2.5 U	2.5 U	2.7 U	110	2.5 U	2.5 U	2.5 U	2.7 U	17.7	2.5 U	2.5 U	2.5 U	2.5 U
Mercury	0.17 U	0.17 U	0.17 U	0.12 U	0.17 U	0.17 U	0.17 U	0.17 U	0.12 U	0.12 U	0.17 U	0.17 U	0.17 U	0.17 U
Nickel	1.4 U	1.4 U	1.4 U	1.3 U	5	1.4 U	1.4 U	1.4 U	1.3 U	1.4 J	1.4 U	1.4 U	1.4 U	1.4 U
Potassium	1020	1060	705	837	1460	890	810	815	769	1610	657	709	798	663
Selenium	0.84 J	0.82 J	0.73 U	0.69 U	3.3 J	1.4 J	1.1 J	0.73 J	0.69 U	2.4 J	0.73 U	0.73 U	0.73 U	0.73 U
Silver	1.3 U	1.3 U	1.3 U	1.4 U	1.3 U	1.3 U	1.3 U	1.3 U	1.4 U	1.4 U	1.3 U	1.3 U	1.3 U	1.3 U
Sodium	173000	191000	77700	77400	445000	231000	198000	95400	43100	307000 J	9950	11200	13300	15300
Thallium	0.26 U	0.26 U	0.26 U	0.24 U	0.26 U	0.26 U	0.26 U	0.26 U	0.24 U	0.24 U	0.26 U	0.26 U	0.26 U	0.26 U
Vanadium	1.9 U	1.9 U	1.9 U	1.2 U	1.9 U	1.9 U	1.9 U	1.9 U	1.2 U	1.2 U	1.9 U	1.9 U	1.9 U	1.9 U
Zinc	7 U	7 U	7 U	5.4 U	7.5 J	7 U	7 U	7 U	10.2 J	5.4 U	7 U	7 U	7 U	7 U
Aluminum	--	--	86.4	26.1 J	--	--	--	218	134	377	--	--	--	18.2 U
Antimony	--	--	0.62 U	0.62 U	--	--	--	0.62 U	0.62 U	0.62 U	--	--	--	0.62 U
Arsenic	--	--	0.84 J	0.91 J	--	--	--	2.9	1.5 J	4.4	--	--	--	0.64 U
Barium	--	--	199	163	--	--	--	141	145	331	--	--	--	199
Beryllium	--	--	0.24 U	0.26 U	--	--	--	0.24 U	0.26 U	0.26 U	--	--	--	0.24 U
Cadmium	--	--	0.71 U	0.61 U	--	--	--	0.71 U	0.61 U	0.61 U	--	--	--	0.71 U
Calcium	--	--	27800	23900	--	--	--	28800	34000	49500	--	--	--	46500
Chromium, Total	--	--	1.3 U	1.3 U	--	--	--	1.3 U	1.3 U	2.3 J	--	--	--	1.3 U
Cobalt	--	--	2.4 J	1.3 J	--	--	--	3 J	1.3 U	20	--	--	--	1.3 U
Copper	--	--	1.8 J	1.9 U	--	--	--	4.7	1.9 U	20.2	--	--	--	1.4 U
Iron	--	--	617	424	--	--	--	902	413	3500	--	--	--	62 J
Lead	--	--	0.38 U	0.37 U	--	--	--	0.38 U	0.37 U	0.37 J	--	--	--	0.38 U
Magnesium	--	--	10700	10000	--	--	--	12300	11600	32200	--	--	--	14100
Manganese	--	--	3.6 J	2.7 U	--	--	--	10.3	3.7 J	29.4	--	--	--	2.5 U
Mercury	--	--	0.17 U	0.12 U	--	--	--	0.17 U	0.12 U	0.12 U	--	--	--	0.17 U
Nickel	--	--	1.4 U	1.3 U	--	--	--	1.4 U	1.3 U	2.2 J	--	--	--	1.4 U
Potassium	--	--	793	772	--	--	--	929	717	1880	--	--	--	733
Selenium	--	--	0.73 U	0.69 U	--	--	--	0.74 J	0.69 U	2.4 J	--	--	--	0.73 U
Silver	--	--	1.3 U	1.4 U	--	--	--	1.3 U	1.4 U	1.4 U	--	--	--	1.3 U
Sodium	--	--	97300	78800	--	--	--	122000	43400	335000	--	--	--	18100
Thallium	--	--	0.26 U	0.24 U	--	--	--	0.26 U	0.24 U	0.24 U	--	--	--	0.26 U
Vanadium	--	--	1.9 U	1.2 U	--	--	--	1.9 U	1.2 U	1.2 U	--	--	--	1.9 U
Zinc	--	--	7 U	5.4 U	--	--	--	7 U	10.7 J	5.4 U	--	--	--	7 U
POLYCHLORINATED BIPHENYLS (µg/L)														
PCB-1016 (Aroclor 1016)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1221 (Aroclor 1221)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1232 (Aroclor 1232)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1242 (Aroclor 1242)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1248 (Aroclor 1248)	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Table E-38
Summary of Data Used in Risk Assessment
Groundwater Upper Hydrogeologic Unit Plume Area - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-002	CFMW-002	CFMW-002	CFMW-002	CFMW-010	CFMW-010	CFMW-010	CFMW-010	CFMW-010	CFMW-010	CFMW-011	CFMW-011	CFMW-011	CFMW-011
Sample Lab IDs	460-120053-1	460-130333-4	460-136178-9	460-158058-1	460-120053-2	460-125567-2	460-130333-5	460-136178-8	460-158058-2	460-166051-1	460-120143-13	460-125105-2	460-130410-7	460-136263-7
Sample Name	CFMW-002-GW 9/12/2016	CFMW-002-GW 3/24/2017	CFMW-002-GW 6/27/2017	CFMW-002-GW 6/11/2018	CFMW-010-GW 9/12/2016	CFMW-010-GW 12/15/2016	CFMW-010-GW 3/24/2017	CFMW-010-GW 6/27/2017	CFMW-010-GW 6/11/2018	CFMW-010-GW 10/3/2018	CFMW-011-GW 9/13/2016	CFMW-011-GW 12/8/2016	CFMW-011-GW 3/27/2017	CFMW-011-GW 6/28/2017
Chemical														
PCB-1254 (Aroclor 1254)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1260 (Aroclor 1260)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1262 (Aroclor 1262)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1268 (Aroclor 1268)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Polychlorinated Biphenyl (PCBs)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SEMIVOLATILE ORGANIC COMPOUNDS (µg/L)														
1,2,4,5-Tetrachlorobenzene	0.43 U	0.43 U	0.45 U	--	0.43 U	0.43 UJ	0.43 U	0.45 U	--	--	0.45 U	0.43 U	0.45 U	0.43 U
1,4-Dioxane (P-Dioxane)	3.1 U	3.1 U	3.3 U	--	3.1 U	3.1 U	3.1 U	3.2 U	--	--	3.2 U	3.1 U	3.2 U	3.1 U
2,3,4,6-Tetrachlorophenol	0.69 U	0.69 U	0.72 U	--	0.69 U	0.69 U	0.69 U	0.72 U	--	--	0.72 U	0.69 U	0.72 U	0.69 U
2,4,5-Trichlorophenol	0.49 U	0.49 U	0.51 U	--	0.49 U	0.49 U	0.49 U	0.51 U	--	--	0.51 U	0.49 U	0.51 U	0.49 U
2,4,6-Trichlorophenol	0.53 U	0.53 U	0.55 U	--	0.53 U	0.53 U	0.53 U	0.55 U	--	--	0.55 U	0.53 U	0.55 U	0.53 U
2,4-Dichlorophenol	0.63 U	0.63 U	0.66 U	--	0.63 U	0.63 U	0.63 U	0.66 U	--	--	0.66 U	0.63 U	0.66 U	0.63 U
2,4-Dimethylphenol	0.91 U	0.91 U	0.95 U	--	0.91 U	0.91 U	0.91 U	0.95 U	--	--	0.95 U	0.91 U	0.95 U	0.91 U
2,4-Dinitrophenol	2.4 U	2.4 U	2.5 U	--	2.4 U	2.4 U	2.4 U	2.5 U	--	--	2.5 UJ	2.4 U	2.5 U	2.4 U
2,4-Dinitrotoluene	1 U	1 U	1.1 U	--	1 U	1 U	1 U	1.1 U	--	--	1.1 U	1 U	1.1 U	1 U
2,6-Dinitrotoluene	0.88 U	0.88 U	0.92 U	--	0.88 U	0.88 U	0.88 U	0.92 U	--	--	0.92 U	0.88 U	0.92 U	0.88 U
2-Chloronaphthalene	0.61 U	0.61 U	0.64 U	--	0.61 U	0.61 U	0.61 U	0.64 U	--	--	0.64 U	0.61 U	0.64 U	0.61 U
2-Chlorophenol	0.74 U	0.74 U	0.77 U	--	0.74 U	0.74 U	0.74 U	0.77 U	--	--	0.77 U	0.74 U	0.77 U	0.74 U
2-Methylnaphthalene	0.88 U	0.88 U	0.92 U	--	0.88 U	0.88 U	0.88 U	0.92 U	--	--	0.92 U	0.88 U	0.92 U	0.88 U
2-Methylphenol (O-Cresol)	1.3 U	1.3 U	1.3 U	--	1.3 U	1.3 U	1.3 U	1.3 U	--	--	1.3 U	1.3 U	1.3 U	1.3 U
2-Nitroaniline	0.65 U	0.65 U	0.68 U	--	0.65 U	0.65 U	0.65 U	0.68 U	--	--	0.68 U	0.65 U	0.68 U	0.65 U
2-Nitrophenol	0.59 U	0.59 U	0.62 U	--	0.59 U	0.59 U	0.59 U	0.61 U	--	--	0.61 U	0.59 U	0.61 U	0.59 U
3- And 4- Methylphenol (Total)	0.88 U	0.88 U	0.92 U	--	0.88 U	0.88 U	0.88 U	0.92 U	--	--	0.92 U	0.88 U	0.92 U	0.88 U
3,3'-Dichlorobenzidine	1 U	1 U	1.1 U	--	1 U	1 U	1 U	1.1 U	--	--	1.1 U	1 U	1.1 U	1 U
3-Nitroaniline	0.82 U	0.82 U	0.86 U	--	0.82 U	0.82 U	0.82 U	0.85 U	--	--	0.85 U	0.82 U	0.85 U	0.82 U
4,6-Dinitro-2-Methylphenol	2 U	2 U	2.1 U	--	2 U	2 U	2 U	2.1 U	--	--	2.1 U	2 U	2.1 U	2 U
4-Bromophenyl Phenyl Ether	1 U	1 U	1.1 U	--	1 U	1 U	1 U	1.1 U	--	--	1.1 U	1 U	1.1 U	1 U
4-Chloro-3-Methylphenol	0.76 U	0.76 U	0.79 U	--	0.76 U	0.76 U	0.76 U	0.79 U	--	--	0.79 U	0.76 U	0.79 U	0.76 U
4-Chloroaniline	0.73 U	0.73 U	0.76 U	--	0.73 U	0.73 U	0.73 U	0.76 U	--	--	0.76 U	0.73 U	0.76 U	0.73 U
4-Chlorophenyl Phenyl Ether	0.96 U	0.96 U	1 U	--	0.96 U	0.96 U	0.96 U	1 U	--	--	1 U	0.96 U	1 U	0.96 U
4-Nitroaniline	0.48 U	0.48 U	0.5 U	--	0.48 U	0.48 U	0.48 U	0.5 U	--	--	0.5 U	0.48 U	0.5 UJ	0.48 U
4-Nitrophenol	4.7 U	4.7 U	4.9 U	--	4.7 U	4.7 U	4.7 U	4.8 U	--	--	4.8 U	4.7 U	4.8 U	4.7 U
Acenaphthene	0.88 U	0.88 U	0.92 U	--	0.88 U	0.88 UJ	0.88 U	0.92 U	--	--	0.92 U	0.88 U	0.92 U	0.88 U
Acenaphthylene	0.65 U	0.65 U	0.68 U	--	0.65 U	0.65 U	0.65 U	0.68 U	--	--	0.68 U	0.65 U	0.68 U	0.65 U
Acetophenone	1 U	1 U	1.1 U	--	1 U	1 U	1 U	1.1 U	--	--	1.1 U	1 U	1.1 U	1 U
Anthracene	0.57 U	0.57 U	0.6 U	--	0.57 U	0.57 U	0.57 U	0.59 U	--	--	0.59 U	0.57 U	0.59 U	0.57 U
Atrazine	0.77 U	0.77 U	0.81 U	--	0.77 U	0.77 U	0.77 U	0.8 U	--	--	0.8 U	0.77 U	0.8 U	0.77 U
Benzaldehyde	0.86 U	0.86 U	0.9 U	--	0.86 U	0.86 U	0.86 U	0.9 U	--	--	0.9 U	0.86 U	0.9 U	0.86 U
Benzo(A)Anthracene	0.55 U	0.55 U	0.58 U	--	0.55 U	0.55 U	0.55 U	0.57 U	--	--	0.57 U	0.55 U	0.57 U	0.55 U
Benzo(A)Pyrene	0.16 U	0.16 U	0.17 U	--	0.16 U	0.16 U	0.16 U	0.17 U	--	--	0.17 U	0.16 U	0.17 U	0.16 U
Benzo(B)Fluoranthene	0.44 U	0.44 U	0.46 U	--	0.44 U	0.44 U	0.44 U	0.46 U	--	--	0.46 U	0.44 U	0.46 U	0.44 U
Benzo(G,H,I)Perylene	0.75 U	0.75 U	0.78 U	--	0.75 U	0.75 U	0.75 U	0.78 U	--	--	0.78 U	0.75 U	0.78 U	0.75 U
Benzo(K)Fluoranthene	0.18 U	0.18 U	0.19 U	--	0.18 U	0.18 U	0.18 U	0.19 U	--	--	0.19 U	0.18 U	0.19 U	0.18 U
Benzyl Butyl Phthalate	0.6 U	0.6 U	0.63 U	--	0.6 U	0.6 U	0.6 U	0.63 U	--	--	0.63 U	0.6 U	0.63 U	0.6 U
Biphenyl (Diphenyl)	0.63 U	0.63 U	0.66 U	--	0.63 U	0.63 UJ	0.63 U	0.66 U	--	--	0.66 U	0.63 U	0.66 U	0.63 U
Bis(2-Chloroethoxy) Methane	0.69 U	0.69 U	0.72 U	--	0.69 U	0.69 U	0.69 U	0.72 U	--	--	0.72 U	0.69 U	0.72 U	0.69 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.12 U	0.12 U	0.13 U	--	0.12 U	0.12 UJ	0.12 U	0.13 U	--	--	0.13 U	0.12 UJ	0.13 U	0.12 U
Bis(2-Chloroisopropyl) Ether	0.93 U	0.93 U	0.97 U	--	0.93 U	0.93 U	0.93 U	0.97 U	--	--	0.97 U	0.93 U	0.97 U	0.93 U
Bis(2-Ethylhexyl) Phthalate	0.72 U	0.72 U	0.75 U	--	0.72 U	0.72 U	0.72 U	0.75 U	--	--	0.75 U	0.72 U	0.75 U	0.72 U
Caprolactam	1.1 U	1.1 UJ	1.1 U	--	1.1 U	1.1 U	1.1 UJ	1.1 U	--	--	1.1 U	1.1 U	1.1 U	1.1 U
Carbazole	0.85 U	0.85 U	0.89 U	--	0.85 U	0.85 U	0.85 U	0.89 U	--	--	0.89 U	0.85 U	0.89 U	0.85 U
Chrysene	0.67 U	0.67 U	0.7 U	--	0.67 U	0.67 U	0.67 U	0.7 U	--	--	0.7 U	0.67 U	0.7 U	0.67 U
Dibenz(A,H)Anthracene	0.09 U	0.09 U	0.094 U	--	0.09 U	0.09 U	0.09 U	0.094 U	--	--	0.094 U	0.09 U	0.094 U	0.09 U
Dibenzofuran	0.85 U	0.85 U	0.89 U	--	0.85 U	0.85 U	0.85 U	0.89 U	--	--	0.89 U	0.85 U	0.89 U	0.85 U
Diethyl Phthalate	1 U	1 U	1 U	--	1 U	1 U	1 U	1 U	--	--	1 U	1 U	1 U	1 U
Dimethyl Phthalate	0.98 U	0.98 U	1 U	--	0.98 U	0.98 U	0.98 U	1 U	--	--	1 U	0.98 U	1 U	0.98 U
Di-N-Butyl Phthalate	0.82 U	0.82 UJ	0.86 U	--	0.82 U	0.82 U	0.82 UJ	0.85 U	--	--	0.85 U	0.82 U	0.85 U	0.82 U
Di-N-Octylphthalate	0.69 U	0.69 U	0.72 U	--	0.69 U	0.69 U	0.69 U	0.72 U	--	--	0.72 U	0.69 U	0.72 U	0.69 U
Fluoranthene	0.72 U	0.72 U	0.75 U	--	0.72 U	0.72 U	0.72 U	0.75 U	--	--	0.75 U	0.72 U	0.75 U	0.72 U

Table E-38
Summary of Data Used in Risk Assessment
Groundwater Upper Hydrogeologic Unit Plume Area - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Chemical	CFMW-002 460-120053-1 CFMW-002-GW 9/12/2016	CFMW-002 460-130333-4 CFMW-002-GW 3/24/2017	CFMW-002 460-136178-9 CFMW-002-GW 6/27/2017	CFMW-002 460-158058-1 CFMW-002-GW 6/11/2018	CFMW-010 460-120053-2 CFMW-010-GW 9/12/2016	CFMW-010 460-125567-2 CFMW-010-GW 12/15/2016	CFMW-010 460-130333-5 CFMW-010-GW 3/24/2017	CFMW-010 460-136178-8 CFMW-010-GW 6/27/2017	CFMW-010 460-158058-2 CFMW-010-GW 6/11/2018	CFMW-010 460-166051-1 CFMW-010-GW 10/3/2018	CFMW-011 460-120143-13 CFMW-011-GW 9/13/2016	CFMW-011 460-125105-2 CFMW-011-GW 12/8/2016	CFMW-011 460-130410-7 CFMW-011-GW 3/27/2017	CFMW-011 460-136263-7 CFMW-011-GW 6/28/2017
Fluorene	0.8 U	0.8 U	0.84 U	--	0.8 U	0.8 U	0.8 U	0.83 U	--	--	0.83 U	0.8 U	0.83 U	0.8 U
Hexachlorobenzene	0.47 U	0.47 U	0.49 U	--	0.47 U	0.47 U	0.47 U	0.49 U	--	--	0.49 U	0.47 U	0.49 U	0.47 U
Hexachlorobutadiene	0.76 U	0.76 U	0.79 U	--	0.76 U	0.76 U	0.76 U	0.79 U	--	--	0.79 U	0.76 U	0.79 U	0.76 U
Hexachlorocyclopentadiene	0.61 U	0.61 UJ	0.64 U	--	0.61 U	0.61 U	0.61 UJ	0.64 U	--	--	0.64 U	0.61 U	0.64 U	0.61 U
Hexachloroethane	0.09 U	0.09 U	0.094 U	--	0.09 U	0.09 U	0.09 U	0.094 U	--	--	0.094 U	0.09 U	0.094 U	0.09 U
Indeno(1,2,3-C,D)Pyrene	0.21 U	0.21 U	0.22 U	--	0.21 U	0.21 U	0.21 U	0.22 U	--	--	0.22 U	0.21 U	0.22 U	0.21 U
Isophorone	0.67 U	0.67 U	0.7 U	--	0.67 U	0.67 U	0.67 U	0.7 U	--	--	0.7 U	0.67 U	0.7 U	0.67 U
Naphthalene	0.8 U	0.8 U	0.84 U	--	0.8 U	0.8 U	0.8 U	0.83 U	--	--	0.83 U	0.8 U	0.83 U	0.8 U
Nitrobenzene	0.49 U	0.49 U	0.51 U	--	0.49 U	0.49 U	0.49 U	0.51 U	--	--	0.51 U	0.49 U	0.51 U	0.49 U
N-Nitrosodi-N-Propylamine	0.83 U	0.83 U	0.87 U	--	0.83 U	0.83 U	0.83 U	0.86 U	--	--	0.86 U	0.83 U	0.86 U	0.83 U
N-Nitrosodiphenylamine	0.74 U	0.74 U	0.77 U	--	0.74 U	0.74 U	0.74 U	0.77 U	--	--	0.77 U	0.74 U	0.77 U	0.74 U
Pentachlorophenol	2.2 U	2.2 U	2.3 U	--	2.2 U	2.2 UJ	2.2 U	2.3 U	--	--	2.3 UR	2.2 U	2.3 U	2.2 U
Phenanthrene	0.65 U	0.65 U	0.68 U	--	0.65 U	0.65 U	0.65 U	0.68 U	--	--	0.68 U	0.65 U	0.68 U	0.65 U
Phenol	0.41 U	0.41 U	0.43 U	--	0.41 U	0.41 U	0.41 U	0.43 U	--	--	0.43 U	0.41 U	0.43 U	0.41 U
Pyrene	0.83 U	0.83 U	0.87 U	--	0.83 U	0.83 U	0.83 U	0.86 U	--	--	0.86 U	0.83 U	0.86 UJ	0.83 U
SEMIVOLATILE ORGANIC COMPOUNDS|LOW LEVEL (µg/L)														
1,2,4,5-Tetrachlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,4-Dioxane (P-Dioxane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,3,4,6-Tetrachlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4,5-Trichlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4,6-Trichlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4-Dichlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4-Dimethylphenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4-Dinitrophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4-Dinitrotoluene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,6-Dinitrotoluene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Chloronaphthalene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Chlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Methylnaphthalene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Methylphenol (O-Cresol)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Nitroaniline	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Nitrophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3,3'-Dichlorobenzidine	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3-Nitroaniline	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4,6-Dinitro-2-Methylphenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Bromophenyl Phenyl Ether	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Chloro-3-Methylphenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Chloroaniline	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Chlorophenyl Phenyl Ether	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Nitroaniline	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Nitrophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acenaphthene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acenaphthylene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acetophenone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Anthracene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Atrazine	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzaldehyde	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(A)Anthracene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(A)Pyrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(B)Fluoranthene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(G,H,I)Perylene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(K)Fluoranthene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzyl Butyl Phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Biphenyl (Diphenyl)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bis(2-Chloroethoxy) Methane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bis(2-Chloroisopropyl) Ether	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bis(2-Ethylhexyl) Phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Caprolactam	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Table E-38
Summary of Data Used in Risk Assessment
Groundwater Upper Hydrogeologic Unit Plume Area - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-002	CFMW-002	CFMW-002	CFMW-002	CFMW-010	CFMW-010	CFMW-010	CFMW-010	CFMW-010	CFMW-010	CFMW-011	CFMW-011	CFMW-011	CFMW-011
Sample Lab IDs	460-120053-1	460-130333-4	460-136178-9	460-158058-1	460-120053-2	460-125567-2	460-130333-5	460-136178-8	460-158058-2	460-166051-1	460-120143-13	460-125105-2	460-130410-7	460-136263-7
Sample Name Chemical	CFMW-002-GW 9/12/2016	CFMW-002-GW 3/24/2017	CFMW-002-GW 6/27/2017	CFMW-002-GW 6/11/2018	CFMW-010-GW 9/12/2016	CFMW-010-GW 12/15/2016	CFMW-010-GW 3/24/2017	CFMW-010-GW 6/27/2017	CFMW-010-GW 6/11/2018	CFMW-010-GW 10/3/2018	CFMW-011-GW 9/13/2016	CFMW-011-GW 12/8/2016	CFMW-011-GW 3/27/2017	CFMW-011-GW 6/28/2017
Carbazole	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chrysene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibenz(A,H)Anthracene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibenzofuran	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Diethyl Phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dimethyl Phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Di-N-Butyl Phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Di-N-Octylphthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Fluoranthene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Fluorene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorobutadiene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorocyclopentadiene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Indeno(1,2,3-C,D)Pyrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Isophorone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Naphthalene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Nitrobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
N-Nitrosodi-N-Propylamine	--	--	--	--	--	--	--	--	--	--	--	--	--	--
N-Nitrosodiphenylamine	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Pentachlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Phenanthrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Phenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Pyrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
VOLATILE ORGANIC COMPOUNDS (µg/L)														
1,1,1-Trichloroethane	0.28 U	0.28 U	0.28 U	--	0.28 U	0.28 U	0.28 U	0.28 U	--	--	0.28 U	0.28 U	0.28 U	0.28 U
1,1,2,2-Tetrachloroethane	0.19 UJ	0.19 U	0.19 U	--	0.19 UJ	0.19 U	0.19 U	0.19 U	--	--	0.19 U	0.19 U	0.19 U	0.19 U
1,1,2-Trichloro-1,2,2-Trifluoroethane	0.34 U	0.34 U	0.34 U	--	0.34 U	0.34 U	0.34 U	0.34 U	--	--	0.34 U	0.34 U	0.34 U	0.34 U
1,1,2-Trichloroethane	0.08 U	0.08 U	0.08 U	--	0.08 U	0.08 U	0.08 U	0.08 U	--	--	0.08 U	0.08 U	0.08 U	0.08 U
1,1-Dichloroethane	0.24 U	0.24 U	0.24 U	--	0.24 U	0.24 U	0.24 U	0.24 U	--	--	0.24 U	0.24 U	0.24 U	0.24 U
1,1-Dichloroethene	0.34 U	0.34 U	0.34 U	--	0.34 U	0.34 U	0.34 U	0.34 U	--	--	0.34 U	0.34 U	0.34 U	0.34 U
1,2,3-Trichlorobenzene	0.35 U	0.35 U	0.35 U	--	0.35 U	0.35 U	0.35 U	0.35 U	--	--	0.35 U	0.35 U	0.35 U	0.35 U
1,2,4-Trichlorobenzene	0.27 U	0.27 U	0.27 U	--	0.27 U	0.27 U	0.27 U	0.27 U	--	--	0.27 U	0.27 U	0.27 U	0.27 U
1,2-Dibromo-3-Chloropropane	0.23 U	0.23 U	0.23 U	--	0.23 U	0.23 UJ	0.23 U	0.23 U	--	--	0.23 U	0.23 U	0.23 U	0.23 U
1,2-Dibromoethane (Ethylene Dibromide)	0.19 U	0.19 U	0.19 U	--	0.19 U	0.19 U	0.19 U	0.19 U	--	--	0.19 U	0.19 U	0.19 U	0.19 U
1,2-Dichlorobenzene	0.22 U	0.22 U	0.22 U	--	0.22 U	0.22 U	0.22 U	0.22 U	--	--	0.22 U	0.22 U	0.22 U	0.22 U
1,2-Dichloroethane	0.25 U	0.25 U	0.25 U	--	0.25 U	0.25 U	0.25 U	0.25 U	--	--	0.25 U	0.25 U	0.25 U	0.25 U
1,2-Dichloropropane	0.18 U	0.18 U	0.18 U	--	0.18 U	0.18 U	0.18 U	0.18 U	--	--	0.18 U	0.18 U	0.18 U	0.18 U
1,3-Dichlorobenzene	0.33 U	0.33 U	0.33 U	--	0.33 U	0.33 U	0.33 U	0.33 U	--	--	0.33 U	0.33 U	0.33 U	0.33 U
1,4-Dichlorobenzene	0.33 U	0.33 U	0.33 U	--	0.33 U	0.33 U	0.33 U	0.33 U	--	--	0.33 U	0.33 U	0.33 U	0.33 U
2-Hexanone	0.72 U	0.72 U	0.72 U	--	0.72 U	0.72 U	0.72 U	0.72 U	--	--	0.72 U	0.72 U	0.72 U	0.72 U
Acetone	1.1 U	1.1 U	1.1 U	--	1.1 U	1.1 UJ	1.1 U	1.1 U	--	--	1.1 U	1.1 U	1.1 U	1.1 U
Benzene	0.09 U	0.09 U	0.09 U	--	0.09 U	0.09 U	0.09 U	0.09 U	--	--	0.09 U	0.09 U	0.09 U	0.09 U
Bromochloromethane	0.3 U	0.3 U	0.3 U	--	0.3 U	0.3 U	0.3 U	0.3 U	--	--	0.3 U	0.3 U	0.3 U	0.3 U
Bromodichloromethane	0.15 U	0.15 U	0.15 U	--	0.15 U	0.15 U	0.15 U	0.15 U	--	--	0.15 U	0.15 U	0.15 U	0.15 U
Bromoform	0.18 U	0.18 U	0.18 U	--	0.18 U	0.18 U	0.18 U	0.18 U	--	--	0.18 U	0.18 U	0.18 U	0.18 U
Bromomethane	0.18 UJ	0.18 U	0.18 U	--	0.18 UJ	0.18 U	0.18 U	0.18 U	--	--	0.18 UJ	0.18 U	0.18 U	0.18 U
Carbon Disulfide	0.22 U	0.22 U	0.22 U	--	0.22 U	0.22 U	0.22 U	0.22 U	--	--	0.22 U	0.22 U	0.22 U	0.22 U
Carbon Tetrachloride	0.33 U	0.33 U	0.33 U	--	0.33 U	0.33 U	0.33 U	0.33 U	--	--	0.33 U	0.33 U	0.33 U	0.33 U
Chlorobenzene	0.24 U	0.24 U	0.24 U	--	0.24 U	0.24 U	0.24 U	0.24 U	--	--	0.24 U	0.24 U	0.24 U	0.24 U
Chloroethane	0.37 U	0.37 U	0.37 U	--	0.37 U	0.37 U	0.37 U	0.37 U	--	--	0.37 U	0.37 U	0.37 U	0.37 U
Chloroform	0.22 U	0.22 U	0.22 U	--	0.22 U	0.22 U	0.22 U	0.22 U	--	--	0.22 U	0.22 U	0.22 U	0.22 U
Chloromethane	0.22 U	0.22 U	0.22 U	--	0.22 U	0.22 U	0.22 U	0.22 U	--	--	0.22 U	0.22 U	0.22 U	0.22 U
Cis-1,2-Dichloroethylene	0.26 U	0.26 U	0.26 U	--	0.26 U	0.26 U	0.26 U	0.26 U	--	--	0.26 U	0.26 U	0.26 U	0.26 U
Cis-1,3-Dichloropropene	0.16 U	0.16 U	0.16 U	--	0.16 U	0.16 U	0.16 U	0.16 U	--	--	0.16 U	0.16 U	0.16 U	0.16 U
Cyclohexane	0.26 U	0.26 U	0.26 U	--	0.26 U	0.26 U	0.26 U	0.26 U	--	--	0.26 U	0.26 U	0.26 U	0.26 UJ
Dibromochloromethane	0.22 U	0.22 U	0.22 U	--	0.22 U	0.22 U	0.22 U	0.22 U	--	--	0.22 U	0.22 U	0.22 U	0.22 U
Dichlorodifluoromethane	0.14 UJ	0.14 U	0.14 U	--	0.14 UJ	0.14 U	0.14 U	0.14 U	--	--	0.14 UJ	0.14 U	0.14 U	0.14 UJ
Ethylbenzene	0.3 U	0.3 U	0.3 U	--	0.3 U	0.3 U	0.3 U	0.3 U	--	--	0.3 U	0.3 U	0.3 U	0.3 U

Table E-38
Summary of Data Used in Risk Assessment
Groundwater Upper Hydrogeologic Unit Plume Area - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-002	CFMW-002	CFMW-002	CFMW-002	CFMW-010	CFMW-010	CFMW-010	CFMW-010	CFMW-010	CFMW-010	CFMW-011	CFMW-011	CFMW-011	CFMW-011
Sample Lab IDs	460-120053-1	460-130333-4	460-136178-9	460-158058-1	460-120053-2	460-125567-2	460-130333-5	460-136178-8	460-158058-2	460-166051-1	460-120143-13	460-125105-2	460-130410-7	460-136263-7
Sample Name Chemical	CFMW-002-GW 9/12/2016	CFMW-002-GW 3/24/2017	CFMW-002-GW 6/27/2017	CFMW-002-GW 6/11/2018	CFMW-010-GW 9/12/2016	CFMW-010-GW 12/15/2016	CFMW-010-GW 3/24/2017	CFMW-010-GW 6/27/2017	CFMW-010-GW 6/11/2018	CFMW-010-GW 10/3/2018	CFMW-011-GW 9/13/2016	CFMW-011-GW 12/8/2016	CFMW-011-GW 3/27/2017	CFMW-011-GW 6/28/2017
Isopropylbenzene (Cumene)	0.32 U	0.32 U	0.32 U	--	0.32 U	0.32 U	0.32 U	0.32 U	--	--	0.32 U	0.32 U	0.32 U	0.32 U
M,P-Xylene	0.28 U	0.28 U	0.28 U	--	0.28 U	0.28 U	0.28 U	0.28 U	--	--	0.28 U	0.28 U	0.28 U	0.28 U
Methyl Acetate	0.58 U	0.58 U	0.58 U	--	0.58 U	0.58 UJ	0.58 U	0.58 U	--	--	0.58 U	0.58 U	0.58 U	0.58 U
Methyl Ethyl Ketone (2-Butanone)	2.2 U	2.2 U	2.2 U	--	2.2 U	2.2 U	2.2 U	2.2 U	--	--	2.2 U	2.2 U	2.2 U	2.2 U
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	0.63 U	0.63 U	0.63 U	--	0.63 U	0.63 U	0.63 U	0.63 U	--	--	0.63 U	0.63 U	0.63 U	0.63 U
Methylcyclohexane	0.22 U	0.22 U	0.22 U	--	0.22 U	0.22 U	0.22 U	0.22 U	--	--	0.22 U	0.22 U	0.22 U	0.22 UJ
Methylene Chloride	0.21 U	0.21 U	0.21 U	--	0.21 U	0.21 U	0.21 U	0.21 U	--	--	0.21 U	0.21 U	0.21 U	0.21 U
O-Xylene (1,2-Dimethylbenzene)	0.32 U	0.32 U	0.32 U	--	0.32 U	0.32 U	0.32 U	0.32 U	--	--	0.32 U	0.32 U	0.32 U	0.32 U
Styrene	0.17 U	0.17 U	0.17 U	--	0.17 U	0.17 U	0.17 U	0.17 U	--	--	0.17 U	0.17 U	0.17 U	0.17 U
Tert-Butyl Methyl Ether	0.13 U	0.13 U	0.13 U	--	0.13 U	0.13 U	0.13 U	0.13 U	--	--	0.13 U	0.13 U	0.13 U	0.13 U
Tetrachloroethylene (PCE)	0.12 U	0.12 U	0.12 U	--	0.12 U	0.12 U	0.12 U	0.12 U	--	--	0.12 U	0.12 U	0.12 U	0.12 U
Toluene	0.25 U	0.25 U	0.25 U	--	0.25 U	0.25 U	0.25 U	0.25 U	--	--	0.25 U	0.25 U	0.25 U	0.25 U
Trans-1,2-Dichloroethene	0.18 U	0.18 U	0.18 U	--	0.18 U	0.18 U	0.18 U	0.18 U	--	--	0.18 U	0.18 U	0.18 U	0.18 U
Trans-1,3-Dichloropropene	0.19 U	0.19 U	0.19 U	--	0.19 U	0.19 U	0.19 U	0.19 U	--	--	0.19 U	0.19 U	0.19 U	0.19 U
Trichloroethylene (TCE)	0.22 U	0.22 U	0.22 U	--	0.22 U	0.22 U	0.22 U	0.22 U	--	--	0.22 U	0.22 U	0.22 U	0.22 U
Trichlorofluoromethane	0.15 U	0.15 U	0.15 U	--	0.15 U	0.15 UJ	0.15 U	0.15 U	--	--	0.15 U	0.15 U	0.15 U	0.15 U
Vinyl Chloride	0.06 U	0.06 U	0.06 U	--	0.06 U	0.06 U	0.06 U	0.06 U	--	--	0.06 U	0.06 U	0.06 U	0.06 U

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-38
Summary of Data Used in Risk Assessment
Groundwater Upper Hydrogeologic Unit Plume Area - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Chemical	CFMW-011-DUP 460-136263-11 CFMW-DUP15-GW 6/28/2017	CFMW-011 460-157853-4 CFMW-011-GW 6/7/2018	CFMW-011 460-166734-3 CFMW-011-GW 10/11/2018	CFMW-011-DUP 460-166734-9 CFMW-DUP22-GW 10/11/2018	CFMW-012 460-120053-5 CFMW-012-GW 9/12/2016	CFMW-012 460-125477-4 CFMW-012-GW 12/14/2016	CFMW-012 460-130225-3 CFMW-012-GW 3/22/2017	CFMW-012 460-135989-9 CFMW-012-GW 6/23/2017	CFMW-012 460-157970-1 CFMW-012-GW 6/8/2018	CFMW-012 460-166051-2 CFMW-012-GW 10/3/2018	CFMW-014 460-120053-7 CFMW-014-GW 9/12/2016	CFMW-014 460-125567-4 CFMW-014-GW 12/15/2016	CFMW-014 460-130620-1 CFMW-014-GW 3/29/2017	CFMW-014 460-136178-11 CFMW-014-GW 6/27/2017
GENERAL CHEMISTRY (µg/L)														
Fluoride	296 J+	--	--	--	--	--	--	31900	--	--	--	--	--	4110 J+
Cyanide	126	70.6	186 J	122 J	--	--	--	5860	1900	11500	--	--	--	720
Cyanide (Free)	3.1 J-	1.9 J	1.5 U	1.5 U	--	--	--	40.6	5.7	137	--	--	--	27.4
Cyanide	123	69.9	188 J-	167	2280 J	972	2340	5780	1810	6500	2750 J	3360	3320	720
Cyanide (Free)	9.8 J	4.4 J	1.5 U	1.5 U	--	--	48	35.2	9.4 J-	131	--	--	87.4	111
METALS (µg/L)														
Aluminum	18.2 U	15 U	15 U	15 U	25.7 J	18.2 U	32.4 J	18.2 U	128	29 J	18.2 U	18.2 U	18.2 U	18.2 U
Antimony	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U
Arsenic	0.64 U	0.77 U	0.77 U	0.77 U	15.5	10.7	2.9	92.6	70	6.4	0.64 U	0.82 J	0.72 J	2.1
Barium	186	188	207	212	79.6	133	306	129	102	140 J	336	354	417	158
Beryllium	0.24 U	0.26 U	0.26 U	0.26 U	0.24 U	0.24 U	0.24 U	0.24 U	0.26 U	0.26 U	0.24 U	0.24 U	0.24 U	0.24 U
Cadmium	0.71 U	0.61 U	0.61 U	0.61 U	0.71 U	0.71 U	0.71 U	0.71 U	0.61 U	0.61 U	0.71 U	0.71 U	0.71 U	0.71 U
Calcium	43600	44700	49800	49300	8660	11700	31000	7270	8430	10800 J	44900	42000	60200	25900
Chromium, Total	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	2.5 J	2.9 J	1.5 J	2 J	1.3 U	1.3 J	1.6 J	1.3 U
Cobalt	1.3 U	1.3 U	1.3 U	1.3 U	7.9	2.4 J	4.9	23.2	12.8	12.8	5.3	8.2	6.5	1.3 J
Copper	1.4 U	1.9 U	1.9 U	1.9 U	12.6	4.6	6.6	17.6	24.7	7.1	5.7	10.5	3.5 J	1.7 J
Iron	47.3 J	45.7 U	48.1 J	47.6 J	717	427	964	2420	1090	2120	927	1200	1420	320
Lead	0.38 U	0.37 U	0.37 U	0.37 U	0.38 U	0.38 U	0.38 U	0.38 U	0.37 U	0.37 U	0.38 U	0.38 U	0.38 U	0.38 U
Magnesium	11900	12100	14300	14500	4130	6070	17100	6990	6340	6530 J	16800	16100	22100	9070
Manganese	2.5 U	2.7 U	2.7 U	2.7 U	2.5 U	2.5 U	2.5 U	2.5 U	13.8	4.7 J	2.5 U	2.5 U	2.5 U	2.5 U
Mercury	0.17 U	0.12 U	0.12 U	0.12 U	0.17 U	0.17 U	0.17 U	0.17 U	0.12 U	0.12 U	0.17 U	0.17 U	0.17 U	0.17 U
Nickel	1.4 U	1.3 U	1.3 U	1.3 U	1.5 J	1.4 U	1.4 U	4.8	6	1.6 J	1.4 U	1.4 U	4.2	1.4 U
Potassium	663	719	693	724	817	937	1600	3190	2120	1220	1120	1160	1140	769
Selenium	0.73 U	0.69 U	0.69 U	0.69 U	4.4 J	1.4 J	1.6 J	8.5 J	5.2 J	1.5 J	1.7 J	1.4 J	1.6 J	0.73 U
Silver	1.3 U	1.4 U	1.4 U	1.4 U	1.3 U	1.3 U	1.3 U	1.3 U	1.4 U	1.4 U	1.3 U	1.3 U	1.3 U	1.3 U
Sodium	15000	14800	13900	14100	226000	234000	232000	707000	423000	288000 J	168000	239000	191000	64700
Thallium	0.26 U	0.24 U	0.24 U	0.24 U	0.26 U	0.26 U	0.26 U	0.26 U	0.24 U	0.24 U	0.26 U	0.26 U	0.26 U	0.26 U
Vanadium	1.9 U	1.2 U	1.2 U	1.2 U	19.8	15.4	13.5	397	440	52.2	1.9 U	1.9 U	1.9 U	10.2
Zinc	7 U	9.9 J	5.4 U	5.4 U	7 U	7 U	7 U	7 U	6.9 J	5.4 U	7 U	7 U	7 U	7 U
Aluminum	18.2 U	15 U	19.3 J	17.2 J	--	--	--	18.2 U	499	104	--	--	--	47
Antimony	0.62 U	0.62 U	0.62 U	0.62 U	--	--	--	0.86 J	0.82 J	0.62 U	--	--	--	0.62 U
Arsenic	0.64 U	0.77 U	0.77 U	0.77 U	--	--	--	80.2	65.1	8	--	--	--	2.2
Barium	197	219	212	201	--	--	--	145	121	167	--	--	--	169
Beryllium	0.24 U	0.26 U	0.26 U	0.26 U	--	--	--	0.24 U	0.26 U	0.26 U	--	--	--	0.24 U
Cadmium	0.71 U	0.61 U	0.61 U	0.61 U	--	--	--	0.71 U	0.61 U	0.61 U	--	--	--	0.71 U
Calcium	46300	50500	52100	48800	--	--	--	7480	8160	11500	--	--	--	26500
Chromium, Total	1.3 U	1.3 U	1.3 U	1.3 U	--	--	--	3.5 J	2.5 J	3.3 J	--	--	--	1.3 U
Cobalt	1.3 U	1.3 U	1.3 U	1.3 U	--	--	--	28.4	15.2	14.8	--	--	--	1.6 J
Copper	1.4 U	1.9 U	13.6 J	4.6 J	--	--	--	22.9	33	11.3	--	--	--	1.5 J
Iron	62.9 J	63.3 J	70.5 J	75.3 J	--	--	--	2750	2780	3330	--	--	--	441
Lead	0.38 U	0.37 U	0.37 U	0.37 U	--	--	--	0.38 U	0.58 J	0.47 J	--	--	--	0.38 U
Magnesium	14100	15800	14800	13800	--	--	--	7710	6670	7390	--	--	--	10200
Manganese	2.5 U	2.7 U	2.7 U	2.7 U	--	--	--	2.5 J	31.8	12.3	--	--	--	2.5 U
Mercury	0.17 U	0.12 U	0.12 U	0.12 U	--	--	--	0.17 U	0.12 U	0.12 U	--	--	--	0.17 U
Nickel	1.4 U	1.3 U	1.3 U	1.3 U	--	--	--	6	7.2	2.4 J	--	--	--	1.4 U
Potassium	737	801	759	681	--	--	--	3410	2080	1400	--	--	--	805
Selenium	0.73 U	0.69 U	0.69 U	0.69 U	--	--	--	7.5 J	4.4 J	2.2 J	--	--	--	0.73 U
Silver	1.3 U	1.4 U	1.4 U	1.4 U	--	--	--	1.3 U	1.4 U	1.4 U	--	--	--	1.3 U
Sodium	18200	18100	14300	13400	--	--	--	834000	427000	319000	--	--	--	79100
Thallium	0.26 U	0.24 U	0.24 U	0.24 U	--	--	--	0.26 U	0.24 U	0.24 U	--	--	--	0.26 U
Vanadium	1.9 U	1.2 U	1.2 U	1.2 U	--	--	--	457	481	67.1	--	--	--	11.7
Zinc	7 U	15.7 J	5.4 U	5.4 U	--	--	--	7 U	25.7	10.7 J	--	--	--	7 U
POLYCHLORINATED BIPHENYLS (µg/L)														
PCB-1016 (Aroclor 1016)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1221 (Aroclor 1221)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1232 (Aroclor 1232)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1242 (Aroclor 1242)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1248 (Aroclor 1248)	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Table E-38
Summary of Data Used in Risk Assessment
Groundwater Upper Hydrogeologic Unit Plume Area - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Chemical	CFMW-011-DUP 460-136263-11 CFMW-DUP15-GW 6/28/2017	CFMW-011 460-157853-4 CFMW-011-GW 6/7/2018	CFMW-011 460-166734-3 CFMW-011-GW 10/11/2018	CFMW-011-DUP 460-166734-9 CFMW-DUP22-GW 10/11/2018	CFMW-012 460-120053-5 CFMW-012-GW 9/12/2016	CFMW-012 460-125477-4 CFMW-012-GW 12/14/2016	CFMW-012 460-130225-3 CFMW-012-GW 3/22/2017	CFMW-012 460-135989-9 CFMW-012-GW 6/23/2017	CFMW-012 460-157970-1 CFMW-012-GW 6/8/2018	CFMW-012 460-166051-2 CFMW-012-GW 10/3/2018	CFMW-014 460-120053-7 CFMW-014-GW 9/12/2016	CFMW-014 460-125567-4 CFMW-014-GW 12/15/2016	CFMW-014 460-130620-1 CFMW-014-GW 3/29/2017	CFMW-014 460-136178-11 CFMW-014-GW 6/27/2017
PCB-1254 (Aroclor 1254)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1260 (Aroclor 1260)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1262 (Aroclor 1262)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1268 (Aroclor 1268)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Polychlorinated Biphenyl (PCBs)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SEMIVOLATILE ORGANIC COMPOUNDS (µg/L)														
1,2,4,5-Tetrachlorobenzene	0.43 U	--	--	--	0.43 U	0.43 U	0.43 U	0.43 U	--	--	0.47 U	0.43 UJ	0.43 U	0.43 U
1,4-Dioxane (P-Dioxane)	3.1 U	--	--	--	3.1 U	3.1 UJ	3.1 U	3.1 U	--	--	3.4 U	3.1 U	3.1 U	3.1 U
2,3,4,6-Tetrachlorophenol	0.69 U	--	--	--	0.69 U	0.69 U	0.69 U	0.69 U	--	--	0.75 U	0.69 U	0.69 U	0.69 U
2,4,5-Trichlorophenol	0.49 U	--	--	--	0.49 U	0.49 U	0.49 U	0.49 U	--	--	0.53 U	0.49 U	0.49 U	0.49 U
2,4,6-Trichlorophenol	0.53 U	--	--	--	0.53 U	0.53 U	0.53 U	0.53 U	--	--	0.58 U	0.53 U	0.53 U	0.53 U
2,4-Dichlorophenol	0.63 U	--	--	--	0.63 U	0.63 U	0.63 U	0.63 U	--	--	0.68 U	0.63 U	0.63 U	0.63 U
2,4-Dimethylphenol	0.91 U	--	--	--	0.91 U	0.91 U	0.91 U	0.91 U	--	--	0.99 U	0.91 U	0.91 U	0.91 U
2,4-Dinitrophenol	2.4 U	--	--	--	2.4 U	2.4 U	2.4 U	2.4 U	--	--	2.6 U	2.4 U	2.4 UJ	2.4 U
2,4-Dinitrotoluene	1 U	--	--	--	1 U	1 U	1 U	1 U	--	--	1.1 U	1 U	1 U	1 U
2,6-Dinitrotoluene	0.88 U	--	--	--	0.88 U	0.88 U	0.88 U	0.88 U	--	--	0.96 U	0.88 U	0.88 U	0.88 U
2-Chloronaphthalene	0.61 U	--	--	--	0.61 U	0.61 U	0.61 U	0.61 U	--	--	0.66 U	0.61 U	0.61 U	0.61 U
2-Chlorophenol	0.74 U	--	--	--	0.74 U	0.74 U	0.74 U	0.74 U	--	--	0.8 U	0.74 U	0.74 U	0.74 U
2-Methylnaphthalene	0.88 U	--	--	--	0.88 U	0.88 U	0.88 U	0.88 U	--	--	0.96 U	0.88 U	0.88 U	0.88 U
2-Methylphenol (O-Cresol)	1.3 U	--	--	--	1.3 U	1.3 U	1.3 U	1.3 U	--	--	1.4 U	1.3 U	1.3 U	1.3 U
2-Nitroaniline	0.65 U	--	--	--	0.65 U	0.65 U	0.65 U	0.65 U	--	--	0.71 U	0.65 U	0.65 U	0.65 U
2-Nitrophenol	0.59 U	--	--	--	0.59 U	0.59 U	0.59 U	0.59 U	--	--	0.64 U	0.59 U	0.59 U	0.59 U
3- And 4- Methylphenol (Total)	0.88 U	--	--	--	0.88 U	0.88 U	0.88 U	0.88 U	--	--	0.96 U	0.88 U	0.88 U	0.88 U
3,3'-Dichlorobenzidine	1 U	--	--	--	1 U	1 U	1 U	1 U	--	--	1.1 U	1 U	1 U	1 U
3-Nitroaniline	0.82 U	--	--	--	0.82 U	0.82 U	0.82 U	0.82 U	--	--	0.89 U	0.82 U	0.82 U	0.82 U
4,6-Dinitro-2-Methylphenol	2 U	--	--	--	2 U	2 U	2 U	2 U	--	--	2.2 U	2 U	2 U	2 U
4-Bromophenyl Phenyl Ether	1 U	--	--	--	1 U	1 U	1 U	1 U	--	--	1.1 U	1 U	1 U	1 U
4-Chloro-3-Methylphenol	0.76 U	--	--	--	0.76 U	0.76 U	0.76 U	0.76 U	--	--	0.83 U	0.76 U	0.76 U	0.76 U
4-Chloroaniline	0.73 U	--	--	--	0.73 U	0.73 U	0.73 U	0.73 U	--	--	0.79 U	0.73 U	0.73 U	0.73 U
4-Chlorophenyl Phenyl Ether	0.96 U	--	--	--	0.96 U	0.96 U	0.96 U	0.96 U	--	--	1 U	0.96 U	0.96 U	0.96 U
4-Nitroaniline	0.48 U	--	--	--	0.48 U	0.48 U	0.48 U	0.48 U	--	--	0.52 U	0.48 U	0.48 U	0.48 U
4-Nitrophenol	4.7 U	--	--	--	4.7 U	4.7 U	4.7 U	4.7 U	--	--	5.1 U	4.7 U	4.7 U	4.7 U
Acenaphthene	0.88 U	--	--	--	0.88 U	0.88 UJ	0.88 U	0.88 U	--	--	0.96 U	0.88 UJ	0.88 U	0.88 U
Acenaphthylene	0.65 U	--	--	--	0.65 U	0.65 U	0.65 U	0.65 U	--	--	0.71 U	0.65 U	0.65 U	0.65 U
Acetophenone	1 U	--	--	--	1 U	1 U	1 U	1 U	--	--	1.1 U	1 U	1 U	1 U
Anthracene	0.57 U	--	--	--	0.57 U	0.57 U	0.57 U	0.57 U	--	--	0.62 U	0.57 U	0.57 U	0.57 U
Atrazine	0.77 U	--	--	--	0.77 U	0.77 U	0.77 U	0.77 U	--	--	0.84 U	0.77 U	0.77 U	0.77 U
Benzaldehyde	0.86 U	--	--	--	0.86 U	0.86 U	0.86 U	0.86 UJ	--	--	0.93 U	0.86 U	0.86 U	0.86 U
Benzo(A)Anthracene	0.55 U	--	--	--	0.55 U	0.55 U	0.55 U	0.55 U	--	--	0.6 U	0.55 U	0.55 UJ	0.55 U
Benzo(A)Pyrene	0.16 U	--	--	--	0.16 U	0.16 U	0.16 U	0.16 U	--	--	0.17 U	0.16 U	0.16 U	0.16 U
Benzo(B)Fluoranthene	0.44 U	--	--	--	0.44 U	0.44 U	0.44 U	0.44 U	--	--	0.48 U	0.44 U	0.44 U	0.44 U
Benzo(G,H,I)Perylene	0.75 U	--	--	--	0.75 U	0.75 U	0.75 U	0.75 U	--	--	0.82 U	0.75 U	0.75 U	0.75 U
Benzo(K)Fluoranthene	0.18 U	--	--	--	0.18 U	0.18 U	0.18 U	0.18 U	--	--	0.2 U	0.18 U	0.18 U	0.18 U
Benzyl Butyl Phthalate	0.6 U	--	--	--	0.6 U	0.6 U	0.6 U	0.6 U	--	--	0.65 U	0.6 U	0.6 U	0.6 U
Biphenyl (Diphenyl)	0.63 U	--	--	--	0.63 U	0.63 U	0.63 U	0.63 U	--	--	0.68 U	0.63 UJ	0.63 U	0.63 U
Bis(2-Chloroethoxy) Methane	0.69 U	--	--	--	0.69 U	0.69 U	0.69 U	0.69 U	--	--	0.75 U	0.69 U	0.69 U	0.69 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.12 U	--	--	--	0.12 U	0.12 UJ	0.12 U	0.12 U	--	--	0.13 U	0.12 UJ	0.12 U	0.12 U
Bis(2-Chloroisopropyl) Ether	0.93 U	--	--	--	0.93 U	0.93 U	0.93 U	0.93 U	--	--	1 U	0.93 U	0.93 U	0.93 U
Bis(2-Ethylhexyl) Phthalate	0.72 U	--	--	--	0.72 U	0.72 U	0.72 U	0.72 U	--	--	0.78 U	0.72 U	0.72 U	0.72 U
Caprolactam	1.1 U	--	--	--	1.1 U	1.1 U	1.1 UJ	1.1 U	--	--	1.1 U	1.1 U	1.1 U	1.1 U
Carbazole	0.85 U	--	--	--	0.85 U	0.85 U	0.85 U	0.85 U	--	--	0.92 U	0.85 U	0.85 U	0.85 U
Chrysene	0.67 U	--	--	--	0.67 U	0.67 U	0.67 U	0.67 U	--	--	0.73 U	0.67 U	0.67 UJ	0.67 U
Dibenz(A,H)Anthracene	0.09 U	--	--	--	0.09 U	0.09 U	0.09 U	0.09 U	--	--	0.098 U	0.09 U	0.09 U	0.09 U
Dibenzofuran	0.85 U	--	--	--	0.85 U	0.85 U	0.85 U	0.85 U	--	--	0.92 U	0.85 U	0.85 UJ	0.85 U
Diethyl Phthalate	1 U	--	--	--	1 U	1 U	1 U	1 U	--	--	1.1 U	1 U	1 U	1 U
Dimethyl Phthalate	0.98 U	--	--	--	0.98 U	0.98 U	0.98 U	0.98 U	--	--	1.1 U	0.98 U	0.98 U	0.98 U
Di-N-Butyl Phthalate	0.82 U	--	--	--	0.82 U	0.82 U	0.82 U	0.82 U	--	--	0.89 U	0.82 U	0.82 U	0.82 U
Di-N-Octylphthalate	0.69 U	--	--	--	0.69 U	0.69 U	0.69 U	0.69 U	--	--	0.75 U	0.69 U	0.69 U	0.69 U
Fluoranthene	0.72 U	--	--	--	0.72 U	0.72 U	0.72 U	0.72 U	--	--	0.78 U	0.72 U	0.72 U	0.72 U

Table E-38
Summary of Data Used in Risk Assessment
Groundwater Upper Hydrogeologic Unit Plume Area - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Chemical	CFMW-011-DUP 460-136263-11 CFMW-DUP15-GW 6/28/2017	CFMW-011 460-157853-4 CFMW-011-GW 6/7/2018	CFMW-011 460-166734-3 CFMW-011-GW 10/11/2018	CFMW-011-DUP 460-166734-9 CFMW-DUP22-GW 10/11/2018	CFMW-012 460-120053-5 CFMW-012-GW 9/12/2016	CFMW-012 460-125477-4 CFMW-012-GW 12/14/2016	CFMW-012 460-130225-3 CFMW-012-GW 3/22/2017	CFMW-012 460-135989-9 CFMW-012-GW 6/23/2017	CFMW-012 460-157970-1 CFMW-012-GW 6/8/2018	CFMW-012 460-166051-2 CFMW-012-GW 10/3/2018	CFMW-014 460-120053-7 CFMW-014-GW 9/12/2016	CFMW-014 460-125567-4 CFMW-014-GW 12/15/2016	CFMW-014 460-130620-1 CFMW-014-GW 3/29/2017	CFMW-014 460-136178-11 CFMW-014-GW 6/27/2017
Fluorene	0.8 U	--	--	--	0.8 U	0.8 U	0.8 U	0.8 U	--	--	0.87 U	0.8 U	0.8 U	0.8 U
Hexachlorobenzene	0.47 U	--	--	--	0.47 U	0.47 U	0.47 U	0.47 U	--	--	0.51 U	0.47 U	0.47 U	0.47 U
Hexachlorobutadiene	0.76 U	--	--	--	0.76 U	0.76 U	0.76 U	0.76 U	--	--	0.83 U	0.76 U	0.76 U	0.76 U
Hexachlorocyclopentadiene	0.61 U	--	--	--	0.61 U	0.61 U	0.61 U	0.61 UJ	--	--	0.66 U	0.61 U	0.61 U	0.61 U
Hexachloroethane	0.09 U	--	--	--	0.09 U	0.09 U	0.09 U	0.09 U	--	--	0.098 U	0.09 U	0.09 U	0.09 U
Indeno(1,2,3-C,D)Pyrene	0.21 U	--	--	--	0.21 U	0.21 U	0.21 U	0.21 U	--	--	0.23 U	0.21 U	0.21 U	0.21 U
Isophorone	0.67 U	--	--	--	0.67 U	0.67 U	0.67 U	0.67 U	--	--	0.73 U	0.67 U	0.67 U	0.67 U
Naphthalene	0.8 U	--	--	--	0.8 U	0.8 U	0.8 U	0.8 U	--	--	0.87 U	0.8 U	0.8 U	0.8 U
Nitrobenzene	0.49 U	--	--	--	0.49 U	0.49 U	0.49 U	0.49 U	--	--	0.53 U	0.49 U	0.49 U	0.49 U
N-Nitrosodi-N-Propylamine	0.83 U	--	--	--	0.83 U	0.83 U	0.83 U	0.83 U	--	--	0.9 U	0.83 U	0.83 U	0.83 U
N-Nitrosodiphenylamine	0.74 U	--	--	--	0.74 U	0.74 UJ	0.74 U	0.74 U	--	--	0.8 U	0.74 U	0.74 U	0.74 U
Pentachlorophenol	2.2 U	--	--	--	2.2 U	2.2 UJ	2.2 U	2.2 U	--	--	2.4 U	2.2 UJ	2.2 U	2.2 U
Phenanthrene	0.65 U	--	--	--	0.65 U	0.65 U	0.65 U	0.65 U	--	--	0.71 U	0.65 U	0.65 U	0.65 U
Phenol	0.41 U	--	--	--	0.41 U	0.41 U	0.41 U	0.41 U	--	--	0.45 U	0.41 U	0.41 U	0.41 U
Pyrene	0.83 U	--	--	--	0.83 U	0.83 U	0.83 U	0.83 U	--	--	0.9 U	0.83 U	0.83 U	0.83 U
SEMIVOLATILE ORGANIC COMPOUNDS|LOW LEVEL (µg/L)														
1,2,4,5-Tetrachlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,4-Dioxane (P-Dioxane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,3,4,6-Tetrachlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4,5-Trichlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4,6-Trichlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4-Dichlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4-Dimethylphenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4-Dinitrophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4-Dinitrotoluene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,6-Dinitrotoluene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Chloronaphthalene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Chlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Methylnaphthalene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Methylphenol (O-Cresol)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Nitroaniline	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Nitrophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3,3'-Dichlorobenzidine	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3-Nitroaniline	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4,6-Dinitro-2-Methylphenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Bromophenyl Phenyl Ether	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Chloro-3-Methylphenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Chloroaniline	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Chlorophenyl Phenyl Ether	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Nitroaniline	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Nitrophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acenaphthene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acenaphthylene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acetophenone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Anthracene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Atrazine	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzaldehyde	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(A)Anthracene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(A)Pyrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(B)Fluoranthene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(G,H,I)Perylene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(K)Fluoranthene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzyl Butyl Phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Biphenyl (Diphenyl)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bis(2-Chloroethoxy) Methane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bis(2-Chloroisopropyl) Ether	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bis(2-Ethylhexyl) Phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Caprolactam	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Table E-38
Summary of Data Used in Risk Assessment
Groundwater Upper Hydrogeologic Unit Plume Area - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Chemical	CFMW-011-DUP 460-136263-11 CFMW-DUP15-GW 6/28/2017	CFMW-011 460-157853-4 CFMW-011-GW 6/7/2018	CFMW-011 460-166734-3 CFMW-011-GW 10/11/2018	CFMW-011-DUP 460-166734-9 CFMW-DUP22-GW 10/11/2018	CFMW-012 460-120053-5 CFMW-012-GW 9/12/2016	CFMW-012 460-125477-4 CFMW-012-GW 12/14/2016	CFMW-012 460-130225-3 CFMW-012-GW 3/22/2017	CFMW-012 460-135989-9 CFMW-012-GW 6/23/2017	CFMW-012 460-157970-1 CFMW-012-GW 6/8/2018	CFMW-012 460-166051-2 CFMW-012-GW 10/3/2018	CFMW-014 460-120053-7 CFMW-014-GW 9/12/2016	CFMW-014 460-125567-4 CFMW-014-GW 12/15/2016	CFMW-014 460-130620-1 CFMW-014-GW 3/29/2017	CFMW-014 460-136178-11 CFMW-014-GW 6/27/2017
Carbazole	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chrysene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibenz(A,H)Anthracene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibenzofuran	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Diethyl Phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dimethyl Phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Di-N-Butyl Phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Di-N-Octylphthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Fluoranthene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Fluorene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorobutadiene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorocyclopentadiene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Indeno(1,2,3-C,D)Pyrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Isophorone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Naphthalene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Nitrobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
N-Nitrosodi-N-Propylamine	--	--	--	--	--	--	--	--	--	--	--	--	--	--
N-Nitrosodiphenylamine	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Pentachlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Phenanthrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Phenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Pyrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
VOLATILE ORGANIC COMPOUNDS (µg/L)														
1,1,1-Trichloroethane	0.28 U	--	--	--	0.28 U	0.28 U	0.28 U	0.28 U	--	--	0.28 U	0.28 U	0.28 U	0.28 U
1,1,2,2-Tetrachloroethane	0.19 U	--	--	--	0.19 UJ	0.19 U	0.19 U	0.19 UJ	--	--	0.19 U	0.19 U	0.19 U	0.19 U
1,1,2-Trichloro-1,2,2-Trifluoroethane	0.34 U	--	--	--	0.34 U	0.34 U	0.34 U	0.34 U	--	--	0.34 U	0.34 U	0.34 U	0.34 U
1,1,2-Trichloroethane	0.08 U	--	--	--	0.08 U	0.08 U	0.08 U	0.08 U	--	--	0.08 U	0.08 U	0.08 U	0.08 U
1,1-Dichloroethane	0.24 U	--	--	--	0.24 U	0.24 U	0.24 U	0.24 U	--	--	0.24 U	0.24 U	0.24 U	0.24 U
1,1-Dichloroethene	0.34 U	--	--	--	0.34 U	0.34 U	0.34 U	0.34 U	--	--	0.34 U	0.34 U	0.34 U	0.34 U
1,2,3-Trichlorobenzene	0.35 U	--	--	--	0.35 U	0.35 U	0.35 U	0.35 U	--	--	0.35 U	0.35 U	0.35 U	0.35 U
1,2,4-Trichlorobenzene	0.27 U	--	--	--	0.27 U	0.27 U	0.27 U	0.27 U	--	--	0.27 U	0.27 U	0.27 U	0.27 U
1,2-Dibromo-3-Chloropropane	0.23 U	--	--	--	0.23 U	0.23 UJ	0.23 U	0.23 UJ	--	--	0.23 U	0.23 UJ	0.23 U	0.23 U
1,2-Dibromoethane (Ethylene Dibromide)	0.19 U	--	--	--	0.19 U	0.19 U	0.19 U	0.19 U	--	--	0.19 U	0.19 U	0.19 U	0.19 U
1,2-Dichlorobenzene	0.22 U	--	--	--	0.22 U	0.22 U	0.22 U	0.22 U	--	--	0.22 U	0.22 U	0.22 U	0.22 U
1,2-Dichloroethane	0.25 U	--	--	--	0.25 U	0.25 U	0.25 U	0.25 UJ	--	--	0.25 U	0.25 U	0.25 U	0.25 U
1,2-Dichloropropane	0.18 U	--	--	--	0.18 U	0.18 U	0.18 U	0.18 U	--	--	0.18 U	0.18 U	0.18 U	0.18 U
1,3-Dichlorobenzene	0.33 U	--	--	--	0.33 U	0.33 U	0.33 U	0.33 U	--	--	0.33 U	0.33 U	0.33 U	0.33 U
1,4-Dichlorobenzene	0.33 U	--	--	--	0.33 U	0.33 U	0.33 U	0.33 U	--	--	0.33 U	0.33 U	0.33 U	0.33 U
2-Hexanone	0.72 U	--	--	--	0.72 U	0.72 U	0.72 U	0.72 U	--	--	0.72 U	0.72 U	0.72 U	0.72 U
Acetone	1.1 U	--	--	--	1.1 U	1.1 UJ	3.6 J	1.1 U	--	--	1.1 U	1.1 UJ	1.1 U	1.1 U
Benzene	0.09 U	--	--	--	0.09 U	0.09 U	0.09 U	0.09 U	--	--	0.09 U	0.09 U	0.09 U	0.09 U
Bromochloromethane	0.3 U	--	--	--	0.3 U	0.3 U	0.3 U	0.3 U	--	--	0.3 U	0.3 U	0.3 U	0.3 U
Bromodichloromethane	0.15 U	--	--	--	0.15 U	0.15 U	0.15 U	0.15 U	--	--	0.15 U	0.15 U	0.15 U	0.15 U
Bromoform	0.18 U	--	--	--	0.18 U	0.18 U	0.18 U	0.18 U	--	--	0.18 U	0.18 U	0.18 U	0.18 U
Bromomethane	0.18 U	--	--	--	0.18 UJ	0.18 U	0.18 U	0.18 UJ	--	--	0.18 U	0.18 U	0.18 U	0.18 U
Carbon Disulfide	0.22 U	--	--	--	0.22 U	0.22 U	0.22 U	0.22 UJ	--	--	0.22 U	0.22 U	0.22 U	0.22 U
Carbon Tetrachloride	0.33 U	--	--	--	0.33 U	0.33 U	0.33 U	0.33 U	--	--	0.33 U	0.33 U	0.33 U	0.33 U
Chlorobenzene	0.24 U	--	--	--	0.24 U	0.24 U	0.24 U	0.24 U	--	--	0.24 U	0.24 U	0.24 U	0.24 U
Chloroethane	0.37 U	--	--	--	0.37 U	0.37 U	0.37 U	0.37 U	--	--	0.37 U	0.37 U	0.37 U	0.37 U
Chloroform	0.22 U	--	--	--	0.22 U	0.22 U	0.22 U	0.22 U	--	--	0.22 U	0.22 U	0.22 U	0.22 U
Chloromethane	0.22 U	--	--	--	0.22 U	0.22 U	0.22 U	0.22 UJ	--	--	0.22 U	0.22 U	0.22 U	0.22 U
Cis-1,2-Dichloroethylene	0.26 U	--	--	--	0.26 U	0.26 U	0.26 U	0.26 U	--	--	0.26 U	0.26 U	0.26 U	0.26 U
Cis-1,3-Dichloropropene	0.16 U	--	--	--	0.16 U	0.16 U	0.16 U	0.16 U	--	--	0.16 U	0.16 U	0.16 U	0.16 U
Cyclohexane	0.26 UJ	--	--	--	0.26 U	0.26 U	0.26 U	0.26 U	--	--	0.26 U	0.26 U	0.26 U	0.26 U
Dibromochloromethane	0.22 U	--	--	--	0.22 U	0.22 U	0.22 U	0.22 U	--	--	0.22 U	0.22 U	0.22 U	0.22 U
Dichlorodifluoromethane	0.14 UJ	--	--	--	0.14 UJ	0.14 U	0.14 U	0.14 UJ	--	--	0.14 UJ	0.14 U	0.14 U	0.14 U
Ethylbenzene	0.3 U	--	--	--	0.3 U	0.3 U	0.3 U	0.3 U	--	--	0.3 U	0.3 U	0.3 U	0.3 U

Table E-38
Summary of Data Used in Risk Assessment
Groundwater Upper Hydrogeologic Unit Plume Area - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-011-DUP	CFMW-011	CFMW-011	CFMW-011-DUP	CFMW-012	CFMW-012	CFMW-012	CFMW-012	CFMW-012	CFMW-012	CFMW-014	CFMW-014	CFMW-014	CFMW-014
Sample Lab IDs	460-136263-11	460-157853-4	460-166734-3	460-166734-9	460-120053-5	460-125477-4	460-130225-3	460-135989-9	460-157970-1	460-166051-2	460-120053-7	460-125567-4	460-130620-1	460-136178-11
Sample Name	CFMW-DUP15-GW	CFMW-011-GW	CFMW-011-GW	CFMW-DUP22-GW	CFMW-012-GW	CFMW-012-GW	CFMW-012-GW	CFMW-012-GW	CFMW-012-GW	CFMW-012-GW	CFMW-014-GW	CFMW-014-GW	CFMW-014-GW	CFMW-014-GW
Chemical	6/28/2017	6/7/2018	10/11/2018	10/11/2018	9/12/2016	12/14/2016	3/22/2017	6/23/2017	6/8/2018	10/3/2018	9/12/2016	12/15/2016	3/29/2017	6/27/2017
Isopropylbenzene (Cumene)	0.32 U	--	--	--	0.32 U	0.32 U	0.32 U	0.32 U	--	--	0.32 U	0.32 U	0.32 U	0.32 U
M,P-Xylene	0.28 U	--	--	--	0.28 U	0.28 U	0.28 U	0.28 U	--	--	0.28 U	0.28 U	0.28 U	0.28 U
Methyl Acetate	0.58 U	--	--	--	0.58 U	0.58 UJ	0.58 U	0.58 U	--	--	0.58 U	0.58 UJ	0.58 U	0.58 U
Methyl Ethyl Ketone (2-Butanone)	2.2 U	--	--	--	2.2 U	2.2 U	2.2 U	2.2 U	--	--	2.2 U	2.2 U	2.2 U	2.2 U
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	0.63 U	--	--	--	0.63 U	0.63 U	0.63 U	0.63 U	--	--	0.63 U	0.63 U	0.63 U	0.63 U
Methylcyclohexane	0.22 UJ	--	--	--	0.22 U	0.22 U	0.22 U	0.22 U	--	--	0.22 U	0.22 U	0.22 U	0.22 U
Methylene Chloride	0.21 U	--	--	--	0.21 U	0.21 U	0.21 U	0.21 U	--	--	0.21 U	0.21 U	0.21 U	0.21 U
O-Xylene (1,2-Dimethylbenzene)	0.32 U	--	--	--	0.32 U	0.32 U	0.32 U	0.32 U	--	--	0.32 U	0.32 U	0.32 U	0.32 U
Styrene	0.17 U	--	--	--	0.17 U	0.17 U	0.17 U	0.17 U	--	--	0.17 U	0.17 U	0.17 U	0.17 U
Tert-Butyl Methyl Ether	0.13 U	--	--	--	0.13 U	0.13 U	0.13 U	0.13 U	--	--	0.13 U	0.13 U	0.13 U	0.13 U
Tetrachloroethylene (PCE)	0.12 U	--	--	--	0.12 U	0.12 U	0.16 J	0.12 U	--	--	0.12 U	0.12 U	0.12 U	0.12 U
Toluene	0.25 U	--	--	--	0.25 U	0.25 U	0.25 U	0.25 U	--	--	0.25 U	0.25 U	0.25 U	0.25 U
Trans-1,2-Dichloroethene	0.18 U	--	--	--	0.18 U	0.18 U	0.18 U	0.18 U	--	--	0.18 U	0.18 U	0.18 U	0.18 U
Trans-1,3-Dichloropropene	0.19 U	--	--	--	0.19 U	0.19 U	0.19 U	0.19 U	--	--	0.19 U	0.19 U	0.19 U	0.19 U
Trichloroethylene (TCE)	0.22 U	--	--	--	0.22 U	0.22 U	0.22 U	0.22 U	--	--	0.22 U	0.22 U	0.22 U	0.22 U
Trichlorofluoromethane	0.15 U	--	--	--	0.15 U	0.15 UJ	0.15 U	0.15 U	--	--	0.15 U	0.15 UJ	0.15 U	0.15 U
Vinyl Chloride	0.06 U	--	--	--	0.06 U	0.06 U	0.06 U	0.06 U	--	--	0.06 U	0.06 U	0.06 U	0.06 U

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-38
Summary of Data Used in Risk Assessment
Groundwater Upper Hydrogeologic Unit Plume Area - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-014	CFMW-014	CFMW-015	CFMW-015	CFMW-015	CFMW-015	CFMW-015	CFMW-015	CFMW-016	CFMW-016-DUP	CFMW-016	CFMW-016	CFMW-016A	CFMW-016A
Sample Lab IDs	460-158058-3	460-166734-4	460-120053-8	460-125567-3	460-130620-2	460-136178-10	460-158058-4	460-166734-5	460-130507-5	460-130507-4	460-136351-4	460-158493-6	460-120664-3	460-125477-9
Sample Name	CFMW-014-GW	CFMW-014-GW	CFMW-015-GW	CFMW-015-GW	CFMW-015-GW	CFMW-015-GW	CFMW-015-GW	CFMW-015-GW	CFMW-016-GW	CFMW-DUP10-GW	CFMW-016-GW	CFMW-016-GW	CFMW-016a-GW	CFMW-016a-GW
Chemical	6/11/2018	10/11/2018	9/12/2016	12/15/2016	3/29/2017	6/27/2017	6/11/2018	10/11/2018	3/28/2017	3/28/2017	6/29/2017	6/15/2018	9/21/2016	12/14/2016
GENERAL CHEMISTRY (µg/L)														
Fluoride	--	--	--	--	--	55300 J+	--	--	--	--	352 J+	--	--	--
Cyanide	382	2110 J	--	--	--	7780	6520	5120 J	--	--	2 U	2 U	--	--
Cyanide (Free)	5.3	36.7	--	--	--	36.9	10.1	4.6 J	--	--	1.5 UJ	1.5 UJ	--	--
Cyanide	410 J+	2140 J-	6240 J	3100	6600	8120	5500 J+	5180 J-	2.3 J	3.3 J	2 U	2 U	2.8 J	2 J
Cyanide (Free)	10.6	23.5	--	--	23.9	97.3	34.6	4.6 J	--	--	1.5 UJ	2.5 J+	--	--
METALS (µg/L)														
Aluminum	15 U	15 U	18.2 U	18.2 U	18.2 U	18.2 U	15 U	37.9 J	18.2 U	18.2 U	18.2 U	15 U	64.8	18.2 U
Antimony	0.62 U	0.62 U	0.69 J	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U
Arsenic	7.2	8	47.7	50.8	38.1	92.1	91.6	61.1	0.64 U	0.64 U	0.64 U	0.77 U	1.3 J	1.3 J
Barium	103	145	62	34	72.6	67	49	38.9	220 J	220 J	199	171	99.5	143
Beryllium	0.26 U	0.26 U	0.24 U	0.24 U	0.24 U	0.24 U	0.26 U	0.26 U	0.24 U	0.24 U	0.24 U	0.26 U	0.24 U	0.24 U
Cadmium	0.61 U	0.61 U	0.71 U	0.71 U	0.71 U	0.71 U	0.61 U	0.61 U	0.71 U	0.71 U	0.71 U	0.61 U	0.71 U	0.71 U
Calcium	16100	19100	2710	1410	4210	3550	2340	1780	46700 J	46800 J	45800	39300	38100	31400
Chromium, Total	1.3 U	1.3 U	2 J	1.3 U	2.2 J	2 J	2.3 J	1.7 J	1.3 U	1.3 U	1.3 U	1.3 U	1.8 J	1.3 U
Cobalt	1.3 U	4.1	27.8	17.2	20.8	37.5	17.3	14.4	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
Copper	3 J	7.2	46.8	29.2	42.4	50.9	31.2	29	1.4 U	1.4 U	1.4 U	1.9 U	3.6 J	1.4 U
Iron	140	627	2550	1330	2640	3320	2180	1500	42.4 UJ	42.4 UJ	42.4 U	45.7 U	42.4 U	42.4 U
Lead	0.37 U	0.37 U	0.38 U	0.38 U	0.38 U	0.38 U	0.37 U	0.37 U	0.38 U	0.38 U	0.38 U	0.37 U	0.38 U	0.38 U
Magnesium	5650	7130	4010	1640	5540	6110	2730	1800	11500 J	11600 J	11300	9390	4060	9330
Manganese	14.4	2.7 U	4.1 J	3.3 J	3.9 J	4.3 J	3.9 J	4.5 J	2.5 U	2.5 U	4 J	2.7 U	2.5 U	6.1 J
Mercury	0.12 U	0.12 U	0.17 U	0.17 U	0.17 U	0.17 U	0.12 U	0.12 U	0.17 U	0.17 U	0.17 U	0.12 U	0.17 U	0.17 U
Nickel	1.3 U	1.3 U	7.7	4.8	4.9	9	5.4	4.4	1.4 U	1.4 U	1.4 U	1.3 U	1.4 U	1.4 U
Potassium	674	803	2400	1520	2560	2860	2240	1720	646	648	534	518	2780	1360
Selenium	0.69 U	1.3 J	13.5	9.6 J	8.9 J	17.1	9.2 J	5.1 J	0.73 U	0.73 U	0.73 U	0.69 U	0.73 U	0.73 U
Silver	1.4 U	1.4 U	1.3 U	1.3 U	1.3 U	1.3 U	1.4 U	1.4 U	1.3 U	1.3 U	1.3 U	1.4 U	1.3 U	1.3 U
Sodium	92500	159000	620000	365000	601000	662000	508000	422000	14300	13300	3250	3280	18600	13100
Thallium	0.24 U	0.24 U	0.26 U	0.26 U	0.26 U	0.26 U	0.24 U	0.24 U	0.26 U	0.26 U	0.26 U	0.24 U	0.26 U	0.26 U
Vanadium	32.1	30.4	50.4	108	75.7	378	428	213	1.9 U	1.9 U	1.9 U	1.2 U	1.9 J	1.9 U
Zinc	45.5	5.4 U	7 U	7 U	7 U	7 U	5.4 U	5.4 U	7 U	7 U	7 U	5.4 U	7 U	7 U
Aluminum	420	106	--	--	--	48.7	179	105	--	--	67	15 U	--	--
Antimony	0.62 U	0.62 U	--	--	--	0.82 J	0.8 J	0.62 U	--	--	0.62 U	0.62 U	--	--
Arsenic	8.3	7	--	--	--	77.7	82.1	61.7	--	--	0.64 U	0.77 U	--	--
Barium	114	156	--	--	--	76.5	52.5	43.7	--	--	213	193	--	--
Beryllium	0.26 U	0.26 U	--	--	--	0.24 U	0.26 U	0.26 U	--	--	0.24 U	0.26 U	--	--
Cadmium	0.61 U	0.61 U	--	--	--	0.71 U	0.61 U	0.61 U	--	--	0.71 U	0.61 U	--	--
Calcium	16100	20300	--	--	--	3730	2270	1990	--	--	48400	43800	--	--
Chromium, Total	1.3 U	1.6 J	--	--	--	2.9 J	3.2 J	2.4 J	--	--	1.3 U	1.3 U	--	--
Cobalt	1.5 J	4.5	--	--	--	39.5	18.9	15.3	--	--	1.3 U	1.3 U	--	--
Copper	5.5	14.8	--	--	--	59.5	40.7	42.8	--	--	1.4 U	1.9 U	--	--
Iron	821	872	--	--	--	3180	2590	1650	--	--	78.9 J	57.9 J	--	--
Lead	0.37 U	0.37 U	--	--	--	0.38 U	0.48 J	0.43 J	--	--	0.38 U	0.37 U	--	--
Magnesium	6030	7660	--	--	--	6400	2710	1790	--	--	12300	11500	--	--
Manganese	14.5	7.1 J	--	--	--	9.6	10.8	7.9 J	--	--	4.9 J	2.7 U	--	--
Mercury	0.12 U	0.12 U	--	--	--	0.17 U	0.13 J	0.12 U	--	--	0.17 U	0.12 U	--	--
Nickel	1.3 U	1.3 U	--	--	--	10.2	6.4	5.4	--	--	1.4 U	1.3 U	--	--
Potassium	738	859	--	--	--	2760	2080	1800	--	--	584	592	--	--
Selenium	0.69 U	1.7 J	--	--	--	13	7.4 J	4.8 J	--	--	0.73 U	0.69 U	--	--
Silver	1.4 U	1.4 U	--	--	--	1.3 U	1.4 U	1.4 U	--	--	1.3 U	1.4 U	--	--
Sodium	103000	169000	--	--	--	703000	504000	393000	--	--	3580	4620 J+	--	--
Thallium	0.24 U	0.24 U	--	--	--	0.26 U	0.24 U	0.24 U	--	--	0.26 U	0.24 U	--	--
Vanadium	40	32.5	--	--	--	378	429	206	--	--	1.9 U	1.2 U	--	--
Zinc	34.7	5.4 U	--	--	--	7 U	9.4 J	9.1 J	--	--	7 U	5.4 U	--	--
POLYCHLORINATED BIPHENYLS (µg/L)														
PCB-1016 (Aroclor 1016)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1221 (Aroclor 1221)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1232 (Aroclor 1232)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1242 (Aroclor 1242)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1248 (Aroclor 1248)	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Table E-38
Summary of Data Used in Risk Assessment
Groundwater Upper Hydrogeologic Unit Plume Area - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Chemical	CFMW-014 460-158058-3 CFMW-014-GW 6/11/2018	CFMW-014 460-166734-4 CFMW-014-GW 10/11/2018	CFMW-015 460-120053-8 CFMW-015-GW 9/12/2016	CFMW-015 460-125567-3 CFMW-015-GW 12/15/2016	CFMW-015 460-130620-2 CFMW-015-GW 3/29/2017	CFMW-015 460-136178-10 CFMW-015-GW 6/27/2017	CFMW-015 460-158058-4 CFMW-015-GW 6/11/2018	CFMW-015 460-166734-5 CFMW-015-GW 10/11/2018	CFMW-016 460-130507-5 CFMW-016-GW 3/28/2017	CFMW-016-DUP 460-130507-4 CFMW-DUP10-GW 3/28/2017	CFMW-016 460-136351-4 CFMW-016-GW 6/29/2017	CFMW-016 460-158493-6 CFMW-016-GW 6/15/2018	CFMW-016A 460-120664-3 CFMW-016a-GW 9/21/2016	CFMW-016A 460-125477-9 CFMW-016a-GW 12/14/2016
PCB-1254 (Aroclor 1254)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1260 (Aroclor 1260)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1262 (Aroclor 1262)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1268 (Aroclor 1268)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Polychlorinated Biphenyl (PCBs)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SEMIVOLATILE ORGANIC COMPOUNDS (µg/L)														
1,2,4,5-Tetrachlorobenzene	--	--	0.43 U	0.43 UJ	0.43 U	0.45 U	--	--	0.45 U	0.45 U	0.43 U	--	--	--
1,4-Dioxane (P-Dioxane)	--	--	3.1 U	3.1 U	3.1 U	3.2 U	--	--	3.2 U	3.2 U	3.1 U	--	--	--
2,3,4,6-Tetrachlorophenol	--	--	0.69 U	0.69 U	0.69 U	0.72 U	--	--	0.72 U	0.72 U	0.69 U	--	--	--
2,4,5-Trichlorophenol	--	--	0.49 U	0.49 U	0.49 U	0.51 U	--	--	0.51 U	0.51 U	0.49 U	--	--	--
2,4,6-Trichlorophenol	--	--	0.53 U	0.53 U	0.53 U	0.55 U	--	--	0.55 U	0.55 U	0.53 U	--	--	--
2,4-Dichlorophenol	--	--	0.63 U	0.63 U	0.63 U	0.66 U	--	--	0.66 U	0.66 U	0.63 U	--	--	--
2,4-Dimethylphenol	--	--	0.91 U	0.91 UJ	0.91 U	0.95 U	--	--	0.95 U	0.95 U	0.91 U	--	--	--
2,4-Dinitrophenol	--	--	2.4 U	2.4 U	2.4 U	2.5 U	--	--	2.5 UJ	2.5 UJ	2.4 U	--	--	--
2,4-Dinitrotoluene	--	--	1 U	1 U	1 U	1.1 U	--	--	1.1 U	1.1 U	1 U	--	--	--
2,6-Dinitrotoluene	--	--	0.88 U	0.88 U	0.88 U	0.92 U	--	--	0.92 U	0.92 U	0.88 U	--	--	--
2-Chloronaphthalene	--	--	0.61 U	0.61 U	0.61 U	0.64 U	--	--	0.64 U	0.64 U	0.61 U	--	--	--
2-Chlorophenol	--	--	0.74 U	0.74 U	0.74 U	0.77 U	--	--	0.77 U	0.77 U	0.74 U	--	--	--
2-Methylnaphthalene	--	--	0.88 U	0.88 U	0.88 U	0.92 U	--	--	0.92 U	0.92 U	0.88 U	--	--	--
2-Methylphenol (O-Cresol)	--	--	1.3 U	1.3 U	1.3 U	1.3 U	--	--	1.3 U	1.3 U	1.3 U	--	--	--
2-Nitroaniline	--	--	0.65 U	0.65 UJ	0.65 U	0.68 U	--	--	0.68 U	0.68 U	0.65 U	--	--	--
2-Nitrophenol	--	--	0.59 U	0.59 U	0.59 U	0.61 U	--	--	0.61 U	0.61 U	0.59 U	--	--	--
3- And 4- Methylphenol (Total)	--	--	0.88 UJ	0.88 U	0.88 U	0.92 U	--	--	0.92 U	0.92 U	0.88 U	--	--	--
3,3'-Dichlorobenzidine	--	--	1 U	1 UR	1 U	1.1 U	--	--	1.1 U	1.1 U	1 U	--	--	--
3-Nitroaniline	--	--	0.82 U	0.82 UR	0.82 U	0.85 U	--	--	0.85 U	0.85 U	0.82 U	--	--	--
4,6-Dinitro-2-Methylphenol	--	--	2 U	2 U	2 U	2.1 U	--	--	2.1 U	2.1 U	2 U	--	--	--
4-Bromophenyl Phenyl Ether	--	--	1 U	1 U	1 U	1.1 U	--	--	1.1 U	1.1 U	1 U	--	--	--
4-Chloro-3-Methylphenol	--	--	0.76 U	0.76 U	0.76 U	0.79 U	--	--	0.79 U	0.79 U	0.76 U	--	--	--
4-Chloroaniline	--	--	0.73 U	0.73 UJ	0.73 U	0.76 U	--	--	0.76 U	0.76 U	0.73 U	--	--	--
4-Chlorophenyl Phenyl Ether	--	--	0.96 U	0.96 U	0.96 U	1 U	--	--	1 U	1 U	0.96 U	--	--	--
4-Nitroaniline	--	--	0.48 U	0.48 UR	0.48 U	0.5 U	--	--	0.5 UJ	0.5 UJ	0.48 U	--	--	--
4-Nitrophenol	--	--	4.7 U	4.7 U	4.7 U	4.8 U	--	--	4.8 U	4.8 U	4.7 U	--	--	--
Acenaphthene	--	--	0.88 U	0.88 UJ	0.88 U	0.92 U	--	--	0.92 U	0.92 U	0.88 U	--	--	--
Acenaphthylene	--	--	0.65 U	0.65 U	0.65 U	0.68 U	--	--	0.68 U	0.68 U	0.65 U	--	--	--
Acetophenone	--	--	1 U	1 U	1 U	1.1 U	--	--	1.1 U	1.1 U	1 U	--	--	--
Anthracene	--	--	0.57 U	0.57 U	0.57 U	0.59 U	--	--	0.59 U	0.59 U	0.57 U	--	--	--
Atrazine	--	--	0.77 U	0.77 U	0.77 U	0.8 U	--	--	0.8 U	0.8 U	0.77 U	--	--	--
Benzaldehyde	--	--	0.86 U	0.86 U	0.86 U	0.9 U	--	--	0.9 U	0.9 U	0.86 U	--	--	--
Benzo(A)Anthracene	--	--	0.55 U	0.55 U	0.55 U	0.57 U	--	--	0.57 U	0.57 U	0.55 U	--	--	--
Benzo(A)Pyrene	--	--	0.16 U	0.16 U	0.16 U	0.17 U	--	--	0.17 U	0.17 U	0.16 U	--	--	--
Benzo(B)Fluoranthene	--	--	0.44 U	0.44 U	0.44 U	0.46 U	--	--	0.46 U	0.46 U	0.44 U	--	--	--
Benzo(G,H,I)Perylene	--	--	0.75 U	0.75 U	0.75 U	0.78 U	--	--	0.78 U	0.78 U	0.75 U	--	--	--
Benzo(K)Fluoranthene	--	--	0.18 U	0.18 U	0.18 U	0.19 U	--	--	0.19 U	0.19 U	0.18 U	--	--	--
Benzyl Butyl Phthalate	--	--	0.6 U	0.6 U	0.6 U	0.63 U	--	--	0.63 UJ	0.63 UJ	0.6 U	--	--	--
Biphenyl (Diphenyl)	--	--	0.63 U	0.63 UJ	0.63 U	0.66 U	--	--	0.66 U	0.66 U	0.63 U	--	--	--
Bis(2-Chloroethoxy) Methane	--	--	0.69 U	0.69 U	0.69 U	0.72 U	--	--	0.72 U	0.72 U	0.69 U	--	--	--
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	--	--	0.12 U	0.12 UJ	0.12 U	0.13 U	--	--	0.13 U	0.13 U	0.12 U	--	--	--
Bis(2-Chloroisopropyl) Ether	--	--	0.93 U	0.93 U	0.93 U	0.97 U	--	--	0.97 U	0.97 U	0.93 U	--	--	--
Bis(2-Ethylhexyl) Phthalate	--	--	0.72 U	0.72 U	0.72 U	0.75 U	--	--	0.75 U	0.75 U	0.72 U	--	--	--
Caprolactam	--	--	1.1 U	1.1 U	1.1 U	1.1 U	--	--	1.1 U	1.1 U	1.1 U	--	--	--
Carbazole	--	--	0.85 U	0.85 U	0.85 U	0.89 U	--	--	0.89 U	0.89 U	0.85 U	--	--	--
Chrysene	--	--	0.67 U	0.67 U	0.67 U	0.7 U	--	--	0.7 U	0.7 U	0.67 U	--	--	--
Dibenz(A,H)Anthracene	--	--	0.09 U	0.09 U	0.09 U	0.094 U	--	--	0.094 U	0.094 U	0.09 U	--	--	--
Dibenzofuran	--	--	0.85 U	0.85 U	0.85 U	0.89 U	--	--	0.89 U	0.89 U	0.85 U	--	--	--
Diethyl Phthalate	--	--	1 U	1 U	1 U	1 U	--	--	1 UJ	1 UJ	1 U	--	--	--
Dimethyl Phthalate	--	--	0.98 U	0.98 U	0.98 U	1 U	--	--	1 UJ	1 UJ	0.98 U	--	--	--
Di-N-Butyl Phthalate	--	--	0.82 U	0.82 U	0.82 U	0.85 U	--	--	0.85 U	0.85 U	0.82 U	--	--	--
Di-N-Octylphthalate	--	--	0.69 U	0.69 U	0.69 UJ	0.72 U	--	--	0.72 U	0.72 U	0.69 U	--	--	--
Fluoranthene	--	--	0.72 U	0.72 U	0.72 U	0.75 U	--	--	0.75 U	0.75 U	0.72 U	--	--	--

Table E-38
Summary of Data Used in Risk Assessment
Groundwater Upper Hydrogeologic Unit Plume Area - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Chemical	CFMW-014 460-158058-3 CFMW-014-GW 6/11/2018	CFMW-014 460-166734-4 CFMW-014-GW 10/11/2018	CFMW-015 460-120053-8 CFMW-015-GW 9/12/2016	CFMW-015 460-125567-3 CFMW-015-GW 12/15/2016	CFMW-015 460-130620-2 CFMW-015-GW 3/29/2017	CFMW-015 460-136178-10 CFMW-015-GW 6/27/2017	CFMW-015 460-158058-4 CFMW-015-GW 6/11/2018	CFMW-015 460-166734-5 CFMW-015-GW 10/11/2018	CFMW-016 460-130507-5 CFMW-016-GW 3/28/2017	CFMW-016-DUP 460-130507-4 CFMW-DUP10-GW 3/28/2017	CFMW-016 460-136351-4 CFMW-016-GW 6/29/2017	CFMW-016 460-158493-6 CFMW-016-GW 6/15/2018	CFMW-016A 460-120664-3 CFMW-016a-GW 9/21/2016	CFMW-016A 460-125477-9 CFMW-016a-GW 12/14/2016
Fluorene	--	--	0.8 U	0.8 U	0.8 U	0.83 U	--	--	0.83 U	0.83 U	0.8 U	--	--	--
Hexachlorobenzene	--	--	0.47 U	0.47 U	0.47 U	0.49 U	--	--	0.49 U	0.49 U	0.47 U	--	--	--
Hexachlorobutadiene	--	--	0.76 U	0.76 U	0.76 U	0.79 U	--	--	0.79 U	0.79 U	0.76 U	--	--	--
Hexachlorocyclopentadiene	--	--	0.61 U	0.61 U	0.61 U	0.64 U	--	--	0.64 U	0.64 U	0.61 UJ	--	--	--
Hexachloroethane	--	--	0.09 U	0.09 U	0.09 U	0.094 U	--	--	0.094 U	0.094 U	0.09 U	--	--	--
Indeno(1,2,3-C,D)Pyrene	--	--	0.21 U	0.21 U	0.21 U	0.22 U	--	--	0.22 U	0.22 U	0.21 U	--	--	--
Isophorone	--	--	0.67 U	0.67 U	0.67 U	0.7 U	--	--	0.7 U	0.7 U	0.67 U	--	--	--
Naphthalene	--	--	0.8 U	0.8 U	0.8 U	0.83 U	--	--	0.83 U	0.83 U	0.8 U	--	--	--
Nitrobenzene	--	--	0.49 U	0.49 U	0.49 U	0.51 U	--	--	0.51 U	0.51 U	0.49 U	--	--	--
N-Nitrosodi-N-Propylamine	--	--	0.83 U	0.83 U	0.83 U	0.86 U	--	--	0.86 U	0.86 U	0.83 U	--	--	--
N-Nitrosodiphenylamine	--	--	0.74 U	0.74 U	0.74 U	0.77 U	--	--	0.77 U	0.77 U	0.74 U	--	--	--
Pentachlorophenol	--	--	2.2 U	2.2 UJ	2.2 U	2.3 U	--	--	2.3 U	2.3 U	2.2 U	--	--	--
Phenanthrene	--	--	0.65 U	0.65 U	0.65 U	0.68 U	--	--	0.68 U	0.68 U	0.65 U	--	--	--
Phenol	--	--	0.41 U	0.41 U	0.41 U	0.43 U	--	--	0.43 U	0.43 U	0.41 U	--	--	--
Pyrene	--	--	0.83 U	0.83 U	0.83 UJ	0.86 U	--	--	0.86 UJ	0.86 UJ	0.83 U	--	--	--
SEMIVOLATILE ORGANIC COMPOUNDS|LOW LEVEL (µg/L)														
1,2,4,5-Tetrachlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,4-Dioxane (P-Dioxane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,3,4,6-Tetrachlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4,5-Trichlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4,6-Trichlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4-Dichlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4-Dimethylphenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4-Dinitrophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4-Dinitrotoluene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,6-Dinitrotoluene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Chloronaphthalene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Chlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Methylnaphthalene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Methylphenol (O-Cresol)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Nitroaniline	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Nitrophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3,3'-Dichlorobenzidine	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3-Nitroaniline	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4,6-Dinitro-2-Methylphenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Bromophenyl Phenyl Ether	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Chloro-3-Methylphenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Chloroaniline	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Chlorophenyl Phenyl Ether	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Nitroaniline	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Nitrophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acenaphthene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acenaphthylene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acetophenone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Anthracene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Atrazine	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzaldehyde	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(A)Anthracene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(A)Pyrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(B)Fluoranthene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(G,H,I)Perylene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(K)Fluoranthene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzyl Butyl Phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Biphenyl (Diphenyl)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bis(2-Chloroethoxy) Methane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bis(2-Chloroisopropyl) Ether	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bis(2-Ethylhexyl) Phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Caprolactam	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Table E-38
Summary of Data Used in Risk Assessment
Groundwater Upper Hydrogeologic Unit Plume Area - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-014	CFMW-014	CFMW-015	CFMW-015	CFMW-015	CFMW-015	CFMW-015	CFMW-015	CFMW-016	CFMW-016-DUP	CFMW-016	CFMW-016	CFMW-016A	CFMW-016A
Sample Lab IDs	460-158058-3	460-166734-4	460-120053-8	460-125567-3	460-130620-2	460-136178-10	460-158058-4	460-166734-5	460-130507-5	460-130507-4	460-136351-4	460-158493-6	460-120664-3	460-125477-9
Sample Name	CFMW-014-GW	CFMW-014-GW	CFMW-015-GW	CFMW-015-GW	CFMW-015-GW	CFMW-015-GW	CFMW-015-GW	CFMW-015-GW	CFMW-016-GW	CFMW-DUP10-GW	CFMW-016-GW	CFMW-016-GW	CFMW-016a-GW	CFMW-016a-GW
Chemical	6/11/2018	10/11/2018	9/12/2016	12/15/2016	3/29/2017	6/27/2017	6/11/2018	10/11/2018	3/28/2017	3/28/2017	6/29/2017	6/15/2018	9/21/2016	12/14/2016
Carbazole	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chrysene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibenz(A,H)Anthracene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibenzofuran	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Diethyl Phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dimethyl Phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Di-N-Butyl Phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Di-N-Octylphthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Fluoranthene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Fluorene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorobutadiene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorocyclopentadiene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Indeno(1,2,3-C,D)Pyrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Isophorone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Naphthalene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Nitrobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
N-Nitrosodi-N-Propylamine	--	--	--	--	--	--	--	--	--	--	--	--	--	--
N-Nitrosodiphenylamine	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Pentachlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Phenanthrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Phenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Pyrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
VOLATILE ORGANIC COMPOUNDS (µg/L)														
1,1,1-Trichloroethane	--	--	0.28 U	0.28 U	0.28 U	0.28 U	--	--	0.28 U	0.28 U	0.28 U	--	--	--
1,1,2,2-Tetrachloroethane	--	--	0.19 U	0.19 U	0.19 U	0.19 U	--	--	0.19 U	0.19 U	0.19 U	--	--	--
1,1,2-Trichloro-1,2,2-Trifluoroethane	--	--	0.34 U	0.34 U	0.34 U	0.34 U	--	--	0.34 U	0.34 U	0.34 U	--	--	--
1,1,2-Trichloroethane	--	--	0.08 U	0.08 U	0.08 U	0.08 U	--	--	0.08 U	0.08 U	0.08 U	--	--	--
1,1-Dichloroethane	--	--	0.24 U	0.24 U	0.24 U	0.24 U	--	--	0.24 U	0.24 U	0.24 U	--	--	--
1,1-Dichloroethene	--	--	0.34 U	0.34 U	0.34 U	0.34 U	--	--	0.34 U	0.34 U	0.34 U	--	--	--
1,2,3-Trichlorobenzene	--	--	0.35 U	0.35 U	0.35 U	0.35 U	--	--	0.35 U	0.35 U	0.35 U	--	--	--
1,2,4-Trichlorobenzene	--	--	0.27 U	0.27 U	0.27 U	0.27 U	--	--	0.27 U	0.27 U	0.27 U	--	--	--
1,2-Dibromo-3-Chloropropane	--	--	0.23 U	0.23 UJ	0.23 U	0.23 U	--	--	0.23 U	0.23 U	0.23 UJ	--	--	--
1,2-Dibromoethane (Ethylene Dibromide)	--	--	0.19 U	0.19 U	0.19 U	0.19 U	--	--	0.19 U	0.19 U	0.19 U	--	--	--
1,2-Dichlorobenzene	--	--	0.22 U	0.22 U	0.22 U	0.22 U	--	--	0.22 U	0.22 U	0.22 U	--	--	--
1,2-Dichloroethane	--	--	0.25 U	0.25 U	0.25 U	0.25 U	--	--	0.25 U	0.25 U	0.25 U	--	--	--
1,2-Dichloropropane	--	--	0.18 U	0.18 U	0.18 U	0.18 U	--	--	0.18 U	0.18 U	0.18 U	--	--	--
1,3-Dichlorobenzene	--	--	0.33 U	0.33 U	0.33 U	0.33 U	--	--	0.33 U	0.33 U	0.33 U	--	--	--
1,4-Dichlorobenzene	--	--	0.33 U	0.33 U	0.33 U	0.33 U	--	--	0.33 U	0.33 U	0.33 U	--	--	--
2-Hexanone	--	--	0.72 U	0.72 U	0.72 U	0.72 U	--	--	0.72 U	0.72 U	0.72 U	--	--	--
Acetone	--	--	1.1 U	1.1 UJ	1.1 U	1.1 U	--	--	1.1 U	1.1 U	1.1 U	--	--	--
Benzene	--	--	0.09 U	0.09 U	0.09 U	0.09 U	--	--	0.09 U	0.09 U	0.09 U	--	--	--
Bromochloromethane	--	--	0.3 U	0.3 U	0.3 U	0.3 U	--	--	0.3 U	0.3 U	0.3 U	--	--	--
Bromodichloromethane	--	--	0.15 U	0.15 U	0.15 U	0.15 U	--	--	0.15 U	0.15 U	0.15 U	--	--	--
Bromoform	--	--	0.18 U	0.18 U	0.18 U	0.18 U	--	--	0.18 U	0.18 U	0.18 UJ	--	--	--
Bromomethane	--	--	0.18 U	0.18 U	0.18 U	0.18 U	--	--	0.18 U	0.18 U	0.18 U	--	--	--
Carbon Disulfide	--	--	0.22 U	0.22 U	0.22 U	0.22 U	--	--	0.22 U	0.22 U	0.22 U	--	--	--
Carbon Tetrachloride	--	--	0.33 U	0.33 U	0.33 U	0.33 U	--	--	0.33 U	0.33 U	0.33 U	--	--	--
Chlorobenzene	--	--	0.24 U	0.24 U	0.24 U	0.24 U	--	--	0.24 U	0.24 U	0.24 U	--	--	--
Chloroethane	--	--	0.37 U	0.37 U	0.37 U	0.37 U	--	--	0.37 U	0.37 U	0.37 U	--	--	--
Chloroform	--	--	0.22 U	0.22 U	0.22 U	0.22 U	--	--	0.22 U	0.22 U	0.22 U	--	--	--
Chloromethane	--	--	0.22 U	0.22 U	0.22 U	0.22 U	--	--	0.22 U	0.22 U	0.22 U	--	--	--
Cis-1,2-Dichloroethylene	--	--	0.26 U	0.26 U	0.26 U	0.26 U	--	--	0.26 U	0.26 U	0.26 U	--	--	--
Cis-1,3-Dichloropropene	--	--	0.16 U	0.16 U	0.16 U	0.16 U	--	--	0.16 U	0.16 U	0.16 UJ	--	--	--
Cyclohexane	--	--	0.26 U	0.26 U	0.26 U	0.26 U	--	--	0.26 U	0.26 U	0.26 U	--	--	--
Dibromochloromethane	--	--	0.22 U	0.22 U	0.22 U	0.22 U	--	--	0.22 U	0.22 U	0.22 U	--	--	--
Dichlorodifluoromethane	--	--	0.14 UJ	0.14 U	0.14 U	0.14 U	--	--	0.14 U	0.14 U	0.14 U	--	--	--
Ethylbenzene	--	--	0.3 U	0.3 U	0.3 U	0.3 U	--	--	0.3 U	0.3 U	0.3 U	--	--	--

Table E-38
Summary of Data Used in Risk Assessment
Groundwater Upper Hydrogeologic Unit Plume Area - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Chemical	CFMW-014 460-158058-3 CFMW-014-GW 6/11/2018	CFMW-014 460-166734-4 CFMW-014-GW 10/11/2018	CFMW-015 460-120053-8 CFMW-015-GW 9/12/2016	CFMW-015 460-125567-3 CFMW-015-GW 12/15/2016	CFMW-015 460-130620-2 CFMW-015-GW 3/29/2017	CFMW-015 460-136178-10 CFMW-015-GW 6/27/2017	CFMW-015 460-158058-4 CFMW-015-GW 6/11/2018	CFMW-015 460-166734-5 CFMW-015-GW 10/11/2018	CFMW-016 460-130507-5 CFMW-016-GW 3/28/2017	CFMW-016-DUP 460-130507-4 CFMW-DUP10-GW 3/28/2017	CFMW-016 460-136351-4 CFMW-016-GW 6/29/2017	CFMW-016 460-158493-6 CFMW-016-GW 6/15/2018	CFMW-016A 460-120664-3 CFMW-016a-GW 9/21/2016	CFMW-016A 460-125477-9 CFMW-016a-GW 12/14/2016
Isopropylbenzene (Cumene)	--	--	0.32 U	0.32 U	0.32 U	0.32 U	--	--	0.32 U	0.32 U	0.32 U	--	--	--
M,P-Xylene	--	--	0.28 U	0.28 U	0.28 U	0.28 U	--	--	0.28 U	0.28 U	0.28 U	--	--	--
Methyl Acetate	--	--	0.58 U	0.58 UJ	0.58 U	0.58 U	--	--	0.58 U	0.58 U	0.58 U	--	--	--
Methyl Ethyl Ketone (2-Butanone)	--	--	2.2 U	2.2 U	2.2 U	2.2 U	--	--	2.2 U	2.2 U	2.2 U	--	--	--
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	--	--	0.63 U	0.63 U	0.63 U	0.63 U	--	--	0.63 U	0.63 U	0.63 U	--	--	--
Methylcyclohexane	--	--	0.22 U	0.22 U	0.22 U	0.22 U	--	--	0.22 U	0.22 U	0.22 U	--	--	--
Methylene Chloride	--	--	0.21 U	1.8	0.21 U	0.21 U	--	--	0.21 U	0.21 U	0.21 U	--	--	--
O-Xylene (1,2-Dimethylbenzene)	--	--	0.32 U	0.32 U	0.32 U	0.32 U	--	--	0.32 U	0.32 U	0.32 U	--	--	--
Styrene	--	--	0.17 U	0.17 U	0.17 U	0.17 U	--	--	0.17 U	0.17 U	0.17 U	--	--	--
Tert-Butyl Methyl Ether	--	--	0.13 U	0.13 U	0.13 U	0.13 U	--	--	0.13 U	0.13 U	0.13 U	--	--	--
Tetrachloroethylene (PCE)	--	--	0.12 U	0.12 U	0.12 U	0.12 U	--	--	0.12 U	0.12 U	0.12 U	--	--	--
Toluene	--	--	0.25 U	0.25 U	0.25 U	0.25 U	--	--	0.25 U	0.25 U	0.25 U	--	--	--
Trans-1,2-Dichloroethene	--	--	0.18 U	0.18 U	0.18 U	0.18 U	--	--	0.18 U	0.18 U	0.18 U	--	--	--
Trans-1,3-Dichloropropene	--	--	0.19 U	0.19 U	0.19 U	0.19 U	--	--	0.19 U	0.19 U	0.19 UJ	--	--	--
Trichloroethylene (TCE)	--	--	0.22 U	0.22 U	0.22 U	0.22 U	--	--	0.22 U	0.22 U	0.22 U	--	--	--
Trichlorofluoromethane	--	--	0.15 U	0.15 UJ	0.15 U	0.15 U	--	--	0.15 U	0.15 U	0.15 U	--	--	--
Vinyl Chloride	--	--	0.06 U	0.06 U	0.06 U	0.06 U	--	--	0.06 U	0.06 U	0.06 U	--	--	--

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-38
Summary of Data Used in Risk Assessment
Groundwater Upper Hydrogeologic Unit Plume Area - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-016A	CFMW-016A	CFMW-016A	CFMW-016A	CFMW-016A-DUP	CFMW-017	CFMW-017	CFMW-017	CFMW-019	CFMW-019	CFMW-019	CFMW-019	CFMW-019	CFMW-019
Sample Lab IDs	460-130410-3	460-136063-4	460-158183-8	460-166219-1	460-166219-3	460-130507-9	460-136063-6	460-157703-1	460-120053-3	460-125567-5	460-130620-3	460-136351-5	460-158367-4	460-166928-9
Sample Name	CFMW-016a-GW	CFMW-016a-GW	CFMW-016a-GW	CFMW-016a-GW	CFMW-DUP20-GW	CFMW-017-GW	CFMW-017-GW	CFMW-017-GW	CFMW-019-GW	CFMW-019-GW	CFMW-019-GW	CFMW-019-GW	CFMW-019-GW	CFMW-019-GW
Chemical	3/27/2017	6/26/2017	6/12/2018	10/5/2018	10/5/2018	3/28/2017	6/26/2017	6/6/2018	9/12/2016	12/15/2016	3/29/2017	6/29/2017	6/14/2018	10/15/2018
GENERAL CHEMISTRY (µg/L)														
Fluoride	--	275	--	--	--	--	1220	--	--	--	--	3390 J+	--	--
Cyanide	--	2 U	2 UR	2 U	2 U	--	93.6	48	--	--	--	1250	1190	1190
Cyanide (Free)	--	1.5 U	1.5 J	1.5 U	1.5 U	--	1.5 U	2.9 J	--	--	--	44.5 J-	49.5	150
Cyanide	2.1 J	2.1 J	2 U	2 U	2 U	1880	103	46.6	961 J	791	1770	1230	1080	1210
Cyanide (Free)	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U	--	1.5 U	10.2	--	--	44.1	67.8 J-	51.8	145
METALS (µg/L)														
Aluminum	18.2 U	18.2 U	15 U	15 U	15 U	18.2 U	18.2 U	15 U	18.2 U	18.2 U	18.2 U	18.2 U	15 U	15 U
Antimony	0.62 U	2.6	2.4	0.94 J	0.93 J	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U
Arsenic	0.64 U	0.64 U	0.77 U	0.77 U	0.77 U	5.6	0.67 J	0.77 U	0.64 U	0.64 U	0.64 U	0.64 U	0.77 U	0.77 U
Barium	263	97.1	190	214	214	46.8 J	88.9	89.3	104	113	140	122	95.4	121
Beryllium	0.24 U	0.24 U	0.26 U	0.26 U	0.26 U	0.24 U	0.24 U	0.26 U	0.24 U	0.24 U	0.24 U	0.24 U	0.26 U	0.26 U
Cadmium	0.71 U	0.71 U	0.61 U	0.61 U	0.61 U	0.71 U	0.71 U	0.61 U	0.71 U	0.71 U	0.71 U	0.71 U	0.61 U	0.61 U
Calcium	56800	37900	33300	36800	37600	26400 J	47800	44200	55100	54600	71900	58200	48200	59400
Chromium, Total	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
Cobalt	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.6 J	1.3 U	1.3 U	3.3 J	5.1	6.9	5.1	3.8 J	5.5
Copper	1.4 U	1.4 U	1.9 U	1.9 U	1.9 U	3.5 J	1.4 U	1.9 U	1.4 U	1.6 J	1.8 J	1.4 U	1.9 U	1.9 U
Iron	42.4 U	42.4 U	45.7 U	45.7 U	45.7 U	784 J	42.4 U	128	1160	260	656	596	388	578
Lead	0.38 U	1.3	0.37 U	0.37 U	0.37 U	0.38 U	0.38 U	0.37 U	0.38 U	0.38 U	0.38 U	0.38 U	0.37 U	0.37 U
Magnesium	15000	7100	9470	12500	12500	8990 J	10900	9430	17200	17800	25000	19000	15300	19500
Manganese	2.5 U	2.5 U	2.7 U	2.7 U	2.7 U	2.5 U	2.5 U	8.1	35.8	61.2	3.9 J	2.5 U	2.7 U	71.3
Mercury	0.17 U	0.17 U	0.12 U	0.12 U	0.12 U	0.17 U	0.17 U	0.12 U	0.17 U	0.17 U	0.17 U	0.17 U	0.12 U	0.12 U
Nickel	1.4 U	1.4 U	1.3 U	1.3 U	1.3 U	1.4 U	1.4 U	1.3 U	1.4 U	6.8	1.4 U	1.4 U	1.3 U	1.9 J
Potassium	892	1130	817	815	815	865	475	494	1520	1840	1820	1720	1540	1800
Selenium	0.73 U	0.73 U	0.69 U	0.69 U	0.69 U	0.73 U	0.73 U	0.69 U	0.84 J	0.77 J	1.4 J	1.2 J	0.96 J	1.3 J
Silver	1.3 U	1.3 U	1.4 U	1.4 U	1.4 U	1.3 U	1.3 U	1.4 U	1.3 U	1.3 U	1.3 U	1.3 U	1.4 U	1.4 U
Sodium	9300	7690	6550	7930	7810	135000	8460	5370	104000	120000	149000	138000	137000	148000
Thallium	0.26 U	0.26 U	0.24 U	0.24 U	0.24 U	0.26 U	0.26 U	0.24 U	0.26 U	0.26 U	0.26 U	0.26 U	0.24 U	0.24 U
Vanadium	1.9 U	1.9 U	1.2 U	1.2 U	1.2 U	29.5	5.6	6	1.9 U	1.9 U	1.9 U	1.9 U	1.2 U	1.2 U
Zinc	7 U	7 U	5.4 U	5.4 U	5.4 U	7 U	7 U	5.4 U	27.8	9.3 J	7 J	7 U	12.3 J	7.6 J
Aluminum	--	41.7	101	30 J	41.8 J	--	18.2 U	15 U	--	--	--	18.2 U	15 U	15 U
Antimony	--	4.4	3.2	1.6 J	1.7 J	--	0.62 U	0.62 U	--	--	--	0.62 U	0.62 U	1.1 J
Arsenic	--	0.64 U	0.77 U	0.77 U	0.77 U	--	1.1 J	0.86 J	--	--	--	0.64 U	0.77 U	0.77 U
Barium	--	141	190	213	213	--	87.9	90.5	--	--	--	131	101	128
Beryllium	--	0.24 U	0.26 U	0.26 U	0.26 U	--	0.24 U	0.26 U	--	--	--	0.24 U	0.26 U	0.26 U
Cadmium	--	0.71 U	0.61 U	0.61 U	0.61 U	--	0.71 U	0.61 U	--	--	--	0.71 U	0.61 U	0.61 U
Calcium	--	62800	34300	38300	39700	--	46900	45100	--	--	--	59200	45600	59900
Chromium, Total	--	1.3 U	1.4 J	1.4 J	1.4 J	--	1.3 U	1.3 U	--	--	--	1.3 U	1.3 U	1.3 U
Cobalt	--	1.3 U	1.3 U	1.3 U	1.3 U	--	1.3 U	1.3 U	--	--	--	5.6	4.1	6
Copper	--	1.4 U	1.9 U	4.9 J	3.4 J	--	1.4 U	1.9 U	--	--	--	1.6 J	1.9 U	1.9 J
Iron	--	42.4 U	114 J	45.7 U	52.5 J	--	670	427	--	--	--	2370	1490	1680
Lead	--	0.38 U	0.37 U	0.37 U	0.37 U	--	0.38 U	0.37 U	--	--	--	0.38 U	0.37 U	0.37 U
Magnesium	--	8920	9690	12700	12600	--	10600	10500	--	--	--	19900	14700	19500
Manganese	--	2.5 U	2.7 U	2.7 U	2.7 U	--	23.2	10.2	--	--	--	35.1	11.2	84.4
Mercury	--	0.17 U	0.12 U	0.12 U	0.12 U	--	0.17 U	0.12 U	--	--	--	0.17 U	0.12 U	0.12 U
Nickel	--	1.4 U	1.3 U	1.3 U	1.3 U	--	1.4 U	1.3 U	--	--	--	1.4 U	1.3 U	1.3 U
Potassium	--	1080	916	853	834	--	476	453	--	--	--	1720	1420	1810
Selenium	--	0.73 U	0.69 U	0.69 U	0.69 U	--	0.73 U	0.69 U	--	--	--	0.99 J	0.84 J	1.1 J
Silver	--	1.3 U	1.4 U	1.4 U	1.4 U	--	1.3 U	1.4 U	--	--	--	1.3 U	1.4 U	1.4 U
Sodium	--	29200	6780	7920	8010	--	8960	6020	--	--	--	145000	143000	153000
Thallium	--	0.26 U	0.24 U	0.24 U	0.24 U	--	0.26 U	0.24 U	--	--	--	0.26 U	0.24 U	0.24 U
Vanadium	--	1.9 U	1.2 U	1.2 U	1.2 U	--	9.2	7.5	--	--	--	1.9 U	1.2 U	1.2 U
Zinc	--	7 U	5.4 U	5.4 U	5.4 U	--	7 U	5.4 U	--	--	--	24.9	29.8	16.1
POLYCHLORINATED BIPHENYLS (µg/L)														
PCB-1016 (Aroclor 1016)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1221 (Aroclor 1221)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1232 (Aroclor 1232)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1242 (Aroclor 1242)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1248 (Aroclor 1248)	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Table E-38
Summary of Data Used in Risk Assessment
Groundwater Upper Hydrogeologic Unit Plume Area - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Chemical	CFMW-016A 460-130410-3 CFMW-016a-GW 3/27/2017	CFMW-016A 460-136063-4 CFMW-016a-GW 6/26/2017	CFMW-016A 460-158183-8 CFMW-016a-GW 6/12/2018	CFMW-016A 460-166219-1 CFMW-016a-GW 10/5/2018	CFMW-016A-DUP 460-166219-3 CFMW-DUP20-GW 10/5/2018	CFMW-017 460-130507-9 CFMW-017-GW 3/28/2017	CFMW-017 460-136063-6 CFMW-017-GW 6/26/2017	CFMW-017 460-157703-1 CFMW-017-GW 6/6/2018	CFMW-019 460-120053-3 CFMW-019-GW 9/12/2016	CFMW-019 460-125567-5 CFMW-019-GW 12/15/2016	CFMW-019 460-130620-3 CFMW-019-GW 3/29/2017	CFMW-019 460-136351-5 CFMW-019-GW 6/29/2017	CFMW-019 460-158367-4 CFMW-019-GW 6/14/2018	CFMW-019 460-166928-9 CFMW-019-GW 10/15/2018
PCB-1254 (Aroclor 1254)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1260 (Aroclor 1260)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1262 (Aroclor 1262)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1268 (Aroclor 1268)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Polychlorinated Biphenyl (PCBs)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SEMIVOLATILE ORGANIC COMPOUNDS (µg/L)														
1,2,4,5-Tetrachlorobenzene	--	--	--	--	--	0.45 U	0.43 U	--	0.43 U	0.44 UJ	0.43 U	0.43 U	--	--
1,4-Dioxane (P-Dioxane)	--	--	--	--	--	3.2 U	3.1 U	--	3.1 U	3.2 U	3.1 U	3.1 U	--	--
2,3,4,6-Tetrachlorophenol	--	--	--	--	--	0.72 U	0.69 U	--	0.69 U	0.71 U	0.7 U	0.69 U	--	--
2,4,5-Trichlorophenol	--	--	--	--	--	0.51 U	0.49 U	--	0.49 U	0.51 U	0.49 U	0.49 U	--	--
2,4,6-Trichlorophenol	--	--	--	--	--	0.55 U	0.53 U	--	0.53 U	0.55 U	0.53 U	0.53 U	--	--
2,4-Dichlorophenol	--	--	--	--	--	0.66 U	0.63 U	--	0.63 U	0.65 U	0.64 U	0.63 U	--	--
2,4-Dimethylphenol	--	--	--	--	--	0.95 U	0.91 U	--	0.91 U	0.94 U	0.92 U	0.91 U	--	--
2,4-Dinitrophenol	--	--	--	--	--	2.5 UJ	2.4 U	--	2.4 U	2.4 U	2.4 U	2.4 U	--	--
2,4-Dinitrotoluene	--	--	--	--	--	1.1 U	1 U	--	1 U	1.1 U	1 U	1 U	--	--
2,6-Dinitrotoluene	--	--	--	--	--	0.92 U	0.88 U	--	0.88 U	0.91 U	0.89 U	0.88 U	--	--
2-Chloronaphthalene	--	--	--	--	--	0.64 U	0.61 U	--	0.61 U	0.63 U	0.61 U	0.61 U	--	--
2-Chlorophenol	--	--	--	--	--	0.77 U	0.74 U	--	0.74 U	0.76 U	0.75 U	0.74 U	--	--
2-Methylnaphthalene	--	--	--	--	--	0.92 U	0.88 U	--	0.88 U	0.91 U	0.89 U	0.88 U	--	--
2-Methylphenol (O-Cresol)	--	--	--	--	--	1.3 U	1.3 U	--	1.3 U	1.3 U	1.3 U	1.3 U	--	--
2-Nitroaniline	--	--	--	--	--	0.68 U	0.65 U	--	0.65 U	0.67 U	0.66 U	0.65 U	--	--
2-Nitrophenol	--	--	--	--	--	0.61 U	0.59 U	--	0.59 U	0.61 U	0.59 U	0.59 U	--	--
3- And 4- Methylphenol (Total)	--	--	--	--	--	0.92 U	0.88 U	--	0.88 U	0.91 U	0.89 U	0.88 U	--	--
3,3'-Dichlorobenzidine	--	--	--	--	--	1.1 U	1 U	--	1 U	1.1 U	1 U	1 U	--	--
3-Nitroaniline	--	--	--	--	--	0.85 U	0.82 U	--	0.82 U	0.85 U	0.83 U	0.82 U	--	--
4,6-Dinitro-2-Methylphenol	--	--	--	--	--	2.1 U	2 U	--	2 U	2.1 U	2 U	2 U	--	--
4-Bromophenyl Phenyl Ether	--	--	--	--	--	1.1 U	1 U	--	1 U	1.1 U	1 U	1 U	--	--
4-Chloro-3-Methylphenol	--	--	--	--	--	0.79 U	0.76 U	--	0.76 U	0.79 U	0.77 U	0.76 U	--	--
4-Chloroaniline	--	--	--	--	--	0.76 U	0.73 U	--	0.73 U	0.75 U	0.74 U	0.73 U	--	--
4-Chlorophenyl Phenyl Ether	--	--	--	--	--	1 U	0.96 U	--	0.96 U	0.99 U	0.97 U	0.96 U	--	--
4-Nitroaniline	--	--	--	--	--	0.5 UJ	0.48 U	--	0.48 U	0.5 U	0.48 U	0.48 U	--	--
4-Nitrophenol	--	--	--	--	--	4.8 U	4.7 U	--	4.7 U	4.8 U	4.7 U	4.7 U	--	--
Acenaphthene	--	--	--	--	--	0.92 U	0.88 U	--	0.88 U	0.91 UJ	0.89 U	0.88 U	--	--
Acenaphthylene	--	--	--	--	--	0.68 U	0.65 U	--	0.65 U	0.67 U	0.66 U	0.65 U	--	--
Acetophenone	--	--	--	--	--	1.1 U	1 U	--	1 U	1.1 U	1 U	1 U	--	--
Anthracene	--	--	--	--	--	0.59 U	0.57 U	--	0.57 U	0.59 U	0.57 U	0.57 U	--	--
Atrazine	--	--	--	--	--	0.8 U	0.77 U	--	0.77 U	0.8 U	0.78 U	0.77 U	--	--
Benzaldehyde	--	--	--	--	--	0.9 U	0.86 UJ	--	0.86 U	0.89 U	0.87 U	0.86 U	--	--
Benzo(A)Anthracene	--	--	--	--	--	0.57 U	0.55 U	--	0.55 U	0.57 U	0.55 U	0.55 U	--	--
Benzo(A)Pyrene	--	--	--	--	--	0.17 U	0.16 U	--	0.16 U	0.17 U	0.16 U	0.16 U	--	--
Benzo(B)Fluoranthene	--	--	--	--	--	0.46 U	0.44 U	--	0.44 U	0.45 U	0.44 U	0.44 U	--	--
Benzo(G,H,I)Perylene	--	--	--	--	--	0.78 U	0.75 U	--	0.75 U	0.77 U	0.76 U	0.75 U	--	--
Benzo(K)Fluoranthene	--	--	--	--	--	0.19 U	0.18 U	--	0.18 U	0.19 U	0.18 U	0.18 U	--	--
Benzyl Butyl Phthalate	--	--	--	--	--	0.63 UJ	0.6 U	--	0.6 U	0.62 U	0.6 U	0.6 U	--	--
Biphenyl (Diphenyl)	--	--	--	--	--	0.66 U	0.63 U	--	0.63 U	0.65 UJ	0.64 U	0.63 U	--	--
Bis(2-Chloroethoxy) Methane	--	--	--	--	--	0.72 U	0.69 U	--	0.69 U	0.71 U	0.7 U	0.69 U	--	--
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	--	--	--	--	--	0.13 U	0.12 U	--	0.12 U	0.12 UJ	0.12 U	0.12 U	--	--
Bis(2-Chloroisopropyl) Ether	--	--	--	--	--	0.97 U	0.93 U	--	0.93 U	0.96 U	0.94 U	0.93 U	--	--
Bis(2-Ethylhexyl) Phthalate	--	--	--	--	--	0.75 U	0.72 U	--	0.72 U	0.74 U	0.73 U	0.72 U	--	--
Caprolactam	--	--	--	--	--	1.1 U	1.1 U	--	1.1 U	1.1 U	1.1 U	1.1 U	--	--
Carbazole	--	--	--	--	--	0.89 U	0.85 U	--	0.85 U	0.88 U	0.86 U	0.85 U	--	--
Chrysene	--	--	--	--	--	0.7 U	0.67 U	--	0.67 U	0.69 U	0.68 U	0.67 U	--	--
Dibenz(A,H)Anthracene	--	--	--	--	--	0.094 U	0.09 U	--	0.09 U	0.093 U	0.091 U	0.09 U	--	--
Dibenzofuran	--	--	--	--	--	0.89 U	0.85 U	--	0.85 U	0.88 U	0.86 U	0.85 U	--	--
Diethyl Phthalate	--	--	--	--	--	1 UJ	1 U	--	1 U	1 U	1 U	1 U	--	--
Dimethyl Phthalate	--	--	--	--	--	1 UJ	0.98 U	--	0.98 U	1 U	0.99 U	0.98 U	--	--
Di-N-Butyl Phthalate	--	--	--	--	--	0.85 U	0.82 U	--	0.82 U	0.85 U	0.83 U	0.82 U	--	--
Di-N-Octylphthalate	--	--	--	--	--	0.72 U	0.69 U	--	0.69 U	0.71 U	0.7 UJ	0.69 U	--	--
Fluoranthene	--	--	--	--	--	0.75 U	0.72 U	--	0.72 U	0.74 U	0.73 U	0.72 U	--	--

Table E-38
Summary of Data Used in Risk Assessment
Groundwater Upper Hydrogeologic Unit Plume Area - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Chemical	CFMW-016A 460-130410-3 CFMW-016a-GW 3/27/2017	CFMW-016A 460-136063-4 CFMW-016a-GW 6/26/2017	CFMW-016A 460-158183-8 CFMW-016a-GW 6/12/2018	CFMW-016A 460-166219-1 CFMW-016a-GW 10/5/2018	CFMW-016A-DUP 460-166219-3 CFMW-DUP20-GW 10/5/2018	CFMW-017 460-130507-9 CFMW-017-GW 3/28/2017	CFMW-017 460-136063-6 CFMW-017-GW 6/26/2017	CFMW-017 460-157703-1 CFMW-017-GW 6/6/2018	CFMW-019 460-120053-3 CFMW-019-GW 9/12/2016	CFMW-019 460-125567-5 CFMW-019-GW 12/15/2016	CFMW-019 460-130620-3 CFMW-019-GW 3/29/2017	CFMW-019 460-136351-5 CFMW-019-GW 6/29/2017	CFMW-019 460-158367-4 CFMW-019-GW 6/14/2018	CFMW-019 460-166928-9 CFMW-019-GW 10/15/2018
Fluorene	--	--	--	--	--	0.83 U	0.8 U	--	0.8 U	0.83 U	0.81 U	0.8 U	--	--
Hexachlorobenzene	--	--	--	--	--	0.49 U	0.47 U	--	0.47 U	0.49 U	0.47 U	0.47 U	--	--
Hexachlorobutadiene	--	--	--	--	--	0.79 U	0.76 U	--	0.76 U	0.79 U	0.77 U	0.76 U	--	--
Hexachlorocyclopentadiene	--	--	--	--	--	0.64 U	0.61 UJ	--	0.61 U	0.63 U	0.61 U	0.61 UJ	--	--
Hexachloroethane	--	--	--	--	--	0.094 U	0.09 U	--	0.09 U	0.093 U	0.091 U	0.09 U	--	--
Indeno(1,2,3-C,D)Pyrene	--	--	--	--	--	0.22 U	0.21 U	--	0.21 U	0.22 U	0.21 U	0.21 U	--	--
Isophorone	--	--	--	--	--	0.7 U	0.67 U	--	0.67 U	0.69 U	0.68 U	0.67 U	--	--
Naphthalene	--	--	--	--	--	0.83 U	0.8 U	--	0.8 U	0.83 U	0.81 U	0.8 U	--	--
Nitrobenzene	--	--	--	--	--	0.51 U	0.49 U	--	0.49 U	0.51 U	0.49 U	0.49 U	--	--
N-Nitrosodi-N-Propylamine	--	--	--	--	--	0.86 U	0.83 U	--	0.83 U	0.86 U	0.84 U	0.83 U	--	--
N-Nitrosodiphenylamine	--	--	--	--	--	0.77 U	0.74 U	--	0.74 U	0.76 U	0.75 U	0.74 U	--	--
Pentachlorophenol	--	--	--	--	--	2.3 U	2.2 U	--	2.2 U	2.3 UJ	2.2 U	2.2 U	--	--
Phenanthrene	--	--	--	--	--	0.68 U	0.65 U	--	0.65 U	0.67 U	0.66 U	0.65 U	--	--
Phenol	--	--	--	--	--	0.43 U	0.41 U	--	0.41 U	0.42 U	0.41 U	0.41 U	--	--
Pyrene	--	--	--	--	--	0.86 UJ	0.83 U	--	0.83 U	0.86 U	0.84 UJ	0.83 U	--	--
SEMIVOLATILE ORGANIC COMPOUNDS|LOW LEVEL (µg/L)														
1,2,4,5-Tetrachlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,4-Dioxane (P-Dioxane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,3,4,6-Tetrachlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4,5-Trichlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4,6-Trichlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4-Dichlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4-Dimethylphenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4-Dinitrophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4-Dinitrotoluene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,6-Dinitrotoluene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Chloronaphthalene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Chlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Methylnaphthalene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Methylphenol (O-Cresol)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Nitroaniline	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Nitrophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3,3'-Dichlorobenzidine	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3-Nitroaniline	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4,6-Dinitro-2-Methylphenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Bromophenyl Phenyl Ether	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Chloro-3-Methylphenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Chloroaniline	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Chlorophenyl Phenyl Ether	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Nitroaniline	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Nitrophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acenaphthene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acenaphthylene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acetophenone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Anthracene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Atrazine	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzaldehyde	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(A)Anthracene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(A)Pyrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(B)Fluoranthene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(G,H,I)Perylene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(K)Fluoranthene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzyl Butyl Phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Biphenyl (Diphenyl)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bis(2-Chloroethoxy) Methane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bis(2-Chloroisopropyl) Ether	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bis(2-Ethylhexyl) Phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Caprolactam	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Table E-38
Summary of Data Used in Risk Assessment
Groundwater Upper Hydrogeologic Unit Plume Area - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-016A	CFMW-016A	CFMW-016A	CFMW-016A	CFMW-016A-DUP	CFMW-017	CFMW-017	CFMW-017	CFMW-019	CFMW-019	CFMW-019	CFMW-019	CFMW-019	CFMW-019
Sample Lab IDs	460-130410-3	460-136063-4	460-158183-8	460-166219-1	460-166219-3	460-130507-9	460-136063-6	460-157703-1	460-120053-3	460-125567-5	460-130620-3	460-136351-5	460-158367-4	460-166928-9
Sample Name	CFMW-016a-GW	CFMW-016a-GW	CFMW-016a-GW	CFMW-016a-GW	CFMW-DUP20-GW	CFMW-017-GW	CFMW-017-GW	CFMW-017-GW	CFMW-019-GW	CFMW-019-GW	CFMW-019-GW	CFMW-019-GW	CFMW-019-GW	CFMW-019-GW
Chemical	3/27/2017	6/26/2017	6/12/2018	10/5/2018	10/5/2018	3/28/2017	6/26/2017	6/6/2018	9/12/2016	12/15/2016	3/29/2017	6/29/2017	6/14/2018	10/15/2018
Carbazole	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chrysene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibenz(A,H)Anthracene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibenzofuran	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Diethyl Phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dimethyl Phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Di-N-Butyl Phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Di-N-Octylphthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Fluoranthene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Fluorene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorobutadiene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorocyclopentadiene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Indeno(1,2,3-C,D)Pyrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Isophorone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Naphthalene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Nitrobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
N-Nitrosodi-N-Propylamine	--	--	--	--	--	--	--	--	--	--	--	--	--	--
N-Nitrosodiphenylamine	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Pentachlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Phenanthrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Phenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Pyrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
VOLATILE ORGANIC COMPOUNDS (µg/L)														
1,1,1-Trichloroethane	--	--	--	--	--	0.28 U	0.28 UJ	--	0.28 U	0.28 U	0.28 U	0.28 U	--	--
1,1,2,2-Tetrachloroethane	--	--	--	--	--	0.19 U	0.19 U	--	0.19 UJ	0.19 U	0.19 U	0.19 U	--	--
1,1,2-Trichloro-1,2,2-Trifluoroethane	--	--	--	--	--	0.34 U	0.34 U	--	0.34 U	0.34 U	0.34 U	0.34 U	--	--
1,1,2-Trichloroethane	--	--	--	--	--	0.08 U	0.08 U	--	0.08 U	0.08 U	0.08 U	0.08 U	--	--
1,1-Dichloroethane	--	--	--	--	--	0.24 U	0.24 U	--	0.24 U	0.24 U	0.24 U	0.24 U	--	--
1,1-Dichloroethene	--	--	--	--	--	0.34 U	0.34 U	--	0.34 U	0.34 U	0.34 U	0.34 U	--	--
1,2,3-Trichlorobenzene	--	--	--	--	--	0.35 U	0.35 U	--	0.35 U	0.35 U	0.35 U	0.35 U	--	--
1,2,4-Trichlorobenzene	--	--	--	--	--	0.27 U	0.27 U	--	0.27 U	0.27 U	0.27 U	0.27 U	--	--
1,2-Dibromo-3-Chloropropane	--	--	--	--	--	0.23 U	0.23 U	--	0.23 U	0.23 UJ	0.23 U	0.23 UJ	--	--
1,2-Dibromoethane (Ethylene Dibromide)	--	--	--	--	--	0.19 U	0.19 U	--	0.19 U	0.19 U	0.19 U	0.19 U	--	--
1,2-Dichlorobenzene	--	--	--	--	--	0.22 U	0.22 U	--	0.22 U	0.22 U	0.22 U	0.22 U	--	--
1,2-Dichloroethane	--	--	--	--	--	0.25 U	0.25 U	--	0.25 U	0.25 U	0.25 U	0.25 U	--	--
1,2-Dichloropropane	--	--	--	--	--	0.18 U	0.18 U	--	0.18 U	0.18 U	0.18 U	0.18 U	--	--
1,3-Dichlorobenzene	--	--	--	--	--	0.33 U	0.33 U	--	0.33 U	0.33 U	0.33 U	0.33 U	--	--
1,4-Dichlorobenzene	--	--	--	--	--	0.33 U	0.33 U	--	0.33 U	0.33 U	0.33 U	0.33 U	--	--
2-Hexanone	--	--	--	--	--	0.72 U	0.72 U	--	0.72 U	0.72 U	0.72 U	0.72 U	--	--
Acetone	--	--	--	--	--	1.1 U	1.1 U	--	1.1 U	1.1 UJ	1.1 U	1.1 U	--	--
Benzene	--	--	--	--	--	0.09 U	0.09 U	--	0.09 U	0.09 U	0.09 U	0.09 U	--	--
Bromochloromethane	--	--	--	--	--	0.3 U	0.3 U	--	0.3 U	0.3 U	0.3 U	0.3 U	--	--
Bromodichloromethane	--	--	--	--	--	0.15 U	0.15 U	--	0.15 U	0.15 U	0.15 U	0.15 U	--	--
Bromoform	--	--	--	--	--	0.18 U	0.18 U	--	0.18 U	0.18 U	0.18 U	0.18 UJ	--	--
Bromomethane	--	--	--	--	--	0.18 U	0.18 UJ	--	0.18 UJ	0.18 U	0.18 U	0.18 U	--	--
Carbon Disulfide	--	--	--	--	--	0.22 U	0.22 U	--	0.22 U	0.22 U	0.22 U	0.22 U	--	--
Carbon Tetrachloride	--	--	--	--	--	0.33 U	0.33 U	--	0.33 U	0.33 U	0.33 U	0.33 U	--	--
Chlorobenzene	--	--	--	--	--	0.24 U	0.24 U	--	0.24 U	0.24 U	0.24 U	0.24 U	--	--
Chloroethane	--	--	--	--	--	0.37 U	0.37 U	--	0.37 U	0.37 U	0.37 U	0.37 U	--	--
Chloroform	--	--	--	--	--	0.22 U	0.22 U	--	0.22 U	0.22 U	0.22 U	0.22 U	--	--
Chloromethane	--	--	--	--	--	0.22 U	0.22 U	--	0.22 U	0.22 U	0.22 U	0.22 U	--	--
Cis-1,2-Dichloroethylene	--	--	--	--	--	0.26 U	0.26 U	--	0.26 U	0.26 U	0.26 U	0.26 U	--	--
Cis-1,3-Dichloropropene	--	--	--	--	--	0.16 U	0.16 U	--	0.16 U	0.16 U	0.16 U	0.16 UJ	--	--
Cyclohexane	--	--	--	--	--	0.26 U	0.26 U	--	0.26 U	0.26 U	0.26 U	0.26 U	--	--
Dibromochloromethane	--	--	--	--	--	0.22 U	0.22 U	--	0.22 U	0.22 U	0.22 U	0.22 U	--	--
Dichlorodifluoromethane	--	--	--	--	--	0.14 U	0.14 UJ	--	0.14 UJ	0.14 U	0.14 U	0.14 U	--	--
Ethylbenzene	--	--	--	--	--	0.3 U	0.3 U	--	0.3 U	0.3 U	0.3 U	0.3 U	--	--

Table E-38
Summary of Data Used in Risk Assessment
Groundwater Upper Hydrogeologic Unit Plume Area - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-016A	CFMW-016A	CFMW-016A	CFMW-016A	CFMW-016A-DUP	CFMW-017	CFMW-017	CFMW-017	CFMW-019	CFMW-019	CFMW-019	CFMW-019	CFMW-019	CFMW-019
Sample Lab IDs	460-130410-3	460-136063-4	460-158183-8	460-166219-1	460-166219-3	460-130507-9	460-136063-6	460-157703-1	460-120053-3	460-125567-5	460-130620-3	460-136351-5	460-158367-4	460-166928-9
Sample Name Chemical	CFMW-016a-GW 3/27/2017	CFMW-016a-GW 6/26/2017	CFMW-016a-GW 6/12/2018	CFMW-016a-GW 10/5/2018	CFMW-DUP20-GW 10/5/2018	CFMW-017-GW 3/28/2017	CFMW-017-GW 6/26/2017	CFMW-017-GW 6/6/2018	CFMW-019-GW 9/12/2016	CFMW-019-GW 12/15/2016	CFMW-019-GW 3/29/2017	CFMW-019-GW 6/29/2017	CFMW-019-GW 6/14/2018	CFMW-019-GW 10/15/2018
Isopropylbenzene (Cumene)	--	--	--	--	--	0.32 U	0.32 U	--	0.32 U	0.32 U	0.32 U	0.32 U	--	--
M,P-Xylene	--	--	--	--	--	0.28 U	0.28 U	--	0.28 U	0.28 U	0.28 U	0.28 U	--	--
Methyl Acetate	--	--	--	--	--	0.58 U	0.58 U	--	0.58 U	0.58 UJ	0.58 U	0.58 U	--	--
Methyl Ethyl Ketone (2-Butanone)	--	--	--	--	--	2.2 U	2.2 U	--	2.2 U	2.2 U	2.2 U	2.2 U	--	--
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	--	--	--	--	--	0.63 U	0.63 U	--	0.63 U	0.63 U	0.63 U	0.63 U	--	--
Methylcyclohexane	--	--	--	--	--	0.22 U	0.22 U	--	0.22 U	0.22 U	0.22 U	0.22 U	--	--
Methylene Chloride	--	--	--	--	--	0.21 U	0.21 U	--	0.21 U	0.21 U	0.21 U	0.21 U	--	--
O-Xylene (1,2-Dimethylbenzene)	--	--	--	--	--	0.32 U	0.32 U	--	0.32 U	0.32 U	0.32 U	0.32 U	--	--
Styrene	--	--	--	--	--	0.17 U	0.17 U	--	0.17 U	0.17 U	0.17 U	0.17 U	--	--
Tert-Butyl Methyl Ether	--	--	--	--	--	0.13 U	0.13 U	--	0.13 U	0.13 U	0.13 U	0.13 U	--	--
Tetrachloroethylene (PCE)	--	--	--	--	--	0.12 U	0.12 U	--	0.56 J+	0.29 J	0.5 J	0.54 J	--	--
Toluene	--	--	--	--	--	0.25 U	0.25 U	--	0.25 U	0.25 U	0.25 U	0.25 U	--	--
Trans-1,2-Dichloroethene	--	--	--	--	--	0.18 U	0.18 U	--	0.18 U	0.18 U	0.18 U	0.18 U	--	--
Trans-1,3-Dichloropropene	--	--	--	--	--	0.19 U	0.19 U	--	0.19 U	0.19 U	0.19 U	0.19 UJ	--	--
Trichloroethylene (TCE)	--	--	--	--	--	0.22 U	0.22 U	--	0.22 U	0.22 U	0.22 U	0.22 U	--	--
Trichlorofluoromethane	--	--	--	--	--	0.15 U	0.15 U	--	0.15 U	0.15 UJ	0.15 U	0.15 U	--	--
Vinyl Chloride	--	--	--	--	--	0.06 U	0.06 U	--	0.06 U	0.06 U	0.06 U	0.06 U	--	--

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-38
Summary of Data Used in Risk Assessment
Groundwater Upper Hydrogeologic Unit Plume Area - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-021	CFMW-021	CFMW-021	CFMW-021	CFMW-021	CFMW-021	CFMW-022	CFMW-022	CFMW-022	CFMW-022	CFMW-022	CFMW-022	CFMW-027	CFMW-027
Sample Lab IDs	460-120053-9	460-125477-1	460-130620-4	460-136063-11	460-157853-2	460-166928-8	460-120143-12	460-125196-7	460-130507-6	460-136063-10	460-157853-3	460-166151-6	460-120143-11	460-125477-3
Sample Name	CFMW-021-GW	CFMW-021-GW	CFMW-021-GW	CFMW-021-GW	CFMW-021-GW	CFMW-021-GW	CFMW-022-GW	CFMW-022-GW	CFMW-022-GW	CFMW-022-GW	CFMW-022-GW	CFMW-022-GW	CFMW-027-GW	CFMW-027-GW
Chemical	9/12/2016	12/14/2016	3/29/2017	6/26/2017	6/7/2018	10/15/2018	9/13/2016	12/9/2016	3/28/2017	6/26/2017	6/7/2018	10/4/2018	9/13/2016	12/14/2016
GENERAL CHEMISTRY (µg/L)														
Fluoride	--	--	--	1810	--	--	--	--	--	607	--	--	--	--
Cyanide	--	--	--	302	605	951	--	--	--	11.8	4.7 J	143	--	--
Cyanide (Free)	--	--	--	7.5	19.3	33.5	--	--	--	1.5 U	38.9	1.5 U	--	--
Cyanide	400 J	1560	1020	321	565	737	155	279	141	13.3	4.8 J	169	603	793
Cyanide (Free)	--	--	23	18.9	39.7	44.3	--	--	3.4 J	1.5 U	1.9 J	1.5 U	--	--
METALS (µg/L)														
Aluminum	18.2 U	18.2 U	18.2 U	18.2 U	15 U	15 U	9.1 U	18.2 U	18.2 U	18.2 U	15 U	15 U	9.1 U	18.2 U
Antimony	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.31 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.31 U	0.62 U
Arsenic	0.64 U	0.81 J	0.78 J	0.64 U	0.77 U	0.77 U	0.32 U	0.64 U	0.64 U	0.64 U	0.77 U	0.77 U	0.32 U	0.64 U
Barium	193	189	220	109	119	184	102	233	232 J	170	154	189	89.1	187
Beryllium	0.24 U	0.24 U	0.24 U	0.24 U	0.26 U	0.26 U	0.12 U	0.24 U	0.24 U	0.24 U	0.26 U	0.26 U	0.12 U	0.24 U
Cadmium	0.71 U	0.71 U	0.71 U	0.71 U	0.61 U	0.61 U	0.36 U	0.71 U	0.71 U	0.71 U	0.61 U	0.61 U	0.36 U	0.71 U
Calcium	62300	45700	55700	38900	35000	69400	27700	59800	55100 J	47500	42100	53400	24500	51500
Chromium, Total	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	0.66 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	0.66 U	1.3 U
Cobalt	1.5 J	7.2	4.7	1.5 J	2.5 J	3.4 J	0.65 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	0.85 J	2 J
Copper	4.2	2.9 J	3 J	1.4 U	1.9 J	1.9 U	1.6 J	1.4 J	3.6 J	1.4 U	1.9 U	1.9 U	1.9 J	1.4 U
Iron	85.9 J	660	371	135	208	326	36.1 J	119 J	51.8 J	42.4 U	45.7 U	47 J	147	341
Lead	0.38 U	0.38 U	0.38 U	0.38 U	0.37 U	0.37 U	0.19 U	0.38 U	0.38 U	0.38 U	0.37 U	0.37 U	0.19 U	0.38 U
Magnesium	18800	14000	18900	12500	10700	21300	6720	14400	15100 J	11500	9780	13600	7890	16100
Manganese	2.5 U	2.5 U	2.5 U	2.5 U	2.7 U	2.7 U	1.2 U	2.5 U	2.5 U	2.5 U	2.7 U	2.7 U	1.2 J	2.5 U
Mercury	0.17 U	0.17 U	0.17 U	0.17 U	0.12 U	0.12 U	0.17 U	0.17 U	0.17 U	0.17 U	0.12 U	0.12 U	0.17 U	0.17 U
Nickel	1.4 U	1.4 U	1.4 U	1.4 U	1.3 U	1.3 U	0.68 U	1.4 U	1.4 U	1.4 U	1.3 U	1.3 U	0.68 U	1.4 U
Potassium	1000	1070	1360	881	1060	1060	318	685	761	546	539	614	520	1090
Selenium	0.73 U	1.6 J	1.1 J	0.73 U	0.69 J	0.85 J	0.37 U	0.73 U	0.73 U	0.73 U	0.69 U	0.69 U	0.37 U	0.73 U
Silver	1.3 U	1.3 U	1.3 U	1.3 U	1.4 U	1.4 U	0.64 U	1.3 U	1.3 U	1.3 U	1.4 U	1.4 U	0.64 U	1.3 U
Sodium	54300	142000	178000	46100	108000	67900	5090	15600	23600	5310	5150	6430	31000	56500
Thallium	0.26 U	0.26 U	0.26 U	0.26 U	0.24 U	0.24 U	0.13 U	0.26 U	0.26 U	0.26 U	0.24 U	0.24 U	0.13 U	0.26 U
Vanadium	1.9 U	1.9 U	1.9 U	1.9 U	1.2 U	1.2 U	0.95 U	1.9 U	1.9 U	1.9 U	1.2 U	1.2 U	0.95 U	1.9 U
Zinc	7 U	7 U	7 U	7 U	5.4 U	5.4 U	3.5 U	7 U	7 U	7 U	20.2	5.4 U	3.5 U	7 U
Aluminum	--	--	--	18.2 U	15 U	15 U	--	--	--	18.2 U	15 U	15 U	--	--
Antimony	--	--	--	0.62 U	0.62 U	1.1 J	--	--	--	0.62 U	1.6 J	0.62 U	--	--
Arsenic	--	--	--	0.64 U	0.85 J	0.77 U	--	--	--	0.64 U	0.77 U	0.77 U	--	--
Barium	--	--	--	110	124	209	--	--	--	171	167	195	--	--
Beryllium	--	--	--	0.24 U	0.26 U	0.26 U	--	--	--	0.24 U	0.26 U	0.26 U	--	--
Cadmium	--	--	--	0.71 U	0.61 U	0.61 U	--	--	--	0.71 U	0.61 U	0.61 U	--	--
Calcium	--	--	--	38300	35200	76000	--	--	--	48900	46200	53400 J	--	--
Chromium, Total	--	--	--	1.3 U	1.3 U	1.3 U	--	--	--	1.3 U	1.3 U	1.3 U	--	--
Cobalt	--	--	--	1.7 J	3.1 J	3.9 J	--	--	--	1.3 U	1.3 U	1.3 U	--	--
Copper	--	--	--	1.4 U	2.2 J	1.9 U	--	--	--	1.4 U	1.9 U	1.9 U	--	--
Iron	--	--	--	210	563	620	--	--	--	42.4 U	45.7 U	59.2 J	--	--
Lead	--	--	--	0.38 U	0.37 U	0.37 U	--	--	--	0.38 U	0.37 U	0.37 U	--	--
Magnesium	--	--	--	12000	12400	23500	--	--	--	11700	11200	13800	--	--
Manganese	--	--	--	2.5 U	3.3 J	3.5 J	--	--	--	2.5 U	2.7 U	2.7 U	--	--
Mercury	--	--	--	0.17 U	0.12 U	0.12 U	--	--	--	0.17 U	0.12 U	0.12 U	--	--
Nickel	--	--	--	1.4 U	1.3 U	1.3 U	--	--	--	1.4 U	1.3 U	1.3 U	--	--
Potassium	--	--	--	883	1060	1180	--	--	--	554	597	621	--	--
Selenium	--	--	--	0.73 U	0.75 J	1 J	--	--	--	0.73 U	0.69 U	0.69 U	--	--
Silver	--	--	--	1.3 U	1.4 U	1.4 U	--	--	--	1.3 U	1.4 U	1.4 U	--	--
Sodium	--	--	--	47200	121000	77100	--	--	--	5180	5610	6630	--	--
Thallium	--	--	--	0.26 U	0.24 U	0.24 U	--	--	--	0.26 U	0.24 U	0.24 U	--	--
Vanadium	--	--	--	1.9 U	1.2 U	1.2 U	--	--	--	1.9 U	1.2 U	1.2 U	--	--
Zinc	--	--	--	7 U	5.4 U	5.4 U	--	--	--	7 U	24.4	5.4 U	--	--
POLYCHLORINATED BIPHENYLS (µg/L)														
PCB-1016 (Aroclor 1016)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1221 (Aroclor 1221)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1232 (Aroclor 1232)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1242 (Aroclor 1242)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1248 (Aroclor 1248)	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Table E-38
Summary of Data Used in Risk Assessment
Groundwater Upper Hydrogeologic Unit Plume Area - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-021	CFMW-021	CFMW-021	CFMW-021	CFMW-021	CFMW-021	CFMW-022	CFMW-022	CFMW-022	CFMW-022	CFMW-022	CFMW-022	CFMW-027	CFMW-027
Sample Lab IDs	460-120053-9	460-125477-1	460-130620-4	460-136063-11	460-157853-2	460-166928-8	460-120143-12	460-125196-7	460-130507-6	460-136063-10	460-157853-3	460-166151-6	460-120143-11	460-125477-3
Sample Name	CFMW-021-GW	CFMW-021-GW	CFMW-021-GW	CFMW-021-GW	CFMW-021-GW	CFMW-021-GW	CFMW-022-GW	CFMW-022-GW	CFMW-022-GW	CFMW-022-GW	CFMW-022-GW	CFMW-022-GW	CFMW-027-GW	CFMW-027-GW
Chemical	9/12/2016	12/14/2016	3/29/2017	6/26/2017	6/7/2018	10/15/2018	9/13/2016	12/9/2016	3/28/2017	6/26/2017	6/7/2018	10/4/2018	9/13/2016	12/14/2016
PCB-1254 (Aroclor 1254)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1260 (Aroclor 1260)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1262 (Aroclor 1262)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1268 (Aroclor 1268)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Polychlorinated Biphenyl (PCBs)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SEMIVOLATILE ORGANIC COMPOUNDS (µg/L)														
1,2,4,5-Tetrachlorobenzene	0.43 U	0.43 U	0.44 U	0.43 U	--	--	0.43 U	0.43 U	0.46 U	0.43 U	--	--	0.44 U	0.43 U
1,4-Dioxane (P-Dioxane)	3.1 U	3.1 UJ	3.2 U	3.1 U	--	--	3.1 U	3.1 U	3.3 U	3.1 U	--	--	3.2 U	3.1 UJ
2,3,4,6-Tetrachlorophenol	0.69 U	0.69 U	0.7 U	0.69 U	--	--	0.69 U	0.69 U	0.73 U	0.69 U	--	--	0.7 U	0.69 U
2,4,5-Trichlorophenol	0.49 U	0.49 U	0.5 U	0.49 U	--	--	0.49 U	0.49 U	0.52 U	0.49 U	--	--	0.5 U	0.49 U
2,4,6-Trichlorophenol	0.53 U	0.53 U	0.54 U	0.53 U	--	--	0.53 U	0.53 U	0.56 U	0.53 U	--	--	0.54 U	0.53 U
2,4-Dichlorophenol	0.63 U	0.63 U	0.64 U	0.63 U	--	--	0.63 U	0.63 U	0.67 U	0.63 U	--	--	0.64 U	0.63 U
2,4-Dimethylphenol	0.91 U	0.91 U	0.92 U	0.91 U	--	--	0.91 U	0.91 U	0.96 U	0.91 U	--	--	0.93 U	0.91 U
2,4-Dinitrophenol	2.4 U	2.4 U	2.4 U	2.4 U	--	--	2.4 UJ	2.4 U	2.5 UJ	2.4 U	--	--	2.4 UJ	2.4 U
2,4-Dinitrotoluene	1 U	1 U	1.1 U	1 U	--	--	1 U	1 U	1.1 U	1 U	--	--	1.1 U	1 U
2,6-Dinitrotoluene	0.88 U	0.88 U	0.89 U	0.88 U	--	--	0.88 U	0.88 U	0.93 U	0.88 U	--	--	0.9 U	0.88 U
2-Chloronaphthalene	0.61 U	0.61 U	0.62 U	0.61 U	--	--	0.61 U	0.61 U	0.65 U	0.61 U	--	--	0.62 U	0.61 U
2-Chlorophenol	0.74 U	0.74 U	0.75 U	0.74 U	--	--	0.74 U	0.74 U	0.78 U	0.74 U	--	--	0.76 U	0.74 U
2-Methylnaphthalene	0.88 U	0.88 U	0.89 U	0.88 U	--	--	0.88 U	0.88 U	0.93 U	0.88 U	--	--	0.9 U	0.88 U
2-Methylphenol (O-Cresol)	1.3 U	1.3 U	1.3 U	1.3 U	--	--	1.3 U	1.3 U	1.4 U	1.3 U	--	--	1.3 U	1.3 U
2-Nitroaniline	0.65 U	0.65 U	0.66 U	0.65 UJ	--	--	0.65 U	0.65 U	0.69 U	0.65 U	--	--	0.66 U	0.65 U
2-Nitrophenol	0.59 U	0.59 U	0.6 U	0.59 U	--	--	0.59 U	0.59 U	0.63 U	0.59 U	--	--	0.6 U	0.59 U
3- And 4- Methylphenol (Total)	0.88 UJ	0.88 U	0.89 U	0.88 U	--	--	0.88 U	0.88 U	0.93 U	0.88 U	--	--	0.9 U	0.88 U
3,3'-Dichlorobenzidine	1 U	1 U	1.1 U	1 U	--	--	1 U	1 U	1.1 U	1 U	--	--	1.1 U	1 U
3-Nitroaniline	0.82 U	0.82 U	0.83 U	0.82 U	--	--	0.82 U	0.82 U	0.87 U	0.82 U	--	--	0.84 U	0.82 U
4,6-Dinitro-2-Methylphenol	2 U	2 U	2 U	2 U	--	--	2 U	2 U	2.1 U	2 U	--	--	2.1 U	2 U
4-Bromophenyl Phenyl Ether	1 U	1 U	1 U	1 U	--	--	1 U	1 U	1.1 U	1 U	--	--	1 U	1 U
4-Chloro-3-Methylphenol	0.76 U	0.76 U	0.77 U	0.76 U	--	--	0.76 U	0.76 U	0.81 U	0.76 U	--	--	0.78 U	0.76 U
4-Chloroaniline	0.73 U	0.73 U	0.74 U	0.73 U	--	--	0.73 U	0.73 U	0.77 U	0.73 U	--	--	0.74 U	0.73 U
4-Chlorophenyl Phenyl Ether	0.96 U	0.96 U	0.98 U	0.96 U	--	--	0.96 U	0.96 U	1 U	0.96 U	--	--	0.98 U	0.96 U
4-Nitroaniline	0.48 U	0.48 U	0.49 U	0.48 UJ	--	--	0.48 U	0.48 U	0.51 UJ	0.48 U	--	--	0.49 U	0.48 U
4-Nitrophenol	4.7 U	4.7 U	4.7 U	4.7 UJ	--	--	4.7 U	4.7 U	4.9 U	4.7 U	--	--	4.7 U	4.7 U
Acenaphthene	0.88 U	0.88 UJ	0.89 U	0.88 UJ	--	--	0.88 U	0.88 U	0.93 U	0.88 U	--	--	0.9 U	0.88 UJ
Acenaphthylene	0.65 U	0.65 U	0.66 U	0.65 U	--	--	0.65 U	0.65 U	0.69 U	0.65 U	--	--	0.66 U	0.65 U
Acetophenone	1 U	1 U	1.1 U	1 U	--	--	1 U	1 U	1.1 U	1 U	--	--	1.1 U	1 U
Anthracene	0.57 U	0.57 U	0.58 U	0.57 U	--	--	0.57 U	0.57 U	0.6 U	0.57 U	--	--	0.58 U	0.57 U
Atrazine	0.77 U	0.77 U	0.78 U	0.77 U	--	--	0.77 U	0.77 U	0.82 U	0.77 U	--	--	0.79 U	0.77 U
Benzaldehyde	0.86 U	0.86 U	0.87 U	0.86 U	--	--	0.86 U	0.86 U	0.91 U	0.86 UJ	--	--	0.88 U	0.86 U
Benzo(A)Anthracene	0.55 U	0.55 U	0.56 U	0.55 U	--	--	0.55 U	0.55 U	0.58 U	0.55 U	--	--	0.56 U	0.55 U
Benzo(A)Pyrene	0.16 U	0.16 U	0.16 U	0.16 U	--	--	0.16 U	0.16 U	0.17 U	0.16 U	--	--	0.16 U	0.16 U
Benzo(B)Fluoranthene	0.44 U	0.44 U	0.45 U	0.44 U	--	--	0.44 U	0.44 U	0.47 U	0.44 U	--	--	0.45 U	0.44 U
Benzo(G,H,I)Perylene	0.75 U	0.75 U	0.76 U	0.75 U	--	--	0.75 U	0.75 U	0.79 U	0.75 U	--	--	0.77 U	0.75 U
Benzo(K)Fluoranthene	0.18 U	0.18 U	0.18 U	0.18 U	--	--	0.18 U	0.18 U	0.19 U	0.18 U	--	--	0.18 U	0.18 U
Benzyl Butyl Phthalate	0.6 U	0.6 U	0.61 U	0.6 U	--	--	0.6 U	0.6 U	0.64 UJ	0.6 U	--	--	0.61 U	0.6 U
Biphenyl (Diphenyl)	0.63 U	0.63 U	0.64 U	0.63 U	--	--	0.63 U	0.63 U	0.67 U	0.63 U	--	--	0.64 U	0.63 U
Bis(2-Chloroethoxy) Methane	0.69 U	0.69 U	0.7 U	0.69 U	--	--	0.69 U	0.69 U	0.73 U	0.69 U	--	--	0.7 U	0.69 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.12 U	0.12 UJ	0.12 U	0.12 U	--	--	0.12 U	0.12 UJ	0.13 U	0.12 U	--	--	0.12 U	0.12 UJ
Bis(2-Chloroisopropyl) Ether	0.93 U	0.93 U	0.95 U	0.93 UJ	--	--	0.93 U	0.93 U	0.99 U	0.93 U	--	--	0.95 U	0.93 U
Bis(2-Ethylhexyl) Phthalate	0.72 U	0.72 U	0.73 U	0.72 U	--	--	0.72 U	1.2 J	0.76 U	0.72 U	--	--	0.73 U	0.72 U
Caprolactam	1.1 U	1.1 U	1.1 U	1.1 U	--	--	1.1 U	1.1 U	1.1 U	1.1 U	--	--	1.1 U	1.1 U
Carbazole	0.85 U	0.85 U	0.86 U	0.85 U	--	--	0.85 U	0.85 U	0.9 U	0.85 U	--	--	0.87 U	0.85 U
Chrysene	0.67 U	0.67 U	0.68 U	0.67 U	--	--	0.67 U	0.67 U	0.71 U	0.67 U	--	--	0.68 U	0.67 U
Dibenz(A,H)Anthracene	0.09 U	0.09 U	0.091 U	0.09 U	--	--	0.09 U	0.09 U	0.095 U	0.09 U	--	--	0.092 U	0.09 U
Dibenzofuran	0.85 U	0.85 U	0.86 U	0.85 U	--	--	0.85 U	0.85 U	0.9 U	0.85 U	--	--	0.87 U	0.85 U
Diethyl Phthalate	1 U	1 U	1 U	1 U	--	--	1 U	1 U	1.1 UJ	1 U	--	--	1 U	1 U
Dimethyl Phthalate	0.98 U	0.98 U	1 U	0.98 U	--	--	0.98 U	0.98 U	1 UJ	0.98 U	--	--	1 U	0.98 U
Di-N-Butyl Phthalate	0.82 U	0.82 U	0.83 U	0.82 U	--	--	0.82 U	1.2 J	0.87 U	0.82 U	--	--	0.84 U	0.82 U
Di-N-Octylphthalate	0.69 U	0.69 U	0.7 UJ	0.69 U	--	--	0.69 U	0.69 U	0.73 U	0.69 U	--	--	0.7 U	0.69 U
Fluoranthene	0.72 U	0.72 U	0.73 U	0.72 U	--	--	0.72 U	0.72 U	0.76 U	0.72 U	--	--	0.73 U	0.72 U

Table E-38
Summary of Data Used in Risk Assessment
Groundwater Upper Hydrogeologic Unit Plume Area - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Chemical	CFMW-021 460-120053-9 CFMW-021-GW 9/12/2016	CFMW-021 460-125477-1 CFMW-021-GW 12/14/2016	CFMW-021 460-130620-4 CFMW-021-GW 3/29/2017	CFMW-021 460-136063-11 CFMW-021-GW 6/26/2017	CFMW-021 460-157853-2 CFMW-021-GW 6/7/2018	CFMW-021 460-166928-8 CFMW-021-GW 10/15/2018	CFMW-022 460-120143-12 CFMW-022-GW 9/13/2016	CFMW-022 460-125196-7 CFMW-022-GW 12/9/2016	CFMW-022 460-130507-6 CFMW-022-GW 3/28/2017	CFMW-022 460-136063-10 CFMW-022-GW 6/26/2017	CFMW-022 460-157853-3 CFMW-022-GW 6/7/2018	CFMW-022 460-166151-6 CFMW-022-GW 10/4/2018	CFMW-027 460-120143-11 CFMW-027-GW 9/13/2016	CFMW-027 460-125477-3 CFMW-027-GW 12/14/2016
Fluorene	0.8 U	0.8 U	0.81 U	0.8 U	--	--	0.8 U	0.8 U	0.85 U	0.8 U	--	--	0.82 U	0.8 U
Hexachlorobenzene	0.47 U	0.47 U	0.48 U	0.47 U	--	--	0.47 U	0.47 U	0.5 U	0.47 U	--	--	0.48 U	0.47 U
Hexachlorobutadiene	0.76 U	0.76 U	0.77 U	0.76 U	--	--	0.76 U	0.76 U	0.81 U	0.76 U	--	--	0.78 U	0.76 U
Hexachlorocyclopentadiene	0.61 U	0.61 U	0.62 U	0.61 U	--	--	0.61 U	0.61 U	0.65 U	0.61 UJ	--	--	0.62 U	0.61 U
Hexachloroethane	0.09 U	0.09 U	0.091 U	0.09 U	--	--	0.09 U	0.09 U	0.095 U	0.09 U	--	--	0.092 U	0.09 U
Indeno(1,2,3-C,D)Pyrene	0.21 U	0.21 U	0.21 U	0.21 U	--	--	0.21 U	0.21 U	0.22 U	0.21 U	--	--	0.21 U	0.21 U
Isophorone	0.67 U	0.67 U	0.68 U	0.67 U	--	--	0.67 U	0.67 U	0.71 U	0.67 U	--	--	0.68 U	0.67 U
Naphthalene	0.8 U	0.8 U	0.81 U	0.8 U	--	--	0.8 U	0.8 U	0.85 U	0.8 U	--	--	0.82 U	0.8 U
Nitrobenzene	0.49 U	0.49 U	0.5 U	0.49 U	--	--	0.49 U	0.49 U	0.52 U	0.49 U	--	--	0.5 U	0.49 U
N-Nitrosodi-N-Propylamine	0.83 U	0.83 U	0.84 U	0.83 U	--	--	0.83 U	0.83 U	0.88 U	0.83 U	--	--	0.85 U	0.83 U
N-Nitrosodiphenylamine	0.74 U	0.74 UJ	0.75 U	0.74 U	--	--	0.74 U	0.74 U	0.78 U	0.74 U	--	--	0.76 U	0.74 UJ
Pentachlorophenol	2.2 U	2.2 UJ	2.2 U	2.2 U	--	--	2.2 UR	2.2 UJ	2.3 U	2.2 U	--	--	2.2 UR	2.2 UJ
Phenanthrene	0.65 U	0.65 U	0.66 U	0.65 U	--	--	0.65 U	0.65 U	0.69 U	0.65 U	--	--	0.66 U	0.65 U
Phenol	0.41 U	0.41 U	0.42 U	0.41 U	--	--	0.41 U	0.41 U	0.43 U	0.41 U	--	--	0.42 U	0.41 U
Pyrene	0.83 U	0.83 U	0.84 UJ	0.83 U	--	--	0.83 U	0.83 U	0.88 UJ	0.83 U	--	--	0.85 U	0.83 U
SEMIVOLATILE ORGANIC COMPOUNDS|LOW LEVEL (µg/L)														
1,2,4,5-Tetrachlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,4-Dioxane (P-Dioxane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,3,4,6-Tetrachlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4,5-Trichlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4,6-Trichlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4-Dichlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4-Dimethylphenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4-Dinitrophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4-Dinitrotoluene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,6-Dinitrotoluene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Chloronaphthalene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Chlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Methylnaphthalene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Methylphenol (O-Cresol)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Nitroaniline	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Nitrophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3,3'-Dichlorobenzidine	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3-Nitroaniline	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4,6-Dinitro-2-Methylphenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Bromophenyl Phenyl Ether	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Chloro-3-Methylphenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Chloroaniline	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Chlorophenyl Phenyl Ether	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Nitroaniline	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Nitrophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acenaphthene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acenaphthylene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acetophenone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Anthracene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Atrazine	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzaldehyde	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(A)Anthracene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(A)Pyrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(B)Fluoranthene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(G,H,I)Perylene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(K)Fluoranthene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzyl Butyl Phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Biphenyl (Diphenyl)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bis(2-Chloroethoxy) Methane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bis(2-Chloroisopropyl) Ether	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bis(2-Ethylhexyl) Phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Caprolactam	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Table E-38
Summary of Data Used in Risk Assessment
Groundwater Upper Hydrogeologic Unit Plume Area - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-021	CFMW-021	CFMW-021	CFMW-021	CFMW-021	CFMW-021	CFMW-022	CFMW-022	CFMW-022	CFMW-022	CFMW-022	CFMW-022	CFMW-027	CFMW-027
Sample Lab IDs	460-120053-9	460-125477-1	460-130620-4	460-136063-11	460-157853-2	460-166928-8	460-120143-12	460-125196-7	460-130507-6	460-136063-10	460-157853-3	460-166151-6	460-120143-11	460-125477-3
Sample Name	CFMW-021-GW 9/12/2016	CFMW-021-GW 12/14/2016	CFMW-021-GW 3/29/2017	CFMW-021-GW 6/26/2017	CFMW-021-GW 6/7/2018	CFMW-021-GW 10/15/2018	CFMW-022-GW 9/13/2016	CFMW-022-GW 12/9/2016	CFMW-022-GW 3/28/2017	CFMW-022-GW 6/26/2017	CFMW-022-GW 6/7/2018	CFMW-022-GW 10/4/2018	CFMW-027-GW 9/13/2016	CFMW-027-GW 12/14/2016
Chemical														
Carbazole	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chrysene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibenz(A,H)Anthracene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibenzofuran	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Diethyl Phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dimethyl Phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Di-N-Butyl Phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Di-N-Octylphthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Fluoranthene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Fluorene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorobutadiene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorocyclopentadiene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Indeno(1,2,3-C,D)Pyrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Isophorone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Naphthalene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Nitrobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
N-Nitrosodi-N-Propylamine	--	--	--	--	--	--	--	--	--	--	--	--	--	--
N-Nitrosodiphenylamine	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Pentachlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Phenanthrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Phenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Pyrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
VOLATILE ORGANIC COMPOUNDS (µg/L)														
1,1,1-Trichloroethane	0.28 U	0.28 U	0.28 U	0.28 UJ	--	--	0.28 U	0.28 U	0.28 U	0.28 U	--	--	0.28 U	0.28 U
1,1,2,2-Tetrachloroethane	0.19 U	0.19 U	0.19 U	0.19 U	--	--	0.19 U	0.19 U	0.19 U	0.19 U	--	--	0.19 U	0.19 U
1,1,2-Trichloro-1,2,2-Trifluoroethane	0.34 U	0.34 U	0.34 U	0.34 U	--	--	0.34 U	0.34 U	0.34 U	0.34 U	--	--	0.34 U	0.34 U
1,1,2-Trichloroethane	0.08 U	0.08 U	0.08 U	0.08 U	--	--	0.08 U	0.08 U	0.08 U	0.08 U	--	--	0.08 U	0.08 U
1,1-Dichloroethane	0.24 U	0.24 U	0.24 U	0.24 U	--	--	0.24 U	0.24 U	0.24 U	0.24 U	--	--	0.24 U	0.24 U
1,1-Dichloroethene	0.34 U	0.34 U	0.34 U	0.34 U	--	--	0.34 U	0.34 U	0.34 U	0.34 U	--	--	0.34 U	0.34 U
1,2,3-Trichlorobenzene	0.35 U	0.35 U	0.35 U	0.35 U	--	--	0.35 U	0.35 U	0.35 U	0.35 U	--	--	0.35 U	0.35 U
1,2,4-Trichlorobenzene	0.27 U	0.27 U	0.27 U	0.27 U	--	--	0.27 U	0.27 U	0.27 U	0.27 U	--	--	0.27 U	0.27 U
1,2-Dibromo-3-Chloropropane	0.23 U	0.23 UJ	0.23 U	0.23 U	--	--	0.23 U	0.23 U	0.23 U	0.23 U	--	--	0.23 U	0.23 UJ
1,2-Dibromoethane (Ethylene Dibromide)	0.19 U	0.19 U	0.19 U	0.19 U	--	--	0.19 U	0.19 U	0.19 U	0.19 U	--	--	0.19 U	0.19 U
1,2-Dichlorobenzene	0.22 U	0.22 U	0.22 U	0.22 U	--	--	0.22 U	0.22 U	0.22 U	0.22 U	--	--	0.22 U	0.22 U
1,2-Dichloroethane	0.25 U	0.25 U	0.25 U	0.25 U	--	--	0.25 U	0.25 U	0.25 U	0.25 U	--	--	0.25 U	0.25 U
1,2-Dichloropropane	0.18 U	0.18 U	0.18 U	0.18 U	--	--	0.18 U	0.18 U	0.18 U	0.18 U	--	--	0.18 U	0.18 U
1,3-Dichlorobenzene	0.33 U	0.33 U	0.33 U	0.33 U	--	--	0.33 U	0.33 U	0.33 U	0.33 U	--	--	0.33 U	0.33 U
1,4-Dichlorobenzene	0.33 U	0.33 U	0.33 U	0.33 U	--	--	0.33 U	0.33 U	0.33 U	0.33 U	--	--	0.33 U	0.33 U
2-Hexanone	0.72 U	0.72 U	0.72 U	0.72 U	--	--	0.72 U	0.72 U	0.72 U	0.72 U	--	--	0.72 U	0.72 U
Acetone	1.1 U	1.1 UJ	1.1 U	1.1 U	--	--	1.1 U	1.1 U	1.1 U	1.1 UJ	--	--	1.1 U	1.1 UJ
Benzene	0.09 U	0.09 U	0.09 U	0.09 U	--	--	0.09 U	0.09 U	0.09 U	0.09 U	--	--	0.09 U	0.09 U
Bromochloromethane	0.3 U	0.3 U	0.3 U	0.3 U	--	--	0.3 U	0.3 U	0.3 U	0.3 U	--	--	0.3 U	0.3 U
Bromodichloromethane	0.15 U	0.15 U	0.15 U	0.15 U	--	--	0.15 U	0.15 U	0.15 U	0.15 U	--	--	0.15 U	0.15 U
Bromoform	0.18 U	0.18 U	0.18 U	0.18 U	--	--	0.18 U	0.18 U	0.18 U	0.18 UJ	--	--	0.18 U	0.18 U
Bromomethane	0.18 U	0.18 U	0.18 U	0.18 UJ	--	--	0.18 UJ	0.18 U	0.18 U	0.18 UJ	--	--	0.18 UJ	0.18 U
Carbon Disulfide	0.22 U	0.22 U	0.22 U	0.22 U	--	--	0.22 U	0.22 U	0.22 U	0.22 U	--	--	0.22 U	0.22 U
Carbon Tetrachloride	0.33 U	0.33 U	0.33 U	0.33 U	--	--	0.33 U	0.33 U	0.33 U	0.33 U	--	--	0.33 U	0.33 U
Chlorobenzene	0.24 U	0.24 U	0.24 U	0.24 U	--	--	0.24 U	0.24 U	0.24 U	0.24 U	--	--	0.24 U	0.24 U
Chloroethane	0.37 U	0.37 U	0.37 U	0.37 U	--	--	0.37 U	0.37 U	0.37 U	0.37 U	--	--	0.37 U	0.37 U
Chloroform	0.22 U	0.22 U	0.22 U	0.22 U	--	--	0.22 U	0.22 U	0.22 U	0.22 U	--	--	0.22 U	0.22 U
Chloromethane	0.22 U	0.22 U	0.22 U	0.22 U	--	--	0.22 U	0.22 U	0.22 U	0.22 U	--	--	0.22 U	0.22 U
Cis-1,2-Dichloroethylene	0.26 U	0.26 U	0.26 U	0.26 U	--	--	0.26 U	0.26 U	0.26 U	0.26 U	--	--	0.26 U	0.26 U
Cis-1,3-Dichloropropene	0.16 U	0.16 U	0.16 U	0.16 U	--	--	0.16 U	0.16 U	0.16 U	0.16 U	--	--	0.16 U	0.16 U
Cyclohexane	0.26 U	0.26 U	0.26 U	0.26 U	--	--	0.26 U	0.26 U	0.26 U	0.26 U	--	--	0.26 U	0.26 U
Dibromochloromethane	0.22 U	0.22 U	0.22 U	0.22 U	--	--	0.22 U	0.22 U	0.22 U	0.22 U	--	--	0.22 U	0.22 U
Dichlorodifluoromethane	0.14 UJ	0.14 U	0.14 U	0.14 UJ	--	--	0.14 UJ	0.14 U	0.14 U	0.14 U	--	--	0.14 UJ	0.14 U
Ethylbenzene	0.3 U	0.3 U	0.3 U	0.3 U	--	--	0.3 U	0.3 U	0.3 U	0.3 U	--	--	0.3 U	0.3 U

Table E-38
Summary of Data Used in Risk Assessment
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Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-021	CFMW-021	CFMW-021	CFMW-021	CFMW-021	CFMW-021	CFMW-022	CFMW-022	CFMW-022	CFMW-022	CFMW-022	CFMW-022	CFMW-027	CFMW-027
Sample Lab IDs	460-120053-9	460-125477-1	460-130620-4	460-136063-11	460-157853-2	460-166928-8	460-120143-12	460-125196-7	460-130507-6	460-136063-10	460-157853-3	460-166151-6	460-120143-11	460-125477-3
Sample Name Chemical	CFMW-021-GW 9/12/2016	CFMW-021-GW 12/14/2016	CFMW-021-GW 3/29/2017	CFMW-021-GW 6/26/2017	CFMW-021-GW 6/7/2018	CFMW-021-GW 10/15/2018	CFMW-022-GW 9/13/2016	CFMW-022-GW 12/9/2016	CFMW-022-GW 3/28/2017	CFMW-022-GW 6/26/2017	CFMW-022-GW 6/7/2018	CFMW-022-GW 10/4/2018	CFMW-027-GW 9/13/2016	CFMW-027-GW 12/14/2016
Isopropylbenzene (Cumene)	0.32 U	0.32 U	0.32 U	0.32 U	--	--	0.32 U	0.32 U	0.32 U	0.32 U	--	--	0.32 U	0.32 U
M,P-Xylene	0.28 U	0.28 U	0.28 U	0.28 U	--	--	0.28 U	0.28 U	0.28 U	0.28 U	--	--	0.28 U	0.28 U
Methyl Acetate	0.58 U	0.58 UJ	0.58 U	0.58 U	--	--	0.58 U	0.58 U	0.58 U	0.58 U	--	--	0.58 U	0.58 UJ
Methyl Ethyl Ketone (2-Butanone)	2.2 U	2.2 U	2.2 U	2.2 U	--	--	2.2 U	2.2 U	2.2 U	2.2 U	--	--	2.2 U	2.2 U
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	0.63 U	0.63 U	0.63 U	0.63 U	--	--	0.63 U	0.63 U	0.63 U	0.63 U	--	--	0.63 U	0.63 U
Methylcyclohexane	0.22 U	0.22 U	0.22 U	0.22 U	--	--	0.22 U	0.22 U	0.22 U	0.22 U	--	--	0.22 U	0.22 U
Methylene Chloride	0.21 U	0.21 U	0.21 U	0.21 U	--	--	0.21 U	0.21 U	0.21 U	0.21 U	--	--	0.21 U	0.21 U
O-Xylene (1,2-Dimethylbenzene)	0.32 U	0.32 U	0.32 U	0.32 U	--	--	0.32 U	0.32 U	0.32 U	0.32 U	--	--	0.32 U	0.32 U
Styrene	0.17 U	0.17 U	0.17 U	0.17 U	--	--	0.17 U	0.17 U	0.17 U	0.17 U	--	--	0.17 U	0.17 U
Tert-Butyl Methyl Ether	0.13 U	0.13 U	0.13 U	0.13 U	--	--	0.13 U	0.13 U	0.13 U	0.13 U	--	--	0.13 U	0.13 U
Tetrachloroethylene (PCE)	0.18 J	0.12 U	0.69 J	0.12 U	--	--	0.12 U	0.12 U	0.12 U	0.12 U	--	--	0.21 J	0.12 U
Toluene	0.25 U	0.25 U	0.25 U	0.25 U	--	--	0.25 U	0.25 U	0.25 U	0.25 U	--	--	0.25 U	0.25 U
Trans-1,2-Dichloroethene	0.18 U	0.18 U	0.18 U	0.18 U	--	--	0.18 U	0.18 U	0.18 U	0.18 U	--	--	0.18 U	0.18 U
Trans-1,3-Dichloropropene	0.19 U	0.19 U	0.19 U	0.19 U	--	--	0.19 U	0.19 U	0.19 U	0.19 U	--	--	0.19 U	0.19 U
Trichloroethylene (TCE)	0.22 U	0.22 U	0.22 U	0.22 U	--	--	0.22 U	0.22 U	0.22 U	0.22 U	--	--	0.22 U	0.22 U
Trichlorofluoromethane	0.15 U	0.15 UJ	0.15 U	0.15 U	--	--	0.15 U	0.15 U	0.15 U	0.15 U	--	--	0.15 U	0.15 UJ
Vinyl Chloride	0.06 U	0.06 U	0.06 U	0.06 U	--	--	0.06 U	0.06 U	0.06 U	0.06 U	--	--	0.06 U	0.06 U

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-38
Summary of Data Used in Risk Assessment
Groundwater Upper Hydrogeologic Unit Plume Area - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-027	CFMW-027	CFMW-027	CFMW-027	CFMW-028	CFMW-028	CFMW-028	CFMW-028	CFMW-028	CFMW-028	CFMW-028A	CFMW-028A	CFMW-028A	CFMW-028A
Sample Lab IDs	460-130410-6	460-136063-9	460-158270-4	460-166734-2	460-120143-10	460-124783-2	460-130032-7	460-136063-7	460-158367-7	460-167096-4	460-120581-8	460-125196-5	460-130088-11	460-136178-4
Sample Name Chemical	CFMW-027-GW 3/27/2017	CFMW-027-GW 6/26/2017	CFMW-027-GW 6/13/2018	CFMW-027-GW 10/11/2018	CFMW-028-GW 9/13/2016	CFMW-028-GW 12/5/2016	CFMW-028-GW 3/20/2017	CFMW-028-GW 6/26/2017	CFMW-028-GW 6/14/2018	CFMW-028-GW 10/17/2018	CFMW-028a-GW 9/20/2016	CFMW-028a-GW 12/9/2016	CFMW-028a-GW 3/21/2017	CFMW-028a-GW 6/27/2017
GENERAL CHEMISTRY (µg/L)														
Fluoride	--	5160	--	--	--	--	--	3770	--	--	--	--	--	293 J+
Cyanide	--	520	918	580 J	--	--	--	304	384	331	--	--	--	2 U
Cyanide (Free)	--	46.3	14.5	11.1	--	--	--	10.5	6.2	8.6	--	--	--	1.5 U
Cyanide	755	560	895	575 J-	104	195	283	315	389	329	2 J	2.9 J	2 U	2 U
Cyanide (Free)	33.7	62	20.8	9.2	--	--	10.4	10.7	3.2 J	15.8 J-	--	--	1.5 U	1.5 U
METALS (µg/L)														
Aluminum	18.2 U	18.2 U	15 U	15 U	18.2 U	18.2 U	18.2 U	18.2 U	15 U	15 U	34.6 J	310	266	60.5
Antimony	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	1 J	0.62 U	0.62 U	0.62 U
Arsenic	0.64 U	0.64 U	0.77 U	0.77 U	0.64 U	0.64 U	0.64 U	0.64 U	0.77 U	0.77 U	1.7 J	8.2	8.9	9.4
Barium	200	148	187	136	141	152	154	177	197	179	48	35.5	36.3	40.2
Beryllium	0.24 U	0.24 U	0.26 U	0.26 U	0.24 U	0.24 U	0.24 U	0.24 U	0.26 U	0.26 U	0.24 U	0.24 U	0.24 U	0.24 U
Cadmium	0.71 U	0.71 U	0.61 U	0.61 U	0.71 U	0.71 U	0.71 U	0.71 U	0.61 U	0.61 U	0.71 U	0.71 U	0.71 U	0.71 U
Calcium	55800	37900	47100	35600	44100	48700	49600	51500	51800	51000	12200	43200	35000	33700
Chromium, Total	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 J	1.3 U	1.3 U	1.3 U	1.3 U
Cobalt	2.5 J	1.3 J	1.9 J	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
Copper	1.4 U	1.4 U	1.9 U	1.9 U	4.2	1.4 U	1.4 U	1.4 U	1.9 U	1.9 U	2.2 J	1.4 U	1.4 U	1.4 U
Iron	371	237	375	189	46.6 J	80.1 J	124	134	110 J	109 J	42.4 U	42.4 U	230	42.4 U
Lead	0.38 U	0.38 U	0.37 U	0.37 U	0.38 U	0.38 U	0.38 U	0.38 U	0.37 U	0.37 U	0.38 U	0.38 U	0.39 J	0.38 U
Magnesium	17400	11500	14000	11400	15900	15800	15500	15400	15300	15200	8100	282	3940	6150
Manganese	2.5 U	2.5 U	2.7 U	2.7 U	366	10.7	2.5 U	2.5 U	2.7 U	2.7 U	2.5 U	2.5 U	23.7	3 J
Mercury	0.17 U	0.17 U	0.12 U	0.12 U	0.17 U	0.17 U	0.17 U	0.17 U	0.12 U	0.12 U	0.17 U	0.17 U	0.17 U	0.17 U
Nickel	1.4 U	1.4 U	1.3 U	1.3 U	1.4 U	1.4 U	1.4 U	1.4 U	1.3 U	1.3 U	1.4 U	1.4 U	1.4 U	1.4 U
Potassium	1110 J+	965	1060	938	4230	2730	1630	1170	952	944	3260	2080	1520	1490
Selenium	0.73 U	0.73 U	0.69 U	0.69 U	0.73 U	0.73 U	0.73 U	0.73 U	0.77 J	0.69 U	0.73 U	0.73 U	0.73 U	0.73 U
Silver	1.3 U	1.3 U	1.4 U	1.4 U	1.3 U	1.3 U	1.3 U	1.3 U	1.4 U	1.4 U	1.3 U	1.3 U	1.3 U	1.3 U
Sodium	60800	72300	87900	76000	26000	24900	23200	26700	29000	30200	13600	9320	6190	6370
Thallium	0.26 U	0.26 U	0.24 U	0.24 U	0.26 U	0.26 U	0.26 U	0.26 U	0.24 U	0.24 U	0.26 U	0.26 U	0.26 U	0.26 U
Vanadium	1.9 U	1.9 U	1.2 U	1.2 U	1.9 U	1.9 U	1.9 U	1.9 U	1.2 U	1.2 U	7.2	22.1	7.7	2.7 J
Zinc	7 U	7 U	5.4 U	5.4 U	7 U	7 U	7 U	7 U	26	5.4 U	7 U	7 U	7 U	7 U
Aluminum	--	56.3	60.6 J+	151	--	--	--	38.6 J	15 U	29.4 J	--	--	--	1350
Antimony	--	0.62 U	0.62 U	0.62 U	--	--	--	0.62 U	0.62 U	0.62 U	--	--	--	0.62 U
Arsenic	--	0.64 U	0.77 U	0.77 U	--	--	--	0.64 U	0.77 U	0.77 U	--	--	--	10.2
Barium	--	146	191	144	--	--	--	181	199	195	--	--	--	53.5
Beryllium	--	0.24 U	0.26 U	0.26 U	--	--	--	0.24 U	0.26 U	0.26 U	--	--	--	0.24 U
Cadmium	--	0.71 U	0.61 U	0.61 U	--	--	--	0.71 U	0.61 U	0.61 U	--	--	--	0.71 U
Calcium	--	38300	48100	38900	--	--	--	51400	49300	54900	--	--	--	35900
Chromium, Total	--	1.3 U	1.3 U	1.3 U	--	--	--	1.3 U	1.3 U	1.8 J	--	--	--	1.9 J
Cobalt	--	1.4 J	2 J	1.3 J	--	--	--	1.3 U	1.3 U	1.3 U	--	--	--	1.3 U
Copper	--	1.5 J	1.9 U	2.8 J	--	--	--	1.4 U	1.9 U	1.9 U	--	--	--	5.3
Iron	--	329	503	389	--	--	--	188	173	159	--	--	--	1540
Lead	--	0.38 U	0.37 U	0.37 U	--	--	--	0.38 U	0.37 U	0.37 U	--	--	--	1.3
Magnesium	--	11600	14900	12000	--	--	--	16100	15100	17000	--	--	--	6560
Manganese	--	2.5 U	2.9 J	6.4 J	--	--	--	2.5 U	3.1 J	2.7 U	--	--	--	49.9
Mercury	--	0.17 U	0.12 U	0.12 U	--	--	--	0.17 U	0.12 U	0.12 U	--	--	--	0.17 U
Nickel	--	1.7 J	1.3 U	1.3 U	--	--	--	1.4 U	1.3 U	1.3 U	--	--	--	1.6 J
Potassium	--	998	1130	1040	--	--	--	1230	894	1050	--	--	--	1710
Selenium	--	0.73 U	0.69 U	0.69 U	--	--	--	0.73 U	0.78 J	0.69 U	--	--	--	0.73 U
Silver	--	1.3 U	1.4 U	1.4 U	--	--	--	1.3 U	1.4 U	1.4 U	--	--	--	1.3 U
Sodium	--	76700	93300	78400	--	--	--	29300	30800	31500	--	--	--	7040
Thallium	--	0.26 U	0.24 U	0.24 U	--	--	--	0.26 U	0.24 U	0.24 U	--	--	--	0.26 U
Vanadium	--	1.9 U	1.2 U	1.2 U	--	--	--	1.9 U	1.2 U	1.2 U	--	--	--	5
Zinc	--	7 U	5.4 U	5.4 U	--	--	--	7 U	25.9	5.4 U	--	--	--	7 U
POLYCHLORINATED BIPHENYLS (µg/L)														
PCB-1016 (Aroclor 1016)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1221 (Aroclor 1221)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1232 (Aroclor 1232)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1242 (Aroclor 1242)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1248 (Aroclor 1248)	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Table E-38
Summary of Data Used in Risk Assessment
Groundwater Upper Hydrogeologic Unit Plume Area - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-027	CFMW-027	CFMW-027	CFMW-027	CFMW-028	CFMW-028	CFMW-028	CFMW-028	CFMW-028	CFMW-028	CFMW-028A	CFMW-028A	CFMW-028A	CFMW-028A
Sample Lab IDs	460-130410-6	460-136063-9	460-158270-4	460-166734-2	460-120143-10	460-124783-2	460-130032-7	460-136063-7	460-158367-7	460-167096-4	460-120581-8	460-125196-5	460-130088-11	460-136178-4
Sample Name Chemical	CFMW-027-GW 3/27/2017	CFMW-027-GW 6/26/2017	CFMW-027-GW 6/13/2018	CFMW-027-GW 10/11/2018	CFMW-028-GW 9/13/2016	CFMW-028-GW 12/5/2016	CFMW-028-GW 3/20/2017	CFMW-028-GW 6/26/2017	CFMW-028-GW 6/14/2018	CFMW-028-GW 10/17/2018	CFMW-028a-GW 9/20/2016	CFMW-028a-GW 12/9/2016	CFMW-028a-GW 3/21/2017	CFMW-028a-GW 6/27/2017
PCB-1254 (Aroclor 1254)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1260 (Aroclor 1260)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1262 (Aroclor 1262)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1268 (Aroclor 1268)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Polychlorinated Biphenyl (PCBs)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SEMIVOLATILE ORGANIC COMPOUNDS (µg/L)														
1,2,4,5-Tetrachlorobenzene	0.45 U	0.43 U	--	--	0.43 U	0.43 U	0.43 U	0.43 U	--	--	--	--	--	--
1,4-Dioxane (P-Dioxane)	3.2 U	3.1 U	--	--	3.1 U	3.1 U	3.1 U	3.1 U	--	--	--	--	--	--
2,3,4,6-Tetrachlorophenol	0.72 U	0.69 U	--	--	0.69 U	0.69 U	0.69 U	0.69 U	--	--	--	--	--	--
2,4,5-Trichlorophenol	0.51 U	0.49 U	--	--	0.49 U	0.49 U	0.49 U	0.49 U	--	--	--	--	--	--
2,4,6-Trichlorophenol	0.55 U	0.53 U	--	--	0.53 U	0.53 U	0.53 U	0.53 U	--	--	--	--	--	--
2,4-Dichlorophenol	0.66 U	0.63 U	--	--	0.63 U	0.63 U	0.63 U	0.63 U	--	--	--	--	--	--
2,4-Dimethylphenol	0.95 U	0.91 U	--	--	0.91 U	0.91 U	0.91 U	0.91 U	--	--	--	--	--	--
2,4-Dinitrophenol	2.5 U	2.4 U	--	--	2.4 UJ	2.4 U	2.4 U	2.4 U	--	--	--	--	--	--
2,4-Dinitrotoluene	1.1 U	1 U	--	--	1 U	1 U	1 U	1 U	--	--	--	--	--	--
2,6-Dinitrotoluene	0.92 U	0.88 U	--	--	0.88 U	0.88 U	0.88 U	0.88 U	--	--	--	--	--	--
2-Chloronaphthalene	0.64 U	0.61 U	--	--	0.61 U	0.61 U	0.61 U	0.61 U	--	--	--	--	--	--
2-Chlorophenol	0.77 U	0.74 U	--	--	0.74 U	0.74 U	0.74 U	0.74 U	--	--	--	--	--	--
2-Methylnaphthalene	0.92 U	0.88 U	--	--	0.88 U	0.88 U	0.88 U	0.88 U	--	--	--	--	--	--
2-Methylphenol (O-Cresol)	1.3 U	1.3 U	--	--	1.3 U	1.3 U	1.3 U	1.3 U	--	--	--	--	--	--
2-Nitroaniline	0.68 U	0.65 U	--	--	0.65 U	0.65 U	0.65 U	0.65 U	--	--	--	--	--	--
2-Nitrophenol	0.61 U	0.59 U	--	--	0.59 U	0.59 U	0.59 U	0.59 U	--	--	--	--	--	--
3- And 4- Methylphenol (Total)	0.92 U	0.88 U	--	--	0.88 U	0.88 U	0.88 U	0.88 U	--	--	--	--	--	--
3,3'-Dichlorobenzidine	1.1 U	1 U	--	--	1 U	1 U	1 U	1 U	--	--	--	--	--	--
3-Nitroaniline	0.85 U	0.82 U	--	--	0.82 U	0.82 U	0.82 U	0.82 U	--	--	--	--	--	--
4,6-Dinitro-2-Methylphenol	2.1 U	2 U	--	--	2 U	2 U	2 U	2 U	--	--	--	--	--	--
4-Bromophenyl Phenyl Ether	1.1 U	1 U	--	--	1 U	1 U	1 U	1 U	--	--	--	--	--	--
4-Chloro-3-Methylphenol	0.79 U	0.76 U	--	--	0.76 U	0.76 U	0.76 U	0.76 U	--	--	--	--	--	--
4-Chloroaniline	0.76 U	0.73 U	--	--	0.73 U	0.73 U	0.73 U	0.73 U	--	--	--	--	--	--
4-Chlorophenyl Phenyl Ether	1 U	0.96 U	--	--	0.96 U	0.96 U	0.96 U	0.96 U	--	--	--	--	--	--
4-Nitroaniline	0.5 UJ	0.48 U	--	--	0.48 U	0.48 U	0.48 U	0.48 U	--	--	--	--	--	--
4-Nitrophenol	4.8 U	4.7 U	--	--	4.7 U	4.7 U	4.7 U	4.7 U	--	--	--	--	--	--
Acenaphthene	0.92 U	0.88 U	--	--	0.88 U	0.88 U	0.88 U	0.88 U	--	--	--	--	--	--
Acenaphthylene	0.68 U	0.65 U	--	--	0.65 U	0.65 U	0.65 U	0.65 U	--	--	--	--	--	--
Acetophenone	1.1 U	1 U	--	--	1 U	1 U	1 U	1 U	--	--	--	--	--	--
Anthracene	0.59 U	0.57 U	--	--	0.57 U	0.57 U	0.57 U	0.57 U	--	--	--	--	--	--
Atrazine	0.8 U	0.77 U	--	--	0.77 U	0.77 U	0.77 U	0.77 U	--	--	--	--	--	--
Benzaldehyde	0.9 U	0.86 UJ	--	--	0.86 U	0.86 U	0.86 U	0.86 UJ	--	--	--	--	--	--
Benzo(A)Anthracene	0.57 U	0.55 U	--	--	0.55 U	0.55 U	0.55 U	0.55 U	--	--	--	--	--	--
Benzo(A)Pyrene	0.17 U	0.16 U	--	--	0.16 U	0.16 U	0.16 U	0.16 U	--	--	--	--	--	--
Benzo(B)Fluoranthene	0.46 U	0.44 U	--	--	0.44 U	0.44 U	0.44 U	0.44 U	--	--	--	--	--	--
Benzo(G,H,I)Perylene	0.78 U	0.75 U	--	--	0.75 U	0.75 U	0.75 U	0.75 U	--	--	--	--	--	--
Benzo(K)Fluoranthene	0.19 U	0.18 U	--	--	0.18 U	0.18 U	0.18 U	0.18 U	--	--	--	--	--	--
Benzyl Butyl Phthalate	0.63 U	0.6 U	--	--	0.6 U	0.6 U	0.6 U	0.6 U	--	--	--	--	--	--
Biphenyl (Diphenyl)	0.66 U	0.63 U	--	--	0.63 U	0.63 U	0.63 U	0.63 U	--	--	--	--	--	--
Bis(2-Chloroethoxy) Methane	0.72 U	0.69 U	--	--	0.69 U	0.69 U	0.69 U	0.69 U	--	--	--	--	--	--
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.13 U	0.12 U	--	--	0.12 U	0.12 U	0.12 U	0.12 U	--	--	--	--	--	--
Bis(2-Chloroisopropyl) Ether	0.97 U	0.93 U	--	--	0.93 U	0.93 U	0.93 U	0.93 U	--	--	--	--	--	--
Bis(2-Ethylhexyl) Phthalate	0.75 U	0.72 U	--	--	0.72 U	0.72 U	0.72 U	0.72 U	--	--	--	--	--	--
Caprolactam	1.1 U	1.1 U	--	--	1.1 U	1.1 U	1.1 U	1.1 U	--	--	--	--	--	--
Carbazole	0.89 U	0.85 U	--	--	0.85 U	0.85 U	0.85 U	0.85 U	--	--	--	--	--	--
Chrysene	0.7 U	0.67 U	--	--	0.67 U	0.67 U	0.67 U	0.67 U	--	--	--	--	--	--
Dibenz(A,H)Anthracene	0.094 U	0.09 U	--	--	0.09 U	0.09 U	0.09 U	0.09 U	--	--	--	--	--	--
Dibenzofuran	0.89 U	0.85 U	--	--	0.85 U	0.85 U	0.85 U	0.85 U	--	--	--	--	--	--
Diethyl Phthalate	1 U	1 U	--	--	1 U	1 U	1 U	1 U	--	--	--	--	--	--
Dimethyl Phthalate	1 U	0.98 U	--	--	0.98 U	0.98 U	0.98 U	0.98 U	--	--	--	--	--	--
Di-N-Butyl Phthalate	0.85 U	0.82 U	--	--	0.82 U	0.82 U	0.82 U	0.82 U	--	--	--	--	--	--
Di-N-Octylphthalate	0.72 U	0.69 U	--	--	0.69 U	0.69 U	0.69 U	0.69 U	--	--	--	--	--	--
Fluoranthene	0.75 U	0.72 U	--	--	0.72 U	0.72 U	0.72 U	0.72 U	--	--	--	--	--	--

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Sample Location ID	CFMW-027	CFMW-027	CFMW-027	CFMW-027	CFMW-028	CFMW-028	CFMW-028	CFMW-028	CFMW-028	CFMW-028	CFMW-028A	CFMW-028A	CFMW-028A	CFMW-028A
Sample Lab IDs	460-130410-6	460-136063-9	460-158270-4	460-166734-2	460-120143-10	460-124783-2	460-130032-7	460-136063-7	460-158367-7	460-167096-4	460-120581-8	460-125196-5	460-130088-11	460-136178-4
Sample Name Chemical	CFMW-027-GW 3/27/2017	CFMW-027-GW 6/26/2017	CFMW-027-GW 6/13/2018	CFMW-027-GW 10/11/2018	CFMW-028-GW 9/13/2016	CFMW-028-GW 12/5/2016	CFMW-028-GW 3/20/2017	CFMW-028-GW 6/26/2017	CFMW-028-GW 6/14/2018	CFMW-028-GW 10/17/2018	CFMW-028a-GW 9/20/2016	CFMW-028a-GW 12/9/2016	CFMW-028a-GW 3/21/2017	CFMW-028a-GW 6/27/2017
Fluorene	0.83 U	0.8 U	--	--	0.8 U	0.8 U	0.8 U	0.8 U	--	--	--	--	--	--
Hexachlorobenzene	0.49 U	0.47 U	--	--	0.47 U	0.47 U	0.47 U	0.47 U	--	--	--	--	--	--
Hexachlorobutadiene	0.79 U	0.76 U	--	--	0.76 U	0.76 U	0.76 U	0.76 U	--	--	--	--	--	--
Hexachlorocyclopentadiene	0.64 U	0.61 UJ	--	--	0.61 U	0.61 U	0.61 U	0.61 UJ	--	--	--	--	--	--
Hexachloroethane	0.094 U	0.09 U	--	--	0.09 U	0.09 U	0.09 U	0.09 U	--	--	--	--	--	--
Indeno(1,2,3-C,D)Pyrene	0.22 U	0.21 U	--	--	0.21 U	0.21 U	0.21 U	0.21 U	--	--	--	--	--	--
Isophorone	0.7 U	0.67 U	--	--	0.67 U	0.67 U	0.67 U	0.67 U	--	--	--	--	--	--
Naphthalene	0.83 U	0.8 U	--	--	0.8 U	0.8 U	0.8 U	0.8 U	--	--	--	--	--	--
Nitrobenzene	0.51 U	0.49 U	--	--	0.49 U	0.49 U	0.49 U	0.49 U	--	--	--	--	--	--
N-Nitrosodi-N-Propylamine	0.86 U	0.83 U	--	--	0.83 U	0.83 U	0.83 U	0.83 U	--	--	--	--	--	--
N-Nitrosodiphenylamine	0.77 U	0.74 U	--	--	0.74 U	0.74 U	0.74 U	0.74 U	--	--	--	--	--	--
Pentachlorophenol	2.3 U	2.2 U	--	--	2.2 UR	2.2 U	2.2 U	2.2 U	--	--	--	--	--	--
Phenanthrene	0.68 U	0.65 U	--	--	0.65 U	0.65 U	0.65 U	0.65 U	--	--	--	--	--	--
Phenol	0.43 U	0.41 U	--	--	0.41 U	0.41 U	0.41 U	0.41 U	--	--	--	--	--	--
Pyrene	0.86 UJ	0.83 U	--	--	0.83 U	0.83 U	0.83 U	0.83 U	--	--	--	--	--	--
SEMIVOLATILE ORGANIC COMPOUNDS|LOW LEVEL (µg/L)														
1,2,4,5-Tetrachlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,4-Dioxane (P-Dioxane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,3,4,6-Tetrachlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4,5-Trichlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4,6-Trichlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4-Dichlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4-Dimethylphenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4-Dinitrophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4-Dinitrotoluene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,6-Dinitrotoluene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Chloronaphthalene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Chlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Methylnaphthalene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Methylphenol (O-Cresol)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Nitroaniline	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Nitrophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3,3'-Dichlorobenzidine	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3-Nitroaniline	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4,6-Dinitro-2-Methylphenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Bromophenyl Phenyl Ether	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Chloro-3-Methylphenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Chloroaniline	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Chlorophenyl Phenyl Ether	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Nitroaniline	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Nitrophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acenaphthene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acenaphthylene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acetophenone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Anthracene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Atrazine	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzaldehyde	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(A)Anthracene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(A)Pyrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(B)Fluoranthene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(G,H,I)Perylene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(K)Fluoranthene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzyl Butyl Phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Biphenyl (Diphenyl)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bis(2-Chloroethoxy) Methane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bis(2-Chloroisopropyl) Ether	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bis(2-Ethylhexyl) Phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Caprolactam	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Table E-38
Summary of Data Used in Risk Assessment
Groundwater Upper Hydrogeologic Unit Plume Area - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-027	CFMW-027	CFMW-027	CFMW-027	CFMW-028	CFMW-028	CFMW-028	CFMW-028	CFMW-028	CFMW-028	CFMW-028A	CFMW-028A	CFMW-028A	CFMW-028A
Sample Lab IDs	460-130410-6	460-136063-9	460-158270-4	460-166734-2	460-120143-10	460-124783-2	460-130032-7	460-136063-7	460-158367-7	460-167096-4	460-120581-8	460-125196-5	460-130088-11	460-136178-4
Sample Name Chemical	CFMW-027-GW 3/27/2017	CFMW-027-GW 6/26/2017	CFMW-027-GW 6/13/2018	CFMW-027-GW 10/11/2018	CFMW-028-GW 9/13/2016	CFMW-028-GW 12/5/2016	CFMW-028-GW 3/20/2017	CFMW-028-GW 6/26/2017	CFMW-028-GW 6/14/2018	CFMW-028-GW 10/17/2018	CFMW-028a-GW 9/20/2016	CFMW-028a-GW 12/9/2016	CFMW-028a-GW 3/21/2017	CFMW-028a-GW 6/27/2017
Carbazole	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chrysene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibenz(A,H)Anthracene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibenzofuran	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Diethyl Phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dimethyl Phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Di-N-Butyl Phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Di-N-Octylphthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Fluoranthene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Fluorene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorobutadiene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorocyclopentadiene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Indeno(1,2,3-C,D)Pyrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Isophorone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Naphthalene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Nitrobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
N-Nitrosodi-N-Propylamine	--	--	--	--	--	--	--	--	--	--	--	--	--	--
N-Nitrosodiphenylamine	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Pentachlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Phenanthrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Phenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Pyrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
VOLATILE ORGANIC COMPOUNDS (µg/L)														
1,1,1-Trichloroethane	0.28 U	0.28 UJ	--	--	0.28 U	0.28 U	0.28 U	0.28 UJ	--	--	--	--	--	--
1,1,2,2-Tetrachloroethane	0.19 U	0.19 U	--	--	0.19 U	0.19 U	0.19 U	0.19 U	--	--	--	--	--	--
1,1,2-Trichloro-1,2,2-Trifluoroethane	0.34 U	0.34 U	--	--	0.34 U	0.34 U	0.34 U	0.34 U	--	--	--	--	--	--
1,1,2-Trichloroethane	0.08 U	0.08 U	--	--	0.08 U	0.08 U	0.08 U	0.08 U	--	--	--	--	--	--
1,1-Dichloroethane	0.24 U	0.24 U	--	--	0.24 U	0.24 U	0.24 U	0.24 U	--	--	--	--	--	--
1,1-Dichloroethene	0.34 U	0.34 U	--	--	0.34 U	0.34 U	0.34 U	0.34 U	--	--	--	--	--	--
1,2,3-Trichlorobenzene	0.35 U	0.35 U	--	--	0.35 U	0.35 U	0.35 U	0.35 U	--	--	--	--	--	--
1,2,4-Trichlorobenzene	0.27 U	0.27 U	--	--	0.27 U	0.27 U	0.27 U	0.27 U	--	--	--	--	--	--
1,2-Dibromo-3-Chloropropane	0.23 U	0.23 U	--	--	0.23 U	0.23 U	0.23 UJ	0.23 U	--	--	--	--	--	--
1,2-Dibromoethane (Ethylene Dibromide)	0.19 U	0.19 U	--	--	0.19 U	0.19 U	0.19 U	0.19 U	--	--	--	--	--	--
1,2-Dichlorobenzene	0.22 U	0.22 U	--	--	0.22 U	0.22 U	0.22 U	0.22 U	--	--	--	--	--	--
1,2-Dichloroethane	0.25 U	0.25 U	--	--	0.25 U	0.25 U	0.25 U	0.25 U	--	--	--	--	--	--
1,2-Dichloropropane	0.18 U	0.18 U	--	--	0.18 U	0.18 U	0.18 U	0.18 U	--	--	--	--	--	--
1,3-Dichlorobenzene	0.33 U	0.33 U	--	--	0.33 U	0.33 U	0.33 U	0.33 U	--	--	--	--	--	--
1,4-Dichlorobenzene	0.33 U	0.33 U	--	--	0.33 U	0.33 U	0.33 U	0.33 U	--	--	--	--	--	--
2-Hexanone	0.72 U	0.72 U	--	--	0.72 U	0.72 U	0.72 U	0.72 U	--	--	--	--	--	--
Acetone	1.1 U	1.1 U	--	--	1.1 U	1.1 U	1.1 U	1.1 U	--	--	--	--	--	--
Benzene	0.09 U	0.09 U	--	--	0.09 U	0.09 U	0.09 U	0.09 U	--	--	--	--	--	--
Bromochloromethane	0.3 U	0.3 U	--	--	0.3 U	0.3 U	0.3 U	0.3 U	--	--	--	--	--	--
Bromodichloromethane	0.15 U	0.15 U	--	--	0.15 U	0.15 U	0.15 U	0.15 U	--	--	--	--	--	--
Bromoform	0.18 U	0.18 U	--	--	0.18 U	0.18 U	0.18 U	0.18 U	--	--	--	--	--	--
Bromomethane	0.18 U	0.18 UJ	--	--	0.18 UJ	0.18 U	0.18 UJ	0.18 UJ	--	--	--	--	--	--
Carbon Disulfide	0.22 U	0.22 U	--	--	0.22 U	0.22 U	0.22 U	0.22 U	--	--	--	--	--	--
Carbon Tetrachloride	0.33 U	0.33 U	--	--	0.33 U	0.33 U	0.33 U	0.33 U	--	--	--	--	--	--
Chlorobenzene	0.24 U	0.24 U	--	--	0.24 U	0.24 U	0.24 U	0.24 U	--	--	--	--	--	--
Chloroethane	0.37 U	0.37 U	--	--	0.37 U	0.37 U	0.37 UJ	0.37 U	--	--	--	--	--	--
Chloroform	0.22 U	0.22 U	--	--	0.22 U	0.22 U	0.22 U	0.22 U	--	--	--	--	--	--
Chloromethane	0.22 U	0.22 U	--	--	0.22 U	0.22 U	0.22 UJ	0.22 U	--	--	--	--	--	--
Cis-1,2-Dichloroethylene	0.26 U	0.26 U	--	--	0.26 U	0.26 U	0.26 U	0.26 U	--	--	--	--	--	--
Cis-1,3-Dichloropropene	0.16 U	0.16 U	--	--	0.16 U	0.16 U	0.16 U	0.16 U	--	--	--	--	--	--
Cyclohexane	0.26 U	0.26 U	--	--	0.26 U	0.26 U	0.26 UJ	0.26 U	--	--	--	--	--	--
Dibromochloromethane	0.22 U	0.22 U	--	--	0.22 U	0.22 U	0.22 U	0.22 U	--	--	--	--	--	--
Dichlorodifluoromethane	0.14 U	0.14 UJ	--	--	0.14 UJ	0.14 U	0.14 UJ	0.14 UJ	--	--	--	--	--	--
Ethylbenzene	0.3 U	0.3 U	--	--	0.3 U	0.3 U	0.3 U	0.3 U	--	--	--	--	--	--

Table E-38
Summary of Data Used in Risk Assessment
Groundwater Upper Hydrogeologic Unit Plume Area - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-027	CFMW-027	CFMW-027	CFMW-027	CFMW-028	CFMW-028	CFMW-028	CFMW-028	CFMW-028	CFMW-028	CFMW-028A	CFMW-028A	CFMW-028A	CFMW-028A
Sample Lab IDs	460-130410-6	460-136063-9	460-158270-4	460-166734-2	460-120143-10	460-124783-2	460-130032-7	460-136063-7	460-158367-7	460-167096-4	460-120581-8	460-125196-5	460-130088-11	460-136178-4
Sample Name Chemical	CFMW-027-GW 3/27/2017	CFMW-027-GW 6/26/2017	CFMW-027-GW 6/13/2018	CFMW-027-GW 10/11/2018	CFMW-028-GW 9/13/2016	CFMW-028-GW 12/5/2016	CFMW-028-GW 3/20/2017	CFMW-028-GW 6/26/2017	CFMW-028-GW 6/14/2018	CFMW-028-GW 10/17/2018	CFMW-028a-GW 9/20/2016	CFMW-028a-GW 12/9/2016	CFMW-028a-GW 3/21/2017	CFMW-028a-GW 6/27/2017
Isopropylbenzene (Cumene)	0.32 U	0.32 U	--	--	0.32 U	0.32 U	0.32 U	0.32 U	--	--	--	--	--	--
M,P-Xylene	0.28 U	0.28 U	--	--	0.28 U	0.28 U	0.28 U	0.28 U	--	--	--	--	--	--
Methyl Acetate	0.58 U	0.58 U	--	--	0.58 U	0.58 U	0.58 U	0.58 U	--	--	--	--	--	--
Methyl Ethyl Ketone (2-Butanone)	2.2 U	2.2 U	--	--	2.2 U	2.2 U	2.2 U	2.2 U	--	--	--	--	--	--
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	0.63 U	0.63 U	--	--	0.63 U	0.63 U	0.63 U	0.63 U	--	--	--	--	--	--
Methylcyclohexane	0.22 U	0.22 U	--	--	0.22 U	0.22 U	0.22 UJ	0.22 U	--	--	--	--	--	--
Methylene Chloride	0.21 U	0.21 U	--	--	0.21 U	0.21 U	0.21 U	0.21 U	--	--	--	--	--	--
O-Xylene (1,2-Dimethylbenzene)	0.32 U	0.32 U	--	--	0.32 U	0.32 U	0.32 U	0.32 U	--	--	--	--	--	--
Styrene	0.17 U	0.17 U	--	--	0.17 U	0.17 U	0.17 U	0.17 U	--	--	--	--	--	--
Tert-Butyl Methyl Ether	0.13 U	0.13 U	--	--	0.13 U	0.13 U	0.13 U	0.13 U	--	--	--	--	--	--
Tetrachloroethylene (PCE)	0.12 U	0.12 U	--	--	0.12 U	0.12 U	0.12 U	0.12 U	--	--	--	--	--	--
Toluene	0.25 U	0.25 U	--	--	0.25 U	0.25 U	0.25 U	0.25 U	--	--	--	--	--	--
Trans-1,2-Dichloroethene	0.18 U	0.18 U	--	--	0.18 U	0.18 U	0.18 U	0.18 U	--	--	--	--	--	--
Trans-1,3-Dichloropropene	0.19 U	0.19 U	--	--	0.19 U	0.19 U	0.19 U	0.19 U	--	--	--	--	--	--
Trichloroethylene (TCE)	0.22 U	0.22 U	--	--	0.22 U	0.22 U	0.22 U	0.22 U	--	--	--	--	--	--
Trichlorofluoromethane	0.15 U	0.15 U	--	--	0.15 U	0.15 U	0.15 U	0.15 U	--	--	--	--	--	--
Vinyl Chloride	0.06 U	0.06 U	--	--	0.06 U	0.06 U	0.06 U	0.06 U	--	--	--	--	--	--

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-38
Summary of Data Used in Risk Assessment
Groundwater Upper Hydrogeologic Unit Plume Area - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-028A	CFMW-028A-DUP	CFMW-028A	CFMW-029	CFMW-029-DUP	CFMW-029	CFMW-029	CFMW-029	CFMW-029	CFMW-029	CFMW-031	CFMW-031	CFMW-031	CFMW-031
Sample Lab IDs	460-157856-1	460-157856-2	460-166400-1	460-120143-8	460-120143-9	460-125477-2	460-130333-6	460-136063-8	460-157970-2	460-166151-7	460-120318-2	460-125196-4	460-130088-6	460-135818-7
Sample Name	CFMW-028a-GW	CFMW-DUP16-GW	CFMW-028a-GW	CFMW-029-GW	CFMW-DUP1-GW	CFMW-029-GW	CFMW-029-GW	CFMW-029-GW	CFMW-029-GW	CFMW-029-GW	CFMW-031-GW	CFMW-031-GW	CFMW-031-GW	CFMW-031-GW
Chemical	6/7/2018	6/7/2018	10/8/2018	9/13/2016	9/13/2016	12/14/2016	3/24/2017	6/26/2017	6/8/2018	10/4/2018	9/15/2016	12/9/2016	3/21/2017	6/21/2017
GENERAL CHEMISTRY (µg/L)														
Fluoride	--	--	--	--	--	--	--	2570	--	--	--	--	--	2900
Cyanide	2.7 J	2.4 J	2 U	--	--	--	--	116	354	220	--	--	--	101
Cyanide (Free)	12.7 J	2.1 J	1.5 U	--	--	--	--	5.4	7.7	2.1 J	--	--	--	2.4 J
Cyanide	7.3 J	3.5 J	2 U	366	357	186	258	128	365	227	233	690	520	104
Cyanide (Free)	2.1 J	1.5 UJ	1.5 U	--	--	--	8	19.7	9.9 J-	1.5 U	--	--	45.7	2.8 J
METALS (µg/L)														
Aluminum	32.8 J	33.1 J	19.2 J	18.2 U	18.2 U	18.2 U	18.2 U	18.2 U	15 U	15 U	18.2 U	18.2 U	18.2 U	18.2 U
Antimony	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U
Arsenic	12.3	11.7	12.6	0.64 U	0.64 U	0.64 U	0.64 U	0.64 U	0.77 U	0.77 U	0.64 U	0.64 U	0.64 U	0.64 U
Barium	41	40.8	29.6	233	225	220	251	141	136	170	164	217	213	151
Beryllium	0.26 U	0.26 U	0.26 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.26 U	0.26 U	0.24 U	0.24 U	0.24 U	0.24 U
Cadmium	0.61 U	0.61 U	0.61 U	0.71 U	0.71 U	0.71 U	0.71 U	0.71 U	0.61 U	0.61 U	0.71 U	0.71 U	0.71 U	0.71 U
Calcium	28200	27800	20200	52700	51100	52800	58400	34300	29800	42600	47700	60300	59000	40000
Chromium, Total	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 J	7.3	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
Cobalt	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.6 J	1.4 J	1.3 U
Copper	1.9 U	1.9 U	1.9 U	4.5 J	1.4 UJ	1.4 U	1.7 J	1.4 U	1.9 U	1.9 U	1.4 U	1.7 J	1.4 U	1.4 U
Iron	71.1 J	72.7 J	45.7 U	172	164	115 J	125	48.8 J	115 J	63.2 J	99.8 J	300	224	42.4 U
Lead	0.37 U	0.37 U	0.37 U	0.38 U	0.38 U	0.38 U	0.38 U	0.38 U	0.37 U	0.37 U	0.38 U	0.38 U	0.38 U	0.38 U
Magnesium	2730	2740	1820	18700	17800	17700	18900	11200	9870	13900	13200	17300	17200	11100
Manganese	25.9	25.5	3.1 J	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.7 U	2.7 U	2.5 U	2.5 U	2.5 U	2.5 U
Mercury	0.12 U	0.12 U	0.12 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.12 U	0.12 U	0.17 U	0.17 U	0.17 U	0.17 U
Nickel	1.3 U	1.3 U	1.3 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.3 U	1.3 U	1.4 U	1.4 U	1.4 U	1.4 U
Potassium	1330	1310	1300	898	864	923	1050	691	775	716	736	842	861	691
Selenium	0.69 U	0.69 U	0.69 U	0.73 U	0.73 U	0.73 U	0.73 U	0.73 U	0.69 U	0.69 U	0.73 U	0.73 U	0.73 U	0.73 U
Silver	1.4 U	1.4 U	1.4 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.4 U	1.4 U	1.3 U	1.3 U	1.3 U	1.3 U
Sodium	6010	5880	6780	35400	34200	21500	36400	35300	56900	37700	29800	32200	40600	30100
Thallium	0.24 U	0.24 U	0.24 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.24 U	0.24 U	0.26 U	0.26 U	0.26 U	0.26 U
Vanadium	1.2 U	1.2 U	1.2 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.2 U	1.2 U	1.9 U	1.9 U	1.9 U	1.9 U
Zinc	5.4 U	5.4 U	5.4 U	7 U	7 U	7 U	7 U	7 U	9.9 J	5.4 U	7 U	7 U	7 U	7 U
Aluminum	4230 J	2770 J	1080	--	--	--	--	25.5 J	15 U	25.2 J	--	--	--	18.2 U
Antimony	0.73 J	0.62 U	0.66 J	--	--	--	--	0.62 U	0.62 U	0.62 U	--	--	--	0.62 U
Arsenic	13.7	13.4	10.9	--	--	--	--	0.66 J	0.77 U	0.77 U	--	--	--	0.64 U
Barium	77.1	64.9	44.6	--	--	--	--	147	132	173	--	--	--	150
Beryllium	0.26 J	0.26 U	0.26 U	--	--	--	--	0.24 U	0.26 U	0.26 U	--	--	--	0.24 U
Cadmium	0.61 U	0.61 U	0.61 U	--	--	--	--	0.71 U	0.61 U	0.61 U	--	--	--	0.71 U
Calcium	27800	27600	21600	--	--	--	--	34500	28100	43100 J	--	--	--	40500
Chromium, Total	5.7	4.9	1.9 J	--	--	--	--	1.3 U	1.3 U	1.4 J	--	--	--	1.3 U
Cobalt	2.3 J	1.6 J	1.3 U	--	--	--	--	1.3 U	1.3 U	1.3 U	--	--	--	1.3 U
Copper	9.5	7.1	8.7	--	--	--	--	1.4 U	2.1 J	3.4 J	--	--	--	1.4 U
Iron	4920 J	3300 J	1290	--	--	--	--	104 J	247	86.7 J	--	--	--	46.4 J
Lead	4.3 J	3 J	1.5	--	--	--	--	0.38 U	0.37 U	0.37 U	--	--	--	0.38 U
Magnesium	4950	4580	2770	--	--	--	--	11500	10100	14400	--	--	--	12100
Manganese	140 J	94.1 J	41.3	--	--	--	--	2.5 U	2.7 U	2.7 U	--	--	--	2.5 U
Mercury	0.12 U	0.12 U	0.12 U	--	--	--	--	0.17 U	0.12 U	0.12 U	--	--	--	0.17 U
Nickel	4.5	4	1.3 J	--	--	--	--	1.4 U	1.3 U	1.3 U	--	--	--	1.4 U
Potassium	2000	1720	1510	--	--	--	--	692	708	748	--	--	--	712
Selenium	0.69 U	0.69 U	0.69 U	--	--	--	--	0.73 U	0.69 U	0.69 U	--	--	--	0.73 U
Silver	1.4 U	1.4 U	1.4 U	--	--	--	--	1.3 U	1.4 U	1.4 U	--	--	--	1.3 U
Sodium	6550	6340	7170	--	--	--	--	38900	57400	38600	--	--	--	35000
Thallium	0.24 U	0.24 U	0.24 U	--	--	--	--	0.26 U	0.24 U	0.24 U	--	--	--	0.26 U
Vanadium	6.1 J	4.2 J	2.2 J	--	--	--	--	1.9 U	1.2 U	1.2 U	--	--	--	1.9 U
Zinc	23.8	19.2	6 J	--	--	--	--	7 U	16.6	5.4 U	--	--	--	7 U
POLYCHLORINATED BIPHENYLS (µg/L)														
PCB-1016 (Aroclor 1016)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1221 (Aroclor 1221)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1232 (Aroclor 1232)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1242 (Aroclor 1242)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1248 (Aroclor 1248)	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Table E-38
Summary of Data Used in Risk Assessment
Groundwater Upper Hydrogeologic Unit Plume Area - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Chemical	CFMW-028A 460-157856-1 CFMW-028a-GW 6/7/2018	CFMW-028A-DUP 460-157856-2 CFMW-DUP16-GW 6/7/2018	CFMW-028A 460-166400-1 CFMW-028a-GW 10/8/2018	CFMW-029 460-120143-8 CFMW-029-GW 9/13/2016	CFMW-029-DUP 460-120143-9 CFMW-DUP1-GW 9/13/2016	CFMW-029 460-125477-2 CFMW-029-GW 12/14/2016	CFMW-029 460-130333-6 CFMW-029-GW 3/24/2017	CFMW-029 460-136063-8 CFMW-029-GW 6/26/2017	CFMW-029 460-157970-2 CFMW-029-GW 6/8/2018	CFMW-029 460-166151-7 CFMW-029-GW 10/4/2018	CFMW-031 460-120318-2 CFMW-031-GW 9/15/2016	CFMW-031 460-125196-4 CFMW-031-GW 12/9/2016	CFMW-031 460-130088-6 CFMW-031-GW 3/21/2017	CFMW-031 460-135818-7 CFMW-031-GW 6/21/2017
PCB-1254 (Aroclor 1254)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1260 (Aroclor 1260)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1262 (Aroclor 1262)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1268 (Aroclor 1268)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Polychlorinated Biphenyl (PCBs)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SEMIVOLATILE ORGANIC COMPOUNDS (µg/L)														
1,2,4,5-Tetrachlorobenzene	--	--	--	0.45 U	0.45 U	0.43 U	0.43 U	0.43 U	--	--	0.43 U	0.43 U	0.43 U	0.43 U
1,4-Dioxane (P-Dioxane)	--	--	--	3.2 U	3.2 U	3.1 UJ	3.1 U	3.1 U	--	--	3.1 U	3.1 U	3.1 U	3.1 U
2,3,4,6-Tetrachlorophenol	--	--	--	0.72 U	0.72 U	0.69 U	0.69 U	0.69 U	--	--	0.69 U	0.69 U	0.69 U	0.69 U
2,4,5-Trichlorophenol	--	--	--	0.51 U	0.51 U	0.49 U	0.49 U	0.49 U	--	--	0.49 U	0.49 U	0.49 U	0.49 U
2,4,6-Trichlorophenol	--	--	--	0.55 U	0.55 U	0.53 U	0.53 U	0.53 U	--	--	0.53 U	0.53 U	0.53 U	0.53 U
2,4-Dichlorophenol	--	--	--	0.66 U	0.66 U	0.63 U	0.63 U	0.63 U	--	--	0.63 U	0.63 U	0.63 U	0.63 U
2,4-Dimethylphenol	--	--	--	0.95 U	0.95 U	0.91 U	0.91 U	0.91 U	--	--	0.91 U	0.91 U	0.91 U	0.91 U
2,4-Dinitrophenol	--	--	--	2.5 UJ	2.5 UJ	2.4 U	2.4 U	2.4 U	--	--	2.4 U	2.4 U	2.4 U	2.4 U
2,4-Dinitrotoluene	--	--	--	1.1 U	1.1 U	1 U	1 U	1 U	--	--	1 U	1 U	1 U	1 U
2,6-Dinitrotoluene	--	--	--	0.92 U	0.92 U	0.88 U	0.88 U	0.88 U	--	--	0.88 U	0.88 U	0.88 U	0.88 U
2-Chloronaphthalene	--	--	--	0.64 U	0.64 U	0.61 U	0.61 U	0.61 U	--	--	0.61 U	0.61 U	0.61 U	0.61 U
2-Chlorophenol	--	--	--	0.77 U	0.77 U	0.74 U	0.74 U	0.74 U	--	--	0.74 U	0.74 U	0.74 U	0.74 U
2-Methylnaphthalene	--	--	--	0.92 U	0.92 U	0.88 U	0.88 U	0.88 U	--	--	0.88 U	0.88 U	0.88 U	0.88 U
2-Methylphenol (O-Cresol)	--	--	--	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	--	--	1.3 U	1.3 U	1.3 U	1.3 U
2-Nitroaniline	--	--	--	0.68 U	0.68 U	0.65 U	0.65 U	0.65 U	--	--	0.65 U	0.65 U	0.65 U	0.65 U
2-Nitrophenol	--	--	--	0.61 U	0.61 U	0.59 U	0.59 U	0.59 U	--	--	0.59 U	0.59 U	0.59 U	0.59 U
3- And 4- Methylphenol (Total)	--	--	--	0.92 U	0.92 U	0.88 U	0.88 U	0.88 U	--	--	0.88 UJ	0.88 U	0.88 U	0.88 U
3,3'-Dichlorobenzidine	--	--	--	1.1 U	1.1 U	1 U	1 U	1 U	--	--	1 U	1 U	1 U	1 U
3-Nitroaniline	--	--	--	0.85 U	0.85 U	0.82 U	0.82 U	0.82 U	--	--	0.82 U	0.82 U	0.82 U	0.82 U
4,6-Dinitro-2-Methylphenol	--	--	--	2.1 U	2.1 U	2 U	2 U	2 U	--	--	2 U	2 U	2 U	2 U
4-Bromophenyl Phenyl Ether	--	--	--	1.1 U	1.1 U	1 U	1 U	1 U	--	--	1 U	1 U	1 U	1 U
4-Chloro-3-Methylphenol	--	--	--	0.79 U	0.79 U	0.76 U	0.76 U	0.76 U	--	--	0.76 U	0.76 U	0.76 U	0.76 U
4-Chloroaniline	--	--	--	0.76 U	0.76 U	0.73 U	0.73 U	0.73 U	--	--	0.73 U	0.73 U	0.73 U	0.73 U
4-Chlorophenyl Phenyl Ether	--	--	--	1 U	1 U	0.96 U	0.96 U	0.96 U	--	--	0.96 U	0.96 U	0.96 U	0.96 U
4-Nitroaniline	--	--	--	0.5 U	0.5 U	0.48 U	0.48 U	0.48 U	--	--	0.48 U	0.48 U	0.48 U	0.48 U
4-Nitrophenol	--	--	--	4.8 U	4.8 U	4.7 U	4.7 U	4.7 U	--	--	4.7 UJ	4.7 U	4.7 U	4.7 U
Acenaphthene	--	--	--	0.92 U	0.92 U	0.88 UJ	0.88 U	0.88 U	--	--	0.88 U	0.88 U	0.88 U	0.88 U
Acenaphthylene	--	--	--	0.68 U	0.68 U	0.65 U	0.65 U	0.65 U	--	--	0.65 U	0.65 U	0.65 U	0.65 U
Acetophenone	--	--	--	1.1 U	1.1 U	1 U	1 U	1 U	--	--	1 U	1 U	1 U	1 U
Anthracene	--	--	--	0.59 U	0.59 U	0.57 U	0.57 U	0.57 U	--	--	0.57 U	0.57 U	0.57 U	0.57 U
Atrazine	--	--	--	0.8 U	0.8 U	0.77 U	0.77 U	0.77 U	--	--	0.77 U	0.77 U	0.77 U	0.77 U
Benzaldehyde	--	--	--	0.9 U	0.9 U	0.86 U	0.86 U	0.86 UJ	--	--	0.86 U	0.86 U	0.86 U	0.86 U
Benzo(A)Anthracene	--	--	--	0.57 U	0.57 U	0.55 U	0.55 U	0.55 U	--	--	0.55 U	0.55 U	0.55 U	0.55 U
Benzo(A)Pyrene	--	--	--	0.17 U	0.17 U	0.16 U	0.16 U	0.16 U	--	--	0.16 U	0.16 U	0.16 U	0.16 U
Benzo(B)Fluoranthene	--	--	--	0.46 U	0.46 U	0.44 U	0.44 U	0.44 U	--	--	0.44 U	0.44 U	0.44 U	0.44 U
Benzo(G,H,I)Perylene	--	--	--	0.78 U	0.78 U	0.75 U	0.75 U	0.75 U	--	--	0.75 U	0.75 U	0.75 U	0.75 U
Benzo(K)Fluoranthene	--	--	--	0.19 U	0.19 U	0.18 U	0.18 U	0.18 U	--	--	0.18 U	0.18 U	0.18 U	0.18 U
Benzyl Butyl Phthalate	--	--	--	0.63 U	0.63 U	0.6 U	0.6 U	0.6 U	--	--	0.6 U	0.6 U	0.6 U	0.6 U
Biphenyl (Diphenyl)	--	--	--	0.66 U	0.66 U	0.63 U	0.63 U	0.63 U	--	--	0.63 U	0.63 U	0.63 U	0.63 U
Bis(2-Chloroethoxy) Methane	--	--	--	0.72 U	0.72 U	0.69 U	0.69 U	0.69 U	--	--	0.69 U	0.69 U	0.69 U	0.69 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	--	--	--	0.13 U	0.13 U	0.12 UJ	0.12 U	0.12 U	--	--	0.12 U	0.12 UJ	0.12 U	0.12 U
Bis(2-Chloroisopropyl) Ether	--	--	--	0.97 U	0.97 U	0.93 U	0.93 U	0.93 U	--	--	0.93 U	0.93 U	0.93 U	0.93 U
Bis(2-Ethylhexyl) Phthalate	--	--	--	0.75 U	0.75 U	0.72 U	0.72 U	0.72 U	--	--	0.72 U	0.72 U	0.72 U	0.72 U
Caprolactam	--	--	--	1.1 U	1.1 U	1.1 U	1.1 UJ	1.1 U	--	--	1.1 U	1.1 U	1.1 U	1.1 U
Carbazole	--	--	--	0.89 U	0.89 U	0.85 U	0.85 U	0.85 U	--	--	0.85 U	0.85 U	0.85 U	0.85 U
Chrysene	--	--	--	0.7 U	0.7 U	0.67 U	0.67 U	0.67 U	--	--	0.67 U	0.67 U	0.67 U	0.67 U
Dibenz(A,H)Anthracene	--	--	--	0.094 U	0.094 U	0.09 U	0.09 U	0.09 U	--	--	0.09 U	0.09 U	0.09 U	0.09 U
Dibenzofuran	--	--	--	0.89 U	0.89 U	0.85 U	0.85 U	0.85 U	--	--	0.85 U	0.85 U	0.85 U	0.85 U
Diethyl Phthalate	--	--	--	1 U	1 U	1 U	1 U	1 U	--	--	1 U	1 U	1 U	1 U
Dimethyl Phthalate	--	--	--	1 U	1 U	0.98 U	0.98 U	0.98 U	--	--	0.98 U	0.98 U	0.98 U	0.98 U
Di-N-Butyl Phthalate	--	--	--	0.85 U	0.85 U	0.82 U	0.82 UJ	0.82 U	--	--	0.82 U	1.3 J	0.82 U	0.82 U
Di-N-Octylphthalate	--	--	--	0.72 U	0.72 U	0.69 U	0.69 U	0.69 U	--	--	0.69 U	0.69 U	0.69 U	0.69 U
Fluoranthene	--	--	--	0.75 U	0.75 U	0.72 U	0.72 U	0.72 U	--	--	0.72 U	0.72 U	0.72 U	0.72 U

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Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Chemical	CFMW-028A 460-157856-1 CFMW-028a-GW 6/7/2018	CFMW-028A-DUP 460-157856-2 CFMW-DUP16-GW 6/7/2018	CFMW-028A 460-166400-1 CFMW-028a-GW 10/8/2018	CFMW-029 460-120143-8 CFMW-029-GW 9/13/2016	CFMW-029-DUP 460-120143-9 CFMW-DUP1-GW 9/13/2016	CFMW-029 460-125477-2 CFMW-029-GW 12/14/2016	CFMW-029 460-130333-6 CFMW-029-GW 3/24/2017	CFMW-029 460-136063-8 CFMW-029-GW 6/26/2017	CFMW-029 460-157970-2 CFMW-029-GW 6/8/2018	CFMW-029 460-166151-7 CFMW-029-GW 10/4/2018	CFMW-031 460-120318-2 CFMW-031-GW 9/15/2016	CFMW-031 460-125196-4 CFMW-031-GW 12/9/2016	CFMW-031 460-130088-6 CFMW-031-GW 3/21/2017	CFMW-031 460-135818-7 CFMW-031-GW 6/21/2017
Fluorene	--	--	--	0.83 U	0.83 U	0.8 U	0.8 U	0.8 U	--	--	0.8 U	0.8 U	0.8 U	0.8 U
Hexachlorobenzene	--	--	--	0.49 U	0.49 U	0.47 U	0.47 U	0.47 U	--	--	0.47 U	0.47 U	0.47 U	0.47 U
Hexachlorobutadiene	--	--	--	0.79 U	0.79 U	0.76 U	0.76 U	0.76 U	--	--	0.76 U	0.76 U	0.76 U	0.76 U
Hexachlorocyclopentadiene	--	--	--	0.64 U	0.64 U	0.61 U	0.61 UJ	0.61 UJ	--	--	0.61 U	0.61 U	0.61 U	0.61 U
Hexachloroethane	--	--	--	0.094 U	0.094 U	0.09 U	0.09 U	0.09 U	--	--	0.09 U	0.09 U	0.09 U	0.09 U
Indeno(1,2,3-C,D)Pyrene	--	--	--	0.22 U	0.22 U	0.21 U	0.21 U	0.21 U	--	--	0.21 U	0.21 U	0.21 U	0.21 U
Isophorone	--	--	--	0.7 U	0.7 U	0.67 U	0.67 U	0.67 U	--	--	0.67 U	0.67 U	0.67 U	0.67 U
Naphthalene	--	--	--	0.83 U	0.83 U	0.8 U	0.8 U	0.8 U	--	--	0.8 U	0.8 U	0.8 U	0.8 U
Nitrobenzene	--	--	--	0.51 U	0.51 U	0.49 U	0.49 U	0.49 U	--	--	0.49 U	0.49 U	0.49 U	0.49 U
N-Nitrosodi-N-Propylamine	--	--	--	0.86 U	0.86 U	0.83 U	0.83 U	0.83 U	--	--	0.83 U	0.83 U	0.83 U	0.83 U
N-Nitrosodiphenylamine	--	--	--	0.77 U	0.77 U	0.74 UJ	0.74 U	0.74 U	--	--	0.74 U	0.74 U	0.74 U	0.74 U
Pentachlorophenol	--	--	--	--	2.3 UR	2.2 UJ	2.2 U	2.2 U	--	--	2.2 U	2.2 UJ	2.2 U	2.2 U
Phenanthrene	--	--	--	0.68 U	0.68 U	0.65 U	0.65 U	0.65 U	--	--	0.65 U	0.65 U	0.65 U	0.65 U
Phenol	--	--	--	0.43 U	0.43 U	0.41 U	0.41 U	0.41 U	--	--	0.41 U	0.41 U	0.41 U	0.41 U
Pyrene	--	--	--	0.86 U	0.86 U	0.83 U	0.83 U	0.83 U	--	--	0.83 U	0.83 U	0.83 U	0.83 U
SEMIVOLATILE ORGANIC COMPOUNDS|LOW LEVEL (µg/L)														
1,2,4,5-Tetrachlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,4-Dioxane (P-Dioxane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,3,4,6-Tetrachlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4,5-Trichlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4,6-Trichlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4-Dichlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4-Dimethylphenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4-Dinitrophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4-Dinitrotoluene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,6-Dinitrotoluene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Chloronaphthalene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Chlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Methylnaphthalene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Methylphenol (O-Cresol)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Nitroaniline	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Nitrophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3,3'-Dichlorobenzidine	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3-Nitroaniline	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4,6-Dinitro-2-Methylphenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Bromophenyl Phenyl Ether	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Chloro-3-Methylphenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Chloroaniline	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Chlorophenyl Phenyl Ether	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Nitroaniline	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Nitrophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acenaphthene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acenaphthylene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acetophenone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Anthracene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Atrazine	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzaldehyde	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(A)Anthracene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(A)Pyrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(B)Fluoranthene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(G,H,I)Perylene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(K)Fluoranthene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzyl Butyl Phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Biphenyl (Diphenyl)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bis(2-Chloroethoxy) Methane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bis(2-Chloroisopropyl) Ether	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bis(2-Ethylhexyl) Phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Caprolactam	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Table E-38
Summary of Data Used in Risk Assessment
Groundwater Upper Hydrogeologic Unit Plume Area - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-028A	CFMW-028A-DUP	CFMW-028A	CFMW-029	CFMW-029-DUP	CFMW-029	CFMW-029	CFMW-029	CFMW-029	CFMW-029	CFMW-031	CFMW-031	CFMW-031	CFMW-031
Sample Lab IDs	460-157856-1	460-157856-2	460-166400-1	460-120143-8	460-120143-9	460-125477-2	460-130333-6	460-136063-8	460-157970-2	460-166151-7	460-120318-2	460-125196-4	460-130088-6	460-135818-7
Sample Name	CFMW-028a-GW	CFMW-DUP16-GW	CFMW-028a-GW	CFMW-029-GW	CFMW-DUP1-GW	CFMW-029-GW	CFMW-029-GW	CFMW-029-GW	CFMW-029-GW	CFMW-029-GW	CFMW-031-GW	CFMW-031-GW	CFMW-031-GW	CFMW-031-GW
Chemical	6/7/2018	6/7/2018	10/8/2018	9/13/2016	9/13/2016	12/14/2016	3/24/2017	6/26/2017	6/8/2018	10/4/2018	9/15/2016	12/9/2016	3/21/2017	6/21/2017
Carbazole	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chrysene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibenz(A,H)Anthracene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibenzofuran	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Diethyl Phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dimethyl Phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Di-N-Butyl Phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Di-N-Octylphthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Fluoranthene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Fluorene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorobutadiene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorocyclopentadiene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Indeno(1,2,3-C,D)Pyrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Isophorone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Naphthalene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Nitrobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
N-Nitrosodi-N-Propylamine	--	--	--	--	--	--	--	--	--	--	--	--	--	--
N-Nitrosodiphenylamine	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Pentachlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Phenanthrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Phenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Pyrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
VOLATILE ORGANIC COMPOUNDS (µg/L)														
1,1,1-Trichloroethane	--	--	--	0.28 U	0.28 U	0.28 U	0.28 U	0.28 UJ	--	--	0.28 U	0.28 U	0.28 U	0.28 U
1,1,2,2-Tetrachloroethane	--	--	--	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	--	--	0.19 U	0.19 U	0.19 U	0.19 U
1,1,2-Trichloro-1,2,2-Trifluoroethane	--	--	--	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	--	--	0.34 U	0.34 U	0.34 U	0.34 U
1,1,2-Trichloroethane	--	--	--	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	--	--	0.08 U	0.08 U	0.08 U	0.08 U
1,1-Dichloroethane	--	--	--	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	--	--	0.24 U	0.24 U	0.24 U	0.24 U
1,1-Dichloroethene	--	--	--	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	--	--	0.34 U	0.34 U	0.34 U	0.34 U
1,2,3-Trichlorobenzene	--	--	--	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U	--	--	0.35 U	0.35 U	0.35 U	0.35 U
1,2,4-Trichlorobenzene	--	--	--	0.27 U	0.27 U	0.27 U	0.27 U	0.27 U	--	--	0.27 U	0.27 U	0.27 U	0.27 U
1,2-Dibromo-3-Chloropropane	--	--	--	0.23 U	0.23 U	0.23 UJ	0.23 U	0.23 U	--	--	0.23 U	0.23 U	0.23 U	0.23 U
1,2-Dibromoethane (Ethylene Dibromide)	--	--	--	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	--	--	0.19 U	0.19 U	0.19 U	0.19 U
1,2-Dichlorobenzene	--	--	--	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	--	--	0.22 U	0.22 U	0.22 U	0.22 U
1,2-Dichloroethane	--	--	--	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	--	--	0.25 U	0.25 U	0.25 U	0.25 U
1,2-Dichloropropane	--	--	--	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	--	--	0.18 U	0.18 U	0.18 U	0.18 U
1,3-Dichlorobenzene	--	--	--	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	--	--	0.33 U	0.33 U	0.33 U	0.33 U
1,4-Dichlorobenzene	--	--	--	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	--	--	0.33 U	0.33 U	0.33 U	0.33 U
2-Hexanone	--	--	--	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U	--	--	0.72 U	0.72 U	0.72 U	0.72 U
Acetone	--	--	--	1.1 U	1.1 U	1.1 UJ	1.1 U	1.1 U	--	--	1.1 U	1.1 U	1.1 U	1.1 U
Benzene	--	--	--	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	--	--	0.09 U	0.09 U	0.09 U	0.09 U
Bromochloromethane	--	--	--	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	--	--	0.3 U	0.3 U	0.3 U	0.3 U
Bromodichloromethane	--	--	--	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	--	--	0.15 U	0.15 U	0.15 U	0.15 U
Bromoform	--	--	--	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	--	--	0.18 U	0.18 U	0.18 U	0.18 U
Bromomethane	--	--	--	0.18 UJ	0.18 UJ	0.18 U	0.18 U	0.18 UJ	--	--	0.18 U	0.18 U	0.18 U	0.18 UJ
Carbon Disulfide	--	--	--	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	--	--	0.22 U	0.22 U	0.22 U	0.22 U
Carbon Tetrachloride	--	--	--	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	--	--	0.33 U	0.33 U	0.33 U	0.33 U
Chlorobenzene	--	--	--	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	--	--	0.24 U	0.24 U	0.24 U	0.24 U
Chloroethane	--	--	--	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U	--	--	0.37 U	0.37 U	0.37 U	0.37 U
Chloroform	--	--	--	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	--	--	0.22 U	0.22 U	0.22 U	0.22 U
Chloromethane	--	--	--	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	--	--	0.22 U	0.22 U	0.22 U	0.22 U
Cis-1,2-Dichloroethylene	--	--	--	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	--	--	0.26 U	0.26 U	0.26 U	0.26 U
Cis-1,3-Dichloropropene	--	--	--	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U	--	--	0.16 U	0.16 U	0.16 U	0.16 U
Cyclohexane	--	--	--	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	--	--	0.26 U	0.26 U	0.26 U	0.26 U
Dibromochloromethane	--	--	--	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	--	--	0.22 U	0.22 U	0.22 U	0.22 U
Dichlorodifluoromethane	--	--	--	0.14 UJ	0.14 UJ	0.14 U	0.14 U	0.14 UJ	--	--	0.14 U	0.14 U	0.14 UJ	0.14 UJ
Ethylbenzene	--	--	--	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	--	--	0.3 U	0.3 U	0.3 U	0.3 U

Table E-38
Summary of Data Used in Risk Assessment
Groundwater Upper Hydrogeologic Unit Plume Area - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-028A	CFMW-028A-DUP	CFMW-028A	CFMW-029	CFMW-029-DUP	CFMW-029	CFMW-029	CFMW-029	CFMW-029	CFMW-029	CFMW-031	CFMW-031	CFMW-031	CFMW-031
Sample Lab IDs	460-157856-1	460-157856-2	460-166400-1	460-120143-8	460-120143-9	460-125477-2	460-130333-6	460-136063-8	460-157970-2	460-166151-7	460-120318-2	460-125196-4	460-130088-6	460-135818-7
Sample Name	CFMW-028a-GW	CFMW-DUP16-GW	CFMW-028a-GW	CFMW-029-GW	CFMW-DUP1-GW	CFMW-029-GW	CFMW-029-GW	CFMW-029-GW	CFMW-029-GW	CFMW-029-GW	CFMW-031-GW	CFMW-031-GW	CFMW-031-GW	CFMW-031-GW
Chemical	6/7/2018	6/7/2018	10/8/2018	9/13/2016	9/13/2016	12/14/2016	3/24/2017	6/26/2017	6/8/2018	10/4/2018	9/15/2016	12/9/2016	3/21/2017	6/21/2017
Isopropylbenzene (Cumene)	--	--	--	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	--	--	0.32 U	0.32 U	0.32 U	0.32 U
M,P-Xylene	--	--	--	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	--	--	0.28 U	0.28 U	0.28 U	0.28 U
Methyl Acetate	--	--	--	0.58 U	0.58 U	0.58 UJ	0.58 U	0.58 U	--	--	0.58 U	0.58 U	0.58 U	0.58 UJ
Methyl Ethyl Ketone (2-Butanone)	--	--	--	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U	--	--	2.2 U	2.2 U	2.2 U	2.2 U
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	--	--	--	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U	--	--	0.63 U	0.63 U	0.63 U	0.63 U
Methylcyclohexane	--	--	--	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	--	--	0.22 U	0.22 U	0.22 UJ	0.22 U
Methylene Chloride	--	--	--	0.21 U	0.21 U	0.21 U	0.21 U	0.21 U	--	--	0.21 U	0.21 U	0.21 U	0.21 U
O-Xylene (1,2-Dimethylbenzene)	--	--	--	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	--	--	0.32 U	0.32 U	0.32 U	0.32 U
Styrene	--	--	--	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	--	--	0.17 U	0.17 U	0.17 U	0.17 U
Tert-Butyl Methyl Ether	--	--	--	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	--	--	0.13 U	0.13 U	0.13 U	0.13 U
Tetrachloroethylene (PCE)	--	--	--	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	--	--	0.12 U	0.12 U	0.12 U	0.12 U
Toluene	--	--	--	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	--	--	0.25 U	0.25 U	0.25 U	0.25 U
Trans-1,2-Dichloroethene	--	--	--	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	--	--	0.18 U	0.18 U	0.18 U	0.18 U
Trans-1,3-Dichloropropene	--	--	--	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	--	--	0.19 U	0.19 U	0.19 U	0.19 U
Trichloroethylene (TCE)	--	--	--	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	--	--	0.22 U	0.22 U	0.22 U	0.22 U
Trichlorofluoromethane	--	--	--	0.15 U	0.15 U	0.15 UJ	0.15 U	0.15 U	--	--	0.15 U	0.15 U	0.15 U	0.15 U
Vinyl Chloride	--	--	--	0.06 U	0.06 U	0.06 U	0.06 U	0.06 U	--	--	0.06 U	0.06 U	0.06 U	0.06 U

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-38
Summary of Data Used in Risk Assessment
Groundwater Upper Hydrogeologic Unit Plume Area - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Chemical	CFMW-031-DUP 460-135818-8 CFMW-DUP13-GW 6/21/2017	CFMW-031 460-158493-4 CFMW-031-GW 6/15/2018	CFMW-031 460-166219-5 CFMW-031-GW 10/5/2018	CFMW-032 460-120318-1 CFMW-032-GW 9/15/2016	CFMW-032 460-125356-1 CFMW-032-GW 12/13/2016	CFMW-032 460-130410-8 CFMW-032-GW 3/27/2017	CFMW-032 460-135701-7 CFMW-032-GW 6/20/2017	CFMW-032-DUP 460-135701-9 CFMW-DUP12-GW 6/20/2017	CFMW-032 460-158493-5 CFMW-032-GW 6/15/2018	CFMW-032 460-166151-5 CFMW-032-GW 10/4/2018	CFMW-033 460-120318-3 CFMW-033-GW 9/15/2016	CFMW-033 460-124871-1 CFMW-033-GW 12/6/2016	CFMW-033 460-130088-3 CFMW-033-GW 3/21/2017	CFMW-033 460-135619-2 CFMW-033-GW 6/19/2017
GENERAL CHEMISTRY (µg/L)														
Fluoride	2900	--	--	--	--	--	8400	8420	--	--	--	--	--	3220
Cyanide	100	273	204	--	--	--	494 J-	483 J-	645	530	--	--	--	190
Cyanide (Free)	3.1 J	9.9 J-	3 J	--	--	--	45.9 J	135 J	32.4 J-	11	--	--	--	5.7
Cyanide	103	268	201	412 J-	152	238	478	470	675	565	478	483	515	181
Cyanide (Free)	3.5 J	23.6 J+	2.9 J	--	--	4.2 J	46.1 J	129 J	95.3 J+	8.6	--	--	12.8	10.6
METALS (µg/L)														
Aluminum	18.2 U	15 U	15 U	18.2 U	18.2 U	18.2 U	18.2 U	18.2 U	19.6 J	37.3 J	18.2 U	18.2 U	18.2 U	18.2 U
Antimony	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U
Arsenic	0.64 U	0.77 U	0.77 U	0.64 U	0.64 U	0.64 U	0.64 U	0.64 U	0.77 U	0.77 U	0.64 U	0.64 U	0.64 U	0.64 U
Barium	150	151	160	147	297	285	146	145	192	243	176	172	174	134
Beryllium	0.24 U	0.26 U	0.26 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.26 U	0.26 U	0.24 U	0.24 U	0.24 U	0.24 U
Cadmium	0.71 U	0.61 U	0.61 U	0.71 U	0.71 U	0.71 U	0.71 U	0.71 U	0.61 U	0.61 U	0.71 U	0.71 U	0.71 U	0.71 U
Calcium	39600	40300	44900	38800	88000	85700	42800	42300	52400	67700	53600	53600	55600	41700
Chromium, Total	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
Cobalt	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.4 J	1.3 U
Copper	1.4 U	1.9 U	1.9 U	2.1 J	2.9 J	2.6 J	1.4 J	1.4 U	1.9 U	1.9 U	4.1	1.4 U	1.4 U	1.4 U
Iron	42.4 U	72.8 J	60.7 J	198	52.2 J	121	209	206	234	217	210	223	228	75.8 J
Lead	0.38 U	0.37 U	0.37 U	0.38 U	0.38 U	0.38 U	0.38 U	0.38 U	0.37 U	0.37 U	0.38 U	0.38 U	0.38 U	0.38 U
Magnesium	10900	10800	13000	11700	22100	23100	10500	10400	12900	17900	16600	15600 J	17000	11800
Manganese	2.5 U	2.7 U	2.7 U	536	211	3 J	74	72.2	8.4	3.8 J	2.5 U	2.5 U	2.5 U	2.5 U
Mercury	0.17 U	0.12 U	0.12 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.12 U	0.12 U	0.17 U	0.17 U	0.17 U	0.17 U
Nickel	1.4 U	1.3 U	1.3 U	1.4 J	1.4 U	1.4 U	1.4 U	1.4 U	1.3 U	1.3 U	1.4 U	1.4 U	1.4 U	1.4 U
Potassium	678	741	709	2630	3020	3120	2380	2270	2440	2150	944	1040	891	799
Selenium	0.73 U	0.69 U	0.69 U	0.73 U	0.73 U	0.73 U	0.73 U	0.73 U	0.69 U	0.69 U	0.73 U	0.73 U	0.73 U	0.73 U
Silver	1.3 U	1.4 U	1.4 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.4 U	1.4 U	1.3 U	1.3 U	1.3 U	1.3 U
Sodium	29700	37900	30600	155000	153000	132000	159000	160000	122000	155000	43500	39500	37900	38400
Thallium	0.26 U	0.24 U	0.24 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.24 U	0.24 U	0.26 U	0.26 U	0.26 U	0.26 U
Vanadium	1.9 U	1.2 U	1.2 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.2 U	1.2 U	1.9 U	1.9 U	1.9 U	1.9 U
Zinc	7 U	5.8 J	5.4 U	7 U	7 U	7 U	7 U	7 U	35.1	5.4 U	7 U	7 U	7 U	7 U
Aluminum	18.2 U	15 U	94.3	--	--	--	131	169	319	175	--	--	--	18.2 U
Antimony	0.62 U	0.62 U	0.62 U	--	--	--	0.62 U	0.62 U	0.62 U	0.62 U	--	--	--	0.62 U
Arsenic	0.64 U	0.77 U	0.77 U	--	--	--	0.64 U	0.64 U	0.77 U	0.77 U	--	--	--	0.64 U
Barium	147	160	158	--	--	--	156	158	214	247	--	--	--	143
Beryllium	0.24 U	0.26 U	0.26 U	--	--	--	0.24 U	0.24 U	0.26 U	0.26 U	--	--	--	0.24 U
Cadmium	0.71 U	0.61 U	0.61 U	--	--	--	0.71 U	0.71 U	0.61 U	0.61 U	--	--	--	0.71 U
Calcium	39600	39800	47100	--	--	--	42900	42800	54000	65400 J	--	--	--	40600
Chromium, Total	1.3 U	1.3 U	1.3 U	--	--	--	1.6 J	2.1 J	1.8 J	1.7 J	--	--	--	1.3 U
Cobalt	1.3 U	1.3 U	1.3 U	--	--	--	1.4 J	1.5 J	1.3 U	1.3 U	--	--	--	1.3 U
Copper	1.4 U	1.9 U	3.3 J	--	--	--	2.1 J	2.2 J	2 J	2.4 J	--	--	--	1.4 U
Iron	46.4 J	97.9 J	209	--	--	--	407	446	689	362	--	--	--	94.5 J
Lead	0.38 U	0.37 U	0.37 U	--	--	--	0.38 U	0.38 U	0.39 J	0.37 U	--	--	--	0.38 U
Magnesium	11900	11500	13200	--	--	--	11900	12000	14600	18100	--	--	--	12800
Manganese	2.5 U	2.7 U	4 J	--	--	--	83.2	84.3	22.9	8	--	--	--	2.5 U
Mercury	0.17 U	0.12 U	0.12 U	--	--	--	0.17 U	0.17 U	0.12 U	0.12 U	--	--	--	0.17 U
Nickel	1.4 U	1.3 U	1.3 U	--	--	--	1.4 U	1.4 U	1.3 U	1.3 U	--	--	--	1.4 U
Potassium	697	754	770	--	--	--	2300	2350	2560	2240	--	--	--	806
Selenium	0.73 U	0.69 U	0.69 U	--	--	--	0.73 U	0.73 U	0.69 U	0.69 U	--	--	--	0.73 U
Silver	1.3 U	1.4 U	1.4 U	--	--	--	1.3 U	1.3 U	1.4 U	1.4 U	--	--	--	1.3 U
Sodium	34400	43400	31700	--	--	--	198000	200000	144000	168000	--	--	--	44900
Thallium	0.26 U	0.24 U	0.24 U	--	--	--	0.26 U	0.26 U	0.24 U	0.24 U	--	--	--	0.26 U
Vanadium	1.9 U	1.2 U	1.2 U	--	--	--	1.9 U	1.9 U	1.2 U	1.2 U	--	--	--	1.9 U
Zinc	7 U	11.3 J	9.6 J	--	--	--	7 U	7 U	29.2	5.4 U	--	--	--	7 U
POLYCHLORINATED BIPHENYLS (µg/L)														
PCB-1016 (Aroclor 1016)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1221 (Aroclor 1221)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1232 (Aroclor 1232)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1242 (Aroclor 1242)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1248 (Aroclor 1248)	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Table E-38
Summary of Data Used in Risk Assessment
Groundwater Upper Hydrogeologic Unit Plume Area - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Chemical	CFMW-031-DUP 460-135818-8 CFMW-DUP13-GW 6/21/2017	CFMW-031 460-158493-4 CFMW-031-GW 6/15/2018	CFMW-031 460-166219-5 CFMW-031-GW 10/5/2018	CFMW-032 460-120318-1 CFMW-032-GW 9/15/2016	CFMW-032 460-125356-1 CFMW-032-GW 12/13/2016	CFMW-032 460-130410-8 CFMW-032-GW 3/27/2017	CFMW-032 460-135701-7 CFMW-032-GW 6/20/2017	CFMW-032-DUP 460-135701-9 CFMW-DUP12-GW 6/20/2017	CFMW-032 460-158493-5 CFMW-032-GW 6/15/2018	CFMW-032 460-166151-5 CFMW-032-GW 10/4/2018	CFMW-033 460-120318-3 CFMW-033-GW 9/15/2016	CFMW-033 460-124871-1 CFMW-033-GW 12/6/2016	CFMW-033 460-130088-3 CFMW-033-GW 3/21/2017	CFMW-033 460-135619-2 CFMW-033-GW 6/19/2017
PCB-1254 (Aroclor 1254)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1260 (Aroclor 1260)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1262 (Aroclor 1262)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1268 (Aroclor 1268)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Polychlorinated Biphenyl (PCBs)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SEMIVOLATILE ORGANIC COMPOUNDS (µg/L)														
1,2,4,5-Tetrachlorobenzene	0.43 U	--	--	0.43 U	0.43 U	0.45 U	0.43 U	0.43 U	--	--	0.43 U	0.43 U	0.43 U	0.43 U
1,4-Dioxane (P-Dioxane)	3.1 U	--	--	3.1 U	3.1 U	3.2 U	3.1 U	3.1 U	--	--	3.1 U	3.1 U	3.1 U	3.1 U
2,3,4,6-Tetrachlorophenol	0.69 U	--	--	0.69 U	0.69 U	0.72 U	0.69 U	0.69 U	--	--	0.69 U	0.69 U	0.69 U	0.69 U
2,4,5-Trichlorophenol	0.49 U	--	--	0.49 U	0.49 U	0.51 U	0.49 U	0.49 U	--	--	0.49 U	0.49 U	0.49 U	0.49 U
2,4,6-Trichlorophenol	0.53 U	--	--	0.53 U	0.53 U	0.55 U	0.53 U	0.53 U	--	--	0.53 U	0.53 U	0.53 U	0.53 U
2,4-Dichlorophenol	0.63 U	--	--	0.63 U	0.63 U	0.66 U	0.63 U	0.63 U	--	--	0.63 U	0.63 U	0.63 U	0.63 U
2,4-Dimethylphenol	0.91 U	--	--	0.91 U	0.91 UJ	0.95 U	0.91 U	0.91 U	--	--	0.91 U	0.91 U	0.91 U	0.91 U
2,4-Dinitrophenol	2.4 U	--	--	2.4 U	2.4 U	2.5 U	2.4 UJ	2.4 UJ	--	--	2.4 U	2.4 U	2.4 U	2.4 UJ
2,4-Dinitrotoluene	1 U	--	--	1 U	1 U	1.1 U	1 U	1 U	--	--	1 U	1 U	1 U	1 U
2,6-Dinitrotoluene	0.88 U	--	--	0.88 U	0.88 U	0.92 U	0.88 U	0.88 U	--	--	0.88 U	0.88 U	0.88 U	0.88 U
2-Chloronaphthalene	0.61 U	--	--	0.61 U	0.61 U	0.64 U	0.61 U	0.61 U	--	--	0.61 U	0.61 U	0.61 U	0.61 U
2-Chlorophenol	0.74 U	--	--	0.74 U	0.74 U	0.77 U	0.74 U	0.74 U	--	--	0.74 U	0.74 U	0.74 U	0.74 U
2-Methylnaphthalene	0.88 U	--	--	0.88 U	0.88 U	0.92 U	0.88 U	0.88 U	--	--	0.88 U	0.88 U	0.88 U	0.88 U
2-Methylphenol (O-Cresol)	1.3 U	--	--	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	--	--	1.3 U	1.3 UJ	1.3 U	1.3 U
2-Nitroaniline	0.65 U	--	--	0.65 U	0.65 U	0.68 U	0.65 U	0.65 U	--	--	0.65 UJ	0.65 U	0.65 U	0.65 U
2-Nitrophenol	0.59 U	--	--	0.59 U	0.59 U	0.61 U	0.59 U	0.59 U	--	--	0.59 U	0.59 U	0.59 U	0.59 U
3- And 4- Methylphenol (Total)	0.88 U	--	--	0.88 UJ	0.88 U	0.92 U	0.88 U	0.88 U	--	--	0.88 UJ	0.88 UJ	0.88 U	0.88 U
3,3'-Dichlorobenzidine	1 U	--	--	1 U	1 U	1.1 U	1 U	1 U	--	--	1 U	1 U	1 U	1 U
3-Nitroaniline	0.82 U	--	--	0.82 U	0.82 U	0.85 U	0.82 U	0.82 U	--	--	0.82 U	0.82 U	0.82 U	0.82 U
4,6-Dinitro-2-Methylphenol	2 U	--	--	2 U	2 U	2.1 U	2 U	2 U	--	--	2 U	2 U	2 U	2 UJ
4-Bromophenyl Phenyl Ether	1 U	--	--	1 U	1 U	1.1 U	1 U	1 U	--	--	1 U	1 U	1 U	1 U
4-Chloro-3-Methylphenol	0.76 U	--	--	0.76 U	0.76 U	0.79 U	0.76 U	0.76 U	--	--	0.76 U	0.76 U	0.76 U	0.76 U
4-Chloroaniline	0.73 U	--	--	0.73 U	0.73 U	0.76 U	0.73 U	0.73 U	--	--	0.73 U	0.73 U	0.73 U	0.73 U
4-Chlorophenyl Phenyl Ether	0.96 U	--	--	0.96 U	0.96 U	1 U	0.96 U	0.96 U	--	--	0.96 U	0.96 U	0.96 U	0.96 U
4-Nitroaniline	0.48 U	--	--	0.48 U	0.48 U	0.5 UJ	0.48 UJ	0.48 UJ	--	--	0.48 U	0.48 U	0.48 U	0.48 U
4-Nitrophenol	4.7 U	--	--	4.7 UJ	4.7 UJ	4.8 U	4.7 U	4.7 U	--	--	4.7 U	4.7 UJ	4.7 U	4.7 U
Acenaphthene	0.88 U	--	--	0.88 U	0.88 UJ	0.92 U	0.88 U	0.88 U	--	--	0.88 U	0.88 U	0.88 U	0.88 U
Acenaphthylene	0.65 U	--	--	0.65 U	0.65 U	0.68 U	0.65 U	0.65 U	--	--	0.65 U	0.65 U	0.65 U	0.65 U
Acetophenone	1 U	--	--	1 U	1 U	1.1 U	1 U	1 U	--	--	1 U	1 U	1 U	1 U
Anthracene	0.57 U	--	--	0.57 U	0.57 U	0.59 U	0.57 U	0.57 U	--	--	0.57 U	0.57 U	0.57 U	0.57 U
Atrazine	0.77 U	--	--	0.77 U	0.77 U	0.8 U	0.77 U	0.77 U	--	--	0.77 U	0.77 U	0.77 U	0.77 U
Benzaldehyde	0.86 U	--	--	0.86 U	0.86 U	0.9 U	0.86 U	0.86 U	--	--	0.86 U	0.86 U	0.86 U	0.86 U
Benzo(A)Anthracene	0.55 U	--	--	0.55 U	0.55 U	0.57 U	0.55 U	0.55 U	--	--	0.55 U	0.55 U	0.55 U	0.55 U
Benzo(A)Pyrene	0.16 U	--	--	0.16 U	0.16 U	0.17 U	0.16 U	0.16 U	--	--	0.16 U	0.16 U	0.16 U	0.16 U
Benzo(B)Fluoranthene	0.44 U	--	--	0.44 U	0.44 U	0.46 U	0.44 U	0.44 U	--	--	0.44 U	0.44 U	0.44 U	0.44 U
Benzo(G,H,I)Perylene	0.75 U	--	--	0.75 U	0.75 U	0.78 U	0.75 U	0.75 U	--	--	0.75 U	0.75 U	0.75 U	0.75 U
Benzo(K)Fluoranthene	0.18 U	--	--	0.18 U	0.18 U	0.19 U	0.18 U	0.18 U	--	--	0.18 U	0.18 U	0.18 U	0.18 U
Benzyl Butyl Phthalate	0.6 U	--	--	0.6 U	0.6 UJ	0.63 U	0.6 U	0.6 U	--	--	0.6 U	0.6 U	0.6 U	0.6 U
Biphenyl (Diphenyl)	0.63 U	--	--	0.63 U	0.63 U	0.66 U	0.63 U	0.63 U	--	--	0.63 U	0.63 U	0.63 U	0.63 U
Bis(2-Chloroethoxy) Methane	0.69 U	--	--	0.69 U	0.69 U	0.72 U	0.69 U	0.69 U	--	--	0.69 U	0.69 U	0.69 U	0.69 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.12 U	--	--	0.12 U	0.12 UJ	0.13 U	0.12 U	0.12 U	--	--	0.12 U	0.12 UJ	0.12 U	0.12 U
Bis(2-Chloroisopropyl) Ether	0.93 U	--	--	0.93 U	0.93 U	0.97 U	0.93 U	0.93 U	--	--	0.93 U	0.93 UJ	0.93 U	0.93 U
Bis(2-Ethylhexyl) Phthalate	0.72 U	--	--	0.72 U	0.72 U	0.75 U	0.72 U	0.72 U	--	--	0.72 U	0.72 U	0.72 U	0.72 U
Caprolactam	1.1 U	--	--	1.1 U	1.1 UJ	1.1 U	1.1 U	1.1 U	--	--	1.1 U	1.1 U	1.1 U	1.1 U
Carbazole	0.85 U	--	--	0.85 U	0.85 U	0.89 U	0.85 U	0.85 U	--	--	0.85 U	0.85 U	0.85 U	0.85 U
Chrysene	0.67 U	--	--	0.67 U	0.67 U	0.7 U	0.67 U	0.67 U	--	--	0.67 U	0.67 UJ	0.67 U	0.67 U
Dibenz(A,H)Anthracene	0.09 U	--	--	0.09 U	0.09 U	0.094 U	0.09 U	0.09 U	--	--	0.09 U	0.09 U	0.09 U	0.09 U
Dibenzofuran	0.85 U	--	--	0.85 U	0.85 U	0.89 U	0.85 U	0.85 U	--	--	0.85 U	0.85 U	0.85 U	0.85 U
Diethyl Phthalate	1 U	--	--	1 U	1 UJ	1 U	1 U	1 U	--	--	1 U	1 U	1 U	1 U
Dimethyl Phthalate	0.98 U	--	--	0.98 U	0.98 U	1 U	0.98 U	0.98 U	--	--	0.98 U	0.98 U	0.98 U	0.98 U
Di-N-Butyl Phthalate	0.82 U	--	--	0.82 U	0.82 U	0.85 U	0.82 U	0.82 U	--	--	0.82 U	0.82 U	0.82 U	0.82 U
Di-N-Octylphthalate	0.69 U	--	--	0.69 U	0.69 UJ	0.72 U	0.69 U	0.69 U	--	--	0.69 U	0.69 U	0.69 U	0.69 U
Fluoranthene	0.72 U	--	--	0.72 U	0.72 U	0.75 U	0.72 U	0.72 U	--	--	0.72 U	0.72 U	0.72 U	0.72 U

Table E-38
Summary of Data Used in Risk Assessment
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Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Chemical	CFMW-031-DUP 460-135818-8 CFMW-DUP13-GW 6/21/2017	CFMW-031 460-158493-4 CFMW-031-GW 6/15/2018	CFMW-031 460-166219-5 CFMW-031-GW 10/5/2018	CFMW-032 460-120318-1 CFMW-032-GW 9/15/2016	CFMW-032 460-125356-1 CFMW-032-GW 12/13/2016	CFMW-032 460-130410-8 CFMW-032-GW 3/27/2017	CFMW-032 460-135701-7 CFMW-032-GW 6/20/2017	CFMW-032-DUP 460-135701-9 CFMW-DUP12-GW 6/20/2017	CFMW-032 460-158493-5 CFMW-032-GW 6/15/2018	CFMW-032 460-166151-5 CFMW-032-GW 10/4/2018	CFMW-033 460-120318-3 CFMW-033-GW 9/15/2016	CFMW-033 460-124871-1 CFMW-033-GW 12/6/2016	CFMW-033 460-130088-3 CFMW-033-GW 3/21/2017	CFMW-033 460-135619-2 CFMW-033-GW 6/19/2017
Fluorene	0.8 U	--	--	0.8 U	0.8 U	0.83 U	0.8 U	0.8 U	--	--	0.8 U	0.8 U	0.8 U	0.8 U
Hexachlorobenzene	0.47 U	--	--	0.47 U	0.47 U	0.49 U	0.47 U	0.47 U	--	--	0.47 U	0.47 U	0.47 U	0.47 U
Hexachlorobutadiene	0.76 U	--	--	0.76 U	0.76 U	0.79 U	0.76 U	0.76 U	--	--	0.76 U	0.76 U	0.76 U	0.76 UJ
Hexachlorocyclopentadiene	0.61 U	--	--	0.61 U	0.61 U	0.64 U	0.61 U	0.61 U	--	--	0.61 U	0.61 U	0.61 U	0.61 UJ
Hexachloroethane	0.09 U	--	--	0.09 U	0.09 U	0.094 U	0.09 U	0.09 U	--	--	0.09 U	0.09 U	0.09 U	0.09 U
Indeno(1,2,3-C,D)Pyrene	0.21 U	--	--	0.21 U	0.21 U	0.22 U	0.21 U	0.21 U	--	--	0.21 U	0.21 U	0.21 U	0.21 U
Isophorone	0.67 U	--	--	0.67 U	0.67 U	0.7 U	0.67 U	0.67 U	--	--	0.67 U	0.67 U	0.67 U	0.67 U
Naphthalene	0.8 U	--	--	0.8 U	0.8 U	0.83 U	0.8 U	0.8 U	--	--	0.8 U	0.8 U	0.8 U	0.8 U
Nitrobenzene	0.49 U	--	--	0.49 U	0.49 U	0.51 U	0.49 U	0.49 U	--	--	0.49 U	0.49 U	0.49 U	0.49 UJ
N-Nitrosodi-N-Propylamine	0.83 U	--	--	0.83 U	0.83 U	0.86 U	0.83 U	0.83 U	--	--	0.83 UJ	0.83 U	0.83 U	0.83 U
N-Nitrosodiphenylamine	0.74 U	--	--	0.74 U	0.74 U	0.77 U	0.74 U	0.74 U	--	--	0.74 U	0.74 U	0.74 U	0.74 U
Pentachlorophenol	2.2 U	--	--	2.2 U	2.2 UJ	2.3 U	2.2 U	2.2 U	--	--	2.2 U	2.2 U	2.2 U	2.2 U
Phenanthrene	0.65 U	--	--	0.65 U	0.65 U	0.68 U	0.65 U	0.65 U	--	--	0.65 U	0.65 U	0.65 U	0.65 U
Phenol	0.41 U	--	--	0.41 U	0.41 U	0.43 U	0.41 U	0.41 U	--	--	0.41 U	0.41 U	0.41 U	0.41 U
Pyrene	0.83 U	--	--	0.83 U	0.83 U	0.86 UJ	0.83 U	0.83 U	--	--	0.83 U	0.83 U	0.83 U	0.83 U
SEMIVOLATILE ORGANIC COMPOUNDS|LOW LEVEL (µg/L)														
1,2,4,5-Tetrachlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,4-Dioxane (P-Dioxane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,3,4,6-Tetrachlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4,5-Trichlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4,6-Trichlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4-Dichlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4-Dimethylphenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4-Dinitrophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4-Dinitrotoluene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,6-Dinitrotoluene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Chloronaphthalene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Chlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Methylnaphthalene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Methylphenol (O-Cresol)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Nitroaniline	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Nitrophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3,3'-Dichlorobenzidine	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3-Nitroaniline	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4,6-Dinitro-2-Methylphenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Bromophenyl Phenyl Ether	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Chloro-3-Methylphenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Chloroaniline	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Chlorophenyl Phenyl Ether	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Nitroaniline	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Nitrophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acenaphthene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acenaphthylene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acetophenone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Anthracene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Atrazine	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzaldehyde	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(A)Anthracene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(A)Pyrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(B)Fluoranthene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(G,H,I)Perylene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(K)Fluoranthene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzyl Butyl Phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Biphenyl (Diphenyl)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bis(2-Chloroethoxy) Methane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bis(2-Chloroisopropyl) Ether	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bis(2-Ethylhexyl) Phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Caprolactam	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Table E-38
Summary of Data Used in Risk Assessment
Groundwater Upper Hydrogeologic Unit Plume Area - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Chemical	CFMW-031-DUP 460-135818-8 CFMW-DUP13-GW 6/21/2017	CFMW-031 460-158493-4 CFMW-031-GW 6/15/2018	CFMW-031 460-166219-5 CFMW-031-GW 10/5/2018	CFMW-032 460-120318-1 CFMW-032-GW 9/15/2016	CFMW-032 460-125356-1 CFMW-032-GW 12/13/2016	CFMW-032 460-130410-8 CFMW-032-GW 3/27/2017	CFMW-032 460-135701-7 CFMW-032-GW 6/20/2017	CFMW-032-DUP 460-135701-9 CFMW-DUP12-GW 6/20/2017	CFMW-032 460-158493-5 CFMW-032-GW 6/15/2018	CFMW-032 460-166151-5 CFMW-032-GW 10/4/2018	CFMW-033 460-120318-3 CFMW-033-GW 9/15/2016	CFMW-033 460-124871-1 CFMW-033-GW 12/6/2016	CFMW-033 460-130088-3 CFMW-033-GW 3/21/2017	CFMW-033 460-135619-2 CFMW-033-GW 6/19/2017
Carbazole	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chrysene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibenz(A,H)Anthracene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibenzofuran	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Diethyl Phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dimethyl Phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Di-N-Butyl Phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Di-N-Octylphthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Fluoranthene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Fluorene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorobutadiene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorocyclopentadiene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Indeno(1,2,3-C,D)Pyrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Isophorone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Naphthalene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Nitrobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
N-Nitrosodi-N-Propylamine	--	--	--	--	--	--	--	--	--	--	--	--	--	--
N-Nitrosodiphenylamine	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Pentachlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Phenanthrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Phenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Pyrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
VOLATILE ORGANIC COMPOUNDS (µg/L)														
1,1,1-Trichloroethane	0.28 U	--	--	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	--	--	0.28 U	0.28 U	0.28 U	0.28 U
1,1,2,2-Tetrachloroethane	0.19 U	--	--	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	--	--	0.19 U	0.19 U	0.19 U	0.19 U
1,1,2-Trichloro-1,2,2-Trifluoroethane	0.34 U	--	--	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	--	--	0.34 U	0.34 U	0.34 U	0.34 U
1,1,2-Trichloroethane	0.08 U	--	--	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	--	--	0.08 U	0.08 U	0.08 U	0.08 U
1,1-Dichloroethane	0.24 U	--	--	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	--	--	0.24 U	0.24 U	0.24 U	0.24 U
1,1-Dichloroethene	0.34 U	--	--	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	--	--	0.34 U	0.34 U	0.34 U	0.34 U
1,2,3-Trichlorobenzene	0.35 U	--	--	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U	--	--	0.35 U	0.35 U	0.35 U	0.35 U
1,2,4-Trichlorobenzene	0.27 U	--	--	0.27 U	0.27 U	0.27 U	0.27 U	0.27 U	--	--	0.27 U	0.27 U	0.27 U	0.27 U
1,2-Dibromo-3-Chloropropane	0.23 U	--	--	0.23 U	0.23 U	0.23 U	0.23 UJ	0.23 UJ	--	--	0.23 U	0.23 U	0.23 U	0.23 UJ
1,2-Dibromoethane (Ethylene Dibromide)	0.19 U	--	--	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	--	--	0.19 U	0.19 U	0.19 U	0.19 U
1,2-Dichlorobenzene	0.22 U	--	--	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	--	--	0.22 U	0.22 U	0.22 U	0.22 U
1,2-Dichloroethane	0.25 U	--	--	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	--	--	0.25 U	0.25 U	0.25 U	0.25 U
1,2-Dichloropropane	0.18 U	--	--	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	--	--	0.18 U	0.18 U	0.18 U	0.18 U
1,3-Dichlorobenzene	0.33 U	--	--	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	--	--	0.33 U	0.33 U	0.33 U	0.33 U
1,4-Dichlorobenzene	0.33 U	--	--	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	--	--	0.33 U	0.33 U	0.33 U	0.33 U
2-Hexanone	0.72 U	--	--	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U	--	--	0.72 U	0.72 U	0.72 U	0.72 U
Acetone	1.1 U	--	--	1.1 U	1.1 U	1.1 U	1.1 UJ	1.1 UJ	--	--	1.1 U	1.1 U	1.1 U	1.1 UJ
Benzene	0.09 U	--	--	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	--	--	0.09 U	0.09 U	0.09 U	0.09 U
Bromochloromethane	0.3 U	--	--	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	--	--	0.3 U	0.3 U	0.3 U	0.3 U
Bromodichloromethane	0.15 U	--	--	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	--	--	0.15 U	0.15 U	0.15 U	0.15 U
Bromoform	0.18 U	--	--	0.18 U	0.18 U	0.18 U	0.18 UJ	0.18 UJ	--	--	0.18 U	0.18 U	0.18 U	0.18 UJ
Bromomethane	0.18 UJ	--	--	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	--	--	0.18 U	0.18 U	0.18 UJ	0.18 U
Carbon Disulfide	0.22 U	--	--	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	--	--	0.22 U	0.22 U	0.22 U	0.22 UJ
Carbon Tetrachloride	0.33 U	--	--	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	--	--	0.33 U	0.33 U	0.33 U	0.33 U
Chlorobenzene	0.24 U	--	--	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	--	--	0.24 U	0.24 U	0.24 U	0.24 U
Chloroethane	0.37 U	--	--	0.37 U	0.37 U	0.37 U	0.37 UJ	0.37 UJ	--	--	0.37 U	0.37 U	0.37 U	0.37 UJ
Chloroform	0.22 U	--	--	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	--	--	0.22 U	0.22 U	0.22 U	0.22 U
Chloromethane	0.22 U	--	--	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	--	--	0.22 U	0.22 U	0.22 U	0.22 U
Cis-1,2-Dichloroethylene	0.26 U	--	--	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	--	--	0.26 U	0.26 U	0.26 U	0.26 U
Cis-1,3-Dichloropropene	0.16 U	--	--	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U	--	--	0.16 U	0.16 U	0.16 U	0.16 U
Cyclohexane	0.26 U	--	--	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	--	--	0.26 U	0.26 U	0.26 U	0.26 U
Dibromochloromethane	0.22 U	--	--	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	--	--	0.22 U	0.22 U	0.22 U	0.22 U
Dichlorodifluoromethane	0.14 UJ	--	--	0.14 U	0.14 U	0.14 U	0.14 UJ	0.14 UJ	--	--	0.14 U	0.14 U	0.14 U	0.14 UJ
Ethylbenzene	0.3 U	--	--	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	--	--	0.3 U	0.3 U	0.3 U	0.3 U

Table E-38
Summary of Data Used in Risk Assessment
Groundwater Upper Hydrogeologic Unit Plume Area - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Chemical	CFMW-031-DUP 460-135818-8 CFMW-DUP13-GW 6/21/2017	CFMW-031 460-158493-4 CFMW-031-GW 6/15/2018	CFMW-031 460-166219-5 CFMW-031-GW 10/5/2018	CFMW-032 460-120318-1 CFMW-032-GW 9/15/2016	CFMW-032 460-125356-1 CFMW-032-GW 12/13/2016	CFMW-032 460-130410-8 CFMW-032-GW 3/27/2017	CFMW-032 460-135701-7 CFMW-032-GW 6/20/2017	CFMW-032-DUP 460-135701-9 CFMW-DUP12-GW 6/20/2017	CFMW-032 460-158493-5 CFMW-032-GW 6/15/2018	CFMW-032 460-166151-5 CFMW-032-GW 10/4/2018	CFMW-033 460-120318-3 CFMW-033-GW 9/15/2016	CFMW-033 460-124871-1 CFMW-033-GW 12/6/2016	CFMW-033 460-130088-3 CFMW-033-GW 3/21/2017	CFMW-033 460-135619-2 CFMW-033-GW 6/19/2017
Isopropylbenzene (Cumene)	0.32 U	--	--	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	--	--	0.32 U	0.32 U	0.32 U	0.32 U
M,P-Xylene	0.28 U	--	--	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	--	--	0.28 U	0.28 U	0.28 U	0.28 U
Methyl Acetate	0.58 UJ	--	--	0.58 U	0.58 U	0.58 U	0.58 U	0.58 U	--	--	0.58 U	0.58 U	0.58 U	0.58 U
Methyl Ethyl Ketone (2-Butanone)	2.2 U	--	--	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U	--	--	2.2 U	2.2 U	2.2 U	2.2 U
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	0.63 U	--	--	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U	--	--	0.63 U	0.63 U	0.63 U	0.63 U
Methylcyclohexane	0.22 U	--	--	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	--	--	0.22 U	0.22 U	0.22 U	0.22 U
Methylene Chloride	0.21 U	--	--	0.21 U	0.21 U	0.21 U	0.21 U	0.21 U	--	--	0.21 U	0.21 U	0.55	0.21 U
O-Xylene (1,2-Dimethylbenzene)	0.32 U	--	--	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	--	--	0.32 U	0.32 U	0.32 U	0.32 U
Styrene	0.17 U	--	--	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	--	--	0.17 U	0.17 U	0.17 U	0.17 U
Tert-Butyl Methyl Ether	0.13 U	--	--	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	--	--	0.13 U	0.13 U	0.13 U	0.13 U
Tetrachloroethylene (PCE)	0.12 U	--	--	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	--	--	0.16 J	0.12 U	0.12 U	0.12 U
Toluene	0.25 U	--	--	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	--	--	0.25 U	0.25 U	0.25 U	0.25 U
Trans-1,2-Dichloroethene	0.18 U	--	--	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	--	--	0.18 U	0.18 U	0.18 U	0.18 U
Trans-1,3-Dichloropropene	0.19 U	--	--	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	--	--	0.19 U	0.19 U	0.19 U	0.19 U
Trichloroethylene (TCE)	0.22 U	--	--	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	--	--	0.22 U	0.22 U	0.22 U	0.22 U
Trichlorofluoromethane	0.15 U	--	--	0.15 U	0.15 U	0.15 U	0.15 UJ	0.15 UJ	--	--	0.15 U	0.15 U	0.15 U	0.15 U
Vinyl Chloride	0.06 U	--	--	0.06 U	0.06 U	0.06 U	0.06 U	0.06 U	--	--	0.06 U	0.06 U	0.06 U	0.06 U

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-38
Summary of Data Used in Risk Assessment
Groundwater Upper Hydrogeologic Unit Plume Area - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-033	CFMW-033	CFMW-034	CFMW-034	CFMW-034	CFMW-034	CFMW-034	CFMW-034	CFMW-038	CFMW-038	CFMW-038	CFMW-038	CFMW-038	CFMW-038
Sample Lab IDs	460-158493-1	460-167033-6	460-120223-1	460-125356-2	460-130088-5	460-135619-4	460-158493-3	460-166832-5	460-120223-10	460-125196-8	460-130333-7	460-136178-6	320-40194-2, 460-157970-4	320-44042-2, 460-166506-8
Sample Name	CFMW-033-GW	CFMW-033-GW	CFMW-034-GW	CFMW-034-GW	CFMW-034-GW	CFMW-034-GW	CFMW-034-GW	CFMW-034-GW	CFMW-038-GW	CFMW-038-GW	CFMW-038-GW	CFMW-038-GW	CFMW-038-GW	CFMW-038-GW
Chemical	6/15/2018	10/16/2018	9/14/2016	12/13/2016	3/21/2017	6/19/2017	6/15/2018	10/12/2018	9/14/2016	12/9/2016	3/24/2017	6/27/2017	6/8/2018	10/9/2018
GENERAL CHEMISTRY (µg/L)														
Fluoride	--	--	--	--	--	6500	--	--	--	--	--	2830 J+	--	--
Cyanide	433	402	--	--	--	287	625	489 J+	--	--	--	197	323	524
Cyanide (Free)	14.3 J-	12.5	--	--	--	6.7	30.8 J-	6.4	--	--	--	4.4 J	13	8.7
Cyanide	436	396	327	255	275	287	645	412	260	286	110	298	307	508
Cyanide (Free)	35.1 J+	18.3 J-	--	--	17.1	24.9	43.4 J+	9	--	--	3.3 J	4.8 J	25.1 J-	8
METALS (µg/L)														
Aluminum	15 U	15 U	18.2 U	18.2 U	18.2 U	18.2 U	15 U	42.4	18.2 U	18.2 U	18.2 U	18.2 U	15 U	15 U
Antimony	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U
Arsenic	0.77 U	0.77 U	0.64 U	0.64 U	0.64 U	0.64 U	0.77 U	0.77 U	0.64 U	0.64 U	0.64 U	0.64 U	0.77 U	0.77 U
Barium	160	143	199	300	321	157	185	256	253	250	239	231	252	239
Beryllium	0.26 U	0.26 U	0.24 U	0.24 U	0.24 U	0.24 U	0.26 U	0.26 U	0.24 U	0.24 U	0.24 U	0.24 U	0.26 U	0.26 U
Cadmium	0.61 U	0.61 U	0.71 U	0.71 U	0.71 U	0.71 U	0.61 U	0.61 U	0.71 U	0.71 U	0.71 U	0.71 U	0.61 U	0.61 U
Calcium	48300	44200	59100	82500	84000	44100	49700	71500	60600	60000	59000	57800	61700	58400
Chromium, Total	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
Cobalt	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
Copper	1.9 U	1.9 U	4.5	1.4 U	1.4 U	1.4 U	1.9 U	1.9 U	1.4 U	1.5 J	1.4 U	1.4 U	1.9 U	1.9 U
Iron	139	132	148	86.2 J	123	112 J	194	137	115 J	128	120	125	103 J	147
Lead	0.37 U	0.37 U	0.38 U	0.38 U	0.38 U	0.38 U	0.37 U	0.37 U	0.38 U	0.38 U	0.38 U	0.38 U	0.37 U	0.37 U
Magnesium	13800	13200	15500	19200	20700	11600	12800	19400	16300	16900	16500	15300	16500	16600
Manganese	2.7 U	2.7 U	9.4	20.5	48.9	2.5 U	2.7 U	2.7 U	2.5 U	2.5 U	2.5 U	2.5 U	2.7 U	2.7 U
Mercury	0.12 U	0.12 U	0.17 U	0.17 U	0.17 U	0.17 U	0.12 U	0.12 U	0.17 U	0.17 U	0.17 U	0.17 U	0.12 U	0.12 U
Nickel	1.3 U	1.3 U	1.4 U	1.4 U	1.4 U	1.4 U	1.3 U	1.4 J	1.4 U	1.4 U	1.4 U	1.4 U	1.3 U	1.7 J
Potassium	874	878	918	970	959	830	900	972	1030	961	947	910	1030	934
Selenium	0.69 U	0.69 U	0.73 U	0.73 U	0.73 U	0.73 U	0.69 U	0.69 U	0.73 U	0.73 U	0.73 U	0.73 U	0.69 U	0.69 U
Silver	1.4 U	1.4 U	1.3 U	1.3 U	1.3 U	1.3 U	1.4 U	1.4 U	1.3 U	1.3 U	1.3 U	1.3 U	1.4 U	1.4 U
Sodium	45100	52400	27400	31500	29200	43600	42800	37200	37300	36500	35700	32100	36000	40100
Thallium	0.24 U	0.24 U	0.26 U	0.26 U	0.26 U	0.26 U	0.24 U	0.24 U	0.26 U	0.26 U	0.26 U	0.26 U	0.24 U	0.24 U
Vanadium	1.2 U	1.2 U	1.9 U	1.9 U	1.9 U	1.9 U	1.2 U	1.2 U	1.9 U	1.9 U	1.9 U	1.9 U	1.2 U	1.2 U
Zinc	5.4 U	5.4 U	7 U	7 U	7 U	7 U	9.4 J	7 J	7 U	7 U	7 U	7 U	34.3	6.6 J
Aluminum	15 U	62	--	--	--	59.5	51.6	15 U	--	--	--	27.1 J	15 U	20.9 J
Antimony	0.62 U	1.1 J	--	--	--	0.62 U	0.62 U	0.62 U	--	--	--	0.62 U	0.62 U	0.62 U
Arsenic	0.77 U	0.77 U	--	--	--	0.64 U	0.77 U	0.77 U	--	--	--	0.64 U	0.77 U	0.77 U
Barium	167	148	--	--	--	176	198	47.2	--	--	--	266	249	246
Beryllium	0.26 U	0.26 U	--	--	--	0.24 U	0.26 U	0.26 U	--	--	--	0.24 U	0.26 U	0.26 U
Cadmium	0.61 U	0.61 U	--	--	--	0.71 U	0.61 U	0.61 U	--	--	--	0.71 U	0.61 U	0.61 U
Calcium	47600	45700	--	--	--	45100	51000	49100	--	--	--	63100	60200	62400
Chromium, Total	1.3 U	1.3 U	--	--	--	1.3 U	1.3 J	1.3 U	--	--	--	1.3 U	1.3 U	1.3 U
Cobalt	1.3 U	1.3 U	--	--	--	1.3 U	1.3 U	1.3 U	--	--	--	1.3 U	1.3 U	1.3 U
Copper	1.9 U	1.9 U	--	--	--	1.4 U	1.9 U	2.7 J	--	--	--	1.4 U	2.1 J	7.2
Iron	176	219	--	--	--	228	304	45.7 U	--	--	--	192	123	177
Lead	0.37 U	0.37 U	--	--	--	0.38 U	0.37 U	0.37 U	--	--	--	0.38 U	0.37 U	0.37 U
Magnesium	14500	13000	--	--	--	13100	14100	10300	--	--	--	18300	18000	17200
Manganese	2.7 U	2.7 U	--	--	--	2.6 J	2.7 U	2.7 U	--	--	--	6.8 J	2.7 U	2.7 U
Mercury	0.12 U	0.12 U	--	--	--	0.17 U	0.12 U	0.12 U	--	--	--	0.17 U	0.12 U	0.12 U
Nickel	1.3 U	1.3 U	--	--	--	1.4 U	1.3 U	1.3 U	--	--	--	1.4 U	1.3 U	1.3 U
Potassium	872	875	--	--	--	902	955	296	--	--	--	1040	991	989
Selenium	0.69 U	0.69 U	--	--	--	0.73 U	0.69 U	0.69 U	--	--	--	0.73 U	0.69 U	0.69 U
Silver	1.4 U	1.4 U	--	--	--	1.3 U	1.4 U	1.4 U	--	--	--	1.3 U	1.4 U	1.4 U
Sodium	50600	52100	--	--	--	53100	50900	1880	--	--	--	40800	37900	41200
Thallium	0.24 U	0.24 U	--	--	--	0.26 U	0.24 U	0.24 U	--	--	--	0.26 U	0.24 U	0.24 U
Vanadium	1.2 U	1.2 U	--	--	--	1.9 U	1.2 U	1.2 U	--	--	--	1.9 U	1.2 U	1.2 U
Zinc	5.4 U	5.4 U	--	--	--	7 U	11.8 J	5.4 U	--	--	--	7 U	40.4	5.4 U
POLYCHLORINATED BIPHENYLS (µg/L)														
PCB-1016 (Aroclor 1016)	--	--	--	--	--	--	--	--	--	--	--	--	0.12 U	0.12 UJ
PCB-1221 (Aroclor 1221)	--	--	--	--	--	--	--	--	--	--	--	--	0.12 U	0.12 UJ
PCB-1232 (Aroclor 1232)	--	--	--	--	--	--	--	--	--	--	--	--	0.12 U	0.12 UJ
PCB-1242 (Aroclor 1242)	--	--	--	--	--	--	--	--	--	--	--	--	0.12 U	0.12 UJ
PCB-1248 (Aroclor 1248)	--	--	--	--	--	--	--	--	--	--	--	--	0.12 U	0.12 UJ

Table E-38
Summary of Data Used in Risk Assessment
Groundwater Upper Hydrogeologic Unit Plume Area - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-033	CFMW-033	CFMW-034	CFMW-034	CFMW-034	CFMW-034	CFMW-034	CFMW-034	CFMW-038	CFMW-038	CFMW-038	CFMW-038	CFMW-038	CFMW-038
Sample Lab IDs	460-158493-1	460-167033-6	460-120223-1	460-125356-2	460-130088-5	460-135619-4	460-158493-3	460-166832-5	460-120223-10	460-125196-8	460-130333-7	460-136178-6	320-40194-2, 460-157970-4	320-44042-2, 460-166506-8
Sample Name Chemical	CFMW-033-GW 6/15/2018	CFMW-033-GW 10/16/2018	CFMW-034-GW 9/14/2016	CFMW-034-GW 12/13/2016	CFMW-034-GW 3/21/2017	CFMW-034-GW 6/19/2017	CFMW-034-GW 6/15/2018	CFMW-034-GW 10/12/2018	CFMW-038-GW 9/14/2016	CFMW-038-GW 12/9/2016	CFMW-038-GW 3/24/2017	CFMW-038-GW 6/27/2017	CFMW-038-GW 6/8/2018	CFMW-038-GW 10/9/2018
PCB-1254 (Aroclor 1254)	--	--	--	--	--	--	--	--	--	--	--	--	0.11 U	0.11 UJ
PCB-1260 (Aroclor 1260)	--	--	--	--	--	--	--	--	--	--	--	--	0.11 U	0.11 UJ
PCB-1262 (Aroclor 1262)	--	--	--	--	--	--	--	--	--	--	--	--	0.11 U	0.11 UJ
PCB-1268 (Aroclor 1268)	--	--	--	--	--	--	--	--	--	--	--	--	0.11 U	0.11 UJ
Polychlorinated Biphenyl (PCBs)	--	--	--	--	--	--	--	--	--	--	--	--	0.12 U	0.12 UJ
SEMIVOLATILE ORGANIC COMPOUNDS (µg/L)														
1,2,4,5-Tetrachlorobenzene	--	--	0.45 U	0.43 U	0.43 U	0.44 U	--	--	0.45 U	0.43 U	0.43 U	0.43 U	--	--
1,4-Dioxane (P-Dioxane)	--	--	3.3 U	3.1 U	3.1 U	3.2 U	--	--	3.2 U	3.1 U	3.1 U	3.1 U	--	--
2,3,4,6-Tetrachlorophenol	--	--	0.72 U	0.69 U	0.69 U	0.7 U	--	--	0.72 U	0.69 U	0.69 U	0.7 U	--	--
2,4,5-Trichlorophenol	--	--	0.51 U	0.49 U	0.49 U	0.5 U	--	--	0.51 U	0.49 U	0.49 U	0.49 U	--	--
2,4,6-Trichlorophenol	--	--	0.55 U	0.53 U	0.53 U	0.54 U	--	--	0.55 U	0.53 U	0.53 U	0.53 U	--	--
2,4-Dichlorophenol	--	--	0.66 U	0.63 U	0.63 U	0.64 U	--	--	0.66 U	0.63 U	0.63 U	0.64 U	--	--
2,4-Dimethylphenol	--	--	0.95 U	0.91 UJ	0.91 U	0.93 U	--	--	0.95 U	0.91 U	0.91 U	0.92 U	--	--
2,4-Dinitrophenol	--	--	2.5 UJ	2.4 U	2.4 U	2.4 UJ	--	--	2.5 UJ	2.4 U	2.4 U	2.4 U	--	--
2,4-Dinitrotoluene	--	--	1.1 U	1 U	1 U	1.1 U	--	--	1.1 U	1 U	1 U	1 U	--	--
2,6-Dinitrotoluene	--	--	0.92 U	0.88 U	0.88 U	0.9 U	--	--	0.92 U	0.88 U	0.88 U	0.89 U	--	--
2-Chloronaphthalene	--	--	0.64 U	0.61 U	0.61 U	0.62 U	--	--	0.64 U	0.61 U	0.61 U	0.61 U	--	--
2-Chlorophenol	--	--	0.77 U	0.74 U	0.74 U	0.76 U	--	--	0.77 U	0.74 U	0.74 U	0.75 U	--	--
2-Methylnaphthalene	--	--	0.92 U	0.88 U	0.88 U	0.9 U	--	--	0.92 U	0.88 U	0.88 U	0.89 U	--	--
2-Methylphenol (O-Cresol)	--	--	1.3 U	1.3 U	1.3 U	1.3 U	--	--	1.3 U	1.3 U	1.3 U	1.3 U	--	--
2-Nitroaniline	--	--	0.68 UJ	0.65 U	0.65 U	0.66 U	--	--	0.68 UJ	0.65 U	0.65 U	0.66 U	--	--
2-Nitrophenol	--	--	0.62 U	0.59 U	0.59 U	0.6 U	--	--	0.61 U	0.59 U	0.59 U	0.59 U	--	--
3- And 4- Methylphenol (Total)	--	--	0.92 UJ	0.88 U	0.88 U	0.9 U	--	--	0.92 UJ	0.88 U	0.88 U	0.89 U	--	--
3,3'-Dichlorobenzidine	--	--	1.1 U	1 U	1 U	1.1 U	--	--	1.1 U	1 U	1 U	1 U	--	--
3-Nitroaniline	--	--	0.86 U	0.82 U	0.82 U	0.84 U	--	--	0.85 U	0.82 U	0.82 U	0.83 U	--	--
4,6-Dinitro-2-Methylphenol	--	--	2.1 U	2 U	2 U	2.1 UJ	--	--	2.1 U	2 U	2 U	2 U	--	--
4-Bromophenyl Phenyl Ether	--	--	1.1 U	1 U	1 U	1 U	--	--	1.1 U	1 U	1 U	1 U	--	--
4-Chloro-3-Methylphenol	--	--	0.79 U	0.76 U	0.76 U	0.78 U	--	--	0.79 U	0.76 U	0.76 U	0.77 U	--	--
4-Chloroaniline	--	--	0.76 U	0.73 U	0.73 U	0.74 U	--	--	0.76 U	0.73 U	0.73 U	0.74 U	--	--
4-Chlorophenyl Phenyl Ether	--	--	1 U	0.96 U	0.96 U	0.98 U	--	--	1 U	0.96 U	0.96 U	0.97 U	--	--
4-Nitroaniline	--	--	0.5 U	0.48 U	0.48 U	0.49 U	--	--	0.5 U	0.48 U	0.48 U	0.48 U	--	--
4-Nitrophenol	--	--	4.9 U	4.7 UJ	4.7 U	4.7 U	--	--	4.8 U	4.7 U	4.7 U	4.7 U	--	--
Acenaphthene	--	--	0.92 U	0.88 UJ	0.88 U	0.9 U	--	--	0.92 U	0.88 UJ	0.88 U	0.89 U	--	--
Acenaphthylene	--	--	0.68 U	0.65 U	0.65 U	0.66 U	--	--	0.68 U	0.65 U	0.65 U	0.66 U	--	--
Acetophenone	--	--	1.1 U	1 U	1 U	1.1 U	--	--	1.1 U	1 U	1 U	1 U	--	--
Anthracene	--	--	0.6 U	0.57 U	0.57 U	0.58 U	--	--	0.59 U	0.57 U	0.57 U	0.57 U	--	--
Atrazine	--	--	0.81 U	0.77 U	0.77 U	0.79 U	--	--	0.8 U	0.77 U	0.77 U	0.78 U	--	--
Benzaldehyde	--	--	0.9 U	0.86 U	0.86 U	0.88 U	--	--	0.9 U	0.86 UJ	0.86 U	0.87 U	--	--
Benzo(A)Anthracene	--	--	0.58 U	0.55 U	0.55 U	0.56 U	--	--	0.57 U	0.55 U	0.55 U	0.55 U	--	--
Benzo(A)Pyrene	--	--	0.17 U	0.16 U	0.16 U	0.16 U	--	--	0.17 U	0.16 U	0.16 U	0.16 U	--	--
Benzo(B)Fluoranthene	--	--	0.46 U	0.44 U	0.44 U	0.45 U	--	--	0.46 U	0.44 U	0.44 U	0.44 U	--	--
Benzo(G,H,I)Perylene	--	--	0.78 U	0.75 U	0.75 U	0.77 U	--	--	0.78 U	0.75 U	0.75 U	0.76 U	--	--
Benzo(K)Fluoranthene	--	--	0.19 U	0.18 U	0.18 U	0.18 U	--	--	0.19 U	0.18 U	0.18 U	0.18 U	--	--
Benzyl Butyl Phthalate	--	--	0.63 U	0.6 UJ	0.6 U	0.61 U	--	--	0.63 U	0.6 U	0.6 U	0.6 U	--	--
Biphenyl (Diphenyl)	--	--	0.66 U	0.63 U	0.63 U	0.64 U	--	--	0.66 U	0.63 U	0.63 U	0.64 U	--	--
Bis(2-Chloroethoxy) Methane	--	--	0.72 U	0.69 U	0.69 U	0.7 U	--	--	0.72 U	0.69 U	0.69 U	0.7 U	--	--
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	--	--	0.13 U	0.12 UJ	0.12 U	0.12 U	--	--	0.13 U	0.12 UJ	0.12 U	0.12 U	--	--
Bis(2-Chloroisopropyl) Ether	--	--	0.97 U	0.93 U	0.93 U	0.95 U	--	--	0.97 U	0.93 U	0.93 U	0.94 U	--	--
Bis(2-Ethylhexyl) Phthalate	--	--	0.75 U	0.72 U	0.72 U	0.73 U	--	--	1.1 J	0.72 U	0.72 U	0.73 U	--	--
Caprolactam	--	--	1.1 U	1.1 UJ	1.1 U	1.1 U	--	--	1.1 U	1.1 U	1.1 UJ	1.1 U	--	--
Carbazole	--	--	0.89 U	0.85 U	0.85 U	0.87 U	--	--	0.89 U	0.85 U	0.85 U	0.86 U	--	--
Chrysene	--	--	0.7 U	0.67 U	0.67 U	0.68 U	--	--	0.7 U	0.67 U	0.67 U	0.68 U	--	--
Dibenz(A,H)Anthracene	--	--	0.094 U	0.09 U	0.09 U	0.092 U	--	--	0.094 U	0.09 U	0.09 U	0.091 U	--	--
Dibenzofuran	--	--	0.89 U	0.85 U	0.85 U	0.87 U	--	--	0.89 U	0.85 U	0.85 U	0.86 U	--	--
Diethyl Phthalate	--	--	1 U	1 UJ	1 U	1 U	--	--	1 U	1 U	1 U	1 U	--	--
Dimethyl Phthalate	--	--	1 U	0.98 U	0.98 U	1 U	--	--	1 U	0.98 U	0.98 U	0.99 U	--	--
Di-N-Butyl Phthalate	--	--	0.86 U	0.82 U	0.82 U	0.84 U	--	--	0.85 U	0.82 U	0.82 UJ	0.83 U	--	--
Di-N-Octylphthalate	--	--	0.72 U	0.69 UJ	0.69 U	0.7 U	--	--	0.72 U	0.69 U	0.69 U	0.7 U	--	--
Fluoranthene	--	--	0.75 U	0.72 U	0.72 U	0.73 U	--	--	0.75 U	0.72 U	0.72 U	0.73 U	--	--

Table E-38
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Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-033	CFMW-033	CFMW-034	CFMW-034	CFMW-034	CFMW-034	CFMW-034	CFMW-034	CFMW-038	CFMW-038	CFMW-038	CFMW-038	CFMW-038	CFMW-038
Sample Lab IDs	460-158493-1	460-167033-6	460-120223-1	460-125356-2	460-130088-5	460-135619-4	460-158493-3	460-166832-5	460-120223-10	460-125196-8	460-130333-7	460-136178-6	320-40194-2, 460-157970-4	320-44042-2, 460-166506-8
Sample Name Chemical	CFMW-033-GW 6/15/2018	CFMW-033-GW 10/16/2018	CFMW-034-GW 9/14/2016	CFMW-034-GW 12/13/2016	CFMW-034-GW 3/21/2017	CFMW-034-GW 6/19/2017	CFMW-034-GW 6/15/2018	CFMW-034-GW 10/12/2018	CFMW-038-GW 9/14/2016	CFMW-038-GW 12/9/2016	CFMW-038-GW 3/24/2017	CFMW-038-GW 6/27/2017	CFMW-038-GW 6/8/2018	CFMW-038-GW 10/9/2018
Fluorene	--	--	0.84 U	0.8 U	0.8 U	0.82 U	--	--	0.83 U	0.8 U	0.8 U	0.81 U	--	--
Hexachlorobenzene	--	--	0.49 U	0.47 U	0.47 U	0.48 U	--	--	0.49 U	0.47 U	0.47 U	0.47 U	--	--
Hexachlorobutadiene	--	--	0.79 U	0.76 U	0.76 U	0.78 UJ	--	--	0.79 U	0.76 U	0.76 U	0.77 U	--	--
Hexachlorocyclopentadiene	--	--	0.64 U	0.61 U	0.61 U	0.62 UJ	--	--	0.64 U	0.61 U	0.61 UJ	0.61 U	--	--
Hexachloroethane	--	--	0.094 U	0.09 U	0.09 U	0.092 U	--	--	0.094 U	0.09 U	0.09 U	0.091 U	--	--
Indeno(1,2,3-C,D)Pyrene	--	--	0.22 U	0.21 U	0.21 U	0.21 U	--	--	0.22 U	0.21 U	0.21 U	0.21 U	--	--
Isophorone	--	--	0.7 U	0.67 U	0.67 U	0.68 U	--	--	0.7 U	0.67 U	0.67 U	0.68 U	--	--
Naphthalene	--	--	0.84 U	0.8 U	0.8 U	0.82 U	--	--	0.83 U	0.8 U	0.8 U	0.81 U	--	--
Nitrobenzene	--	--	0.51 U	0.49 U	0.49 U	0.5 UJ	--	--	0.51 U	0.49 U	0.49 U	0.49 U	--	--
N-Nitrosodi-N-Propylamine	--	--	0.87 UJ	0.83 U	0.83 U	0.85 U	--	--	0.86 UJ	0.83 U	0.83 U	0.84 U	--	--
N-Nitrosodiphenylamine	--	--	0.77 U	0.74 U	0.74 U	0.76 U	--	--	0.77 U	0.74 U	0.74 U	0.75 U	--	--
Pentachlorophenol	--	--	2.3 UR	2.2 UJ	2.2 U	2.2 U	--	--	2.3 UR	2.2 U	2.2 U	2.2 U	--	--
Phenanthrene	--	--	0.68 U	0.65 U	0.65 U	0.66 U	--	--	0.68 U	0.65 U	0.65 U	0.66 U	--	--
Phenol	--	--	0.43 U	0.41 U	0.41 U	0.42 U	--	--	0.43 U	0.41 U	0.41 U	0.41 U	--	--
Pyrene	--	--	0.87 U	0.83 U	0.83 U	0.85 U	--	--	0.86 U	0.83 U	0.83 U	0.84 U	--	--
SEMIVOLATILE ORGANIC COMPOUNDS|LOW LEVEL (µg/L)														
1,2,4,5-Tetrachlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,4-Dioxane (P-Dioxane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,3,4,6-Tetrachlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4,5-Trichlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4,6-Trichlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4-Dichlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4-Dimethylphenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4-Dinitrophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4-Dinitrotoluene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,6-Dinitrotoluene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Chloronaphthalene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Chlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Methylnaphthalene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Methylphenol (O-Cresol)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Nitroaniline	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Nitrophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3,3'-Dichlorobenzidine	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3-Nitroaniline	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4,6-Dinitro-2-Methylphenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Bromophenyl Phenyl Ether	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Chloro-3-Methylphenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Chloroaniline	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Chlorophenyl Phenyl Ether	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Nitroaniline	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Nitrophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acenaphthene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acenaphthylene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acetophenone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Anthracene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Atrazine	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzaldehyde	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(A)Anthracene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(A)Pyrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(B)Fluoranthene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(G,H,I)Perylene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(K)Fluoranthene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzyl Butyl Phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Biphenyl (Diphenyl)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bis(2-Chloroethoxy) Methane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bis(2-Chloroisopropyl) Ether	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bis(2-Ethylhexyl) Phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Caprolactam	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Table E-38
Summary of Data Used in Risk Assessment
Groundwater Upper Hydrogeologic Unit Plume Area - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-033	CFMW-033	CFMW-034	CFMW-034	CFMW-034	CFMW-034	CFMW-034	CFMW-034	CFMW-038	CFMW-038	CFMW-038	CFMW-038	CFMW-038	CFMW-038
Sample Lab IDs	460-158493-1	460-167033-6	460-120223-1	460-125356-2	460-130088-5	460-135619-4	460-158493-3	460-166832-5	460-120223-10	460-125196-8	460-130333-7	460-136178-6	320-40194-2, 460-157970-4	320-44042-2, 460-166506-8
Sample Name Chemical	CFMW-033-GW 6/15/2018	CFMW-033-GW 10/16/2018	CFMW-034-GW 9/14/2016	CFMW-034-GW 12/13/2016	CFMW-034-GW 3/21/2017	CFMW-034-GW 6/19/2017	CFMW-034-GW 6/15/2018	CFMW-034-GW 10/12/2018	CFMW-038-GW 9/14/2016	CFMW-038-GW 12/9/2016	CFMW-038-GW 3/24/2017	CFMW-038-GW 6/27/2017	CFMW-038-GW 6/8/2018	CFMW-038-GW 10/9/2018
Carbazole	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chrysene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibenz(A,H)Anthracene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibenzofuran	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Diethyl Phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dimethyl Phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Di-N-Butyl Phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Di-N-Octylphthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Fluoranthene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Fluorene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorobutadiene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorocyclopentadiene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Indeno(1,2,3-C,D)Pyrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Isophorone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Naphthalene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Nitrobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
N-Nitrosodi-N-Propylamine	--	--	--	--	--	--	--	--	--	--	--	--	--	--
N-Nitrosodiphenylamine	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Pentachlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Phenanthrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Phenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Pyrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
VOLATILE ORGANIC COMPOUNDS (µg/L)														
1,1,1-Trichloroethane	--	--	0.28 U	0.28 U	0.28 U	0.28 U	--	--	0.28 U	0.28 U	0.28 U	0.28 U	--	--
1,1,2,2-Tetrachloroethane	--	--	0.19 U	0.19 U	0.19 U	0.19 U	--	--	0.19 U	0.19 U	0.19 U	0.19 U	--	--
1,1,2-Trichloro-1,2,2-Trifluoroethane	--	--	0.34 U	0.34 U	0.34 U	0.34 U	--	--	0.34 U	0.34 U	0.34 U	0.34 U	--	--
1,1,2-Trichloroethane	--	--	0.08 U	0.08 U	0.08 U	0.08 U	--	--	0.08 U	0.08 U	0.08 U	0.08 U	--	--
1,1-Dichloroethane	--	--	0.24 U	0.24 U	0.24 U	0.24 U	--	--	0.24 U	0.24 U	0.24 U	0.24 U	--	--
1,1-Dichloroethene	--	--	0.34 U	0.34 U	0.34 U	0.34 U	--	--	0.34 U	0.34 U	0.34 U	0.34 U	--	--
1,2,3-Trichlorobenzene	--	--	0.35 U	0.35 U	0.35 U	0.35 U	--	--	0.35 U	0.35 U	0.35 U	0.35 U	--	--
1,2,4-Trichlorobenzene	--	--	0.27 U	0.27 U	0.27 U	0.27 U	--	--	0.27 U	0.27 U	0.27 U	0.27 U	--	--
1,2-Dibromo-3-Chloropropane	--	--	0.23 U	0.23 U	0.23 U	0.23 UJ	--	--	0.23 U	0.23 U	0.23 U	0.23 U	--	--
1,2-Dibromoethane (Ethylene Dibromide)	--	--	0.19 U	0.19 U	0.19 U	0.19 U	--	--	0.19 U	0.19 U	0.19 U	0.19 U	--	--
1,2-Dichlorobenzene	--	--	0.22 U	0.22 U	0.22 U	0.22 U	--	--	0.22 U	0.22 U	0.22 U	0.22 U	--	--
1,2-Dichloroethane	--	--	0.25 U	0.25 U	0.25 U	0.25 U	--	--	0.25 U	0.25 U	0.25 U	0.25 U	--	--
1,2-Dichloropropane	--	--	0.18 U	0.18 U	0.18 U	0.18 U	--	--	0.18 U	0.18 U	0.18 U	0.18 U	--	--
1,3-Dichlorobenzene	--	--	0.33 U	0.33 U	0.33 U	0.33 U	--	--	0.33 U	0.33 U	0.33 U	0.33 U	--	--
1,4-Dichlorobenzene	--	--	0.33 U	0.33 U	0.33 U	0.33 U	--	--	0.33 U	0.33 U	0.33 U	0.33 U	--	--
2-Hexanone	--	--	0.72 U	0.72 U	0.72 U	0.72 U	--	--	0.72 U	0.72 U	0.72 U	0.72 U	--	--
Acetone	--	--	1.1 U	1.1 U	1.1 U	1.1 UJ	--	--	1.1 U	1.1 U	1.1 U	1.1 U	--	--
Benzene	--	--	0.09 U	0.09 U	0.09 U	0.09 U	--	--	0.09 U	0.09 U	0.09 U	0.09 U	--	--
Bromochloromethane	--	--	0.3 U	0.3 U	0.3 U	0.3 U	--	--	0.3 U	0.3 U	0.3 U	0.3 U	--	--
Bromodichloromethane	--	--	0.15 U	0.15 U	0.15 U	0.15 U	--	--	0.15 U	0.15 U	0.15 U	0.15 U	--	--
Bromoform	--	--	0.18 U	0.18 U	0.18 U	0.18 UJ	--	--	0.18 U	0.18 U	0.18 U	0.18 U	--	--
Bromomethane	--	--	0.18 U	0.18 U	0.18 UJ	0.18 U	--	--	0.18 U	0.18 U	0.18 U	0.18 U	--	--
Carbon Disulfide	--	--	0.22 U	0.22 U	0.22 U	0.22 UJ	--	--	0.22 U	0.22 U	0.22 U	0.22 U	--	--
Carbon Tetrachloride	--	--	0.33 U	0.33 U	0.33 U	0.33 U	--	--	0.33 U	0.33 U	0.33 U	0.33 U	--	--
Chlorobenzene	--	--	0.24 U	0.24 U	0.24 U	0.24 U	--	--	0.24 U	0.24 U	0.24 U	0.24 U	--	--
Chloroethane	--	--	0.37 U	0.37 U	0.37 U	0.37 UJ	--	--	0.37 U	0.37 U	0.37 U	0.37 U	--	--
Chloroform	--	--	0.22 U	0.22 U	0.22 U	0.22 U	--	--	0.22 U	0.22 U	0.22 U	0.22 U	--	--
Chloromethane	--	--	0.22 U	0.22 U	0.22 U	0.22 U	--	--	0.22 U	0.22 U	0.22 U	0.22 U	--	--
Cis-1,2-Dichloroethylene	--	--	0.26 U	0.26 U	0.26 U	0.26 U	--	--	0.26 U	0.26 U	0.26 U	0.26 U	--	--
Cis-1,3-Dichloropropene	--	--	0.16 U	0.16 U	0.16 U	0.16 U	--	--	0.16 U	0.16 U	0.16 U	0.16 U	--	--
Cyclohexane	--	--	0.26 U	0.26 U	0.26 U	0.26 U	--	--	0.26 U	0.26 U	0.26 U	0.26 U	--	--
Dibromochloromethane	--	--	0.22 U	0.22 U	0.22 U	0.22 U	--	--	0.22 U	0.22 U	0.22 U	0.22 U	--	--
Dichlorodifluoromethane	--	--	0.14 U	0.14 U	0.14 U	0.14 UJ	--	--	0.14 U	0.14 U	0.14 U	0.14 U	--	--
Ethylbenzene	--	--	0.3 U	0.3 U	0.3 U	0.3 U	--	--	0.3 U	0.3 U	0.3 U	0.3 U	--	--

Table E-38
Summary of Data Used in Risk Assessment
Groundwater Upper Hydrogeologic Unit Plume Area - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-033	CFMW-033	CFMW-034	CFMW-034	CFMW-034	CFMW-034	CFMW-034	CFMW-034	CFMW-038	CFMW-038	CFMW-038	CFMW-038	CFMW-038	CFMW-038
Sample Lab IDs	460-158493-1	460-167033-6	460-120223-1	460-125356-2	460-130088-5	460-135619-4	460-158493-3	460-166832-5	460-120223-10	460-125196-8	460-130333-7	460-136178-6	320-40194-2, 460-157970-4	320-44042-2, 460-166506-8
Sample Name Chemical	CFMW-033-GW 6/15/2018	CFMW-033-GW 10/16/2018	CFMW-034-GW 9/14/2016	CFMW-034-GW 12/13/2016	CFMW-034-GW 3/21/2017	CFMW-034-GW 6/19/2017	CFMW-034-GW 6/15/2018	CFMW-034-GW 10/12/2018	CFMW-038-GW 9/14/2016	CFMW-038-GW 12/9/2016	CFMW-038-GW 3/24/2017	CFMW-038-GW 6/27/2017	CFMW-038-GW 6/8/2018	CFMW-038-GW 10/9/2018
Isopropylbenzene (Cumene)	--	--	0.32 U	0.32 U	0.32 U	0.32 U	--	--	0.32 U	0.32 U	0.32 U	0.32 U	--	--
M,P-Xylene	--	--	0.28 U	0.28 U	0.28 U	0.28 U	--	--	0.28 U	0.28 U	0.28 U	0.28 U	--	--
Methyl Acetate	--	--	0.58 U	0.58 U	0.58 U	0.58 U	--	--	0.58 U	0.58 U	0.58 U	0.58 U	--	--
Methyl Ethyl Ketone (2-Butanone)	--	--	2.2 U	2.2 U	2.2 U	2.2 U	--	--	2.2 U	2.2 U	2.2 U	2.2 U	--	--
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	--	--	0.63 U	0.63 U	0.63 U	0.63 U	--	--	0.63 U	0.63 U	0.63 U	0.63 U	--	--
Methylcyclohexane	--	--	0.22 U	0.22 U	0.22 U	0.22 U	--	--	0.22 U	0.22 U	0.22 U	0.22 U	--	--
Methylene Chloride	--	--	0.21 U	0.21 U	0.59	0.21 U	--	--	0.21 U	0.21 U	0.21 U	0.21 U	--	--
O-Xylene (1,2-Dimethylbenzene)	--	--	0.32 U	0.32 U	0.32 U	0.32 U	--	--	0.32 U	0.32 U	0.32 U	0.32 U	--	--
Styrene	--	--	0.17 U	0.17 U	0.17 U	0.17 U	--	--	0.17 U	0.17 U	0.17 U	0.17 U	--	--
Tert-Butyl Methyl Ether	--	--	0.13 U	0.13 U	0.13 U	0.13 U	--	--	0.13 U	0.13 U	0.13 U	0.13 U	--	--
Tetrachloroethylene (PCE)	--	--	0.12 U	0.12 U	0.12 U	0.12 U	--	--	0.12 U	0.12 U	0.12 U	0.12 U	--	--
Toluene	--	--	0.25 U	0.25 U	0.25 U	0.25 U	--	--	0.25 U	0.25 U	0.25 U	0.25 U	--	--
Trans-1,2-Dichloroethene	--	--	0.18 U	0.18 U	0.18 U	0.18 U	--	--	0.18 U	0.18 U	0.18 U	0.18 U	--	--
Trans-1,3-Dichloropropene	--	--	0.19 U	0.19 U	0.19 U	0.19 U	--	--	0.19 U	0.19 U	0.19 U	0.19 U	--	--
Trichloroethylene (TCE)	--	--	0.22 U	0.22 U	0.22 U	0.22 U	--	--	0.22 U	0.22 U	0.22 U	0.22 U	--	--
Trichlorofluoromethane	--	--	0.15 U	0.15 U	0.15 U	0.15 U	--	--	0.15 U	0.15 U	0.15 U	0.15 U	--	--
Vinyl Chloride	--	--	0.06 U	0.06 U	0.06 U	0.06 U	--	--	0.06 U	0.06 U	0.06 U	0.06 U	--	--

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-38
Summary of Data Used in Risk Assessment
Groundwater Upper Hydrogeologic Unit Plume Area - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-040	CFMW-040	CFMW-040	CFMW-040	CFMW-040	CFMW-040	CFMW-042	CFMW-042	CFMW-042	CFMW-042	CFMW-043	CFMW-043	CFMW-043	CFMW-043
Sample Lab IDs	460-120223-11	460-125356-4	460-130691-3	460-135701-10	320-40194-1, 460-157970-3	320-43992-3, 460-166400-6	460-120223-3	460-135701-8	460-158183-5	460-166151-4	460-120143-6	460-125477-5	460-130032-8	460-135818-9
Sample Name	CFMW-040-GW 9/14/2016	CFMW-040-GW 12/13/2016	CFMW-040-GW 3/30/2017	CFMW-040-GW 6/20/2017	CFMW-040-GW 6/8/2018	CFMW-040-GW 10/8/2018	CFMW-042-GW 9/14/2016	CFMW-042-GW 6/20/2017	CFMW-042-GW 6/12/2018	CFMW-042-GW 10/4/2018	CFMW-043-GW 9/13/2016	CFMW-043-GW 12/14/2016	CFMW-043-GW 3/20/2017	CFMW-043-GW 6/21/2017
Chemical														
GENERAL CHEMISTRY (µg/L)														
Fluoride	--	--	--	2560	--	--	--	2590	--	--	--	--	--	2210
Cyanide	--	--	--	391 J-	318	418	--	391 J-	610 J	695	--	--	--	530
Cyanide (Free)	--	--	--	45	7.2	6.6	--	21.1	1.5 U	13.2	--	--	--	66.2
Cyanide	304	288	288	385	320	429	402	395	620	705	510	423	477	535
Cyanide (Free)	--	--	5.7	40.4	10.8 J-	8	--	27.6 J-	30.5	12.8	--	--	14.7	120
METALS (µg/L)														
Aluminum	18.2 U	18.2 U	18.2 U	18.2 U	15 U	15 U	18.2 U	18.2 U	15 U	15 U	18.2 U	20.2 J	18.2 U	18.2 U
Antimony	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U
Arsenic	0.64 U	0.64 U	0.64 U	0.64 U	0.77 U	0.77 U	0.64 U	0.64 U	0.77 U	0.77 U	0.64 U	0.64 U	0.64 U	0.64 U
Barium	148	150	131	175	167	166	157	171	186	159	136	142	150	169
Beryllium	0.24 U	0.24 U	0.24 U	0.24 U	0.26 U	0.26 U	0.24 U	0.24 U	0.26 U	0.26 U	0.24 U	0.24 U	0.24 U	0.24 U
Cadmium	0.71 U	0.71 U	0.71 U	0.71 U	0.61 U	0.61 U	0.71 U	0.71 U	0.61 U	0.61 U	0.71 U	0.71 U	0.71 U	0.71 U
Calcium	55700	53600	53700	58200	53700	52900	56000	52100	54300	51700	51600	51700	55400	60800
Chromium, Total	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
Cobalt	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 J	1.3 U	1.4 J	1.5 J	1.3 J	1.3 U	1.3 U	1.4 J
Copper	4	1.4 U	1.4 U	1.4 U	1.9 U	1.9 U	1.4 U	1.4 U	1.9 U	2.6 J	1.4 U	1.4 U	1.4 U	1.4 U
Iron	140	96.4 J	130	147	103 J	153	184	178	223	244	207	185	222	228
Lead	0.38 U	0.38 U	0.38 U	0.38 U	0.37 U	0.37 U	0.38 U	0.38 U	0.37 U	0.37 U	0.38 U	0.38 U	0.38 U	0.38 U
Magnesium	15600	15200	16300	15800	15100	15900	16200	14600	15800	15800	15900	15600	16700	17000
Manganese	54.5	7.1 J	2.5 U	2.5 U	2.7 U	2.7 U	2.5 U	2.5 U	2.7 U	2.7 U	38.8	11.4	3.1 J	2.5 U
Mercury	0.17 U	0.17 U	0.17 U	0.17 U	0.12 U	0.12 U	0.17 U	0.17 U	0.12 U	0.12 U	0.17 U	0.17 U	0.17 U	0.17 U
Nickel	1.4 U	1.4 U	1.4 U	1.4 U	1.3 U	1.3 U	1.4 U	1.4 U	1.3 U	1.5 J	1.4 U	1.4 U	1.4 U	1.4 U
Potassium	1180	1020	1040	1100	1110	1070	1010	1010	940	1210	999	960	988	986
Selenium	0.73 U	0.73 U	0.73 U	0.73 U	0.69 U	0.69 U	0.73 U	0.73 U	0.69 U	0.69 U	0.73 U	0.73 U	0.73 U	0.73 U
Silver	1.3 U	1.3 U	1.3 UJ	1.3 U	1.4 U	1.4 U	1.3 U	1.3 U	1.4 U	1.4 U	1.3 U	1.3 U	1.3 U	1.3 U
Sodium	34700	32500	31900	39900	40700	50200	43900	51100	54600	64800	44200	37900	41700	37100
Thallium	0.26 U	0.26 U	0.26 U	0.26 U	0.24 U	0.24 U	0.26 U	0.26 U	0.24 U	0.24 U	0.26 U	0.26 U	0.26 U	0.26 U
Vanadium	1.9 U	1.9 U	1.9 U	1.9 U	1.2 U	1.2 U	1.9 U	1.9 U	1.2 U	1.2 U	1.9 U	1.9 U	1.9 U	1.9 U
Zinc	7 U	7 U	7 U	7 U	22.6	5.4 U	7 U	7 U	21.8	24.2	7 U	7 U	7 U	7 U
Aluminum	--	--	--	18.5 J	15.4 J	15 U	--	38.8 J	101 J+	449	--	--	--	22.9 J
Antimony	--	--	--	0.62 U	0.62 U	1.2 J	--	0.62 U	0.62 U	0.62 U	--	--	--	0.62 U
Arsenic	--	--	--	0.64 U	0.77 U	7.7 U	--	0.64 U	0.77 U	0.77 U	--	--	--	0.64 U
Barium	--	--	--	184	161	161	--	178	192	166	--	--	--	171
Beryllium	--	--	--	0.24 U	0.26 U	0.26 U	--	0.24 U	0.26 U	0.26 U	--	--	--	0.24 U
Cadmium	--	--	--	0.71 U	0.61 U	0.61 U	--	0.71 U	0.61 U	0.61 U	--	--	--	0.71 U
Calcium	--	--	--	58300	51100	54000	--	50400	52200	51500 J	--	--	--	63000
Chromium, Total	--	--	--	1.3 U	1.3 U	1.3 U	--	1.3 U	1.3 U	1.8 J	--	--	--	1.3 U
Cobalt	--	--	--	1.3 U	1.3 U	1.3 U	--	1.3 J	1.7 J	1.7 J	--	--	--	1.6 J
Copper	--	--	--	1.4 U	1.9 U	30.4	--	1.4 U	1.9 U	977	--	--	--	1.8 J
Iron	--	--	--	225	132	176	--	297	464	919	--	--	--	308
Lead	--	--	--	0.38 U	0.37 U	0.37 U	--	0.38 U	0.37 U	0.41 J	--	--	--	0.38 U
Magnesium	--	--	--	18800	16000	15600	--	16500	15800	16500	--	--	--	20300
Manganese	--	--	--	2.5 U	2.7 U	2.7 U	--	2.5 U	2.7 U	13.8	--	--	--	2.5 U
Mercury	--	--	--	0.17 U	0.12 U	0.12 U	--	0.17 U	0.12 U	0.12 U	--	--	--	0.17 U
Nickel	--	--	--	1.4 U	1.3 U	1.3 U	--	1.4 U	1.3 U	1.3 U	--	--	--	1.4 U
Potassium	--	--	--	1150	1030	1070	--	1030	1050	1120	--	--	--	1030
Selenium	--	--	--	0.73 U	0.69 U	6.9 U	--	0.73 U	0.69 U	0.69 U	--	--	--	0.73 U
Silver	--	--	--	1.3 U	1.4 U	1.4 U	--	1.3 U	1.4 U	1.4 U	--	--	--	1.3 U
Sodium	--	--	--	47200	42100	50000	--	59600	57000	66000	--	--	--	44900
Thallium	--	--	--	0.26 U	0.24 U	0.24 U	--	0.26 U	0.24 U	0.24 U	--	--	--	0.26 U
Vanadium	--	--	--	1.9 U	1.2 U	1.2 U	--	1.9 U	1.2 U	1.2 U	--	--	--	1.9 U
Zinc	--	--	--	7 U	30.1	5.4 U	--	7 U	23.9	5.4 U	--	--	--	7 U
POLYCHLORINATED BIPHENYLS (µg/L)														
PCB-1016 (Aroclor 1016)	--	--	--	--	0.12 U	0.12 U	--	--	--	--	--	--	--	--
PCB-1221 (Aroclor 1221)	--	--	--	--	0.12 U	0.12 U	--	--	--	--	--	--	--	--
PCB-1232 (Aroclor 1232)	--	--	--	--	0.12 U	0.12 U	--	--	--	--	--	--	--	--
PCB-1242 (Aroclor 1242)	--	--	--	--	0.12 U	0.12 U	--	--	--	--	--	--	--	--
PCB-1248 (Aroclor 1248)	--	--	--	--	0.12 U	0.12 U	--	--	--	--	--	--	--	--

Table E-38
Summary of Data Used in Risk Assessment
Groundwater Upper Hydrogeologic Unit Plume Area - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-040	CFMW-040	CFMW-040	CFMW-040	CFMW-040	CFMW-040	CFMW-042	CFMW-042	CFMW-042	CFMW-042	CFMW-043	CFMW-043	CFMW-043	CFMW-043
Sample Lab IDs	460-120223-11	460-125356-4	460-130691-3	460-135701-10	320-40194-1, 460-157970-3	320-43992-3, 460-166400-6	460-120223-3	460-135701-8	460-158183-5	460-166151-4	460-120143-6	460-125477-5	460-130032-8	460-135818-9
Sample Name Chemical	CFMW-040-GW 9/14/2016	CFMW-040-GW 12/13/2016	CFMW-040-GW 3/30/2017	CFMW-040-GW 6/20/2017	CFMW-040-GW 6/8/2018	CFMW-040-GW 10/8/2018	CFMW-042-GW 9/14/2016	CFMW-042-GW 6/20/2017	CFMW-042-GW 6/12/2018	CFMW-042-GW 10/4/2018	CFMW-043-GW 9/13/2016	CFMW-043-GW 12/14/2016	CFMW-043-GW 3/20/2017	CFMW-043-GW 6/21/2017
PCB-1254 (Aroclor 1254)	--	--	--	--	0.11 U	0.11 U	--	--	--	--	--	--	--	--
PCB-1260 (Aroclor 1260)	--	--	--	--	0.11 U	0.11 U	--	--	--	--	--	--	--	--
PCB-1262 (Aroclor 1262)	--	--	--	--	0.11 U	0.11 U	--	--	--	--	--	--	--	--
PCB-1268 (Aroclor 1268)	--	--	--	--	0.11 U	0.11 U	--	--	--	--	--	--	--	--
Polychlorinated Biphenyl (PCBs)	--	--	--	--	0.12 U	0.12 U	--	--	--	--	--	--	--	--
SEMIVOLATILE ORGANIC COMPOUNDS (µg/L)														
1,2,4,5-Tetrachlorobenzene	0.44 U	0.43 U	0.44 U	0.43 U	--	--	0.45 U	0.43 U	--	--	0.46 U	0.43 U	0.43 U	0.43 U
1,4-Dioxane (P-Dioxane)	3.2 U	3.1 U	3.2 U	3.1 U	--	--	3.2 U	3.1 U	--	--	3.3 U	3.1 UJ	3.1 U	3.1 U
2,3,4,6-Tetrachlorophenol	0.7 U	0.69 U	0.7 U	0.69 U	--	--	0.72 U	0.69 U	--	--	0.73 U	0.69 U	0.69 U	0.69 U
2,4,5-Trichlorophenol	0.5 U	0.49 U	0.5 U	0.49 U	--	--	0.51 U	0.49 U	--	--	0.52 U	0.49 U	0.49 U	0.49 U
2,4,6-Trichlorophenol	0.54 U	0.53 U	0.54 U	0.53 U	--	--	0.55 U	0.53 U	--	--	0.56 U	0.53 U	0.53 U	0.53 U
2,4-Dichlorophenol	0.64 U	0.63 U	0.64 U	0.63 U	--	--	0.66 U	0.63 U	--	--	0.67 U	0.63 U	0.63 U	0.63 U
2,4-Dimethylphenol	0.93 U	0.91 UJ	0.93 U	0.91 U	--	--	0.95 U	0.91 U	--	--	0.97 U	0.91 U	0.91 U	0.91 U
2,4-Dinitrophenol	2.4 UJ	2.4 U	2.4 U	2.4 UJ	--	--	2.5 UJ	2.4 UJ	--	--	2.5 UJ	2.4 U	2.4 U	2.4 U
2,4-Dinitrotoluene	1.1 U	1 U	1.1 U	1 U	--	--	1.1 U	1 U	--	--	1.1 U	1 U	1 U	1 U
2,6-Dinitrotoluene	0.9 U	0.88 U	0.9 U	0.88 U	--	--	0.92 U	0.88 U	--	--	0.94 U	0.88 U	0.88 U	0.88 U
2-Chloronaphthalene	0.62 U	0.61 U	0.62 U	0.61 U	--	--	0.64 U	0.61 U	--	--	0.65 U	0.61 U	0.61 U	0.61 U
2-Chlorophenol	0.76 U	0.74 U	0.76 U	0.74 U	--	--	0.77 U	0.74 U	--	--	0.79 U	0.74 U	0.74 U	0.74 U
2-Methylnaphthalene	0.9 U	0.88 U	0.9 U	0.88 U	--	--	0.92 U	0.88 U	--	--	0.94 U	0.88 U	0.88 U	0.88 U
2-Methylphenol (O-Cresol)	1.3 U	1.3 U	1.3 U	1.3 U	--	--	1.3 U	1.3 U	--	--	1.4 U	1.3 U	1.3 U	1.3 U
2-Nitroaniline	0.66 UJ	0.65 U	0.66 U	0.65 U	--	--	0.68 UJ	0.65 U	--	--	0.69 U	0.65 U	0.65 U	0.65 U
2-Nitrophenol	0.6 U	0.59 U	0.6 U	0.59 U	--	--	0.61 U	0.59 U	--	--	0.63 U	0.59 U	0.59 U	0.59 U
3- And 4- Methylphenol (Total)	0.9 UJ	0.88 U	0.9 U	0.88 U	--	--	0.92 UJ	0.88 U	--	--	0.94 U	0.88 U	0.88 U	0.88 U
3,3'-Dichlorobenzidine	1.1 U	1 U	1.1 U	1 U	--	--	1.1 U	1 U	--	--	1.1 U	1 U	1 U	1 U
3-Nitroaniline	0.84 U	0.82 U	0.84 U	0.82 U	--	--	0.85 U	0.82 U	--	--	0.87 U	0.82 U	0.82 U	0.82 U
4,6-Dinitro-2-Methylphenol	2.1 U	2 U	2.1 U	2 U	--	--	2.1 U	2 U	--	--	2.1 U	2 U	2 U	2 U
4-Bromophenyl Phenyl Ether	1 U	1 U	1 U	1 U	--	--	1.1 U	1 U	--	--	1.1 U	1 U	1 U	1 U
4-Chloro-3-Methylphenol	0.78 U	0.76 U	0.78 U	0.76 U	--	--	0.79 U	0.76 U	--	--	0.81 U	0.76 U	0.76 U	0.76 U
4-Chloroaniline	0.74 U	0.73 U	0.74 U	0.73 U	--	--	0.76 U	0.73 U	--	--	0.78 U	0.73 U	0.73 U	0.73 U
4-Chlorophenyl Phenyl Ether	0.98 U	0.96 U	0.98 U	0.96 U	--	--	1 U	0.96 U	--	--	1 U	0.96 U	0.96 U	0.96 U
4-Nitroaniline	0.49 U	0.48 U	0.49 U	0.48 UJ	--	--	0.5 U	0.48 UJ	--	--	0.51 U	0.48 U	0.48 U	0.48 U
4-Nitrophenol	4.7 U	4.7 UJ	4.7 U	4.7 U	--	--	4.8 U	4.7 U	--	--	4.9 U	4.7 U	4.7 U	4.7 U
Acenaphthene	0.9 U	0.88 UJ	0.9 U	0.88 U	--	--	0.92 U	0.88 U	--	--	0.94 U	0.88 UJ	0.88 U	0.88 U
Acenaphthylene	0.66 U	0.65 U	0.66 U	0.65 U	--	--	0.68 U	0.65 U	--	--	0.69 U	0.65 U	0.65 U	0.65 U
Acetophenone	1.1 U	1 U	1.1 U	1 U	--	--	1.1 U	1 U	--	--	1.1 U	1 U	1 U	1 U
Anthracene	0.58 U	0.57 U	0.58 U	0.57 U	--	--	0.59 U	0.57 U	--	--	0.61 U	0.57 U	0.57 U	0.57 U
Atrazine	0.79 U	0.77 U	0.79 U	0.77 U	--	--	0.8 U	0.77 U	--	--	0.82 U	0.77 U	0.77 U	0.77 U
Benzaldehyde	0.88 U	0.86 U	0.88 U	0.86 U	--	--	0.9 U	0.86 U	--	--	0.91 U	0.86 U	0.86 U	0.86 U
Benzo(A)Anthracene	0.56 U	0.55 U	0.56 U	0.55 U	--	--	0.57 U	0.55 U	--	--	0.59 U	0.55 U	0.55 U	0.55 U
Benzo(A)Pyrene	0.16 U	0.16 U	0.16 U	0.16 U	--	--	0.17 U	0.16 U	--	--	0.17 U	0.16 U	0.16 U	0.16 U
Benzo(B)Fluoranthene	0.45 U	0.44 U	0.45 U	0.44 U	--	--	0.46 U	0.44 U	--	--	0.47 U	0.44 U	0.44 U	0.44 U
Benzo(G,H,I)Perylene	0.77 U	0.75 U	0.77 U	0.75 U	--	--	0.78 U	0.75 U	--	--	0.8 U	0.75 U	0.75 U	0.75 U
Benzo(K)Fluoranthene	0.18 U	0.18 U	0.18 U	0.18 U	--	--	0.19 U	0.18 U	--	--	0.19 U	0.18 U	0.18 U	0.18 U
Benzyl Butyl Phthalate	0.61 U	0.6 UJ	0.61 U	0.6 U	--	--	0.63 U	0.6 U	--	--	0.64 U	0.6 U	0.6 U	0.6 U
Biphenyl (Diphenyl)	0.64 U	0.63 U	0.64 U	0.63 U	--	--	0.66 U	0.63 U	--	--	0.67 U	0.63 U	0.63 U	0.63 U
Bis(2-Chloroethoxy) Methane	0.7 U	0.69 U	0.7 U	0.69 U	--	--	0.72 U	0.69 U	--	--	0.73 U	0.69 U	0.69 U	0.69 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.12 U	0.12 UJ	0.12 U	0.12 U	--	--	0.13 U	0.12 U	--	--	0.13 U	0.12 UJ	0.12 U	0.12 U
Bis(2-Chloroisopropyl) Ether	0.95 U	0.93 U	0.95 U	0.93 U	--	--	0.97 U	0.93 U	--	--	0.99 U	0.93 U	0.93 U	0.93 U
Bis(2-Ethylhexyl) Phthalate	0.73 U	0.72 U	0.73 U	0.72 U	--	--	0.75 U	0.72 U	--	--	0.77 U	0.72 U	0.72 U	0.72 U
Caprolactam	1.1 U	1.1 UJ	1.1 U	1.1 U	--	--	1.1 U	1.1 U	--	--	1.1 U	1.1 U	1.1 U	1.1 U
Carbazole	0.87 U	0.85 U	0.87 U	0.85 U	--	--	0.89 U	0.85 U	--	--	0.9 U	0.85 U	0.85 U	0.85 U
Chrysene	0.68 U	0.67 U	0.68 U	0.67 U	--	--	0.7 U	0.67 U	--	--	0.71 U	0.67 U	0.67 U	0.67 U
Dibenz(A,H)Anthracene	0.092 U	0.09 U	0.092 U	0.09 U	--	--	0.094 U	0.09 U	--	--	0.096 U	0.09 U	0.09 U	0.09 U
Dibenzofuran	0.87 U	0.85 U	0.87 U	0.85 U	--	--	0.89 U	0.85 U	--	--	0.9 U	0.85 U	0.85 U	0.85 U
Diethyl Phthalate	1 U	1 UJ	1 UJ	1 U	--	--	1 U	1 U	--	--	1.1 U	1 U	1 U	1 U
Dimethyl Phthalate	1 U	0.98 U	1 U	0.98 U	--	--	1 U	0.98 U	--	--	1 U	0.98 U	0.98 U	0.98 U
Di-N-Butyl Phthalate	0.84 U	0.82 U	0.84 U	0.82 U	--	--	0.85 U	0.82 U	--	--	0.87 U	0.82 U	0.82 U	0.82 U
Di-N-Octylphthalate	0.7 U	0.69 UJ	0.7 U	0.69 U	--	--	0.72 U	0.69 U	--	--	0.73 U	0.69 U	0.69 U	0.69 U
Fluoranthene	0.73 U	0.72 U	0.73 U	0.72 U	--	--	0.75 U	0.72 U	--	--	0.77 U	0.72 U	0.72 U	0.72 U

Table E-38
Summary of Data Used in Risk Assessment
Groundwater Upper Hydrogeologic Unit Plume Area - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-040	CFMW-040	CFMW-040	CFMW-040	CFMW-040	CFMW-040	CFMW-042	CFMW-042	CFMW-042	CFMW-042	CFMW-043	CFMW-043	CFMW-043	CFMW-043
Sample Lab IDs	460-120223-11	460-125356-4	460-130691-3	460-135701-10	320-40194-1, 460-157970-3	320-43992-3, 460-166400-6	460-120223-3	460-135701-8	460-158183-5	460-166151-4	460-120143-6	460-125477-5	460-130032-8	460-135818-9
Sample Name Chemical	CFMW-040-GW 9/14/2016	CFMW-040-GW 12/13/2016	CFMW-040-GW 3/30/2017	CFMW-040-GW 6/20/2017	CFMW-040-GW 6/8/2018	CFMW-040-GW 10/8/2018	CFMW-042-GW 9/14/2016	CFMW-042-GW 6/20/2017	CFMW-042-GW 6/12/2018	CFMW-042-GW 10/4/2018	CFMW-043-GW 9/13/2016	CFMW-043-GW 12/14/2016	CFMW-043-GW 3/20/2017	CFMW-043-GW 6/21/2017
Fluorene	0.82 U	0.8 U	0.82 U	0.8 U	--	--	0.83 U	0.8 U	--	--	0.85 U	0.8 U	0.8 U	0.8 U
Hexachlorobenzene	0.48 U	0.47 U	0.48 U	0.47 U	--	--	0.49 U	0.47 U	--	--	0.5 U	0.47 U	0.47 U	0.47 U
Hexachlorobutadiene	0.78 U	0.76 U	0.78 U	0.76 U	--	--	0.79 U	0.76 U	--	--	0.81 U	0.76 U	0.76 U	0.76 U
Hexachlorocyclopentadiene	0.62 U	0.61 U	0.62 U	0.61 U	--	--	0.64 U	0.61 U	--	--	0.65 U	0.61 U	0.61 U	0.61 U
Hexachloroethane	0.092 U	0.09 U	0.092 U	0.09 U	--	--	0.094 U	0.09 U	--	--	0.096 U	0.09 U	0.09 U	0.09 U
Indeno(1,2,3-C,D)Pyrene	0.21 U	0.21 U	0.21 U	0.21 U	--	--	0.22 U	0.21 U	--	--	0.22 U	0.21 U	0.21 U	0.21 U
Isophorone	0.68 U	0.67 U	0.68 U	0.67 U	--	--	0.7 U	0.67 U	--	--	0.71 U	0.67 U	0.67 U	0.67 U
Naphthalene	0.82 U	0.8 U	0.82 U	0.8 U	--	--	0.83 U	0.8 U	--	--	0.85 U	0.8 U	0.8 U	0.8 U
Nitrobenzene	0.5 U	0.49 U	0.5 U	0.49 U	--	--	0.51 U	0.49 U	--	--	0.52 U	0.49 U	0.49 U	0.49 U
N-Nitrosodi-N-Propylamine	0.85 UJ	0.83 U	0.85 U	0.83 U	--	--	0.86 UJ	0.83 U	--	--	0.88 U	0.83 U	0.83 U	0.83 U
N-Nitrosodiphenylamine	0.76 U	0.74 U	0.76 U	0.74 U	--	--	0.77 U	0.74 U	--	--	0.79 U	0.74 UJ	0.74 U	0.74 U
Pentachlorophenol	2.2 UR	2.2 UJ	2.2 U	2.2 U	--	--	2.3 UR	2.2 U	--	--	2.3 UR	2.2 UJ	2.2 U	2.2 U
Phenanthrene	0.66 U	0.65 U	0.66 U	0.65 U	--	--	0.68 U	0.65 U	--	--	0.69 U	0.65 U	0.65 U	0.65 U
Phenol	0.42 U	0.41 U	0.42 U	0.41 U	--	--	0.43 U	0.41 U	--	--	0.44 U	0.41 U	0.41 U	0.41 U
Pyrene	0.85 U	0.83 U	0.85 U	0.83 U	--	--	0.86 U	0.83 U	--	--	0.88 U	0.83 U	0.83 U	0.83 U
SEMIVOLATILE ORGANIC COMPOUNDS|LOW LEVEL (µg/L)														
1,2,4,5-Tetrachlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,4-Dioxane (P-Dioxane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,3,4,6-Tetrachlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4,5-Trichlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4,6-Trichlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4-Dichlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4-Dimethylphenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4-Dinitrophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4-Dinitrotoluene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,6-Dinitrotoluene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Chloronaphthalene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Chlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Methylnaphthalene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Methylphenol (O-Cresol)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Nitroaniline	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Nitrophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3,3'-Dichlorobenzidine	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3-Nitroaniline	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4,6-Dinitro-2-Methylphenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Bromophenyl Phenyl Ether	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Chloro-3-Methylphenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Chloroaniline	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Chlorophenyl Phenyl Ether	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Nitroaniline	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Nitrophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acenaphthene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acenaphthylene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acetophenone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Anthracene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Atrazine	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzaldehyde	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(A)Anthracene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(A)Pyrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(B)Fluoranthene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(G,H,I)Perylene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(K)Fluoranthene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzyl Butyl Phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Biphenyl (Diphenyl)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bis(2-Chloroethoxy) Methane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bis(2-Chloroisopropyl) Ether	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bis(2-Ethylhexyl) Phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Caprolactam	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Table E-38
Summary of Data Used in Risk Assessment
Groundwater Upper Hydrogeologic Unit Plume Area - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-040	CFMW-040	CFMW-040	CFMW-040	CFMW-040	CFMW-040	CFMW-042	CFMW-042	CFMW-042	CFMW-042	CFMW-043	CFMW-043	CFMW-043	CFMW-043
Sample Lab IDs	460-120223-11	460-125356-4	460-130691-3	460-135701-10	320-40194-1, 460-157970-3	320-43992-3, 460-166400-6	460-120223-3	460-135701-8	460-158183-5	460-166151-4	460-120143-6	460-125477-5	460-130032-8	460-135818-9
Sample Name Chemical	CFMW-040-GW 9/14/2016	CFMW-040-GW 12/13/2016	CFMW-040-GW 3/30/2017	CFMW-040-GW 6/20/2017	CFMW-040-GW 6/8/2018	CFMW-040-GW 10/8/2018	CFMW-042-GW 9/14/2016	CFMW-042-GW 6/20/2017	CFMW-042-GW 6/12/2018	CFMW-042-GW 10/4/2018	CFMW-043-GW 9/13/2016	CFMW-043-GW 12/14/2016	CFMW-043-GW 3/20/2017	CFMW-043-GW 6/21/2017
Carbazole	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chrysene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibenz(A,H)Anthracene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibenzofuran	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Diethyl Phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dimethyl Phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Di-N-Butyl Phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Di-N-Octylphthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Fluoranthene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Fluorene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorobutadiene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorocyclopentadiene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Indeno(1,2,3-C,D)Pyrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Isophorone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Naphthalene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Nitrobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
N-Nitrosodi-N-Propylamine	--	--	--	--	--	--	--	--	--	--	--	--	--	--
N-Nitrosodiphenylamine	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Pentachlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Phenanthrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Phenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Pyrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
VOLATILE ORGANIC COMPOUNDS (µg/L)														
1,1,1-Trichloroethane	0.28 U	0.28 U	0.28 U	0.28 U	--	--	0.28 U	0.28 U	--	--	0.28 U	0.28 U	0.28 U	0.28 U
1,1,2,2-Tetrachloroethane	0.19 U	0.19 U	0.19 U	0.19 U	--	--	0.19 U	0.19 U	--	--	0.19 U	0.19 U	0.19 U	0.19 U
1,1,2-Trichloro-1,2,2-Trifluoroethane	0.34 U	0.34 U	0.34 U	0.34 U	--	--	0.34 U	0.34 U	--	--	0.34 U	0.34 U	0.34 U	0.34 U
1,1,2-Trichloroethane	0.08 U	0.08 U	0.08 U	0.08 U	--	--	0.08 U	0.08 U	--	--	0.08 U	0.08 U	0.08 U	0.08 U
1,1-Dichloroethane	0.24 U	0.24 U	0.24 U	0.24 U	--	--	0.24 U	0.24 U	--	--	0.24 U	0.24 U	0.24 U	0.24 U
1,1-Dichloroethene	0.34 U	0.34 U	0.34 U	0.34 U	--	--	0.34 U	0.34 U	--	--	0.34 U	0.34 U	0.34 U	0.34 U
1,2,3-Trichlorobenzene	0.35 U	0.35 U	0.35 U	0.35 U	--	--	0.35 U	0.35 U	--	--	0.35 U	0.35 U	0.35 U	0.35 U
1,2,4-Trichlorobenzene	0.27 U	0.27 U	0.27 U	0.27 U	--	--	0.27 U	0.27 U	--	--	0.27 U	0.27 U	0.27 U	0.27 U
1,2-Dibromo-3-Chloropropane	0.23 U	0.23 U	0.23 U	0.23 UJ	--	--	0.23 U	0.23 UJ	--	--	0.23 U	0.23 UJ	0.23 UJ	0.23 U
1,2-Dibromoethane (Ethylene Dibromide)	0.19 U	0.19 U	0.19 U	0.19 U	--	--	0.19 U	0.19 U	--	--	0.19 U	0.19 U	0.19 U	0.19 U
1,2-Dichlorobenzene	0.22 U	0.22 U	0.22 U	0.22 U	--	--	0.22 U	0.22 U	--	--	0.22 U	0.22 U	0.22 U	0.22 U
1,2-Dichloroethane	0.25 U	0.25 U	0.25 U	0.25 U	--	--	0.25 U	0.25 U	--	--	0.25 U	0.25 U	0.25 U	0.25 U
1,2-Dichloropropane	0.18 U	0.18 U	0.18 U	0.18 U	--	--	0.18 U	0.18 U	--	--	0.18 U	0.18 U	0.18 U	0.18 U
1,3-Dichlorobenzene	0.33 U	0.33 U	0.33 U	0.33 U	--	--	0.33 U	0.33 U	--	--	0.33 U	0.33 U	0.33 U	0.33 U
1,4-Dichlorobenzene	0.33 U	0.33 U	0.33 U	0.33 U	--	--	0.33 U	0.33 U	--	--	0.33 U	0.33 U	0.33 U	0.33 U
2-Hexanone	0.72 U	0.72 U	0.72 U	0.72 U	--	--	0.72 U	0.72 U	--	--	0.72 U	0.72 U	0.72 U	0.72 U
Acetone	1.1 U	1.1 U	1.1 U	1.1 UJ	--	--	1.1 U	1.1 UJ	--	--	1.1 U	1.1 UJ	1.1 U	1.1 U
Benzene	0.09 U	0.09 U	0.09 U	0.09 U	--	--	0.09 U	0.09 U	--	--	0.09 U	0.09 U	0.09 U	0.09 U
Bromochloromethane	0.3 U	0.3 U	0.3 U	0.3 U	--	--	0.3 U	0.3 U	--	--	0.3 U	0.3 U	0.3 U	0.3 U
Bromodichloromethane	0.15 U	0.15 U	0.15 U	0.15 U	--	--	0.15 U	0.15 U	--	--	0.15 U	0.15 U	0.15 U	0.15 U
Bromoform	0.18 U	0.18 U	0.18 U	0.18 UJ	--	--	0.18 U	0.18 UJ	--	--	0.18 U	0.18 U	0.18 U	0.18 U
Bromomethane	0.18 U	0.18 U	0.18 U	0.18 U	--	--	0.18 U	0.18 U	--	--	0.18 UJ	0.18 U	0.18 UJ	0.18 UJ
Carbon Disulfide	0.22 U	0.22 U	0.22 U	0.22 U	--	--	0.22 U	0.22 U	--	--	0.22 U	0.22 U	0.22 U	0.22 U
Carbon Tetrachloride	0.33 U	0.33 U	0.33 U	0.33 U	--	--	0.33 U	0.33 U	--	--	0.33 U	0.33 U	0.33 U	0.33 U
Chlorobenzene	0.24 U	0.24 U	0.24 U	0.24 U	--	--	0.24 U	0.24 U	--	--	0.24 U	0.24 U	0.24 U	0.24 U
Chloroethane	0.37 U	0.37 U	0.37 U	0.37 UJ	--	--	0.37 U	0.37 UJ	--	--	0.37 U	0.37 U	0.37 UJ	0.37 U
Chloroform	0.22 U	0.22 U	0.22 U	0.22 U	--	--	0.22 U	0.22 U	--	--	0.22 U	0.22 U	0.22 U	0.22 U
Chloromethane	0.22 U	0.22 U	0.22 U	0.22 U	--	--	0.22 U	0.22 U	--	--	0.22 U	0.22 U	0.22 UJ	0.22 U
Cis-1,2-Dichloroethylene	0.26 U	0.26 U	0.26 U	0.26 U	--	--	0.26 U	0.26 U	--	--	0.26 U	0.26 U	0.26 U	0.26 U
Cis-1,3-Dichloropropene	0.16 U	0.16 U	0.16 U	0.16 U	--	--	0.16 U	0.16 U	--	--	0.16 U	0.16 U	0.16 U	0.16 U
Cyclohexane	0.26 U	0.26 U	0.26 U	0.26 U	--	--	0.26 U	0.26 U	--	--	0.26 U	0.26 U	0.26 UJ	0.26 U
Dibromochloromethane	0.22 U	0.22 U	0.22 U	0.22 U	--	--	0.22 U	0.22 U	--	--	0.22 U	0.22 U	0.22 U	0.22 U
Dichlorodifluoromethane	0.14 U	0.14 U	0.14 U	0.14 UJ	--	--	0.14 U	0.14 UJ	--	--	0.14 UJ	0.14 U	0.14 UJ	0.14 UJ
Ethylbenzene	0.3 U	0.3 U	0.3 U	0.3 U	--	--	0.3 U	0.3 U	--	--	0.3 U	0.3 U	0.3 U	0.3 U

Table E-38
Summary of Data Used in Risk Assessment
Groundwater Upper Hydrogeologic Unit Plume Area - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-040	CFMW-040	CFMW-040	CFMW-040	CFMW-040	CFMW-040	CFMW-042	CFMW-042	CFMW-042	CFMW-042	CFMW-043	CFMW-043	CFMW-043	CFMW-043
Sample Lab IDs	460-120223-11	460-125356-4	460-130691-3	460-135701-10	320-40194-1, 460-157970-3	320-43992-3, 460-166400-6	460-120223-3	460-135701-8	460-158183-5	460-166151-4	460-120143-6	460-125477-5	460-130032-8	460-135818-9
Sample Name Chemical	CFMW-040-GW 9/14/2016	CFMW-040-GW 12/13/2016	CFMW-040-GW 3/30/2017	CFMW-040-GW 6/20/2017	CFMW-040-GW 6/8/2018	CFMW-040-GW 10/8/2018	CFMW-042-GW 9/14/2016	CFMW-042-GW 6/20/2017	CFMW-042-GW 6/12/2018	CFMW-042-GW 10/4/2018	CFMW-043-GW 9/13/2016	CFMW-043-GW 12/14/2016	CFMW-043-GW 3/20/2017	CFMW-043-GW 6/21/2017
Isopropylbenzene (Cumene)	0.32 U	0.32 U	0.32 U	0.32 U	--	--	0.32 U	0.32 U	--	--	0.32 U	0.32 U	0.32 U	0.32 U
M,P-Xylene	0.28 U	0.28 U	0.28 U	0.28 U	--	--	0.28 U	0.28 U	--	--	0.28 U	0.28 U	0.28 U	0.28 U
Methyl Acetate	0.58 U	0.58 U	0.58 U	0.58 U	--	--	0.58 U	0.58 U	--	--	0.58 U	0.58 UJ	0.58 U	0.58 UJ
Methyl Ethyl Ketone (2-Butanone)	2.2 U	2.2 U	2.2 U	2.2 U	--	--	2.2 U	2.2 U	--	--	2.2 U	2.2 U	2.2 U	2.2 U
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	0.63 U	0.63 U	0.63 U	0.63 U	--	--	0.63 U	0.63 U	--	--	0.63 U	0.63 U	0.63 U	0.63 U
Methylcyclohexane	0.22 U	0.22 U	0.22 U	0.22 U	--	--	0.22 U	0.22 U	--	--	0.22 U	0.22 U	0.22 UJ	0.22 U
Methylene Chloride	0.21 U	0.21 U	0.21 U	0.21 U	--	--	0.21 U	0.21 U	--	--	0.21 U	0.21 U	0.21 U	0.21 U
O-Xylene (1,2-Dimethylbenzene)	0.32 U	0.32 U	0.32 U	0.32 U	--	--	0.32 U	0.32 U	--	--	0.32 U	0.32 U	0.32 U	0.32 U
Styrene	0.17 U	0.17 U	0.17 U	0.17 U	--	--	0.17 U	0.17 U	--	--	0.17 U	0.17 U	0.17 U	0.17 U
Tert-Butyl Methyl Ether	0.13 U	0.13 U	0.13 U	0.13 U	--	--	0.13 U	0.13 U	--	--	0.13 U	0.13 U	0.13 U	0.13 U
Tetrachloroethylene (PCE)	0.12 U	0.12 U	0.12 U	0.12 U	--	--	0.12 U	0.14 J	--	--	0.12 U	0.12 U	0.12 U	0.12 U
Toluene	0.25 U	0.25 U	0.25 U	0.25 U	--	--	0.25 U	0.25 U	--	--	0.25 U	0.25 U	0.25 U	0.25 U
Trans-1,2-Dichloroethene	0.18 U	0.18 U	0.18 U	0.18 U	--	--	0.18 U	0.18 U	--	--	0.18 U	0.18 U	0.18 U	0.18 U
Trans-1,3-Dichloropropene	0.19 U	0.19 U	0.19 U	0.19 U	--	--	0.19 U	0.19 U	--	--	0.19 U	0.19 U	0.19 U	0.19 U
Trichloroethylene (TCE)	0.22 U	0.22 U	0.22 U	0.22 U	--	--	0.22 U	0.22 U	--	--	0.22 U	0.22 U	0.22 U	0.22 U
Trichlorofluoromethane	0.15 U	0.15 U	0.15 U	0.15 UJ	--	--	0.15 U	0.15 UJ	--	--	0.15 U	0.15 UJ	0.15 U	0.15 U
Vinyl Chloride	0.06 U	0.06 U	0.06 U	0.06 U	--	--	0.06 U	0.06 U	--	--	0.06 U	0.06 U	0.06 U	0.06 U

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-38
Summary of Data Used in Risk Assessment
Groundwater Upper Hydrogeologic Unit Plume Area - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-043	CFMW-043	CFMW-044	CFMW-044	CFMW-044	CFMW-044	CFMW-044	CFMW-044	CFMW-044A	CFMW-044A	CFMW-044A	CFMW-044A	CFMW-044A	CFMW-044A
Sample Lab IDs	460-158058-5	460-166734-1	460-120318-4	460-125196-2	460-130507-2	460-135818-10	460-158058-6	460-166051-3	460-120477-7	460-125747-3	460-130088-13	460-135989-3	460-157856-3	460-167033-1
Sample Name Chemical	CFMW-043-GW 6/11/2018	CFMW-043-GW 10/11/2018	CFMW-044-GW 9/15/2016	CFMW-044-GW 12/9/2016	CFMW-044-GW 3/28/2017	CFMW-044-GW 6/21/2017	CFMW-044-GW 6/11/2018	CFMW-044-GW 10/3/2018	CFMW-044a-GW 9/19/2016	CFMW-044a-GW 12/19/2016	CFMW-044a-GW 3/21/2017	CFMW-044a-GW 6/23/2017	CFMW-044a-GW 6/7/2018	CFMW-044a-GW 10/16/2018
GENERAL CHEMISTRY (µg/L)														
Fluoride	--	--	--	--	--	1580	--	--	--	--	--	2350	--	--
Cyanide	459	620 J	--	--	--	89.4	367	758	--	--	--	120	129	166
Cyanide (Free)	11.2	9.5	--	--	--	2.8 J	16.3	25.5	--	--	--	10.3	44	29.3
Cyanide	445 J+	657 J-	430	220	233	69.5	342 J+	766	32.8	125	80.8	119	151	123
Cyanide (Free)	16.5	10.8	--	--	4.9 J	4.5 J	9.4	25.7	--	--	11.4	7.8	44.5	25.1 J-
METALS (µg/L)														
Aluminum	15 U	15 U	18.2 U	18.2 U	18.2 U	18.2 U	15 U	15 U	108	41.1	171	21.9 J	15 U	25.9 J
Antimony	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U
Arsenic	0.77 U	0.77 U	0.64 U	0.64 U	0.64 U	0.64 U	0.77 U	0.77 U	0.64 U	2	1.1 J	1.5 J	0.86 J	0.77 U
Barium	159	144	109	119	96.8 J	147	53	92.1 J	75	18.7	24.2	31	58.6	71.2
Beryllium	0.26 U	0.26 U	0.24 U	0.24 U	0.24 U	0.24 U	0.26 U	0.26 U	0.24 U	0.24 U	0.24 U	0.24 U	0.26 U	0.26 U
Cadmium	0.61 U	0.61 U	0.71 U	0.71 U	0.71 U	0.71 U	0.61 U	0.61 U	0.71 U	0.71 U	0.71 U	0.71 U	0.61 U	0.61 U
Calcium	55400	47500	50100	45200	51700 J	67300	57600	45400 J	155000	24600	23900	25200	36900	42600
Chromium, Total	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	4.2	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
Cobalt	1.3 U	1.3 U	1.4 J	1.3 J	1.3 U	1.3 U	1.3 U	1.5 J	1.3 U	1.5 J	1.4 J	1.3 J	1.3 J	1.4 J
Copper	1.9 U	1.9 U	1.4 U	1.4 U	1.4 U	1.4 U	1.9 U	1.9 U	1.9 J	2.9 J	8.7	6.2	4.3	4.9
Iron	147	185	370	5120	387 J	42.4 U	147	574	42.4 U	42.4 U	230	53.6 J	46.5 J	60.5 J
Lead	0.37 U	0.37 U	0.38 U	0.38 U	0.38 U	0.38 U	0.37 U	0.37 U	0.38 U	0.38 U	0.38 U	0.38 U	0.37 U	0.37 U
Magnesium	16000	14200	16200	17000	16700 J	13600	18300	14600 J	121 J	9190	11600	10600	11600	14500
Manganese	2.7 U	2.7 U	45.4	209	77.6	2.5 U	207	52.8	2.5 U	2.5 U	10.5	22.6	123	169
Mercury	0.12 U	0.12 U	0.17 U	0.17 U	0.17 U	0.17 U	0.12 U	0.12 U	0.17 U	0.17 U	0.17 U	0.17 U	0.12 U	0.12 U
Nickel	1.3 U	1.3 U	1.4 U	2.6 J	2 J	1.4 U	1.5 J	1.3 U	1.4 U	1.4 U	1.4 U	1.4 U	1.3 U	1.3 U
Potassium	1110	977	888	1980	958	1050	1320	859	1660	1120	900	889	845	1010
Selenium	0.69 U	0.69 U	0.73 U	0.73 U	0.73 U	0.73 U	0.69 U	0.69 U	0.73 U	0.73 U	0.73 U	0.73 U	0.69 U	0.69 U
Silver	1.4 U	1.4 U	1.3 U	1.3 U	1.3 U	1.3 U	1.4 U	1.4 U	1.3 U	1.3 U	1.3 U	1.3 U	1.4 U	1.4 U
Sodium	52600	62200	45000	48100	42400	19100	54800	56600 J	40700	38700	38700	38800	42000	49100
Thallium	0.24 U	0.24 U	0.26 U	0.26 U	0.26 U	0.26 U	0.24 U	0.24 U	0.26 U	0.26 U	0.26 U	0.26 U	0.24 U	0.24 U
Vanadium	1.2 U	1.2 U	1.9 U	1.9 U	1.9 U	1.9 U	1.2 U	1.2 U	10.3	8.6	4.5	3.6 J	2.3 J	2.2 J
Zinc	33.2	5.4 U	7 U	7 U	7 U	7 U	33.1	5.4 U	7 U	7 U	7 U	7 U	5.4 U	5.4 U
Aluminum	40.7	22.8 J	--	--	--	18.2 U	15 U	15 U	--	--	--	417	54.8	145
Antimony	0.62 U	0.62 U	--	--	--	0.62 U	0.62 U	0.62 U	--	--	--	0.62 U	0.62 U	1.1 J
Arsenic	0.77 U	0.77 U	--	--	--	0.64 U	0.77 U	0.77 U	--	--	--	1.5 J	0.81 J	0.77 J
Barium	153	142	--	--	--	125	53.1	96.7	--	--	--	35.5	61.1	75.5
Beryllium	0.26 U	0.26 U	--	--	--	0.24 U	0.26 U	0.26 U	--	--	--	0.24 U	0.26 U	0.26 U
Cadmium	0.61 U	0.61 U	--	--	--	0.71 U	0.61 U	0.61 U	--	--	--	0.71 U	0.61 U	0.61 U
Calcium	51600	48900	--	--	--	45100	54000	48400	--	--	--	27000	38700	46000
Chromium, Total	1.3 U	1.3 U	--	--	--	1.3 U	1.3 U	1.3 U	--	--	--	1.3 U	1.3 U	1.3 U
Cobalt	1.4 J	1.3 J	--	--	--	2.1 J	1.3 J	1.6 J	--	--	--	1.6 J	1.6 J	1.5 J
Copper	1.9 U	5.6	--	--	--	1.5 J	1.9 U	1.9 U	--	--	--	9.5	6.3	5.9
Iron	278	214	--	--	--	20400	850	969	--	--	--	486	104 J	209
Lead	0.37 U	0.37 U	--	--	--	0.38 U	0.37 U	0.37 U	--	--	--	0.38 U	0.37 U	0.37 U
Magnesium	15200	14400	--	--	--	19700	17400	16800	--	--	--	12100	14200	15200
Manganese	2.8 J	2.7 U	--	--	--	829	201	68	--	--	--	36	138	185
Mercury	0.12 U	0.12 U	--	--	--	0.17 U	0.12 U	0.12 U	--	--	--	0.17 U	0.12 U	0.12 U
Nickel	1.3 U	1.3 U	--	--	--	8.8	1.8 J	1.3 J	--	--	--	1.4 U	1.3 U	1.3 U
Potassium	1010	1020	--	--	--	3210	1200	967	--	--	--	987	860	1130
Selenium	0.69 U	0.69 U	--	--	--	0.73 U	0.69 U	0.69 U	--	--	--	0.73 U	0.69 U	0.69 U
Silver	1.4 U	1.4 U	--	--	--	1.3 U	1.4 U	1.4 U	--	--	--	1.3 U	1.4 U	1.4 U
Sodium	53400	62500	--	--	--	50600	55800	64400	--	--	--	44700	48900	52000
Thallium	0.24 U	0.24 U	--	--	--	0.26 U	0.24 U	0.24 U	--	--	--	0.26 U	0.24 U	0.24 U
Vanadium	1.2 U	1.2 U	--	--	--	1.9 U	1.2 U	1.2 U	--	--	--	4.8	2.9 J	2.6 J
Zinc	33.4	5.4 U	--	--	--	15.9 J	45.6	5.4 U	--	--	--	12.9 J	5.4 U	5.4 U
POLYCHLORINATED BIPHENYLS (µg/L)														
PCB-1016 (Aroclor 1016)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1221 (Aroclor 1221)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1232 (Aroclor 1232)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1242 (Aroclor 1242)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1248 (Aroclor 1248)	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Table E-38
Summary of Data Used in Risk Assessment
Groundwater Upper Hydrogeologic Unit Plume Area - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-043	CFMW-043	CFMW-044	CFMW-044	CFMW-044	CFMW-044	CFMW-044	CFMW-044	CFMW-044A	CFMW-044A	CFMW-044A	CFMW-044A	CFMW-044A	CFMW-044A
Sample Lab IDs	460-158058-5	460-166734-1	460-120318-4	460-125196-2	460-130507-2	460-135818-10	460-158058-6	460-166051-3	460-120477-7	460-125747-3	460-130088-13	460-135989-3	460-157856-3	460-167033-1
Sample Name Chemical	CFMW-043-GW 6/11/2018	CFMW-043-GW 10/11/2018	CFMW-044-GW 9/15/2016	CFMW-044-GW 12/9/2016	CFMW-044-GW 3/28/2017	CFMW-044-GW 6/21/2017	CFMW-044-GW 6/11/2018	CFMW-044-GW 10/3/2018	CFMW-044a-GW 9/19/2016	CFMW-044a-GW 12/19/2016	CFMW-044a-GW 3/21/2017	CFMW-044a-GW 6/23/2017	CFMW-044a-GW 6/7/2018	CFMW-044a-GW 10/16/2018
PCB-1254 (Aroclor 1254)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1260 (Aroclor 1260)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1262 (Aroclor 1262)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1268 (Aroclor 1268)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Polychlorinated Biphenyl (PCBs)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SEMIVOLATILE ORGANIC COMPOUNDS (µg/L)														
1,2,4,5-Tetrachlorobenzene	--	--	0.43 U	0.43 U	0.46 U	0.43 U	--	--	--	--	--	--	--	--
1,4-Dioxane (P-Dioxane)	--	--	3.1 U	3.1 U	3.3 U	3.1 U	--	--	--	--	--	--	--	--
2,3,4,6-Tetrachlorophenol	--	--	0.69 U	0.69 U	0.73 U	0.69 U	--	--	--	--	--	--	--	--
2,4,5-Trichlorophenol	--	--	0.49 U	0.49 U	0.52 U	0.49 U	--	--	--	--	--	--	--	--
2,4,6-Trichlorophenol	--	--	0.53 U	0.53 U	0.56 U	0.53 U	--	--	--	--	--	--	--	--
2,4-Dichlorophenol	--	--	0.63 U	0.63 U	0.67 U	0.63 U	--	--	--	--	--	--	--	--
2,4-Dimethylphenol	--	--	0.91 U	0.91 U	0.97 U	0.91 U	--	--	--	--	--	--	--	--
2,4-Dinitrophenol	--	--	2.4 U	2.4 U	2.5 UJ	2.4 U	--	--	--	--	--	--	--	--
2,4-Dinitrotoluene	--	--	1 U	1 U	1.1 U	1 U	--	--	--	--	--	--	--	--
2,6-Dinitrotoluene	--	--	0.88 U	0.88 U	0.94 U	0.88 U	--	--	--	--	--	--	--	--
2-Chloronaphthalene	--	--	0.61 U	0.61 U	0.65 U	0.61 U	--	--	--	--	--	--	--	--
2-Chlorophenol	--	--	0.74 U	0.74 U	0.79 U	0.74 U	--	--	--	--	--	--	--	--
2-Methylnaphthalene	--	--	0.88 U	0.88 U	0.94 U	0.88 U	--	--	--	--	--	--	--	--
2-Methylphenol (O-Cresol)	--	--	1.3 U	1.3 U	1.4 U	1.3 U	--	--	--	--	--	--	--	--
2-Nitroaniline	--	--	0.65 U	0.65 U	0.69 U	0.65 U	--	--	--	--	--	--	--	--
2-Nitrophenol	--	--	0.59 U	0.59 U	0.63 U	0.59 U	--	--	--	--	--	--	--	--
3- And 4- Methylphenol (Total)	--	--	0.88 UJ	34	0.94 U	42	--	--	--	--	--	--	--	--
3,3'-Dichlorobenzidine	--	--	1 U	1 U	1.1 U	1 U	--	--	--	--	--	--	--	--
3-Nitroaniline	--	--	0.82 U	0.82 U	0.87 U	0.82 U	--	--	--	--	--	--	--	--
4,6-Dinitro-2-Methylphenol	--	--	2 U	2 U	2.1 U	2 U	--	--	--	--	--	--	--	--
4-Bromophenyl Phenyl Ether	--	--	1 U	1 U	1.1 U	1 U	--	--	--	--	--	--	--	--
4-Chloro-3-Methylphenol	--	--	0.76 U	0.76 U	0.81 U	0.76 U	--	--	--	--	--	--	--	--
4-Chloroaniline	--	--	0.73 U	0.73 U	0.78 U	0.73 U	--	--	--	--	--	--	--	--
4-Chlorophenyl Phenyl Ether	--	--	0.96 U	0.96 U	1 U	0.96 U	--	--	--	--	--	--	--	--
4-Nitroaniline	--	--	0.48 U	0.48 U	0.51 UJ	0.48 U	--	--	--	--	--	--	--	--
4-Nitrophenol	--	--	4.7 UJ	4.7 U	4.9 U	4.7 U	--	--	--	--	--	--	--	--
Acenaphthene	--	--	0.88 U	0.88 UJ	0.94 U	0.88 U	--	--	--	--	--	--	--	--
Acenaphthylene	--	--	0.65 U	0.65 U	0.69 U	0.65 U	--	--	--	--	--	--	--	--
Acetophenone	--	--	1 U	1 U	1.1 U	1 U	--	--	--	--	--	--	--	--
Anthracene	--	--	0.57 U	0.57 U	0.61 U	0.57 U	--	--	--	--	--	--	--	--
Atrazine	--	--	0.77 U	0.77 U	0.82 U	0.77 U	--	--	--	--	--	--	--	--
Benzaldehyde	--	--	0.86 U	0.86 UJ	0.91 U	0.86 U	--	--	--	--	--	--	--	--
Benzo(A)Anthracene	--	--	0.55 U	0.55 U	0.59 U	0.55 U	--	--	--	--	--	--	--	--
Benzo(A)Pyrene	--	--	0.16 U	0.16 U	0.17 U	0.16 U	--	--	--	--	--	--	--	--
Benzo(B)Fluoranthene	--	--	0.44 U	0.44 U	0.47 U	0.44 U	--	--	--	--	--	--	--	--
Benzo(G,H,I)Perylene	--	--	0.75 U	0.75 U	0.8 U	0.75 U	--	--	--	--	--	--	--	--
Benzo(K)Fluoranthene	--	--	0.18 U	0.18 U	0.19 U	0.18 U	--	--	--	--	--	--	--	--
Benzyl Butyl Phthalate	--	--	0.6 U	0.6 U	0.64 UJ	0.6 U	--	--	--	--	--	--	--	--
Biphenyl (Diphenyl)	--	--	0.63 U	0.63 U	0.67 U	0.63 U	--	--	--	--	--	--	--	--
Bis(2-Chloroethoxy) Methane	--	--	0.69 U	0.69 U	0.73 U	0.69 U	--	--	--	--	--	--	--	--
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	--	--	0.12 U	0.12 UJ	0.13 U	0.12 U	--	--	--	--	--	--	--	--
Bis(2-Chloroisopropyl) Ether	--	--	0.93 U	0.93 U	0.99 U	0.93 U	--	--	--	--	--	--	--	--
Bis(2-Ethylhexyl) Phthalate	--	--	0.72 U	0.72 U	0.77 U	0.72 U	--	--	--	--	--	--	--	--
Caprolactam	--	--	1.1 U	1.1 U	1.1 U	1.1 U	--	--	--	--	--	--	--	--
Carbazole	--	--	0.85 U	0.85 U	0.9 U	0.85 U	--	--	--	--	--	--	--	--
Chrysene	--	--	0.67 U	0.67 U	0.71 U	0.67 U	--	--	--	--	--	--	--	--
Dibenz(A,H)Anthracene	--	--	0.09 U	0.09 U	0.096 U	0.09 U	--	--	--	--	--	--	--	--
Dibenzofuran	--	--	0.85 U	0.85 U	0.9 U	0.85 U	--	--	--	--	--	--	--	--
Diethyl Phthalate	--	--	1 U	1 U	1.1 UJ	1 U	--	--	--	--	--	--	--	--
Dimethyl Phthalate	--	--	0.98 U	0.98 U	1 UJ	0.98 U	--	--	--	--	--	--	--	--
Di-N-Butyl Phthalate	--	--	0.82 U	0.82 U	0.87 U	0.82 U	--	--	--	--	--	--	--	--
Di-N-Octylphthalate	--	--	0.69 U	0.69 U	0.73 U	0.69 U	--	--	--	--	--	--	--	--
Fluoranthene	--	--	0.72 U	0.72 U	0.77 U	0.72 U	--	--	--	--	--	--	--	--

Table E-38
Summary of Data Used in Risk Assessment
Groundwater Upper Hydrogeologic Unit Plume Area - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-043	CFMW-043	CFMW-044	CFMW-044	CFMW-044	CFMW-044	CFMW-044	CFMW-044	CFMW-044A	CFMW-044A	CFMW-044A	CFMW-044A	CFMW-044A	CFMW-044A
Sample Lab IDs	460-158058-5	460-166734-1	460-120318-4	460-125196-2	460-130507-2	460-135818-10	460-158058-6	460-166051-3	460-120477-7	460-125747-3	460-130088-13	460-135989-3	460-157856-3	460-167033-1
Sample Name Chemical	CFMW-043-GW 6/11/2018	CFMW-043-GW 10/11/2018	CFMW-044-GW 9/15/2016	CFMW-044-GW 12/9/2016	CFMW-044-GW 3/28/2017	CFMW-044-GW 6/21/2017	CFMW-044-GW 6/11/2018	CFMW-044-GW 10/3/2018	CFMW-044a-GW 9/19/2016	CFMW-044a-GW 12/19/2016	CFMW-044a-GW 3/21/2017	CFMW-044a-GW 6/23/2017	CFMW-044a-GW 6/7/2018	CFMW-044a-GW 10/16/2018
Fluorene	--	--	0.8 U	0.8 U	0.85 U	0.8 U	--	--	--	--	--	--	--	--
Hexachlorobenzene	--	--	0.47 U	0.47 U	0.5 U	0.47 U	--	--	--	--	--	--	--	--
Hexachlorobutadiene	--	--	0.76 U	0.76 U	0.81 U	0.76 U	--	--	--	--	--	--	--	--
Hexachlorocyclopentadiene	--	--	0.61 U	0.61 U	0.65 U	0.61 U	--	--	--	--	--	--	--	--
Hexachloroethane	--	--	0.09 U	0.09 U	0.096 U	0.09 U	--	--	--	--	--	--	--	--
Indeno(1,2,3-C,D)Pyrene	--	--	0.21 U	0.21 U	0.22 U	0.21 U	--	--	--	--	--	--	--	--
Isophorone	--	--	0.67 U	0.67 U	0.71 U	0.67 U	--	--	--	--	--	--	--	--
Naphthalene	--	--	0.8 U	0.8 U	0.85 U	0.8 U	--	--	--	--	--	--	--	--
Nitrobenzene	--	--	0.49 U	0.49 U	0.52 U	0.49 U	--	--	--	--	--	--	--	--
N-Nitrosodi-N-Propylamine	--	--	0.83 U	0.83 U	0.88 U	0.83 U	--	--	--	--	--	--	--	--
N-Nitrosodiphenylamine	--	--	0.74 U	0.74 U	0.79 U	0.74 U	--	--	--	--	--	--	--	--
Pentachlorophenol	--	--	2.2 U	2.2 U	2.3 U	2.2 U	--	--	--	--	--	--	--	--
Phenanthrene	--	--	0.65 U	0.65 U	0.69 U	0.65 U	--	--	--	--	--	--	--	--
Phenol	--	--	0.41 U	1.6 J	0.44 U	3.9 J	--	--	--	--	--	--	--	--
Pyrene	--	--	0.83 U	0.83 U	0.88 UJ	0.83 U	--	--	--	--	--	--	--	--
SEMIVOLATILE ORGANIC COMPOUNDS|LOW LEVEL (µg/L)														
1,2,4,5-Tetrachlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,4-Dioxane (P-Dioxane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,3,4,6-Tetrachlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4,5-Trichlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4,6-Trichlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4-Dichlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4-Dimethylphenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4-Dinitrophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4-Dinitrotoluene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,6-Dinitrotoluene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Chloronaphthalene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Chlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Methylnaphthalene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Methylphenol (O-Cresol)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Nitroaniline	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Nitrophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3,3'-Dichlorobenzidine	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3-Nitroaniline	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4,6-Dinitro-2-Methylphenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Bromophenyl Phenyl Ether	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Chloro-3-Methylphenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Chloroaniline	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Chlorophenyl Phenyl Ether	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Nitroaniline	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Nitrophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acenaphthene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acenaphthylene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acetophenone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Anthracene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Atrazine	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzaldehyde	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(A)Anthracene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(A)Pyrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(B)Fluoranthene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(G,H,I)Perylene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(K)Fluoranthene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzyl Butyl Phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Biphenyl (Diphenyl)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bis(2-Chloroethoxy) Methane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bis(2-Chloroisopropyl) Ether	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bis(2-Ethylhexyl) Phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Caprolactam	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Table E-38
Summary of Data Used in Risk Assessment
Groundwater Upper Hydrogeologic Unit Plume Area - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-043	CFMW-043	CFMW-044	CFMW-044	CFMW-044	CFMW-044	CFMW-044	CFMW-044	CFMW-044A	CFMW-044A	CFMW-044A	CFMW-044A	CFMW-044A	CFMW-044A
Sample Lab IDs	460-158058-5	460-166734-1	460-120318-4	460-125196-2	460-130507-2	460-135818-10	460-158058-6	460-166051-3	460-120477-7	460-125747-3	460-130088-13	460-135989-3	460-157856-3	460-167033-1
Sample Name Chemical	CFMW-043-GW 6/11/2018	CFMW-043-GW 10/11/2018	CFMW-044-GW 9/15/2016	CFMW-044-GW 12/9/2016	CFMW-044-GW 3/28/2017	CFMW-044-GW 6/21/2017	CFMW-044-GW 6/11/2018	CFMW-044-GW 10/3/2018	CFMW-044a-GW 9/19/2016	CFMW-044a-GW 12/19/2016	CFMW-044a-GW 3/21/2017	CFMW-044a-GW 6/23/2017	CFMW-044a-GW 6/7/2018	CFMW-044a-GW 10/16/2018
Carbazole	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chrysene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibenz(A,H)Anthracene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibenzofuran	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Diethyl Phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dimethyl Phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Di-N-Butyl Phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Di-N-Octylphthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Fluoranthene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Fluorene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorobutadiene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorocyclopentadiene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Indeno(1,2,3-C,D)Pyrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Isophorone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Naphthalene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Nitrobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
N-Nitrosodi-N-Propylamine	--	--	--	--	--	--	--	--	--	--	--	--	--	--
N-Nitrosodiphenylamine	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Pentachlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Phenanthrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Phenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Pyrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
VOLATILE ORGANIC COMPOUNDS (µg/L)														
1,1,1-Trichloroethane	--	--	0.28 U	0.28 U	0.28 U	0.28 U	--	--	--	--	--	--	--	--
1,1,2,2-Tetrachloroethane	--	--	0.19 U	0.19 U	0.19 U	0.19 U	--	--	--	--	--	--	--	--
1,1,2-Trichloro-1,2,2-Trifluoroethane	--	--	0.34 U	0.34 U	0.34 U	0.34 U	--	--	--	--	--	--	--	--
1,1,2-Trichloroethane	--	--	0.08 U	0.08 U	0.08 U	0.08 U	--	--	--	--	--	--	--	--
1,1-Dichloroethane	--	--	0.24 U	0.24 U	0.24 U	0.24 U	--	--	--	--	--	--	--	--
1,1-Dichloroethene	--	--	0.34 U	0.34 U	0.34 U	0.34 U	--	--	--	--	--	--	--	--
1,2,3-Trichlorobenzene	--	--	0.35 U	0.35 U	0.35 U	0.35 U	--	--	--	--	--	--	--	--
1,2,4-Trichlorobenzene	--	--	0.27 U	0.27 U	0.27 U	0.27 U	--	--	--	--	--	--	--	--
1,2-Dibromo-3-Chloropropane	--	--	0.23 U	0.23 U	0.23 U	0.23 U	--	--	--	--	--	--	--	--
1,2-Dibromoethane (Ethylene Dibromide)	--	--	0.19 U	0.19 U	0.19 U	0.19 U	--	--	--	--	--	--	--	--
1,2-Dichlorobenzene	--	--	0.22 U	0.22 U	0.22 U	0.22 U	--	--	--	--	--	--	--	--
1,2-Dichloroethane	--	--	0.25 U	0.25 U	0.25 U	0.25 U	--	--	--	--	--	--	--	--
1,2-Dichloropropane	--	--	0.18 U	0.18 U	0.18 U	0.18 U	--	--	--	--	--	--	--	--
1,3-Dichlorobenzene	--	--	0.33 U	0.33 U	0.33 U	0.33 U	--	--	--	--	--	--	--	--
1,4-Dichlorobenzene	--	--	0.33 U	0.33 U	0.33 U	0.33 U	--	--	--	--	--	--	--	--
2-Hexanone	--	--	0.72 U	0.72 U	0.72 U	0.72 U	--	--	--	--	--	--	--	--
Acetone	--	--	1.1 U	1.1 U	1.1 U	5.3	--	--	--	--	--	--	--	--
Benzene	--	--	0.09 U	0.09 U	0.09 U	0.09 U	--	--	--	--	--	--	--	--
Bromochloromethane	--	--	0.3 U	0.3 U	0.3 U	0.3 U	--	--	--	--	--	--	--	--
Bromodichloromethane	--	--	0.15 U	0.15 U	0.15 U	0.15 U	--	--	--	--	--	--	--	--
Bromoform	--	--	0.18 U	0.18 U	0.18 U	0.18 U	--	--	--	--	--	--	--	--
Bromomethane	--	--	0.18 U	0.18 U	0.18 U	0.18 UJ	--	--	--	--	--	--	--	--
Carbon Disulfide	--	--	0.22 U	0.22 U	0.22 U	0.22 U	--	--	--	--	--	--	--	--
Carbon Tetrachloride	--	--	0.33 U	0.33 U	0.33 U	0.33 U	--	--	--	--	--	--	--	--
Chlorobenzene	--	--	0.24 U	0.24 U	0.24 U	0.24 U	--	--	--	--	--	--	--	--
Chloroethane	--	--	0.37 U	0.37 U	0.37 U	0.37 U	--	--	--	--	--	--	--	--
Chloroform	--	--	0.22 U	0.22 U	0.22 U	0.22 U	--	--	--	--	--	--	--	--
Chloromethane	--	--	0.22 U	0.22 U	0.22 U	0.22 U	--	--	--	--	--	--	--	--
Cis-1,2-Dichloroethylene	--	--	0.26 U	0.26 U	0.26 U	0.26 U	--	--	--	--	--	--	--	--
Cis-1,3-Dichloropropene	--	--	0.16 U	0.16 U	0.16 U	0.16 U	--	--	--	--	--	--	--	--
Cyclohexane	--	--	0.26 U	0.26 U	0.26 U	0.26 U	--	--	--	--	--	--	--	--
Dibromochloromethane	--	--	0.22 U	0.22 U	0.22 U	0.22 U	--	--	--	--	--	--	--	--
Dichlorodifluoromethane	--	--	0.14 U	0.14 U	0.14 U	0.14 UJ	--	--	--	--	--	--	--	--
Ethylbenzene	--	--	0.3 U	0.3 U	0.3 U	0.3 U	--	--	--	--	--	--	--	--

Table E-38
Summary of Data Used in Risk Assessment
Groundwater Upper Hydrogeologic Unit Plume Area - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-043	CFMW-043	CFMW-044	CFMW-044	CFMW-044	CFMW-044	CFMW-044	CFMW-044	CFMW-044A	CFMW-044A	CFMW-044A	CFMW-044A	CFMW-044A	CFMW-044A
Sample Lab IDs	460-158058-5	460-166734-1	460-120318-4	460-125196-2	460-130507-2	460-135818-10	460-158058-6	460-166051-3	460-120477-7	460-125747-3	460-130088-13	460-135989-3	460-157856-3	460-167033-1
Sample Name Chemical	CFMW-043-GW 6/11/2018	CFMW-043-GW 10/11/2018	CFMW-044-GW 9/15/2016	CFMW-044-GW 12/9/2016	CFMW-044-GW 3/28/2017	CFMW-044-GW 6/21/2017	CFMW-044-GW 6/11/2018	CFMW-044-GW 10/3/2018	CFMW-044a-GW 9/19/2016	CFMW-044a-GW 12/19/2016	CFMW-044a-GW 3/21/2017	CFMW-044a-GW 6/23/2017	CFMW-044a-GW 6/7/2018	CFMW-044a-GW 10/16/2018
Isopropylbenzene (Cumene)	--	--	0.32 U	0.32 U	0.32 U	0.32 U	--	--	--	--	--	--	--	--
M,P-Xylene	--	--	0.28 U	0.28 U	0.28 U	0.28 U	--	--	--	--	--	--	--	--
Methyl Acetate	--	--	0.58 U	0.58 U	0.58 U	0.58 UJ	--	--	--	--	--	--	--	--
Methyl Ethyl Ketone (2-Butanone)	--	--	2.2 U	2.2 U	2.2 U	2.2 U	--	--	--	--	--	--	--	--
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	--	--	0.63 U	0.63 U	0.63 U	0.63 U	--	--	--	--	--	--	--	--
Methylcyclohexane	--	--	0.22 U	0.22 U	0.22 U	0.22 U	--	--	--	--	--	--	--	--
Methylene Chloride	--	--	0.21 U	0.21 U	0.21 U	0.21 U	--	--	--	--	--	--	--	--
O-Xylene (1,2-Dimethylbenzene)	--	--	0.32 U	0.32 U	0.32 U	0.32 U	--	--	--	--	--	--	--	--
Styrene	--	--	0.17 U	0.17 U	0.17 U	0.17 U	--	--	--	--	--	--	--	--
Tert-Butyl Methyl Ether	--	--	0.13 U	0.13 U	0.13 U	0.13 U	--	--	--	--	--	--	--	--
Tetrachloroethylene (PCE)	--	--	0.12 U	0.12 U	0.12 U	0.12 U	--	--	--	--	--	--	--	--
Toluene	--	--	0.25 U	0.25 U	0.25 U	0.25 U	--	--	--	--	--	--	--	--
Trans-1,2-Dichloroethene	--	--	0.18 U	0.18 U	0.18 U	0.18 U	--	--	--	--	--	--	--	--
Trans-1,3-Dichloropropene	--	--	0.19 U	0.19 U	0.19 U	0.19 U	--	--	--	--	--	--	--	--
Trichloroethylene (TCE)	--	--	0.22 U	0.22 U	0.22 U	0.22 U	--	--	--	--	--	--	--	--
Trichlorofluoromethane	--	--	0.15 U	0.15 U	0.15 U	0.15 U	--	--	--	--	--	--	--	--
Vinyl Chloride	--	--	0.06 U	0.06 U	0.06 U	0.06 U	--	--	--	--	--	--	--	--

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-38
Summary of Data Used in Risk Assessment
Groundwater Upper Hydrogeologic Unit Plume Area - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-045	CFMW-045	CFMW-045	CFMW-045	CFMW-045	CFMW-045	CFMW-045A	CFMW-045A	CFMW-045A	CFMW-045A	CFMW-045A	CFMW-045A	CFMW-047	CFMW-047
Sample Lab IDs	460-120318-5	460-125477-11	460-130226-7	460-136263-8	320-40411-1, 460-158628-1	320-43992-4, 460-166400-7	460-120477-2	460-125196-9	460-130333-8	460-135989-5	460-158270-9	460-167033-2	460-120223-7	460-125567-10
Sample Name	CFMW-045-GW	CFMW-045-GW	CFMW-045-GW	CFMW-045-GW	CFMW-045-GW	CFMW-045-GW	CFMW-045a-GW	CFMW-045a-GW	CFMW-045a-GW	CFMW-045a-GW	CFMW-045a-GW	CFMW-045a-GW	CFMW-047-GW	CFMW-047-GW
Chemical	9/15/2016	12/14/2016	3/23/2017	6/28/2017	6/18/2018	10/8/2018	9/19/2016	12/9/2016	3/24/2017	6/23/2017	6/13/2018	10/16/2018	9/14/2016	12/15/2016
GENERAL CHEMISTRY (µg/L)														
Fluoride	--	--	--	2370 J+	--	--	--	--	--	3230	--	--	--	--
Cyanide	--	--	--	428	640	620	--	--	--	67.3	64	75.9	--	--
Cyanide (Free)	--	--	--	14.4 J-	11.5	10.6	--	--	--	2.4 J	6	6.4	--	--
Cyanide	365	392	381	450	645	605	56	34.8	52.9	63.2	54	59.5	120	145
Cyanide (Free)	--	--	2.9 J	33.7 J-	9.6 J-	24	--	--	1.5 U	1.6 J	7.5	4.9 J-	--	--
METALS (µg/L)														
Aluminum	18.2 U	18.5 J	18.2 U	18.2 U	15 U	15 U	18.2 U	18.2 U	18.2 U	18.2 U	15 U	15.4 J	18.2 U	18.2 U
Antimony	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U
Arsenic	0.64 U	0.64 U	0.64 U	0.64 U	0.77 U	0.77 U	0.64 U	0.64 U	0.64 U	0.64 U	0.77 U	0.77 U	0.64 U	0.64 U
Barium	150	155	130	156	164	171	88.5	18.9	115	124	103	96.5	232	244
Beryllium	0.24 U	0.24 U	0.24 U	0.24 U	0.26 U	0.26 U	0.24 U	0.24 U	0.24 U	0.24 U	0.26 U	0.26 U	0.24 U	0.24 U
Cadmium	0.71 U	0.71 U	0.71 U	0.71 U	0.61 U	0.61 U	0.71 U	0.71 U	0.71 U	0.71 U	0.61 U	0.61 U	0.71 U	0.71 U
Calcium	53700	52900	48600	53000	52900	53100	45800	4500	53700	56800	44000	46900	57100	58400
Chromium, Total	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	5	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
Cobalt	1.3 U	1.3 U	1.3 U	1.3 U	1.3 J	1.4 J	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
Copper	3.8 J	2.8 J	1.4 U	1.4 U	1.9 U	1.9 U	1.4 U	1.4 U	1.4 U	1.4 U	1.9 U	1.9 U	4.1	1.4 J
Iron	152	170	147	169	199	226	42.4 U	42.4 U	317	316	127	296	55.1 J	42.4 U
Lead	0.38 U	0.38 U	0.38 U	0.38 U	0.37 U	0.37 U	0.38 U	0.38 U	0.38 U	0.38 U	0.37 U	0.37 U	0.38 U	0.38 U
Magnesium	15600	15500	14100	14300	15600	16000	13000	4800	15100	15200	12600	12400	15600	16600
Manganese	8.8	6.6 J	10.1	2.5 U	2.7 U	2.7 U	23.6	2.5 U	58.2	66.9	23.2	45.6	2.5 U	2.5 U
Mercury	0.17 U	0.17 U	0.17 U	0.17 U	0.12 U	0.12 U	0.17 U	0.17 U	0.17 U	0.17 U	0.12 U	0.12 U	0.17 U	0.17 U
Nickel	1.4 U	1.4 U	1.4 U	1.4 U	1.3 U	1.3 U	1.4 U	1.4 U	1.4 U	1.4 U	1.3 U	1.9 J	1.4 U	1.4 U
Potassium	936	986	860	962	939	1020	2300	3590	1560	1180	1290	1800	1200	972
Selenium	0.73 U	0.73 U	0.73 U	0.73 U	0.69 U	0.69 U	0.73 U	0.73 U	0.73 U	0.73 U	0.69 U	0.69 U	0.73 U	0.73 U
Silver	1.3 U	1.3 U	1.3 U	1.3 U	1.4 U	1.4 U	1.3 U	1.3 U	1.3 U	1.3 U	1.4 U	1.4 U	1.3 U	1.3 U
Sodium	39000	40700	36000	44300	52800	62400	31100	27700	31600	28300	30900	32800	18500	21100
Thallium	0.26 U	0.26 U	0.26 U	0.26 U	0.24 U	0.24 U	0.26 U	0.26 U	0.26 U	0.26 U	0.24 U	0.24 U	0.26 U	0.26 U
Vanadium	1.9 U	1.9 U	1.9 U	1.9 U	1.2 U	1.2 U	2.3 J	4	1.9 U	1.9 U	1.2 U	1.2 U	1.9 U	1.9 U
Zinc	7 U	7 U	7 U	7 U	42.3	5.4 U	7 U	7 U	7 U	7 U	5.4 U	9.5 J	7 U	7 U
Aluminum	--	--	--	139	241	15 U	--	--	--	25.1 J	15 U	27.8 J	--	--
Antimony	--	--	--	0.62 U	0.62 U	1.2 J	--	--	--	0.62 U	0.62 U	1.4 J	--	--
Arsenic	--	--	--	0.64 U	0.77 U	0.77 U	--	--	--	0.64 U	0.77 U	0.77 U	--	--
Barium	--	--	--	175	183	167	--	--	--	127	106	94.6	--	--
Beryllium	--	--	--	0.24 U	0.26 U	0.26 U	--	--	--	0.24 U	0.26 U	0.26 U	--	--
Cadmium	--	--	--	0.71 U	0.61 U	0.61 U	--	--	--	0.71 U	0.61 U	0.61 U	--	--
Calcium	--	--	--	55500	57900	55500	--	--	--	57000	43900	45600	--	--
Chromium, Total	--	--	--	1.3 U	1.3 U	1.3 U	--	--	--	3.2 J	1.3 U	2.3 J	--	--
Cobalt	--	--	--	1.3 J	1.5 J	1.5 J	--	--	--	1.3 U	1.3 U	1.3 U	--	--
Copper	--	--	--	1.4 U	1.9 U	9.7	--	--	--	1.4 U	1.9 U	3.6 J	--	--
Iron	--	--	--	432	348	241	--	--	--	489	324	359	--	--
Lead	--	--	--	0.38 U	0.37 U	0.37 U	--	--	--	0.38 U	0.37 U	0.37 U	--	--
Magnesium	--	--	--	17100	17400	15500	--	--	--	16100	13400	12300	--	--
Manganese	--	--	--	3.5 J	2.7 U	2.7 U	--	--	--	74.9	22.3	28.2	--	--
Mercury	--	--	--	0.17 U	0.12 U	0.12 U	--	--	--	0.17 U	0.12 U	0.12 U	--	--
Nickel	--	--	--	1.4 U	1.3 U	1.3 U	--	--	--	1.4 U	1.3 U	1.3 U	--	--
Potassium	--	--	--	1090	1120	1010	--	--	--	1240	1390	2120	--	--
Selenium	--	--	--	0.73 U	0.69 U	0.69 U	--	--	--	0.73 U	0.69 U	0.69 U	--	--
Silver	--	--	--	1.3 U	1.4 U	1.4 U	--	--	--	1.3 U	1.4 U	1.4 U	--	--
Sodium	--	--	--	54200	60200	54700	--	--	--	32600	32700	34200	--	--
Thallium	--	--	--	0.26 U	0.24 U	0.24 U	--	--	--	0.26 U	0.24 U	0.24 U	--	--
Vanadium	--	--	--	1.9 U	1.2 U	1.2 U	--	--	--	1.9 U	1.4 J	1.9 J	--	--
Zinc	--	--	--	7 U	56	5.4 U	--	--	--	7 U	5.4 U	8.6 J	--	--
POLYCHLORINATED BIPHENYLS (µg/L)														
PCB-1016 (Aroclor 1016)	--	--	--	--	0.12 U	0.12 U	--	--	--	--	--	--	--	--
PCB-1221 (Aroclor 1221)	--	--	--	--	0.12 U	0.12 U	--	--	--	--	--	--	--	--
PCB-1232 (Aroclor 1232)	--	--	--	--	0.12 U	0.12 U	--	--	--	--	--	--	--	--
PCB-1242 (Aroclor 1242)	--	--	--	--	0.12 U	0.12 U	--	--	--	--	--	--	--	--
PCB-1248 (Aroclor 1248)	--	--	--	--	0.12 U	0.12 U	--	--	--	--	--	--	--	--

Table E-38
Summary of Data Used in Risk Assessment
Groundwater Upper Hydrogeologic Unit Plume Area - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-045	CFMW-045	CFMW-045	CFMW-045	CFMW-045	CFMW-045	CFMW-045A	CFMW-045A	CFMW-045A	CFMW-045A	CFMW-045A	CFMW-045A	CFMW-047	CFMW-047
Sample Lab IDs	460-120318-5	460-125477-11	460-130226-7	460-136263-8	320-40411-1, 460-158628-1	320-43992-4, 460-166400-7	460-120477-2	460-125196-9	460-130333-8	460-135989-5	460-158270-9	460-167033-2	460-120223-7	460-125567-10
Sample Name	CFMW-045-GW 9/15/2016	CFMW-045-GW 12/14/2016	CFMW-045-GW 3/23/2017	CFMW-045-GW 6/28/2017	CFMW-045-GW 6/18/2018	CFMW-045-GW 10/8/2018	CFMW-045a-GW 9/19/2016	CFMW-045a-GW 12/9/2016	CFMW-045a-GW 3/24/2017	CFMW-045a-GW 6/23/2017	CFMW-045a-GW 6/13/2018	CFMW-045a-GW 10/16/2018	CFMW-047-GW 9/14/2016	CFMW-047-GW 12/15/2016
Chemical														
PCB-1254 (Aroclor 1254)	--	--	--	--	0.11 U	0.11 U	--	--	--	--	--	--	--	--
PCB-1260 (Aroclor 1260)	--	--	--	--	0.11 U	0.11 U	--	--	--	--	--	--	--	--
PCB-1262 (Aroclor 1262)	--	--	--	--	0.11 U	0.11 U	--	--	--	--	--	--	--	--
PCB-1268 (Aroclor 1268)	--	--	--	--	0.11 U	0.11 U	--	--	--	--	--	--	--	--
Polychlorinated Biphenyl (PCBs)	--	--	--	--	0.12 U	0.12 U	--	--	--	--	--	--	--	--
SEMIVOLATILE ORGANIC COMPOUNDS (µg/L)														
1,2,4,5-Tetrachlorobenzene	0.43 U	0.43 U	0.45 U	0.43 U	--	--	--	--	--	--	--	--	0.44 U	0.45 UJ
1,4-Dioxane (P-Dioxane)	3.1 U	3.1 UJ	3.3 U	3.1 U	--	--	--	--	--	--	--	--	3.2 U	3.2 U
2,3,4,6-Tetrachlorophenol	0.69 U	0.69 U	0.72 U	0.69 U	--	--	--	--	--	--	--	--	0.7 U	0.72 U
2,4,5-Trichlorophenol	0.49 U	0.49 U	0.51 U	0.49 U	--	--	--	--	--	--	--	--	0.5 U	0.51 U
2,4,6-Trichlorophenol	0.53 U	0.53 U	0.55 U	0.53 U	--	--	--	--	--	--	--	--	0.54 U	0.55 U
2,4-Dichlorophenol	0.63 U	0.63 U	0.66 U	0.63 U	--	--	--	--	--	--	--	--	0.64 U	0.65 U
2,4-Dimethylphenol	0.91 U	0.91 U	0.95 U	0.91 U	--	--	--	--	--	--	--	--	0.93 U	0.94 U
2,4-Dinitrophenol	2.4 U	2.4 U	2.5 U	2.4 U	--	--	--	--	--	--	--	--	2.4 UJ	2.5 U
2,4-Dinitrotoluene	1 U	1 U	1.1 U	1 U	--	--	--	--	--	--	--	--	1.1 U	1.1 U
2,6-Dinitrotoluene	0.88 U	0.88 U	0.92 U	0.88 U	--	--	--	--	--	--	--	--	0.9 U	0.91 U
2-Chloronaphthalene	0.61 U	0.61 U	0.64 U	0.61 U	--	--	--	--	--	--	--	--	0.62 U	0.63 U
2-Chlorophenol	0.74 U	0.74 U	0.77 U	0.74 U	--	--	--	--	--	--	--	--	0.76 U	0.77 U
2-Methylnaphthalene	0.88 U	0.88 U	0.92 U	0.88 U	--	--	--	--	--	--	--	--	0.9 U	0.91 U
2-Methylphenol (O-Cresol)	1.3 U	1.3 U	1.3 U	1.3 U	--	--	--	--	--	--	--	--	1.3 U	1.3 U
2-Nitroaniline	0.65 UJ	0.65 U	0.68 U	0.65 U	--	--	--	--	--	--	--	--	0.66 UJ	0.67 U
2-Nitrophenol	0.59 U	0.59 U	0.62 U	0.59 U	--	--	--	--	--	--	--	--	0.6 U	0.61 U
3- And 4- Methylphenol (Total)	0.88 UJ	0.88 U	0.92 U	0.88 U	--	--	--	--	--	--	--	--	0.9 UJ	0.91 U
3,3'-Dichlorobenzidine	1 U	1 U	1.1 U	1 U	--	--	--	--	--	--	--	--	1.1 U	1.1 U
3-Nitroaniline	0.82 U	0.82 U	0.86 U	0.82 U	--	--	--	--	--	--	--	--	0.84 U	0.85 U
4,6-Dinitro-2-Methylphenol	2 U	2 U	2.1 U	2 U	--	--	--	--	--	--	--	--	2.1 U	2.1 U
4-Bromophenyl Phenyl Ether	1 U	1 U	1.1 U	1 U	--	--	--	--	--	--	--	--	1 U	1.1 U
4-Chloro-3-Methylphenol	0.76 U	0.76 U	0.79 U	0.76 U	--	--	--	--	--	--	--	--	0.78 U	0.79 U
4-Chloroaniline	0.73 U	0.73 U	0.76 U	0.73 U	--	--	--	--	--	--	--	--	0.74 U	0.76 U
4-Chlorophenyl Phenyl Ether	0.96 U	0.96 U	1 U	0.96 U	--	--	--	--	--	--	--	--	0.98 U	1 U
4-Nitroaniline	0.48 U	0.48 U	0.5 U	0.48 U	--	--	--	--	--	--	--	--	0.49 U	0.5 U
4-Nitrophenol	4.7 U	4.7 U	4.9 U	4.7 U	--	--	--	--	--	--	--	--	4.7 U	4.8 U
Acenaphthene	0.88 U	0.88 UJ	0.92 U	0.88 U	--	--	--	--	--	--	--	--	0.9 U	0.91 UJ
Acenaphthylene	0.65 U	0.65 U	0.68 U	0.65 U	--	--	--	--	--	--	--	--	0.66 U	0.67 U
Acetophenone	1 U	1 U	1.1 U	1 U	--	--	--	--	--	--	--	--	1.1 U	1.1 U
Anthracene	0.57 U	0.57 U	0.6 U	0.57 U	--	--	--	--	--	--	--	--	0.58 U	0.59 U
Atrazine	0.77 U	0.77 U	0.81 U	0.77 U	--	--	--	--	--	--	--	--	0.79 U	0.8 U
Benzaldehyde	0.86 U	0.86 U	0.9 U	0.86 U	--	--	--	--	--	--	--	--	0.88 U	0.89 U
Benzo(A)Anthracene	0.55 U	0.55 U	0.58 U	0.55 U	--	--	--	--	--	--	--	--	0.56 U	0.57 U
Benzo(A)Pyrene	0.16 U	0.16 U	0.17 U	0.16 U	--	--	--	--	--	--	--	--	0.16 U	0.17 U
Benzo(B)Fluoranthene	0.44 U	0.44 U	0.46 U	0.44 U	--	--	--	--	--	--	--	--	0.45 U	0.46 U
Benzo(G,H,I)Perylene	0.75 U	0.75 U	0.78 U	0.75 U	--	--	--	--	--	--	--	--	0.77 U	0.78 U
Benzo(K)Fluoranthene	0.18 U	0.18 U	0.19 U	0.18 U	--	--	--	--	--	--	--	--	0.18 U	0.19 U
Benzyl Butyl Phthalate	0.6 U	0.6 U	0.63 U	0.6 U	--	--	--	--	--	--	--	--	0.61 U	0.62 U
Biphenyl (Diphenyl)	0.63 U	0.63 U	0.66 U	0.63 U	--	--	--	--	--	--	--	--	0.64 U	0.65 UJ
Bis(2-Chloroethoxy) Methane	0.69 U	0.69 U	0.72 U	0.69 U	--	--	--	--	--	--	--	--	0.7 U	0.72 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.12 U	0.12 UJ	0.13 U	0.12 U	--	--	--	--	--	--	--	--	0.12 U	0.12 UJ
Bis(2-Chloroisopropyl) Ether	0.93 U	0.93 U	0.97 U	0.93 U	--	--	--	--	--	--	--	--	0.95 U	0.96 U
Bis(2-Ethylhexyl) Phthalate	0.72 U	0.72 U	0.75 U	0.72 U	--	--	--	--	--	--	--	--	0.73 U	0.75 U
Caprolactam	1.1 U	1.1 U	1.1 U	1.1 U	--	--	--	--	--	--	--	--	1.1 U	1.1 U
Carbazole	0.85 U	0.85 U	0.89 U	0.85 U	--	--	--	--	--	--	--	--	0.87 U	0.88 U
Chrysene	0.67 U	0.67 U	0.7 U	0.67 U	--	--	--	--	--	--	--	--	0.68 U	0.7 U
Dibenz(A,H)Anthracene	0.09 U	0.09 U	0.094 U	0.09 U	--	--	--	--	--	--	--	--	0.092 U	0.093 U
Dibenzofuran	0.85 U	0.85 U	0.89 U	0.85 U	--	--	--	--	--	--	--	--	0.87 U	0.88 U
Diethyl Phthalate	1 U	1 U	1 U	1 U	--	--	--	--	--	--	--	--	1 U	1 U
Dimethyl Phthalate	0.98 U	0.98 U	1 U	0.98 U	--	--	--	--	--	--	--	--	1 U	1 U
Di-N-Butyl Phthalate	0.82 U	0.82 U	0.86 U	0.82 U	--	--	--	--	--	--	--	--	0.84 U	0.85 U
Di-N-Octylphthalate	0.69 U	0.69 U	0.72 U	0.69 U	--	--	--	--	--	--	--	--	0.7 U	0.72 U
Fluoranthene	0.72 U	0.72 U	0.75 U	0.72 U	--	--	--	--	--	--	--	--	0.73 U	0.75 U

Table E-38
Summary of Data Used in Risk Assessment
Groundwater Upper Hydrogeologic Unit Plume Area - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Chemical	CFMW-045 460-120318-5 CFMW-045-GW 9/15/2016	CFMW-045 460-125477-11 CFMW-045-GW 12/14/2016	CFMW-045 460-130226-7 CFMW-045-GW 3/23/2017	CFMW-045 460-136263-8 CFMW-045-GW 6/28/2017	CFMW-045 320-40411-1, 460-158628-1 CFMW-045-GW 6/18/2018	CFMW-045 320-43992-4, 460-166400-7 CFMW-045-GW 10/8/2018	CFMW-045A 460-120477-2 CFMW-045a-GW 9/19/2016	CFMW-045A 460-125196-9 CFMW-045a-GW 12/9/2016	CFMW-045A 460-130333-8 CFMW-045a-GW 3/24/2017	CFMW-045A 460-135989-5 CFMW-045a-GW 6/23/2017	CFMW-045A 460-158270-9 CFMW-045a-GW 6/13/2018	CFMW-045A 460-167033-2 CFMW-045a-GW 10/16/2018	CFMW-047 460-120223-7 CFMW-047-GW 9/14/2016	CFMW-047 460-125567-10 CFMW-047-GW 12/15/2016
Fluorene	0.8 U	0.8 U	0.84 U	0.8 U	--	--	--	--	--	--	--	--	0.82 U	0.83 U
Hexachlorobenzene	0.47 U	0.47 U	0.49 U	0.47 U	--	--	--	--	--	--	--	--	0.48 U	0.49 U
Hexachlorobutadiene	0.76 U	0.76 U	0.79 U	0.76 U	--	--	--	--	--	--	--	--	0.78 U	0.79 U
Hexachlorocyclopentadiene	0.61 U	0.61 U	0.64 U	0.61 U	--	--	--	--	--	--	--	--	0.62 U	0.63 U
Hexachloroethane	0.09 U	0.09 U	0.094 U	0.09 U	--	--	--	--	--	--	--	--	0.092 U	0.093 U
Indeno(1,2,3-C,D)Pyrene	0.21 U	0.21 U	0.22 U	0.21 U	--	--	--	--	--	--	--	--	0.21 U	0.22 U
Isophorone	0.67 U	0.67 U	0.7 U	0.67 U	--	--	--	--	--	--	--	--	0.68 U	0.7 U
Naphthalene	0.8 U	0.8 U	0.84 U	0.8 U	--	--	--	--	--	--	--	--	0.82 U	0.83 U
Nitrobenzene	0.49 U	0.49 U	0.51 U	0.49 U	--	--	--	--	--	--	--	--	0.5 U	0.51 U
N-Nitrosodi-N-Propylamine	0.83 UJ	0.83 U	0.87 U	0.83 U	--	--	--	--	--	--	--	--	0.85 UJ	0.86 U
N-Nitrosodiphenylamine	0.74 U	0.74 UJ	0.77 U	0.74 U	--	--	--	--	--	--	--	--	0.76 U	0.77 U
Pentachlorophenol	2.2 U	2.2 UJ	2.3 U	2.2 U	--	--	--	--	--	--	--	--	2.2 UR	2.3 UJ
Phenanthrene	0.65 U	0.65 U	0.68 U	0.65 U	--	--	--	--	--	--	--	--	0.66 U	0.67 U
Phenol	0.41 U	0.41 U	0.43 U	0.41 U	--	--	--	--	--	--	--	--	0.42 U	0.43 U
Pyrene	0.83 U	0.83 U	0.87 U	0.83 U	--	--	--	--	--	--	--	--	0.85 U	0.86 U
SEMIVOLATILE ORGANIC COMPOUNDS|LOW LEVEL (µg/L)														
1,2,4,5-Tetrachlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,4-Dioxane (P-Dioxane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,3,4,6-Tetrachlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4,5-Trichlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4,6-Trichlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4-Dichlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4-Dimethylphenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4-Dinitrophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4-Dinitrotoluene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,6-Dinitrotoluene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Chloronaphthalene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Chlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Methylnaphthalene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Methylphenol (O-Cresol)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Nitroaniline	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Nitrophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3,3'-Dichlorobenzidine	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3-Nitroaniline	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4,6-Dinitro-2-Methylphenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Bromophenyl Phenyl Ether	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Chloro-3-Methylphenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Chloroaniline	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Chlorophenyl Phenyl Ether	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Nitroaniline	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Nitrophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acenaphthene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acenaphthylene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acetophenone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Anthracene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Atrazine	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzaldehyde	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(A)Anthracene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(A)Pyrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(B)Fluoranthene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(G,H,I)Perylene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(K)Fluoranthene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzyl Butyl Phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Biphenyl (Diphenyl)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bis(2-Chloroethoxy) Methane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bis(2-Chloroisopropyl) Ether	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bis(2-Ethylhexyl) Phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Caprolactam	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Table E-38
Summary of Data Used in Risk Assessment
Groundwater Upper Hydrogeologic Unit Plume Area - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-045	CFMW-045	CFMW-045	CFMW-045	CFMW-045	CFMW-045	CFMW-045A	CFMW-045A	CFMW-045A	CFMW-045A	CFMW-045A	CFMW-045A	CFMW-047	CFMW-047
Sample Lab IDs	460-120318-5	460-125477-11	460-130226-7	460-136263-8	320-40411-1, 460-158628-1	320-43992-4, 460-166400-7	460-120477-2	460-125196-9	460-130333-8	460-135989-5	460-158270-9	460-167033-2	460-120223-7	460-125567-10
Sample Name Chemical	CFMW-045-GW 9/15/2016	CFMW-045-GW 12/14/2016	CFMW-045-GW 3/23/2017	CFMW-045-GW 6/28/2017	CFMW-045-GW 6/18/2018	CFMW-045-GW 10/8/2018	CFMW-045a-GW 9/19/2016	CFMW-045a-GW 12/9/2016	CFMW-045a-GW 3/24/2017	CFMW-045a-GW 6/23/2017	CFMW-045a-GW 6/13/2018	CFMW-045a-GW 10/16/2018	CFMW-047-GW 9/14/2016	CFMW-047-GW 12/15/2016
Carbazole	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chrysene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibenz(A,H)Anthracene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibenzofuran	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Diethyl Phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dimethyl Phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Di-N-Butyl Phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Di-N-Octylphthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Fluoranthene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Fluorene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorobutadiene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorocyclopentadiene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Indeno(1,2,3-C,D)Pyrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Isophorone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Naphthalene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Nitrobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
N-Nitrosodi-N-Propylamine	--	--	--	--	--	--	--	--	--	--	--	--	--	--
N-Nitrosodiphenylamine	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Pentachlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Phenanthrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Phenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Pyrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
VOLATILE ORGANIC COMPOUNDS (µg/L)														
1,1,1-Trichloroethane	0.28 U	0.28 U	0.28 U	0.28 U	--	--	--	--	--	--	--	--	0.28 U	0.28 U
1,1,2,2-Tetrachloroethane	0.19 U	0.19 U	0.19 U	0.19 U	--	--	--	--	--	--	--	--	0.19 U	0.19 U
1,1,2-Trichloro-1,2,2-Trifluoroethane	0.34 U	0.34 U	0.34 U	0.34 U	--	--	--	--	--	--	--	--	0.34 U	0.34 U
1,1,2-Trichloroethane	0.08 U	0.08 U	0.08 U	0.08 U	--	--	--	--	--	--	--	--	0.08 U	0.08 U
1,1-Dichloroethane	0.24 U	0.24 U	0.24 U	0.24 U	--	--	--	--	--	--	--	--	0.24 U	0.24 U
1,1-Dichloroethene	0.34 U	0.34 U	0.34 U	0.34 U	--	--	--	--	--	--	--	--	0.34 U	0.34 U
1,2,3-Trichlorobenzene	0.35 U	0.35 U	0.35 U	0.35 U	--	--	--	--	--	--	--	--	0.35 U	0.35 U
1,2,4-Trichlorobenzene	0.27 U	0.27 U	0.27 U	0.27 U	--	--	--	--	--	--	--	--	0.27 U	0.27 U
1,2-Dibromo-3-Chloropropane	0.23 U	0.23 UJ	0.23 U	0.23 U	--	--	--	--	--	--	--	--	0.23 U	0.23 UJ
1,2-Dibromoethane (Ethylene Dibromide)	0.19 U	0.19 U	0.19 U	0.19 U	--	--	--	--	--	--	--	--	0.19 U	0.19 U
1,2-Dichlorobenzene	0.22 U	0.22 U	0.22 U	0.22 U	--	--	--	--	--	--	--	--	0.22 U	0.22 U
1,2-Dichloroethane	0.25 U	0.25 U	0.25 U	0.25 U	--	--	--	--	--	--	--	--	0.25 U	0.25 U
1,2-Dichloropropane	0.18 U	0.18 U	0.18 U	0.18 U	--	--	--	--	--	--	--	--	0.18 U	0.18 U
1,3-Dichlorobenzene	0.33 U	0.33 U	0.33 U	0.33 U	--	--	--	--	--	--	--	--	0.33 U	0.33 U
1,4-Dichlorobenzene	0.33 U	0.33 U	0.33 U	0.33 U	--	--	--	--	--	--	--	--	0.33 U	0.33 U
2-Hexanone	0.72 U	0.72 U	0.72 U	0.72 U	--	--	--	--	--	--	--	--	0.72 U	0.72 U
Acetone	1.1 U	1.1 UJ	2.8 J	1.1 U	--	--	--	--	--	--	--	--	10	1.1 UJ
Benzene	0.09 U	0.09 U	0.09 U	0.09 U	--	--	--	--	--	--	--	--	0.09 U	0.09 U
Bromochloromethane	0.3 U	0.3 U	0.3 U	0.3 U	--	--	--	--	--	--	--	--	0.3 U	0.3 U
Bromodichloromethane	0.15 U	0.15 U	0.15 U	0.15 U	--	--	--	--	--	--	--	--	0.15 U	0.15 U
Bromoform	0.18 U	0.18 U	0.18 U	0.18 U	--	--	--	--	--	--	--	--	0.18 U	0.18 U
Bromomethane	0.18 U	0.18 U	0.18 U	0.18 U	--	--	--	--	--	--	--	--	0.18 U	0.18 U
Carbon Disulfide	0.22 U	0.22 U	0.22 U	0.22 U	--	--	--	--	--	--	--	--	3	0.22 U
Carbon Tetrachloride	0.33 U	0.33 U	0.33 U	0.33 U	--	--	--	--	--	--	--	--	0.33 U	0.33 U
Chlorobenzene	0.24 U	0.24 U	0.24 U	0.24 U	--	--	--	--	--	--	--	--	0.24 U	0.24 U
Chloroethane	0.37 U	0.37 U	0.37 U	0.37 U	--	--	--	--	--	--	--	--	0.37 U	0.37 U
Chloroform	0.22 U	0.22 U	0.22 U	0.22 U	--	--	--	--	--	--	--	--	0.22 U	0.22 U
Chloromethane	0.22 U	0.22 U	0.22 U	0.22 U	--	--	--	--	--	--	--	--	0.22 U	0.22 U
Cis-1,2-Dichloroethylene	0.26 U	0.26 U	0.26 U	0.26 U	--	--	--	--	--	--	--	--	0.26 U	0.26 U
Cis-1,3-Dichloropropene	0.16 U	0.16 U	0.16 U	0.16 U	--	--	--	--	--	--	--	--	0.16 U	0.16 U
Cyclohexane	0.26 U	0.26 U	0.26 U	0.26 UJ	--	--	--	--	--	--	--	--	0.26 U	0.26 U
Dibromochloromethane	0.22 U	0.22 U	0.22 U	0.22 U	--	--	--	--	--	--	--	--	0.22 U	0.22 U
Dichlorodifluoromethane	0.14 U	0.14 U	0.14 U	0.14 UJ	--	--	--	--	--	--	--	--	0.14 U	0.14 U
Ethylbenzene	0.3 U	0.3 U	0.3 U	0.3 U	--	--	--	--	--	--	--	--	0.3 U	0.3 U

Table E-38
Summary of Data Used in Risk Assessment
Groundwater Upper Hydrogeologic Unit Plume Area - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-045	CFMW-045	CFMW-045	CFMW-045	CFMW-045	CFMW-045	CFMW-045A	CFMW-045A	CFMW-045A	CFMW-045A	CFMW-045A	CFMW-045A	CFMW-047	CFMW-047
Sample Lab IDs	460-120318-5	460-125477-11	460-130226-7	460-136263-8	320-40411-1, 460-158628-1	320-43992-4, 460-166400-7	460-120477-2	460-125196-9	460-130333-8	460-135989-5	460-158270-9	460-167033-2	460-120223-7	460-125567-10
Sample Name Chemical	CFMW-045-GW 9/15/2016	CFMW-045-GW 12/14/2016	CFMW-045-GW 3/23/2017	CFMW-045-GW 6/28/2017	CFMW-045-GW 6/18/2018	CFMW-045-GW 10/8/2018	CFMW-045a-GW 9/19/2016	CFMW-045a-GW 12/9/2016	CFMW-045a-GW 3/24/2017	CFMW-045a-GW 6/23/2017	CFMW-045a-GW 6/13/2018	CFMW-045a-GW 10/16/2018	CFMW-047-GW 9/14/2016	CFMW-047-GW 12/15/2016
Isopropylbenzene (Cumene)	0.32 U	0.32 U	0.32 U	0.32 U	--	--	--	--	--	--	--	--	0.32 U	0.32 U
M,P-Xylene	0.28 U	0.28 U	0.28 U	0.28 U	--	--	--	--	--	--	--	--	0.28 U	0.28 U
Methyl Acetate	0.58 U	0.58 UJ	0.58 U	0.58 U	--	--	--	--	--	--	--	--	0.58 U	0.58 UJ
Methyl Ethyl Ketone (2-Butanone)	2.2 U	2.2 U	2.2 U	2.2 U	--	--	--	--	--	--	--	--	2.2 U	2.2 U
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	0.63 U	0.63 U	0.63 U	0.63 U	--	--	--	--	--	--	--	--	0.63 U	0.63 U
Methylcyclohexane	0.22 U	0.22 U	0.22 U	0.22 UJ	--	--	--	--	--	--	--	--	0.22 U	0.22 U
Methylene Chloride	0.21 U	0.51 J	0.21 U	0.21 U	--	--	--	--	--	--	--	--	0.21 U	0.21 U
O-Xylene (1,2-Dimethylbenzene)	0.32 U	0.32 U	0.32 U	0.32 U	--	--	--	--	--	--	--	--	0.32 U	0.32 U
Styrene	0.17 U	0.17 U	0.17 U	0.17 U	--	--	--	--	--	--	--	--	0.17 U	0.17 U
Tert-Butyl Methyl Ether	0.13 U	0.13 U	0.13 U	0.13 U	--	--	--	--	--	--	--	--	0.13 U	0.13 U
Tetrachloroethylene (PCE)	0.12 U	0.12 U	0.12 U	0.12 U	--	--	--	--	--	--	--	--	0.12 U	0.12 U
Toluene	0.25 U	0.25 U	0.25 U	0.25 U	--	--	--	--	--	--	--	--	2.2	0.66 J
Trans-1,2-Dichloroethene	0.18 U	0.18 U	0.18 U	0.18 U	--	--	--	--	--	--	--	--	0.18 U	0.18 U
Trans-1,3-Dichloropropene	0.19 U	0.19 U	0.19 U	0.19 U	--	--	--	--	--	--	--	--	0.19 U	0.19 U
Trichloroethylene (TCE)	0.22 U	0.22 U	0.22 U	0.22 U	--	--	--	--	--	--	--	--	0.22 U	0.22 U
Trichlorofluoromethane	0.15 U	0.15 UJ	0.15 U	0.15 U	--	--	--	--	--	--	--	--	0.15 U	0.15 UJ
Vinyl Chloride	0.06 U	0.06 U	0.06 U	0.06 U	--	--	--	--	--	--	--	--	0.06 U	0.06 U

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-38
Summary of Data Used in Risk Assessment
Groundwater Upper Hydrogeologic Unit Plume Area - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-047	CFMW-047	CFMW-047	CFMW-047	CFMW-053	CFMW-053	CFMW-053	CFMW-053	CFMW-053	CFMW-054	CFMW-054	CFMW-054	CFMW-054	CFMW-054
Sample Lab IDs	460-130226-5	460-135818-6	320-40194-3, 460-157970-6	320-43930-1, 460-166151-1	460-120223-5	460-125342-3	460-136263-10	460-158628-2	460-167096-3	460-120223-6	460-125342-4	460-130225-5	460-135818-12	460-158628-3
Sample Name	CFMW-047-GW	CFMW-047-GW	CFMW-047-GW	CFMW-047-GW	CFMW-053-GW	CFMW-053-GW	CFMW-053-GW	CFMW-053-GW	CFMW-053-GW	CFMW-054-GW	CFMW-054-GW	CFMW-054-GW	CFMW-054-GW	CFMW-054-GW
Chemical	3/23/2017	6/21/2017	6/8/2018	10/4/2018	9/14/2016	12/12/2016	6/28/2017	6/18/2018	10/17/2018	9/14/2016	12/12/2016	3/22/2017	6/21/2017	6/18/2018
GENERAL CHEMISTRY (µg/L)														
Fluoride	--	2100	--	--	--	--	1740 J+	--	--	--	--	--	1910	--
Cyanide	--	120	176	245	--	--	238	439	474	--	--	--	284	300
Cyanide (Free)	--	4.1 J	8.9	2.3 J	--	--	3.3 J-	18.1 J-	16.8	--	--	--	19.1	14
Cyanide	171	119	159	246	363	386	239	447	474	327	382	391	302	296
Cyanide (Free)	1.5 U	10	10.3 J-	5.3	--	--	5.2 J-	29.4 J-	19.8 J-	--	--	13.5	40.3	16.3 J-
METALS (µg/L)														
Aluminum	20.7 J	18.2 U	55.8	15 U	18.2 U	18.2 U	18.2 U	15 U	15.5 J	18.2 U	18.2 U	18.2 U	18.2 U	15 U
Antimony	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U
Arsenic	0.64 U	0.64 U	0.77 U	0.77 U	0.64 U	0.64 U	0.64 U	0.77 U	0.77 U	0.64 U	0.64 U	0.64 U	0.64 U	0.77 U
Barium	217	201	227	243	147	143	132	153	138	153	153	146	145	149
Beryllium	0.24 U	0.24 U	0.26 U	0.26 U	0.24 U	0.24 U	0.24 U	0.26 U	0.26 U	0.24 U	0.24 U	0.24 U	0.24 U	0.26 U
Cadmium	0.71 U	0.71 U	0.61 U	0.61 U	0.71 U	0.71 U	0.71 U	0.61 U	0.61 U	0.71 U	0.71 U	0.71 U	0.71 U	0.61 U
Calcium	53000	49500	62100	58500	58200	55100	57100	58600	55400	59400	56200	56100	57400	59800
Chromium, Total	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
Cobalt	1.3 U	1.3 U	1.3 U	1.3 U	1.3 J	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
Copper	1.4 J	1.4 U	5.2	1.9 U	4.6	1.4 U	1.4 U	1.9 U	1.9 U	1.4 U	1.4 U	1.4 U	1.4 U	1.9 U
Iron	95.6 J	45.6 J	67.6 J	73.8 J	179	135	86.8 J	147	199	156	126	167	163	93.7 J
Lead	0.38 U	0.38 U	0.45 J	0.37 U	0.38 U	0.38 U	0.38 U	0.37 U	0.37 U	0.38 U	0.38 U	0.38 U	0.38 U	0.37 U
Magnesium	15300	13700	15300	17400	16600	15600	15500	16000	16200	16500	15600	16200	16200	15700
Manganese	2.5 U	2.5 U	3 J	2.7 U	2.5 U	2.5 U	2.5 U	2.7 U	2.8 J	2.5 U	2.5 U	2.5 U	2.5 U	2.7 U
Mercury	0.17 U	0.17 U	0.12 U	0.12 U	0.17 U	0.17 U	0.17 U	0.12 U	0.12 U	0.17 U	0.17 U	0.17 U	0.17 U	0.12 U
Nickel	1.4 U	1.4 U	1.3 U	1.3 U	1.4 U	1.4 U	1.4 U	1.3 U	1.3 U	1.4 U	1.4 U	1.4 U	1.4 U	1.3 U
Potassium	907	875	4580	964	1070	918	868	1020	933	1050	931	1000	958	1020
Selenium	0.73 U	0.73 U	0.69 U	0.69 U	0.73 U	0.73 U	0.73 U	0.69 U	0.69 U	0.73 U	0.73 U	0.73 U	0.73 U	0.69 U
Silver	1.3 U	1.3 U	1.4 U	1.4 U	1.3 U	1.3 U	1.3 U	1.4 U	1.4 U	1.3 U	1.3 U	1.3 U	1.3 U	1.4 U
Sodium	23600	16400	23200	26000	44000	41900	24500	37700	48400	38800	38900	41100	34800	31200
Thallium	0.26 U	0.26 U	0.24 U	0.24 U	0.26 U	0.26 U	0.26 U	0.24 U	0.24 U	0.26 U	0.26 U	0.26 U	0.26 U	0.24 U
Vanadium	1.9 U	1.9 U	1.2 U	1.2 U	1.9 U	1.9 U	1.9 U	1.2 U	1.2 U	1.9 U	1.9 U	1.9 U	1.9 U	1.2 U
Zinc	7 U	7 U	6.9 J	5.4 U	7 U	7 U	7 U	31.8	5.4 U	7 U	7 U	7 U	7 U	9.8 J
Aluminum	--	39.6 J	80.3	15 U	--	--	18.2 U	15 U	132	--	--	--	277	79.1
Antimony	--	0.62 U	1.2 J	0.62 U	--	--	0.62 U	0.62 U	0.62 U	--	--	--	0.62 U	0.62 U
Arsenic	--	0.64 U	0.77 U	0.77 U	--	--	0.64 U	0.77 U	0.77 U	--	--	--	0.64 U	0.77 U
Barium	--	209	208	249	--	--	145	152	162	--	--	--	148	144
Beryllium	--	0.24 U	0.26 U	0.26 U	--	--	0.24 U	0.26 U	0.26 U	--	--	--	0.24 U	0.26 U
Cadmium	--	0.71 U	0.61 U	0.61 U	--	--	0.71 U	0.61 U	0.61 U	--	--	--	0.71 U	0.61 U
Calcium	--	51300	53300	59300 J	--	--	57600	58700	62200	--	--	--	57800	57500
Chromium, Total	--	1.3 U	1.5 J	1.3 U	--	--	1.3 U	1.3 U	1.3 U	--	--	--	1.3 U	1.3 U
Cobalt	--	1.3 U	1.3 U	1.3 U	--	--	1.3 U	1.3 U	1.3 J	--	--	--	1.3 U	1.3 U
Copper	--	2.3 J	6.4	2.9 J	--	--	2 J	1.9 U	1.9 U	--	--	--	1.4 U	1.9 U
Iron	--	105 J	345	93 J	--	--	116 J	167	414	--	--	--	463	99.5 J
Lead	--	0.38 U	0.61 J	0.37 U	--	--	0.38 U	0.37 U	0.37 U	--	--	--	0.38 U	0.37 U
Magnesium	--	15700	15500	17700	--	--	17800	17500	18200	--	--	--	17400	16300
Manganese	--	2.5 U	5.2 J	2.7 U	--	--	2.5 U	2.7 U	7.6 J	--	--	--	9.2	2.7 U
Mercury	--	0.17 U	0.12 U	0.12 U	--	--	0.17 U	0.12 U	0.12 U	--	--	--	0.17 U	0.12 U
Nickel	--	1.4 U	1.3 U	1.3 U	--	--	1.4 U	1.3 U	1.3 U	--	--	--	1.4 U	1.3 U
Potassium	--	909	4550	977	--	--	920	976	1120	--	--	--	1020	925
Selenium	--	0.73 U	0.69 U	0.69 U	--	--	0.73 U	0.69 U	0.69 U	--	--	--	0.73 U	0.69 U
Silver	--	1.3 U	1.4 U	1.4 U	--	--	1.3 U	1.4 U	1.4 U	--	--	--	1.3 U	1.4 U
Sodium	--	19100	23100	26300	--	--	28600	43300	54400	--	--	--	36400	32400
Thallium	--	0.26 U	0.24 U	0.24 U	--	--	0.26 U	0.24 U	0.24 U	--	--	--	0.26 U	0.24 U
Vanadium	--	1.9 U	1.2 U	1.2 U	--	--	1.9 U	1.2 U	1.2 U	--	--	--	1.9 U	1.2 U
Zinc	--	7 U	8.2 J	5.4 U	--	--	7 U	30.8	5.4 U	--	--	--	7 U	14.4 J
POLYCHLORINATED BIPHENYLS (µg/L)														
PCB-1016 (Aroclor 1016)	--	--	0.12 U	0.12 U	--	--	--	--	--	--	--	--	--	--
PCB-1221 (Aroclor 1221)	--	--	0.12 U	0.12 U	--	--	--	--	--	--	--	--	--	--
PCB-1232 (Aroclor 1232)	--	--	0.12 U	0.12 U	--	--	--	--	--	--	--	--	--	--
PCB-1242 (Aroclor 1242)	--	--	0.12 U	0.12 U	--	--	--	--	--	--	--	--	--	--
PCB-1248 (Aroclor 1248)	--	--	0.12 U	0.12 U	--	--	--	--	--	--	--	--	--	--

Table E-38
Summary of Data Used in Risk Assessment
Groundwater Upper Hydrogeologic Unit Plume Area - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-047	CFMW-047	CFMW-047	CFMW-047	CFMW-053	CFMW-053	CFMW-053	CFMW-053	CFMW-053	CFMW-054	CFMW-054	CFMW-054	CFMW-054	CFMW-054
Sample Lab IDs	460-130226-5	460-135818-6	320-40194-3, 460-157970-6	320-43930-1, 460-166151-1	460-120223-5	460-125342-3	460-136263-10	460-158628-2	460-167096-3	460-120223-6	460-125342-4	460-130225-5	460-135818-12	460-158628-3
Sample Name Chemical	CFMW-047-GW 3/23/2017	CFMW-047-GW 6/21/2017	CFMW-047-GW 6/8/2018	CFMW-047-GW 10/4/2018	CFMW-053-GW 9/14/2016	CFMW-053-GW 12/12/2016	CFMW-053-GW 6/28/2017	CFMW-053-GW 6/18/2018	CFMW-053-GW 10/17/2018	CFMW-054-GW 9/14/2016	CFMW-054-GW 12/12/2016	CFMW-054-GW 3/22/2017	CFMW-054-GW 6/21/2017	CFMW-054-GW 6/18/2018
PCB-1254 (Aroclor 1254)	--	--	0.11 U	0.11 U	--	--	--	--	--	--	--	--	--	--
PCB-1260 (Aroclor 1260)	--	--	0.11 U	0.11 U	--	--	--	--	--	--	--	--	--	--
PCB-1262 (Aroclor 1262)	--	--	0.11 U	0.11 U	--	--	--	--	--	--	--	--	--	--
PCB-1268 (Aroclor 1268)	--	--	0.11 U	0.11 U	--	--	--	--	--	--	--	--	--	--
Polychlorinated Biphenyl (PCBs)	--	--	0.12 U	0.12 U	--	--	--	--	--	--	--	--	--	--
SEMIVOLATILE ORGANIC COMPOUNDS (µg/L)														
1,2,4,5-Tetrachlorobenzene	0.45 U	0.43 U	--	--	0.45 U	0.43 U	0.43 U	--	--	0.45 U	0.43 U	0.43 U	0.43 U	--
1,4-Dioxane (P-Dioxane)	3.2 U	3.1 U	--	--	3.3 U	3.1 U	3.1 U	--	--	3.2 U	3.1 U	3.1 U	3.1 U	--
2,3,4,6-Tetrachlorophenol	0.72 U	0.69 U	--	--	0.72 U	0.69 U	0.69 U	--	--	0.72 U	0.69 U	0.69 U	0.69 U	--
2,4,5-Trichlorophenol	0.51 U	0.49 U	--	--	0.51 U	0.49 U	0.49 U	--	--	0.51 U	0.49 U	0.49 U	0.49 U	--
2,4,6-Trichlorophenol	0.55 U	0.53 U	--	--	0.55 U	0.53 U	0.53 U	--	--	0.55 U	0.53 U	0.53 U	0.53 U	--
2,4-Dichlorophenol	0.66 U	0.63 U	--	--	0.66 U	0.63 U	0.63 U	--	--	0.66 U	0.63 U	0.63 U	0.63 U	--
2,4-Dimethylphenol	0.95 U	0.91 U	--	--	0.95 U	0.91 U	0.91 U	--	--	0.95 U	0.91 U	0.91 U	0.91 U	--
2,4-Dinitrophenol	2.5 U	2.4 U	--	--	2.5 UJ	2.4 U	2.4 U	--	--	2.5 UJ	2.4 U	2.4 U	2.4 U	--
2,4-Dinitrotoluene	1.1 U	1 U	--	--	1.1 U	1 U	1 U	--	--	1.1 U	1 U	1 U	1 U	--
2,6-Dinitrotoluene	0.92 U	0.88 U	--	--	0.92 U	0.88 U	0.88 U	--	--	0.92 U	0.88 U	0.88 U	0.88 U	--
2-Chloronaphthalene	0.64 U	0.61 U	--	--	0.64 U	0.61 U	0.61 U	--	--	0.64 U	0.61 U	0.61 U	0.61 U	--
2-Chlorophenol	0.77 U	0.74 U	--	--	0.77 U	0.74 U	0.74 U	--	--	0.77 U	0.74 U	0.74 U	0.74 U	--
2-Methylnaphthalene	0.92 U	0.88 U	--	--	0.92 U	0.88 U	0.88 U	--	--	0.92 U	0.88 U	0.88 U	0.88 U	--
2-Methylphenol (O-Cresol)	1.3 U	1.3 U	--	--	1.3 U	1.3 U	1.3 U	--	--	1.3 U	1.3 U	1.3 U	1.3 U	--
2-Nitroaniline	0.68 U	0.65 U	--	--	0.68 UJ	0.65 U	0.65 U	--	--	0.68 UJ	0.65 U	0.65 U	0.65 U	--
2-Nitrophenol	0.61 U	0.59 U	--	--	0.62 U	0.59 U	0.59 U	--	--	0.61 U	0.59 U	0.59 U	0.59 U	--
3- And 4- Methylphenol (Total)	0.92 U	0.88 U	--	--	0.92 UJ	0.88 U	0.88 U	--	--	0.92 UJ	0.88 U	0.88 U	0.88 U	--
3,3'-Dichlorobenzidine	1.1 U	1 U	--	--	1.1 U	1 U	1 U	--	--	1.1 U	1 U	1 U	1 U	--
3-Nitroaniline	0.85 U	0.82 U	--	--	0.86 U	0.82 U	0.82 U	--	--	0.85 U	0.82 U	0.82 U	0.82 U	--
4,6-Dinitro-2-Methylphenol	2.1 U	2 U	--	--	2.1 U	2 U	2 U	--	--	2.1 U	2 U	2 U	2 U	--
4-Bromophenyl Phenyl Ether	1.1 U	1 U	--	--	1.1 U	1 U	1 U	--	--	1.1 U	1 U	1 U	1 U	--
4-Chloro-3-Methylphenol	0.79 U	0.76 U	--	--	0.79 U	0.76 U	0.76 U	--	--	0.79 U	0.76 U	0.76 U	0.76 U	--
4-Chloroaniline	0.76 U	0.73 U	--	--	0.76 U	0.73 U	0.73 U	--	--	0.76 U	0.73 U	0.73 U	0.73 U	--
4-Chlorophenyl Phenyl Ether	1 U	0.96 U	--	--	1 U	0.96 U	0.96 U	--	--	1 U	0.96 U	0.96 U	0.96 U	--
4-Nitroaniline	0.5 U	0.48 U	--	--	0.5 U	0.48 U	0.48 U	--	--	0.5 U	0.48 U	0.48 U	0.48 U	--
4-Nitrophenol	4.8 U	4.7 U	--	--	4.9 U	4.7 U	4.7 U	--	--	4.8 U	4.7 U	4.7 U	4.7 U	--
Acenaphthene	0.92 U	0.88 U	--	--	0.92 U	0.88 U	0.88 U	--	--	0.92 U	0.88 U	0.88 U	0.88 U	--
Acenaphthylene	0.68 U	0.65 U	--	--	0.68 U	0.65 U	0.65 U	--	--	0.68 U	0.65 U	0.65 U	0.65 U	--
Acetophenone	1.1 U	1 U	--	--	1.1 U	1 U	1 U	--	--	1.1 U	1 U	1 U	1 U	--
Anthracene	0.59 U	0.57 U	--	--	0.6 U	0.57 U	0.57 U	--	--	0.59 U	0.57 U	0.57 U	0.57 U	--
Atrazine	0.8 U	0.77 U	--	--	0.81 U	0.77 U	0.77 U	--	--	0.8 U	0.77 U	0.77 U	0.77 U	--
Benzaldehyde	0.9 U	0.86 U	--	--	0.9 U	0.86 U	0.86 U	--	--	0.9 U	0.86 U	0.86 U	0.86 U	--
Benzo(A)Anthracene	0.57 U	0.55 U	--	--	0.58 U	0.55 U	0.55 U	--	--	0.57 U	0.55 U	0.55 U	0.55 U	--
Benzo(A)Pyrene	0.17 U	0.16 U	--	--	0.17 U	0.16 U	0.16 U	--	--	0.17 U	0.16 U	0.16 U	0.16 U	--
Benzo(B)Fluoranthene	0.46 U	0.44 U	--	--	0.46 U	0.44 U	0.44 U	--	--	0.46 U	0.44 U	0.44 U	0.44 U	--
Benzo(G,H,I)Perylene	0.78 U	0.75 U	--	--	0.78 U	0.75 U	0.75 U	--	--	0.78 U	0.75 U	0.75 U	0.75 U	--
Benzo(K)Fluoranthene	0.19 U	0.18 U	--	--	0.19 U	0.18 U	0.18 U	--	--	0.19 U	0.18 U	0.18 U	0.18 U	--
Benzyl Butyl Phthalate	0.63 U	0.6 U	--	--	0.63 U	0.6 U	0.6 U	--	--	0.63 U	0.6 U	0.6 U	0.6 U	--
Biphenyl (Diphenyl)	0.66 U	0.63 U	--	--	0.66 U	0.63 U	0.63 U	--	--	0.66 U	0.63 U	0.63 U	0.63 U	--
Bis(2-Chloroethoxy) Methane	0.72 U	0.69 U	--	--	0.72 U	0.69 U	0.69 U	--	--	0.72 U	0.69 U	0.69 U	0.69 U	--
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.13 U	0.12 U	--	--	0.13 U	0.12 U	0.12 U	--	--	0.13 U	0.12 U	0.12 U	0.12 U	--
Bis(2-Chloroisopropyl) Ether	0.97 U	0.93 U	--	--	0.97 U	0.93 U	0.93 U	--	--	0.97 U	0.93 U	0.93 U	0.93 U	--
Bis(2-Ethylhexyl) Phthalate	0.75 U	0.72 U	--	--	0.75 U	0.72 U	0.72 U	--	--	0.75 U	0.72 U	0.72 U	0.72 U	--
Caprolactam	1.1 U	1.1 U	--	--	1.1 U	1.1 U	1.1 U	--	--	1.1 U	1.1 U	1.1 UJ	1.1 U	--
Carbazole	0.89 U	0.85 U	--	--	0.89 U	0.85 U	0.85 U	--	--	0.89 U	0.85 U	0.85 U	0.85 U	--
Chrysene	0.7 U	0.67 U	--	--	0.7 U	0.67 U	0.67 U	--	--	0.7 U	0.67 U	0.67 U	0.67 U	--
Dibenz(A,H)Anthracene	0.094 U	0.09 U	--	--	0.094 U	0.09 U	0.09 U	--	--	0.094 U	0.09 U	0.09 U	0.09 U	--
Dibenzofuran	0.89 U	0.85 U	--	--	0.89 U	0.85 U	0.85 U	--	--	0.89 U	0.85 U	0.85 U	0.85 U	--
Diethyl Phthalate	1 U	1 U	--	--	1 U	1 U	1 U	--	--	1 U	1 U	1 U	1 U	--
Dimethyl Phthalate	1 U	0.98 U	--	--	1 U	0.98 U	0.98 U	--	--	1 U	0.98 U	0.98 U	0.98 U	--
Di-N-Butyl Phthalate	0.85 U	0.82 U	--	--	0.86 U	0.82 U	0.82 U	--	--	0.85 U	0.82 U	0.82 U	0.82 U	--
Di-N-Octylphthalate	0.72 U	0.69 U	--	--	0.72 U	0.69 U	0.69 U	--	--	0.72 U	0.69 U	0.69 U	0.69 U	--
Fluoranthene	0.75 U	0.72 U	--	--	0.75 U	0.72 U	0.72 U	--	--	0.75 U	0.72 U	0.72 U	0.72 U	--

Table E-38
Summary of Data Used in Risk Assessment
Groundwater Upper Hydrogeologic Unit Plume Area - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-047	CFMW-047	CFMW-047	CFMW-047	CFMW-053	CFMW-053	CFMW-053	CFMW-053	CFMW-053	CFMW-054	CFMW-054	CFMW-054	CFMW-054	CFMW-054
Sample Lab IDs	460-130226-5	460-135818-6	320-40194-3, 460-157970-6	320-43930-1, 460-166151-1	460-120223-5	460-125342-3	460-136263-10	460-158628-2	460-167096-3	460-120223-6	460-125342-4	460-130225-5	460-135818-12	460-158628-3
Sample Name Chemical	CFMW-047-GW 3/23/2017	CFMW-047-GW 6/21/2017	CFMW-047-GW 6/8/2018	CFMW-047-GW 10/4/2018	CFMW-053-GW 9/14/2016	CFMW-053-GW 12/12/2016	CFMW-053-GW 6/28/2017	CFMW-053-GW 6/18/2018	CFMW-053-GW 10/17/2018	CFMW-054-GW 9/14/2016	CFMW-054-GW 12/12/2016	CFMW-054-GW 3/22/2017	CFMW-054-GW 6/21/2017	CFMW-054-GW 6/18/2018
Fluorene	0.83 U	0.8 U	--	--	0.84 U	0.8 U	0.8 U	--	--	0.83 U	0.8 U	0.8 U	0.8 U	--
Hexachlorobenzene	0.49 U	0.47 U	--	--	0.49 U	0.47 U	0.47 U	--	--	0.49 U	0.47 U	0.47 U	0.47 U	--
Hexachlorobutadiene	0.79 U	0.76 U	--	--	0.79 U	0.76 U	0.76 U	--	--	0.79 U	0.76 U	0.76 U	0.76 U	--
Hexachlorocyclopentadiene	0.64 U	0.61 U	--	--	0.64 U	0.61 U	0.61 U	--	--	0.64 U	0.61 U	0.61 U	0.61 U	--
Hexachloroethane	0.094 U	0.09 U	--	--	0.094 U	0.09 U	0.09 U	--	--	0.094 U	0.09 U	0.09 U	0.09 U	--
Indeno(1,2,3-C,D)Pyrene	0.22 U	0.21 U	--	--	0.22 U	0.21 U	0.21 U	--	--	0.22 U	0.21 U	0.21 U	0.21 U	--
Isophorone	0.7 U	0.67 U	--	--	0.7 U	0.67 U	0.67 U	--	--	0.7 U	0.67 U	0.67 U	0.67 U	--
Naphthalene	0.83 U	0.8 U	--	--	0.84 U	0.8 U	0.8 U	--	--	0.83 U	0.8 U	0.8 U	0.8 U	--
Nitrobenzene	0.51 U	0.49 U	--	--	0.51 U	0.49 U	0.49 U	--	--	0.51 U	0.49 U	0.49 U	0.49 U	--
N-Nitrosodi-N-Propylamine	0.86 U	0.83 U	--	--	0.87 UJ	0.83 U	0.83 U	--	--	0.86 UJ	0.83 U	0.83 U	0.83 U	--
N-Nitrosodiphenylamine	0.77 U	0.74 U	--	--	0.77 U	0.74 U	0.74 U	--	--	0.77 U	0.74 U	0.74 U	0.74 U	--
Pentachlorophenol	2.3 U	2.2 U	--	--	2.3 UR	2.2 U	2.2 U	--	--	2.3 UR	2.2 U	2.2 U	2.2 U	--
Phenanthrene	0.68 U	0.65 U	--	--	0.68 U	0.65 U	0.65 U	--	--	0.68 U	0.65 U	0.65 U	0.65 U	--
Phenol	0.43 U	0.41 U	--	--	0.43 U	0.41 U	0.41 U	--	--	0.43 U	0.41 U	0.41 U	0.41 U	--
Pyrene	0.86 U	0.83 U	--	--	0.87 U	0.83 U	0.83 U	--	--	0.86 U	0.83 U	0.83 U	0.83 U	--
SEMIVOLATILE ORGANIC COMPOUNDS|LOW LEVEL (µg/L)														
1,2,4,5-Tetrachlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,4-Dioxane (P-Dioxane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,3,4,6-Tetrachlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4,5-Trichlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4,6-Trichlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4-Dichlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4-Dimethylphenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4-Dinitrophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4-Dinitrotoluene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,6-Dinitrotoluene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Chloronaphthalene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Chlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Methylnaphthalene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Methylphenol (O-Cresol)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Nitroaniline	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Nitrophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3,3'-Dichlorobenzidine	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3-Nitroaniline	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4,6-Dinitro-2-Methylphenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Bromophenyl Phenyl Ether	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Chloro-3-Methylphenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Chloroaniline	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Chlorophenyl Phenyl Ether	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Nitroaniline	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Nitrophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acenaphthene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acenaphthylene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acetophenone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Anthracene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Atrazine	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzaldehyde	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(A)Anthracene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(A)Pyrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(B)Fluoranthene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(G,H,I)Perylene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(K)Fluoranthene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzyl Butyl Phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Biphenyl (Diphenyl)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bis(2-Chloroethoxy) Methane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bis(2-Chloroisopropyl) Ether	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bis(2-Ethylhexyl) Phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Caprolactam	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Table E-38
Summary of Data Used in Risk Assessment
Groundwater Upper Hydrogeologic Unit Plume Area - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-047	CFMW-047	CFMW-047	CFMW-047	CFMW-053	CFMW-053	CFMW-053	CFMW-053	CFMW-053	CFMW-054	CFMW-054	CFMW-054	CFMW-054	CFMW-054
Sample Lab IDs	460-130226-5	460-135818-6	320-40194-3, 460-157970-6	320-43930-1, 460-166151-1	460-120223-5	460-125342-3	460-136263-10	460-158628-2	460-167096-3	460-120223-6	460-125342-4	460-130225-5	460-135818-12	460-158628-3
Sample Name	CFMW-047-GW 3/23/2017	CFMW-047-GW 6/21/2017	CFMW-047-GW 6/8/2018	CFMW-047-GW 10/4/2018	CFMW-053-GW 9/14/2016	CFMW-053-GW 12/12/2016	CFMW-053-GW 6/28/2017	CFMW-053-GW 6/18/2018	CFMW-053-GW 10/17/2018	CFMW-054-GW 9/14/2016	CFMW-054-GW 12/12/2016	CFMW-054-GW 3/22/2017	CFMW-054-GW 6/21/2017	CFMW-054-GW 6/18/2018
Chemical														
Carbazole	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chrysene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibenz(A,H)Anthracene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibenzofuran	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Diethyl Phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dimethyl Phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Di-N-Butyl Phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Di-N-Octylphthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Fluoranthene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Fluorene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorobutadiene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorocyclopentadiene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Indeno(1,2,3-C,D)Pyrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Isophorone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Naphthalene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Nitrobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
N-Nitrosodi-N-Propylamine	--	--	--	--	--	--	--	--	--	--	--	--	--	--
N-Nitrosodiphenylamine	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Pentachlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Phenanthrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Phenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Pyrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
VOLATILE ORGANIC COMPOUNDS (µg/L)														
1,1,1-Trichloroethane	0.28 U	0.28 U	--	--	0.28 U	0.28 U	0.28 U	--	--	0.28 U	0.28 U	0.28 U	0.28 U	--
1,1,2,2-Tetrachloroethane	0.19 U	0.19 U	--	--	0.19 U	0.19 U	0.19 U	--	--	0.19 U	0.19 U	0.19 U	0.19 U	--
1,1,2-Trichloro-1,2,2-Trifluoroethane	0.34 U	0.34 U	--	--	0.34 U	0.34 U	0.34 U	--	--	0.34 U	0.34 U	0.34 U	0.34 U	--
1,1,2-Trichloroethane	0.08 U	0.08 U	--	--	0.08 U	0.08 U	0.08 U	--	--	0.08 U	0.08 U	0.08 U	0.08 U	--
1,1-Dichloroethane	0.24 U	0.24 U	--	--	0.24 U	0.24 U	0.24 U	--	--	0.24 U	0.24 U	0.24 U	0.24 U	--
1,1-Dichloroethene	0.34 U	0.34 U	--	--	0.34 U	0.34 U	0.34 U	--	--	0.34 U	0.34 U	0.34 U	0.34 U	--
1,2,3-Trichlorobenzene	0.35 U	0.35 U	--	--	0.35 U	0.35 U	0.35 U	--	--	0.35 U	0.35 U	0.35 U	0.35 U	--
1,2,4-Trichlorobenzene	0.27 U	0.27 U	--	--	0.27 U	0.27 U	0.27 U	--	--	0.27 U	0.27 U	0.27 U	0.27 U	--
1,2-Dibromo-3-Chloropropane	0.23 U	0.23 U	--	--	0.23 U	0.23 U	0.23 U	--	--	0.23 U	0.23 U	0.23 U	0.23 U	--
1,2-Dibromoethane (Ethylene Dibromide)	0.19 U	0.19 U	--	--	0.19 U	0.19 U	0.19 U	--	--	0.19 U	0.19 U	0.19 U	0.19 U	--
1,2-Dichlorobenzene	0.22 U	0.22 U	--	--	0.22 U	0.22 U	0.22 U	--	--	0.22 U	0.22 U	0.22 U	0.22 U	--
1,2-Dichloroethane	0.25 U	0.25 U	--	--	0.25 U	0.25 U	0.25 U	--	--	0.25 U	0.25 U	0.25 U	0.25 U	--
1,2-Dichloropropane	0.18 U	0.18 U	--	--	0.18 U	0.18 U	0.18 U	--	--	0.18 U	0.18 U	0.18 U	0.18 U	--
1,3-Dichlorobenzene	0.33 U	0.33 U	--	--	0.33 U	0.33 U	0.33 U	--	--	0.33 U	0.33 U	0.33 U	0.33 U	--
1,4-Dichlorobenzene	0.33 U	0.33 U	--	--	0.33 U	0.33 U	0.33 U	--	--	0.33 U	0.33 U	0.33 U	0.33 U	--
2-Hexanone	0.72 U	0.72 U	--	--	0.72 U	0.72 U	0.72 U	--	--	0.72 U	0.72 U	0.72 U	0.72 U	--
Acetone	3.2 J	1.1 U	--	--	1.1 U	1.1 U	1.1 U	--	--	1.1 U	1.1 U	1.1 U	1.1 U	--
Benzene	0.09 U	0.09 U	--	--	0.09 U	0.09 U	0.09 U	--	--	0.09 U	0.09 U	0.09 U	0.09 U	--
Bromochloromethane	0.3 U	0.3 U	--	--	0.3 U	0.3 U	0.3 U	--	--	0.3 U	0.3 U	0.3 U	0.3 U	--
Bromodichloromethane	0.15 U	0.15 U	--	--	0.15 U	0.15 U	0.15 U	--	--	0.15 U	0.15 U	0.15 U	0.15 U	--
Bromoform	0.18 U	0.18 U	--	--	0.18 U	0.18 U	0.18 U	--	--	0.18 U	0.18 U	0.18 U	0.18 U	--
Bromomethane	0.18 U	0.18 UJ	--	--	0.18 U	0.18 U	0.18 U	--	--	0.18 U	0.18 U	0.18 U	0.18 UJ	--
Carbon Disulfide	0.22 U	0.22 U	--	--	0.22 U	0.22 U	0.22 U	--	--	0.22 U	0.22 U	0.22 U	0.22 U	--
Carbon Tetrachloride	0.33 U	0.33 U	--	--	0.33 U	0.33 U	0.33 U	--	--	0.33 U	0.33 U	0.33 U	0.33 U	--
Chlorobenzene	0.24 U	0.24 U	--	--	0.24 U	0.24 U	0.24 U	--	--	0.24 U	0.24 U	0.24 U	0.24 U	--
Chloroethane	0.37 U	0.37 U	--	--	0.37 U	0.37 U	0.37 U	--	--	0.37 U	0.37 U	0.37 U	0.37 U	--
Chloroform	0.22 U	0.22 U	--	--	0.22 U	0.22 U	0.22 U	--	--	0.22 U	0.22 U	0.22 U	0.22 U	--
Chloromethane	0.22 U	0.22 U	--	--	0.22 U	0.22 U	0.22 U	--	--	0.22 U	0.22 U	0.22 U	0.22 U	--
Cis-1,2-Dichloroethylene	0.26 U	0.26 U	--	--	0.26 U	0.26 U	0.26 U	--	--	0.26 U	0.26 U	0.26 U	0.26 U	--
Cis-1,3-Dichloropropene	0.16 U	0.16 U	--	--	0.16 U	0.16 U	0.16 U	--	--	0.16 U	0.16 U	0.16 U	0.16 U	--
Cyclohexane	0.26 U	0.26 U	--	--	0.26 U	0.26 U	0.26 UJ	--	--	0.26 U	0.26 U	0.26 U	0.26 U	--
Dibromochloromethane	0.22 U	0.22 U	--	--	0.22 U	0.22 U	0.22 U	--	--	0.22 U	0.22 U	0.22 U	0.22 U	--
Dichlorodifluoromethane	0.14 U	0.14 UJ	--	--	0.14 U	0.14 U	0.14 UJ	--	--	0.14 U	0.14 U	0.14 U	0.14 UJ	--
Ethylbenzene	0.3 U	0.3 U	--	--	0.3 U	0.3 U	0.3 U	--	--	0.3 U	0.3 U	0.3 U	0.3 U	--

Table E-38
Summary of Data Used in Risk Assessment
Groundwater Upper Hydrogeologic Unit Plume Area - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-047	CFMW-047	CFMW-047	CFMW-047	CFMW-053	CFMW-053	CFMW-053	CFMW-053	CFMW-053	CFMW-054	CFMW-054	CFMW-054	CFMW-054	CFMW-054
Sample Lab IDs	460-130226-5	460-135818-6	320-40194-3, 460-157970-6	320-43930-1, 460-166151-1	460-120223-5	460-125342-3	460-136263-10	460-158628-2	460-167096-3	460-120223-6	460-125342-4	460-130225-5	460-135818-12	460-158628-3
Sample Name Chemical	CFMW-047-GW 3/23/2017	CFMW-047-GW 6/21/2017	CFMW-047-GW 6/8/2018	CFMW-047-GW 10/4/2018	CFMW-053-GW 9/14/2016	CFMW-053-GW 12/12/2016	CFMW-053-GW 6/28/2017	CFMW-053-GW 6/18/2018	CFMW-053-GW 10/17/2018	CFMW-054-GW 9/14/2016	CFMW-054-GW 12/12/2016	CFMW-054-GW 3/22/2017	CFMW-054-GW 6/21/2017	CFMW-054-GW 6/18/2018
Isopropylbenzene (Cumene)	0.32 U	0.32 U	--	--	0.32 U	0.32 U	0.32 U	--	--	0.32 U	0.32 U	0.32 U	0.32 U	--
M,P-Xylene	0.28 U	0.28 U	--	--	0.28 U	0.28 U	0.28 U	--	--	0.28 U	0.28 U	0.28 U	0.28 U	--
Methyl Acetate	0.58 U	0.58 UJ	--	--	0.58 U	0.58 U	0.58 U	--	--	0.58 U	0.58 U	0.58 U	0.58 UJ	--
Methyl Ethyl Ketone (2-Butanone)	2.2 U	2.2 U	--	--	2.2 U	2.2 U	2.2 U	--	--	2.2 U	2.2 U	2.2 U	2.2 U	--
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	0.63 U	0.63 U	--	--	0.63 U	0.63 U	0.63 U	--	--	0.63 U	0.63 U	0.63 U	0.63 U	--
Methylcyclohexane	0.22 U	0.22 U	--	--	0.22 U	0.22 U	0.22 UJ	--	--	0.22 U	0.22 U	0.22 U	0.22 U	--
Methylene Chloride	0.21 U	0.21 U	--	--	0.21 U	0.21 U	0.21 U	--	--	0.21 U	0.21 U	0.21 U	0.21 U	--
O-Xylene (1,2-Dimethylbenzene)	0.32 U	0.32 U	--	--	0.32 U	0.32 U	0.32 U	--	--	0.32 U	0.32 U	0.32 U	0.32 U	--
Styrene	0.17 U	0.17 U	--	--	0.17 U	0.17 U	0.17 U	--	--	0.17 U	0.17 U	0.17 U	0.17 U	--
Tert-Butyl Methyl Ether	0.13 U	0.13 U	--	--	0.13 U	0.13 U	0.13 U	--	--	0.13 U	0.13 U	0.13 U	0.13 U	--
Tetrachloroethylene (PCE)	0.12 U	0.12 U	--	--	0.12 U	0.12 U	0.12 U	--	--	0.12 U	0.12 U	0.12 U	0.12 U	--
Toluene	0.25 U	0.25 U	--	--	0.25 U	0.25 U	0.25 U	--	--	0.25 U	0.25 U	0.25 U	0.25 U	--
Trans-1,2-Dichloroethene	0.18 U	0.18 U	--	--	0.18 U	0.18 U	0.18 U	--	--	0.18 U	0.18 U	0.18 U	0.18 U	--
Trans-1,3-Dichloropropene	0.19 U	0.19 U	--	--	0.19 U	0.19 U	0.19 U	--	--	0.19 U	0.19 U	0.19 U	0.19 U	--
Trichloroethylene (TCE)	0.22 U	0.22 U	--	--	0.22 U	0.22 U	0.22 U	--	--	0.22 U	0.22 U	0.22 U	0.22 U	--
Trichlorofluoromethane	0.15 U	0.15 U	--	--	0.15 U	0.15 U	0.15 U	--	--	0.15 U	0.15 U	0.15 U	0.15 U	--
Vinyl Chloride	0.06 U	0.06 U	--	--	0.06 U	0.06 U	0.06 U	--	--	0.06 U	0.06 U	0.06 U	0.06 U	--

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-38
Summary of Data Used in Risk Assessment
Groundwater Upper Hydrogeologic Unit Plume Area - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Chemical	CFMW-054 460-166219-4 CFMW-054-GW 10/5/2018	CFMW-070 180-78892-1, 460-158628-4 CFMW-070-GW 6/18/2018	CFMW-070 180-82741-1, 460-166219-6 CFMW-070-GW 10/5/2018
GENERAL CHEMISTRY (µg/L)			
Fluoride	--	--	--
Cyanide	383	1070	804
Cyanide (Free)	7.2	15.6	23
Cyanide	384	1010	825
Cyanide (Free)	9.1	305 J-	49.6
METALS (µg/L)			
Aluminum	15 U	15 U	15 U
Antimony	0.62 U	0.62 U	0.62 U
Arsenic	0.77 U	0.77 U	0.77 U
Barium	154	207	231
Beryllium	0.26 U	0.26 U	0.26 U
Cadmium	0.61 U	0.61 U	0.61 U
Calcium	62400	43700	51500
Chromium, Total	1.3 U	1.3 U	1.3 U
Cobalt	1.3 U	1.3 U	1.3 U
Copper	1.9 U	1.9 U	1.9 U
Iron	121	350	260
Lead	0.37 U	0.37 U	0.37 U
Magnesium	17700	13500	17100
Manganese	2.7 U	3.8 J	3 J
Mercury	0.12 U	0.12 U	0.12 U
Nickel	1.3 U	1.3 U	1.3 U
Potassium	1020	963	1010
Selenium	0.69 U	0.69 U	0.69 U
Silver	1.4 U	1.4 U	1.4 U
Sodium	38700	59200	68000
Thallium	0.24 U	0.24 U	0.24 U
Vanadium	1.2 U	1.2 U	1.2 U
Zinc	5.4 U	7.6 J	5.4 U
Aluminum	15 U	161	27.9 J
Antimony	0.62 U	0.62 U	0.62 U
Arsenic	0.77 U	0.77 U	0.77 U
Barium	149	201	224
Beryllium	0.26 U	0.26 U	0.26 U
Cadmium	0.61 U	0.61 U	0.61 U
Calcium	60800	42100	52300
Chromium, Total	1.3 U	1.5 J	1.6 J
Cobalt	1.3 U	1.3 U	1.3 U
Copper	3.5 J	1.9 U	3.9 J
Iron	139	580	329
Lead	0.37 U	0.37 U	0.37 U
Magnesium	17000	14300	16800
Manganese	2.7 U	8.1	4.4 J
Mercury	0.12 U	0.12 U	0.12 U
Nickel	1.3 U	1.3 U	1.3 U
Potassium	990	914	1040
Selenium	0.69 U	0.69 U	0.69 U
Silver	1.4 U	1.4 U	1.4 U
Sodium	36400	65200	67300
Thallium	0.24 U	0.24 U	0.24 U
Vanadium	1.2 U	1.2 U	1.2 U
Zinc	5.4 U	12.6 J	5.4 U
POLYCHLORINATED BIPHENYLS (µg/L)			
PCB-1016 (Aroclor 1016)	--	--	--
PCB-1221 (Aroclor 1221)	--	--	--
PCB-1232 (Aroclor 1232)	--	--	--
PCB-1242 (Aroclor 1242)	--	--	--
PCB-1248 (Aroclor 1248)	--	--	--

Table E-38
Summary of Data Used in Risk Assessment
Groundwater Upper Hydrogeologic Unit Plume Area - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Chemical	CFMW-054 460-166219-4 CFMW-054-GW 10/5/2018	CFMW-070 180-78892-1, 460-158628-4 CFMW-070-GW 6/18/2018	CFMW-070 180-82741-1, 460-166219-6 CFMW-070-GW 10/5/2018
PCB-1254 (Aroclor 1254)	--	--	--
PCB-1260 (Aroclor 1260)	--	--	--
PCB-1262 (Aroclor 1262)	--	--	--
PCB-1268 (Aroclor 1268)	--	--	--
Polychlorinated Biphenyl (PCBs)	--	--	--
SEMIVOLATILE ORGANIC COMPOUNDS (µg/L)			
1,2,4,5-Tetrachlorobenzene	--	0.05 U	--
1,4-Dioxane (P-Dioxane)	--	0.19 U	--
2,3,4,6-Tetrachlorophenol	--	0.043 U	--
2,4,5-Trichlorophenol	--	0.059 U	--
2,4,6-Trichlorophenol	--	0.065 U	--
2,4-Dichlorophenol	--	0.049 U	--
2,4-Dimethylphenol	--	0.039 U	--
2,4-Dinitrophenol	--	1.5 U	--
2,4-Dinitrotoluene	--	0.049 U	--
2,6-Dinitrotoluene	--	0.058 U	--
2-Chloronaphthalene	--	0.057 U	--
2-Chlorophenol	--	0.062 U	--
2-Methylnaphthalene	--	0.06 U	--
2-Methylphenol (O-Cresol)	--	0.1 U	--
2-Nitroaniline	--	0.2 U	--
2-Nitrophenol	--	0.059 U	--
3- And 4- Methylphenol (Total)	--	--	--
3,3'-Dichlorobenzidine	--	0.56 U	--
3-Nitroaniline	--	0.064 U	--
4,6-Dinitro-2-Methylphenol	--	1.4 U	--
4-Bromophenyl Phenyl Ether	--	0.061 U	--
4-Chloro-3-Methylphenol	--	0.059 U	--
4-Chloroaniline	--	0.042 U	--
4-Chlorophenyl Phenyl Ether	--	0.059 U	--
4-Nitroaniline	--	0.056 U	--
4-Nitrophenol	--	0.14 U	--
Acenaphthene	--	0.063 U	--
Acenaphthylene	--	0.063 U	--
Acetophenone	--	0.06 U	--
Anthracene	--	0.047 U	--
Atrazine	--	0.18 U	--
Benzaldehyde	--	0.11 U	--
Benzo(A)Anthracene	--	0.072 U	--
Benzo(A)Pyrene	--	0.051 U	--
Benzo(B)Fluoranthene	--	0.093 U	--
Benzo(G,H,I)Perylene	--	0.066 U	--
Benzo(K)Fluoranthene	--	0.085 U	--
Benzyl Butyl Phthalate	--	0.45 J	--
Biphenyl (Diphenyl)	--	0.057 U	--
Bis(2-Chloroethoxy) Methane	--	0.064 U	--
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	--	0.038 U	--
Bis(2-Chloroisopropyl) Ether	--	0.056 U	--
Bis(2-Ethylhexyl) Phthalate	--	36	--
Caprolactam	--	0.99 J	--
Carbazole	--	0.049 U	--
Chrysene	--	0.078 U	--
Dibenz(A,H)Anthracene	--	0.069 U	--
Dibenzofuran	--	0.07 U	--
Diethyl Phthalate	--	0.55 U	--
Dimethyl Phthalate	--	0.054 U	--
Di-N-Butyl Phthalate	--	0.71 U	--
Di-N-Octylphthalate	--	0.66 U	--
Fluoranthene	--	0.058 U	--

Table E-38
Summary of Data Used in Risk Assessment
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Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Chemical	CFMW-054 460-166219-4 CFMW-054-GW 10/5/2018	CFMW-070 180-78892-1, 460-158628-4 CFMW-070-GW 6/18/2018	CFMW-070 180-82741-1, 460-166219-6 CFMW-070-GW 10/5/2018
Fluorene	--	0.066 U	--
Hexachlorobenzene	--	0.054 U	--
Hexachlorobutadiene	--	0.066 U	--
Hexachlorocyclopentadiene	--	0.48 U	--
Hexachloroethane	--	0.06 U	--
Indeno(1,2,3-C,D)Pyrene	--	0.082 U	--
Isophorone	--	0.052 U	--
Naphthalene	--	0.057 U	--
Nitrobenzene	--	0.16 U	--
N-Nitrosodi-N-Propylamine	--	0.068 U	--
N-Nitrosodiphenylamine	--	0.11 U	--
Pentachlorophenol	--	0.23 U	--
Phenanthrene	--	0.053 U	--
Phenol	--	0.094 U	--
Pyrene	--	0.052 U	--
SEMIVOLATILE ORGANIC COMPOUNDS|LOW LEVEL (µg/L)			
1,2,4,5-Tetrachlorobenzene	--	--	0.048 U
1,4-Dioxane (P-Dioxane)	--	--	0.18 U
2,3,4,6-Tetrachlorophenol	--	--	0.042 U
2,4,5-Trichlorophenol	--	--	0.056 U
2,4,6-Trichlorophenol	--	--	0.063 U
2,4-Dichlorophenol	--	--	0.047 U
2,4-Dimethylphenol	--	--	0.038 U
2,4-Dinitrophenol	--	--	1.4 U
2,4-Dinitrotoluene	--	--	0.047 U
2,6-Dinitrotoluene	--	--	0.056 U
2-Chloronaphthalene	--	--	0.055 U
2-Chlorophenol	--	--	0.059 U
2-Methylnaphthalene	--	--	0.057 U
2-Methylphenol (O-Cresol)	--	--	0.1 U
2-Nitroaniline	--	--	0.19 U
2-Nitrophenol	--	--	0.056 U
3,3'-Dichlorobenzidine	--	--	0.54 U
3-Nitroaniline	--	--	0.062 U
4,6-Dinitro-2-Methylphenol	--	--	1.4 U
4-Bromophenyl Phenyl Ether	--	--	0.058 U
4-Chloro-3-Methylphenol	--	--	0.056 U
4-Chloroaniline	--	--	0.041 U
4-Chlorophenyl Phenyl Ether	--	--	0.056 U
4-Nitroaniline	--	--	0.054 U
4-Nitrophenol	--	--	0.13 U
Acenaphthene	--	--	0.06 U
Acenaphthylene	--	--	0.06 U
Acetophenone	--	--	0.057 U
Anthracene	--	--	0.045 U
Atrazine	--	--	0.17 U
Benzaldehyde	--	--	0.1 U
Benzo(A)Anthracene	--	--	0.069 U
Benzo(A)Pyrene	--	--	0.049 U
Benzo(B)Fluoranthene	--	--	0.09 U
Benzo(G,H,I)Perylene	--	--	0.064 U
Benzo(K)Fluoranthene	--	--	0.081 U
Benzyl Butyl Phthalate	--	--	0.43 U
Biphenyl (Diphenyl)	--	--	0.055 U
Bis(2-Chloroethoxy) Methane	--	--	0.062 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	--	--	0.037 U
Bis(2-Chloroisopropyl) Ether	--	--	0.054 U
Bis(2-Ethylhexyl) Phthalate	--	--	4.3 U
Caprolactam	--	--	0.77 J

Table E-38
Summary of Data Used in Risk Assessment
Groundwater Upper Hydrogeologic Unit Plume Area - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Chemical	CFMW-054 460-166219-4 CFMW-054-GW 10/5/2018	CFMW-070 180-78892-1, 460-158628-4 CFMW-070-GW 6/18/2018	CFMW-070 180-82741-1, 460-166219-6 CFMW-070-GW 10/5/2018
Carbazole	--	--	0.047 U
Chrysene	--	--	0.075 U
Dibenz(A,H)Anthracene	--	--	0.067 U
Dibenzofuran	--	--	0.068 U
Diethyl Phthalate	--	--	0.53 U
Dimethyl Phthalate	--	--	0.052 U
Di-N-Butyl Phthalate	--	--	0.69 U
Di-N-Octylphthalate	--	--	0.63 U
Fluoranthene	--	--	0.056 U
Fluorene	--	--	0.064 U
Hexachlorobenzene	--	--	0.052 U
Hexachlorobutadiene	--	--	0.064 U
Hexachlorocyclopentadiene	--	--	0.46 U
Hexachloroethane	--	--	0.057 U
Indeno(1,2,3-C,D)Pyrene	--	--	0.079 U
Isophorone	--	--	0.05 U
Naphthalene	--	--	0.055 U
Nitrobenzene	--	--	0.15 U
N-Nitrosodi-N-Propylamine	--	--	0.066 U
N-Nitrosodiphenylamine	--	--	0.11 U
Pentachlorophenol	--	--	0.22 U
Phenanthrene	--	--	0.051 U
Phenol	--	--	0.091 U
Pyrene	--	--	0.05 U
VOLATILE ORGANIC COMPOUNDS (µg/L)			
1,1,1-Trichloroethane	--	0.24 U	0.24 U
1,1,2,2-Tetrachloroethane	--	0.37 U	0.37 U
1,1,2-Trichloro-1,2,2-Trifluoroethane	--	0.31 U	0.31 U
1,1,2-Trichloroethane	--	0.43 U	0.43 U
1,1-Dichloroethane	--	0.26 U	0.26 U
1,1-Dichloroethene	--	0.12 U	0.12 U
1,2,3-Trichlorobenzene	--	0.36 U	0.36 U
1,2,4-Trichlorobenzene	--	0.37 U	0.37 U
1,2-Dibromo-3-Chloropropane	--	0.38 U	0.38 UJ
1,2-Dibromoethane (Ethylene Dibromide)	--	0.5 U	0.5 U
1,2-Dichlorobenzene	--	0.43 U	0.43 U
1,2-Dichloroethane	--	0.43 U	0.43 U
1,2-Dichloropropane	--	0.35 U	0.35 U
1,3-Dichlorobenzene	--	0.34 U	0.34 U
1,4-Dichlorobenzene	--	0.76 U	0.76 U
2-Hexanone	--	2.9 U	2.9 U
Acetone	--	5 U	5 U
Benzene	--	0.43 U	0.43 U
Bromochloromethane	--	0.41 U	0.41 U
Bromodichloromethane	--	0.34 U	0.34 U
Bromoform	--	0.54 U	0.54 U
Bromomethane	--	1 U	1 UJ
Carbon Disulfide	--	0.16 U	0.16 U
Carbon Tetrachloride	--	0.21 U	0.21 U
Chlorobenzene	--	0.38 U	0.38 U
Chloroethane	--	0.32 U	0.32 U
Chloroform	--	0.33 U	0.33 U
Chloromethane	--	0.14 U	0.14 UJ
Cis-1,2-Dichloroethylene	--	0.22 U	0.22 U
Cis-1,3-Dichloropropene	--	0.46 U	0.46 U
Cyclohexane	--	0.32 U	0.32 U
Dibromochloromethane	--	0.28 U	0.28 U
Dichlorodifluoromethane	--	0.12 U	0.12 UJ
Ethylbenzene	--	0.3 U	0.3 U

Table E-38
Summary of Data Used in Risk Assessment
Groundwater Upper Hydrogeologic Unit Plume Area - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Chemical	CFMW-054 460-166219-4 CFMW-054-GW 10/5/2018	CFMW-070 180-78892-1, 460-158628-4 CFMW-070-GW 6/18/2018	CFMW-070 180-82741-1, 460-166219-6 CFMW-070-GW 10/5/2018
Isopropylbenzene (Cumene)	--	0.34 U	0.34 U
M,P-Xylene	--	0.3 U	0.3 U
Methyl Acetate	--	0.31 U	0.31 UJ
Methyl Ethyl Ketone (2-Butanone)	--	1.9 U	1.9 U
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	--	2.7 U	2.7 U
Methylcyclohexane	--	0.26 U	0.26 UJ
Methylene Chloride	--	0.32 U	0.32 U
O-Xylene (1,2-Dimethylbenzene)	--	0.36 U	0.36 U
Styrene	--	0.42 U	0.42 U
Tert-Butyl Methyl Ether	--	0.47 U	0.47 U
Tetrachloroethylene (PCE)	--	0.25 U	0.25 U
Toluene	--	0.38 U	0.38 U
Trans-1,2-Dichloroethene	--	0.24 U	0.24 U
Trans-1,3-Dichloropropene	--	0.49 U	0.49 U
Trichloroethylene (TCE)	--	0.31 U	0.31 U
Trichlorofluoromethane	--	0.14 U	0.14 U
Vinyl Chloride	--	0.17 U	0.17 U

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-39
Summary of Data Used in Risk Assessment
Groundwater Below Upper Hydrogeologic Unit Site Wide - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-003A	CFMW-003A	CFMW-003A	CFMW-003A	CFMW-003A	CFMW-003A	CFMW-011A	CFMW-011A	CFMW-011A	CFMW-011A	CFMW-011A	CFMW-011A	CFMW-012A	CFMW-012A-DUP
Sample Lab IDs	460-120581-1	460-125342-7	460-130032-3	460-135619-3	460-158493-8	460-167518-1	460-120581-2	460-125477-8	460-130088-12	460-136351-3	460-158367-11	460-166400-2	460-120318-7	460-120318-12
Sample Name Chemical	CFMW-003a-GW 9/20/2016	CFMW-003a-GW 12/12/2016	CFMW-003a-GW 3/20/2017	CFMW-003a-GW 6/19/2017	CFMW-003a-GW 6/15/2018	CFMW-003a-GW 10/23/2018	CFMW-011a-GW 9/20/2016	CFMW-011a-GW 12/14/2016	CFMW-011a-GW 3/21/2017	CFMW-011a-GW 6/29/2017	CFMW-011a-GW 6/14/2018	CFMW-011a-GW 10/8/2018	CFMW-012a-GW 9/15/2016	CFMW-DUP2-GW 9/15/2016
GENERAL CHEMISTRY (µg/L)														
Fluoride	--	--	--	274	--	--	--	--	--	170 J+	--	--	--	--
Cyanide	--	--	--	2 U	2 U	2 U	--	--	--	2 U	2 U	2 U	--	--
Cyanide (Free)	--	--	--	1.5 U	1.5 UJ	1.5 UJ	--	--	--	--	1.5 U	1.5 U	--	--
Cyanide	2.1 J	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Cyanide (Free)	--	--	1.5 U	1.5 U	2.7 J+	1.5 U	--	--	--	--	2 J	1.5 U	--	--
METALS (µg/L)														
Aluminum	33.8 J	18.2 U	18.2 U	24.4 J	18.4 J	141	27.2 J	60.9	18.2 U	18.2 U	15 U	15 U	18.2 U	18.2 U
Antimony	0.62 J	0.62 U	0.62 U	0.62 U	0.62 J	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U
Arsenic	5.2	3.5	2.8	2.8	3.1	6.5	3.3	1.7 J	1.4 J	1.3 J	0.77 U	0.93 J	0.64 U	0.64 U
Barium	53.3	39.9	41.2	45.5	35.2	183	42.7	48.8	52.8	57.9	67.7	60.5	78.2	77.7
Beryllium	0.24 U	0.24 U	0.24 U	0.24 U	0.26 U	0.26 U	0.24 U	0.24 U	0.24 U	0.24 U	0.26 U	0.26 U	0.24 U	0.24 U
Cadmium	0.71 U	0.71 U	0.71 U	0.71 U	0.61 U	0.61 U	0.71 U	0.71 U	0.71 U	0.71 U	0.61 U	0.61 U	0.71 U	0.71 U
Calcium	31000	28500	31700	36900	6860	78400	24600	21700	37000	39100	51200	43600	51300	50800
Chromium, Total	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
Cobalt	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.5 J	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
Copper	1.4 U	1.4 U	1.4 U	1.4 U	1.9 U	1.9 U	1.4 U	1.4 U	1.4 U	1.4 U	1.9 U	1.9 U	1.4 UJ	3.3 J
Iron	42.4 U	42.4 U	42.4 U	51.6 J	45.7 U	4530	42.4 U	42.4 U	86.9 J	42.4 U	45.7 U	45.7 U	42.4 U	42.4 U
Lead	0.38 U	0.38 U	0.38 U	0.38 U	0.37 U	0.37 U	0.38 U	0.38 U	0.38 U	0.38 U	0.37 U	0.37 U	0.38 U	0.38 U
Magnesium	5380	4870	5980	7140	5280	15900	9010	8910	14300	14400	18300	16300	13000	13000
Manganese	56.2	52.6	183	308	23.2	1720	13.7	30.7	154	93.6	7 J	78	21.6	21.3
Mercury	0.17 U	0.17 U	0.17 U	0.17 U	0.12 U	0.12 U	0.17 U	0.17 U	0.17 U	0.17 U	0.12 U	0.12 U	0.17 U	0.17 U
Nickel	1.4 U	1.4 U	1.4 U	1.4 U	1.3 U	1.9 J	1.4 U	1.4 U	1.4 U	1.4 U	1.3 U	1.3 U	1.4 U	1.4 U
Potassium	3270	4960	3100	2120	47400	14500	2070	3120	1430	1380	1530	1560	721	726
Selenium	0.73 U	0.73 U	1.2 J	1.1 J	0.69 U	0.69 U	0.73 U	0.73 U	0.73 U	0.73 U	0.69 U	0.69 U	0.73 U	0.73 U
Silver	1.3 U	1.3 U	1.3 U	1.3 U	1.4 U	1.4 U	1.3 U	1.3 U	1.3 U	1.3 U	1.4 U	1.4 U	1.3 U	1.3 U
Sodium	17500	19500	14500	12900	37400	24700	19900	24100	10900	8640	8750	10600	6380	6190
Thallium	0.26 U	0.26 U	0.26 U	0.26 U	0.24 U	0.24 U	0.26 U	0.26 U	0.26 U	0.26 U	0.24 U	0.24 U	0.26 U	0.26 U
Vanadium	3.7 J	1.9 U	1.9 U	1.9 U	1.2 U	1.2 U	2.8 J	1.9 U	1.9 U	1.9 U	1.2 U	1.2 U	1.9 U	1.9 U
Zinc	7 U	7 U	7 U	7 U	7.6 J	12.1 J	7 U	7 U	7 U	7 U	5.4 U	5.4 U	7 U	7 U
Aluminum	--	--	--	1570	206	412	--	--	--	2030 J+	87.5	119	--	--
Antimony	--	--	--	0.62 U	1.5 J	0.62 U	--	--	--	0.62 U	0.62 U	0.8 J	--	--
Arsenic	--	--	--	3.6	3.8	6.2	--	--	--	2.1	0.77 U	0.83 J	--	--
Barium	--	--	--	63.8	41.1	181	--	--	--	83	72.4	62.9	--	--
Beryllium	--	--	--	0.24 U	0.26 U	0.26 U	--	--	--	0.24 U	0.26 U	0.26 U	--	--
Cadmium	--	--	--	0.71 U	0.61 U	0.61 U	--	--	--	0.71 U	0.61 U	0.61 U	--	--
Calcium	--	--	--	36900	8830	78100	--	--	--	43700	48900	45900	--	--
Chromium, Total	--	--	--	2.3 J	8.5	1.6 J	--	--	--	2.6 J	1.3 U	1.3 U	--	--
Cobalt	--	--	--	1.3 U	1.3 U	1.8 J	--	--	--	1.3 U	1.3 U	1.3 U	--	--
Copper	--	--	--	3.4 J	6.9	10.9	--	--	--	4	1.9 U	7.3	--	--
Iron	--	--	--	2110	400	5060	--	--	--	2280	174	185	--	--
Lead	--	--	--	1.2	0.78 J	0.76 J	--	--	--	1.4	0.37 U	0.38 J	--	--
Magnesium	--	--	--	8510	6500	17100	--	--	--	17000	18000	16600	--	--
Manganese	--	--	--	366	28.2	1810	--	--	--	167	9.9	85.7	--	--
Mercury	--	--	--	0.17 U	0.12 U	0.12 U	--	--	--	0.17 U	0.12 U	0.12 U	--	--
Nickel	--	--	--	1.8 J	1.3 U	2.5 J	--	--	--	1.9 J	1.3 U	2.7 J	--	--
Potassium	--	--	--	2320	49500	15200	--	--	--	1850	1390	1650	--	--
Selenium	--	--	--	0.73 U	0.69 U	0.69 U	--	--	--	0.73 U	0.69 U	0.69 U	--	--
Silver	--	--	--	1.3 U	1.4 U	1.4 U	--	--	--	1.3 U	1.4 U	1.4 U	--	--
Sodium	--	--	--	14200	46000	24900	--	--	--	9740	9260	11200	--	--
Thallium	--	--	--	0.26 U	0.24 U	0.24 U	--	--	--	0.26 U	0.24 U	0.24 U	--	--
Vanadium	--	--	--	1.9 U	1.2 U	1.2 U	--	--	--	2 J	1.2 U	1.2 U	--	--
Zinc	--	--	--	14.2 J	19.7	15.5 J	--	--	--	8.3 J	5.4 U	33.3	--	--
SEMIVOLATILE ORGANIC COMPOUNDS (µg/L)														
1,2,4,5-Tetrachlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,4-Dioxane (P-Dioxane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,3,4,6-Tetrachlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4,5-Trichlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4,6-Trichlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Table E-39
Summary of Data Used in Risk Assessment
Groundwater Below Upper Hydrogeologic Unit Site Wide - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-003A	CFMW-003A	CFMW-003A	CFMW-003A	CFMW-003A	CFMW-003A	CFMW-011A	CFMW-011A	CFMW-011A	CFMW-011A	CFMW-011A	CFMW-011A	CFMW-012A	CFMW-012A-DUP
Sample Lab IDs	460-120581-1	460-125342-7	460-130032-3	460-135619-3	460-158493-8	460-167518-1	460-120581-2	460-125477-8	460-130088-12	460-136351-3	460-158367-11	460-166400-2	460-120318-7	460-120318-12
Sample Name Chemical	CFMW-003a-GW 9/20/2016	CFMW-003a-GW 12/12/2016	CFMW-003a-GW 3/20/2017	CFMW-003a-GW 6/19/2017	CFMW-003a-GW 6/15/2018	CFMW-003a-GW 10/23/2018	CFMW-011a-GW 9/20/2016	CFMW-011a-GW 12/14/2016	CFMW-011a-GW 3/21/2017	CFMW-011a-GW 6/29/2017	CFMW-011a-GW 6/14/2018	CFMW-011a-GW 10/8/2018	CFMW-012a-GW 9/15/2016	CFMW-DUP2-GW 9/15/2016
2,4-Dichlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4-Dimethylphenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4-Dinitrophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4-Dinitrotoluene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,6-Dinitrotoluene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Chloronaphthalene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Chlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Methylnaphthalene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Methylphenol (O-Cresol)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Nitroaniline	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Nitrophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3- And 4- Methylphenol (Total)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3,3'-Dichlorobenzidine	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3-Nitroaniline	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4,6-Dinitro-2-Methylphenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Bromophenyl Phenyl Ether	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Chloro-3-Methylphenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Chloroaniline	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Chlorophenyl Phenyl Ether	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Nitroaniline	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Nitrophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acenaphthene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acenaphthylene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acetophenone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Anthracene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Atrazine	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzaldehyde	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(A)Anthracene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(A)Pyrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(B)Fluoranthene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(G,H,I)Perylene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(K)Fluoranthene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzyl Butyl Phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Biphenyl (Diphenyl)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bis(2-Chloroethoxy) Methane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bis(2-Chloroisopropyl) Ether	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bis(2-Ethylhexyl) Phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Caprolactam	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Carbazole	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chrysene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibenz(A,H)Anthracene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibenzofuran	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Diethyl Phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dimethyl Phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Di-N-Butyl Phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Di-N-Octylphthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Fluoranthene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Fluorene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorobutadiene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorocyclopentadiene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Indeno(1,2,3-C,D)Pyrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Isophorone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Naphthalene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Nitrobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
N-Nitrosodi-N-Propylamine	--	--	--	--	--	--	--	--	--	--	--	--	--	--
N-Nitrosodiphenylamine	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Table E-39
Summary of Data Used in Risk Assessment
Groundwater Below Upper Hydrogeologic Unit Site Wide - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-003A	CFMW-003A	CFMW-003A	CFMW-003A	CFMW-003A	CFMW-003A	CFMW-011A	CFMW-011A	CFMW-011A	CFMW-011A	CFMW-011A	CFMW-011A	CFMW-012A	CFMW-012A-DUP
Sample Lab IDs	460-120581-1	460-125342-7	460-130032-3	460-135619-3	460-158493-8	460-167518-1	460-120581-2	460-125477-8	460-130088-12	460-136351-3	460-158367-11	460-166400-2	460-120318-7	460-120318-12
Sample Name Chemical	CFMW-003a-GW 9/20/2016	CFMW-003a-GW 12/12/2016	CFMW-003a-GW 3/20/2017	CFMW-003a-GW 6/19/2017	CFMW-003a-GW 6/15/2018	CFMW-003a-GW 10/23/2018	CFMW-011a-GW 9/20/2016	CFMW-011a-GW 12/14/2016	CFMW-011a-GW 3/21/2017	CFMW-011a-GW 6/29/2017	CFMW-011a-GW 6/14/2018	CFMW-011a-GW 10/8/2018	CFMW-012a-GW 9/15/2016	CFMW-DUP2-GW 9/15/2016
Pentachlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Phenanthrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Phenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Pyrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SEMIVOLATILE ORGANIC COMPOUNDS|LOW LEVEL (µg/L)														
1,2,4,5-Tetrachlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,4-Dioxane (P-Dioxane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,3,4,6-Tetrachlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4,5-Trichlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4,6-Trichlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4-Dichlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4-Dimethylphenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4-Dinitrophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4-Dinitrotoluene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,6-Dinitrotoluene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Chloronaphthalene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Chlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Methylnaphthalene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Methylphenol (O-Cresol)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Nitroaniline	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Nitrophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3,3'-Dichlorobenzidine	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3-Nitroaniline	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4,6-Dinitro-2-Methylphenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Bromophenyl Phenyl Ether	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Chloro-3-Methylphenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Chloroaniline	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Chlorophenyl Phenyl Ether	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Nitroaniline	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Nitrophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acenaphthene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acenaphthylene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acetophenone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Anthracene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Atrazine	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzaldehyde	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(A)Anthracene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(A)Pyrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(B)Fluoranthene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(G,H,I)Perylene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(K)Fluoranthene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzyl Butyl Phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Biphenyl (Diphenyl)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bis(2-Chloroethoxy) Methane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bis(2-Chloroisopropyl) Ether	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bis(2-Ethylhexyl) Phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Caprolactam	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Carbazole	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chrysene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibenz(A,H)Anthracene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibenzofuran	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Diethyl Phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dimethyl Phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Di-N-Butyl Phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Di-N-Octylphthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Fluoranthene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Fluorene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Table E-39
Summary of Data Used in Risk Assessment
Groundwater Below Upper Hydrogeologic Unit Site Wide - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-003A	CFMW-003A	CFMW-003A	CFMW-003A	CFMW-003A	CFMW-003A	CFMW-011A	CFMW-011A	CFMW-011A	CFMW-011A	CFMW-011A	CFMW-011A	CFMW-012A	CFMW-012A-DUP
Sample Lab IDs	460-120581-1	460-125342-7	460-130032-3	460-135619-3	460-158493-8	460-167518-1	460-120581-2	460-125477-8	460-130088-12	460-136351-3	460-158367-11	460-166400-2	460-120318-7	460-120318-12
Sample Name Chemical	CFMW-003a-GW 9/20/2016	CFMW-003a-GW 12/12/2016	CFMW-003a-GW 3/20/2017	CFMW-003a-GW 6/19/2017	CFMW-003a-GW 6/15/2018	CFMW-003a-GW 10/23/2018	CFMW-011a-GW 9/20/2016	CFMW-011a-GW 12/14/2016	CFMW-011a-GW 3/21/2017	CFMW-011a-GW 6/29/2017	CFMW-011a-GW 6/14/2018	CFMW-011a-GW 10/8/2018	CFMW-012a-GW 9/15/2016	CFMW-DUP2-GW 9/15/2016
Hexachlorobutadiene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorocyclopentadiene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Indeno(1,2,3-C,D)Pyrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Isophorone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Naphthalene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Nitrobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
N-Nitrosodi-N-Propylamine	--	--	--	--	--	--	--	--	--	--	--	--	--	--
N-Nitrosodiphenylamine	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Pentachlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Phenanthrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Phenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Pyrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
VOLATILE ORGANIC COMPOUNDS (µg/L)														
1,1,1-Trichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,2,2-Tetrachloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,2-Trichloro-1,2,2-Trifluoroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,2-Trichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1-Dichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1-Dichloroethene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,3-Trichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,4-Trichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dibromo-3-Chloropropane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dibromoethane (Ethylene Dibromide)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichloropropane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,3-Dichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,4-Dichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Hexanone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acetone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromochloromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromodichloromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromoform	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromomethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Carbon Disulfide	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Carbon Tetrachloride	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chloroform	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chloromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cis-1,2-Dichloroethylene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cis-1,3-Dichloropropene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cyclohexane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibromochloromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dichlorodifluoromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Ethylbenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Isopropylbenzene (Cumene)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
M,P-Xylene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methyl Acetate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methyl Ethyl Ketone (2-Butanone)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methylcyclohexane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methylene Chloride	--	--	--	--	--	--	--	--	--	--	--	--	--	--
O-Xylene (1,2-Dimethylbenzene)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Styrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Tert-Butyl Methyl Ether	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Tetrachloroethylene (PCE)	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Table E-39
Summary of Data Used in Risk Assessment
Groundwater Below Upper Hydrogeologic Unit Site Wide - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-003A	CFMW-003A	CFMW-003A	CFMW-003A	CFMW-003A	CFMW-003A	CFMW-011A	CFMW-011A	CFMW-011A	CFMW-011A	CFMW-011A	CFMW-011A	CFMW-012A	CFMW-012A-DUP
Sample Lab IDs	460-120581-1	460-125342-7	460-130032-3	460-135619-3	460-158493-8	460-167518-1	460-120581-2	460-125477-8	460-130088-12	460-136351-3	460-158367-11	460-166400-2	460-120318-7	460-120318-12
Sample Name Chemical	CFMW-003a-GW 9/20/2016	CFMW-003a-GW 12/12/2016	CFMW-003a-GW 3/20/2017	CFMW-003a-GW 6/19/2017	CFMW-003a-GW 6/15/2018	CFMW-003a-GW 10/23/2018	CFMW-011a-GW 9/20/2016	CFMW-011a-GW 12/14/2016	CFMW-011a-GW 3/21/2017	CFMW-011a-GW 6/29/2017	CFMW-011a-GW 6/14/2018	CFMW-011a-GW 10/8/2018	CFMW-012a-GW 9/15/2016	CFMW-DUP2-GW 9/15/2016
Toluene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Trans-1,2-Dichloroethene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Trans-1,3-Dichloropropene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Trichloroethylene (TCE)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Trichlorofluoromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Vinyl Chloride	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-39
Summary of Data Used in Risk Assessment
Groundwater Below Upper Hydrogeologic Unit Site Wide - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-012A	CFMW-012A	CFMW-012A	CFMW-012A	CFMW-012A	CFMW-019A	CFMW-019A	CFMW-019A	CFMW-019A-DUP	CFMW-019A	CFMW-019A	CFMW-019A	CFMW-025A	CFMW-025A
Sample Lab IDs	460-125356-7	460-130032-1	460-135701-3	460-158058-8	460-167518-2	460-120581-3	460-125477-10	460-130410-2	460-130410-5	460-136063-3	460-158721-1	460-167518-3	460-120143-1	460-124783-5
Sample Name Chemical	CFMW-012a-GW 12/13/2016	CFMW-012a-GW 3/20/2017	CFMW-012a-GW 6/20/2017	CFMW-012a-GW 6/11/2018	CFMW-012a-GW 10/23/2018	CFMW-019a-GW 9/20/2016	CFMW-019a-GW 12/14/2016	CFMW-019a-GW 3/27/2017	CFMW-DUP9-GW 3/27/2017	CFMW-019a-GW 6/26/2017	CFMW-019a-GW 6/19/2018	CFMW-019a-GW 10/23/2018	CFMW-025a-GW 9/13/2016	CFMW-025a-GW 12/5/2016
GENERAL CHEMISTRY (µg/L)														
Fluoride	--	--	90.2	--	--	--	--	--	--	145	--	--	--	--
Cyanide	--	--	2 U	2.1 J	2 U	--	--	--	--	2.8 J	2.6 J	2.8 J	--	--
Cyanide (Free)	--	--	--	1.5 U	1.7 J	--	--	--	--	--	3.8 J	1.5 UJ	--	--
Cyanide	2 U	2 U	2 U	2.3 J	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2.4 J	2 U	2 U
Cyanide (Free)	--	--	--	1.5 U	1.5 U	--	--	--	--	--	2 J-	1.5 U	--	--
METALS (µg/L)														
Aluminum	18.2 U	18.2 U	18.2 U	15 U	15 U	82.3	29.5 J	20.6 J	18.2 U	22.5 J	15 U	22.6 J	18.2 U	22.9 J
Antimony	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U
Arsenic	0.64 U	0.64 U	0.64 U	0.77 U	0.77 U	8.3	2.2	1.2 J	1.2 J	1.3 J	1.4 J	1.3 J	0.93 J	2.7
Barium	84.1	79.6	79.3	86.7	77.8	56.9	56.6	42.5	42.6	46.8	49.6	52.2	128	336
Beryllium	0.24 U	0.24 U	0.24 U	0.26 U	0.26 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.26 U	0.26 U	0.24 U	0.24 U
Cadmium	0.71 U	0.71 U	0.71 U	0.61 U	0.61 U	0.71 U	0.71 U	0.71 U	0.71 U	0.71 U	0.61 U	0.61 U	0.71 U	0.71 U
Calcium	52900	51000	51300	59600	52200	15100	40100	30100	30300	31800	34600	37800	38300	137000
Chromium, Total	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
Cobalt	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	2.7 J
Copper	1.4 U	1.4 U	1.4 U	1.9 U	1.9 U	1.4 U	2.6 J	1.4 U	1.4 U	1.4 U	1.9 U	1.9 U	2.4 J	1.4 U
Iron	42.4 U	42.4 U	42.4 U	45.7 U	45.7 U	42.4 U	42.4 U	61.8 J	65.1 J	80.5 J	254	263	174	4350
Lead	0.38 U	0.38 U	0.38 U	0.37 U	0.37 U	0.38 U	0.38 U	0.38 U	0.38 U	0.38 U	0.37 U	0.37 U	0.38 U	0.38 U
Magnesium	12900	13100	13000	13200	13300	3700	14900	11400	11600	12100	13400	14800	24100	33000
Manganese	5.9 J	32.8	18.7	5.4 J	2.7 U	9.4	88.6	221	225	254	316	321	297	1540
Mercury	0.17 U	0.17 U	0.17 U	0.12 U	0.12 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.12 U	0.12 U	0.17 U	0.17 U
Nickel	1.4 U	1.4 U	1.4 U	1.3 U	1.3 U	1.4 U	1.4 U	1.7 J	1.4 U	1.4 U	1.3 U	1.3 U	1.4 U	1.4 U
Potassium	767	796	725	845	682	8880	1520	2770	2820	2960	2450	1960	2090	2500
Selenium	0.73 U	0.73 U	0.73 U	0.69 U	0.69 U	0.73 U	0.73 U	0.73 U	0.73 U	0.73 U	0.69 U	0.69 U	0.73 U	0.73 U
Silver	1.3 U	1.3 U	1.3 U	1.4 U	1.4 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.4 U	1.4 U	1.3 U	1.3 U
Sodium	6490	6130	5960	6410	5980	50900	10000	22200	22600	18200	14500	13800	8850	9180
Thallium	0.26 U	0.26 U	0.26 U	0.24 U	0.24 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.24 U	0.24 U	0.26 U	0.26 U
Vanadium	1.9 U	1.9 U	1.9 U	1.2 U	1.2 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.2 U	1.2 U	1.9 U	1.9 U
Zinc	7.6 J	7 U	7 U	5.4 U	5.4 U	7 U	7 U	7 U	7 U	7 U	5.4 U	5.4 U	7 U	7 U
Aluminum	--	--	292 J+	56.2	21.6 J	--	--	--	--	664	15 U	145	--	--
Antimony	--	--	0.62 U	0.62 U	0.62 U	--	--	--	--	1 J	0.62 U	0.62 U	--	--
Arsenic	--	--	0.64 U	0.77 U	0.77 U	--	--	--	--	1.8 J	1.3 J	1.1 J	--	--
Barium	--	--	85.7	82.6	76	--	--	--	--	54.5	53.8	53.3	--	--
Beryllium	--	--	0.24 U	0.26 U	0.26 U	--	--	--	--	0.24 U	0.26 U	0.26 U	--	--
Cadmium	--	--	0.71 U	0.61 U	0.61 U	--	--	--	--	0.71 U	0.61 U	0.61 U	--	--
Calcium	--	--	51600	56600	50500	--	--	--	--	34000	36600	37900	--	--
Chromium, Total	--	--	1.3 U	1.3 J	1.3 U	--	--	--	--	1.3 U	1.3 U	1.3 U	--	--
Cobalt	--	--	1.3 U	1.3 U	1.3 U	--	--	--	--	1.3 U	1.3 U	1.3 U	--	--
Copper	--	--	1.4 J	4.7	17.8	--	--	--	--	1.5 J	1.9 U	2 J	--	--
Iron	--	--	358	206	45.7 U	--	--	--	--	960	348	439	--	--
Lead	--	--	0.38 U	0.49 J	0.37 U	--	--	--	--	0.78 J	0.37 U	0.37 U	--	--
Magnesium	--	--	14500	13500	13500	--	--	--	--	12400	15300	15500	--	--
Manganese	--	--	28.9	7.2 J	2.7 U	--	--	--	--	286	364	336	--	--
Mercury	--	--	0.17 U	0.12 U	0.12 U	--	--	--	--	0.17 U	0.12 U	0.12 U	--	--
Nickel	--	--	1.4 U	1.3 U	1.3 U	--	--	--	--	1.4 U	1.3 U	1.3 U	--	--
Potassium	--	--	802	856	665	--	--	--	--	3170	2300	1960	--	--
Selenium	--	--	0.73 U	0.69 U	0.69 U	--	--	--	--	0.73 U	0.69 U	0.69 U	--	--
Silver	--	--	1.3 U	1.4 U	1.4 U	--	--	--	--	1.3 U	1.4 U	1.4 U	--	--
Sodium	--	--	6620 J+	6390	6400	--	--	--	--	19100	16700	14000	--	--
Thallium	--	--	0.26 U	0.24 U	0.24 U	--	--	--	--	0.26 U	0.24 U	0.24 U	--	--
Vanadium	--	--	1.9 U	1.2 U	1.2 U	--	--	--	--	1.9 U	1.2 U	1.2 U	--	--
Zinc	--	--	7 U	8.6 J	5.4 U	--	--	--	--	7.9 J	5.4 U	5.4 U	--	--
SEMIVOLATILE ORGANIC COMPOUNDS (µg/L)														
1,2,4,5-Tetrachlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,4-Dioxane (P-Dioxane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,3,4,6-Tetrachlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4,5-Trichlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4,6-Trichlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Table E-39
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Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-012A	CFMW-012A	CFMW-012A	CFMW-012A	CFMW-012A	CFMW-019A	CFMW-019A	CFMW-019A	CFMW-019A-DUP	CFMW-019A	CFMW-019A	CFMW-019A	CFMW-025A	CFMW-025A
Sample Lab IDs	460-125356-7	460-130032-1	460-135701-3	460-158058-8	460-167518-2	460-120581-3	460-125477-10	460-130410-2	460-130410-5	460-136063-3	460-158721-1	460-167518-3	460-120143-1	460-124783-5
Sample Name Chemical	CFMW-012a-GW 12/13/2016	CFMW-012a-GW 3/20/2017	CFMW-012a-GW 6/20/2017	CFMW-012a-GW 6/11/2018	CFMW-012a-GW 10/23/2018	CFMW-019a-GW 9/20/2016	CFMW-019a-GW 12/14/2016	CFMW-019a-GW 3/27/2017	CFMW-DUP9-GW 3/27/2017	CFMW-019a-GW 6/26/2017	CFMW-019a-GW 6/19/2018	CFMW-019a-GW 10/23/2018	CFMW-025a-GW 9/13/2016	CFMW-025a-GW 12/5/2016
2,4-Dichlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4-Dimethylphenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4-Dinitrophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4-Dinitrotoluene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,6-Dinitrotoluene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Chloronaphthalene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Chlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Methylnaphthalene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Methylphenol (O-Cresol)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Nitroaniline	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Nitrophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3- And 4- Methylphenol (Total)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3,3'-Dichlorobenzidine	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3-Nitroaniline	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4,6-Dinitro-2-Methylphenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Bromophenyl Phenyl Ether	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Chloro-3-Methylphenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Chloroaniline	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Chlorophenyl Phenyl Ether	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Nitroaniline	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Nitrophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acenaphthene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acenaphthylene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acetophenone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Anthracene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Atrazine	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzaldehyde	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(A)Anthracene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(A)Pyrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(B)Fluoranthene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(G,H,I)Perylene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(K)Fluoranthene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzyl Butyl Phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Biphenyl (Diphenyl)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bis(2-Chloroethoxy) Methane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bis(2-Chloroisopropyl) Ether	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bis(2-Ethylhexyl) Phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Caprolactam	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Carbazole	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chrysene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibenz(A,H)Anthracene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibenzofuran	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Diethyl Phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dimethyl Phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Di-N-Butyl Phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Di-N-Octylphthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Fluoranthene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Fluorene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorobutadiene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorocyclopentadiene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Indeno(1,2,3-C,D)Pyrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Isophorone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Naphthalene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Nitrobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
N-Nitrosodi-N-Propylamine	--	--	--	--	--	--	--	--	--	--	--	--	--	--
N-Nitrosodiphenylamine	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Table E-39
Summary of Data Used in Risk Assessment
Groundwater Below Upper Hydrogeologic Unit Site Wide - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-012A	CFMW-012A	CFMW-012A	CFMW-012A	CFMW-012A	CFMW-019A	CFMW-019A	CFMW-019A	CFMW-019A-DUP	CFMW-019A	CFMW-019A	CFMW-019A	CFMW-025A	CFMW-025A
Sample Lab IDs	460-125356-7	460-130032-1	460-135701-3	460-158058-8	460-167518-2	460-120581-3	460-125477-10	460-130410-2	460-130410-5	460-136063-3	460-158721-1	460-167518-3	460-120143-1	460-124783-5
Sample Name Chemical	CFMW-012a-GW 12/13/2016	CFMW-012a-GW 3/20/2017	CFMW-012a-GW 6/20/2017	CFMW-012a-GW 6/11/2018	CFMW-012a-GW 10/23/2018	CFMW-019a-GW 9/20/2016	CFMW-019a-GW 12/14/2016	CFMW-019a-GW 3/27/2017	CFMW-DUP9-GW 3/27/2017	CFMW-019a-GW 6/26/2017	CFMW-019a-GW 6/19/2018	CFMW-019a-GW 10/23/2018	CFMW-025a-GW 9/13/2016	CFMW-025a-GW 12/5/2016
Pentachlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Phenanthrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Phenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Pyrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SEMIVOLATILE ORGANIC COMPOUNDS|LOW LEVEL (µg/L)														
1,2,4,5-Tetrachlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,4-Dioxane (P-Dioxane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,3,4,6-Tetrachlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4,5-Trichlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4,6-Trichlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4-Dichlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4-Dimethylphenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4-Dinitrophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4-Dinitrotoluene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,6-Dinitrotoluene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Chloronaphthalene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Chlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Methylnaphthalene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Methylphenol (O-Cresol)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Nitroaniline	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Nitrophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3,3'-Dichlorobenzidine	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3-Nitroaniline	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4,6-Dinitro-2-Methylphenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Bromophenyl Phenyl Ether	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Chloro-3-Methylphenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Chloroaniline	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Chlorophenyl Phenyl Ether	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Nitroaniline	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Nitrophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acenaphthene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acenaphthylene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acetophenone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Anthracene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Atrazine	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzaldehyde	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(A)Anthracene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(A)Pyrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(B)Fluoranthene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(G,H,I)Perylene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(K)Fluoranthene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzyl Butyl Phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Biphenyl (Diphenyl)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bis(2-Chloroethoxy) Methane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bis(2-Chloroisopropyl) Ether	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bis(2-Ethylhexyl) Phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Caprolactam	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Carbazole	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chrysene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibenz(A,H)Anthracene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibenzofuran	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Diethyl Phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dimethyl Phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Di-N-Butyl Phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Di-N-Octylphthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Fluoranthene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Fluorene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Table E-39
Summary of Data Used in Risk Assessment
Groundwater Below Upper Hydrogeologic Unit Site Wide - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-012A	CFMW-012A	CFMW-012A	CFMW-012A	CFMW-012A	CFMW-019A	CFMW-019A	CFMW-019A	CFMW-019A-DUP	CFMW-019A	CFMW-019A	CFMW-019A	CFMW-025A	CFMW-025A
Sample Lab IDs	460-125356-7	460-130032-1	460-135701-3	460-158058-8	460-167518-2	460-120581-3	460-125477-10	460-130410-2	460-130410-5	460-136063-3	460-158721-1	460-167518-3	460-120143-1	460-124783-5
Sample Name Chemical	CFMW-012a-GW 12/13/2016	CFMW-012a-GW 3/20/2017	CFMW-012a-GW 6/20/2017	CFMW-012a-GW 6/11/2018	CFMW-012a-GW 10/23/2018	CFMW-019a-GW 9/20/2016	CFMW-019a-GW 12/14/2016	CFMW-019a-GW 3/27/2017	CFMW-DUP9-GW 3/27/2017	CFMW-019a-GW 6/26/2017	CFMW-019a-GW 6/19/2018	CFMW-019a-GW 10/23/2018	CFMW-025a-GW 9/13/2016	CFMW-025a-GW 12/5/2016
Hexachlorobutadiene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorocyclopentadiene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Indeno(1,2,3-C,D)Pyrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Isophorone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Naphthalene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Nitrobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
N-Nitrosodi-N-Propylamine	--	--	--	--	--	--	--	--	--	--	--	--	--	--
N-Nitrosodiphenylamine	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Pentachlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Phenanthrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Phenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Pyrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
VOLATILE ORGANIC COMPOUNDS (µg/L)														
1,1,1-Trichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,2,2-Tetrachloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,2-Trichloro-1,2,2-Trifluoroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,2-Trichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1-Dichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1-Dichloroethene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,3-Trichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,4-Trichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dibromo-3-Chloropropane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dibromoethane (Ethylene Dibromide)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichloropropane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,3-Dichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,4-Dichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Hexanone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acetone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromochloromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromodichloromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromoform	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromomethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Carbon Disulfide	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Carbon Tetrachloride	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chloroform	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chloromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cis-1,2-Dichloroethylene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cis-1,3-Dichloropropene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cyclohexane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibromochloromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dichlorodifluoromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Ethylbenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Isopropylbenzene (Cumene)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
M,P-Xylene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methyl Acetate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methyl Ethyl Ketone (2-Butanone)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methylcyclohexane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methylene Chloride	--	--	--	--	--	--	--	--	--	--	--	--	--	--
O-Xylene (1,2-Dimethylbenzene)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Styrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Tert-Butyl Methyl Ether	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Tetrachloroethylene (PCE)	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Table E-39
Summary of Data Used in Risk Assessment
Groundwater Below Upper Hydrogeologic Unit Site Wide - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-012A	CFMW-012A	CFMW-012A	CFMW-012A	CFMW-012A	CFMW-019A	CFMW-019A	CFMW-019A	CFMW-019A-DUP	CFMW-019A	CFMW-019A	CFMW-019A	CFMW-025A	CFMW-025A
Sample Lab IDs	460-125356-7	460-130032-1	460-135701-3	460-158058-8	460-167518-2	460-120581-3	460-125477-10	460-130410-2	460-130410-5	460-136063-3	460-158721-1	460-167518-3	460-120143-1	460-124783-5
Sample Name Chemical	CFMW-012a-GW 12/13/2016	CFMW-012a-GW 3/20/2017	CFMW-012a-GW 6/20/2017	CFMW-012a-GW 6/11/2018	CFMW-012a-GW 10/23/2018	CFMW-019a-GW 9/20/2016	CFMW-019a-GW 12/14/2016	CFMW-019a-GW 3/27/2017	CFMW-DUP9-GW 3/27/2017	CFMW-019a-GW 6/26/2017	CFMW-019a-GW 6/19/2018	CFMW-019a-GW 10/23/2018	CFMW-025a-GW 9/13/2016	CFMW-025a-GW 12/5/2016
Toluene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Trans-1,2-Dichloroethene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Trans-1,3-Dichloropropene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Trichloroethylene (TCE)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Trichlorofluoromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Vinyl Chloride	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-39
Summary of Data Used in Risk Assessment
Groundwater Below Upper Hydrogeologic Unit Site Wide - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-025A	CFMW-025A	CFMW-025A	CFMW-025A	CFMW-032A	CFMW-032A	CFMW-032A	CFMW-032A	CFMW-032A	CFMW-032A	CFMW-044B	CFMW-044B	CFMW-044B	CFMW-044B
Sample Lab IDs	460-130333-2	460-135884-7	460-157853-1	460-166582-6	460-120382-3	460-125644-3	460-130620-6	460-136178-5	460-158367-10	460-166151-2	460-120477-8	460-125747-2	460-130333-9	460-135989-4
Sample Name Chemical	CFMW-025a-GW 3/24/2017	CFMW-025a-GW 6/22/2017	CFMW-025a-GW 6/7/2018	CFMW-025a-GW 10/10/2018	CFMW-032a-GW 9/16/2016	CFMW-032a-GW 12/16/2016	CFMW-032a-GW 3/29/2017	CFMW-032a-GW 6/27/2017	CFMW-032a-GW 6/14/2018	CFMW-032a-GW 10/4/2018	CFMW-044b-GW 9/19/2016	CFMW-044b-GW 12/19/2016	CFMW-044b-GW 3/24/2017	CFMW-044b-GW 6/23/2017
GENERAL CHEMISTRY (µg/L)														
Fluoride	--	422	--	--	--	--	--	193 J+	--	--	--	--	--	116
Cyanide	--	2 U	2 U	2.1 J+	--	--	--	2 U	5.1 J	5.1 J	--	--	--	10.1
Cyanide (Free)	--	--	2.9 J	1.5 U	--	--	--	1.5 U	1.5 U	2.1 J	--	--	--	1.5 U
Cyanide	2 U	2 U	2 U	2 U	2 U	2 U	3.9 J	2 U	4.8 J	5.6 J	5.9 J	8.2 J	9.8 J	10.5
Cyanide (Free)	--	--	3.9 J	1.5 U	--	--	--	1.5 U	1.5 U	1.5 U	--	--	1.5 U	1.5 U
METALS (µg/L)														
Aluminum	18.2 U	23 J	20.3 J	33.1 J	69.3	20.5 J	102	97.5	43.6	56.8	18.2 U	18.2 U	18.2 U	18.2 U
Antimony	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.86 J	0.62 U	0.62 U	1.1 J	1.6 J	0.62 U	0.62 U	0.62 U	0.62 U
Arsenic	1.6 J	1.6 J	0.77 U	0.96 J	0.64 U	0.64 U	0.64 U	0.64 U	0.77 U	0.77 U	0.64 U	0.64 U	0.64 U	0.64 U
Barium	121	122	118	120	890	269	481	412	327	355	87.4	251	309	352
Beryllium	0.24 U	0.24 U	0.26 U	0.26 U	0.24 U	0.24 U	0.24 U	0.24 U	0.26 U	0.26 U	0.24 U	0.24 U	0.24 U	0.24 U
Cadmium	0.71 U	0.71 U	0.61 U	0.61 U	0.71 U	0.71 U	0.71 U	0.71 U	0.61 U	0.61 U	0.71 U	0.71 U	0.71 U	0.71 U
Calcium	38000	37900	35800	36800	628000	253000	436000	404000	272000	274000	13700	31300	37700	40200
Chromium, Total	1.3 U	1.3 U	1.3 U	1.3 U	3.1 J	8.1	7.3	6.6	9.9	11	1.3 U	1.3 U	1.3 U	1.3 U
Cobalt	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
Copper	1.4 U	1.4 U	1.9 U	1.9 U	1.7 J	1.7 J	3.5 J	3.1 J	5.7	7.4	1.4 U	1.4 U	1.4 U	1.4 U
Iron	293	314	123	161	42.4 U	42.4 U	42.4 U	42.4 U	45.7 U	45.7 U	732	2200	1760	1400
Lead	0.38 U	0.38 U	0.37 U	0.37 U	0.6 J	0.38 U	0.38 U	1.2	1.2	1.4	0.38 U	0.38 U	0.38 U	0.38 U
Magnesium	22900	22900	21100	23800	63.6 U	69 J	63.6 U	63.6 U	65.7 U	65.7 U	16500	21500	21500	19700
Manganese	225	225	117	128	2.5 U	2.5 U	2.5 U	2.5 U	2.7 U	2.7 U	86.2	155	137	140
Mercury	0.17 U	0.17 U	0.12 U	0.12 U	0.17 U	0.17 U	0.17 U	0.17 U	0.12 U	0.12 U	0.17 U	0.17 U	0.17 U	0.17 U
Nickel	1.4 U	1.4 U	1.3 U	1.3 U	1.4 U	1.4 U	1.4 U	1.4 U	1.3 U	1.3 U	1.4 U	1.4 U	1.4 U	1.4 U
Potassium	1950	2030	2000	1980	21600	3860	7870	17800	99700	121000	2520	1440	1010	950
Selenium	0.73 U	0.73 U	0.69 U	0.69 U	0.73 U	0.73 U	0.73 U	0.73 U	0.69 U	0.69 U	0.73 U	0.73 U	0.73 U	0.73 U
Silver	1.3 U	1.3 U	1.4 U	1.4 U	1.3 U	1.3 U	1.3 U	1.3 U	1.4 U	1.4 U	1.3 U	1.3 U	1.3 U	1.3 U
Sodium	7410	8020	6660	7020	25400	11900	13900	16400	61700	78000	3900	4060	4020	4340
Thallium	0.26 U	0.26 U	0.24 U	0.24 U	0.26 U	0.26 U	0.26 U	0.26 U	0.24 U	0.24 U	0.26 U	0.26 U	0.26 U	0.26 U
Vanadium	1.9 U	1.9 U	1.2 U	1.2 U	1.9 U	1.9 U	1.9 U	1.9 U	1.2 U	1.2 U	1.9 U	1.9 U	1.9 U	1.9 U
Zinc	7 U	7 U	6.5 J	5.4 U	7 U	7 U	7 U	7 U	5.4 U	5.4 U	7 U	7 U	26.6	7.2 J
Aluminum	--	6370	30.2 J	391	--	--	--	195	71.3	92.5	--	--	--	40.9
Antimony	--	0.62 U	0.62 U	0.62 U	--	--	--	0.64 J	1.5 J	1.5 J	--	--	--	0.62 U
Arsenic	--	5.3	0.83 J	0.77 U	--	--	--	0.64 U	0.77 U	0.77 U	--	--	--	0.64 U
Barium	--	232	121	134	--	--	--	464	320	354	--	--	--	374
Beryllium	--	0.38 J	0.26 U	0.26 U	--	--	--	0.24 U	0.26 U	0.26 U	--	--	--	0.24 U
Cadmium	--	0.71 U	0.61 U	0.61 U	--	--	--	0.71 U	0.61 U	0.61 U	--	--	--	0.71 U
Calcium	--	48200	37200	39900	--	--	--	390000	255000	271000 J	--	--	--	41100
Chromium, Total	--	8.7	1.3 U	1.3 U	--	--	--	7.4	11	11.5	--	--	--	1.3 U
Cobalt	--	4.4	1.3 U	1.3 U	--	--	--	1.3 U	1.3 U	1.3 U	--	--	--	1.3 U
Copper	--	13.2	1.9 U	3.4 J	--	--	--	7.9	8.2	19	--	--	--	1.4 U
Iron	--	7860	190	527	--	--	--	181	60.5 J	113 J	--	--	--	4880
Lead	--	7.7	0.37 U	0.47 J	--	--	--	1 J	1.5	1.7	--	--	--	3.9
Magnesium	--	26200	24400	25400	--	--	--	259	66.9 J	65.7 U	--	--	--	22500
Manganese	--	347	125	139	--	--	--	3.8 J	2.7 U	2.7 U	--	--	--	169
Mercury	--	0.17 U	0.12 U	0.12 U	--	--	--	0.17 U	0.12 U	0.12 U	--	--	--	0.17 U
Nickel	--	7.6	1.3 U	1.3 U	--	--	--	1.4 U	1.3 U	1.3 U	--	--	--	1.4 U
Potassium	--	3110	1990	2220	--	--	--	16200	94100	121000	--	--	--	1000
Selenium	--	0.73 U	0.69 U	0.69 U	--	--	--	0.73 U	0.69 U	0.69 U	--	--	--	0.73 U
Silver	--	1.3 U	1.4 U	1.4 U	--	--	--	1.3 U	1.4 U	1.4 U	--	--	--	1.3 U
Sodium	--	7370	7280	7550	--	--	--	17700	61600	77600	--	--	--	4840
Thallium	--	0.26 U	0.24 U	0.24 U	--	--	--	0.26 U	0.24 U	0.24 U	--	--	--	0.26 U
Vanadium	--	5.2	1.2 U	1.2 U	--	--	--	1.9 U	1.2 U	1.2 U	--	--	--	1.9 U
Zinc	--	45.5	26.3	5.4 U	--	--	--	11.3 J	5.7 J	7.9 J	--	--	--	384
SEMIVOLATILE ORGANIC COMPOUNDS (µg/L)														
1,2,4,5-Tetrachlorobenzene	--	--	--	--	--	--	--	--	--	--	0.43 U	0.45 U	0.43 U	0.43 U
1,4-Dioxane (P-Dioxane)	--	--	--	--	--	--	--	--	--	--	3.1 U	3.3 U	3.1 U	3.1 U
2,3,4,6-Tetrachlorophenol	--	--	--	--	--	--	--	--	--	--	0.69 U	0.73 U	0.69 U	0.69 U
2,4,5-Trichlorophenol	--	--	--	--	--	--	--	--	--	--	0.49 U	0.52 U	0.49 U	0.49 U
2,4,6-Trichlorophenol	--	--	--	--	--	--	--	--	--	--	0.53 U	0.56 U	0.53 U	0.53 U

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Columbia Falls Aluminum Facility
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Sample Location ID	CFMW-025A	CFMW-025A	CFMW-025A	CFMW-025A	CFMW-032A	CFMW-032A	CFMW-032A	CFMW-032A	CFMW-032A	CFMW-032A	CFMW-044B	CFMW-044B	CFMW-044B	CFMW-044B
Sample Lab IDs	460-130333-2	460-135884-7	460-157853-1	460-166582-6	460-120382-3	460-125644-3	460-130620-6	460-136178-5	460-158367-10	460-166151-2	460-120477-8	460-125747-2	460-130333-9	460-135989-4
Sample Name Chemical	CFMW-025a-GW 3/24/2017	CFMW-025a-GW 6/22/2017	CFMW-025a-GW 6/7/2018	CFMW-025a-GW 10/10/2018	CFMW-032a-GW 9/16/2016	CFMW-032a-GW 12/16/2016	CFMW-032a-GW 3/29/2017	CFMW-032a-GW 6/27/2017	CFMW-032a-GW 6/14/2018	CFMW-032a-GW 10/4/2018	CFMW-044b-GW 9/19/2016	CFMW-044b-GW 12/19/2016	CFMW-044b-GW 3/24/2017	CFMW-044b-GW 6/23/2017
2,4-Dichlorophenol	--	--	--	--	--	--	--	--	--	--	0.63 U	0.66 U	0.63 U	0.63 U
2,4-Dimethylphenol	--	--	--	--	--	--	--	--	--	--	0.91 U	0.96 U	0.91 U	0.91 U
2,4-Dinitrophenol	--	--	--	--	--	--	--	--	--	--	2.4 U	2.5 U	2.4 U	2.4 U
2,4-Dinitrotoluene	--	--	--	--	--	--	--	--	--	--	1 U	1.1 U	1 U	1 U
2,6-Dinitrotoluene	--	--	--	--	--	--	--	--	--	--	0.88 U	0.93 U	0.88 U	0.88 U
2-Chloronaphthalene	--	--	--	--	--	--	--	--	--	--	0.61 U	0.64 U	0.61 U	0.61 U
2-Chlorophenol	--	--	--	--	--	--	--	--	--	--	0.74 U	0.78 U	0.74 U	0.74 U
2-Methylnaphthalene	--	--	--	--	--	--	--	--	--	--	0.88 U	0.93 U	0.88 U	0.88 U
2-Methylphenol (O-Cresol)	--	--	--	--	--	--	--	--	--	--	1.3 U	1.4 U	1.3 U	1.3 U
2-Nitroaniline	--	--	--	--	--	--	--	--	--	--	0.65 U	0.69 U	0.65 U	0.65 UJ
2-Nitrophenol	--	--	--	--	--	--	--	--	--	--	0.59 U	0.62 U	0.59 U	0.59 U
3- And 4- Methylphenol (Total)	--	--	--	--	--	--	--	--	--	--	0.88 U	1.4 J	0.88 U	0.88 U
3,3'-Dichlorobenzidine	--	--	--	--	--	--	--	--	--	--	1 U	1.1 U	1 U	1 U
3-Nitroaniline	--	--	--	--	--	--	--	--	--	--	0.82 U	0.86 U	0.82 U	0.82 U
4,6-Dinitro-2-Methylphenol	--	--	--	--	--	--	--	--	--	--	2 U	2.1 U	2 U	2 U
4-Bromophenyl Phenyl Ether	--	--	--	--	--	--	--	--	--	--	1 U	1.1 U	1 U	1 U
4-Chloro-3-Methylphenol	--	--	--	--	--	--	--	--	--	--	0.76 U	0.8 U	0.76 U	0.76 U
4-Chloroaniline	--	--	--	--	--	--	--	--	--	--	0.73 U	0.77 U	0.73 U	0.73 U
4-Chlorophenyl Phenyl Ether	--	--	--	--	--	--	--	--	--	--	0.96 U	1 U	0.96 U	0.96 U
4-Nitroaniline	--	--	--	--	--	--	--	--	--	--	0.48 U	0.51 U	0.48 U	0.48 UJ
4-Nitrophenol	--	--	--	--	--	--	--	--	--	--	4.7 U	4.9 U	4.7 U	4.7 UJ
Acenaphthene	--	--	--	--	--	--	--	--	--	--	0.88 U	0.93 U	0.88 U	0.88 UJ
Acenaphthylene	--	--	--	--	--	--	--	--	--	--	0.65 U	0.69 U	0.65 U	0.65 U
Acetophenone	--	--	--	--	--	--	--	--	--	--	1 U	1.1 U	1 U	1 U
Anthracene	--	--	--	--	--	--	--	--	--	--	0.57 U	0.6 U	0.57 U	0.57 U
Atrazine	--	--	--	--	--	--	--	--	--	--	0.77 U	0.81 U	0.77 U	0.77 U
Benzaldehyde	--	--	--	--	--	--	--	--	--	--	0.86 U	0.91 U	0.86 U	0.86 U
Benzo(A)Anthracene	--	--	--	--	--	--	--	--	--	--	0.55 U	0.58 U	0.55 U	0.55 U
Benzo(A)Pyrene	--	--	--	--	--	--	--	--	--	--	0.16 U	0.17 U	0.16 U	0.16 U
Benzo(B)Fluoranthene	--	--	--	--	--	--	--	--	--	--	0.44 U	0.46 U	0.44 U	0.44 U
Benzo(G,H,I)Perylene	--	--	--	--	--	--	--	--	--	--	0.75 U	0.79 U	0.75 U	0.75 U
Benzo(K)Fluoranthene	--	--	--	--	--	--	--	--	--	--	0.18 U	0.19 U	0.18 U	0.18 U
Benzyl Butyl Phthalate	--	--	--	--	--	--	--	--	--	--	0.6 U	0.63 U	0.6 U	0.6 U
Biphenyl (Diphenyl)	--	--	--	--	--	--	--	--	--	--	0.63 U	0.66 UJ	0.63 U	0.63 U
Bis(2-Chloroethoxy) Methane	--	--	--	--	--	--	--	--	--	--	0.69 U	0.73 U	0.69 U	0.69 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	--	--	--	--	--	--	--	--	--	--	0.12 U	0.13 UJ	0.12 U	0.12 U
Bis(2-Chloroisopropyl) Ether	--	--	--	--	--	--	--	--	--	--	0.93 U	0.98 U	0.93 U	0.93 UJ
Bis(2-Ethylhexyl) Phthalate	--	--	--	--	--	--	--	--	--	--	0.72 U	0.76 U	0.72 U	0.72 U
Caprolactam	--	--	--	--	--	--	--	--	--	--	1.1 U	1.1 U	1.1 UJ	1.1 U
Carbazole	--	--	--	--	--	--	--	--	--	--	0.85 U	0.9 U	0.85 U	0.85 U
Chrysene	--	--	--	--	--	--	--	--	--	--	0.67 U	0.71 U	0.67 U	0.67 U
Dibenz(A,H)Anthracene	--	--	--	--	--	--	--	--	--	--	0.09 U	0.095 U	0.09 U	0.09 U
Dibenzofuran	--	--	--	--	--	--	--	--	--	--	0.85 U	0.9 U	0.85 U	0.85 U
Diethyl Phthalate	--	--	--	--	--	--	--	--	--	--	1 U	1.1 UJ	1 U	1 U
Dimethyl Phthalate	--	--	--	--	--	--	--	--	--	--	0.98 U	1 UJ	0.98 U	0.98 U
Di-N-Butyl Phthalate	--	--	--	--	--	--	--	--	--	--	0.82 U	0.86 U	0.82 UJ	0.82 U
Di-N-Octylphthalate	--	--	--	--	--	--	--	--	--	--	0.69 U	0.73 U	0.69 U	0.69 U
Fluoranthene	--	--	--	--	--	--	--	--	--	--	0.72 U	0.76 U	0.72 U	0.72 U
Fluorene	--	--	--	--	--	--	--	--	--	--	0.8 U	0.84 U	0.8 U	0.8 U
Hexachlorobenzene	--	--	--	--	--	--	--	--	--	--	0.47 U	0.5 U	0.47 U	0.47 U
Hexachlorobutadiene	--	--	--	--	--	--	--	--	--	--	0.76 U	0.8 U	0.76 U	0.76 U
Hexachlorocyclopentadiene	--	--	--	--	--	--	--	--	--	--	0.61 U	0.64 U	0.61 UJ	0.61 U
Hexachloroethane	--	--	--	--	--	--	--	--	--	--	0.09 U	0.095 U	0.09 U	0.09 U
Indeno(1,2,3-C,D)Pyrene	--	--	--	--	--	--	--	--	--	--	0.21 U	0.22 U	0.21 U	0.21 U
Isophorone	--	--	--	--	--	--	--	--	--	--	0.67 U	0.71 U	0.67 U	0.67 U
Naphthalene	--	--	--	--	--	--	--	--	--	--	0.8 U	0.84 U	0.8 U	0.8 U
Nitrobenzene	--	--	--	--	--	--	--	--	--	--	0.49 U	0.52 U	0.49 U	0.49 U
N-Nitrosodi-N-Propylamine	--	--	--	--	--	--	--	--	--	--	0.83 U	0.88 U	0.83 U	0.83 U
N-Nitrosodiphenylamine	--	--	--	--	--	--	--	--	--	--	0.74 U	0.78 U	0.74 U	0.74 U

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Sample Lab IDs	460-130333-2	460-135884-7	460-157853-1	460-166582-6	460-120382-3	460-125644-3	460-130620-6	460-136178-5	460-158367-10	460-166151-2	460-120477-8	460-125747-2	460-130333-9	460-135989-4
Sample Name Chemical	CFMW-025a-GW 3/24/2017	CFMW-025a-GW 6/22/2017	CFMW-025a-GW 6/7/2018	CFMW-025a-GW 10/10/2018	CFMW-032a-GW 9/16/2016	CFMW-032a-GW 12/16/2016	CFMW-032a-GW 3/29/2017	CFMW-032a-GW 6/27/2017	CFMW-032a-GW 6/14/2018	CFMW-032a-GW 10/4/2018	CFMW-044b-GW 9/19/2016	CFMW-044b-GW 12/19/2016	CFMW-044b-GW 3/24/2017	CFMW-044b-GW 6/23/2017
Pentachlorophenol	--	--	--	--	--	--	--	--	--	--	2.2 U	2.3 U	2.2 U	2.2 U
Phenanthrene	--	--	--	--	--	--	--	--	--	--	0.65 U	0.69 U	0.65 U	0.65 U
Phenol	--	--	--	--	--	--	--	--	--	--	0.41 U	0.43 U	0.41 U	0.41 U
Pyrene	--	--	--	--	--	--	--	--	--	--	0.83 U	0.88 U	0.83 U	0.83 U
SEMIVOLATILE ORGANIC COMPOUNDS|LOW LEVEL (µg/L)														
1,2,4,5-Tetrachlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,4-Dioxane (P-Dioxane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,3,4,6-Tetrachlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4,5-Trichlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4,6-Trichlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4-Dichlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4-Dimethylphenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4-Dinitrophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4-Dinitrotoluene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,6-Dinitrotoluene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Chloronaphthalene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Chlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Methylnaphthalene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Methylphenol (O-Cresol)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Nitroaniline	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Nitrophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3,3'-Dichlorobenzidine	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3-Nitroaniline	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4,6-Dinitro-2-Methylphenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Bromophenyl Phenyl Ether	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Chloro-3-Methylphenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Chloroaniline	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Chlorophenyl Phenyl Ether	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Nitroaniline	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Nitrophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acenaphthene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acenaphthylene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acetophenone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Anthracene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Atrazine	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzaldehyde	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(A)Anthracene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(A)Pyrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(B)Fluoranthene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(G,H,I)Perylene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(K)Fluoranthene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzyl Butyl Phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Biphenyl (Diphenyl)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bis(2-Chloroethoxy) Methane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bis(2-Chloroisopropyl) Ether	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bis(2-Ethylhexyl) Phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Caprolactam	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Carbazole	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chrysene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibenz(A,H)Anthracene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibenzofuran	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Diethyl Phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dimethyl Phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Di-N-Butyl Phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Di-N-Octylphthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Fluoranthene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Fluorene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Table E-39
Summary of Data Used in Risk Assessment
Groundwater Below Upper Hydrogeologic Unit Site Wide - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-025A	CFMW-025A	CFMW-025A	CFMW-025A	CFMW-032A	CFMW-032A	CFMW-032A	CFMW-032A	CFMW-032A	CFMW-032A	CFMW-044B	CFMW-044B	CFMW-044B	CFMW-044B
Sample Lab IDs	460-130333-2	460-135884-7	460-157853-1	460-166582-6	460-120382-3	460-125644-3	460-130620-6	460-136178-5	460-158367-10	460-166151-2	460-120477-8	460-125747-2	460-130333-9	460-135989-4
Sample Name Chemical	CFMW-025a-GW 3/24/2017	CFMW-025a-GW 6/22/2017	CFMW-025a-GW 6/7/2018	CFMW-025a-GW 10/10/2018	CFMW-032a-GW 9/16/2016	CFMW-032a-GW 12/16/2016	CFMW-032a-GW 3/29/2017	CFMW-032a-GW 6/27/2017	CFMW-032a-GW 6/14/2018	CFMW-032a-GW 10/4/2018	CFMW-044b-GW 9/19/2016	CFMW-044b-GW 12/19/2016	CFMW-044b-GW 3/24/2017	CFMW-044b-GW 6/23/2017
Hexachlorobutadiene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorocyclopentadiene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Indeno(1,2,3-C,D)Pyrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Isophorone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Naphthalene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Nitrobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
N-Nitrosodi-N-Propylamine	--	--	--	--	--	--	--	--	--	--	--	--	--	--
N-Nitrosodiphenylamine	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Pentachlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Phenanthrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Phenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Pyrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
VOLATILE ORGANIC COMPOUNDS (µg/L)														
1,1,1-Trichloroethane	--	--	--	--	--	--	--	--	--	--	0.28 U	0.28 U	0.28 U	0.28 U
1,1,2,2-Tetrachloroethane	--	--	--	--	--	--	--	--	--	--	0.19 U	0.19 U	0.19 U	0.19 UJ
1,1,2-Trichloro-1,2,2-Trifluoroethane	--	--	--	--	--	--	--	--	--	--	0.34 U	0.34 UJ	0.34 U	0.34 U
1,1,2-Trichloroethane	--	--	--	--	--	--	--	--	--	--	0.08 U	0.08 U	0.08 U	0.08 U
1,1-Dichloroethane	--	--	--	--	--	--	--	--	--	--	0.24 U	0.24 U	0.24 U	0.24 U
1,1-Dichloroethene	--	--	--	--	--	--	--	--	--	--	0.34 U	0.34 U	0.34 U	0.34 U
1,2,3-Trichlorobenzene	--	--	--	--	--	--	--	--	--	--	0.35 U	0.35 U	0.35 U	0.35 U
1,2,4-Trichlorobenzene	--	--	--	--	--	--	--	--	--	--	0.27 U	0.27 U	0.27 U	0.27 U
1,2-Dibromo-3-Chloropropane	--	--	--	--	--	--	--	--	--	--	0.23 U	0.23 U	0.23 U	0.23 UJ
1,2-Dibromoethane (Ethylene Dibromide)	--	--	--	--	--	--	--	--	--	--	0.19 U	0.19 U	0.19 U	0.19 U
1,2-Dichlorobenzene	--	--	--	--	--	--	--	--	--	--	0.22 U	0.22 U	0.22 U	0.22 U
1,2-Dichloroethane	--	--	--	--	--	--	--	--	--	--	0.28 J	0.25 U	0.25 U	0.25 UJ
1,2-Dichloropropane	--	--	--	--	--	--	--	--	--	--	0.18 U	0.18 U	0.18 U	0.18 U
1,3-Dichlorobenzene	--	--	--	--	--	--	--	--	--	--	0.33 U	0.33 U	0.33 U	0.33 U
1,4-Dichlorobenzene	--	--	--	--	--	--	--	--	--	--	0.33 U	0.33 U	0.33 U	0.33 U
2-Hexanone	--	--	--	--	--	--	--	--	--	--	0.72 U	0.72 U	0.72 U	0.72 U
Acetone	--	--	--	--	--	--	--	--	--	--	1.1 U	1.1 U	4.9 J	1.1 U
Benzene	--	--	--	--	--	--	--	--	--	--	0.09 U	0.09 U	0.09 U	0.09 U
Bromochloromethane	--	--	--	--	--	--	--	--	--	--	0.3 U	0.3 U	0.3 U	0.3 U
Bromodichloromethane	--	--	--	--	--	--	--	--	--	--	0.15 U	0.15 U	0.15 U	0.15 U
Bromoform	--	--	--	--	--	--	--	--	--	--	0.18 U	0.18 U	0.18 U	0.18 U
Bromomethane	--	--	--	--	--	--	--	--	--	--	0.18 U	0.18 UJ	0.18 U	0.18 UJ
Carbon Disulfide	--	--	--	--	--	--	--	--	--	--	0.22 U	0.22 U	0.22 U	0.22 UJ
Carbon Tetrachloride	--	--	--	--	--	--	--	--	--	--	0.33 U	0.33 U	0.33 U	0.33 U
Chlorobenzene	--	--	--	--	--	--	--	--	--	--	0.24 U	0.24 U	0.24 U	0.24 U
Chloroethane	--	--	--	--	--	--	--	--	--	--	0.37 UJ	0.37 U	0.37 U	0.37 U
Chloroform	--	--	--	--	--	--	--	--	--	--	0.22 U	0.22 U	0.22 U	0.22 U
Chloromethane	--	--	--	--	--	--	--	--	--	--	0.22 U	0.22 U	0.22 U	0.22 UJ
Cis-1,2-Dichloroethylene	--	--	--	--	--	--	--	--	--	--	0.26 U	0.26 U	0.26 U	0.26 U
Cis-1,3-Dichloropropene	--	--	--	--	--	--	--	--	--	--	0.16 U	0.16 U	0.16 U	0.16 U
Cyclohexane	--	--	--	--	--	--	--	--	--	--	0.26 U	0.26 U	0.26 U	0.26 U
Dibromochloromethane	--	--	--	--	--	--	--	--	--	--	0.22 U	0.22 U	0.22 U	0.22 U
Dichlorodifluoromethane	--	--	--	--	--	--	--	--	--	--	3.1	3.5 J	0.81 J	0.14 UJ
Ethylbenzene	--	--	--	--	--	--	--	--	--	--	0.3 U	0.3 U	0.3 U	0.3 U
Isopropylbenzene (Cumene)	--	--	--	--	--	--	--	--	--	--	0.32 U	0.32 U	0.32 U	0.32 U
M,P-Xylene	--	--	--	--	--	--	--	--	--	--	0.28 U	0.28 U	0.28 U	0.28 U
Methyl Acetate	--	--	--	--	--	--	--	--	--	--	0.58 U	0.58 U	0.58 U	0.58 U
Methyl Ethyl Ketone (2-Butanone)	--	--	--	--	--	--	--	--	--	--	2.2 U	2.2 U	2.2 U	2.2 U
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	--	--	--	--	--	--	--	--	--	--	0.63 U	0.63 U	0.63 U	0.63 U
Methylcyclohexane	--	--	--	--	--	--	--	--	--	--	0.22 U	0.22 UJ	0.22 U	0.22 U
Methylene Chloride	--	--	--	--	--	--	--	--	--	--	0.21 U	0.21 U	0.21 U	0.21 U
O-Xylene (1,2-Dimethylbenzene)	--	--	--	--	--	--	--	--	--	--	0.32 U	0.32 U	0.32 U	0.32 U
Styrene	--	--	--	--	--	--	--	--	--	--	0.17 U	0.17 U	0.17 U	0.17 U
Tert-Butyl Methyl Ether	--	--	--	--	--	--	--	--	--	--	0.13 U	0.13 U	0.13 U	0.13 U
Tetrachloroethylene (PCE)	--	--	--	--	--	--	--	--	--	--	0.12 U	0.12 U	0.12 U	0.12 U

Table E-39
Summary of Data Used in Risk Assessment
Groundwater Below Upper Hydrogeologic Unit Site Wide - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-025A	CFMW-025A	CFMW-025A	CFMW-025A	CFMW-032A	CFMW-032A	CFMW-032A	CFMW-032A	CFMW-032A	CFMW-032A	CFMW-044B	CFMW-044B	CFMW-044B	CFMW-044B
Sample Lab IDs	460-130333-2	460-135884-7	460-157853-1	460-166582-6	460-120382-3	460-125644-3	460-130620-6	460-136178-5	460-158367-10	460-166151-2	460-120477-8	460-125747-2	460-130333-9	460-135989-4
Sample Name Chemical	CFMW-025a-GW 3/24/2017	CFMW-025a-GW 6/22/2017	CFMW-025a-GW 6/7/2018	CFMW-025a-GW 10/10/2018	CFMW-032a-GW 9/16/2016	CFMW-032a-GW 12/16/2016	CFMW-032a-GW 3/29/2017	CFMW-032a-GW 6/27/2017	CFMW-032a-GW 6/14/2018	CFMW-032a-GW 10/4/2018	CFMW-044b-GW 9/19/2016	CFMW-044b-GW 12/19/2016	CFMW-044b-GW 3/24/2017	CFMW-044b-GW 6/23/2017
Toluene	--	--	--	--	--	--	--	--	--	--	0.25 U	0.25 U	0.25 U	0.25 U
Trans-1,2-Dichloroethene	--	--	--	--	--	--	--	--	--	--	0.18 U	0.18 U	0.18 U	0.18 U
Trans-1,3-Dichloropropene	--	--	--	--	--	--	--	--	--	--	0.19 U	0.19 U	0.19 U	0.19 U
Trichloroethylene (TCE)	--	--	--	--	--	--	--	--	--	--	0.22 U	0.22 U	0.22 U	0.22 U
Trichlorofluoromethane	--	--	--	--	--	--	--	--	--	--	0.15 U	0.15 U	0.15 U	0.15 U
Vinyl Chloride	--	--	--	--	--	--	--	--	--	--	0.06 U	0.06 U	0.06 U	0.06 U

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-39
Summary of Data Used in Risk Assessment
Groundwater Below Upper Hydrogeologic Unit Site Wide - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-044B	CFMW-044B	CFMW-053A	CFMW-053A	CFMW-053A	CFMW-053A	CFMW-053A	CFMW-053A	CFMW-056	CFMW-056-DUP	CFMW-056	CFMW-056	CFMW-056	CFMW-056
Sample Lab IDs	460-158367-9	460-166734-7	460-120477-1	460-125747-5	460-130410-4	460-136263-6	460-158270-7	460-166734-6	460-120581-6	460-120581-7	460-125356-8	460-130225-11	460-135884-5	460-158183-9
Sample Name Chemical	CFMW-044b-GW 6/14/2018	CFMW-044b-GW 10/11/2018	CFMW-053a-GW 9/19/2016	CFMW-053a-GW 12/19/2016	CFMW-053a-GW 3/27/2017	CFMW-053a-GW 6/28/2017	CFMW-053a-GW 6/13/2018	CFMW-053a-GW 10/11/2018	CFMW-056-GW 9/20/2016	CFMW-DUP3-GW 9/20/2016	CFMW-056-GW 12/13/2016	CFMW-056-GW 3/22/2017	CFMW-056-GW 6/22/2017	CFMW-056-GW 6/12/2018
GENERAL CHEMISTRY (µg/L)														
Fluoride	--	--	--	--	--	595 J+	--	--	--	--	--	--	180	--
Cyanide	13.3	6.2 J	--	--	--	2 U	2 U	2 J	--	--	--	--	2 U	2 UR
Cyanide (Free)	1.5 U	1.5 U	--	--	--	--	1.5 U	1.5 U	--	--	--	--	--	1.5 U
Cyanide	13.9	6.1 J	2 U	2 U	2 U	2 U	2 U	2.9 J	2 U	2 U	2 U	2 U	2 U	2 U
Cyanide (Free)	1.5 U	1.5 U	--	--	--	--	1.5 U	1.5 U	--	--	--	--	--	1.5 U
METALS (µg/L)														
Aluminum	15 U	21.2 J	90.6	115	110	115	141	149	18.2 U	18.2 U	18.2 U	18.2 U	18.2 U	15 U
Antimony	0.62 U	0.62 U	0.62 U	0.62 U	1.3 J	8.2	84.5	60.6	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U
Arsenic	0.77 U	0.77 U	0.64 U	0.64 U	0.64 U	0.64 U	0.77 U	0.77 U	0.64 U	0.64 U	0.64 U	0.64 U	0.64 U	0.77 U
Barium	187	93.8	4430	2390	2540	2120	1650	1350	144	142	5.8	137	135	22.5
Beryllium	0.26 U	0.26 U	0.24 U	0.24 U	0.24 U	0.24 U	0.26 U	0.26 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.26 U
Cadmium	0.61 U	0.61 U	0.71 U	0.71 U	0.71 U	0.71 U	0.61 U	0.61 U	0.71 U	0.71 U	0.71 U	0.71 U	0.71 U	0.61 U
Calcium	27700	17000	922000	593000	588000	627000	479000	464000	48700	49700	4800	47800	47000	10900
Chromium, Total	1.3 U	1.3 U	11.4	1.7 J	1.3 U	1.3 U	1.7 J	3.3 J	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
Cobalt	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
Copper	1.9 U	1.9 U	2.4 J	4.5	8.4	8	12.5	10.2	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.9 U
Iron	2450	844	42.4 U	42.4 U	42.4 U	42.4 U	45.7 U	45.7 U	516	514	42.4 U	1680	857	693
Lead	0.37 U	0.37 U	0.62 J	0.89 J	1.5	1.5	2	1.6	0.38 U	0.38 U	0.38 U	0.38 U	0.38 U	0.37 U
Magnesium	22000	18400	63.6 U	63.6 U	63.6 U	63.6 U	65.7 U	65.7 U	18700	19000	7440	18200	17900	12900
Manganese	142	102	2.5 U	2.5 U	2.5 U	2.5 U	2.7 U	2.7 U	36.7	37.4	15.6	32.5	24.8	89
Mercury	0.12 U	0.12 U	0.17 U	0.17 U	0.17 U	0.17 U	0.12 U	0.12 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.12 U
Nickel	1.3 U	1.3 U	1.4 U	1.4 U	3.4 J	1.8 J	3.5 J	2.8 J	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.3 U
Potassium	1350	2480	65200	13500	12400	10400	66800	102000	1570	1590	1590	1530	1530	1550
Selenium	0.69 U	0.69 U	0.73 U	0.73 U	0.73 U	0.73 U	0.69 U	0.69 U	0.73 U	0.73 U	0.73 U	0.73 U	0.73 U	0.69 U
Silver	1.4 U	1.4 U	1.3 U	1.3 U	1.3 U	1.3 U	1.4 U	1.4 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.4 U
Sodium	3830	3990	102000	47500	92700	27200	59200	70000	4100	4280	4590	3980	4270	4390
Thallium	0.24 U	0.24 U	0.26 U	0.26 U	0.26 U	0.26 U	0.24 U	0.24 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.24 U
Vanadium	1.2 U	1.2 U	1.9 U	1.9 U	1.9 U	1.9 U	1.2 U	1.2 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.2 U
Zinc	12.4 J	16.1	7 U	7 U	7 U	7.8 J	12.3 J	14.8 J	7 U	7.1 J	7 U	176	7 U	5.4 U
Aluminum	15 U	16.7 J	--	--	--	151	545	165	--	--	--	--	18.2 U	15 U
Antimony	0.62 U	0.62 U	--	--	--	10	70.7	61.4	--	--	--	--	0.62 U	0.62 U
Arsenic	0.77 U	0.77 U	--	--	--	0.64 U	0.83 J	0.77 U	--	--	--	--	0.74 J	0.77 U
Barium	187	90.1	--	--	--	2310	1700	1300	--	--	--	--	144	21
Beryllium	0.26 U	0.26 U	--	--	--	0.24 U	0.26 U	0.26 U	--	--	--	--	0.24 U	0.26 U
Cadmium	0.61 U	0.61 U	--	--	--	0.71 U	0.61 U	0.61 U	--	--	--	--	0.71 U	0.61 U
Calcium	25400	16800	--	--	--	602000	494000	463000	--	--	--	--	48800	9900
Chromium, Total	1.3 U	1.3 U	--	--	--	1.3 U	5.3	3.5 J	--	--	--	--	1.3 U	1.3 U
Cobalt	1.3 U	1.3 U	--	--	--	1.3 U	1.3 U	1.3 U	--	--	--	--	1.3 U	1.3 U
Copper	1.9 U	3.3 J	--	--	--	12	31	10.8	--	--	--	--	2.6 J	1.9 U
Iron	3560	2990	--	--	--	269	977	79.8 J	--	--	--	--	7280	2580
Lead	0.37 U	0.63 J	--	--	--	2	26.8	0.99 J	--	--	--	--	0.69 J	0.37 U
Magnesium	20400	17700	--	--	--	63.6 U	365	65.7 U	--	--	--	--	19500	12400
Manganese	137	110	--	--	--	2.5 U	20.9	2.7 U	--	--	--	--	60.5	105
Mercury	0.12 U	0.12 U	--	--	--	0.17 U	0.12 U	0.12 U	--	--	--	--	0.17 U	0.12 U
Nickel	1.3 U	1.3 U	--	--	--	2.2 J	23.8	2.7 J	--	--	--	--	2.7 J	1.3 U
Potassium	1160	2400	--	--	--	10800	60900	104000	--	--	--	--	1570	1670
Selenium	0.69 U	0.69 U	--	--	--	0.73 U	0.69 U	0.69 U	--	--	--	--	0.73 U	0.69 U
Silver	1.4 U	1.4 U	--	--	--	1.3 U	1.4 U	1.4 U	--	--	--	--	1.3 U	1.4 U
Sodium	4150	3750	--	--	--	31200	64100	69000	--	--	--	--	4250	4790
Thallium	0.24 U	0.24 U	--	--	--	0.26 U	0.24 U	0.24 U	--	--	--	--	0.26 U	0.24 U
Vanadium	1.2 U	1.2 U	--	--	--	1.9 U	1.2 U	1.2 U	--	--	--	--	1.9 U	1.2 U
Zinc	84.5	138	--	--	--	15.5 J	136	6.8 J	--	--	--	--	907	94.5
SEMIVOLATILE ORGANIC COMPOUNDS (µg/L)														
1,2,4,5-Tetrachlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,4-Dioxane (P-Dioxane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,3,4,6-Tetrachlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4,5-Trichlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4,6-Trichlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Table E-39
Summary of Data Used in Risk Assessment
Groundwater Below Upper Hydrogeologic Unit Site Wide - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-044B	CFMW-044B	CFMW-053A	CFMW-053A	CFMW-053A	CFMW-053A	CFMW-053A	CFMW-053A	CFMW-056	CFMW-056-DUP	CFMW-056	CFMW-056	CFMW-056	CFMW-056
Sample Lab IDs	460-158367-9	460-166734-7	460-120477-1	460-125747-5	460-130410-4	460-136263-6	460-158270-7	460-166734-6	460-120581-6	460-120581-7	460-125356-8	460-130225-11	460-135884-5	460-158183-9
Sample Name Chemical	CFMW-044b-GW 6/14/2018	CFMW-044b-GW 10/11/2018	CFMW-053a-GW 9/19/2016	CFMW-053a-GW 12/19/2016	CFMW-053a-GW 3/27/2017	CFMW-053a-GW 6/28/2017	CFMW-053a-GW 6/13/2018	CFMW-053a-GW 10/11/2018	CFMW-056-GW 9/20/2016	CFMW-DUP3-GW 9/20/2016	CFMW-056-GW 12/13/2016	CFMW-056-GW 3/22/2017	CFMW-056-GW 6/22/2017	CFMW-056-GW 6/12/2018
2,4-Dichlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4-Dimethylphenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4-Dinitrophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4-Dinitrotoluene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,6-Dinitrotoluene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Chloronaphthalene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Chlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Methylnaphthalene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Methylphenol (O-Cresol)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Nitroaniline	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Nitrophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3- And 4- Methylphenol (Total)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3,3'-Dichlorobenzidine	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3-Nitroaniline	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4,6-Dinitro-2-Methylphenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Bromophenyl Phenyl Ether	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Chloro-3-Methylphenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Chloroaniline	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Chlorophenyl Phenyl Ether	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Nitroaniline	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Nitrophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acenaphthene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acenaphthylene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acetophenone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Anthracene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Atrazine	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzaldehyde	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(A)Anthracene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(A)Pyrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(B)Fluoranthene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(G,H,I)Perylene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(K)Fluoranthene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzyl Butyl Phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Biphenyl (Diphenyl)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bis(2-Chloroethoxy) Methane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bis(2-Chloroisopropyl) Ether	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bis(2-Ethylhexyl) Phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Caprolactam	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Carbazole	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chrysene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibenz(A,H)Anthracene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibenzofuran	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Diethyl Phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dimethyl Phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Di-N-Butyl Phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Di-N-Octylphthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Fluoranthene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Fluorene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorobutadiene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorocyclopentadiene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Indeno(1,2,3-C,D)Pyrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Isophorone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Naphthalene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Nitrobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
N-Nitrosodi-N-Propylamine	--	--	--	--	--	--	--	--	--	--	--	--	--	--
N-Nitrosodiphenylamine	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Table E-39
Summary of Data Used in Risk Assessment
Groundwater Below Upper Hydrogeologic Unit Site Wide - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Chemical	CFMW-044B 460-158367-9 CFMW-044b-GW 6/14/2018	CFMW-044B 460-166734-7 CFMW-044b-GW 10/11/2018	CFMW-053A 460-120477-1 CFMW-053a-GW 9/19/2016	CFMW-053A 460-125747-5 CFMW-053a-GW 12/19/2016	CFMW-053A 460-130410-4 CFMW-053a-GW 3/27/2017	CFMW-053A 460-136263-6 CFMW-053a-GW 6/28/2017	CFMW-053A 460-158270-7 CFMW-053a-GW 6/13/2018	CFMW-053A 460-166734-6 CFMW-053a-GW 10/11/2018	CFMW-056 460-120581-6 CFMW-056-GW 9/20/2016	CFMW-056-DUP 460-120581-7 CFMW-DUP3-GW 9/20/2016	CFMW-056 460-125356-8 CFMW-056-GW 12/13/2016	CFMW-056 460-130225-11 CFMW-056-GW 3/22/2017	CFMW-056 460-135884-5 CFMW-056-GW 6/22/2017	CFMW-056 460-158183-9 CFMW-056-GW 6/12/2018
Pentachlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Phenanthrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Phenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Pyrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SEMIVOLATILE ORGANIC COMPOUNDS|LOW LEVEL (µg/L)														
1,2,4,5-Tetrachlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,4-Dioxane (P-Dioxane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,3,4,6-Tetrachlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4,5-Trichlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4,6-Trichlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4-Dichlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4-Dimethylphenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4-Dinitrophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4-Dinitrotoluene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,6-Dinitrotoluene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Chloronaphthalene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Chlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Methylnaphthalene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Methylphenol (O-Cresol)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Nitroaniline	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Nitrophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3,3'-Dichlorobenzidine	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3-Nitroaniline	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4,6-Dinitro-2-Methylphenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Bromophenyl Phenyl Ether	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Chloro-3-Methylphenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Chloroaniline	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Chlorophenyl Phenyl Ether	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Nitroaniline	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Nitrophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acenaphthene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acenaphthylene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acetophenone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Anthracene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Atrazine	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzaldehyde	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(A)Anthracene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(A)Pyrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(B)Fluoranthene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(G,H,I)Perylene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(K)Fluoranthene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzyl Butyl Phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Biphenyl (Diphenyl)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bis(2-Chloroethoxy) Methane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bis(2-Chloroisopropyl) Ether	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bis(2-Ethylhexyl) Phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Caprolactam	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Carbazole	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chrysene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibenz(A,H)Anthracene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibenzofuran	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Diethyl Phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dimethyl Phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Di-N-Butyl Phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Di-N-Octylphthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Fluoranthene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Fluorene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Table E-39
Summary of Data Used in Risk Assessment
Groundwater Below Upper Hydrogeologic Unit Site Wide - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Chemical	CFMW-044B 460-158367-9 CFMW-044b-GW 6/14/2018	CFMW-044B 460-166734-7 CFMW-044b-GW 10/11/2018	CFMW-053A 460-120477-1 CFMW-053a-GW 9/19/2016	CFMW-053A 460-125747-5 CFMW-053a-GW 12/19/2016	CFMW-053A 460-130410-4 CFMW-053a-GW 3/27/2017	CFMW-053A 460-136263-6 CFMW-053a-GW 6/28/2017	CFMW-053A 460-158270-7 CFMW-053a-GW 6/13/2018	CFMW-053A 460-166734-6 CFMW-053a-GW 10/11/2018	CFMW-056 460-120581-6 CFMW-056-GW 9/20/2016	CFMW-056-DUP 460-120581-7 CFMW-DUP3-GW 9/20/2016	CFMW-056 460-125356-8 CFMW-056-GW 12/13/2016	CFMW-056 460-130225-11 CFMW-056-GW 3/22/2017	CFMW-056 460-135884-5 CFMW-056-GW 6/22/2017	CFMW-056 460-158183-9 CFMW-056-GW 6/12/2018
Hexachlorobutadiene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorocyclopentadiene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Indeno(1,2,3-C,D)Pyrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Isophorone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Naphthalene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Nitrobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
N-Nitrosodi-N-Propylamine	--	--	--	--	--	--	--	--	--	--	--	--	--	--
N-Nitrosodiphenylamine	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Pentachlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Phenanthrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Phenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Pyrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
VOLATILE ORGANIC COMPOUNDS (µg/L)														
1,1,1-Trichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,2,2-Tetrachloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,2-Trichloro-1,2,2-Trifluoroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,2-Trichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1-Dichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1-Dichloroethene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,3-Trichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,4-Trichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dibromo-3-Chloropropane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dibromoethane (Ethylene Dibromide)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichloropropane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,3-Dichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,4-Dichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Hexanone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acetone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromochloromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromodichloromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromoform	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromomethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Carbon Disulfide	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Carbon Tetrachloride	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chloroform	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chloromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cis-1,2-Dichloroethylene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cis-1,3-Dichloropropene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cyclohexane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibromochloromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dichlorodifluoromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Ethylbenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Isopropylbenzene (Cumene)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
M,P-Xylene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methyl Acetate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methyl Ethyl Ketone (2-Butanone)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methylcyclohexane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methylene Chloride	--	--	--	--	--	--	--	--	--	--	--	--	--	--
O-Xylene (1,2-Dimethylbenzene)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Styrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Tert-Butyl Methyl Ether	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Tetrachloroethylene (PCE)	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Table E-39
Summary of Data Used in Risk Assessment
Groundwater Below Upper Hydrogeologic Unit Site Wide - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-044B	CFMW-044B	CFMW-053A	CFMW-053A	CFMW-053A	CFMW-053A	CFMW-053A	CFMW-053A	CFMW-056	CFMW-056-DUP	CFMW-056	CFMW-056	CFMW-056	CFMW-056
Sample Lab IDs	460-158367-9	460-166734-7	460-120477-1	460-125747-5	460-130410-4	460-136263-6	460-158270-7	460-166734-6	460-120581-6	460-120581-7	460-125356-8	460-130225-11	460-135884-5	460-158183-9
Sample Name	CFMW-044b-GW	CFMW-044b-GW	CFMW-053a-GW	CFMW-053a-GW	CFMW-053a-GW	CFMW-053a-GW	CFMW-053a-GW	CFMW-053a-GW	CFMW-056-GW	CFMW-DUP3-GW	CFMW-056-GW	CFMW-056-GW	CFMW-056-GW	CFMW-056-GW
Chemical	6/14/2018	10/11/2018	9/19/2016	12/19/2016	3/27/2017	6/28/2017	6/13/2018	10/11/2018	9/20/2016	9/20/2016	12/13/2016	3/22/2017	6/22/2017	6/12/2018
Toluene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Trans-1,2-Dichloroethene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Trans-1,3-Dichloropropene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Trichloroethylene (TCE)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Trichlorofluoromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Vinyl Chloride	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-39
Summary of Data Used in Risk Assessment
Groundwater Below Upper Hydrogeologic Unit Site Wide - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-056	CFMW-056A	CFMW-056A	CFMW-056A-DUP	CFMW-056A	CFMW-056A	CFMW-056A	CFMW-056A	CFMW-057	CFMW-057	CFMW-057	CFMW-057-DUP	CFMW-057	CFMW-057
Sample Lab IDs	460-166506-1	460-120581-4	460-124871-2	460-124871-4	460-130691-2	460-135884-6	460-158183-10	460-166506-2	460-120477-9	460-124783-6	460-130620-7	460-130620-10	460-136263-3	460-158628-10
Sample Name Chemical	CFMW-056-GW 10/9/2018	CFMW-056a-GW 9/20/2016	CFMW-056a-GW 12/6/2016	CFMW-DUP4-GW 12/6/2016	CFMW-056a-GW 3/30/2017	CFMW-056a-GW 6/22/2017	CFMW-056a-GW 6/12/2018	CFMW-056a-GW 10/9/2018	CFMW-057-GW 9/19/2016	CFMW-057-GW 12/5/2016	CFMW-057-GW 3/29/2017	CFMW-DUP11-GW 3/29/2017	CFMW-057-GW 6/28/2017	CFMW-057-GW 6/18/2018
GENERAL CHEMISTRY (µg/L)														
Fluoride	--	--	--	--	--	649	--	--	--	--	--	--	209	--
Cyanide	2 U	--	--	--	--	2 U	2 UR	2 U	--	--	--	--	2 U	2 U
Cyanide (Free)	1.5 U	--	--	--	--	1.5 U	1.5 U	1.5 U	--	--	--	--	--	4.8 J
Cyanide	2 U	2 U	3.3 J	2 UJ	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Cyanide (Free)	1.5 U	--	--	--	1.5 U	1.5 U	1.5 U	1.5 U	--	--	--	--	--	2.9 J-
METALS (µg/L)														
Aluminum	15 U	43	21.4 J	24.6 J	18.2 U	18.2 U	30 J	18.6 J	18.2 U	18.2 U	18.2 U	18.2 U	18.2 U	15 U
Antimony	0.62 U	0.87 J	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U
Arsenic	0.77 U	2.2	2.2	2.3	0.79 J	0.99 J	0.77 U	0.77 U	0.64 U	0.64 U	0.64 U	0.64 U	0.64 U	1.7 J
Barium	28.5	73.3	111	116	214	170	256	281	46.3	43.6	50.8	51	111	32.3
Beryllium	0.26 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.26 U	0.26 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.26 U
Cadmium	0.61 U	0.71 U	0.71 U	0.71 U	0.71 U	0.71 U	0.61 U	0.61 U	0.71 U	0.71 U	0.71 U	0.71 U	0.71 U	0.61 U
Calcium	13900	18600	26400	27000	38400	29000	41300	46100	20500	19400	21900	21800	39400	15600
Chromium, Total	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
Cobalt	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
Copper	1.9 U	3 J	1.4 U	1.4 U	1.4 U	1.4 U	1.9 U	1.9 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.9 U
Iron	2830	42.4 U	42.4 U	42.4 U	120	42.4 U	176	248	2290	2440	3430	3420	2580	1360
Lead	0.37 U	0.42 J	0.38 U	0.38 U	0.38 U	0.38 U	1.9 U	0.37 U	0.38 U	0.38 U	0.38 U	0.38 U	0.38 U	0.37 U
Magnesium	11600	7470	10400 J	10800 J	15700	12700	16100	17000	15600	15700	20500	20200	21500	15500
Manganese	88.1	73.3	241	248	424	327	424	580	65.6	59.1	74.4	74.2	46	39.3
Mercury	0.12 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.12 U	0.12 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.12 U
Nickel	1.3 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.3 U	1.3 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.3 U
Potassium	1670	10800	6160	6500	2670	7310	4640	2390	1730	1690	1830	1820	2240	1970
Selenium	0.69 U	0.73 U	0.73 U	0.73 U	2 J	1.2 J	1.3 J	0.69 U	0.73 U	0.73 U	0.73 U	0.73 U	0.73 U	0.69 U
Silver	1.4 U	1.3 U	1.3 U	1.3 U	1.3 UJ	1.3 U	1.4 U	1.4 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.4 U
Sodium	4530	26700	18300	18200	9290	17100	13300	7910	3700	3800	3920	3850	5040	3300
Thallium	0.24 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	1.2 U	0.24 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.24 U
Vanadium	1.2 U	5.4	3.4 J	3.6 J	1.9 U	1.9 U	1.2 U	1.2 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.2 U
Zinc	90.4	7 U	7 U	7 U	7 U	7 U	5.4 U	5.4 U	7 U	7 U	73.9	71.3	8.8 J	5.4 U
Aluminum	15 U	--	--	--	--	1430	321	580	--	--	--	--	123 J+	15 U
Antimony	0.62 U	--	--	--	--	0.62 U	0.62 U	0.62 U	--	--	--	--	0.62 U	0.62 U
Arsenic	0.77 U	--	--	--	--	1.9 J	0.78 J	0.77 U	--	--	--	--	1.7 J	2.1
Barium	27.1	--	--	--	--	186	259	289	--	--	--	--	121	33.3
Beryllium	0.26 U	--	--	--	--	0.24 U	0.26 U	0.26 U	--	--	--	--	0.24 U	0.26 U
Cadmium	0.61 U	--	--	--	--	0.71 U	0.61 U	0.61 U	--	--	--	--	0.71 U	0.61 U
Calcium	13100	--	--	--	--	29100	39200	47500	--	--	--	--	39500	15500
Chromium, Total	1.3 U	--	--	--	--	2.9 J	1.3 U	1.7 J	--	--	--	--	1.3 U	1.3 U
Cobalt	1.3 U	--	--	--	--	1.3 U	1.3 U	1.3 U	--	--	--	--	1.3 U	1.3 U
Copper	6.2	--	--	--	--	3.8 J	2.7 J	7.3	--	--	--	--	1.4 U	1.9 U
Iron	4420	--	--	--	--	2110	1310	1220	--	--	--	--	17400	2530
Lead	0.37 U	--	--	--	--	1.1 J	0.46 J	0.5 J	--	--	--	--	6.6	0.37 U
Magnesium	12600	--	--	--	--	14100	15700	17700	--	--	--	--	23800	16900
Manganese	97.1	--	--	--	--	391	455	577	--	--	--	--	96.5	44.5
Mercury	0.12 U	--	--	--	--	0.17 U	0.12 U	0.12 U	--	--	--	--	0.17 U	0.12 U
Nickel	2.4 J	--	--	--	--	1.5 J	1.3 U	1.3 U	--	--	--	--	1.4 U	1.3 U
Potassium	1800	--	--	--	--	7650	5230	3030	--	--	--	--	2360	1830
Selenium	0.69 U	--	--	--	--	0.73 U	0.69 U	0.69 U	--	--	--	--	0.73 U	0.69 U
Silver	1.4 U	--	--	--	--	1.3 U	1.4 U	1.4 U	--	--	--	--	1.3 U	1.4 U
Sodium	5400	--	--	--	--	17800	14400	9890	--	--	--	--	5880 J+	4100
Thallium	0.24 U	--	--	--	--	0.26 U	0.24 U	0.24 U	--	--	--	--	0.26 U	0.24 U
Vanadium	1.2 U	--	--	--	--	1.9 J	1.2 U	1.2 U	--	--	--	--	1.9 U	1.2 U
Zinc	238	--	--	--	--	11.6 J	13.2 J	7.3 J	--	--	--	--	770	13.4 J
SEMIVOLATILE ORGANIC COMPOUNDS (µg/L)														
1,2,4,5-Tetrachlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,4-Dioxane (P-Dioxane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,3,4,6-Tetrachlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4,5-Trichlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4,6-Trichlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Table E-39
Summary of Data Used in Risk Assessment
Groundwater Below Upper Hydrogeologic Unit Site Wide - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-056	CFMW-056A	CFMW-056A	CFMW-056A-DUP	CFMW-056A	CFMW-056A	CFMW-056A	CFMW-056A	CFMW-057	CFMW-057	CFMW-057	CFMW-057-DUP	CFMW-057	CFMW-057
Sample Lab IDs	460-166506-1	460-120581-4	460-124871-2	460-124871-4	460-130691-2	460-135884-6	460-158183-10	460-166506-2	460-120477-9	460-124783-6	460-130620-7	460-130620-10	460-136263-3	460-158628-10
Sample Name Chemical	CFMW-056-GW 10/9/2018	CFMW-056a-GW 9/20/2016	CFMW-056a-GW 12/6/2016	CFMW-DUP4-GW 12/6/2016	CFMW-056a-GW 3/30/2017	CFMW-056a-GW 6/22/2017	CFMW-056a-GW 6/12/2018	CFMW-056a-GW 10/9/2018	CFMW-057-GW 9/19/2016	CFMW-057-GW 12/5/2016	CFMW-057-GW 3/29/2017	CFMW-DUP11-GW 3/29/2017	CFMW-057-GW 6/28/2017	CFMW-057-GW 6/18/2018
2,4-Dichlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4-Dimethylphenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4-Dinitrophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4-Dinitrotoluene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,6-Dinitrotoluene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Chloronaphthalene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Chlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Methylnaphthalene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Methylphenol (O-Cresol)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Nitroaniline	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Nitrophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3- And 4- Methylphenol (Total)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3,3'-Dichlorobenzidine	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3-Nitroaniline	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4,6-Dinitro-2-Methylphenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Bromophenyl Phenyl Ether	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Chloro-3-Methylphenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Chloroaniline	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Chlorophenyl Phenyl Ether	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Nitroaniline	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Nitrophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acenaphthene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acenaphthylene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acetophenone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Anthracene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Atrazine	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzaldehyde	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(A)Anthracene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(A)Pyrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(B)Fluoranthene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(G,H,I)Perylene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(K)Fluoranthene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzyl Butyl Phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Biphenyl (Diphenyl)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bis(2-Chloroethoxy) Methane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bis(2-Chloroisopropyl) Ether	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bis(2-Ethylhexyl) Phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Caprolactam	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Carbazole	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chrysene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibenz(A,H)Anthracene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibenzofuran	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Diethyl Phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dimethyl Phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Di-N-Butyl Phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Di-N-Octylphthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Fluoranthene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Fluorene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorobutadiene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorocyclopentadiene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Indeno(1,2,3-C,D)Pyrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Isophorone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Naphthalene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Nitrobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
N-Nitrosodi-N-Propylamine	--	--	--	--	--	--	--	--	--	--	--	--	--	--
N-Nitrosodiphenylamine	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Table E-39
Summary of Data Used in Risk Assessment
Groundwater Below Upper Hydrogeologic Unit Site Wide - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Chemical	CFMW-056 460-166506-1 CFMW-056-GW 10/9/2018	CFMW-056A 460-120581-4 CFMW-056a-GW 9/20/2016	CFMW-056A 460-124871-2 CFMW-056a-GW 12/6/2016	CFMW-056A-DUP 460-124871-4 CFMW-DUP4-GW 12/6/2016	CFMW-056A 460-130691-2 CFMW-056a-GW 3/30/2017	CFMW-056A 460-135884-6 CFMW-056a-GW 6/22/2017	CFMW-056A 460-158183-10 CFMW-056a-GW 6/12/2018	CFMW-056A 460-166506-2 CFMW-056a-GW 10/9/2018	CFMW-057 460-120477-9 CFMW-057-GW 9/19/2016	CFMW-057 460-124783-6 CFMW-057-GW 12/5/2016	CFMW-057 460-130620-7 CFMW-057-GW 3/29/2017	CFMW-057-DUP 460-130620-10 CFMW-DUP11-GW 3/29/2017	CFMW-057 460-136263-3 CFMW-057-GW 6/28/2017	CFMW-057 460-158628-10 CFMW-057-GW 6/18/2018
Pentachlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Phenanthrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Phenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Pyrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SEMIVOLATILE ORGANIC COMPOUNDS|LOW LEVEL (µg/L)														
1,2,4,5-Tetrachlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,4-Dioxane (P-Dioxane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,3,4,6-Tetrachlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4,5-Trichlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4,6-Trichlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4-Dichlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4-Dimethylphenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4-Dinitrophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4-Dinitrotoluene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,6-Dinitrotoluene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Chloronaphthalene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Chlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Methylnaphthalene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Methylphenol (O-Cresol)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Nitroaniline	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Nitrophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3,3'-Dichlorobenzidine	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3-Nitroaniline	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4,6-Dinitro-2-Methylphenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Bromophenyl Phenyl Ether	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Chloro-3-Methylphenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Chloroaniline	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Chlorophenyl Phenyl Ether	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Nitroaniline	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Nitrophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acenaphthene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acenaphthylene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acetophenone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Anthracene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Atrazine	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzaldehyde	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(A)Anthracene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(A)Pyrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(B)Fluoranthene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(G,H,I)Perylene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(K)Fluoranthene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzyl Butyl Phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Biphenyl (Diphenyl)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bis(2-Chloroethoxy) Methane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bis(2-Chloroisopropyl) Ether	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bis(2-Ethylhexyl) Phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Caprolactam	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Carbazole	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chrysene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibenz(A,H)Anthracene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibenzofuran	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Diethyl Phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dimethyl Phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Di-N-Butyl Phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Di-N-Octylphthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Fluoranthene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Fluorene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Table E-39
Summary of Data Used in Risk Assessment
Groundwater Below Upper Hydrogeologic Unit Site Wide - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-056	CFMW-056A	CFMW-056A	CFMW-056A-DUP	CFMW-056A	CFMW-056A	CFMW-056A	CFMW-056A	CFMW-057	CFMW-057	CFMW-057	CFMW-057-DUP	CFMW-057	CFMW-057
Sample Lab IDs	460-166506-1	460-120581-4	460-124871-2	460-124871-4	460-130691-2	460-135884-6	460-158183-10	460-166506-2	460-120477-9	460-124783-6	460-130620-7	460-130620-10	460-136263-3	460-158628-10
Sample Name Chemical	CFMW-056-GW 10/9/2018	CFMW-056a-GW 9/20/2016	CFMW-056a-GW 12/6/2016	CFMW-DUP4-GW 12/6/2016	CFMW-056a-GW 3/30/2017	CFMW-056a-GW 6/22/2017	CFMW-056a-GW 6/12/2018	CFMW-056a-GW 10/9/2018	CFMW-057-GW 9/19/2016	CFMW-057-GW 12/5/2016	CFMW-057-GW 3/29/2017	CFMW-DUP11-GW 3/29/2017	CFMW-057-GW 6/28/2017	CFMW-057-GW 6/18/2018
Hexachlorobutadiene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorocyclopentadiene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Indeno(1,2,3-C,D)Pyrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Isophorone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Naphthalene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Nitrobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
N-Nitrosodi-N-Propylamine	--	--	--	--	--	--	--	--	--	--	--	--	--	--
N-Nitrosodiphenylamine	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Pentachlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Phenanthrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Phenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Pyrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
VOLATILE ORGANIC COMPOUNDS (µg/L)														
1,1,1-Trichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,2,2-Tetrachloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,2-Trichloro-1,2,2-Trifluoroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,2-Trichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1-Dichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1-Dichloroethene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,3-Trichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,4-Trichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dibromo-3-Chloropropane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dibromoethane (Ethylene Dibromide)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichloropropane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,3-Dichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,4-Dichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Hexanone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acetone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromochloromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromodichloromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromoform	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromomethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Carbon Disulfide	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Carbon Tetrachloride	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chloroform	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chloromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cis-1,2-Dichloroethylene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cis-1,3-Dichloropropene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cyclohexane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibromochloromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dichlorodifluoromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Ethylbenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Isopropylbenzene (Cumene)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
M,P-Xylene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methyl Acetate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methyl Ethyl Ketone (2-Butanone)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methylcyclohexane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methylene Chloride	--	--	--	--	--	--	--	--	--	--	--	--	--	--
O-Xylene (1,2-Dimethylbenzene)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Styrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Tert-Butyl Methyl Ether	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Tetrachloroethylene (PCE)	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Table E-39
Summary of Data Used in Risk Assessment
Groundwater Below Upper Hydrogeologic Unit Site Wide - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-056	CFMW-056A	CFMW-056A	CFMW-056A-DUP	CFMW-056A	CFMW-056A	CFMW-056A	CFMW-056A	CFMW-057	CFMW-057	CFMW-057	CFMW-057-DUP	CFMW-057	CFMW-057
Sample Lab IDs	460-166506-1	460-120581-4	460-124871-2	460-124871-4	460-130691-2	460-135884-6	460-158183-10	460-166506-2	460-120477-9	460-124783-6	460-130620-7	460-130620-10	460-136263-3	460-158628-10
Sample Name Chemical	CFMW-056-GW 10/9/2018	CFMW-056a-GW 9/20/2016	CFMW-056a-GW 12/6/2016	CFMW-DUP4-GW 12/6/2016	CFMW-056a-GW 3/30/2017	CFMW-056a-GW 6/22/2017	CFMW-056a-GW 6/12/2018	CFMW-056a-GW 10/9/2018	CFMW-057-GW 9/19/2016	CFMW-057-GW 12/5/2016	CFMW-057-GW 3/29/2017	CFMW-DUP11-GW 3/29/2017	CFMW-057-GW 6/28/2017	CFMW-057-GW 6/18/2018
Toluene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Trans-1,2-Dichloroethene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Trans-1,3-Dichloropropene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Trichloroethylene (TCE)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Trichlorofluoromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Vinyl Chloride	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-39
Summary of Data Used in Risk Assessment
Groundwater Below Upper Hydrogeologic Unit Site Wide - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Chemical	CFMW-057 460-166582-2 CFMW-057-GW 10/10/2018	CFMW-057A 460-120477-10 CFMW-057a-GW 9/19/2016	CFMW-057A 460-125644-7 CFMW-057a-GW 12/16/2016	CFMW-057A 460-130225-7 CFMW-057a-GW 3/22/2017	CFMW-057A 460-136263-4 CFMW-057a-GW 6/28/2017	CFMW-057A 460-158628-11 CFMW-057a-GW 6/18/2018	CFMW-057A 460-166582-1 CFMW-057a-GW 10/10/2018	CFMW-057b 180-78686-3, 460-158183-4 CFMW-057B-GW 6/12/2018	CFMW-057b 180-83122-1, 460-167033-4 CFMW-057b-GW 10/16/2018	CFMW-059A 460-120477-6 CFMW-059a-GW 9/19/2016	CFMW-059A 460-125644-2 CFMW-059a-GW 12/16/2016	CFMW-059A 460-130620-8 CFMW-059a-GW 3/29/2017	CFMW-059A 460-136263-5 CFMW-059a-GW 6/28/2017	CFMW-059A 460-158270-8 CFMW-059a-GW 6/13/2018
GENERAL CHEMISTRY (µg/L)														
Fluoride	--	--	--	--	337 J+	--	--	--	--	--	--	--	157 J+	--
Cyanide	2 U	--	--	--	2 U	2 U	2 U	2 J	2 U	--	--	--	2 U	2 U
Cyanide (Free)	1.5 U	--	--	--	--	2 J	1.5 U	1.5 U	1.5 U	--	--	--	--	1.5 U
Cyanide	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Cyanide (Free)	1.5 U	--	--	--	--	3.1 J-	1.5 U	1.5 U	1.5 UJ	--	--	--	--	1.5 U
METALS (µg/L)														
Aluminum	15 U	168	417	902	897	354	77.3	15 U	15 U	137	18.2 U	20.2 J	34.6 J	23.9 J
Antimony	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	2.8	1.8 J	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U
Arsenic	2	0.64 U	0.64 U	0.64 U	0.64 U	0.88 J	0.8 J	0.77 U	0.77 U	0.64 U	4	4.3	3.7	2.8
Barium	21.4	924	364	148	89.7	56.2	50.3	112	104	268	121	110	125	118
Beryllium	0.26 U	0.24 U	0.24 U	0.24 U	0.24 U	0.26 U	0.26 U	0.26 U	0.26 U	0.24 U	0.24 U	0.24 U	0.24 U	0.26 U
Cadmium	0.61 U	0.71 U	0.71 U	0.71 U	0.71 U	0.61 U	0.61 U	0.61 U	0.61 U	0.71 U	0.71 U	0.71 U	0.71 U	0.61 U
Calcium	11300	581000	344000	154000	109000	50300	36200	62300	61900	340000	29000	32400	34500	31800
Chromium, Total	1.3 U	16	22.3	24.1	17.2	4.7	3.7 J	1.3 U	1.3 U	1.3 J	1.3 U	1.3 U	1.3 U	1.3 U
Cobalt	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
Copper	1.9 U	7.1	3.6 J	5.2	3.9 J	1.9 U	1.9 U	1.9 U	1.9 U	3.7 J	1.4 U	1.4 U	1.4 U	1.9 U
Iron	931	42.4 U	42.4 U	42.4 U	42.4 U	45.7 U	45.7 U	45.7 U	45.7 U	42.4 U	42.4 U	42.4 U	42.4 U	45.7 U
Lead	0.37 U	1.3	0.38 U	0.38 U	0.38 U	0.37 U	0.37 U	0.37 U	0.37 U	0.38 U	0.38 U	0.38 U	0.38 U	0.37 U
Magnesium	12600	63.6 U	63.6 U	63.6 U	63.6 U	145 J	230	14100	13600	63.6 U	10500	9860	9290	9880
Manganese	26	2.5 U	2.5 U	2.5 U	2.5 U	2.7 U	2.7 U	22.4	2.7 U	2.5 U	29.8	29	33.3	26.8
Mercury	0.12 U	0.17 U	0.17 U	0.17 U	0.17 U	0.12 U	0.12 U	0.12 U	0.12 U	0.17 U	0.17 U	0.17 U	0.17 U	0.12 U
Nickel	1.3 U	1.4 U	1.4 U	1.4 U	1.4 U	1.3 U	1.3 U	1.3 U	1.3 U	1.4 U	1.4 U	1.4 U	1.4 U	1.3 U
Potassium	1780	18100	6500	12300	11000	11200	10300	694	566	7920	1210	1560	1560	1950
Selenium	0.69 U	0.73 U	0.73 U	0.73 U	0.73 U	0.69 U	0.69 U	0.69 U	0.69 U	0.73 U	0.73 U	0.73 U	0.73 U	0.69 U
Silver	1.4 U	1.3 U	1.3 U	1.3 U	1.3 U	1.4 U	1.4 U	1.4 U	1.4 U	1.3 U	1.3 U	1.3 U	1.3 U	1.4 U
Sodium	3450	48100	28200	26600	19300	15300	16000	2800	3180	15400	3430 J+	3800	3400	4080
Thallium	0.24 U	0.26 U	0.26 U	0.26 U	0.26 U	0.24 U	0.24 U	0.24 U	0.24 U	0.26 U	0.26 U	0.26 U	0.26 U	0.24 U
Vanadium	1.2 U	1.9 U	1.9 U	1.9 J	3.9 J	9.2	8.3	1.2 U	1.2 U	1.9 U	1.9 U	1.9 U	1.9 U	1.2 U
Zinc	5.4 U	7 U	7 U	7 U	7 U	5.4 U	5.4 U	54	5.4 U	7 U	7 U	7 U	7 U	5.4 U
Aluminum	15 U	--	--	--	1240	358	138	348	17.4 J	--	--	--	861	590
Antimony	0.62 U	--	--	--	1.6 J	3.1	2.3	0.62 U	0.89 J	--	--	--	0.62 U	0.62 U
Arsenic	1.8 J	--	--	--	0.64 J	0.9 J	0.77 U	0.77 U	0.77 U	--	--	--	4.6	3.5
Barium	23.8	--	--	--	98	54.1	49.6	121	117	--	--	--	147	126
Beryllium	0.26 U	--	--	--	0.24 U	0.26 U	0.26 U	0.26 U	0.26 U	--	--	--	0.24 U	0.26 U
Cadmium	0.61 U	--	--	--	0.71 U	0.61 U	0.61 U	0.61 U	0.61 U	--	--	--	0.71 U	0.61 U
Calcium	12100	--	--	--	112000	49400	38100	60200	67700	--	--	--	39700	32200
Chromium, Total	1.3 U	--	--	--	20.4	5.8	4.4	1.3 U	1.3 U	--	--	--	1.5 J	1.3 J
Cobalt	1.3 U	--	--	--	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	--	--	--	1.3 U	1.3 U
Copper	6.4	--	--	--	6.5	2.1 J	10.2	1.9 U	1.9 U	--	--	--	1.9 J	2.1 J
Iron	3420	--	--	--	457	45.7 U	125	757	45.7 U	--	--	--	1120	898
Lead	0.37 U	--	--	--	0.85 J	0.37 U	0.37 U	0.57 J	0.37 U	--	--	--	0.65 J	0.57 J
Magnesium	13600	--	--	--	226	205	364	13800	15000	--	--	--	10900	10500
Manganese	38.8	--	--	--	9.8	2.7 U	2.7 U	82.2	4.1 J	--	--	--	71.5	42.2
Mercury	0.12 U	--	--	--	0.17 U	0.12 U	0.12 U	0.12 U	0.12 U	--	--	--	0.17 U	0.12 U
Nickel	1.3 U	--	--	--	1.4 U	1.3 U	1.3 U	1.3 U	1.3 U	--	--	--	1.4 U	1.3 U
Potassium	1970	--	--	--	11500	9990	10400	846	625	--	--	--	1940	2040
Selenium	0.69 U	--	--	--	0.98 J	0.69 U	0.69 U	0.69 U	0.69 U	--	--	--	0.73 U	0.69 U
Silver	1.4 U	--	--	--	1.3 U	1.4 U	1.4 U	1.4 U	1.4 U	--	--	--	1.3 U	1.4 U
Sodium	3860	--	--	--	21600	16600	16100	3010	3980	--	--	--	4050	4380
Thallium	0.24 U	--	--	--	0.26 U	0.24 U	0.24 U	0.24 U	0.24 U	--	--	--	0.26 U	0.24 U
Vanadium	1.2 U	--	--	--	5.2	9.9	8.7	1.2 U	1.2 U	--	--	--	2 J	1.2 J
Zinc	51.4	--	--	--	7 U	5.4 U	8.2 J	30.2	5.4 U	--	--	--	7 U	5.4 U
SEMIVOLATILE ORGANIC COMPOUNDS (µg/L)														
1,2,4,5-Tetrachlorobenzene	--	--	--	--	--	--	--	0.048 U	--	--	--	--	--	--
1,4-Dioxane (P-Dioxane)	--	--	--	--	--	--	--	0.18 U	--	--	--	--	--	--
2,3,4,6-Tetrachlorophenol	--	--	--	--	--	--	--	0.042 U	--	--	--	--	--	--
2,4,5-Trichlorophenol	--	--	--	--	--	--	--	0.056 U	--	--	--	--	--	--
2,4,6-Trichlorophenol	--	--	--	--	--	--	--	0.063 U	--	--	--	--	--	--

Table E-39
Summary of Data Used in Risk Assessment
Groundwater Below Upper Hydrogeologic Unit Site Wide - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-057	CFMW-057A	CFMW-057A	CFMW-057A	CFMW-057A	CFMW-057A	CFMW-057A	CFMW-057b	CFMW-057b	CFMW-059A	CFMW-059A	CFMW-059A	CFMW-059A	CFMW-059A
Sample Lab IDs	460-166582-2	460-120477-10	460-125644-7	460-130225-7	460-136263-4	460-158628-11	460-166582-1	180-78686-3, 460-158183-4	180-83122-1, 460-167033-4	460-120477-6	460-125644-2	460-130620-8	460-136263-5	460-158270-8
Sample Name Chemical	CFMW-057-GW 10/10/2018	CFMW-057a-GW 9/19/2016	CFMW-057a-GW 12/16/2016	CFMW-057a-GW 3/22/2017	CFMW-057a-GW 6/28/2017	CFMW-057a-GW 6/18/2018	CFMW-057a-GW 10/10/2018	CFMW-057B-GW 6/12/2018	CFMW-057b-GW 10/16/2018	CFMW-059a-GW 9/19/2016	CFMW-059a-GW 12/16/2016	CFMW-059a-GW 3/29/2017	CFMW-059a-GW 6/28/2017	CFMW-059a-GW 6/13/2018
2,4-Dichlorophenol	--	--	--	--	--	--	--	0.047 U	--	--	--	--	--	--
2,4-Dimethylphenol	--	--	--	--	--	--	--	0.038 U	--	--	--	--	--	--
2,4-Dinitrophenol	--	--	--	--	--	--	--	1.4 U	--	--	--	--	--	--
2,4-Dinitrotoluene	--	--	--	--	--	--	--	0.047 U	--	--	--	--	--	--
2,6-Dinitrotoluene	--	--	--	--	--	--	--	0.056 U	--	--	--	--	--	--
2-Chloronaphthalene	--	--	--	--	--	--	--	0.055 U	--	--	--	--	--	--
2-Chlorophenol	--	--	--	--	--	--	--	0.059 U	--	--	--	--	--	--
2-Methylnaphthalene	--	--	--	--	--	--	--	0.057 U	--	--	--	--	--	--
2-Methylphenol (O-Cresol)	--	--	--	--	--	--	--	0.1 U	--	--	--	--	--	--
2-Nitroaniline	--	--	--	--	--	--	--	0.19 U	--	--	--	--	--	--
2-Nitrophenol	--	--	--	--	--	--	--	0.056 U	--	--	--	--	--	--
3- And 4- Methylphenol (Total)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3,3'-Dichlorobenzidine	--	--	--	--	--	--	--	0.54 U	--	--	--	--	--	--
3-Nitroaniline	--	--	--	--	--	--	--	0.062 U	--	--	--	--	--	--
4,6-Dinitro-2-Methylphenol	--	--	--	--	--	--	--	1.4 U	--	--	--	--	--	--
4-Bromophenyl Phenyl Ether	--	--	--	--	--	--	--	0.058 U	--	--	--	--	--	--
4-Chloro-3-Methylphenol	--	--	--	--	--	--	--	0.056 U	--	--	--	--	--	--
4-Chloroaniline	--	--	--	--	--	--	--	0.041 U	--	--	--	--	--	--
4-Chlorophenyl Phenyl Ether	--	--	--	--	--	--	--	0.056 U	--	--	--	--	--	--
4-Nitroaniline	--	--	--	--	--	--	--	0.054 U	--	--	--	--	--	--
4-Nitrophenol	--	--	--	--	--	--	--	0.13 U	--	--	--	--	--	--
Acenaphthene	--	--	--	--	--	--	--	0.06 U	--	--	--	--	--	--
Acenaphthylene	--	--	--	--	--	--	--	0.06 U	--	--	--	--	--	--
Acetophenone	--	--	--	--	--	--	--	0.057 U	--	--	--	--	--	--
Anthracene	--	--	--	--	--	--	--	0.045 U	--	--	--	--	--	--
Atrazine	--	--	--	--	--	--	--	0.17 UJ	--	--	--	--	--	--
Benzaldehyde	--	--	--	--	--	--	--	0.1 U	--	--	--	--	--	--
Benzo(A)Anthracene	--	--	--	--	--	--	--	0.069 U	--	--	--	--	--	--
Benzo(A)Pyrene	--	--	--	--	--	--	--	0.049 U	--	--	--	--	--	--
Benzo(B)Fluoranthene	--	--	--	--	--	--	--	0.09 U	--	--	--	--	--	--
Benzo(G,H,I)Perylene	--	--	--	--	--	--	--	0.064 U	--	--	--	--	--	--
Benzo(K)Fluoranthene	--	--	--	--	--	--	--	0.081 U	--	--	--	--	--	--
Benzyl Butyl Phthalate	--	--	--	--	--	--	--	0.45 J	--	--	--	--	--	--
Biphenyl (Diphenyl)	--	--	--	--	--	--	--	0.055 U	--	--	--	--	--	--
Bis(2-Chloroethoxy) Methane	--	--	--	--	--	--	--	0.062 U	--	--	--	--	--	--
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	--	--	--	--	--	--	--	0.037 U	--	--	--	--	--	--
Bis(2-Chloroisopropyl) Ether	--	--	--	--	--	--	--	0.054 U	--	--	--	--	--	--
Bis(2-Ethylhexyl) Phthalate	--	--	--	--	--	--	--	4.3 U	--	--	--	--	--	--
Caprolactam	--	--	--	--	--	--	--	0.57 J	--	--	--	--	--	--
Carbazole	--	--	--	--	--	--	--	0.047 U	--	--	--	--	--	--
Chrysene	--	--	--	--	--	--	--	0.075 U	--	--	--	--	--	--
Dibenz(A,H)Anthracene	--	--	--	--	--	--	--	0.067 U	--	--	--	--	--	--
Dibenzofuran	--	--	--	--	--	--	--	0.068 U	--	--	--	--	--	--
Diethyl Phthalate	--	--	--	--	--	--	--	0.53 U	--	--	--	--	--	--
Dimethyl Phthalate	--	--	--	--	--	--	--	0.052 U	--	--	--	--	--	--
Di-N-Butyl Phthalate	--	--	--	--	--	--	--	0.69 U	--	--	--	--	--	--
Di-N-Octylphthalate	--	--	--	--	--	--	--	0.63 U	--	--	--	--	--	--
Fluoranthene	--	--	--	--	--	--	--	0.056 U	--	--	--	--	--	--
Fluorene	--	--	--	--	--	--	--	0.064 U	--	--	--	--	--	--
Hexachlorobenzene	--	--	--	--	--	--	--	0.052 U	--	--	--	--	--	--
Hexachlorobutadiene	--	--	--	--	--	--	--	0.064 U	--	--	--	--	--	--
Hexachlorocyclopentadiene	--	--	--	--	--	--	--	0.46 U	--	--	--	--	--	--
Hexachloroethane	--	--	--	--	--	--	--	0.057 U	--	--	--	--	--	--
Indeno(1,2,3-C,D)Pyrene	--	--	--	--	--	--	--	0.079 U	--	--	--	--	--	--
Isophorone	--	--	--	--	--	--	--	0.05 U	--	--	--	--	--	--
Naphthalene	--	--	--	--	--	--	--	0.055 U	--	--	--	--	--	--
Nitrobenzene	--	--	--	--	--	--	--	0.15 U	--	--	--	--	--	--
N-Nitrosodi-N-Propylamine	--	--	--	--	--	--	--	0.066 U	--	--	--	--	--	--
N-Nitrosodiphenylamine	--	--	--	--	--	--	--	0.11 U	--	--	--	--	--	--

Table E-39
Summary of Data Used in Risk Assessment
Groundwater Below Upper Hydrogeologic Unit Site Wide - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Chemical	CFMW-057 460-166582-2 CFMW-057-GW 10/10/2018	CFMW-057A 460-120477-10 CFMW-057a-GW 9/19/2016	CFMW-057A 460-125644-7 CFMW-057a-GW 12/16/2016	CFMW-057A 460-130225-7 CFMW-057a-GW 3/22/2017	CFMW-057A 460-136263-4 CFMW-057a-GW 6/28/2017	CFMW-057A 460-158628-11 CFMW-057a-GW 6/18/2018	CFMW-057A 460-166582-1 CFMW-057a-GW 10/10/2018	CFMW-057b 180-78686-3, 460-158183-4 CFMW-057B-GW 6/12/2018	CFMW-057b 180-83122-1, 460-167033-4 CFMW-057b-GW 10/16/2018	CFMW-059A 460-120477-6 CFMW-059a-GW 9/19/2016	CFMW-059A 460-125644-2 CFMW-059a-GW 12/16/2016	CFMW-059A 460-130620-8 CFMW-059a-GW 3/29/2017	CFMW-059A 460-136263-5 CFMW-059a-GW 6/28/2017	CFMW-059A 460-158270-8 CFMW-059a-GW 6/13/2018
Pentachlorophenol	--	--	--	--	--	--	--	0.22 U	--	--	--	--	--	--
Phenanthrene	--	--	--	--	--	--	--	0.051 U	--	--	--	--	--	--
Phenol	--	--	--	--	--	--	--	0.091 U	--	--	--	--	--	--
Pyrene	--	--	--	--	--	--	--	0.05 U	--	--	--	--	--	--
SEMIVOLATILE ORGANIC COMPOUNDS|LOW LEVEL (µg/L)														
1,2,4,5-Tetrachlorobenzene	--	--	--	--	--	--	--	--	0.048 U	--	--	--	--	--
1,4-Dioxane (P-Dioxane)	--	--	--	--	--	--	--	--	0.18 U	--	--	--	--	--
2,3,4,6-Tetrachlorophenol	--	--	--	--	--	--	--	--	0.042 U	--	--	--	--	--
2,4,5-Trichlorophenol	--	--	--	--	--	--	--	--	0.056 U	--	--	--	--	--
2,4,6-Trichlorophenol	--	--	--	--	--	--	--	--	0.063 U	--	--	--	--	--
2,4-Dichlorophenol	--	--	--	--	--	--	--	--	0.047 U	--	--	--	--	--
2,4-Dimethylphenol	--	--	--	--	--	--	--	--	0.038 U	--	--	--	--	--
2,4-Dinitrophenol	--	--	--	--	--	--	--	--	1.4 U	--	--	--	--	--
2,4-Dinitrotoluene	--	--	--	--	--	--	--	--	0.047 U	--	--	--	--	--
2,6-Dinitrotoluene	--	--	--	--	--	--	--	--	0.056 U	--	--	--	--	--
2-Chloronaphthalene	--	--	--	--	--	--	--	--	0.055 U	--	--	--	--	--
2-Chlorophenol	--	--	--	--	--	--	--	--	0.059 U	--	--	--	--	--
2-Methylnaphthalene	--	--	--	--	--	--	--	--	0.057 U	--	--	--	--	--
2-Methylphenol (O-Cresol)	--	--	--	--	--	--	--	--	0.1 U	--	--	--	--	--
2-Nitroaniline	--	--	--	--	--	--	--	--	0.19 U	--	--	--	--	--
2-Nitrophenol	--	--	--	--	--	--	--	--	0.056 U	--	--	--	--	--
3,3'-Dichlorobenzidine	--	--	--	--	--	--	--	--	0.54 U	--	--	--	--	--
3-Nitroaniline	--	--	--	--	--	--	--	--	0.062 U	--	--	--	--	--
4,6-Dinitro-2-Methylphenol	--	--	--	--	--	--	--	--	1.4 U	--	--	--	--	--
4-Bromophenyl Phenyl Ether	--	--	--	--	--	--	--	--	0.058 U	--	--	--	--	--
4-Chloro-3-Methylphenol	--	--	--	--	--	--	--	--	0.056 U	--	--	--	--	--
4-Chloroaniline	--	--	--	--	--	--	--	--	0.041 U	--	--	--	--	--
4-Chlorophenyl Phenyl Ether	--	--	--	--	--	--	--	--	0.056 U	--	--	--	--	--
4-Nitroaniline	--	--	--	--	--	--	--	--	0.054 U	--	--	--	--	--
4-Nitrophenol	--	--	--	--	--	--	--	--	0.13 U	--	--	--	--	--
Acenaphthene	--	--	--	--	--	--	--	--	0.06 U	--	--	--	--	--
Acenaphthylene	--	--	--	--	--	--	--	--	0.06 U	--	--	--	--	--
Acetophenone	--	--	--	--	--	--	--	--	0.057 U	--	--	--	--	--
Anthracene	--	--	--	--	--	--	--	--	0.045 U	--	--	--	--	--
Atrazine	--	--	--	--	--	--	--	--	0.17 U	--	--	--	--	--
Benzaldehyde	--	--	--	--	--	--	--	--	0.1 U	--	--	--	--	--
Benzo(A)Anthracene	--	--	--	--	--	--	--	--	0.069 U	--	--	--	--	--
Benzo(A)Pyrene	--	--	--	--	--	--	--	--	0.049 U	--	--	--	--	--
Benzo(B)Fluoranthene	--	--	--	--	--	--	--	--	0.09 U	--	--	--	--	--
Benzo(G,H,I)Perylene	--	--	--	--	--	--	--	--	0.064 U	--	--	--	--	--
Benzo(K)Fluoranthene	--	--	--	--	--	--	--	--	0.081 U	--	--	--	--	--
Benzyl Butyl Phthalate	--	--	--	--	--	--	--	--	0.43 U	--	--	--	--	--
Biphenyl (Diphenyl)	--	--	--	--	--	--	--	--	0.055 U	--	--	--	--	--
Bis(2-Chloroethoxy) Methane	--	--	--	--	--	--	--	--	0.062 U	--	--	--	--	--
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	--	--	--	--	--	--	--	--	0.037 U	--	--	--	--	--
Bis(2-Chloroisopropyl) Ether	--	--	--	--	--	--	--	--	0.054 U	--	--	--	--	--
Bis(2-Ethylhexyl) Phthalate	--	--	--	--	--	--	--	--	4.3 U	--	--	--	--	--
Caprolactam	--	--	--	--	--	--	--	--	0.44 U	--	--	--	--	--
Carbazole	--	--	--	--	--	--	--	--	0.047 U	--	--	--	--	--
Chrysene	--	--	--	--	--	--	--	--	0.075 U	--	--	--	--	--
Dibenz(A,H)Anthracene	--	--	--	--	--	--	--	--	0.067 U	--	--	--	--	--
Dibenzofuran	--	--	--	--	--	--	--	--	0.068 U	--	--	--	--	--
Diethyl Phthalate	--	--	--	--	--	--	--	--	0.53 U	--	--	--	--	--
Dimethyl Phthalate	--	--	--	--	--	--	--	--	0.052 U	--	--	--	--	--
Di-N-Butyl Phthalate	--	--	--	--	--	--	--	--	0.69 U	--	--	--	--	--
Di-N-Octylphthalate	--	--	--	--	--	--	--	--	0.63 U	--	--	--	--	--
Fluoranthene	--	--	--	--	--	--	--	--	0.056 U	--	--	--	--	--
Fluorene	--	--	--	--	--	--	--	--	0.064 U	--	--	--	--	--
Hexachlorobenzene	--	--	--	--	--	--	--	--	0.052 U	--	--	--	--	--

Table E-39
Summary of Data Used in Risk Assessment
Groundwater Below Upper Hydrogeologic Unit Site Wide - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-057	CFMW-057A	CFMW-057A	CFMW-057A	CFMW-057A	CFMW-057A	CFMW-057A	CFMW-057b	CFMW-057b	CFMW-059A	CFMW-059A	CFMW-059A	CFMW-059A	CFMW-059A
Sample Lab IDs	460-166582-2	460-120477-10	460-125644-7	460-130225-7	460-136263-4	460-158628-11	460-166582-1	180-78686-3, 460-158183-4	180-83122-1, 460-167033-4	460-120477-6	460-125644-2	460-130620-8	460-136263-5	460-158270-8
Sample Name	CFMW-057-GW	CFMW-057a-GW	CFMW-057a-GW	CFMW-057a-GW	CFMW-057a-GW	CFMW-057a-GW	CFMW-057a-GW	CFMW-057B-GW	CFMW-057b-GW	CFMW-059a-GW	CFMW-059a-GW	CFMW-059a-GW	CFMW-059a-GW	CFMW-059a-GW
Chemical	10/10/2018	9/19/2016	12/16/2016	3/22/2017	6/28/2017	6/18/2018	10/10/2018	6/12/2018	10/16/2018	9/19/2016	12/16/2016	3/29/2017	6/28/2017	6/13/2018
Hexachlorobutadiene	--	--	--	--	--	--	--	--	0.064 U	--	--	--	--	--
Hexachlorocyclopentadiene	--	--	--	--	--	--	--	--	0.46 U	--	--	--	--	--
Hexachloroethane	--	--	--	--	--	--	--	--	0.057 U	--	--	--	--	--
Indeno(1,2,3-C,D)Pyrene	--	--	--	--	--	--	--	--	0.079 U	--	--	--	--	--
Isophorone	--	--	--	--	--	--	--	--	0.05 U	--	--	--	--	--
Naphthalene	--	--	--	--	--	--	--	--	0.055 U	--	--	--	--	--
Nitrobenzene	--	--	--	--	--	--	--	--	0.15 U	--	--	--	--	--
N-Nitrosodi-N-Propylamine	--	--	--	--	--	--	--	--	0.066 U	--	--	--	--	--
N-Nitrosodiphenylamine	--	--	--	--	--	--	--	--	0.11 U	--	--	--	--	--
Pentachlorophenol	--	--	--	--	--	--	--	--	0.22 U	--	--	--	--	--
Phenanthrene	--	--	--	--	--	--	--	--	0.06 J	--	--	--	--	--
Phenol	--	--	--	--	--	--	--	--	0.091 U	--	--	--	--	--
Pyrene	--	--	--	--	--	--	--	--	0.05 U	--	--	--	--	--
VOLATILE ORGANIC COMPOUNDS (µg/L)														
1,1,1-Trichloroethane	--	--	--	--	--	--	--	0.24 U	0.24 U	--	--	--	--	--
1,1,2,2-Tetrachloroethane	--	--	--	--	--	--	--	0.37 U	0.37 UJ	--	--	--	--	--
1,1,2-Trichloro-1,2,2-Trifluoroethane	--	--	--	--	--	--	--	0.31 U	0.31 U	--	--	--	--	--
1,1,2-Trichloroethane	--	--	--	--	--	--	--	0.43 U	0.43 U	--	--	--	--	--
1,1-Dichloroethane	--	--	--	--	--	--	--	0.26 U	0.26 U	--	--	--	--	--
1,1-Dichloroethene	--	--	--	--	--	--	--	0.12 U	0.12 U	--	--	--	--	--
1,2,3-Trichlorobenzene	--	--	--	--	--	--	--	0.36 U	0.36 U	--	--	--	--	--
1,2,4-Trichlorobenzene	--	--	--	--	--	--	--	0.37 U	0.37 U	--	--	--	--	--
1,2-Dibromo-3-Chloropropane	--	--	--	--	--	--	--	0.38 U	0.38 UJ	--	--	--	--	--
1,2-Dibromoethane (Ethylene Dibromide)	--	--	--	--	--	--	--	0.5 U	0.5 U	--	--	--	--	--
1,2-Dichlorobenzene	--	--	--	--	--	--	--	0.43 U	0.43 U	--	--	--	--	--
1,2-Dichloroethane	--	--	--	--	--	--	--	0.43 U	0.43 UJ	--	--	--	--	--
1,2-Dichloropropane	--	--	--	--	--	--	--	0.35 U	0.35 U	--	--	--	--	--
1,3-Dichlorobenzene	--	--	--	--	--	--	--	0.34 U	0.34 U	--	--	--	--	--
1,4-Dichlorobenzene	--	--	--	--	--	--	--	0.76 U	0.76 U	--	--	--	--	--
2-Hexanone	--	--	--	--	--	--	--	2.9 U	2.9 U	--	--	--	--	--
Acetone	--	--	--	--	--	--	--	5 U	5 U	--	--	--	--	--
Benzene	--	--	--	--	--	--	--	0.43 U	0.43 U	--	--	--	--	--
Bromochloromethane	--	--	--	--	--	--	--	0.41 U	0.41 U	--	--	--	--	--
Bromodichloromethane	--	--	--	--	--	--	--	0.34 U	0.34 U	--	--	--	--	--
Bromoform	--	--	--	--	--	--	--	0.54 U	0.54 U	--	--	--	--	--
Bromomethane	--	--	--	--	--	--	--	1 U	1 UJ	--	--	--	--	--
Carbon Disulfide	--	--	--	--	--	--	--	0.16 U	0.16 U	--	--	--	--	--
Carbon Tetrachloride	--	--	--	--	--	--	--	0.21 U	0.21 U	--	--	--	--	--
Chlorobenzene	--	--	--	--	--	--	--	0.38 U	0.38 U	--	--	--	--	--
Chloroethane	--	--	--	--	--	--	--	0.32 U	0.32 U	--	--	--	--	--
Chloroform	--	--	--	--	--	--	--	0.33 U	0.33 U	--	--	--	--	--
Chloromethane	--	--	--	--	--	--	--	0.14 U	0.14 UJ	--	--	--	--	--
Cis-1,2-Dichloroethylene	--	--	--	--	--	--	--	0.22 U	0.22 U	--	--	--	--	--
Cis-1,3-Dichloropropene	--	--	--	--	--	--	--	0.46 U	0.46 U	--	--	--	--	--
Cyclohexane	--	--	--	--	--	--	--	0.32 U	0.32 U	--	--	--	--	--
Dibromochloromethane	--	--	--	--	--	--	--	0.28 U	0.28 U	--	--	--	--	--
Dichlorodifluoromethane	--	--	--	--	--	--	--	0.12 U	0.12 UJ	--	--	--	--	--
Ethylbenzene	--	--	--	--	--	--	--	0.3 U	0.3 U	--	--	--	--	--
Isopropylbenzene (Cumene)	--	--	--	--	--	--	--	0.34 U	0.34 U	--	--	--	--	--
M,P-Xylene	--	--	--	--	--	--	--	0.3 U	0.3 U	--	--	--	--	--
Methyl Acetate	--	--	--	--	--	--	--	0.31 U	0.31 UJ	--	--	--	--	--
Methyl Ethyl Ketone (2-Butanone)	--	--	--	--	--	--	--	1.9 U	1.9 U	--	--	--	--	--
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	--	--	--	--	--	--	--	2.7 U	2.7 U	--	--	--	--	--
Methylcyclohexane	--	--	--	--	--	--	--	0.26 U	0.26 UJ	--	--	--	--	--
Methylene Chloride	--	--	--	--	--	--	--	0.32 U	0.32 U	--	--	--	--	--
O-Xylene (1,2-Dimethylbenzene)	--	--	--	--	--	--	--	0.36 U	0.36 U	--	--	--	--	--
Styrene	--	--	--	--	--	--	--	0.42 U	0.42 U	--	--	--	--	--
Tert-Butyl Methyl Ether	--	--	--	--	--	--	--	0.47 U	0.47 UJ	--	--	--	--	--
Tetrachloroethylene (PCE)	--	--	--	--	--	--	--	0.25 U	0.25 U	--	--	--	--	--

Table E-39
Summary of Data Used in Risk Assessment
Groundwater Below Upper Hydrogeologic Unit Site Wide - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-057	CFMW-057A	CFMW-057A	CFMW-057A	CFMW-057A	CFMW-057A	CFMW-057A	CFMW-057b	CFMW-057b	CFMW-059A	CFMW-059A	CFMW-059A	CFMW-059A	CFMW-059A
Sample Lab IDs	460-166582-2	460-120477-10	460-125644-7	460-130225-7	460-136263-4	460-158628-11	460-166582-1	180-78686-3, 460-158183-4	180-83122-1, 460-167033-4	460-120477-6	460-125644-2	460-130620-8	460-136263-5	460-158270-8
Sample Name	CFMW-057-GW	CFMW-057a-GW	CFMW-057a-GW	CFMW-057a-GW	CFMW-057a-GW	CFMW-057a-GW	CFMW-057a-GW	CFMW-057B-GW	CFMW-057b-GW	CFMW-059a-GW	CFMW-059a-GW	CFMW-059a-GW	CFMW-059a-GW	CFMW-059a-GW
Chemical	10/10/2018	9/19/2016	12/16/2016	3/22/2017	6/28/2017	6/18/2018	10/10/2018	6/12/2018	10/16/2018	9/19/2016	12/16/2016	3/29/2017	6/28/2017	6/13/2018
Toluene	--	--	--	--	--	--	--	0.38 U	0.38 U	--	--	--	--	--
Trans-1,2-Dichloroethene	--	--	--	--	--	--	--	0.24 U	0.24 U	--	--	--	--	--
Trans-1,3-Dichloropropene	--	--	--	--	--	--	--	0.49 U	0.49 U	--	--	--	--	--
Trichloroethylene (TCE)	--	--	--	--	--	--	--	0.31 U	0.31 U	--	--	--	--	--
Trichlorofluoromethane	--	--	--	--	--	--	--	0.14 U	0.14 U	--	--	--	--	--
Vinyl Chloride	--	--	--	--	--	--	--	0.17 U	0.17 U	--	--	--	--	--

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-39
Summary of Data Used in Risk Assessment
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Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Chemical	CFMW-065 180-78788-1, 460-158367-1 CFMW-065-GW 6/14/2018	CFMW-065 180-83066-5, 460-166928-7 CFMW-065-GW 10/15/2018	CFMW-066 180-78737-2, 460-158270-3 CFMW-066-GW 6/13/2018	CFMW-066 180-83066-4, 460-166928-6 CFMW-066-GW 10/15/2018	CFMW-067 180-78737-1, 460-158270-1 CFMW-067-GW 6/13/2018	CFMW-067 180-82741-2, 460-166219-7 CFMW-067-GW 10/5/2018	CFMW-068 180-78686-2, 460-158183-2 CFMW-068-GW 6/12/2018	CFMW-068 180-82834-3, 460-166506-5 CFMW-068-GW 10/9/2018	CFMW-069 180-78788-2, 460-158367-2 CFMW-069-GW 6/14/2018	CFMW-069 180-83122-2, 460-167033-5 CFMW-069-GW 10/16/2018	CFMW-070 180-78892-1, 460-158628-4 CFMW-070-GW 6/18/2018	CFMW-070 180-82741-1, 460-166219-6 CFMW-070-GW 10/5/2018	CFMW-071 180-78686-1, 460-158183-1 CFMW-071-GW 6/12/2018	CFMW-071 180-82834-2, 460-166506-4 CFMW-071-GW 10/9/2018
GENERAL CHEMISTRY (µg/L)														
Fluoride	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cyanide	2 U	2 U	2 U	11.3	2 U	2 U	2 UR	2 U	2 U	2 U	1070	804	18.9 J	18.1
Cyanide (Free)	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U	15.6	23	1.5 U	1.5 U
Cyanide	2 U	2 U	2 U	10.2	2 U	2 U	2.6 J	2 U	2 U	2 U	1010	825	22.1	20.6
Cyanide (Free)	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U	1.7 J-	305 J-	49.6	1.5 U	1.5 U
METALS (µg/L)														
Aluminum	15 U	15 U	15 U	23 J	27.2 J	15 U	15 U	15 U	15 U	15 U	15 U	15 U	20.2 J	15 U
Antimony	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U
Arsenic	0.77 U	0.77 U	0.77 U	0.99 J	0.77 U	0.77 U	0.77 U	0.77 U	0.77 U	0.77 U	0.77 U	0.77 U	0.77 U	0.77 U
Barium	220	235	99.3	16.8	260	214	120	119	112	112	207	231	130	152
Beryllium	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U
Cadmium	0.61 U	0.61 U	0.61 U	0.61 U	0.61 U	0.61 U	0.61 U	0.61 U	0.61 U	0.61 U	0.61 U	0.61 U	0.61 U	0.61 U
Calcium	69800	76600	76800	120000	53800	55000	71100	67500	64400	61200	43700	51500	59900	74400
Chromium, Total	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
Cobalt	1.3 U	1.3 U	1.6 J	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
Copper	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U
Iron	45.7 U	45.7 U	45.7 U	45.7 U	45.7 U	45.7 U	45.7 U	45.7 U	45.7 U	45.7 U	350	260	45.7 U	45.7 U
Lead	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U
Magnesium	15800	17200	18700	29900	13500	14100	17000	16700	14900	14600	13500	17100	15500	18200
Manganese	2.7 U	2.7 U	1230	300	70.5	63.9	63	6.1 J	34.6	3.7 J	3.8 J	3 J	9.9	2.7 U
Mercury	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U
Nickel	1.3 U	1.3 U	2.2 J	1.9 J	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
Potassium	1030	964	2700	2580	1830	922	967	746	679	558	963	1010	3080	1000
Selenium	0.69 U	0.69 U	4.8 J	17.6	0.69 U	0.69 U	0.69 U	0.69 U	0.69 U	0.69 U	0.69 U	0.69 U	0.69 U	0.69 U
Silver	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U
Sodium	17200	18100	141000	433000	7960	4880	3440	2570	2570	2630	59200	68000	12900	5680
Thallium	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U
Vanadium	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U
Zinc	8.4 J	5.4 U	49.8	5.4 U	46.2	5.4 U	56.5	5.4 U	28.5	5.4 U	7.6 J	5.4 U	115	5.4 U
Aluminum	15 J	114	81.8	194	515	280	16.9 J	17.8 J	99.8	43.5	161	27.9 J	37.8 J	44.1
Antimony	0.62 U	1.1 J	0.84 J	1.2 J	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U
Arsenic	0.77 U	0.77 U	0.77 U	1.1 J	0.77 J	0.77 U	0.77 U	0.77 U	0.77 U	0.77 U	0.77 U	0.77 U	0.77 U	0.77 U
Barium	214	261	105	22.7	276	220	119	121	116	123	201	224	145	153
Beryllium	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U
Cadmium	0.61 U	0.61 U	0.61 U	0.61 U	0.61 U	0.61 U	0.61 U	0.61 U	0.61 U	0.61 U	0.61 U	0.61 U	0.61 U	0.61 U
Calcium	63000	81000	74500	134000	55200	59100	68900	72100	60300	66700	42100	52300	62800	80900
Chromium, Total	1.3 U	1.3 U	1.3 U	1.3 J	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.5 J	1.6 J	1.3 U	1.3 U
Cobalt	1.3 U	1.3 U	1.6 J	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
Copper	1.9 U	1.9 U	1.9 U	1.9 U	2.9 J	2.2 J	1.9 U	1.9 J	1.9 U	1.9 U	1.9 U	3.9 J	1.9 U	1.9 U
Iron	45.7 U	228	152	260	833	381	45.7 U	45.7 U	165	47.1 J	580	329	65.9 J	73.6 J
Lead	0.37 U	0.37 U	0.37 U	0.42 J	0.59 J	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U
Magnesium	14800	18200	18300	32400	13600	14500	17000	17100	14400	16500	14300	16800	16000	19100
Manganese	2.7 U	12.3	1150	354	97.7	73.6	81.4	6.8 J	36.2	5.8 J	8.1	4.4 J	12.5	2.7 U
Mercury	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U
Nickel	1.3 U	1.3 U	2.6 J	2.6 J	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
Potassium	888	1050	2780	2910	1410	1050	1150	780	602	624	914	1040	2650	1080
Selenium	0.69 U	0.69 U	4.4 J	17.7	0.69 U	0.69 U	0.69 U	0.69 U	0.69 U	0.69 U	0.69 U	0.69 U	0.69 U	0.69 U
Silver	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U
Sodium	18900	19300	149000	525000	8440	5590	3930	3070	2840	3220	65200	67300	13400	6300
Thallium	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U
Vanadium	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U
Zinc	9.1 J	5.4 U	52.2	5.4 U	30.3	5.4 U	56.9	5.4 U	46.8	5.4 U	12.6 J	5.4 U	145	5.4 U
SEMIVOLATILE ORGANIC COMPOUNDS (µg/L)														
1,2,4,5-Tetrachlorobenzene	0.054 U	--	0.048 U	--	0.05 U	--	0.05 U	--	0.05 U	--	0.05 U	--	0.052 U	--
1,4-Dioxane (P-Dioxane)	0.2 U	--	0.18 U	--	0.19 U	--	0.19 U	--	0.19 U	--	0.19 U	--	0.19 U	--
2,3,4,6-Tetrachlorophenol	0.047 U	--	0.042 U	--	0.043 U	--	0.043 U	--	0.043 U	--	0.043 U	--	0.045 U	--
2,4,5-Trichlorophenol	0.064 U	--	0.056 U	--	0.059 U	--	0.059 U	--	0.059 U	--	0.059 U	--	0.061 U	--
2,4,6-Trichlorophenol	0.071 U	--	0.063 U	--	0.065 U	--	0.065 U	--	0.065 U	--	0.065 U	--	0.068 U	--

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Sample Location ID Sample Lab IDs Sample Name Chemical	CFMW-065 180-78788-1, 460-158367-1 CFMW-065-GW 6/14/2018	CFMW-065 180-83066-5, 460-166928-7 CFMW-065-GW 10/15/2018	CFMW-066 180-78737-2, 460-158270-3 CFMW-066-GW 6/13/2018	CFMW-066 180-83066-4, 460-166928-6 CFMW-066-GW 10/15/2018	CFMW-067 180-78737-1, 460-158270-1 CFMW-067-GW 6/13/2018	CFMW-067 180-82741-2, 460-166219-7 CFMW-067-GW 10/5/2018	CFMW-068 180-78686-2, 460-158183-2 CFMW-068-GW 6/12/2018	CFMW-068 180-82834-3, 460-166506-5 CFMW-068-GW 10/9/2018	CFMW-069 180-78788-2, 460-158367-2 CFMW-069-GW 6/14/2018	CFMW-069 180-83122-2, 460-167033-5 CFMW-069-GW 10/16/2018	CFMW-070 180-78892-1, 460-158628-4 CFMW-070-GW 6/18/2018	CFMW-070 180-82741-1, 460-166219-6 CFMW-070-GW 10/5/2018	CFMW-071 180-78686-1, 460-158183-1 CFMW-071-GW 6/12/2018	CFMW-071 180-82834-2, 460-166506-4 CFMW-071-GW 10/9/2018
2,4-Dichlorophenol	0.053 U	--	0.047 U	--	0.049 U	--	0.049 U	--	0.049 U	--	0.049 U	--	0.051 U	--
2,4-Dimethylphenol	0.043 U	--	0.038 U	--	0.039 U	--	0.039 U	--	0.039 U	--	0.039 U	--	0.041 U	--
2,4-Dinitrophenol	1.6 U	--	1.4 U	--	1.5 U	--	1.5 U	--	1.5 U	--	1.5 U	--	1.5 U	--
2,4-Dinitrotoluene	0.053 U	--	0.047 U	--	0.049 U	--	0.049 U	--	0.049 U	--	0.049 U	--	0.051 U	--
2,6-Dinitrotoluene	0.063 U	--	0.056 U	--	0.058 U	--	0.058 U	--	0.058 U	--	0.058 U	--	0.06 U	--
2-Chloronaphthalene	0.061 U	--	0.055 U	--	0.057 U	--	0.057 U	--	0.057 U	--	0.057 U	--	0.059 U	--
2-Chlorophenol	0.067 U	--	0.059 U	--	0.062 U	--	0.062 U	--	0.062 U	--	0.062 U	--	0.064 U	--
2-Methylnaphthalene	0.065 U	--	0.057 U	--	0.06 U	--	0.06 U	--	0.06 U	--	0.06 U	--	0.062 U	--
2-Methylphenol (O-Cresol)	0.11 U	--	0.1 U	--	0.1 U	--	0.1 U	--	0.1 U	--	0.1 U	--	0.11 U	--
2-Nitroaniline	0.22 U	--	0.19 U	--	0.2 U	--	0.2 U	--	0.2 U	--	0.2 U	--	0.21 U	--
2-Nitrophenol	0.064 U	--	0.056 U	--	0.059 U	--	0.059 U	--	0.059 U	--	0.059 U	--	0.061 U	--
3- And 4- Methylphenol (Total)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3,3'-Dichlorobenzidine	0.61 U	--	0.54 U	--	0.56 U	--	0.56 U	--	0.56 U	--	0.56 U	--	0.58 U	--
3-Nitroaniline	0.07 U	--	0.062 U	--	0.064 U	--	0.064 U	--	0.064 U	--	0.064 U	--	0.067 U	--
4,6-Dinitro-2-Methylphenol	1.5 U	--	1.4 U	--	1.4 U	--	1.4 U	--	1.4 U	--	1.4 U	--	1.5 U	--
4-Bromophenyl Phenyl Ether	0.066 U	--	0.058 U	--	0.061 U	--	0.061 U	--	0.061 U	--	0.061 U	--	0.063 U	--
4-Chloro-3-Methylphenol	0.064 U	--	0.056 U	--	0.059 U	--	0.059 U	--	0.059 U	--	0.059 U	--	0.061 U	--
4-Chloroaniline	0.046 U	--	0.041 U	--	0.042 U	--	0.042 U	--	0.042 U	--	0.042 U	--	0.044 U	--
4-Chlorophenyl Phenyl Ether	0.064 U	--	0.056 U	--	0.059 U	--	0.059 U	--	0.059 U	--	0.059 U	--	0.061 U	--
4-Nitroaniline	0.06 U	--	0.054 U	--	0.056 U	--	0.056 U	--	0.056 U	--	0.056 U	--	0.058 U	--
4-Nitrophenol	0.15 U	--	0.13 U	--	0.14 U	--	0.14 U	--	0.14 U	--	0.14 U	--	0.14 U	--
Acenaphthene	0.068 U	--	0.06 U	--	0.063 U	--	0.063 U	--	0.063 U	--	0.063 U	--	0.065 U	--
Acenaphthylene	0.068 U	--	0.06 U	--	0.063 U	--	0.063 U	--	0.063 U	--	0.063 U	--	0.065 U	--
Acetophenone	0.065 U	--	0.057 U	--	0.06 U	--	0.06 U	--	0.06 U	--	0.06 U	--	0.062 U	--
Anthracene	0.051 U	--	0.045 U	--	0.047 U	--	0.047 U	--	0.047 U	--	0.047 U	--	0.049 U	--
Atrazine	0.19 UJ	--	0.17 UJ	--	0.18 UJ	--	0.18 UJ	--	0.18 UJ	--	0.18 U	--	0.18 UJ	--
Benzaldehyde	0.12 U	--	0.1 U	--	0.11 U	--	0.11 U	--	0.11 U	--	0.11 U	--	0.11 U	--
Benzo(A)Anthracene	0.078 U	--	0.069 U	--	0.072 U	--	0.072 U	--	0.072 U	--	0.072 U	--	0.075 U	--
Benzo(A)Pyrene	0.055 U	--	0.049 U	--	0.051 U	--	0.051 U	--	0.051 U	--	0.051 U	--	0.053 U	--
Benzo(B)Fluoranthene	0.1 U	--	0.09 U	--	0.093 U	--	0.093 U	--	0.093 U	--	0.093 U	--	0.097 U	--
Benzo(G,H,I)Perylene	0.072 U	--	0.064 U	--	0.066 U	--	0.066 U	--	0.066 U	--	0.066 U	--	0.069 U	--
Benzo(K)Fluoranthene	0.092 U	--	0.081 U	--	0.085 U	--	0.085 U	--	0.085 U	--	0.085 U	--	0.088 U	--
Benzyl Butyl Phthalate	0.48 U	--	0.43 U	--	0.44 U	--	0.51 J	--	0.44 U	--	0.45 J	--	0.52 J	--
Biphenyl (Diphenyl)	0.061 U	--	0.055 U	--	0.057 U	--	0.057 U	--	0.057 U	--	0.057 U	--	0.059 U	--
Bis(2-Chloroethoxy) Methane	0.07 U	--	0.062 U	--	0.064 U	--	0.064 U	--	0.064 U	--	0.064 U	--	0.067 U	--
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.042 U	--	0.037 U	--	0.038 U	--	0.038 U	--	0.038 U	--	0.038 U	--	0.04 U	--
Bis(2-Chloroisopropyl) Ether	0.06 U	--	0.054 U	--	0.056 U	--	0.056 U	--	0.056 U	--	0.056 U	--	0.058 U	--
Bis(2-Ethylhexyl) Phthalate	4.8 U	--	4.3 U	--	5.1 J	--	4.4 U	--	4.4 U	--	36	--	4.6 U	--
Caprolactam	0.49 U	--	0.44 U	--	0.45 U	--	0.74 J	--	0.45 U	--	0.99 J	--	0.89 J	--
Carbazole	0.053 U	--	0.047 U	--	0.049 U	--	0.049 U	--	0.049 U	--	0.049 U	--	0.051 U	--
Chrysene	0.084 U	--	0.075 U	--	0.078 U	--	0.078 U	--	0.078 U	--	0.078 U	--	0.081 U	--
Dibenz(A,H)Anthracene	0.075 U	--	0.067 U	--	0.069 U	--	0.069 U	--	0.069 U	--	0.069 U	--	0.072 U	--
Dibenzofuran	0.076 U	--	0.068 U	--	0.07 U	--	0.07 U	--	0.07 U	--	0.07 U	--	0.073 U	--
Diethyl Phthalate	0.59 U	--	0.53 U	--	0.55 U	--	0.55 U	--	0.55 U	--	0.55 U	--	0.57 U	--
Dimethyl Phthalate	0.058 U	--	0.052 U	--	0.054 U	--	0.054 U	--	0.054 U	--	0.054 U	--	0.056 U	--
Di-N-Butyl Phthalate	0.77 U	--	0.69 U	--	0.71 U	--	0.71 U	--	0.71 U	--	0.71 U	--	0.74 U	--
Di-N-Octylphthalate	0.71 U	--	0.63 U	--	0.66 U	--	0.66 U	--	0.66 U	--	0.66 U	--	0.69 U	--
Fluoranthene	0.063 U	--	0.056 U	--	0.058 U	--	0.058 U	--	0.058 U	--	0.058 U	--	0.06 U	--
Fluorene	0.072 U	--	0.064 U	--	0.066 U	--	0.066 U	--	0.066 U	--	0.066 U	--	0.069 U	--
Hexachlorobenzene	0.058 U	--	0.052 U	--	0.054 U	--	0.054 U	--	0.054 U	--	0.054 U	--	0.056 U	--
Hexachlorobutadiene	0.072 U	--	0.064 U	--	0.066 U	--	0.066 U	--	0.066 U	--	0.066 U	--	0.069 U	--
Hexachlorocyclopentadiene	0.52 U	--	0.46 U	--	0.48 U	--	0.48 U	--	0.48 U	--	0.48 U	--	0.5 U	--
Hexachloroethane	0.065 U	--	0.057 U	--	0.06 U	--	0.06 U	--	0.06 U	--	0.06 U	--	0.062 U	--
Indeno(1,2,3-C,D)Pyrene	0.089 U	--	0.079 U	--	0.082 U	--	0.082 U	--	0.082 U	--	0.082 U	--	0.085 U	--
Isophorone	0.056 U	--	0.05 U	--	0.052 U	--	0.052 U	--	0.052 U	--	0.052 U	--	0.054 U	--
Naphthalene	0.18 J	--	0.055 U	--	0.057 U	--	0.057 U	--	0.057 U	--	0.057 U	--	0.059 U	--
Nitrobenzene	0.17 U	--	0.15 U	--	0.16 U	--	0.16 U	--	0.16 U	--	0.16 U	--	0.17 U	--
N-Nitrosodi-N-Propylamine	0.074 U	--	0.066 U	--	0.068 U	--	0.068 U	--	0.068 U	--	0.068 U	--	0.071 U	--
N-Nitrosodiphenylamine	0.12 U	--	0.11 U	--	0.11 U	--	0.11 U	--	0.11 U	--	0.11 U	--	0.12 U	--

Table E-39
Summary of Data Used in Risk Assessment
Groundwater Below Upper Hydrogeologic Unit Site Wide - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Chemical	CFMW-065 180-78788-1, 460-158367-1 CFMW-065-GW 6/14/2018	CFMW-065 180-83066-5, 460-166928-7 CFMW-065-GW 10/15/2018	CFMW-066 180-78737-2, 460-158270-3 CFMW-066-GW 6/13/2018	CFMW-066 180-83066-4, 460-166928-6 CFMW-066-GW 10/15/2018	CFMW-067 180-78737-1, 460-158270-1 CFMW-067-GW 6/13/2018	CFMW-067 180-82741-2, 460-166219-7 CFMW-067-GW 10/5/2018	CFMW-068 180-78686-2, 460-158183-2 CFMW-068-GW 6/12/2018	CFMW-068 180-82834-3, 460-166506-5 CFMW-068-GW 10/9/2018	CFMW-069 180-78788-2, 460-158367-2 CFMW-069-GW 6/14/2018	CFMW-069 180-83122-2, 460-167033-5 CFMW-069-GW 10/16/2018	CFMW-070 180-78892-1, 460-158628-4 CFMW-070-GW 6/18/2018	CFMW-070 180-82741-1, 460-166219-6 CFMW-070-GW 10/5/2018	CFMW-071 180-78686-1, 460-158183-1 CFMW-071-GW 6/12/2018	CFMW-071 180-82834-2, 460-166506-4 CFMW-071-GW 10/9/2018
Pentachlorophenol	0.25 U	--	0.22 U	--	0.23 U	--	0.23 U	--	0.23 U	--	0.23 U	--	0.24 U	--
Phenanthrene	0.057 U	--	0.051 U	--	0.055 J	--	0.053 U	--	0.053 U	--	0.053 U	--	0.055 U	--
Phenol	0.1 U	--	0.091 U	--	0.094 U	--	0.094 U	--	0.094 U	--	0.094 U	--	0.098 U	--
Pyrene	0.056 U	--	0.05 U	--	0.052 U	--	0.052 U	--	0.052 U	--	0.052 U	--	0.054 U	--
SEMIVOLATILE ORGANIC COMPOUNDS|LOW LEVEL (µg/L)														
1,2,4,5-Tetrachlorobenzene	--	0.048 U	--	0.052 U	--	0.052 U	--	0.05 U	--	0.052 U	--	0.048 U	--	0.052 U
1,4-Dioxane (P-Dioxane)	--	0.18 U	--	0.19 U	--	0.19 U	--	0.19 U	--	0.19 U	--	0.18 U	--	0.19 U
2,3,4,6-Tetrachlorophenol	--	0.042 U	--	0.045 U	--	0.045 U	--	0.043 U	--	0.045 U	--	0.042 U	--	0.045 U
2,4,5-Trichlorophenol	--	0.056 U	--	0.061 U	--	0.061 U	--	0.059 U	--	0.061 U	--	0.056 U	--	0.061 U
2,4,6-Trichlorophenol	--	0.063 U	--	0.068 U	--	0.068 U	--	0.065 U	--	0.068 U	--	0.063 U	--	0.068 U
2,4-Dichlorophenol	--	0.047 U	--	0.051 U	--	0.051 U	--	0.049 U	--	0.051 U	--	0.047 U	--	0.051 U
2,4-Dimethylphenol	--	0.038 U	--	0.041 U	--	0.041 U	--	0.039 U	--	0.041 U	--	0.038 U	--	0.041 U
2,4-Dinitrophenol	--	1.4 UJ	--	1.5 UJ	--	1.5 U	--	1.5 U	--	1.5 U	--	1.4 U	--	1.5 UJ
2,4-Dinitrotoluene	--	0.047 U	--	0.051 U	--	0.051 U	--	0.049 U	--	0.051 U	--	0.047 U	--	0.051 U
2,6-Dinitrotoluene	--	0.056 U	--	0.06 U	--	0.06 U	--	0.058 U	--	0.06 U	--	0.056 U	--	0.06 U
2-Chloronaphthalene	--	0.055 U	--	0.059 U	--	0.059 U	--	0.057 U	--	0.059 U	--	0.055 U	--	0.059 U
2-Chlorophenol	--	0.059 U	--	0.064 U	--	0.064 U	--	0.062 U	--	0.064 U	--	0.059 U	--	0.064 U
2-Methylnaphthalene	--	0.057 U	--	0.062 U	--	0.062 U	--	0.06 U	--	0.062 U	--	0.057 U	--	0.062 U
2-Methylphenol (O-Cresol)	--	0.1 U	--	0.11 U	--	0.11 U	--	0.1 U	--	0.11 U	--	0.1 U	--	0.11 U
2-Nitroaniline	--	0.19 U	--	0.21 U	--	0.21 U	--	0.2 U	--	0.21 U	--	0.19 U	--	0.21 U
2-Nitrophenol	--	0.056 U	--	0.061 U	--	0.061 U	--	0.059 U	--	0.061 U	--	0.056 U	--	0.061 U
3,3'-Dichlorobenzidine	--	0.54 U	--	0.58 U	--	0.58 U	--	0.56 U	--	0.58 U	--	0.54 U	--	0.58 U
3-Nitroaniline	--	0.062 U	--	0.067 U	--	0.067 U	--	0.064 U	--	0.067 U	--	0.062 U	--	0.067 U
4,6-Dinitro-2-Methylphenol	--	1.4 U	--	1.5 U	--	1.5 U	--	1.4 U	--	1.5 U	--	1.4 U	--	1.5 U
4-Bromophenyl Phenyl Ether	--	0.058 U	--	0.063 U	--	0.063 U	--	0.061 U	--	0.063 U	--	0.058 U	--	0.063 U
4-Chloro-3-Methylphenol	--	0.056 U	--	0.061 U	--	0.061 U	--	0.059 U	--	0.061 U	--	0.056 U	--	0.061 U
4-Chloroaniline	--	0.041 U	--	0.044 U	--	0.044 U	--	0.042 U	--	0.044 U	--	0.041 U	--	0.044 U
4-Chlorophenyl Phenyl Ether	--	0.056 U	--	0.061 U	--	0.061 U	--	0.059 U	--	0.061 U	--	0.056 U	--	0.061 U
4-Nitroaniline	--	0.054 U	--	0.058 U	--	0.058 U	--	0.056 U	--	0.058 U	--	0.054 U	--	0.058 U
4-Nitrophenol	--	0.13 U	--	0.14 U	--	0.14 U	--	0.14 U	--	0.14 U	--	0.13 U	--	0.14 U
Acenaphthene	--	0.06 U	--	0.065 U	--	0.065 U	--	0.063 U	--	0.065 U	--	0.06 U	--	0.065 U
Acenaphthylene	--	0.06 U	--	0.065 U	--	0.065 U	--	0.063 U	--	0.065 U	--	0.06 U	--	0.065 U
Acetophenone	--	0.057 U	--	0.062 U	--	0.062 U	--	0.06 U	--	0.062 U	--	0.057 U	--	0.062 U
Anthracene	--	0.045 U	--	0.049 U	--	0.049 U	--	0.047 U	--	0.049 U	--	0.045 U	--	0.049 U
Atrazine	--	0.17 U	--	0.18 U	--	0.18 U	--	0.18 U	--	0.18 U	--	0.17 U	--	0.18 U
Benzaldehyde	--	0.1 U	--	0.11 U	--	0.11 U	--	0.11 U	--	0.11 U	--	0.1 U	--	0.11 U
Benzo(A)Anthracene	--	0.069 U	--	0.075 U	--	0.25	--	0.072 U	--	0.075 U	--	0.069 U	--	0.075 U
Benzo(A)Pyrene	--	0.049 U	--	0.053 U	--	0.16 J	--	0.051 U	--	0.053 U	--	0.049 U	--	0.053 U
Benzo(B)Fluoranthene	--	0.09 U	--	0.097 U	--	0.35	--	0.093 U	--	0.097 U	--	0.09 U	--	0.097 U
Benzo(G,H,I)Perylene	--	0.064 U	--	0.069 U	--	0.53	--	0.066 U	--	0.069 U	--	0.064 U	--	0.069 U
Benzo(K)Fluoranthene	--	0.081 U	--	0.088 U	--	0.48	--	0.085 U	--	0.088 U	--	0.081 U	--	0.088 U
Benzyl Butyl Phthalate	--	0.43 U	--	0.46 U	--	0.46 U	--	0.44 J	--	0.46 U	--	0.43 U	--	1 U
Biphenyl (Diphenyl)	--	0.055 U	--	0.059 U	--	0.059 U	--	0.057 U	--	0.059 U	--	0.055 U	--	0.059 U
Bis(2-Chloroethoxy) Methane	--	0.062 U	--	0.067 U	--	0.067 U	--	0.064 U	--	0.067 U	--	0.062 U	--	0.067 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	--	0.037 U	--	0.04 U	--	0.04 U	--	0.038 U	--	0.04 U	--	0.037 U	--	0.04 U
Bis(2-Chloroisopropyl) Ether	--	0.054 U	--	0.058 U	--	0.058 U	--	0.056 U	--	0.058 U	--	0.054 U	--	0.058 U
Bis(2-Ethylhexyl) Phthalate	--	4.3 U	--	4.6 U	--	4.6 U	--	4.4 U	--	73 D	--	4.3 U	--	4.6 U
Caprolactam	--	0.44 U	--	0.47 U	--	0.85 J	--	0.45 U	--	0.47 U	--	0.77 J	--	0.52 J
Carbazole	--	0.047 U	--	0.051 U	--	0.051 U	--	0.049 U	--	0.051 U	--	0.047 U	--	0.051 U
Chrysene	--	0.075 U	--	0.081 U	--	0.58	--	0.078 U	--	0.081 U	--	0.075 U	--	0.081 U
Dibenz(A,H)Anthracene	--	0.067 U	--	0.072 U	--	0.64	--	0.069 U	--	0.072 U	--	0.067 U	--	0.072 U
Dibenzofuran	--	0.068 U	--	0.073 U	--	0.073 U	--	0.07 U	--	0.073 U	--	0.068 U	--	0.073 U
Diethyl Phthalate	--	0.53 U	--	0.57 U	--	0.57 U	--	0.55 U	--	0.57 U	--	0.53 U	--	0.57 U
Dimethyl Phthalate	--	0.052 U	--	0.056 U	--	0.056 U	--	0.054 U	--	0.056 U	--	0.052 U	--	0.056 U
Di-N-Butyl Phthalate	--	0.69 U	--	0.74 U	--	0.74 U	--	0.71 U	--	0.74 U	--	0.69 U	--	0.74 U
Di-N-Octylphthalate	--	0.63 U	--	0.69 U	--	0.69 U	--	0.66 U	--	0.69 U	--	0.63 U	--	1 U
Fluoranthene	--	0.056 U	--	0.06 U	--	0.06 U	--	0.058 U	--	0.06 U	--	0.056 U	--	0.06 U
Fluorene	--	0.064 U	--	0.069 U	--	0.069 U	--	0.066 U	--	0.069 U	--	0.064 U	--	0.069 U
Hexachlorobenzene	--	0.052 U	--	0.056 U	--	0.056 U	--	0.054 U	--	0.056 U	--	0.052 U	--	0.056 U

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Sample Location ID Sample Lab IDs Sample Name Chemical	CFMW-065 180-78788-1, 460-158367-1 CFMW-065-GW 6/14/2018	CFMW-065 180-83066-5, 460-166928-7 CFMW-065-GW 10/15/2018	CFMW-066 180-78737-2, 460-158270-3 CFMW-066-GW 6/13/2018	CFMW-066 180-83066-4, 460-166928-6 CFMW-066-GW 10/15/2018	CFMW-067 180-78737-1, 460-158270-1 CFMW-067-GW 6/13/2018	CFMW-067 180-82741-2, 460-166219-7 CFMW-067-GW 10/5/2018	CFMW-068 180-78686-2, 460-158183-2 CFMW-068-GW 6/12/2018	CFMW-068 180-82834-3, 460-166506-5 CFMW-068-GW 10/9/2018	CFMW-069 180-78788-2, 460-158367-2 CFMW-069-GW 6/14/2018	CFMW-069 180-83122-2, 460-167033-5 CFMW-069-GW 10/16/2018	CFMW-070 180-78892-1, 460-158628-4 CFMW-070-GW 6/18/2018	CFMW-070 180-82741-1, 460-166219-6 CFMW-070-GW 10/5/2018	CFMW-071 180-78686-1, 460-158183-1 CFMW-071-GW 6/12/2018	CFMW-071 180-82834-2, 460-166506-4 CFMW-071-GW 10/9/2018
Hexachlorobutadiene	--	0.064 U	--	0.069 U	--	0.069 U	--	0.066 U	--	0.069 U	--	0.064 U	--	0.069 U
Hexachlorocyclopentadiene	--	0.46 U	--	0.5 U	--	0.5 U	--	0.48 U	--	0.5 U	--	0.46 U	--	0.5 U
Hexachloroethane	--	0.057 U	--	0.062 U	--	0.062 U	--	0.06 U	--	0.062 U	--	0.057 U	--	0.062 U
Indeno(1,2,3-C,D)Pyrene	--	0.079 U	--	0.085 U	--	0.44	--	0.082 U	--	0.085 U	--	0.079 U	--	0.085 U
Isophorone	--	0.05 U	--	0.054 U	--	0.054 U	--	0.052 U	--	0.054 U	--	0.05 U	--	0.054 U
Naphthalene	--	0.055 U	--	0.059 U	--	0.059 U	--	0.057 U	--	0.059 U	--	0.055 U	--	0.059 U
Nitrobenzene	--	0.15 U	--	0.17 U	--	0.17 U	--	0.16 U	--	0.17 U	--	0.15 U	--	0.17 U
N-Nitrosodi-N-Propylamine	--	0.066 U	--	0.071 U	--	0.071 U	--	0.068 U	--	0.071 U	--	0.066 U	--	0.071 U
N-Nitrosodiphenylamine	--	0.11 U	--	0.12 U	--	0.12 U	--	0.11 U	--	0.12 U	--	0.11 U	--	0.12 U
Pentachlorophenol	--	0.22 U	--	0.24 U	--	0.24 U	--	0.23 U	--	0.24 U	--	0.22 U	--	0.24 UJ
Phenanthrene	--	0.051 U	--	0.055 U	--	0.055 U	--	0.056 J	--	0.055 U	--	0.051 U	--	0.19 U
Phenol	--	0.091 U	--	0.098 U	--	0.098 U	--	0.094 U	--	0.098 U	--	0.091 U	--	0.098 U
Pyrene	--	0.05 U	--	0.054 U	--	0.054 U	--	0.052 U	--	0.054 U	--	0.05 U	--	0.054 U
VOLATILE ORGANIC COMPOUNDS (µg/L)														
1,1,1-Trichloroethane	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U
1,1,2,2-Tetrachloroethane	0.37 UJ	0.37 UJ	0.37 UJ	0.37 UJ	0.37 UJ	0.37 U	0.37 U	0.37 U	0.37 UJ	0.37 UJ	0.37 U	0.37 U	0.37 U	0.37 U
1,1,2-Trichloro-1,2,2-Trifluoroethane	0.31 U	0.31 U	0.31 U	0.31 U	0.31 U	0.31 U	0.31 U	0.31 U	0.31 U	0.31 U	0.31 U	0.31 U	0.31 U	0.31 U
1,1,2-Trichloroethane	0.43 U	0.43 U	0.43 U	0.43 U	0.43 U	0.43 U	0.43 U	0.43 U	0.43 U	0.43 U	0.43 U	0.43 U	0.43 U	0.43 U
1,1-Dichloroethane	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U
1,1-Dichloroethene	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U
1,2,3-Trichlorobenzene	0.36 U	0.36 U	0.36 U	0.36 U	0.36 U	0.36 U	0.36 U	0.36 U	0.36 U	0.36 U	0.36 U	0.36 U	0.36 U	0.36 U
1,2,4-Trichlorobenzene	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U
1,2-Dibromo-3-Chloropropane	0.38 UJ	0.38 UJ	0.38 UJ	0.38 UJ	0.38 UJ	0.38 UJ	0.38 U	0.38 UJ	0.38 UJ	0.38 UJ	0.38 U	0.38 UJ	0.38 U	0.38 UJ
1,2-Dibromoethane (Ethylene Dibromide)	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,2-Dichlorobenzene	0.43 U	0.43 U	0.43 U	0.43 U	0.43 U	0.43 U	0.43 U	0.43 U	0.43 U	0.43 U	0.43 U	0.43 U	0.43 U	0.43 U
1,2-Dichloroethane	0.43 UJ	0.43 UJ	0.43 UJ	0.43 UJ	0.43 UJ	0.43 U	0.43 U	0.43 U	0.43 UJ	0.43 UJ	0.43 U	0.43 U	0.43 U	0.43 U
1,2-Dichloropropane	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U
1,3-Dichlorobenzene	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U
1,4-Dichlorobenzene	0.76 U	0.76 U	0.76 U	0.76 U	0.76 U	0.76 U	0.76 U	0.76 U	0.76 U	0.76 U	0.76 U	0.76 U	0.76 U	0.76 U
2-Hexanone	2.9 UJ	2.9 U	2.9 UJ	2.9 U	2.9 UJ	2.9 U	2.9 U	2.9 U	2.9 UJ	2.9 U	2.9 U	2.9 U	2.9 U	2.9 U
Acetone	5 UJ	5 U	5 UJ	5 U	5 UJ	5 U	5 U	5 U	5 UJ	5 U	5 U	5 U	6.1	5 U
Benzene	0.43 U	0.43 U	0.43 U	0.43 U	0.43 U	0.43 U	0.43 U	0.43 U	0.43 U	0.43 U	0.43 U	0.43 U	0.43 U	0.43 U
Bromochloromethane	0.41 U	0.41 U	0.41 U	0.41 U	0.41 U	0.41 U	0.41 U	0.41 U	0.41 U	0.41 U	0.41 U	0.41 U	0.41 U	0.41 U
Bromodichloromethane	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U
Bromoform	0.54 U	0.54 U	0.54 U	0.54 U	0.54 U	0.54 U	0.54 U	0.54 U	0.54 U	0.54 U	0.54 U	0.54 U	0.54 U	0.54 U
Bromomethane	1 U	1 UJ	1 U	1 UJ	1 U	1 UJ	1 U	1 U	1 U	1 UJ	1 U	1 UJ	1 U	1 U
Carbon Disulfide	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U
Carbon Tetrachloride	0.21 U	0.21 U	0.21 U	0.21 U	0.21 U	0.21 U	0.21 U	0.21 U	0.21 U	0.21 U	0.21 U	0.21 U	0.21 U	0.21 U
Chlorobenzene	0.38 U	0.38 U	0.38 U	0.38 U	0.38 U	0.38 U	0.38 U	0.38 U	0.38 U	0.38 U	0.38 U	0.38 U	0.38 U	0.38 U
Chloroethane	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U
Chloroform	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U
Chloromethane	0.14 U	0.14 UJ	0.14 U	0.14 UJ	0.14 U	0.14 UJ	0.14 U	0.14 U	0.14 U	0.14 UJ	0.14 U	0.14 UJ	0.14 U	0.14 U
Cis-1,2-Dichloroethylene	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U
Cis-1,3-Dichloropropene	0.46 UJ	0.46 U	0.46 UJ	0.46 U	0.46 UJ	0.46 U	0.46 U	0.46 U	0.46 UJ	0.46 U	0.46 U	0.46 U	0.46 U	0.46 U
Cyclohexane	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U
Dibromochloromethane	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U
Dichlorodifluoromethane	0.12 U	0.12 UJ	0.12 U	0.12 UJ	0.12 U	0.12 UJ	0.12 U	0.12 UJ	0.12 U	0.12 UJ	0.12 U	0.12 UJ	0.12 U	0.12 UJ
Ethylbenzene	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U
Isopropylbenzene (Cumene)	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U
M,P-Xylene	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U
Methyl Acetate	0.31 U	0.31 UJ	0.31 U	0.31 UJ	0.31 U	0.31 UJ	0.31 U	0.31 U	0.31 U	0.31 UJ	0.31 U	0.31 UJ	0.31 U	0.31 U
Methyl Ethyl Ketone (2-Butanone)	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	2.7 UJ	2.7 U	2.7 UJ	2.7 U	2.7 UJ	2.7 U	2.7 U	2.7 U	2.7 UJ	2.7 U	2.7 U	2.7 U	2.7 U	2.7 U
Methylcyclohexane	0.26 U	0.26 UJ	0.26 U	0.26 UJ	0.26 U	0.26 UJ	0.26 U	0.26 U	0.26 U	0.26 UJ	0.26 U	0.26 UJ	0.26 U	0.26 U
Methylene Chloride	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U
O-Xylene (1,2-Dimethylbenzene)	0.36 U	0.36 U	0.36 U	0.36 U	0.36 U	0.36 U	0.36 U	0.36 U	0.36 U	0.36 U	0.36 U	0.36 U	0.36 U	0.36 U
Styrene	0.42 U	0.42 U	0.42 U	0.42 U	0.42 U	0.42 U	0.42 U	0.42 U	0.42 U	0.42 U	0.42 U	0.42 U	0.42 U	0.42 U
Tert-Butyl Methyl Ether	0.47 U	0.47 UJ	0.47 U	0.47 UJ	0.47 U	0.47 U	0.47 U	0.47 U	0.47 U	0.47 UJ	0.47 U	0.47 U	0.47 U	0.47 U
Tetrachloroethylene (PCE)	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U

Table E-39
Summary of Data Used in Risk Assessment
Groundwater Below Upper Hydrogeologic Unit Site Wide - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Chemical	CFMW-065 180-78788-1, 460-158367-1 CFMW-065-GW 6/14/2018	CFMW-065 180-83066-5, 460-166928-7 CFMW-065-GW 10/15/2018	CFMW-066 180-78737-2, 460-158270-3 CFMW-066-GW 6/13/2018	CFMW-066 180-83066-4, 460-166928-6 CFMW-066-GW 10/15/2018	CFMW-067 180-78737-1, 460-158270-1 CFMW-067-GW 6/13/2018	CFMW-067 180-82741-2, 460-166219-7 CFMW-067-GW 10/5/2018	CFMW-068 180-78686-2, 460-158183-2 CFMW-068-GW 6/12/2018	CFMW-068 180-82834-3, 460-166506-5 CFMW-068-GW 10/9/2018	CFMW-069 180-78788-2, 460-158367-2 CFMW-069-GW 6/14/2018	CFMW-069 180-83122-2, 460-167033-5 CFMW-069-GW 10/16/2018	CFMW-070 180-78892-1, 460-158628-4 CFMW-070-GW 6/18/2018	CFMW-070 180-82741-1, 460-166219-6 CFMW-070-GW 10/5/2018	CFMW-071 180-78686-1, 460-158183-1 CFMW-071-GW 6/12/2018	CFMW-071 180-82834-2, 460-166506-4 CFMW-071-GW 10/9/2018
Toluene	0.38 U	0.38 U	0.38 U	0.38 U	0.38 U	0.38 U	0.38 U	0.38 U	0.38 U	0.38 U	0.38 U	0.38 U	0.38 U	0.38 U
Trans-1,2-Dichloroethene	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U
Trans-1,3-Dichloropropene	0.49 UJ	0.49 U	0.49 UJ	0.49 U	0.49 UJ	0.49 U	0.49 U	0.49 U	0.49 UJ	0.49 U	0.49 U	0.49 U	0.49 U	0.49 U
Trichloroethylene (TCE)	0.31 U	0.31 U	0.31 U	0.31 U	0.31 U	0.31 U	0.31 U	0.31 U	0.31 U	0.31 U	0.31 U	0.31 U	0.31 U	0.31 U
Trichlorofluoromethane	0.14 U	0.14 U	0.14 U	0.14 U	0.14 U	0.14 U	0.14 U	0.14 U	0.14 U	0.14 U	0.14 U	0.14 U	0.14 U	0.14 U
Vinyl Chloride	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-40
Summary of Data Used in Risk Assessment
ATV Areas (surface water) - Current/ Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Sample Depth Chemical	CFSWP-010 460-114997-2 CFSWP-010-SW ?-? ft 6/7/2016	CFSWP-010 460-129899-2 CFSWP-010-SW ?-? ? 3/15/2017	CFSWP-010 460-135182-2 CFSWP-010-SW ?-? ? 6/12/2017	CFSWP-010 460-158366-2 CFSWP-010-SW ?-? ? 6/14/2018	CFSWP-011 460-114997-3 CFSWP-011-SW ?-? ft 6/7/2016	CFSWP-011 460-130874-6 CFSWP-011-SW ?-? ? 4/3/2017	CFSWP-011 460-135182-3 CFSWP-011-SW ?-? ? 6/12/2017	CFSWP-011 460-158366-3 CFSWP-011-SW ?-? ? 6/14/2018	CFSWP-012 460-114997-4 CFSWP-012-SW ?-? ft 6/7/2016	CFSWP-012 460-130874-7 CFSWP-012-SW ?-? ? 4/3/2017	CFSWP-012-DUP 460-130874-8 CFSWP-DUP5-SW ?-? ? 4/3/2017	CFSWP-012 460-135182-4 CFSWP-012-SW ?-? ? 6/12/2017	CFSWP-012 460-158366-4 CFSWP-012-SW ?-? ? 6/14/2018	CFSWP-013 460-114997-5 CFSWP-013-SW ?-? ft 6/7/2016
GENERAL CHEMISTRY (µg/L)														
Fluoride	--	--	177 J+	--	--	--	128 J+	--	--	--	--	129 J+	--	--
Cyanide	--	--	2 U	--	--	--	2 U	--	--	--	--	2 U	--	--
Cyanide (Free)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cyanide	4 U	2 U	2 U	2 U	4 U	2 U	2 U	2 U	4 U	2 U	2 U	2 U	2 U	4 U
Cyanide (Free)	--	--	--	1.5 U	--	--	--	1.5 U	--	--	--	--	1.5 U	--
METALS (µg/L)														
Aluminum	--	--	18.2 U	15 U	--	--	18.2 U	15 U	--	--	--	18.2 U	36.1 J	--
Antimony	--	--	0.62 U	0.62 U	--	--	0.62 U	0.62 U	--	--	--	0.62 U	0.62 U	--
Arsenic	--	--	0.64 U	0.77 U	--	--	0.64 U	0.77 U	--	--	--	0.64 U	0.77 U	--
Barium	--	--	85.2	79.6	--	--	86.6	76.2	--	--	--	85	79.6	--
Beryllium	--	--	0.24 U	0.26 U	--	--	0.24 U	0.26 U	--	--	--	0.24 U	0.26 U	--
Cadmium	--	--	0.71 U	0.61 U	--	--	0.71 U	0.61 U	--	--	--	0.71 U	0.61 U	--
Calcium	--	--	48600	46800	--	--	48700	45200	--	--	--	48700	46000	--
Chromium, Total	--	--	1.3 U	1.3 U	--	--	1.3 U	1.3 U	--	--	--	1.3 U	1.3 U	--
Cobalt	--	--	1.3 U	1.3 U	--	--	1.3 U	1.3 U	--	--	--	1.3 U	1.3 U	--
Copper	--	--	1.4 U	1.9 U	--	--	1.4 U	1.9 U	--	--	--	1.4 U	1.9 U	--
Iron	--	--	42.4 U	45.7 U	--	--	42.4 U	45.7 U	--	--	--	42.4 U	45.7 U	--
Lead	--	--	0.38 U	0.37 U	--	--	0.38 U	0.37 U	--	--	--	0.38 U	0.37 U	--
Magnesium	--	--	10900	10100	--	--	11100	9750	--	--	--	11100	10100	--
Manganese	--	--	2.5 U	2.7 U	--	--	2.5 U	2.7 U	--	--	--	2.5 U	3.4 J	--
Mercury	--	--	0.17 U	0.12 U	--	--	0.17 U	0.12 U	--	--	--	0.17 U	0.12 U	--
Nickel	--	--	1.4 U	1.3 U	--	--	1.4 U	1.3 U	--	--	--	1.4 U	1.3 U	--
Potassium	--	--	417	426	--	--	419	417	--	--	--	410	433	--
Selenium	--	--	0.73 U	0.69 U	--	--	0.73 U	0.69 U	--	--	--	0.73 U	0.69 U	--
Silver	--	--	1.3 U	1.4 U	--	--	1.3 U	1.4 U	--	--	--	1.3 U	1.4 U	--
Sodium	--	--	2060	1800	--	--	2010	1760	--	--	--	2020	1810	--
Thallium	--	--	0.26 U	0.24 U	--	--	0.26 U	0.24 U	--	--	--	0.26 U	0.24 U	--
Vanadium	--	--	1.9 U	1.2 U	--	--	1.9 U	1.2 U	--	--	--	1.9 U	1.2 U	--
Zinc	--	--	7 U	5.4 U	--	--	7 U	5.4 U	--	--	--	7 U	5.4 U	--
Aluminum	44.6	507	18.2 U	50.6	28.2 J	37.9 J	18.2 U	17.1 J	35.9 J	27.4 J	37.7 J	18.2 U	23 J	30 J
Antimony	0.76 U	0.62 U	0.62 U	2.2	0.76 U	0.62 U	0.62 U	0.62 U	0.76 U	0.62 U	0.62 U	0.62 U	0.62 U	0.76 U
Arsenic	0.71 U	0.64 U	0.64 U	0.77 U	0.71 U	0.64 U	0.64 U	0.77 U	0.8 J	0.64 U	0.64 U	0.64 U	0.77 U	0.71 U
Barium	79.6	63.4	88	79.7	78.6	70.8	87.3	80.4	79	70.5	75.8	88.8	79.2	78
Beryllium	0.29 U	0.24 U	0.24 U	0.26 U	0.29 U	0.24 U	0.24 U	0.26 U	0.29 U	0.24 U	0.24 U	0.24 U	0.26 U	0.29 U
Cadmium	0.72 U	0.71 U	0.71 U	0.61 U	0.72 U	0.71 U	0.71 U	0.61 U	0.72 U	0.71 U	0.71 U	0.71 U	0.61 U	0.72 U
Calcium	47000	38300	50700	46100	47000	46600	50600	44300	46800	45600	45300	50000	43900	46500
Chromium, Total	1.5 U	1.3 U	1.3 U	1.3 U	1.5 U	1.3 U	1.3 U	1.3 U	1.5 U	1.3 U	1.3 U	1.3 U	1.3 U	1.5 U
Cobalt	1.5 U	1.3 U	1.3 U	1.3 U	1.5 U	1.3 U	1.3 U	1.3 U	1.5 U	1.3 U	1.3 U	1.3 U	1.3 U	1.5 U
Copper	1.6 U	1.5 J	1.4 U	1.9 U	2.1 J	1.4 U	1.4 U	1.9 U	4.1	1.4 U	1.4 U	1.4 U	1.9 U	2.2 J
Iron	49.3 J	392	42.4 U	57.4 J	49.1 U	42.4 U	42.4 U	45.7 U	72.8 J	42.4 U	54.6 J	42.4 U	45.7 U	49.1 U
Lead	0.44 U	0.54 J	0.38 U	0.37 U	0.44 U	0.38 U	0.38 U	0.37 U	0.44 U	0.38 U	0.38 U	0.38 U	0.37 U	0.44 U
Magnesium	10900	6510	12100	10600	10800	10400	12100	10800	10900	10300	10900	12000	10700	10700
Manganese	7.8 J	19.6	3.1 J	5.3 J	6.3 J	7.5 J	3.8 J	3.9 J	8.6	6.8 J	7.9 J	4.4 J	5.7 J	10.7
Mercury	0.14 U	0.17 U	0.17 U	0.12 U	0.14 U	0.17 U	0.17 U	0.12 U	0.14 U	0.17 U	0.17 U	0.17 U	0.12 U	0.14 U
Nickel	1.6 U	1.4 U	1.4 U	1.3 U	1.6 U	1.4 U	1.4 U	1.3 U	1.6 U	1.4 U	1.4 U	1.4 U	1.3 U	1.6 U
Potassium	535	1100	473	427	540	454	472	392	537	433	451	474	379	530
Selenium	0.79 U	0.73 U	0.73 U	0.69 U	0.79 U	0.73 U	0.73 U	0.69 U	0.79 U	0.73 U	0.73 U	0.73 U	0.69 U	0.79 U
Silver	1.5 U	1.3 U	1.3 U	1.4 U	1.5 U	1.3 U	1.3 U	1.4 U	1.5 U	1.3 U	1.3 U	1.3 U	1.4 U	1.5 U
Sodium	2080	2180	2220	4830	2120	2370	2210	2240	2080	2310	2360	2190	2230	2030
Thallium	0.31 U	0.26 U	0.26 U	0.24 U	0.31 U	0.26 U	0.26 U	0.24 U	0.31 U	0.26 U	0.26 U	0.26 U	0.24 U	0.31 U

Table E-40
Summary of Data Used in Risk Assessment
ATV Areas (surface water) - Current/ Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Sample Depth Chemical	CFSWP-010 460-114997-2 CFSWP-010-SW ?-? ft 6/7/2016	CFSWP-010 460-129899-2 CFSWP-010-SW ?-? ? 3/15/2017	CFSWP-010 460-135182-2 CFSWP-010-SW ?-? ? 6/12/2017	CFSWP-010 460-158366-2 CFSWP-010-SW ?-? ? 6/14/2018	CFSWP-011 460-114997-3 CFSWP-011-SW ?-? ft 6/7/2016	CFSWP-011 460-130874-6 CFSWP-011-SW ?-? ? 4/3/2017	CFSWP-011 460-135182-3 CFSWP-011-SW ?-? ? 6/12/2017	CFSWP-011 460-158366-3 CFSWP-011-SW ?-? ? 6/14/2018	CFSWP-012 460-114997-4 CFSWP-012-SW ?-? ft 6/7/2016	CFSWP-012 460-130874-7 CFSWP-012-SW ?-? ? 4/3/2017	CFSWP-012-DUP 460-130874-8 CFSWP-DUP5-SW ?-? ? 4/3/2017	CFSWP-012 460-135182-4 CFSWP-012-SW ?-? ? 6/12/2017	CFSWP-012 460-158366-4 CFSWP-012-SW ?-? ? 6/14/2018	CFSWP-013 460-114997-5 CFSWP-013-SW ?-? ft 6/7/2016
Vanadium	2.1 J	1.9 U	1.9 U	1.2 U	2.1 J	1.9 U	1.9 U	1.2 U	2.1 J	1.9 U	1.9 U	1.9 U	1.2 U	1.9 J
Zinc	6.5 U	7 U	7 U	7.1 J	6.5 U	7 U	7 U	5.4 U	6.5 U	7 U	7 U	7 U	5.4 U	6.5 U

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-40
Summary of Data Used in Risk Assessment
ATV Areas (surface water) - Current/ Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Sample Depth Chemical	CFSWP-013-DUP 460-114997-6 CFSWP-DUP1-SW ?-? ft 6/7/2016	CFSWP-013 460-124553-1 CFSWP-013-SW ?-? ? 11/30/2016	CFSWP-013 460-129899-3 CFSWP-013-SW ?-? ? 3/15/2017	CFSWP-013 460-135182-5 CFSWP-013-SW ?-? ? 6/12/2017	CFSWP-013 460-158366-5 CFSWP-013-SW ?-? ? 6/14/2018	CFSWP-014 460-119361-1 CFSWP-014-SW ?-? ? 8/29/2016	CFSWP-014 460-124553-2 CFSWP-014-SW ?-? ? 11/30/2016	CFSWP-014-DUP 460-124553-5 CFSWP-DUP3-SW ?-? ? 11/30/2016	CFSWP-014 460-129850-1 CFSWP-014-SW ?-? ? 3/13/2017	CFSWP-014-DUP 460-129850-5 CFSWP-Dup4-SW ?-? ? 3/13/2017	CFSWP-014 460-135255-1 CFSWP-014-SW ?-? ? 6/13/2017	CFSWP-014 460-158059-1 CFSWP-014-SW ?-? ? 6/11/2018	CFSWP-014 460-166579-4 CFSWP-014-SW ?-? ? 10/10/2018	CFSWP-014 460-167026-4 CFSWP-014-SW ?-? ? 10/16/2018
GENERAL CHEMISTRY (µg/L)														
Fluoride	--	--	--	126 J+	--	--	--	--	--	--	130 J+	--	--	--
Cyanide	--	--	--	2 U	--	--	--	--	--	--	2 U	--	--	--
Cyanide (Free)	--	--	--	--	--	--	--	--	--	--	1.5 U	--	--	--
Cyanide	4 U	2 U	2 U	2 U	2 U	2 U	15.3 J	2 UJ	2 U	2 U	2 U	2.3 J	--	--
Cyanide (Free)	--	--	--	--	1.6 J	--	--	--	1.5 U	1.5 U	1.5 U	1.5 UJ	1.5 U	1.5 U
METALS (µg/L)														
Aluminum	--	--	--	18.2 U	15 U	--	--	--	--	--	18.2 U	15 U	15 U	--
Antimony	--	--	--	0.62 U	0.62 U	--	--	--	--	--	0.62 U	0.62 U	0.62 U	--
Arsenic	--	--	--	0.64 U	0.77 U	--	--	--	--	--	0.64 U	0.77 U	0.77 U	--
Barium	--	--	--	86.5	71	--	--	--	--	--	88.5	85.9	108	--
Beryllium	--	--	--	0.24 U	0.26 U	--	--	--	--	--	0.24 U	0.26 U	0.26 U	--
Cadmium	--	--	--	0.71 U	0.61 U	--	--	--	--	--	0.71 U	0.61 U	0.61 U	--
Calcium	--	--	--	48900	47500	--	--	--	--	--	50100	44500	48700	--
Chromium, Total	--	--	--	1.3 U	1.3 U	--	--	--	--	--	1.3 U	1.3 U	1.3 U	--
Cobalt	--	--	--	1.3 U	1.3 U	--	--	--	--	--	1.3 U	1.3 U	1.3 U	--
Copper	--	--	--	1.4 U	1.9 U	--	--	--	--	--	1.4 U	1.9 U	1.9 U	--
Iron	--	--	--	42.4 U	45.7 U	--	--	--	--	--	42.4 U	45.7 U	45.7 U	--
Lead	--	--	--	0.38 U	0.37 U	--	--	--	--	--	0.38 U	0.37 U	0.37 U	--
Magnesium	--	--	--	11000	10500	--	--	--	--	--	11700	10500	14300	--
Manganese	--	--	--	3.2 J	2.7 U	--	--	--	--	--	2.7 J	4.2 J	2.7 U	--
Mercury	--	--	--	0.17 U	0.12 U	--	--	--	--	--	0.17 U	0.12 U	0.12 U	--
Nickel	--	--	--	1.4 U	1.3 U	--	--	--	--	--	1.4 U	1.3 U	1.3 U	--
Potassium	--	--	--	419	434	--	--	--	--	--	435	389	410	--
Selenium	--	--	--	0.73 U	0.69 U	--	--	--	--	--	0.73 U	0.69 U	0.69 U	--
Silver	--	--	--	1.3 U	1.4 U	--	--	--	--	--	1.3 U	1.4 U	1.4 U	--
Sodium	--	--	--	2070	1940	--	--	--	--	--	2000	1910	2850	--
Thallium	--	--	--	0.26 U	0.24 U	--	--	--	--	--	0.26 U	0.24 U	0.24 U	--
Vanadium	--	--	--	1.9 U	1.2 U	--	--	--	--	--	1.9 U	1.2 U	1.2 U	--
Zinc	--	--	--	7 U	5.4 U	--	--	--	--	--	7 U	5.4 U	5.4 U	--
Aluminum	34.6 J	1610	38.6 J	23.1 J	15 U	37.6 J	18.2 UJ	27.4 J	18.2 U	18.2 U	33.7 J	17.6 J	15 U	--
Antimony	0.76 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.64 J	0.62 J	0.62 U	0.62 U	0.62 U	--
Arsenic	0.71 U	1.8 J	2.2	0.64 U	0.77 U	0.64 U	0.64 U	0.64 U	0.64 U	0.64 U	0.64 U	0.77 U	0.77 U	--
Barium	81.2	183	73	91.3	72.9	98.1	101	103	109	104	94.4	85.9	115	--
Beryllium	0.29 U	0.24 U	0.24 U	0.24 U	0.26 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.26 U	0.26 U	--
Cadmium	0.72 U	0.71 U	0.71 U	0.71 U	0.61 U	0.71 U	0.71 U	0.71 U	0.71 U	0.71 U	0.71 U	0.61 U	0.61 U	--
Calcium	47700	40000	42600	50400	43400	43100	52800	53300	55800	52800	50900	43500	51900	--
Chromium, Total	1.5 U	1.4 J	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	37.7 J	2.4 J	1.3 U	1.3 U	1.3 U	--
Cobalt	1.5 U	2.4 J	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	--
Copper	11.7 J	6.2	1.4 U	1.4 U	1.9 U	5.4	1.4 U	1.4 U	2.3 J	1.4 UJ	1.4 U	1.9 U	3.8 J	--
Iron	49.1 U	2910	42.4 U	42.4 U	45.7 U	42.4 U	42.4 U	42.4 U	304 J	51.7 J	42.4 U	45.7 U	45.7 U	--
Lead	0.44 U	2.1	0.38 U	0.38 U	0.37 U	0.41 J	0.38 U	0.38 U	0.38 U	0.38 U	0.38 U	0.37 U	0.37 U	--
Magnesium	11100	11300	10900	12300	10500	13500	13500	13900	13500	12400	12400	10700	15900	--
Manganese	11	3750	5.7 J	7.1 J	4.9 J	13.2	5.2 J	3.9 J	13.7 J	9.7 J	12.7	11.1	4.5 J	--
Mercury	0.14 U	0.17 U	0.17 U	0.17 U	0.12 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.12 U	0.12 U	--
Nickel	1.6 U	2.3 J	1.4 U	1.4 U	1.3 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.3 U	1.3 U	--
Potassium	556	778	556	480	368	377	481	486	656	486	467	398	473	--
Selenium	0.79 U	0.73 U	0.73 U	0.73 U	0.69 U	0.73 U	0.73 U	0.73 U	0.73 U	0.73 U	0.73 U	0.69 U	0.69 U	--
Silver	1.5 U	1.3 U	1.3 U	1.3 U	1.4 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.4 U	1.4 U	--
Sodium	2120	2340	1410	2250	2260	3240	2590	2660	5530 J	2490 J	2240 J+	2010	3200	--
Thallium	0.31 U	0.26 U	0.26 U	0.26 U	0.24 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.24 U	0.24 U	--

Table E-40
Summary of Data Used in Risk Assessment
ATV Areas (surface water) - Current/ Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Sample Depth Chemical	CFSWP-013-DUP 460-114997-6 CFSWP-DUP1-SW ?-? ft 6/7/2016	CFSWP-013 460-124553-1 CFSWP-013-SW ?-? ? 11/30/2016	CFSWP-013 460-129899-3 CFSWP-013-SW ?-? ? 3/15/2017	CFSWP-013 460-135182-5 CFSWP-013-SW ?-? ? 6/12/2017	CFSWP-013 460-158366-5 CFSWP-013-SW ?-? ? 6/14/2018	CFSWP-014 460-119361-1 CFSWP-014-SW ?-? ? 8/29/2016	CFSWP-014 460-124553-2 CFSWP-014-SW ?-? ? 11/30/2016	CFSWP-014-DUP 460-124553-5 CFSWP-DUP3-SW ?-? ? 11/30/2016	CFSWP-014 460-129850-1 CFSWP-014-SW ?-? ? 3/13/2017	CFSWP-014-DUP 460-129850-5 CFSWP-Dup4-SW ?-? ? 3/13/2017	CFSWP-014 460-135255-1 CFSWP-014-SW ?-? ? 6/13/2017	CFSWP-014 460-158059-1 CFSWP-014-SW ?-? ? 6/11/2018	CFSWP-014 460-166579-4 CFSWP-014-SW ?-? ? 10/10/2018	CFSWP-014 460-167026-4 CFSWP-014-SW ?-? ? 10/16/2018
Vanadium	1.8 J	1.9 J	1.9 U	1.9 U	1.2 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.2 U	1.2 U	--
Zinc	6.5 U	18.9	7 U	14.1 J	5.4 U	16.4	7 U	7 U	7 U	7 U	7 U	5.4 U	5.4 U	--

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-40
Summary of Data Used in Risk Assessment
ATV Areas (surface water) - Current/ Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Sample Depth Chemical	CFSWP-015 460-119361-2 CFSWP-015-SW ?-? ? 8/29/2016	CFSWP-015-DUP 460-119361-4 CFSWP-DUP2-SW ?-? ? 8/29/2016	CFSWP-015 460-124553-3 CFSWP-015-SW ?-? ? 11/30/2016	CFSWP-015 460-125810-1 CFSWP-015-SW ?-? ? 12/20/2016	CFSWP-015 460-129850-2 CFSWP-015-SW ?-? ? 3/13/2017	CFSWP-015 460-135255-2 CFSWP-015-SW ?-? ? 6/13/2017	CFSWP-015-DUP 460-135255-4 CFSWP-DUP7-SW ?-? ? 6/13/2017	CFSWP-015 460-158059-2 CFSWP-015-SW ?-? ? 6/11/2018	CFSWP-015 460-166505-3 CFSWP-015-SW ?-? ? 10/9/2018	CFSWP-015 460-167026-2 CFSWP-015-SW ?-? ? 10/16/2018	CFSWP-016 460-119361-3 CFSWP-016-SW ?-? ? 8/29/2016	CFSWP-016 460-124553-4 CFSWP-016-SW ?-? ? 11/30/2016	CFSWP-016 460-129850-4 CFSWP-016-SW ?-? ? 3/13/2017	CFSWP-016 460-135182-6 CFSWP-016-SW ?-? ? 6/12/2017
GENERAL CHEMISTRY (µg/L)														
Fluoride	--	--	--	--	--	121 J+	130 J+	--	--	--	--	--	--	131 J+
Cyanide	--	--	--	--	--	2 U	2 U	--	--	--	--	--	--	2 U
Cyanide (Free)	--	--	--	--	--	1.5 U	1.5 U	--	--	--	--	--	--	--
Cyanide	2.3 J	2 U	10.6	2 U	2 U	2 U	2 U	3 J	--	--	2 U	2 U	2 U	2 U
Cyanide (Free)	--	--	--	--	1.5 U	1.5 U	1.5 U	1.9 J-	1.5 U	1.5 UJ	--	--	--	--
METALS (µg/L)														
Aluminum	--	--	--	--	--	18.2 U	18.2 U	15 U	15 U	--	--	--	--	18.2 U
Antimony	--	--	--	--	--	0.62 U	6.2 U	0.62 U	0.62 U	--	--	--	--	0.62 U
Arsenic	--	--	--	--	--	0.64 U	6.4 U	0.77 U	0.77 U	--	--	--	--	0.64 U
Barium	--	--	--	--	--	93	96.3	92.1	113	--	--	--	--	93.5
Beryllium	--	--	--	--	--	0.24 U	0.24 U	0.26 U	0.26 U	--	--	--	--	0.24 U
Cadmium	--	--	--	--	--	0.71 U	7.1 U	0.61 U	0.61 U	--	--	--	--	0.71 U
Calcium	--	--	--	--	--	50500	50100	46600	48700	--	--	--	--	50300
Chromium, Total	--	--	--	--	--	1.3 U	1.3 U	1.3 U	1.3 U	--	--	--	--	1.3 U
Cobalt	--	--	--	--	--	1.3 U	1.3 U	1.3 U	1.3 U	--	--	--	--	1.3 U
Copper	--	--	--	--	--	1.4 U	1.4 U	1.9 U	1.9 U	--	--	--	--	1.4 U
Iron	--	--	--	--	--	42.4 U	42.4 U	45.7 U	45.7 U	--	--	--	--	42.4 U
Lead	--	--	--	--	--	0.38 U	0.38 U	0.37 U	0.37 U	--	--	--	--	0.38 U
Magnesium	--	--	--	--	--	11700	11700	10900	14300	--	--	--	--	11400
Manganese	--	--	--	--	--	3.5 J	3.2 J	5.3 J	3.6 J	--	--	--	--	3.4 J
Mercury	--	--	--	--	--	0.17 U	0.17 U	0.12 U	0.12 U	--	--	--	--	0.17 U
Nickel	--	--	--	--	--	1.4 U	1.4 U	1.3 U	1.3 U	--	--	--	--	1.4 U
Potassium	--	--	--	--	--	434	429	400	444	--	--	--	--	439
Selenium	--	--	--	--	--	0.73 U	0.73 U	0.69 U	0.69 U	--	--	--	--	0.73 U
Silver	--	--	--	--	--	1.3 U	12.8 U	1.4 U	1.4 U	--	--	--	--	1.3 U
Sodium	--	--	--	--	--	1960	1940	1950	2840	--	--	--	--	2070
Thallium	--	--	--	--	--	0.26 U	0.26 U	0.24 U	0.24 U	--	--	--	--	0.26 U
Vanadium	--	--	--	--	--	1.9 U	1.9 U	1.2 U	1.2 U	--	--	--	--	1.9 U
Zinc	--	--	--	--	--	7 U	7 U	5.4 U	5.4 U	--	--	--	--	7 U
Aluminum	44.9	39.7 J	18.2 U	20 J	18.2 U	45.6	40	20 J	15 U	--	59.2	19.5 J	19.6 J	85.5
Antimony	0.62 U	0.62 U	0.62 U	0.62 U	0.67 J	0.62 U	0.62 U	0.62 U	0.62 U	--	0.62 U	0.62 U	0.78 J	0.62 U
Arsenic	0.64 U	0.64 U	0.64 U	0.64 U	0.64 U	0.64 U	0.64 U	0.77 U	0.77 U	--	0.64 U	0.64 U	0.64 U	0.64 U
Barium	103	101	106	118	107	97.5	97.1	95.7	114	--	99.5	105	106	98.8
Beryllium	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.26 U	0.26 U	--	0.24 U	0.24 U	0.24 U	0.24 U
Cadmium	0.71 U	0.71 U	0.71 U	0.71 U	0.71 U	0.71 U	0.71 U	0.61 U	0.61 U	--	0.71 U	0.71 U	0.71 U	0.71 U
Calcium	47500	44600	53100	56800	53500	51600	51700	46700	52100	--	44400	53100	53700	50500
Chromium, Total	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	--	1.3 U	1.3 U	1.3 U	1.3 U
Cobalt	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	--	1.3 U	1.3 U	1.3 U	1.3 U
Copper	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.9 U	4.2	--	1.4 U	1.4 U	1.4 U	1.9 J
Iron	42.4 U	42.4 U	42.4 U	42.4 U	42.4 U	42.4 U	42.4 U	45.7 U	45.7 U	--	42.4 U	42.4 U	42.4 U	129 J
Lead	0.38 U	0.38 U	0.38 U	0.38 U	0.38 U	0.38 U	0.38 U	0.37 U	0.37 U	--	0.38 U	0.38 U	0.38 U	0.38 U
Magnesium	13600	13400	13600	14000	12500	12600	12700	11500	14900	--	13500	13900	12600	12200
Manganese	8.6 J	5.9 J	4 J	5.5 J	6.6 J	12.5	13	11.4	5.9 J	--	3.5 J	3.6 J	5.6 J	14.7
Mercury	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.12 U	0.12 U	--	0.17 U	0.17 U	0.17 U	0.17 U
Nickel	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.3 U	1.3 U	--	1.4 U	1.4 U	1.4 U	1.4 U
Potassium	405	357	484	519	502	469	466	427	493	--	367	483	495	477
Selenium	0.73 U	0.73 U	0.73 U	0.73 U	0.73 U	0.73 U	0.73 U	0.69 U	0.69 U	--	0.73 U	0.73 U	0.73 U	0.73 U
Silver	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.4 U	1.4 U	--	1.3 U	1.3 U	1.3 U	1.3 U
Sodium	2870	2620	2610	2940	2520	2250	2270	2140	3370	--	3260	2630	2480	2200
Thallium	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.24 U	0.24 U	--	0.26 U	0.26 U	0.26 U	0.26 U

Table E-40
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Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Sample Depth Chemical	CFSWP-015 460-119361-2 CFSWP-015-SW ?-? ? 8/29/2016	CFSWP-015-DUP 460-119361-4 CFSWP-DUP2-SW ?-? ? 8/29/2016	CFSWP-015 460-124553-3 CFSWP-015-SW ?-? ? 11/30/2016	CFSWP-015 460-125810-1 CFSWP-015-SW ?-? ? 12/20/2016	CFSWP-015 460-129850-2 CFSWP-015-SW ?-? ? 3/13/2017	CFSWP-015 460-135255-2 CFSWP-015-SW ?-? ? 6/13/2017	CFSWP-015-DUP 460-135255-4 CFSWP-DUP7-SW ?-? ? 6/13/2017	CFSWP-015 460-158059-2 CFSWP-015-SW ?-? ? 6/11/2018	CFSWP-015 460-166505-3 CFSWP-015-SW ?-? ? 10/9/2018	CFSWP-015 460-167026-2 CFSWP-015-SW ?-? ? 10/16/2018	CFSWP-016 460-119361-3 CFSWP-016-SW ?-? ? 8/29/2016	CFSWP-016 460-124553-4 CFSWP-016-SW ?-? ? 11/30/2016	CFSWP-016 460-129850-4 CFSWP-016-SW ?-? ? 3/13/2017	CFSWP-016 460-135182-6 CFSWP-016-SW ?-? ? 6/12/2017
Vanadium	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.2 U	1.2 U	--	1.9 U	1.9 U	1.9 U	1.9 U
Zinc	7 U	7 U	7 U	7 U	7 U	7 U	7 U	5.4 U	5.4 U	--	7 U	7 U	7 U	13.5 J

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-40
Summary of Data Used in Risk Assessment
ATV Areas (surface water) - Current/ Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Sample Depth Chemical	CFSWP-016-DUP 460-135182-7 CFSWP-DUP6-SW ?-? ? 6/12/2017	CFSWP-016 460-158184-1 CFSWP-016-SW ?-? ? 6/12/2018	CFSWP-016 460-166505-1 CFSWP-016-SW ?-? ? 10/9/2018	CFSWP-021 460-114944-4 CFSWP-021-SW ?-? ft 6/6/2016	CFSWP-021 460-124553-7 CFSWP-021-SW ?-? ? 11/30/2016	CFSWP-021 460-129899-1 CFSWP-021-SW ?-? ? 3/15/2017	CFSWP-021 460-135444-4 CFSWP-021-SW ?-? ? 6/15/2017	CFSWP-021 460-158717-1 CFSWP-021-SW ?-? ? 6/19/2018	CFSWP-022 460-114944-5 CFSWP-022-SW ?-? ft 6/6/2016	CFSWP-022 460-130874-2 CFSWP-022-SW ?-? ? 4/3/2017	CFSWP-022 460-158804-2 CFSWP-022-SW ?-? ? 6/20/2018	CFSWP-025 460-125810-2 CFSWP-025-SW ?-? ? 12/20/2016	CFSWP-025 460-129850-3 CFSWP-025-SW ?-? ? 3/13/2017	CFSWP-025 460-135255-3 CFSWP-025-SW ?-? ? 6/13/2017
GENERAL CHEMISTRY (µg/L)														
Fluoride	138 J+	--	--	--	--	--	188	--	--	--	--	--	--	130 J+
Cyanide	2 U	--	--	--	--	--	2 U	--	--	--	--	--	--	2 U
Cyanide (Free)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cyanide	2 U	2 U	--	4 U	2 U	2 U	2 U	2 U	4 U	2 U	2 U	2 U	2 U	2 U
Cyanide (Free)	--	1.5 U	1.5 U	--	--	--	--	4.1 J	--	--	1.5 U	--	--	--
METALS (µg/L)														
Aluminum	18.2 U	15 U	15 U	--	--	--	18.2 U	15 U	--	--	15 U	--	--	18.2 U
Antimony	0.62 U	0.62 U	0.62 U	--	--	--	0.62 U	0.62 U	--	--	0.62 U	--	--	0.62 U
Arsenic	0.64 U	0.77 U	0.77 U	--	--	--	0.93 J	0.77 U	--	--	0.77 U	--	--	0.64 U
Barium	99.8	92.9	113	--	--	--	96.5	96.4	--	--	118	--	--	93.3
Beryllium	0.24 U	0.26 U	0.26 U	--	--	--	0.24 U	0.26 U	--	--	0.26 U	--	--	0.24 U
Cadmium	0.71 U	0.61 U	0.61 U	--	--	--	0.71 U	0.61 U	--	--	0.61 U	--	--	0.71 U
Calcium	50600	47000	49600	--	--	--	54100	53000	--	--	46700	--	--	50400
Chromium, Total	1.3 U	1.3 U	1.3 U	--	--	--	1.3 U	1.3 U	--	--	1.3 U	--	--	1.3 U
Cobalt	1.3 U	1.3 U	1.3 U	--	--	--	1.3 U	1.3 U	--	--	1.3 U	--	--	1.3 U
Copper	1.4 U	1.9 U	1.9 U	--	--	--	1.4 U	1.9 U	--	--	1.9 U	--	--	1.4 U
Iron	42.4 U	45.7 U	45.7 U	--	--	--	42.4 U	45.7 U	--	--	45.7 U	--	--	42.4 U
Lead	0.38 U	0.37 U	0.37 U	--	--	--	0.38 U	0.37 U	--	--	0.37 U	--	--	0.38 U
Magnesium	11400	11000	14400	--	--	--	12100	11600	--	--	10500	--	--	11700
Manganese	3.2 J	2.8 J	2.7 U	--	--	--	3.4 J	7.4 J	--	--	2.7 U	--	--	3.1 J
Mercury	0.17 U	0.12 U	0.12 U	--	--	--	0.17 U	0.12 U	--	--	0.12 U	--	--	0.17 U
Nickel	1.4 U	1.3 U	1.3 U	--	--	--	1.4 U	1.3 U	--	--	1.3 U	--	--	1.4 U
Potassium	436	393	478	--	--	--	397	420	--	--	454	--	--	421
Selenium	0.73 U	0.69 U	0.69 U	--	--	--	0.73 U	0.69 U	--	--	0.69 U	--	--	0.73 U
Silver	1.3 U	1.4 U	1.4 U	--	--	--	1.3 U	1.4 U	--	--	1.4 U	--	--	1.3 U
Sodium	2020	1920	2820	--	--	--	10400	12000	--	--	7650	--	--	2010
Thallium	0.26 U	0.24 U	0.24 U	--	--	--	0.26 U	0.24 U	--	--	0.24 U	--	--	0.26 U
Vanadium	1.9 U	1.2 U	1.2 U	--	--	--	1.9 U	1.2 U	--	--	1.2 U	--	--	1.9 U
Zinc	7 U	5.4 U	5.4 U	--	--	--	7 U	5.4 U	--	--	5.4 U	--	--	7 U
Aluminum	66.8	32.8 J	15 U	95.3	5750	112	390	36.5 J	937	140	19 J	44.4	18.2 U	49.5
Antimony	0.62 U	0.62 U	0.62 U	0.76 U	0.62 U	0.62 U	0.62 U	0.62 U	0.76 U	0.62 U	2.9	0.62 U	0.74 J	0.62 U
Arsenic	0.64 U	0.77 U	0.77 U	1.2 J	3.7	0.64 U	0.87 J	0.9 J	0.88 J	0.64 U	0.77 U	0.64 U	0.64 U	0.64 U
Barium	99.4	94.1	116	98	219	88.7	104	104	125	77.9	132	122	110	94.7
Beryllium	0.24 U	0.26 U	0.26 U	0.29 U	0.24 U	0.24 U	0.24 U	0.26 U	0.29 U	0.24 U	0.26 U	0.24 U	0.24 U	0.24 U
Cadmium	0.71 U	0.61 U	0.61 U	0.72 U	0.71 U	0.71 U	0.71 U	0.61 U	0.72 U	0.71 U	0.61 U	0.71 U	0.71 U	0.71 U
Calcium	51000	44600	52900	50500	82100	55600	54600	54000	43600	45600	51000	56700	54200	51100
Chromium, Total	1.3 U	1.3 U	1.3 U	1.5 U	3.4 J	1.3 U	1.3 U	1.3 U	1.5 U	1.3 U	1.3 U	1.3 U	8.9	1.3 U
Cobalt	1.3 U	1.3 U	1.3 U	1.5 U	2 J	1.3 U	1.3 U	1.3 U	1.5 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
Copper	1.4 U	1.9 U	2 J	1.6 U	5.7	1.4 U	1.4 U	1.9 U	2.6 J	1.4 U	1.9 U	1.4 U	1.4 U	1.4 U
Iron	54.7 J	45.7 U	45.7 U	79.5 J	4760	99.2 J	197	45.7 U	302	50.2 J	45.7 U	42.4 U	100 J	42.4 U
Lead	0.38 U	0.37 U	0.37 U	0.44 U	4.5	0.38 U	0.66 J	0.37 U	0.44 U	0.38 U	0.37 U	0.38 U	0.38 U	0.38 U
Magnesium	12400	11100	15200	11700	19500	12200	12700	13000	10900	10300	11600	13900	12700	12400
Manganese	14	10	3.8 J	4.1 J	127	3.3 J	8.1	9.1	17.8	2.5 U	2.7 U	8.9	6.7 J	13.5
Mercury	0.17 U	0.12 U	0.12 U	0.14 U	0.17 U	0.17 U	0.17 U	0.12 U	0.14 U	0.17 U	0.12 U	0.17 U	0.17 U	0.17 U
Nickel	1.4 U	1.3 U	1.3 U	1.6 U	3.9 J	1.4 U	2.1 J	1.3 U	1.6 U	1.4 U	1.3 U	1.4 U	1.4 U	1.4 U
Potassium	479	443	517	578	1250	499	443	450	785	459	572	528	509	456
Selenium	0.73 U	0.69 U	0.69 U	0.79 U	0.73 U	0.73 U	0.73 U	0.69 U	0.79 U	0.73 U	0.69 U	0.73 U	0.73 U	0.73 U
Silver	1.3 U	1.4 U	1.4 U	1.5 U	1.3 U	1.3 U	1.3 U	1.4 U	1.5 U	1.3 U	1.4 U	1.3 U	1.3 U	1.3 U
Sodium	2200	2060	3420	6150	31000	26300	10700	13800	6900	4490	8000	2880	2530	2250
Thallium	0.26 U	0.24 U	0.24 U	0.31 U	0.26 U	0.26 U	0.26 U	0.24 U	0.31 U	0.26 U	0.24 U	0.26 U	0.26 U	0.26 U

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Vanadium	1.9 U	1.2 U	1.2 U	2.1 J	3.9 J	1.9 U	1.9 U	1.2 U	2.2 J	1.9 U	1.2 U	1.9 U	1.9 U	1.9 U
Zinc	7 UJ	5.4 U	5.4 U	6.5 U	19.2	7 U	9.1 J	5.4 U	6.5 U	7 U	5.4 U	7 U	7 U	7 U

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
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GENERAL CHEMISTRY (µg/L)														
Fluoride	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cyanide	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cyanide (Free)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cyanide	2 U	--	2 U	2 U	2 U	2 U	--	2 J	--	--	--	2.7 J	--	--
Cyanide (Free)	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U	--	1.5 UJ	1.5 U	1.5 U	7.7	1.5 UJ	1.5 U	1.5 U
METALS (µg/L)														
Aluminum	15 U	15 U	15 U	15 U	15 U	15 U	--	15 U	15 U	15 U	--	15 U	15 U	--
Antimony	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	--	0.62 U	0.62 U	0.62 U	--	0.62 U	0.62 U	--
Arsenic	0.77 U	0.77 U	0.77 U	0.77 U	0.77 U	0.77 U	--	0.77 U	0.77 U	0.77 U	--	0.77 U	0.77 U	--
Barium	93.4	117	76.2	76.9	69.9	84.7	--	89.8	116	117	--	92.3	113	--
Beryllium	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	--	0.26 U	0.26 U	0.26 U	--	0.26 U	0.26 U	--
Cadmium	0.61 U	0.61 U	0.61 U	0.61 U	0.61 U	0.61 U	--	0.61 U	0.61 U	0.61 U	--	0.61 U	0.61 U	--
Calcium	47200	50900	47900	48400	48400	49400	--	46300	50200	50600	--	46700	48900	--
Chromium, Total	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	--	1.3 U	1.3 U	1.3 U	--	1.3 U	1.3 U	--
Cobalt	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	--	1.3 U	1.3 U	1.3 U	--	1.3 U	1.3 U	--
Copper	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	--	1.9 U	1.9 U	1.9 U	--	1.9 U	1.9 U	--
Iron	45.7 U	45.7 U	45.7 U	45.7 U	45.7 U	45.7 U	--	45.7 U	45.7 U	45.7 U	--	45.7 U	45.7 U	--
Lead	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U	--	0.37 U	0.37 U	0.37 U	--	0.37 U	0.37 U	--
Magnesium	11100	14400	10700	10700	10600	11000	--	10900	14800	14500	--	10900	14100	--
Manganese	3.1 J	2.7 U	2.7 U	2.7 U	2.7 U	2.7 U	--	5.5 J	4.8 J	3.9 J	--	4.9 J	3.6 J	--
Mercury	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	--	0.12 U	0.12 U	0.12 U	--	0.12 U	0.12 U	--
Nickel	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	--	1.3 U	1.3 U	1.3 U	--	1.3 U	1.3 U	--
Potassium	396	440	453	466	460	486	--	391	476	452	--	414	454	--
Selenium	0.69 U	0.69 U	0.69 U	0.69 U	0.69 U	0.69 U	--	0.69 U	0.69 U	0.69 U	--	0.69 U	0.69 U	--
Silver	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	--	1.4 U	1.4 U	1.4 U	--	1.4 U	1.4 U	--
Sodium	1940	2810	1910	1910	1970	1940 J+	--	5570	2850	2790	--	1980	2820	--
Thallium	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	--	0.24 U	0.24 U	0.24 U	--	0.24 U	0.24 U	--
Vanadium	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U	--	1.2 U	1.2 U	1.2 U	--	1.2 U	1.2 U	--
Zinc	5.4 U	5.4 U	5.4 U	5.4 U	5.4 U	5.4 U	--	25.4	5.4 U	5.4 U	--	5.4 U	5.4 U	--
Aluminum	26.5 J	15 U	16.7 J	16.5 J	15 U	15 U	--	21.3 J	22.5 J	28.2 J	--	20.3 J	15 U	--
Antimony	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	--	0.62 U	0.62 U	0.62 U	--	0.62 U	0.62 U	--
Arsenic	0.77 U	0.77 U	0.77 U	0.77 U	0.77 U	0.77 U	--	0.77 U	0.77 U	0.77 U	--	0.77 U	0.77 U	--
Barium	91.9	130	79.7	80.6	75.7	84.2	--	91	119	118	--	93.6	115	--
Beryllium	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	--	0.26 U	0.26 U	0.26 U	--	0.26 U	0.26 U	--
Cadmium	0.61 U	0.61 U	0.61 U	0.61 U	0.61 U	0.61 U	--	0.61 U	0.61 U	0.61 U	--	0.61 U	0.61 U	--
Calcium	45800	52800	44500	43400	44300	44800	--	43800	53600	52200	--	45400	52800	--
Chromium, Total	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	--	1.3 U	1.3 U	1.3 U	--	1.3 U	1.3 U	--
Cobalt	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	--	1.3 U	1.3 U	1.3 U	--	1.3 U	1.3 U	--
Copper	1.9 U	3.5 J	1.9 U	1.9 U	4.4	1.9 U	--	1.9 U	8.5 J	6 J	--	1.9 U	7.3	--
Iron	45.7 U	45.7 U	45.7 U	45.7 U	45.7 U	45.7 U	--	45.7 U	45.7 U	45.7 U	--	45.7 U	45.7 U	--
Lead	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U	--	0.37 U	0.37 U	0.37 U	--	0.37 U	0.37 U	--
Magnesium	11200	16800	10800	10700	10800	11100	--	10800	15400	15500	--	11200	15100	--
Manganese	10.5	5.2 J	3.7 J	3.9 J	4.7 J	4.5 J	--	11.1	6.9 J	6.5 J	--	11.2	6 J	--
Mercury	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	--	0.12 U	0.12 U	0.12 U	--	0.12 U	0.12 U	--
Nickel	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	--	1.3 U	1.3 U	1.3 U	--	1.3 U	1.3 U	--
Potassium	435	582	382	363	368	383	--	392	481	499	--	425	489	--
Selenium	0.69 U	0.69 U	0.69 U	0.69 U	0.69 U	0.69 U	--	0.69 U	0.69 U	0.69 U	--	0.69 U	0.69 U	--
Silver	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	--	1.4 U	1.4 U	1.4 U	--	1.4 U	1.4 U	--
Sodium	2120	3320	2120	2160	2170	2140	--	2060	3010	3030	--	2100	3400	--
Thallium	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	--	0.24 U	0.24 U	0.24 U	--	0.24 U	0.24 U	--

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Vanadium	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U	--	1.2 U	1.2 U	1.2 U	--	1.2 U	1.2 U	--
Zinc	5.4 U	5.4 U	5.4 U	5.4 U	5.4 U	5.4 U	--	5.4 U	5.4 U	5.4 U	--	5.4 U	5.4 U	--

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Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Sample Depth Chemical	CFSWP-046 460-158717-3 CFSWP-046-SW ?-? ? 6/19/2018	CFSWP-047 460-158717-2 CFSWP-047-SW ?-? ? 6/19/2018	CFSWP-048 460-158804-1 CFSWP-048-SW ?-? ? 6/20/2018	CFSWP-049 460-158804-3 CFSWP-049-SW ?-? ? 6/20/2018	CFSWP-050 460-158910-6 CFSWP-050-SW ?-? ? 6/21/2018	CFSWP-051 460-158910-7 CFSWP-051-SW ?-? ? 6/21/2018	CFSWP-052 460-158618-2 CFSWP-052-SW ?-? ? 6/18/2018	CFSWP-053 460-158618-1 CFSWP-053-SW ?-? ? 6/18/2018
GENERAL CHEMISTRY (µg/L)								
Fluoride	--	--	--	--	--	--	--	--
Cyanide	--	--	--	--	--	--	--	--
Cyanide (Free)	--	--	--	--	--	--	--	--
Cyanide	4.4 J	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Cyanide (Free)	2.7 J	2.4 J	1.8 J	1.5 U	1.5 UJ	1.5 UJ	3.5 J	2.5 J
METALS (µg/L)								
Aluminum	15 U	15 U	15 U	15 U	15 U	15 U	15 U	15 U
Antimony	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U
Arsenic	0.77 U	0.86 J	0.77 U	0.77 U	0.79 J	0.77 U	1.5 J	0.77 U
Barium	83.5	94.4	106	229	95.3	94.9	198	122
Beryllium	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U
Cadmium	0.61 U	0.61 U	0.61 U	0.61 U	0.61 U	0.61 U	0.61 U	0.61 U
Calcium	75400	50400	47600	59300	51300	51200	66400	50400
Chromium, Total	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
Cobalt	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
Copper	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U
Iron	45.7 U	45.7 U	45.7 U	45.7 U	45.7 U	45.7 U	45.7 U	45.7 U
Lead	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U
Magnesium	16500	10900	10900	15200	11000	11100	16500	11300
Manganese	28.4	10.4	2.7 U	7.8 J	5.7 J	8.8	80.5	2.7 U
Mercury	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U
Nickel	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
Potassium	969	416	477	778	419	416	643	462
Selenium	1.4 J	0.69 U	0.69 U	0.69 U	0.69 U	0.69 U	0.69 U	0.69 U
Silver	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U
Sodium	89200	11000	6400	19700	11000	11800	17500	8530
Thallium	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U
Vanadium	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U
Zinc	5.4 U	5.4 U	5.4 U	5.4 U	5.4 U	5.4 U	5.4 U	5.4 U
Aluminum	45.8	34.2 J	16.1 J	17.1 J	66.5	15 U	59.2	47.8
Antimony	0.62 U	0.62 U	2.4	2.7	0.62 U	0.62 U	0.62 U	0.62 U
Arsenic	0.78 J	0.8 J	0.77 U	0.77 U	0.95 J	0.95 J	1.5 J	0.77 U
Barium	89.8	101	112	245	89.4	101	190	122
Beryllium	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U
Cadmium	0.61 U	0.61 U	0.61 U	0.61 U	0.61 U	0.61 U	0.61 U	0.61 U
Calcium	77000	52100	50200	64100	42600	50700	65400	49000
Chromium, Total	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
Cobalt	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
Copper	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U
Iron	45.7 U	45.7 U	45.7 U	45.7 U	64.5 J	45.7 U	78.5 J	45.7 U
Lead	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U
Magnesium	18200	12600	11600	16000	10400	12400	17300	12200
Manganese	36.5	13.2	3 J	8.5	23.1	10.6	69.5	2.7 U
Mercury	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U
Nickel	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
Potassium	951	439	573	857	432	468	633	458
Selenium	1.5 J	0.69 U	0.69 U	0.69 U	0.69 U	0.69 U	0.69 U	0.69 U
Silver	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U
Sodium	108000	13000	6740	20900	10400	13100	19600	9390
Thallium	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U

Table E-40
Summary of Data Used in Risk Assessment
ATV Areas (surface water) - Current/ Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Sample Depth Chemical	CFSWP-046 460-158717-3 CFSWP-046-SW ?-? ? 6/19/2018	CFSWP-047 460-158717-2 CFSWP-047-SW ?-? ? 6/19/2018	CFSWP-048 460-158804-1 CFSWP-048-SW ?-? ? 6/20/2018	CFSWP-049 460-158804-3 CFSWP-049-SW ?-? ? 6/20/2018	CFSWP-050 460-158910-6 CFSWP-050-SW ?-? ? 6/21/2018	CFSWP-051 460-158910-7 CFSWP-051-SW ?-? ? 6/21/2018	CFSWP-052 460-158618-2 CFSWP-052-SW ?-? ? 6/18/2018	CFSWP-053 460-158618-1 CFSWP-053-SW ?-? ? 6/18/2018
Vanadium	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U
Zinc	5.4 U	5.4 U	5.4 U	5.4 U	5.4 U	5.4 U	5.4 U	5.4 U

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-41
Summary of Data Used in Risk Assessment
ATV Areas (sediment) - Current/ Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSDP-010	CFSDP-011	CFSDP-012	CFSDP-012-DUP	CFSDP-013	CFSDP-014	CFSDP-014	CFSDP-015	CFSDP-015	CFSDP-016	CFSDP-016	CFSDP-016-DUP	CFSDP-021	CFSDP-021
Sample Lab IDs	200-35201-5, 460-119741-2	200-35201-6, 460-119741-3	200-35201-7, 460-119741-4	460-119741-6	200-35201-8, 460-119741-5	200-35201-1, 460-119363-1	180-82906-4, 200-45660-3, 460-166608-4	200-35201-2, 460-119363-2	180-82835-3, 200-45651-3, 460-166517-3	200-35201-3, 460-119363-3	180-82835-1, 200-45651-1, 460-166517-1	180-82835-4, 460-166517-4	200-35201-9, 460-119741-7	180-79106-1, 200-44014-1, 460-158719-1
Sample Name	CFSDP-010-SO	CFSDP-011-SO	CFSDP-012-SO	CFSDP-DUP1-SO	CFSDP-013-SO	CFSDP-014-SD	CFSDP-014-SD	CFSDP-015-SD	CFSDP-015-SD	CFSDP-016-SD	CFSDP-016-SD	CFSDP-DUP4-SD	CFSDP-021-SO	CFSDP-021-SD
Chemical	9/6/2016	9/6/2016	9/6/2016	9/6/2016	9/6/2016	8/29/2016	10/10/2018	8/29/2016	10/9/2018	8/29/2016	10/9/2018	10/9/2018	9/6/2016	6/19/2018
GENERAL CHEMISTRY (mg/kg)														
Fluoride	4.27	1.62	1.3	1.57	1.81	1.63 J+	0.23 U	1.41 J+	0.2 U	1.71 J+	0.21 U	0.24 U	2.6	1.19
Cyanide	0.85	0.3	0.56	0.57	1.5	0.24 J	0.1 J	0.15 J	0.075 U	0.15 J	0.079 U	0.095 U	0.24	0.07 U
METALS (mg/kg)														
Aluminum	22700	14700	20700	21400	18400	10300	11100	8250	6900	9100	9260	9660	15500	12100
Antimony	0.37 UJ	0.32 UJ	0.34 UJ	0.34 UJ	0.46 UJ	0.86 U	0.34 UJ	0.84 U	0.3 UJ	0.93 U	0.32 UJ	0.38 UJ	0.31 UJ	0.36 U
Arsenic	4.3	5.2	5.5	5.8	4.1	2.3 J	4.2	2.1 J	1.8	2.3 J	2.5	1.9	7.6	6.9
Barium	257	180	251	255	290	173	97.1	151	20.2	165	85.6	106	191	136
Beryllium	0.98	0.64	0.8	0.85	1	0.43 J	0.34 J	0.34 J	0.21 J	0.4 J	0.22 J	0.21 U	0.62	0.39 J
Cadmium	0.39 U	0.33 U	0.36 U	0.36 U	0.48 U	0.91 U	0.39 U	0.89 U	0.34 U	0.99 U	0.37 U	0.43 U	0.33 U	0.41 U
Calcium	30100	23500	21700	20600	28500	13800	13900	14800	1120	16400	30000 J	52600 J	11000	2500
Chromium, Total	14.9	11.8	14.1	15.2	15	9.7	11.4	7.7	6.9	8.3	9.4	10.3	9.1	8.3
Cobalt	8.3	7.5	8.4	8.6	7.6	4.2 J	5.2	3.2 J	6.5	3.5 J	5.4	4.4	5.6	5.7
Copper	23.3	20.1	20.8	22.3	27.8	13.6	5.4	12.2	3.3	13.6	4.9	4.1	12.3	10.1
Iron	18800	16800	19500	20200	16300	10100	15300	7770	11900	8680	13000	11500	14000	13100
Lead	18.2	13	18.5	18.1	17.4	7.6	5.8	6.1	6	6.8	5.6	4.3	10.6	9.6
Magnesium	11500	12200	10400	10600	11500	7710	11800	5410	7430	6010	9000	10200	5690	5460
Manganese	640	1070	1250	1280	1140	280	571 J-	272	67.3 J-	302	174 J-	228 J-	234	309
Mercury	0.045	0.029	0.045	0.043	0.045	0.032 J	0.014 U	0.036 J	0.013 U	0.044 J	0.013 U	0.014 U	0.012 J	0.012 J
Nickel	43.8 J+	23.7 J+	28.9 J+	30 J+	18.1 J+	8.6	10.6 J-	6.9	11.9 J-	7.1	10.1 J-	8.9 J-	9.8 J+	9.6
Potassium	1330	922	1290	1290	1700	789	621 J+	613	177 J+	672	476 J+	574 J+	1040	774
Selenium	0.46 J	0.29 U	0.34 J	0.35 J	1.4 J	0.8 U	0.34 U	0.78 U	0.3 U	0.87 U	0.32 U	0.37 U	0.29 U	0.35 U
Silver	0.73 U	0.62 U	0.67 U	0.67 U	0.89 U	1.7 U	0.72 U	1.6 U	0.63 U	1.8 U	0.67 U	0.79 U	0.61 U	0.75 U
Sodium	104 J	60 J	71.5 J	72.4 J	120 J	116 U	40.2 J	128 J	32.1 U	148 J	46.4 J	66.9 J	152	38 U
Thallium	0.15 U	0.13 U	0.14 U	0.14 U	0.18 U	0.34 U	0.14 U	0.33 U	0.13 U	0.37 U	0.14 U	0.16 U	0.12 U	0.15 U
Vanadium	18	11.5	14	14.5	11.6	7.2	8.1	5.4	4.6	5.9	7.4	7.2	11	10.9
Zinc	129	128	81.1	82.3	89.8	47	50.3	37.3	38.9	48.9	44	42.3	41.6	36.4
PESTICIDES (mg/kg)														
Aldrin	0.0011 U	0.00099 U	0.0011 U	0.001 U	0.0015 U	0.0025 U	--	0.0024 U	--	0.0027 U	--	--	0.00093 U	--
Alpha Bhc (Alpha Hexachlorocyclohexane)	0.00084 U	0.00074 U	0.00079 U	0.00079 U	0.0011 U	0.0019 U	--	0.0018 U	--	0.002 U	--	--	0.0007 U	--
Alpha Endosulfan	0.0013 U	0.0011 U	0.0012 U	0.0012 U	0.0017 U	0.0029 U	--	0.0028 U	--	0.0031 U	--	--	0.0011 U	--
Beta Bhc (Beta Hexachlorocyclohexane)	0.0009 U	0.00079 U	0.00085 U	0.00084 U	0.0012 U	0.002 U	--	0.002 U	--	0.0022 U	--	--	0.00075 U	--
Beta Endosulfan	0.0015 U	0.0013 U	0.0014 U	0.0014 U	0.0019 U	0.0033 U	--	0.0032 U	--	0.0035 U	--	--	0.0012 U	--
cis-Chlordane	0.0015 U	0.0013 U	0.0014 U	0.0014 U	0.002 U	0.0034 U	--	0.0033 U	--	0.0036 U	--	--	0.0013 U	--
Delta BHC (Delta Hexachlorocyclohexane)	0.001 U	0.00089 U	0.00095 U	0.00094 U	0.0013 U	0.0023 U	--	0.0022 U	--	0.0024 U	--	--	0.00084 U	--
Dieldrin	0.0012 U	0.0011 U	0.0011 U	0.0011 U	0.0016 U	0.0027 U	--	0.0026 U	--	0.0029 U	--	--	0.001 U	--
Endosulfan Sulfate	0.0011 U	0.00095 U	0.001 U	0.001 U	0.0014 U	0.0025 U	--	0.0024 U	--	0.0026 U	--	--	0.0009 U	--
Endrin	0.0012 U	0.001 U	0.0011 U	0.0011 U	0.0015 U	0.0027 U	--	0.0026 U	--	0.0028 U	--	--	0.00098 U	--
Endrin Aldehyde	0.0011 U	0.001 U	0.0011 U	0.0011 U	0.0015 U	0.0026 U	--	0.0025 U	--	0.0028 U	--	--	0.00095 U	--
Endrin Ketone	0.0013 U	0.0011 U	0.0012 U	0.0012 U	0.0017 U	0.0029 U	--	0.0028 U	--	0.0031 U	--	--	0.0011 U	--
Gamma Bhc (Lindane)	0.00083 U	0.00073 U	0.00078 U	0.00077 U	0.0011 U	0.0019 U	--	0.0018 U	--	0.002 U	--	--	0.00069 U	--
Heptachlor	0.0012 U	0.001 U	0.0011 U	0.0011 U	0.0016 U	0.0027 U	--	0.0026 U	--	0.0029 U	--	--	0.00099 U	--
Heptachlor Epoxide	0.0018 U	0.0016 U	0.0017 U	0.0017 U	0.0024 U	0.0041 U	--	0.004 U	--	0.0044 U	--	--	0.0015 U	--
Methoxychlor	0.002 U	0.0017 U	0.0018 U	0.0018 U	0.0026 U	0.0045 U	--	0.0043 U	--	0.0048 U	--	--	0.0016 U	--
P,P'-DDD	0.0012 U	0.0011 U	0.0011 U	0.0011 U	0.0016 U	0.0028 U	--	0.0027 U	--	0.0029 U	--	--	0.001 U	--
P,P'-DDE	0.0013 U	0.0012 U	0.0013 U	0.0013 U	0.0018 U	0.003 U	--	0.0029 U	--	0.0032 U	--	--	0.0011 U	--
P,P'-DDT	0.00096 U	0.00084 U	0.0009 U	0.00089 U	0.0012 U	0.0022 U	--	0.0021 U	--	0.0023 U	--	--	0.00079 U	--
Toxaphene	0.027 U	0.024 U	0.025 U	0.025 U	0.035 U	0.061 U	--	0.059 U	--	0.065 U	--	--	0.022 U	--
trans-Chlordane	0.002 U	0.0018 U	0.0019 U	0.0019 U	0.0026 U	0.0046 U	--	0.0044 U	--	0.0049 U	--	--	0.0017 U	--
POLYCHLORINATED BIPHENYLS (mg/kg)														
PCB-1016 (Aroclor 1016)	0.012 U	0.011 U	0.012 U	0.011 U	0.016 U	0.028 U	--	0.027 U	--	0.03 U	--	--	0.01 U	--
PCB-1221 (Aroclor 1221)	0.012 U	0.011 U	0.012 U	0.011 U	0.016 U	0.028 U	--	0.027 U	--	0.03 U	--	--	0.01 U	--
PCB-1232 (Aroclor 1232)	0.012 U	0.011 U	0.012 U	0.011 U	0.016 U	0.028 U	--	0.027 U	--	0.03 U	--	--	0.01 U	--
PCB-1242 (Aroclor 1242)	0.012 U	0.011 U	0.012 U	0.011 U	0.016 U	0.028 U	--	0.027 U	--	0.03 U	--	--	0.01 U	--
PCB-1248 (Aroclor 1248)	0.012 U	0.011 U	0.012 U	0.011 U	0.016 U	0.028 U	--	0.027 U	--	0.03 U	--	--	0.01 U	--
PCB-1254 (Aroclor 1254)	0.013 U	0.011 U	0.012 U	0.012 U	0.017 U	0.029 U	--	0.028 U	--	0.031 U	--	--	0.011 U	--
PCB-1260 (Aroclor 1260)	0.013 U	0.011 U	0.012 U	0.012 U	0.017 U	0.029 U	--	0.028 U	--	0.031 U	--	--	0.011 U	--
PCB-1262 (Aroclor 1262)	0.013 U	0.011 U	0.012 U	0.012 U	0.017 U	0.029 U	--	0.028 U	--	0.031 U	--	--	0.011 U	--
PCB-1268 (Aroclor 1268)	0.013 U	0.011 U	0.012 U	0.012 U	0.017 U	0.029 U	--	0.028 U	--	0.031 U	--	--	0.011 U	--
Polychlorinated Biphenyl (PCBs)	0.013 U	0.011 U	0.012 U	0.012 U	0.017 U	0.029 U	--	0.028 U	--	0.031 U	--	--	0.011 U	--

Table E-41
Summary of Data Used in Risk Assessment
ATV Areas (sediment) - Current/ Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSDP-010	CFSDP-011	CFSDP-012	CFSDP-012-DUP	CFSDP-013	CFSDP-014	CFSDP-014	CFSDP-015	CFSDP-015	CFSDP-016	CFSDP-016	CFSDP-016-DUP	CFSDP-021	CFSDP-021
Sample Lab IDs	200-35201-5, 460-119741-2	200-35201-6, 460-119741-3	200-35201-7, 460-119741-4	460-119741-6	200-35201-8, 460-119741-5	200-35201-1, 460-119363-1	180-82906-4, 200-45660-3, 460-166608-4	200-35201-2, 460-119363-2	180-82835-3, 200-45651-3, 460-166517-3	200-35201-3, 460-119363-3	180-82835-1, 200-45651-1, 460-166517-1	180-82835-4, 460-166517-4	200-35201-9, 460-119741-7	180-79106-1, 200-44014-1, 460-158719-1
Sample Name	CFSDP-010-SO	CFSDP-011-SO	CFSDP-012-SO	CFSDP-DUP1-SO	CFSDP-013-SO	CFSDP-014-SD	CFSDP-014-SD	CFSDP-015-SD	CFSDP-015-SD	CFSDP-016-SD	CFSDP-016-SD	CFSDP-DUP4-SD	CFSDP-021-SO	CFSDP-021-SD
Chemical	9/6/2016	9/6/2016	9/6/2016	9/6/2016	9/6/2016	8/29/2016	10/10/2018	8/29/2016	10/9/2018	8/29/2016	10/9/2018	10/9/2018	9/6/2016	6/19/2018
SEMIVOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,2,4,5-Tetrachlorobenzene	0.034 U	0.03 U	0.032 U	0.032 U	0.044 U	0.077 U	--	0.074 U	--	0.082 U	--	--	0.028 U	0.0018 U
1,4-Dioxane (P-Dioxane)	0.12 U	0.11 U	0.11 U	0.11 U	0.16 U	0.28 U	--	0.27 U	--	0.3 U	--	--	0.1 U	0.013 U
2,3,4,6-Tetrachlorophenol	0.043 U	0.038 U	0.04 U	0.04 U	0.056 UJ	0.098 U	--	0.094 U	--	0.1 U	--	--	0.036 U	0.018 UJ
2,4,5-Trichlorophenol	0.046 U	0.04 U	0.043 U	0.042 U	0.059 UJ	0.1 U	--	0.099 U	--	0.11 U	--	--	0.038 U	0.003 U
2,4,6-Trichlorophenol	0.013 U	0.011 U	0.012 U	0.012 U	0.017 UJ	0.03 U	--	0.028 U	--	0.031 U	--	--	0.011 U	0.0023 U
2,4-Dichlorophenol	0.011 U	0.0095 U	0.01 U	0.01 U	0.014 UJ	0.024 U	--	0.024 U	--	0.026 U	--	--	0.009 U	0.0033 U
2,4-Dimethylphenol	0.1 U	0.089 U	0.095 U	0.094 U	0.13 UJ	0.23 U	--	0.22 U	--	0.24 U	--	--	0.083 U	0.0026 U
2,4-Dinitrophenol	0.35 U	0.31 U	0.33 U	0.32 U	0.45 UR	0.78 UJ	--	0.75 UJ	--	0.84 UJ	--	--	0.29 UJ	0.11 UJ
2,4-Dinitrotoluene	0.018 U	0.016 U	0.017 U	0.017 U	0.024 UJ	0.041 U	--	0.04 U	--	0.044 U	--	--	0.015 U	0.0021 U
2,6-Dinitrotoluene	0.024 U	0.021 U	0.023 U	0.023 U	0.032 UJ	0.055 U	--	0.053 U	--	0.059 U	--	--	0.02 U	0.0026 U
2-Chloronaphthalene	0.01 U	0.0092 U	0.0098 U	0.0097 U	0.014 UJ	0.024 U	--	0.023 U	--	0.025 U	--	--	0.0086 U	0.0019 U
2-Chlorophenol	0.012 U	0.01 U	0.011 U	0.011 U	0.015 UJ	0.026 U	--	0.025 U	--	0.028 U	--	--	0.0096 U	0.002 U
2-Methylnaphthalene	0.01 U	0.012 J	0.0095 U	0.0094 U	0.013 UJ	0.023 U	--	0.022 U	--	0.024 U	--	--	0.0084 U	0.002 U
2-Methylphenol (O-Cresol)	0.02 U	0.018 U	0.019 U	0.019 U	0.026 UJ	0.045 U	--	0.043 U	--	0.048 U	--	--	0.017 U	0.012 U
2-Nitroaniline	0.015 U	0.013 U	0.014 U	0.014 U	0.02 U	0.034 U	--	0.033 U	--	0.036 U	--	--	0.013 U	0.019 U
2-Nitrophenol	0.015 U	0.014 U	0.014 U	0.014 U	0.02 UJ	0.035 U	--	0.034 U	--	0.037 U	--	--	0.013 U	0.0024 U
3- And 4- Methylphenol (Total)	0.012 U	0.011 U	0.011 U	0.011 U	0.016 UJ	0.028 U	--	0.027 U	--	0.029 U	--	--	0.01 U	--
3,3'-Dichlorobenzidine	0.051 U	0.045 U	0.048 U	0.048 U	0.067 UJ	0.12 U	--	0.11 U	--	0.12 U	--	--	0.042 U	0.04 U
3-Nitroaniline	0.014 U	0.012 U	0.013 U	0.013 U	0.018 U	0.031 U	--	0.03 U	--	0.033 U	--	--	0.011 U	0.011 U
4,6-Dinitro-2-Methylphenol	0.12 U	0.11 U	0.11 U	0.11 U	0.16 UJ	0.28 U	--	0.27 U	--	0.29 U	--	--	0.1 U	0.073 U
4-Bromophenyl Phenyl Ether	0.014 U	0.013 U	0.014 U	0.013 U	0.019 U	0.033 U	--	0.031 U	--	0.035 U	--	--	0.012 U	0.003 U
4-Chloro-3-Methylphenol	0.02 U	0.017 U	0.018 U	0.018 U	0.026 UJ	0.045 U	--	0.043 U	--	0.047 U	--	--	0.016 U	0.002 U
4-Chloroaniline	0.012 U	0.01 U	0.011 U	0.011 U	0.015 U	0.027 U	--	0.026 U	--	0.028 U	--	--	0.0098 U	0.0014 U
4-Chlorophenyl Phenyl Ether	0.014 U	0.012 U	0.013 U	0.013 U	0.018 UJ	0.031 U	--	0.03 U	--	0.033 U	--	--	0.011 U	0.0026 U
4-Nitroaniline	0.017 U	0.015 U	0.016 U	0.016 U	0.023 UJ	0.039 U	--	0.038 U	--	0.042 U	--	--	0.014 U	0.0021 U
4-Nitrophenol	0.22 U	0.19 U	0.21 U	0.2 U	0.29 UJ	0.5 U	--	0.48 U	--	0.53 U	--	--	0.18 UJ	0.03 UJ
Acenaphthene	0.043 J	0.075 J	0.046 J	0.037 J	0.014 UJ	0.025 U	--	0.024 U	--	0.027 U	--	--	0.0092 U	0.0024 U
Acenaphthylene	0.012 U	0.01 U	0.011 U	0.011 U	0.015 UJ	0.027 U	--	0.026 U	--	0.028 U	--	--	0.0098 U	0.0019 U
Acetophenone	0.011 J	0.0088 U	0.0094 U	0.0093 U	0.013 U	0.023 U	--	0.022 U	--	0.024 U	--	--	0.0083 U	0.0023 U
Anthracene	0.082 J	0.14 J	0.096 J	0.083 J	0.057 UJ	0.099 U	--	0.095 U	--	0.1 U	--	--	0.036 U	0.0022 U
Atrazine	0.02 U	0.018 U	0.019 U	0.019 U	0.027 U	0.046 U	--	0.044 U	--	0.049 U	--	--	0.017 U	0.019 UJ
Benzaldehyde	0.069 J	0.031 U	0.033 U	0.032 U	0.046 UJ	0.079 U	--	0.15 J	--	0.17 J	--	--	0.029 U	0.0053 UR
Benzo(A)Anthracene	0.82	0.74	0.64	0.55	0.093 J-	0.087 U	--	0.083 U	--	0.12	--	--	0.032 U	0.0061 J
Benzo(A)Pyrene	1.1	0.94	0.83	0.74	0.11 J-	0.031 U	--	0.043 J	--	0.094 J	--	--	0.021 J	0.007 J
Benzo(B)Fluoranthene	1.8	1.3	1.2	1.1	0.19 J-	0.04 U	--	0.039 U	--	0.12	--	--	0.036 J	0.015
Benzo(G,H,I)Perylene	1.3	0.84	0.77	0.69	0.13 J	0.06 U	--	0.057 U	--	0.081 J	--	--	0.027 J	0.0076 J
Benzo(K)Fluoranthene	0.47	0.49	0.45	0.45	0.051 J-	0.045 U	--	0.043 U	--	0.048 U	--	--	0.017 U	0.0039 J
Benzyl Butyl Phthalate	0.014 U	0.012 U	0.031 J	0.027 J	0.018 U	0.032 U	--	0.031 U	--	0.034 U	--	--	0.012 U	0.029 U
Biphenyl (Diphenyl)	0.039 U	0.034 U	0.037 U	0.036 U	0.051 U	0.089 U	--	0.085 U	--	0.094 U	--	--	0.032 U	0.0018 U
Bis(2-Chloroethoxy) Methane	0.014 U	0.013 U	0.013 U	0.013 U	0.019 UJ	0.032 U	--	0.031 U	--	0.034 U	--	--	0.012 U	0.002 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.011 U	0.0095 U	0.01 U	0.01 U	0.014 UJ	0.024 U	--	0.024 U	--	0.026 U	--	--	0.009 U	0.0015 U
Bis(2-Chloroisopropyl) Ether	0.019 U	0.017 U	0.018 U	0.018 U	0.025 U	0.043 U	--	0.041 U	--	0.045 U	--	--	0.016 U	0.0032 U
Bis(2-Ethylhexyl) Phthalate	0.018 U	0.016 U	0.045 J	0.031 J	0.023 U	0.04 U	--	0.04 J	--	0.043 U	--	--	0.015 U	0.045 U
Caprolactam	0.033 U	0.029 U	0.031 U	0.031 U	0.043 UJ	0.075 U	--	0.072 U	--	0.08 U	--	--	0.027 UJ	0.028 U
Carbazole	0.1 J	0.1 J	0.1 J	0.091 J	0.017 J-	0.026 U	--	0.025 U	--	0.027 U	--	--	0.0094 U	0.0023 J
Chrysene	1.1	0.93	0.89	0.82	0.13 J-	0.038 J	--	0.069 J	--	0.13 J	--	--	0.019 J	0.016
Dibenz(A,H)Anthracene	0.28	0.16	0.2	0.15	0.031 U	0.054 U	--	0.052 U	--	0.058 U	--	--	0.02 U	0.0019 U
Dibenzofuran	0.014 U	0.024 J	0.015 J	0.014 J	0.018 UJ	0.031 U	--	0.03 U	--	0.033 U	--	--	0.011 U	0.0019 U
Diethyl Phthalate	0.013 U	0.011 U	0.012 U	0.012 U	0.017 UJ	0.03 U	--	0.028 U	--	0.031 U	--	--	0.011 U	0.013 U
Dimethyl Phthalate	0.013 U	0.012 U	0.012 U	0.012 U	0.017 UJ	0.03 U	--	0.029 U	--	0.032 U	--	--	0.011 U	0.0015 U
Di-N-Butyl Phthalate	0.014 U	0.012 U	0.039 J	0.018 J	0.018 UJ	0.031 U	--	0.03 U	--	0.033 U	--	--	0.011 U	0.019 U
Di-N-Octylphthalate	0.023 U	0.02 U	0.022 U	0.022 U	0.03 U	0.053 U	--	0.051 U	--	0.056 U	--	--	0.019 U	0.025 U
Fluoranthene	1.1	1.1	1	0.92	0.14 J-	0.042 J	--	0.08 J	--	0.19 J	--	--	0.018 J	0.013
Fluorene	0.028 J	0.053 J	0.03 J	0.024 J	0.013 UJ	0.023 U	--	0.022 U	--	0.024 U	--	--	0.0083 U	0.0017 U
Hexachlorobenzene	0.019 U	0.016 U	0.017 U	0.017 U	0.024 U	0.042 U	--	0.04 U	--	0.045 U	--	--	0.015 U	0.0031 U
Hexachlorobutadiene	0.013 U	0.011 U	0.012 U	0.012 U	0.017 UJ	0.029 U	--	0.028 U	--	0.031 U	--	--	0.011 U	0.0025 U
Hexachlorocyclopentadiene	0.029 U	0.025 U	0.027 U	0.027 U	0.037 UJ	0.065 U	--	0.062 U	--	0.069 U	--	--	0.024 U	0.0022 UJ
Hexachloroethane	0.017 U	0.015 U	0.016 U	0.016 U	0.022 UJ	0.038 U	--	0.037 U	--	0.04 U	--	--	0.014 U	0.0022 U
Indeno(1,2,3-C,D)Pyrene	1.3	0.95	0.87	0.76	0.11	0.069 U	--	0.066 U	--	0.087 J+	--	--	0.025 J	0.0061 J

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Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Chemical	CFSDP-010 200-35201-5, 460-119741-2 CFSDP-010-SO 9/6/2016	CFSDP-011 200-35201-6, 460-119741-3 CFSDP-011-SO 9/6/2016	CFSDP-012 200-35201-7, 460-119741-4 CFSDP-012-SO 9/6/2016	CFSDP-012-DUP 460-119741-6 CFSDP-DUP1-SO 9/6/2016	CFSDP-013 200-35201-8, 460-119741-5 CFSDP-013-SO 9/6/2016	CFSDP-014 200-35201-1, 460-119363-1 CFSDP-014-SD 8/29/2016	CFSDP-014 180-82906-4, 200-45660-3, 460-166608-4 CFSDP-014-SD 10/10/2018	CFSDP-015 200-35201-2, 460-119363-2 CFSDP-015-SD 8/29/2016	CFSDP-015 180-82835-3, 200-45651-3, 460-166517-3 CFSDP-015-SD 10/9/2018	CFSDP-016 200-35201-3, 460-119363-3 CFSDP-016-SD 8/29/2016	CFSDP-016 180-82835-1, 200-45651-1, 460-166517-1 CFSDP-016-SD 10/9/2018	CFSDP-016-DUP 180-82835-4, 460-166517-4 CFSDP-DUP4-SD 10/9/2018	CFSDP-021 200-35201-9, 460-119741-7 CFSDP-021-SO 9/6/2016	CFSDP-021 180-79106-1, 200-44014-1, 460-158719-1 CFSDP-021-SD 6/19/2018
Isophorone	0.014 J	0.012 J	0.014 J	0.011 J	0.016 J-	0.078 J	--	0.021 U	--	0.06 J	--	--	0.0081 U	0.0022 U
Naphthalene	0.013 J	0.02 J	0.013 J	0.011 J	0.015 UJ	0.026 U	--	0.025 U	--	0.028 U	--	--	0.0096 U	0.0017 U
Nitrobenzene	0.014 U	0.013 U	0.014 U	0.013 U	0.019 UJ	0.033 U	--	0.031 U	--	0.035 U	--	--	0.012 U	0.016 U
N-Nitrosodi-N-Propylamine	0.015 U	0.014 U	0.014 U	0.014 U	0.02 U	0.035 U	--	0.034 U	--	0.037 U	--	--	0.013 U	0.0029 U
N-Nitrosodiphenylamine	0.042 U	0.037 U	0.039 U	0.039 U	0.054 U	0.094 U	--	0.091 U	--	0.1 U	--	--	0.034 U	0.014 U
Pentachlorophenol	0.055 U	0.049 U	0.052 U	0.052 U	0.072 UJ	0.13 U	--	0.12 U	--	0.13 U	--	--	0.046 U	0.068 UJ
Phenanthrene	0.53	0.69	0.55	0.49	0.067 J-	0.039 J	--	0.072 J	--	0.17 J	--	--	0.011 J	0.0058 J
Phenol	0.015 U	0.013 U	0.014 U	0.014 U	0.02 UJ	0.034 U	--	0.033 U	--	0.036 U	--	--	0.012 U	0.013 U
Pyrene	1.5	1.4	1.1	1	0.13 J	0.047 U	--	0.069 J	--	0.16 J	--	--	0.027 J	0.011
SEMIVOLATILE ORGANIC COMPOUNDS|LOW LEVEL (mg/kg)														
1,2,4,5-Tetrachlorobenzene	--	--	--	--	--	--	0.0048 U	--	0.0017 U	--	0.0042 U	0.006 UJ	--	--
1,4-Dioxane (P-Dioxane)	--	--	--	--	--	--	0.035 U	--	0.012 U	--	0.031 U	0.043 UJ	--	--
2,3,4,6-Tetrachlorophenol	--	--	--	--	--	--	0.047 U	--	0.017 U	--	0.041 U	0.057 UJ	--	--
2,4,5-Trichlorophenol	--	--	--	--	--	--	0.008 U	--	0.0028 U	--	0.007 U	0.0098 UJ	--	--
2,4,6-Trichlorophenol	--	--	--	--	--	--	0.0062 U	--	0.0022 U	--	0.0054 U	0.0076 UJ	--	--
2,4-Dichlorophenol	--	--	--	--	--	--	0.0087 U	--	0.0031 U	--	0.0076 U	0.011 UJ	--	--
2,4-Dimethylphenol	--	--	--	--	--	--	0.007 U	--	0.0025 U	--	0.0061 U	0.0086 UJ	--	--
2,4-Dinitrophenol	--	--	--	--	--	--	0.3 U	--	0.11 U	--	0.26 U	0.37 UJ	--	--
2,4-Dinitrotoluene	--	--	--	--	--	--	0.0056 U	--	0.002 U	--	0.0049 U	0.0069 UJ	--	--
2,6-Dinitrotoluene	--	--	--	--	--	--	0.0069 U	--	0.0025 U	--	0.0061 U	0.0085 UJ	--	--
2-Chloronaphthalene	--	--	--	--	--	--	0.0051 U	--	0.0018 U	--	0.0045 U	0.0063 UJ	--	--
2-Chlorophenol	--	--	--	--	--	--	0.0052 U	--	0.0019 U	--	0.0046 U	0.0064 UJ	--	--
2-Methylnaphthalene	--	--	--	--	--	--	0.0054 U	--	0.0019 U	--	0.0047 U	0.0066 UJ	--	--
2-Methylphenol (O-Cresol)	--	--	--	--	--	--	0.032 U	--	0.011 U	--	0.028 U	0.04 UJ	--	--
2-Nitroaniline	--	--	--	--	--	--	0.051 U	--	0.018 U	--	0.045 U	0.063 UJ	--	--
2-Nitrophenol	--	--	--	--	--	--	0.0064 U	--	0.0023 U	--	0.0056 U	0.0079 UJ	--	--
3,3'-Dichlorobenzidine	--	--	--	--	--	--	0.1 U	--	0.037 U	--	0.092 U	0.13 UJ	--	--
3-Nitroaniline	--	--	--	--	--	--	0.029 U	--	0.01 U	--	0.025 U	0.035 UJ	--	--
4,6-Dinitro-2-Methylphenol	--	--	--	--	--	--	0.19 U	--	0.069 U	--	0.17 U	0.24 UJ	--	--
4-Bromophenyl Phenyl Ether	--	--	--	--	--	--	0.0079 U	--	0.0028 U	--	0.0069 U	0.0097 UJ	--	--
4-Chloro-3-Methylphenol	--	--	--	--	--	--	0.0053 U	--	0.0019 U	--	0.0046 U	0.0065 UJ	--	--
4-Chloroaniline	--	--	--	--	--	--	0.0037 U	--	0.0013 U	--	0.0033 U	0.0046 UJ	--	--
4-Chlorophenyl Phenyl Ether	--	--	--	--	--	--	0.0068 U	--	0.0024 U	--	0.0059 U	0.0083 UJ	--	--
4-Nitroaniline	--	--	--	--	--	--	0.0054 U	--	0.0019 U	--	0.0048 U	0.0067 UJ	--	--
4-Nitrophenol	--	--	--	--	--	--	0.079 U	--	0.028 U	--	0.069 U	0.097 UJ	--	--
Acenaphthene	--	--	--	--	--	--	0.0065 U	--	0.0023 U	--	0.0058 J	0.0079 UJ	--	--
Acenaphthylene	--	--	--	--	--	--	0.0049 U	--	0.0017 U	--	0.011 J	0.006 UJ	--	--
Acetophenone	--	--	--	--	--	--	0.0061 U	--	0.0022 U	--	0.0053 U	0.0075 UJ	--	--
Anthracene	--	--	--	--	--	--	0.0058 U	--	0.0021 U	--	0.026 J	0.0072 UJ	--	--
Atrazine	--	--	--	--	--	--	0.049 UJ	--	0.017 UJ	--	0.043 UJ	0.06 UJ	--	--
Benzaldehyde	--	--	--	--	--	--	0.014 UR	--	0.0049 UR	--	0.012 UR	0.017 J	--	--
Benzo(A)Anthracene	--	--	--	--	--	--	0.0042 U	--	0.0015 U	--	0.052 J	0.011 J	--	--
Benzo(A)Pyrene	--	--	--	--	--	--	0.0049 U	--	0.0017 U	--	0.043 J	0.006 UJ	--	--
Benzo(B)Fluoranthene	--	--	--	--	--	--	0.0055 U	--	0.002 U	--	0.061 J	0.0068 UJ	--	--
Benzo(G,H,I)Perylene	--	--	--	--	--	--	0.0048 U	--	0.0017 U	--	0.038 J	0.006 UJ	--	--
Benzo(K)Fluoranthene	--	--	--	--	--	--	0.0067 U	--	0.0024 U	--	0.029 J	0.0083 UJ	--	--
Benzyl Butyl Phthalate	--	--	--	--	--	--	0.077 U	--	0.027 U	--	0.068 U	0.095 UJ	--	--
Biphenyl (Diphenyl)	--	--	--	--	--	--	0.0047 U	--	0.0017 U	--	0.0041 U	0.0058 UJ	--	--
Bis(2-Chloroethoxy) Methane	--	--	--	--	--	--	0.0053 U	--	0.0019 U	--	0.0047 U	0.0066 UJ	--	--
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	--	--	--	--	--	--	0.0041 U	--	0.0014 U	--	0.0036 U	0.005 UJ	--	--
Bis(2-Chloroisopropyl) Ether	--	--	--	--	--	--	0.0083 U	--	0.003 U	--	0.0073 U	0.01 UJ	--	--
Bis(2-Ethylhexyl) Phthalate	--	--	--	--	--	--	0.12 U	--	0.043 U	--	0.1 U	0.15 UJ	--	--
Caprolactam	--	--	--	--	--	--	0.073 U	--	0.026 U	--	0.064 U	0.09 UJ	--	--
Carbazole	--	--	--	--	--	--	0.0052 U	--	0.0019 U	--	0.0098 J	0.0064 UJ	--	--
Chrysene	--	--	--	--	--	--	0.0061 J	--	0.0016 U	--	0.085 J	0.017 J	--	--
Dibenz(A,H)Anthracene	--	--	--	--	--	--	0.005 U	--	0.0018 U	--	0.0066 J	0.0062 UJ	--	--
Dibenzofuran	--	--	--	--	--	--	0.0049 U	--	0.0017 U	--	0.0043 U	0.006 UJ	--	--
Diethyl Phthalate	--	--	--	--	--	--	0.034 U	--	0.012 U	--	0.029 U	0.041 UJ	--	--
Dimethyl Phthalate	--	--	--	--	--	--	0.0041 U	--	0.0014 U	--	0.0036 U	0.005 UJ	--	--
Di-N-Butyl Phthalate	--	--	--	--	--	--	0.049 U	--	0.017 U	--	0.043 U	0.06 UJ	--	--

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Di-N-Octylphthalate	--	--	--	--	--	--	0.065 U	--	0.023 U	--	0.057 U	0.08 UJ	--	--
Fluoranthene	--	--	--	--	--	--	0.0079 J	--	0.0023 J	--	0.12 J	0.026 J	--	--
Fluorene	--	--	--	--	--	--	0.0044 U	--	0.0016 U	--	0.013 J	0.0054 UJ	--	--
Hexachlorobenzene	--	--	--	--	--	--	0.0081 U	--	0.0029 U	--	0.0071 U	0.0099 UJ	--	--
Hexachlorobutadiene	--	--	--	--	--	--	0.0066 U	--	0.0023 U	--	0.0057 U	0.0081 UJ	--	--
Hexachlorocyclopentadiene	--	--	--	--	--	--	0.0057 U	--	0.002 U	--	0.005 U	0.007 UJ	--	--
Hexachloroethane	--	--	--	--	--	--	0.0058 U	--	0.0021 U	--	0.0051 U	0.0071 UJ	--	--
Indeno(1,2,3-C,D)Pyrene	--	--	--	--	--	--	0.0045 U	--	0.0016 U	--	0.032 J	0.0064 J	--	--
Isophorone	--	--	--	--	--	--	0.0057 U	--	0.002 U	--	0.005 U	0.007 UJ	--	--
Naphthalene	--	--	--	--	--	--	0.0044 U	--	0.0016 U	--	0.0038 U	0.0054 UJ	--	--
Nitrobenzene	--	--	--	--	--	--	0.041 U	--	0.015 U	--	0.036 U	0.05 UJ	--	--
N-Nitrosodi-N-Propylamine	--	--	--	--	--	--	0.0076 U	--	0.0027 U	--	0.0066 U	0.0093 UJ	--	--
N-Nitrosodiphenylamine	--	--	--	--	--	--	0.037 U	--	0.013 U	--	0.033 U	0.046 UJ	--	--
Pentachlorophenol	--	--	--	--	--	--	0.18 U	--	0.064 U	--	0.16 U	0.22 UJ	--	--
Phenanthrene	--	--	--	--	--	--	0.006 U	--	0.0028 J	--	0.1 J	0.017 J	--	--
Phenol	--	--	--	--	--	--	0.034 U	--	0.012 U	--	0.03 U	0.042 UJ	--	--
Pyrene	--	--	--	--	--	--	0.007 J	--	0.0019 U	--	0.095 J	0.021 J	--	--

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-41
Summary of Data Used in Risk Assessment
ATV Areas (sediment) - Current/ Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Chemical	CFSDP-022 200-35201-10, 460-119741-8 CFSDP-022-SO 9/6/2016	CFSDP-022 180-79106-5, 200-44014-3, 460-158806-2 CFSDP-022-SD 6/20/2018	CFSDP-025 180-82906-2, 200-45660-2, 460-166608-2 CFSDP-025-SD 10/10/2018	CFSDP-025-DUP 180-82906-3, 460-166608-3 CFSDP-DUP5-SD 10/10/2018	CFSDP-044 180-82906-1, 200-45660-1, 460-166608-1 CFSDP-044-SD 10/10/2018	CFSDP-045 180-82835-2, 200-45651-2, 460-166517-2 CFSDP-045-SD 10/9/2018	CFSDP-046 180-79106-3, 460-158719-3 CFSDP-046-SD 6/19/2018	CFSDP-047 180-79106-2, 460-158719-2 CFSDP-047-SD 6/19/2018	CFSDP-048 180-79106-4, 200-44014-2, 460-158806-1 CFSDP-048-SD 6/20/2018	CFSDP-049 180-79106-6, 200-44014-4, 460-158806-3 CFSDP-049-SD 6/20/2018	CFSDP-050 180-79106-7, 460-158918-1 CFSDP-050-SD 6/21/2018	CFSDP-050-DUP 180-79106-9, 460-158918-3 CFSDP-DUP3-SD 6/21/2018	CFSDP-051 180-79106-8, 460-158918-2 CFSDP-051-SD 6/21/2018
GENERAL CHEMISTRY (mg/kg)													
Fluoride	3.79	3.53	0.21 U	0.23 U	0.76 U	0.21 U	9.59	8.71	3.71	3.47	2.08	1.49	1.14
Cyanide	0.84	0.11 U	0.076 U	0.086 U	0.28 U	0.083 U	0.59 J	0.6 J	0.34 J	0.15 J	0.11 J+	0.12 J+	0.078 U
METALS (mg/kg)													
Aluminum	34700	18700	12600	11300	12100	11800	27800	15000	15700	20700	15300	14400	19900
Antimony	0.44 UJ	0.52 U	0.31 UJ	0.35 UJ	1.1 UJ	0.33 UJ	1.1 U	1.2 U	0.59 U	0.43 U	0.38 U	0.3 U	0.32 UJ
Arsenic	6.2	5.1	2.5	2.2	3.6 J	2	14.5	13.8	3.7	3.2	8.9	8.4	9.8
Barium	905	381	92.8	92	249	71.8	716	340	283	884	171	189	385
Beryllium	1.1	0.43 J	0.28 J	0.31 J	0.68 J	0.33 J	0.75 J	0.67 U	0.32 U	0.7	0.63	0.51	0.62
Cadmium	0.47 U	0.6 U	0.36 U	0.4 U	1.3 U	0.38 U	1.3 U	1.4 U	0.68 U	0.5 U	0.43 U	0.35 U	0.37 U
Calcium	10900	5230	10500 J	17600 J	37000	2500	17800	15200	6680	8740	3910	3500	2590
Chromium, Total	11.3	5.9	13	11.9	11.6	12.7	19.5	9.4	5.9	12.2	11.7	11.7	8
Cobalt	4	3.3 J	5.4	5.9	4.7 J	6.5	6.4 J	4.6 J	1.9 J	5.4	6.6	9.2	5.7
Copper	32.1	14	4.9	4.6	20.8	4.5	42.5	32.4	27.4	22.4	10.3	8.7	10.5
Iron	12700	10300	15700	15100	12000	16400	25200	14300	7770	14300	20500	19200	14200
Lead	14.6	9.1	4.9	4.7	10.3	4.9	17.6	11.7	6.2	14.8	13.8	12.6	11.1
Magnesium	5590	2990	13700	12400	8370	12200	13800	5560	2570	7100	11700	12400	5130
Manganese	175	80.5	125 J-	160 J-	367 J-	112 J-	988	747	34.1	63.3	641 J	1210 J	370
Mercury	0.025 J	0.016 U	0.013 U	0.014 U	0.045 U	0.013 U	0.062 J	0.048 J	0.022 U	0.02 U	0.019 J	0.02 J	0.013 U
Nickel	13.3 J+	7.5	11.5 J-	11.8 J-	9.2 J-	13.8 J-	15.2	13	6	13.8	12.4	11.3	9.4
Potassium	1180	612	684 J+	597 J+	1230 J+	659 J+	1070	911	452	1200	1130	826	811
Selenium	0.81 J	0.52 U	0.31 U	0.34 U	1.8 J	0.33 U	4.4 J	2.5 J	0.59 U	0.57 J	0.37 U	0.3 U	0.32 U
Silver	0.86 U	1.1 U	0.65 U	0.73 U	2.4 U	0.7 U	2.3 U	2.6 U	1.2 U	0.91 U	0.8 U	0.64 U	0.68 U
Sodium	477	473	33.1 UJ	75.9 J	154 J	35.7 U	844	137 J	390	223	51 J	39.9 J	179
Thallium	0.17 U	0.22 U	0.13 U	0.15 U	0.48 U	0.14 U	0.47 U	0.52 U	0.25 U	0.18 U	0.16 U	0.13 U	0.14 U
Vanadium	13.3	10.3	8.3	7.6	8.8	8.1	17.2	11.3	7.9	12.7	13.5	11.4	9.9
Zinc	41	20.4	48.8	51.2	58.5	54.7	45.9	28.6 J	16 J	38.2	65.3	61.3	30.7
PESTICIDES (mg/kg)													
Aldrin	0.0013 U	--	--	--	--	--	--	--	--	--	--	--	--
Alpha Bhc (Alpha Hexachlorocyclohexane)	0.00097 U	--	--	--	--	--	--	--	--	--	--	--	--
Alpha Endosulfan	0.0015 U	--	--	--	--	--	--	--	--	--	--	--	--
Beta Bhc (Beta Hexachlorocyclohexane)	0.001 U	--	--	--	--	--	--	--	--	--	--	--	--
Beta Endosulfan	0.0017 U	--	--	--	--	--	--	--	--	--	--	--	--
cis-Chlordane	0.0017 U	--	--	--	--	--	--	--	--	--	--	--	--
Delta BHC (Delta Hexachlorocyclohexane)	0.0012 U	--	--	--	--	--	--	--	--	--	--	--	--
Dieldrin	0.0014 U	--	--	--	--	--	--	--	--	--	--	--	--
Endosulfan Sulfate	0.0012 U	--	--	--	--	--	--	--	--	--	--	--	--
Endrin	0.0013 U	--	--	--	--	--	--	--	--	--	--	--	--
Endrin Aldehyde	0.0013 U	--	--	--	--	--	--	--	--	--	--	--	--
Endrin Ketone	0.0015 U	--	--	--	--	--	--	--	--	--	--	--	--
Gamma Bhc (Lindane)	0.00095 U	--	--	--	--	--	--	--	--	--	--	--	--
Heptachlor	0.0014 U	--	--	--	--	--	--	--	--	--	--	--	--
Heptachlor Epoxide	0.0021 U	--	--	--	--	--	--	--	--	--	--	--	--
Methoxychlor	0.0022 U	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDD	0.0014 U	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDE	0.0015 U	--	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDT	0.0011 U	--	--	--	--	--	--	--	--	--	--	--	--
Toxaphene	0.031 U	--	--	--	--	--	--	--	--	--	--	--	--
trans-Chlordane	0.0023 U	--	--	--	--	--	--	--	--	--	--	--	--
POLYCHLORINATED BIPHENYLS (mg/kg)													
PCB-1016 (Aroclor 1016)	0.014 U	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1221 (Aroclor 1221)	0.014 U	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1232 (Aroclor 1232)	0.014 U	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1242 (Aroclor 1242)	0.014 U	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1248 (Aroclor 1248)	0.014 U	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1254 (Aroclor 1254)	0.015 U	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1260 (Aroclor 1260)	0.015 U	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1262 (Aroclor 1262)	0.015 U	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1268 (Aroclor 1268)	0.015 U	--	--	--	--	--	--	--	--	--	--	--	--
Polychlorinated Biphenyl (PCBs)	0.015 U	--	--	--	--	--	--	--	--	--	--	--	--

Table E-41
Summary of Data Used in Risk Assessment
ATV Areas (sediment) - Current/ Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSDP-022	CFSDP-022	CFSDP-025	CFSDP-025-DUP	CFSDP-044	CFSDP-045	CFSDP-046	CFSDP-047	CFSDP-048	CFSDP-049	CFSDP-050	CFSDP-050-DUP	CFSDP-051
Sample Lab IDs	200-35201-10, 460-119741-8	180-79106-5, 200-44014-3, 460-158806-2	180-82906-2, 200-45660-2, 460-166608-2	180-82906-3, 460-166608-3	180-82906-1, 200-45660-1, 460-166608-1	180-82835-2, 200-45651-2, 460-166517-2	180-79106-3, 460-158719-3	180-79106-2, 460-158719-2	180-79106-4, 200-44014-2, 460-158806-1	180-79106-6, 200-44014-4, 460-158806-3	180-79106-7, 460-158918-1	180-79106-9, 460-158918-3	180-79106-8, 460-158918-2
Sample Name	CFSDP-022-SO	CFSDP-022-SD	CFSDP-025-SD	CFSDP-DUP5-SD	CFSDP-044-SD	CFSDP-045-SD	CFSDP-046-SD	CFSDP-047-SD	CFSDP-048-SD	CFSDP-049-SD	CFSDP-050-SD	CFSDP-DUP3-SD	CFSDP-051-SD
Chemical	9/6/2016	6/20/2018	10/10/2018	10/10/2018	10/10/2018	10/9/2018	6/19/2018	6/19/2018	6/20/2018	6/20/2018	6/21/2018	6/21/2018	6/21/2018
SEMIVOLATILE ORGANIC COMPOUNDS (mg/kg)													
1,2,4,5-Tetrachlorobenzene	0.039 U	0.0053 U	--	--	--	--	0.014 U	0.0071 U	0.0063 U	0.0068 U	0.0049 U	0.0033 U	0.002 U
1,4-Dioxane (P-Dioxane)	0.14 U	0.038 U	--	--	--	--	0.1 U	0.051 U	0.045 U	0.049 U	0.036 U	0.024 U	0.015 U
2,3,4,6-Tetrachlorophenol	0.049 U	0.051 UJ	--	--	--	--	0.14 UJ	0.068 U	0.061 UJ	0.066 UJ	0.048 UJ	0.032 UJ	0.019 UJ
2,4,5-Trichlorophenol	0.052 U	0.0087 U	--	--	--	--	0.023 U	0.012 U	0.01 U	0.011 U	0.0081 U	0.0054 U	0.0033 U
2,4,6-Trichlorophenol	0.015 U	0.0067 U	--	--	--	--	0.018 U	0.009 U	0.008 U	0.0087 U	0.0063 U	0.0042 U	0.0026 U
2,4-Dichlorophenol	0.012 U	0.0094 U	--	--	--	--	0.025 U	0.013 U	0.011 U	0.012 U	0.0088 U	0.0059 U	0.0036 U
2,4-Dimethylphenol	0.12 U	0.0076 U	--	--	--	--	0.02 U	0.01 U	0.0091 U	0.0098 U	0.0071 U	0.0048 U	0.0029 UJ
2,4-Dinitrophenol	0.4 U	0.33 UJ	--	--	--	--	0.87 UJ	0.44 U	0.39 UJ	0.42 UJ	0.31 UJ	0.21 UJ	0.13 UJ
2,4-Dinitrotoluene	0.021 U	0.0061 U	--	--	--	--	0.016 U	0.0081 U	0.0072 U	0.0079 U	0.0057 U	0.0038 U	0.0023 U
2,6-Dinitrotoluene	0.028 U	0.0075 U	--	--	--	--	0.02 U	0.01 U	0.009 U	0.0097 U	0.007 U	0.0047 U	0.0029 U
2-Chloronaphthalene	0.012 U	0.0056 U	--	--	--	--	0.015 U	0.0075 U	0.0067 U	0.0072 U	0.0052 U	0.0035 U	0.0021 U
2-Chlorophenol	0.013 U	0.0057 U	--	--	--	--	0.015 U	0.0076 U	0.0068 U	0.0073 U	0.0053 U	0.0035 U	0.0022 U
2-Methylnaphthalene	0.012 U	0.0058 U	--	--	--	--	0.016 U	0.0078 U	0.007 U	0.0076 U	0.0055 U	0.0037 U	0.0022 U
2-Methylphenol (O-Cresol)	0.023 U	0.035 U	--	--	--	--	0.093 U	0.047 U	0.042 U	0.045 U	0.033 U	0.022 U	0.013 U
2-Nitroaniline	0.017 U	0.055 U	--	--	--	--	0.15 U	0.074 U	0.066 U	0.072 U	0.052 U	0.035 U	0.021 U
2-Nitrophenol	0.018 U	0.007 U	--	--	--	--	0.019 U	0.0094 U	0.0083 U	0.009 U	0.0065 U	0.0044 U	0.0027 U
3- And 4- Methylphenol (Total)	0.014 U	--	--	--	--	--	--	--	--	--	--	--	--
3,3'-Dichlorobenzidine	0.058 U	0.11 U	--	--	--	--	0.3 U	0.15 U	0.14 U	0.15 U	0.11 U	0.071 U	0.044 UJ
3-Nitroaniline	0.016 U	0.031 U	--	--	--	--	0.083 U	0.042 U	0.037 U	0.04 U	0.029 U	0.019 U	0.012 U
4,6-Dinitro-2-Methylphenol	0.14 U	0.21 U	--	--	--	--	0.56 U	0.28 U	0.25 U	0.27 U	0.2 U	0.13 U	0.08 U
4-Bromophenyl Phenyl Ether	0.016 U	0.0085 U	--	--	--	--	0.023 U	0.011 U	0.01 U	0.011 U	0.008 U	0.0054 U	0.0033 U
4-Chloro-3-Methylphenol	0.023 U	0.0057 U	--	--	--	--	0.015 U	0.0077 U	0.0069 U	0.0074 U	0.0054 U	0.0036 U	0.0022 U
4-Chloroaniline	0.013 U	0.0041 U	--	--	--	--	0.011 U	0.0054 U	0.0048 U	0.0053 U	0.0038 U	0.0025 U	0.0015 UJ
4-Chlorophenyl Phenyl Ether	0.016 U	0.0074 U	--	--	--	--	0.02 U	0.0099 U	0.0088 U	0.0096 U	0.0069 U	0.0046 U	0.0028 U
4-Nitroaniline	0.02 U	0.0059 U	--	--	--	--	0.016 U	0.0079 U	0.0071 U	0.0077 U	0.0055 U	0.0037 U	0.0023 U
4-Nitrophenol	0.25 UJ	0.085 UJ	--	--	--	--	0.23 UJ	0.11 U	0.1 UJ	0.11 UJ	0.08 UJ	0.054 UJ	0.033 UJ
Acenaphthene	0.013 U	0.007 U	--	--	--	--	0.019 U	0.0094 U	0.0084 U	0.0091 U	0.0066 U	0.0044 U	0.0027 U
Acenaphthylene	0.013 U	0.0053 U	--	--	--	--	0.014 U	0.0071 U	0.0064 U	0.0069 U	0.005 U	0.0033 U	0.002 U
Acetophenone	0.011 U	0.0066 U	--	--	--	--	0.018 U	0.0089 U	0.0079 U	0.0093 J	0.0062 U	0.0041 U	0.0025 U
Anthracene	0.05 U	0.0063 U	--	--	--	--	0.017 U	0.012 J	0.0076 U	0.013 J	0.0059 U	0.004 U	0.0024 U
Atrazine	0.023 U	0.053 UJ	--	--	--	--	0.14 UJ	0.071 UJ	0.064 UJ	0.069 UJ	0.05 UJ	0.033 UJ	0.02 UJ
Benzaldehyde	0.04 U	0.015 UR	--	--	--	--	0.1 J	0.02 UR	0.018 UR	0.039 J	0.014 UR	0.0095 UR	0.0058 UR
Benzo(A)Anthracene	0.074	0.021 J	--	--	--	--	0.069	0.057	0.025 J	0.052	0.028 J	0.015 J	0.0018 U
Benzo(A)Pyrene	0.091	0.023 J	--	--	--	--	0.086	0.083	0.033	0.079	0.036 J	0.018 J	0.002 U
Benzo(B)Fluoranthene	0.15	0.038	--	--	--	--	0.13	0.11	0.041	0.11	0.052 J	0.029 J	0.0023 U
Benzo(G,H,I)Perylene	0.1 J	0.024	--	--	--	--	0.079	0.082	0.033	0.082	0.04 J	0.02 J	0.002 U
Benzo(K)Fluoranthene	0.053	0.019 J	--	--	--	--	0.045 J	0.047	0.024 J	0.043	0.028 J	0.011 J	0.0028 U
Benzyl Butyl Phthalate	0.016 U	0.084 U	--	--	--	--	0.22 U	0.11 U	0.1 U	0.11 U	0.079 U	0.053 U	0.032 U
Biphenyl (Diphenyl)	0.045 U	0.0051 U	--	--	--	--	0.014 U	0.0069 U	0.0061 U	0.0066 U	0.0048 U	0.0032 U	0.002 U
Bis(2-Chloroethoxy) Methane	0.016 U	0.0058 U	--	--	--	--	0.015 U	0.0078 U	0.0069 U	0.0075 U	0.0054 U	0.0036 U	0.0022 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.012 U	0.0044 U	--	--	--	--	0.012 U	0.0059 U	0.0053 U	0.0057 U	0.0041 U	0.0028 U	0.0017 U
Bis(2-Chloroisopropyl) Ether	0.022 U	0.0091 U	--	--	--	--	0.024 U	0.012 U	0.011 U	0.012 U	0.0085 U	0.0057 U	0.0035 U
Bis(2-Ethylhexyl) Phthalate	0.02 U	0.13 U	--	--	--	--	0.35 U	0.17 U	0.16 U	0.17 U	0.12 U	0.081 U	0.05 U
Caprolactam	0.038 U	0.08 U	--	--	--	--	0.21 U	0.11 U	0.095 U	0.1 U	0.075 U	0.05 U	0.03 U
Carbazole	0.013 U	0.0067 J	--	--	--	--	0.022 J	0.023 J	0.0093 J	0.016 J	0.0086 J	0.0045 J	0.0022 U
Chrysene	0.13 J	0.054	--	--	--	--	0.1	0.092	0.044	0.084	0.048	0.03	0.0018 U
Dibenz(A,H)Anthracene	0.027 U	0.0071 J	--	--	--	--	0.021 J	0.017 J	0.0065 U	0.015 J	0.0082 J	0.0043 J	0.0021 U
Dibenzofuran	0.016 U	0.0053 U	--	--	--	--	0.014 U	0.0071 U	0.0064 U	0.0069 U	0.005 U	0.0033 U	0.002 U
Diethyl Phthalate	0.015 U	0.037 U	--	--	--	--	0.097 U	0.049 U	0.044 U	0.047 U	0.034 U	0.023 U	0.014 U
Dimethyl Phthalate	0.015 U	0.0044 U	--	--	--	--	0.012 U	0.0059 U	0.0053 U	0.0057 U	0.0041 U	0.0028 U	0.0017 U
Di-N-Butyl Phthalate	0.016 U	0.053 U	--	--	--	--	0.14 U	0.071 U	0.064 U	0.069 U	0.05 U	0.033 U	0.02 U
Di-N-Octylphthalate	0.027 U	0.071 U	--	--	--	--	0.19 U	0.095 U	0.085 U	0.092 U	0.066 U	0.044 U	0.027 U
Fluoranthene	0.12 J	0.047	--	--	--	--	0.11	0.11	0.051	0.1	0.055 J	0.029 J	0.0025 U
Fluorene	0.011 U	0.0048 U	--	--	--	--	0.013 U	0.0064 U	0.0057 U	0.0062 J	0.0045 U	0.003 U	0.0018 U
Hexachlorobenzene	0.021 U	0.0088 U	--	--	--	--	0.023 U	0.012 U	0.01 U	0.011 U	0.0082 U	0.0055 U	0.0033 U
Hexachlorobutadiene	0.015 U	0.0071 U	--	--	--	--	0.019 U	0.0095 U	0.0085 U	0.0092 U	0.0067 U	0.0045 U	0.0027 U
Hexachlorocyclopentadiene	0.033 U	0.0062 UJ	--	--	--	--	0.017 UJ	0.0083 U	0.0074 UJ	0.008 UJ	0.0058 UJ	0.0039 UJ	0.0024 UJ
Hexachloroethane	0.019 U	0.0063 U	--	--	--	--	0.017 U	0.0084 U	0.0075 U	0.0081 U	0.0059 U	0.0039 U	0.0024 U
Indeno(1,2,3-C,D)Pyrene	0.093	0.02 J	--	--	--	--	0.062 J	0.058	0.025 J	0.061	0.029 J	0.016 J	0.0019 U

Table E-41
Summary of Data Used in Risk Assessment
ATV Areas (sediment) - Current/ Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Chemical	CFSDP-022 200-35201-10, 460-119741-8 CFSDP-022-SO 9/6/2016	CFSDP-022 180-79106-5, 200-44014-3, 460-158806-2 CFSDP-022-SD 6/20/2018	CFSDP-025 180-82906-2, 200-45660-2, 460-166608-2 CFSDP-025-SD 10/10/2018	CFSDP-025-DUP 180-82906-3, 460-166608-3 CFSDP-DUP5-SD 10/10/2018	CFSDP-044 180-82906-1, 200-45660-1, 460-166608-1 CFSDP-044-SD 10/10/2018	CFSDP-045 180-82835-2, 200-45651-2, 460-166517-2 CFSDP-045-SD 10/9/2018	CFSDP-046 180-79106-3, 460-158719-3 CFSDP-046-SD 6/19/2018	CFSDP-047 180-79106-2, 460-158719-2 CFSDP-047-SD 6/19/2018	CFSDP-048 180-79106-4, 200-44014-2, 460-158806-1 CFSDP-048-SD 6/20/2018	CFSDP-049 180-79106-6, 200-44014-4, 460-158806-3 CFSDP-049-SD 6/20/2018	CFSDP-050 180-79106-7, 460-158918-1 CFSDP-050-SD 6/21/2018	CFSDP-050-DUP 180-79106-9, 460-158918-3 CFSDP-DUP3-SD 6/21/2018	CFSDP-051 180-79106-8, 460-158918-2 CFSDP-051-SD 6/21/2018
Isophorone	0.015 J	0.0062 U	--	--	--	--	0.017 U	0.0083 U	0.0074 U	0.008 U	0.0058 U	0.0039 U	0.0024 U
Naphthalene	0.013 U	0.0047 U	--	--	--	--	0.013 U	0.0064 U	0.0057 U	0.0062 U	0.0044 U	0.003 U	0.0018 U
Nitrobenzene	0.016 U	0.045 U	--	--	--	--	0.12 U	0.06 U	0.053 U	0.058 U	0.042 U	0.028 U	0.017 U
N-Nitrosodi-N-Propylamine	0.018 U	0.0082 U	--	--	--	--	0.022 U	0.011 U	0.0099 U	0.011 U	0.0077 U	0.0052 U	0.0032 U
N-Nitrosodiphenylamine	0.048 U	0.041 U	--	--	--	--	0.11 U	0.054 U	0.048 U	0.053 U	0.038 U	0.025 U	0.015 U
Pentachlorophenol	0.063 U	0.2 UJ	--	--	--	--	0.52 UJ	0.26 U	0.23 UJ	0.25 UJ	0.18 UJ	0.12 UJ	0.075 UJ
Phenanthrene	0.058 J	0.018 J	--	--	--	--	0.085	0.069	0.045	0.06	0.028 J	0.016 J	0.0025 U
Phenol	0.017 U	0.037 U	--	--	--	--	0.13 J	0.049 U	0.044 U	0.048 U	0.035 U	0.023 U	0.014 U
Pyrene	0.11 J	0.041	--	--	--	--	0.1	0.092	0.046	0.087	0.049 J	0.025 J	0.0022 U
SEMIVOLATILE ORGANIC COMPOUNDS|LOW LEVEL (mg/kg)													
1,2,4,5-Tetrachlorobenzene	--	--	0.0031 U	0.0018 U	0.027 U	0.0029 U	--	--	--	--	--	--	--
1,4-Dioxane (P-Dioxane)	--	--	0.022 U	0.013 U	0.2 U	0.021 U	--	--	--	--	--	--	--
2,3,4,6-Tetrachlorophenol	--	--	0.029 U	0.017 U	0.26 U	0.028 U	--	--	--	--	--	--	--
2,4,5-Trichlorophenol	--	--	0.005 U	0.003 U	0.045 U	0.0048 U	--	--	--	--	--	--	--
2,4,6-Trichlorophenol	--	--	0.0039 U	0.0023 U	0.035 U	0.0037 U	--	--	--	--	--	--	--
2,4-Dichlorophenol	--	--	0.0055 U	0.0032 U	0.049 U	0.0052 U	--	--	--	--	--	--	--
2,4-Dimethylphenol	--	--	0.0044 U	0.0026 U	0.039 U	0.0042 U	--	--	--	--	--	--	--
2,4-Dinitrophenol	--	--	0.19 U	0.11 U	1.7 U	0.18 U	--	--	--	--	--	--	--
2,4-Dinitrotoluene	--	--	0.0035 U	0.0021 U	0.031 U	0.0033 U	--	--	--	--	--	--	--
2,6-Dinitrotoluene	--	--	0.0044 U	0.0026 U	0.039 U	0.0041 U	--	--	--	--	--	--	--
2-Chloronaphthalene	--	--	0.0032 U	0.0019 U	0.029 U	0.0031 U	--	--	--	--	--	--	--
2-Chlorophenol	--	--	0.0033 U	0.0019 U	0.029 U	0.0031 U	--	--	--	--	--	--	--
2-Methylnaphthalene	--	--	0.0034 U	0.002 U	0.03 U	0.0038 J	--	--	--	--	--	--	--
2-Methylphenol (O-Cresol)	--	--	0.02 U	0.012 U	0.18 U	0.019 U	--	--	--	--	--	--	--
2-Nitroaniline	--	--	0.032 U	0.019 U	0.29 U	0.03 U	--	--	--	--	--	--	--
2-Nitrophenol	--	--	0.0041 U	0.0024 U	0.036 U	0.0038 U	--	--	--	--	--	--	--
3,3'-Dichlorobenzidine	--	--	0.066 U	0.039 U	0.59 U	0.062 UR	--	--	--	--	--	--	--
3-Nitroaniline	--	--	0.018 U	0.011 U	0.16 U	0.017 U	--	--	--	--	--	--	--
4,6-Dinitro-2-Methylphenol	--	--	0.12 U	0.072 U	1.1 U	0.12 U	--	--	--	--	--	--	--
4-Bromophenyl Phenyl Ether	--	--	0.005 U	0.0029 U	0.044 U	0.0047 U	--	--	--	--	--	--	--
4-Chloro-3-Methylphenol	--	--	0.0033 U	0.002 U	0.03 U	0.0031 U	--	--	--	--	--	--	--
4-Chloroaniline	--	--	0.0024 U	0.0014 U	0.021 U	0.0022 U	--	--	--	--	--	--	--
4-Chlorophenyl Phenyl Ether	--	--	0.0043 U	0.0025 U	0.038 U	0.004 U	--	--	--	--	--	--	--
4-Nitroaniline	--	--	0.0034 U	0.002 U	0.031 U	0.0032 U	--	--	--	--	--	--	--
4-Nitrophenol	--	--	0.05 U	0.029 U	0.44 U	0.047 U	--	--	--	--	--	--	--
Acenaphthene	--	--	0.0041 U	0.0024 U	0.036 U	0.011 J	--	--	--	--	--	--	--
Acenaphthylene	--	--	0.0031 U	0.0018 U	0.033 J	0.022	--	--	--	--	--	--	--
Acetophenone	--	--	0.0038 U	0.0023 U	0.034 U	0.0036 U	--	--	--	--	--	--	--
Anthracene	--	--	0.0037 U	0.0022 U	0.051 J	0.049 J	--	--	--	--	--	--	--
Atrazine	--	--	0.031 UJ	0.018 UJ	0.28 UJ	0.029 UJ	--	--	--	--	--	--	--
Benzaldehyde	--	--	0.0088 UR	0.0052 UR	0.17 J	0.0083 UR	--	--	--	--	--	--	--
Benzo(A)Anthracene	--	--	0.0034 J	0.0016 UJ	0.091 J	0.061 J	--	--	--	--	--	--	--
Benzo(A)Pyrene	--	--	0.0032 J	0.0018 UJ	0.094 J	0.051 J	--	--	--	--	--	--	--
Benzo(B)Fluoranthene	--	--	0.0035 J	0.002 UJ	0.096 J	0.044 J	--	--	--	--	--	--	--
Benzo(G,H,I)Perylene	--	--	0.0031 U	0.0018 U	0.08 J	0.03 J	--	--	--	--	--	--	--
Benzo(K)Fluoranthene	--	--	0.0042 U	0.0025 U	0.04 J	0.014	--	--	--	--	--	--	--
Benzyl Butyl Phthalate	--	--	0.049 U	0.029 U	0.44 U	0.046 U	--	--	--	--	--	--	--
Biphenyl (Diphenyl)	--	--	0.003 U	0.0017 U	0.027 U	0.0028 U	--	--	--	--	--	--	--
Bis(2-Chloroethoxy) Methane	--	--	0.0034 U	0.002 U	0.03 U	0.0032 U	--	--	--	--	--	--	--
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	--	--	0.0026 U	0.0015 U	0.023 U	0.0024 U	--	--	--	--	--	--	--
Bis(2-Chloroisopropyl) Ether	--	--	0.0053 U	0.0031 U	0.047 U	0.005 U	--	--	--	--	--	--	--
Bis(2-Ethylhexyl) Phthalate	--	--	0.076 U	0.044 U	0.67 U	0.071 U	--	--	--	--	--	--	--
Caprolactam	--	--	0.046 U	0.027 U	0.41 U	0.044 U	--	--	--	--	--	--	--
Carbazole	--	--	0.0033 U	0.0019 U	0.03 U	0.0049 J	--	--	--	--	--	--	--
Chrysene	--	--	0.0052 J	0.0021 J	0.11 J	0.072	--	--	--	--	--	--	--
Dibenz(A,H)Anthracene	--	--	0.0032 U	0.0019 U	0.028 U	0.0075 J	--	--	--	--	--	--	--
Dibenzofuran	--	--	0.0031 U	0.0018 U	0.028 U	0.0031 J	--	--	--	--	--	--	--
Diethyl Phthalate	--	--	0.021 U	0.012 U	0.19 U	0.02 U	--	--	--	--	--	--	--
Dimethyl Phthalate	--	--	0.0026 U	0.0015 U	0.023 U	0.0024 U	--	--	--	--	--	--	--
Di-N-Butyl Phthalate	--	--	0.031 U	0.018 U	0.28 U	0.029 U	--	--	--	--	--	--	--

Table E-41
Summary of Data Used in Risk Assessment
ATV Areas (sediment) - Current/ Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Chemical	CFSDP-022 200-35201-10, 460-119741-8 CFSDP-022-SO 9/6/2016	CFSDP-022 180-79106-5, 200-44014-3, 460-158806-2 CFSDP-022-SD 6/20/2018	CFSDP-025 180-82906-2, 200-45660-2, 460-166608-2 CFSDP-025-SD 10/10/2018	CFSDP-025-DUP 180-82906-3, 460-166608-3 CFSDP-DUP5-SD 10/10/2018	CFSDP-044 180-82906-1, 200-45660-1, 460-166608-1 CFSDP-044-SD 10/10/2018	CFSDP-045 180-82835-2, 200-45651-2, 460-166517-2 CFSDP-045-SD 10/9/2018	CFSDP-046 180-79106-3, 460-158719-3 CFSDP-046-SD 6/19/2018	CFSDP-047 180-79106-2, 460-158719-2 CFSDP-047-SD 6/19/2018	CFSDP-048 180-79106-4, 200-44014-2, 460-158806-1 CFSDP-048-SD 6/20/2018	CFSDP-049 180-79106-6, 200-44014-4, 460-158806-3 CFSDP-049-SD 6/20/2018	CFSDP-050 180-79106-7, 460-158918-1 CFSDP-050-SD 6/21/2018	CFSDP-050-DUP 180-79106-9, 460-158918-3 CFSDP-DUP3-SD 6/21/2018	CFSDP-051 180-79106-8, 460-158918-2 CFSDP-051-SD 6/21/2018
Di-N-Octylphthalate	--	--	0.041 U	0.024 U	0.37 U	0.039 U	--	--	--	--	--	--	--
Fluoranthene	--	--	0.0063 J	0.0023 J	0.18	0.12 J	--	--	--	--	--	--	--
Fluorene	--	--	0.0028 U	0.0016 U	0.025 U	0.028 J	--	--	--	--	--	--	--
Hexachlorobenzene	--	--	0.0051 U	0.003 U	0.045 U	0.0048 U	--	--	--	--	--	--	--
Hexachlorobutadiene	--	--	0.0041 U	0.0024 U	0.037 U	0.0039 U	--	--	--	--	--	--	--
Hexachlorocyclopentadiene	--	--	0.0036 U	0.0021 U	0.032 U	0.0034 UJ	--	--	--	--	--	--	--
Hexachloroethane	--	--	0.0036 U	0.0021 U	0.033 U	0.0034 U	--	--	--	--	--	--	--
Indeno(1,2,3-C,D)Pyrene	--	--	0.0029 U	0.0017 U	0.056 J	0.022 J	--	--	--	--	--	--	--
Isophorone	--	--	0.0036 U	0.0021 U	0.032 U	0.0034 U	--	--	--	--	--	--	--
Naphthalene	--	--	0.0028 U	0.0016 U	0.025 U	0.0026 U	--	--	--	--	--	--	--
Nitrobenzene	--	--	0.026 U	0.015 U	0.23 U	0.024 U	--	--	--	--	--	--	--
N-Nitrosodi-N-Propylamine	--	--	0.0048 U	0.0028 U	0.043 U	0.0045 U	--	--	--	--	--	--	--
N-Nitrosodiphenylamine	--	--	0.024 U	0.014 U	0.21 U	0.022 U	--	--	--	--	--	--	--
Pentachlorophenol	--	--	0.11 U	0.067 U	1 U	0.11 U	--	--	--	--	--	--	--
Phenanthrene	--	--	0.0072 J	0.0034 J	0.19	0.21 J-	--	--	--	--	--	--	--
Phenol	--	--	0.021 U	0.013 U	0.19 U	0.02 U	--	--	--	--	--	--	--
Pyrene	--	--	0.0058 J	0.0031 J	0.16	0.11	--	--	--	--	--	--	--

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-41
Summary of Data Used in Risk Assessment
ATV Areas (sediment) - Current/ Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Chemical	CFSDP-052 180-78893-2, 200-43929-2, 460-158622-2 CFSDP-052-SD 6/18/2018	CFSDP-053 180-78893-1, 200-43929-1, 460-158622-1 CFSDP-053-SD 6/18/2018
GENERAL CHEMISTRY (mg/kg)		
Fluoride	2.01	2.39
Cyanide	0.088 U	0.11 U
METALS (mg/kg)		
Aluminum	16600	35400
Antimony	0.47 U	0.54 U
Arsenic	3.9	5
Barium	375	605
Beryllium	0.32 J	1.1
Cadmium	0.54 U	0.61 U
Calcium	4890	8390
Chromium, Total	5	13.4
Cobalt	2.8 J	5.4
Copper	11.1	19.6
Iron	8930	15600
Lead	6.1	14.5
Magnesium	2660	7700
Manganese	85.6	83.4
Mercury	0.017 U	0.019 U
Nickel	6.6	12.8
Potassium	530	1190
Selenium	0.47 U	0.53 U
Silver	0.99 U	1.1 U
Sodium	549	573
Thallium	0.2 U	0.23 U
Vanadium	8.3	13.2
Zinc	16.9	47.7
PESTICIDES (mg/kg)		
Aldrin	--	--
Alpha Bhc (Alpha Hexachlorocyclohexane)	--	--
Alpha Endosulfan	--	--
Beta Bhc (Beta Hexachlorocyclohexane)	--	--
Beta Endosulfan	--	--
cis-Chlordane	--	--
Delta BHC (Delta Hexachlorocyclohexane)	--	--
Dieldrin	--	--
Endosulfan Sulfate	--	--
Endrin	--	--
Endrin Aldehyde	--	--
Endrin Ketone	--	--
Gamma Bhc (Lindane)	--	--
Heptachlor	--	--
Heptachlor Epoxide	--	--
Methoxychlor	--	--
P,P'-DDD	--	--
P,P'-DDE	--	--
P,P'-DDT	--	--
Toxaphene	--	--
trans-Chlordane	--	--
POLYCHLORINATED BIPHENYLS (mg/kg)		
PCB-1016 (Aroclor 1016)	--	--
PCB-1221 (Aroclor 1221)	--	--
PCB-1232 (Aroclor 1232)	--	--
PCB-1242 (Aroclor 1242)	--	--
PCB-1248 (Aroclor 1248)	--	--
PCB-1254 (Aroclor 1254)	--	--
PCB-1260 (Aroclor 1260)	--	--
PCB-1262 (Aroclor 1262)	--	--
PCB-1268 (Aroclor 1268)	--	--
Polychlorinated Biphenyl (PCBs)	--	--

Table E-41
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Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Chemical	CFSDP-052 180-78893-2, 200-43929-2, 460-158622-2 CFSDP-052-SD 6/18/2018	CFSDP-053 180-78893-1, 200-43929-1, 460-158622-1 CFSDP-053-SD 6/18/2018
SEMIVOLATILE ORGANIC COMPOUNDS (mg/kg)		
1,2,4,5-Tetrachlorobenzene	0.0044 U	0.0051 U
1,4-Dioxane (P-Dioxane)	0.032 U	0.037 U
2,3,4,6-Tetrachlorophenol	0.042 U	0.05 U
2,4,5-Trichlorophenol	0.0073 U	0.0085 U
2,4,6-Trichlorophenol	0.0056 U	0.0065 U
2,4-Dichlorophenol	0.0079 U	0.0092 U
2,4-Dimethylphenol	0.0063 UJ	0.0074 UJ
2,4-Dinitrophenol	0.27 U	0.32 U
2,4-Dinitrotoluene	0.0051 U	0.0059 U
2,6-Dinitrotoluene	0.0063 U	0.0073 U
2-Chloronaphthalene	0.0047 U	0.0054 U
2-Chlorophenol	0.0047 U	0.0055 U
2-Methylnaphthalene	0.0049 U	0.0057 U
2-Methylphenol (O-Cresol)	0.029 U	0.034 U
2-Nitroaniline	0.046 U	0.054 U
2-Nitrophenol	0.0058 U	0.0068 U
3- And 4- Methylphenol (Total)	--	--
3,3'-Dichlorobenzidine	0.095 U	0.11 U
3-Nitroaniline	0.026 U	0.03 U
4,6-Dinitro-2-Methylphenol	0.18 U	0.21 U
4-Bromophenyl Phenyl Ether	0.0071 U	0.0083 U
4-Chloro-3-Methylphenol	0.0048 U	0.0056 U
4-Chloroaniline	0.0034 U	0.004 U
4-Chlorophenyl Phenyl Ether	0.0062 U	0.0072 U
4-Nitroaniline	0.0049 U	0.0058 U
4-Nitrophenol	0.071 U	0.083 U
Acenaphthene	0.0059 U	0.0068 U
Acenaphthylene	0.0045 U	0.0052 U
Acetophenone	0.0055 U	0.0064 U
Anthracene	0.0053 U	0.0098 J
Atrazine	0.045 UJ	0.052 UJ
Benzaldehyde	0.013 UR	0.015 UR
Benzo(A)Anthracene	0.019 J	0.062
Benzo(A)Pyrene	0.024	0.071
Benzo(B)Fluoranthene	0.031	0.16
Benzo(G,H,I)Perylene	0.023	0.072
Benzo(K)Fluoranthene	0.017 J	0.057
Benzyl Butyl Phthalate	0.07 U	0.082 U
Biphenyl (Diphenyl)	0.0043 U	0.005 U
Bis(2-Chloroethoxy) Methane	0.0048 U	0.0057 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.0037 U	0.0043 U
Bis(2-Chloroisopropyl) Ether	0.0076 U	0.0088 U
Bis(2-Ethylhexyl) Phthalate	0.11 U	0.13 U
Caprolactam	0.066 U	0.078 U
Carbazole	0.0053 J	0.021 J
Chrysene	0.03	0.2
Dibenz(A,H)Anthracene	0.0066 J	0.013 J
Dibenzofuran	0.0045 U	0.0052 U
Diethyl Phthalate	0.03 U	0.036 U
Dimethyl Phthalate	0.0037 U	0.0043 U
Di-N-Butyl Phthalate	0.045 U	0.052 U
Di-N-Octylphthalate	0.059 U	0.069 U
Fluoranthene	0.039	0.15
Fluorene	0.004 U	0.0047 U
Hexachlorobenzene	0.0073 U	0.0085 U
Hexachlorobutadiene	0.0059 UJ	0.0069 UJ
Hexachlorocyclopentadiene	0.0052 U	0.0061 U
Hexachloroethane	0.0052 UJ	0.0061 UJ
Indeno(1,2,3-C,D)Pyrene	0.018 J	0.057

Table E-41
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Sample Location ID Sample Lab IDs Sample Name Chemical	CFSDP-052 180-78893-2, 200-43929-2, 460-158622-2 CFSDP-052-SD 6/18/2018	CFSDP-053 180-78893-1, 200-43929-1, 460-158622-1 CFSDP-053-SD 6/18/2018
Isophorone	0.0052 U	0.0061 U
Naphthalene	0.004 U	0.0046 U
Nitrobenzene	0.037 U	0.043 U
N-Nitrosodi-N-Propylamine	0.0069 U	0.008 U
N-Nitrosodiphenylamine	0.034 U	0.04 U
Pentachlorophenol	0.16 U	0.19 U
Phenanthrene	0.026	0.047
Phenol	0.031 U	0.036 U
Pyrene	0.03	0.12
SEMIVOLATILE ORGANIC COMPOUNDS|LOW LEVEL (mg/kg)		
1,2,4,5-Tetrachlorobenzene	--	--
1,4-Dioxane (P-Dioxane)	--	--
2,3,4,6-Tetrachlorophenol	--	--
2,4,5-Trichlorophenol	--	--
2,4,6-Trichlorophenol	--	--
2,4-Dichlorophenol	--	--
2,4-Dimethylphenol	--	--
2,4-Dinitrophenol	--	--
2,4-Dinitrotoluene	--	--
2,6-Dinitrotoluene	--	--
2-Chloronaphthalene	--	--
2-Chlorophenol	--	--
2-Methylnaphthalene	--	--
2-Methylphenol (O-Cresol)	--	--
2-Nitroaniline	--	--
2-Nitrophenol	--	--
3,3'-Dichlorobenzidine	--	--
3-Nitroaniline	--	--
4,6-Dinitro-2-Methylphenol	--	--
4-Bromophenyl Phenyl Ether	--	--
4-Chloro-3-Methylphenol	--	--
4-Chloroaniline	--	--
4-Chlorophenyl Phenyl Ether	--	--
4-Nitroaniline	--	--
4-Nitrophenol	--	--
Acenaphthene	--	--
Acenaphthylene	--	--
Acetophenone	--	--
Anthracene	--	--
Atrazine	--	--
Benzaldehyde	--	--
Benzo(A)Anthracene	--	--
Benzo(A)Pyrene	--	--
Benzo(B)Fluoranthene	--	--
Benzo(G,H,I)Perylene	--	--
Benzo(K)Fluoranthene	--	--
Benzyl Butyl Phthalate	--	--
Biphenyl (Diphenyl)	--	--
Bis(2-Chloroethoxy) Methane	--	--
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	--	--
Bis(2-Chloroisopropyl) Ether	--	--
Bis(2-Ethylhexyl) Phthalate	--	--
Caprolactam	--	--
Carbazole	--	--
Chrysene	--	--
Dibenz(A,H)Anthracene	--	--
Dibenzofuran	--	--
Diethyl Phthalate	--	--
Dimethyl Phthalate	--	--
Di-N-Butyl Phthalate	--	--

Table E-41
Summary of Data Used in Risk Assessment
ATV Areas (sediment) - Current/ Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Chemical	CFSDP-052 180-78893-2, 200-43929-2, 460-158622-2 CFSDP-052-SD 6/18/2018	CFSDP-053 180-78893-1, 200-43929-1, 460-158622-1 CFSDP-053-SD 6/18/2018
Di-N-Octylphthalate	--	--
Fluoranthene	--	--
Fluorene	--	--
Hexachlorobenzene	--	--
Hexachlorobutadiene	--	--
Hexachlorocyclopentadiene	--	--
Hexachloroethane	--	--
Indeno(1,2,3-C,D)Pyrene	--	--
Isophorone	--	--
Naphthalene	--	--
Nitrobenzene	--	--
N-Nitrosodi-N-Propylamine	--	--
N-Nitrosodiphenylamine	--	--
Pentachlorophenol	--	--
Phenanthrene	--	--
Phenol	--	--
Pyrene	--	--

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-42
Summary of Data Used in Risk Assessment
Hunter Areas (surface water) - Current/ Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Chemical	CFSWP-013 460-114997-5 CFSWP-013-SW 6/7/2016	CFSWP-013-DUP 460-114997-6 CFSWP-DUP1-SW 6/7/2016	CFSWP-013 460-124553-1 CFSWP-013-SW 11/30/2016	CFSWP-013 460-129899-3 CFSWP-013-SW 3/15/2017	CFSWP-013 460-135182-5 CFSWP-013-SW 6/12/2017	CFSWP-013 460-158366-5 CFSWP-013-SW 6/14/2018	CFSWP-014 460-119361-1 CFSWP-014-SW 8/29/2016	CFSWP-014 460-124553-2 CFSWP-014-SW 11/30/2016	CFSWP-014-DUP 460-124553-5 CFSWP-DUP3-SW 11/30/2016	CFSWP-014 460-129850-1 CFSWP-014-SW 3/13/2017	CFSWP-014-DUP 460-129850-5 CFSWP-Dup4-SW 3/13/2017	CFSWP-014 460-135255-1 CFSWP-014-SW 6/13/2017	CFSWP-014 460-158059-1 CFSWP-014-SW 6/11/2018	CFSWP-014 460-166579-4 CFSWP-014-SW 10/10/2018
GENERAL CHEMISTRY (µg/L)														
Fluoride	--	--	--	--	126 J+	--	--	--	--	--	--	130 J+	--	--
Cyanide	--	--	--	--	2 U	--	--	--	--	--	--	2 U	--	--
Cyanide (Free)	--	--	--	--	--	--	--	--	--	--	--	1.5 U	--	--
Cyanide	4 U	4 U	2 U	2 U	2 U	2 U	2 U	15.3 J	2 UJ	2 U	2 U	2 U	2.3 J	--
Cyanide (Free)	--	--	--	--	--	1.6 J	--	--	--	1.5 U	1.5 U	1.5 U	1.5 UJ	1.5 U
METALS (µg/L)														
Aluminum	--	--	--	--	18.2 U	15 U	--	--	--	--	--	18.2 U	15 U	15 U
Antimony	--	--	--	--	0.62 U	0.62 U	--	--	--	--	--	0.62 U	0.62 U	0.62 U
Arsenic	--	--	--	--	0.64 U	0.77 U	--	--	--	--	--	0.64 U	0.77 U	0.77 U
Barium	--	--	--	--	86.5	71	--	--	--	--	--	88.5	85.9	108
Beryllium	--	--	--	--	0.24 U	0.26 U	--	--	--	--	--	0.24 U	0.26 U	0.26 U
Cadmium	--	--	--	--	0.71 U	0.61 U	--	--	--	--	--	0.71 U	0.61 U	0.61 U
Calcium	--	--	--	--	48900	47500	--	--	--	--	--	50100	44500	48700
Chromium, Total	--	--	--	--	1.3 U	1.3 U	--	--	--	--	--	1.3 U	1.3 U	1.3 U
Cobalt	--	--	--	--	1.3 U	1.3 U	--	--	--	--	--	1.3 U	1.3 U	1.3 U
Copper	--	--	--	--	1.4 U	1.9 U	--	--	--	--	--	1.4 U	1.9 U	1.9 U
Iron	--	--	--	--	42.4 U	45.7 U	--	--	--	--	--	42.4 U	45.7 U	45.7 U
Lead	--	--	--	--	0.38 U	0.37 U	--	--	--	--	--	0.38 U	0.37 U	0.37 U
Magnesium	--	--	--	--	11000	10500	--	--	--	--	--	11700	10500	14300
Manganese	--	--	--	--	3.2 J	2.7 U	--	--	--	--	--	2.7 J	4.2 J	2.7 U
Mercury	--	--	--	--	0.17 U	0.12 U	--	--	--	--	--	0.17 U	0.12 U	0.12 U
Nickel	--	--	--	--	1.4 U	1.3 U	--	--	--	--	--	1.4 U	1.3 U	1.3 U
Potassium	--	--	--	--	419	434	--	--	--	--	--	435	389	410
Selenium	--	--	--	--	0.73 U	0.69 U	--	--	--	--	--	0.73 U	0.69 U	0.69 U
Silver	--	--	--	--	1.3 U	1.4 U	--	--	--	--	--	1.3 U	1.4 U	1.4 U
Sodium	--	--	--	--	2070	1940	--	--	--	--	--	2000	1910	2850
Thallium	--	--	--	--	0.26 U	0.24 U	--	--	--	--	--	0.26 U	0.24 U	0.24 U
Vanadium	--	--	--	--	1.9 U	1.2 U	--	--	--	--	--	1.9 U	1.2 U	1.2 U
Zinc	--	--	--	--	7 U	5.4 U	--	--	--	--	--	7 U	5.4 U	5.4 U
Aluminum	30 J	34.6 J	1610	38.6 J	23.1 J	15 U	37.6 J	18.2 UJ	27.4 J	18.2 U	18.2 U	33.7 J	17.6 J	15 U
Antimony	0.76 U	0.76 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.64 J	0.62 J	0.62 U	0.62 U	0.62 U
Arsenic	0.71 U	0.71 U	1.8 J	2.2	0.64 U	0.77 U	0.64 U	0.64 U	0.64 U	0.64 U	0.64 U	0.64 U	0.77 U	0.77 U
Barium	78	81.2	183	73	91.3	72.9	98.1	101	103	109	104	94.4	85.9	115
Beryllium	0.29 U	0.29 U	0.24 U	0.24 U	0.24 U	0.26 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.26 U	0.26 U
Cadmium	0.72 U	0.72 U	0.71 U	0.71 U	0.71 U	0.61 U	0.71 U	0.71 U	0.71 U	0.71 U	0.71 U	0.71 U	0.61 U	0.61 U
Calcium	46500	47700	40000	42600	50400	43400	43100	52800	53300	55800	52800	50900	43500	51900
Chromium, Total	1.5 U	1.5 U	1.4 J	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	37.7 J	2.4 J	1.3 U	1.3 U	1.3 U
Cobalt	1.5 U	1.5 U	2.4 J	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
Copper	2.2 J	11.7 J	6.2	1.4 U	1.4 U	1.9 U	5.4	1.4 U	1.4 U	2.3 J	1.4 UJ	1.4 U	1.9 U	3.8 J
Iron	49.1 U	49.1 U	2910	42.4 U	42.4 U	45.7 U	42.4 U	42.4 U	42.4 U	304 J	51.7 J	42.4 U	45.7 U	45.7 U
Lead	0.44 U	0.44 U	2.1	0.38 U	0.38 U	0.37 U	0.41 J	0.38 U	0.38 U	0.38 U	0.38 U	0.38 U	0.37 U	0.37 U
Magnesium	10700	11100	11300	10900	12300	10500	13500	13500	13900	13500	12400	12400	10700	15900
Manganese	10.7	11	3750	5.7 J	7.1 J	4.9 J	13.2	5.2 J	3.9 J	13.7 J	9.7 J	12.7	11.1	4.5 J
Mercury	0.14 U	0.14 U	0.17 U	0.17 U	0.17 U	0.12 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.12 U	0.12 U
Nickel	1.6 U	1.6 U	2.3 J	1.4 U	1.4 U	1.3 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.3 U	1.3 U
Potassium	530	556	778	556	480	368	377	481	486	656	486	467	398	473
Selenium	0.79 U	0.79 U	0.73 U	0.73 U	0.73 U	0.69 U	0.73 U	0.73 U	0.73 U	0.73 U	0.73 U	0.73 U	0.69 U	0.69 U
Silver	1.5 U	1.5 U	1.3 U	1.3 U	1.3 U	1.4 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.4 U	1.4 U
Sodium	2030	2120	2340	1410	2250	2260	3240	2590	2660	5530 J	2490 J	2240 J+	2010	3200
Thallium	0.31 U	0.31 U	0.26 U	0.26 U	0.26 U	0.24 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.24 U	0.24 U

Table E-42
Summary of Data Used in Risk Assessment
Hunter Areas (surface water) - Current/ Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Chemical	CFSWP-013 460-114997-5 CFSWP-013-SW 6/7/2016	CFSWP-013-DUP 460-114997-6 CFSWP-DUP1-SW 6/7/2016	CFSWP-013 460-124553-1 CFSWP-013-SW 11/30/2016	CFSWP-013 460-129899-3 CFSWP-013-SW 3/15/2017	CFSWP-013 460-135182-5 CFSWP-013-SW 6/12/2017	CFSWP-013 460-158366-5 CFSWP-013-SW 6/14/2018	CFSWP-014 460-119361-1 CFSWP-014-SW 8/29/2016	CFSWP-014 460-124553-2 CFSWP-014-SW 11/30/2016	CFSWP-014-DUP 460-124553-5 CFSWP-DUP3-SW 11/30/2016	CFSWP-014 460-129850-1 CFSWP-014-SW 3/13/2017	CFSWP-014-DUP 460-129850-5 CFSWP-Dup4-SW 3/13/2017	CFSWP-014 460-135255-1 CFSWP-014-SW 6/13/2017	CFSWP-014 460-158059-1 CFSWP-014-SW 6/11/2018	CFSWP-014 460-166579-4 CFSWP-014-SW 10/10/2018
Vanadium	1.9 J	1.8 J	1.9 J	1.9 U	1.9 U	1.2 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.2 U	1.2 U
Zinc	6.5 U	6.5 U	18.9	7 U	14.1 J	5.4 U	16.4	7 U	7 U	7 U	7 U	7 U	5.4 U	5.4 U

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
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Table E-42
Summary of Data Used in Risk Assessment
Hunter Areas (surface water) - Current/ Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Chemical	CFSWP-014 460-167026-4 CFSWP-014-SW 10/16/2018	CFSWP-015 460-119361-2 CFSWP-015-SW 8/29/2016	CFSWP-015-DUP 460-119361-4 CFSWP-DUP2-SW 8/29/2016	CFSWP-015 460-124553-3 CFSWP-015-SW 11/30/2016	CFSWP-015 460-125810-1 CFSWP-015-SW 12/20/2016	CFSWP-015 460-129850-2 CFSWP-015-SW 3/13/2017	CFSWP-015 460-135255-2 CFSWP-015-SW 6/13/2017	CFSWP-015-DUP 460-135255-4 CFSWP-DUP7-SW 6/13/2017	CFSWP-015 460-158059-2 CFSWP-015-SW 6/11/2018	CFSWP-015 460-166505-3 CFSWP-015-SW 10/9/2018	CFSWP-015 460-167026-2 CFSWP-015-SW 10/16/2018	CFSWP-016 460-119361-3 CFSWP-016-SW 8/29/2016	CFSWP-016 460-124553-4 CFSWP-016-SW 11/30/2016	CFSWP-016 460-129850-4 CFSWP-016-SW 3/13/2017
GENERAL CHEMISTRY (µg/L)														
Fluoride	--	--	--	--	--	--	121 J+	130 J+	--	--	--	--	--	--
Cyanide	--	--	--	--	--	--	2 U	2 U	--	--	--	--	--	--
Cyanide (Free)	--	--	--	--	--	--	1.5 U	1.5 U	--	--	--	--	--	--
Cyanide	--	2.3 J	2 U	10.6	2 U	2 U	2 U	2 U	3 J	--	--	2 U	2 U	2 U
Cyanide (Free)	1.5 U	--	--	--	--	1.5 U	1.5 U	1.5 U	1.9 J-	1.5 U	1.5 UJ	--	--	--
METALS (µg/L)														
Aluminum	--	--	--	--	--	--	18.2 U	18.2 U	15 U	15 U	--	--	--	--
Antimony	--	--	--	--	--	--	0.62 U	6.2 U	0.62 U	0.62 U	--	--	--	--
Arsenic	--	--	--	--	--	--	0.64 U	6.4 U	0.77 U	0.77 U	--	--	--	--
Barium	--	--	--	--	--	--	93	96.3	92.1	113	--	--	--	--
Beryllium	--	--	--	--	--	--	0.24 U	0.24 U	0.26 U	0.26 U	--	--	--	--
Cadmium	--	--	--	--	--	--	0.71 U	7.1 U	0.61 U	0.61 U	--	--	--	--
Calcium	--	--	--	--	--	--	50500	50100	46600	48700	--	--	--	--
Chromium, Total	--	--	--	--	--	--	1.3 U	1.3 U	1.3 U	1.3 U	--	--	--	--
Cobalt	--	--	--	--	--	--	1.3 U	1.3 U	1.3 U	1.3 U	--	--	--	--
Copper	--	--	--	--	--	--	1.4 U	1.4 U	1.9 U	1.9 U	--	--	--	--
Iron	--	--	--	--	--	--	42.4 U	42.4 U	45.7 U	45.7 U	--	--	--	--
Lead	--	--	--	--	--	--	0.38 U	0.38 U	0.37 U	0.37 U	--	--	--	--
Magnesium	--	--	--	--	--	--	11700	11700	10900	14300	--	--	--	--
Manganese	--	--	--	--	--	--	3.5 J	3.2 J	5.3 J	3.6 J	--	--	--	--
Mercury	--	--	--	--	--	--	0.17 U	0.17 U	0.12 U	0.12 U	--	--	--	--
Nickel	--	--	--	--	--	--	1.4 U	1.4 U	1.3 U	1.3 U	--	--	--	--
Potassium	--	--	--	--	--	--	434	429	400	444	--	--	--	--
Selenium	--	--	--	--	--	--	0.73 U	0.73 U	0.69 U	0.69 U	--	--	--	--
Silver	--	--	--	--	--	--	1.3 U	12.8 U	1.4 U	1.4 U	--	--	--	--
Sodium	--	--	--	--	--	--	1960	1940	1950	2840	--	--	--	--
Thallium	--	--	--	--	--	--	0.26 U	0.26 U	0.24 U	0.24 U	--	--	--	--
Vanadium	--	--	--	--	--	--	1.9 U	1.9 U	1.2 U	1.2 U	--	--	--	--
Zinc	--	--	--	--	--	--	7 U	7 U	5.4 U	5.4 U	--	--	--	--
Aluminum	--	44.9	39.7 J	18.2 U	20 J	18.2 U	45.6	40	20 J	15 U	--	59.2	19.5 J	19.6 J
Antimony	--	0.62 U	0.62 U	0.62 U	0.62 U	0.67 J	0.62 U	0.62 U	0.62 U	0.62 U	--	0.62 U	0.62 U	0.78 J
Arsenic	--	0.64 U	0.64 U	0.64 U	0.64 U	0.64 U	0.64 U	0.64 U	0.77 U	0.77 U	--	0.64 U	0.64 U	0.64 U
Barium	--	103	101	106	118	107	97.5	97.1	95.7	114	--	99.5	105	106
Beryllium	--	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.26 U	0.26 U	--	0.24 U	0.24 U	0.24 U
Cadmium	--	0.71 U	0.71 U	0.71 U	0.71 U	0.71 U	0.71 U	0.71 U	0.61 U	0.61 U	--	0.71 U	0.71 U	0.71 U
Calcium	--	47500	44600	53100	56800	53500	51600	51700	46700	52100	--	44400	53100	53700
Chromium, Total	--	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	--	1.3 U	1.3 U	1.3 U
Cobalt	--	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	--	1.3 U	1.3 U	1.3 U
Copper	--	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.9 U	4.2	--	1.4 U	1.4 U	1.4 U
Iron	--	42.4 U	42.4 U	42.4 U	42.4 U	42.4 U	42.4 U	42.4 U	45.7 U	45.7 U	--	42.4 U	42.4 U	42.4 U
Lead	--	0.38 U	0.38 U	0.38 U	0.38 U	0.38 U	0.38 U	0.38 U	0.37 U	0.37 U	--	0.38 U	0.38 U	0.38 U
Magnesium	--	13600	13400	13600	14000	12500	12600	12700	11500	14900	--	13500	13900	12600
Manganese	--	8.6 J	5.9 J	4 J	5.5 J	6.6 J	12.5	13	11.4	5.9 J	--	3.5 J	3.6 J	5.6 J
Mercury	--	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.12 U	0.12 U	--	0.17 U	0.17 U	0.17 U
Nickel	--	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.3 U	1.3 U	--	1.4 U	1.4 U	1.4 U
Potassium	--	405	357	484	519	502	469	466	427	493	--	367	483	495
Selenium	--	0.73 U	0.73 U	0.73 U	0.73 U	0.73 U	0.73 U	0.73 U	0.69 U	0.69 U	--	0.73 U	0.73 U	0.73 U
Silver	--	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.4 U	1.4 U	--	1.3 U	1.3 U	1.3 U
Sodium	--	2870	2620	2610	2940	2520	2250	2270	2140	3370	--	3260	2630	2480
Thallium	--	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.24 U	0.24 U	--	0.26 U	0.26 U	0.26 U

Table E-42
Summary of Data Used in Risk Assessment
Hunter Areas (surface water) - Current/ Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Chemical	CFSWP-014 460-167026-4 CFSWP-014-SW 10/16/2018	CFSWP-015 460-119361-2 CFSWP-015-SW 8/29/2016	CFSWP-015-DUP 460-119361-4 CFSWP-DUP2-SW 8/29/2016	CFSWP-015 460-124553-3 CFSWP-015-SW 11/30/2016	CFSWP-015 460-125810-1 CFSWP-015-SW 12/20/2016	CFSWP-015 460-129850-2 CFSWP-015-SW 3/13/2017	CFSWP-015 460-135255-2 CFSWP-015-SW 6/13/2017	CFSWP-015-DUP 460-135255-4 CFSWP-DUP7-SW 6/13/2017	CFSWP-015 460-158059-2 CFSWP-015-SW 6/11/2018	CFSWP-015 460-166505-3 CFSWP-015-SW 10/9/2018	CFSWP-015 460-167026-2 CFSWP-015-SW 10/16/2018	CFSWP-016 460-119361-3 CFSWP-016-SW 8/29/2016	CFSWP-016 460-124553-4 CFSWP-016-SW 11/30/2016	CFSWP-016 460-129850-4 CFSWP-016-SW 3/13/2017
Vanadium	--	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.2 U	1.2 U	--	1.9 U	1.9 U	1.9 U
Zinc	--	7 U	7 U	7 U	7 U	7 U	7 U	7 U	5.4 U	5.4 U	--	7 U	7 U	7 U

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-42
Summary of Data Used in Risk Assessment
Hunter Areas (surface water) - Current/ Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Chemical	CFSWP-016 460-135182-6 CFSWP-016-SW 6/12/2017	CFSWP-016-DUP 460-135182-7 CFSWP-DUP6-SW 6/12/2017	CFSWP-016 460-158184-1 CFSWP-016-SW 6/12/2018	CFSWP-016 460-166505-1 CFSWP-016-SW 10/9/2018	CFSWP-021 460-114944-4 CFSWP-021-SW 6/6/2016	CFSWP-021 460-124553-7 CFSWP-021-SW 11/30/2016	CFSWP-021 460-129899-1 CFSWP-021-SW 3/15/2017	CFSWP-021 460-135444-4 CFSWP-021-SW 6/15/2017	CFSWP-021 460-158717-1 CFSWP-021-SW 6/19/2018	CFSWP-022 460-114944-5 CFSWP-022-SW 6/6/2016	CFSWP-022 460-130874-2 CFSWP-022-SW 4/3/2017	CFSWP-022 460-158804-2 CFSWP-022-SW 6/20/2018	CFSWP-025 460-125810-2 CFSWP-025-SW 12/20/2016	CFSWP-025 460-129850-3 CFSWP-025-SW 3/13/2017
GENERAL CHEMISTRY (µg/L)														
Fluoride	131 J+	138 J+	--	--	--	--	--	188	--	--	--	--	--	--
Cyanide	2 U	2 U	--	--	--	--	--	2 U	--	--	--	--	--	--
Cyanide (Free)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cyanide	2 U	2 U	2 U	--	4 U	2 U	2 U	2 U	2 U	4 U	2 U	2 U	2 U	2 U
Cyanide (Free)	--	--	1.5 U	1.5 U	--	--	--	--	4.1 J	--	--	1.5 U	--	--
METALS (µg/L)														
Aluminum	18.2 U	18.2 U	15 U	15 U	--	--	--	18.2 U	15 U	--	--	15 U	--	--
Antimony	0.62 U	0.62 U	0.62 U	0.62 U	--	--	--	0.62 U	0.62 U	--	--	0.62 U	--	--
Arsenic	0.64 U	0.64 U	0.77 U	0.77 U	--	--	--	0.93 J	0.77 U	--	--	0.77 U	--	--
Barium	93.5	99.8	92.9	113	--	--	--	96.5	96.4	--	--	118	--	--
Beryllium	0.24 U	0.24 U	0.26 U	0.26 U	--	--	--	0.24 U	0.26 U	--	--	0.26 U	--	--
Cadmium	0.71 U	0.71 U	0.61 U	0.61 U	--	--	--	0.71 U	0.61 U	--	--	0.61 U	--	--
Calcium	50300	50600	47000	49600	--	--	--	54100	53000	--	--	46700	--	--
Chromium, Total	1.3 U	1.3 U	1.3 U	1.3 U	--	--	--	1.3 U	1.3 U	--	--	1.3 U	--	--
Cobalt	1.3 U	1.3 U	1.3 U	1.3 U	--	--	--	1.3 U	1.3 U	--	--	1.3 U	--	--
Copper	1.4 U	1.4 U	1.9 U	1.9 U	--	--	--	1.4 U	1.9 U	--	--	1.9 U	--	--
Iron	42.4 U	42.4 U	45.7 U	45.7 U	--	--	--	42.4 U	45.7 U	--	--	45.7 U	--	--
Lead	0.38 U	0.38 U	0.37 U	0.37 U	--	--	--	0.38 U	0.37 U	--	--	0.37 U	--	--
Magnesium	11400	11400	11000	14400	--	--	--	12100	11600	--	--	10500	--	--
Manganese	3.4 J	3.2 J	2.8 J	2.7 U	--	--	--	3.4 J	7.4 J	--	--	2.7 U	--	--
Mercury	0.17 U	0.17 U	0.12 U	0.12 U	--	--	--	0.17 U	0.12 U	--	--	0.12 U	--	--
Nickel	1.4 U	1.4 U	1.3 U	1.3 U	--	--	--	1.4 U	1.3 U	--	--	1.3 U	--	--
Potassium	439	436	393	478	--	--	--	397	420	--	--	454	--	--
Selenium	0.73 U	0.73 U	0.69 U	0.69 U	--	--	--	0.73 U	0.69 U	--	--	0.69 U	--	--
Silver	1.3 U	1.3 U	1.4 U	1.4 U	--	--	--	1.3 U	1.4 U	--	--	1.4 U	--	--
Sodium	2070	2020	1920	2820	--	--	--	10400	12000	--	--	7650	--	--
Thallium	0.26 U	0.26 U	0.24 U	0.24 U	--	--	--	0.26 U	0.24 U	--	--	0.24 U	--	--
Vanadium	1.9 U	1.9 U	1.2 U	1.2 U	--	--	--	1.9 U	1.2 U	--	--	1.2 U	--	--
Zinc	7 U	7 U	5.4 U	5.4 U	--	--	--	7 U	5.4 U	--	--	5.4 U	--	--
Aluminum	85.5	66.8	32.8 J	15 U	95.3	5750	112	390	36.5 J	937	140	19 J	44.4	18.2 U
Antimony	0.62 U	0.62 U	0.62 U	0.62 U	0.76 U	0.62 U	0.62 U	0.62 U	0.62 U	0.76 U	0.62 U	2.9	0.62 U	0.74 J
Arsenic	0.64 U	0.64 U	0.77 U	0.77 U	1.2 J	3.7	0.64 U	0.87 J	0.9 J	0.88 J	0.64 U	0.77 U	0.64 U	0.64 U
Barium	98.8	99.4	94.1	116	98	219	88.7	104	104	125	77.9	132	122	110
Beryllium	0.24 U	0.24 U	0.26 U	0.26 U	0.29 U	0.24 U	0.24 U	0.24 U	0.26 U	0.29 U	0.24 U	0.26 U	0.24 U	0.24 U
Cadmium	0.71 U	0.71 U	0.61 U	0.61 U	0.72 U	0.71 U	0.71 U	0.71 U	0.61 U	0.72 U	0.71 U	0.61 U	0.71 U	0.71 U
Calcium	50500	51000	44600	52900	50500	82100	55600	54600	54000	43600	45600	51000	56700	54200
Chromium, Total	1.3 U	1.3 U	1.3 U	1.3 U	1.5 U	3.4 J	1.3 U	1.3 U	1.3 U	1.5 U	1.3 U	1.3 U	1.3 U	8.9
Cobalt	1.3 U	1.3 U	1.3 U	1.3 U	1.5 U	2 J	1.3 U	1.3 U	1.3 U	1.5 U	1.3 U	1.3 U	1.3 U	1.3 U
Copper	1.9 J	1.4 U	1.9 U	2 J	1.6 U	5.7	1.4 U	1.4 U	1.9 U	2.6 J	1.4 U	1.9 U	1.4 U	1.4 U
Iron	129 J	54.7 J	45.7 U	45.7 U	79.5 J	4760	99.2 J	197	45.7 U	302	50.2 J	45.7 U	42.4 U	100 J
Lead	0.38 U	0.38 U	0.37 U	0.37 U	0.44 U	4.5	0.38 U	0.66 J	0.37 U	0.44 U	0.38 U	0.37 U	0.38 U	0.38 U
Magnesium	12200	12400	11100	15200	11700	19500	12200	12700	13000	10900	10300	11600	13900	12700
Manganese	14.7	14	10	3.8 J	4.1 J	127	3.3 J	8.1	9.1	17.8	2.5 U	2.7 U	8.9	6.7 J
Mercury	0.17 U	0.17 U	0.12 U	0.12 U	0.14 U	0.17 U	0.17 U	0.17 U	0.12 U	0.14 U	0.17 U	0.12 U	0.17 U	0.17 U
Nickel	1.4 U	1.4 U	1.3 U	1.3 U	1.6 U	3.9 J	1.4 U	2.1 J	1.3 U	1.6 U	1.4 U	1.3 U	1.4 U	1.4 U
Potassium	477	479	443	517	578	1250	499	443	450	785	459	572	528	509
Selenium	0.73 U	0.73 U	0.69 U	0.69 U	0.79 U	0.73 U	0.73 U	0.73 U	0.69 U	0.79 U	0.73 U	0.69 U	0.73 U	0.73 U
Silver	1.3 U	1.3 U	1.4 U	1.4 U	1.5 U	1.3 U	1.3 U	1.3 U	1.4 U	1.5 U	1.3 U	1.4 U	1.3 U	1.3 U
Sodium	2200	2200	2060	3420	6150	31000	26300	10700	13800	6900	4490	8000	2880	2530
Thallium	0.26 U	0.26 U	0.24 U	0.24 U	0.31 U	0.26 U	0.26 U	0.26 U	0.24 U	0.31 U	0.26 U	0.24 U	0.26 U	0.26 U

Table E-42
Summary of Data Used in Risk Assessment
Hunter Areas (surface water) - Current/ Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Chemical	CFSWP-016 460-135182-6 CFSWP-016-SW 6/12/2017	CFSWP-016-DUP 460-135182-7 CFSWP-DUP6-SW 6/12/2017	CFSWP-016 460-158184-1 CFSWP-016-SW 6/12/2018	CFSWP-016 460-166505-1 CFSWP-016-SW 10/9/2018	CFSWP-021 460-114944-4 CFSWP-021-SW 6/6/2016	CFSWP-021 460-124553-7 CFSWP-021-SW 11/30/2016	CFSWP-021 460-129899-1 CFSWP-021-SW 3/15/2017	CFSWP-021 460-135444-4 CFSWP-021-SW 6/15/2017	CFSWP-021 460-158717-1 CFSWP-021-SW 6/19/2018	CFSWP-022 460-114944-5 CFSWP-022-SW 6/6/2016	CFSWP-022 460-130874-2 CFSWP-022-SW 4/3/2017	CFSWP-022 460-158804-2 CFSWP-022-SW 6/20/2018	CFSWP-025 460-125810-2 CFSWP-025-SW 12/20/2016	CFSWP-025 460-129850-3 CFSWP-025-SW 3/13/2017
Vanadium	1.9 U	1.9 U	1.2 U	1.2 U	2.1 J	3.9 J	1.9 U	1.9 U	1.2 U	2.2 J	1.9 U	1.2 U	1.9 U	1.9 U
Zinc	13.5 J	7 UJ	5.4 U	5.4 U	6.5 U	19.2	7 U	9.1 J	5.4 U	6.5 U	7 U	5.4 U	7 U	7 U

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
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Table E-42
Summary of Data Used in Risk Assessment
Hunter Areas (surface water) - Current/ Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Chemical	CFSWP-025 460-135255-3 CFSWP-025-SW 6/13/2017	CFSWP-025 460-158184-2 CFSWP-025-SW 6/12/2018	CFSWP-025 460-166579-2 CFSWP-025-SW 10/10/2018	CFSWP-042 460-158366-7 CFSWP-042-SW 6/14/2018	CFSWP-043 460-158366-8 CFSWP-043-SW 6/14/2018	CFSWP-043 460-158618-3 CFSWP-043-SW 6/18/2018	CFSWP-044 460-158059-3 CFSWP-044-SW 6/11/2018	CFSWP-044 460-166579-1 CFSWP-044-SW 10/10/2018	CFSWP-044-DUP 460-166579-3 CFSWP-DUP14-SW 10/10/2018	CFSWP-044 460-167026-3 CFSWP-044-SW 10/16/2018	CFSWP-045 460-158059-4 CFSWP-045-SW 6/11/2018	CFSWP-045 460-166505-2 CFSWP-045-SW 10/9/2018	CFSWP-045 460-167026-1 CFSWP-045-SW 10/16/2018	CFSWP-046 460-158717-3 CFSWP-046-SW 6/19/2018
GENERAL CHEMISTRY (µg/L)														
Fluoride	130 J+	--	--	--	--	--	--	--	--	--	--	--	--	--
Cyanide	2 U	--	--	--	--	--	--	--	--	--	--	--	--	--
Cyanide (Free)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cyanide	2 U	2 U	--	2 U	2 U	--	2 J	--	--	--	2.7 J	--	--	4.4 J
Cyanide (Free)	--	1.5 U	1.5 U	1.5 U	1.5 U	--	1.5 UJ	1.5 U	1.5 U	7.7	1.5 UJ	1.5 U	1.5 U	2.7 J
METALS (µg/L)														
Aluminum	18.2 U	15 U	15 U	15 U	15 U	--	15 U	15 U	15 U	--	15 U	15 U	--	15 U
Antimony	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	--	0.62 U	0.62 U	0.62 U	--	0.62 U	0.62 U	--	0.62 U
Arsenic	0.64 U	0.77 U	0.77 U	0.77 U	0.77 U	--	0.77 U	0.77 U	0.77 U	--	0.77 U	0.77 U	--	0.77 U
Barium	93.3	93.4	117	69.9	84.7	--	89.8	116	117	--	92.3	113	--	83.5
Beryllium	0.24 U	0.26 U	0.26 U	0.26 U	0.26 U	--	0.26 U	0.26 U	0.26 U	--	0.26 U	0.26 U	--	0.26 U
Cadmium	0.71 U	0.61 U	0.61 U	0.61 U	0.61 U	--	0.61 U	0.61 U	0.61 U	--	0.61 U	0.61 U	--	0.61 U
Calcium	50400	47200	50900	48400	49400	--	46300	50200	50600	--	46700	48900	--	75400
Chromium, Total	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	--	1.3 U	1.3 U	1.3 U	--	1.3 U	1.3 U	--	1.3 U
Cobalt	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	--	1.3 U	1.3 U	1.3 U	--	1.3 U	1.3 U	--	1.3 U
Copper	1.4 U	1.9 U	1.9 U	1.9 U	1.9 U	--	1.9 U	1.9 U	1.9 U	--	1.9 U	1.9 U	--	1.9 U
Iron	42.4 U	45.7 U	45.7 U	45.7 U	45.7 U	--	45.7 U	45.7 U	45.7 U	--	45.7 U	45.7 U	--	45.7 U
Lead	0.38 U	0.37 U	0.37 U	0.37 U	0.37 U	--	0.37 U	0.37 U	0.37 U	--	0.37 U	0.37 U	--	0.37 U
Magnesium	11700	11100	14400	10600	11000	--	10900	14800	14500	--	10900	14100	--	16500
Manganese	3.1 J	3.1 J	2.7 U	2.7 U	2.7 U	--	5.5 J	4.8 J	3.9 J	--	4.9 J	3.6 J	--	28.4
Mercury	0.17 U	0.12 U	0.12 U	0.12 U	0.12 U	--	0.12 U	0.12 U	0.12 U	--	0.12 U	0.12 U	--	0.12 U
Nickel	1.4 U	1.3 U	1.3 U	1.3 U	1.3 U	--	1.3 U	1.3 U	1.3 U	--	1.3 U	1.3 U	--	1.3 U
Potassium	421	396	440	460	486	--	391	476	452	--	414	454	--	969
Selenium	0.73 U	0.69 U	0.69 U	0.69 U	0.69 U	--	0.69 U	0.69 U	0.69 U	--	0.69 U	0.69 U	--	1.4 J
Silver	1.3 U	1.4 U	1.4 U	1.4 U	1.4 U	--	1.4 U	1.4 U	1.4 U	--	1.4 U	1.4 U	--	1.4 U
Sodium	2010	1940	2810	1970	1940 J+	--	5570	2850	2790	--	1980	2820	--	89200
Thallium	0.26 U	0.24 U	0.24 U	0.24 U	0.24 U	--	0.24 U	0.24 U	0.24 U	--	0.24 U	0.24 U	--	0.24 U
Vanadium	1.9 U	1.2 U	1.2 U	1.2 U	1.2 U	--	1.2 U	1.2 U	1.2 U	--	1.2 U	1.2 U	--	1.2 U
Zinc	7 U	5.4 U	5.4 U	5.4 U	5.4 U	--	25.4	5.4 U	5.4 U	--	5.4 U	5.4 U	--	5.4 U
Aluminum	49.5	26.5 J	15 U	15 U	15 U	--	21.3 J	22.5 J	28.2 J	--	20.3 J	15 U	--	45.8
Antimony	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	--	0.62 U	0.62 U	0.62 U	--	0.62 U	0.62 U	--	0.62 U
Arsenic	0.64 U	0.77 U	0.77 U	0.77 U	0.77 U	--	0.77 U	0.77 U	0.77 U	--	0.77 U	0.77 U	--	0.78 J
Barium	94.7	91.9	130	75.7	84.2	--	91	119	118	--	93.6	115	--	89.8
Beryllium	0.24 U	0.26 U	0.26 U	0.26 U	0.26 U	--	0.26 U	0.26 U	0.26 U	--	0.26 U	0.26 U	--	0.26 U
Cadmium	0.71 U	0.61 U	0.61 U	0.61 U	0.61 U	--	0.61 U	0.61 U	0.61 U	--	0.61 U	0.61 U	--	0.61 U
Calcium	51100	45800	52800	44300	44800	--	43800	53600	52200	--	45400	52800	--	77000
Chromium, Total	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	--	1.3 U	1.3 U	1.3 U	--	1.3 U	1.3 U	--	1.3 U
Cobalt	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	--	1.3 U	1.3 U	1.3 U	--	1.3 U	1.3 U	--	1.3 U
Copper	1.4 U	1.9 U	3.5 J	4.4	1.9 U	--	1.9 U	8.5 J	6 J	--	1.9 U	7.3	--	1.9 U
Iron	42.4 U	45.7 U	45.7 U	45.7 U	45.7 U	--	45.7 U	45.7 U	45.7 U	--	45.7 U	45.7 U	--	45.7 U
Lead	0.38 U	0.37 U	0.37 U	0.37 U	0.37 U	--	0.37 U	0.37 U	0.37 U	--	0.37 U	0.37 U	--	0.37 U
Magnesium	12400	11200	16800	10800	11100	--	10800	15400	15500	--	11200	15100	--	18200
Manganese	13.5	10.5	5.2 J	4.7 J	4.5 J	--	11.1	6.9 J	6.5 J	--	11.2	6 J	--	36.5
Mercury	0.17 U	0.12 U	0.12 U	0.12 U	0.12 U	--	0.12 U	0.12 U	0.12 U	--	0.12 U	0.12 U	--	0.12 U
Nickel	1.4 U	1.3 U	1.3 U	1.3 U	1.3 U	--	1.3 U	1.3 U	1.3 U	--	1.3 U	1.3 U	--	1.3 U
Potassium	456	435	582	368	383	--	392	481	499	--	425	489	--	951
Selenium	0.73 U	0.69 U	0.69 U	0.69 U	0.69 U	--	0.69 U	0.69 U	0.69 U	--	0.69 U	0.69 U	--	1.5 J
Silver	1.3 U	1.4 U	1.4 U	1.4 U	1.4 U	--	1.4 U	1.4 U	1.4 U	--	1.4 U	1.4 U	--	1.4 U
Sodium	2250	2120	3320	2170	2140	--	2060	3010	3030	--	2100	3400	--	108000
Thallium	0.26 U	0.24 U	0.24 U	0.24 U	0.24 U	--	0.24 U	0.24 U	0.24 U	--	0.24 U	0.24 U	--	0.24 U

Table E-42
Summary of Data Used in Risk Assessment
Hunter Areas (surface water) - Current/ Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Chemical	CFSWP-025 460-135255-3 CFSWP-025-SW 6/13/2017	CFSWP-025 460-158184-2 CFSWP-025-SW 6/12/2018	CFSWP-025 460-166579-2 CFSWP-025-SW 10/10/2018	CFSWP-042 460-158366-7 CFSWP-042-SW 6/14/2018	CFSWP-043 460-158366-8 CFSWP-043-SW 6/14/2018	CFSWP-043 460-158618-3 CFSWP-043-SW 6/18/2018	CFSWP-044 460-158059-3 CFSWP-044-SW 6/11/2018	CFSWP-044 460-166579-1 CFSWP-044-SW 10/10/2018	CFSWP-044-DUP 460-166579-3 CFSWP-DUP14-SW 10/10/2018	CFSWP-044 460-167026-3 CFSWP-044-SW 10/16/2018	CFSWP-045 460-158059-4 CFSWP-045-SW 6/11/2018	CFSWP-045 460-166505-2 CFSWP-045-SW 10/9/2018	CFSWP-045 460-167026-1 CFSWP-045-SW 10/16/2018	CFSWP-046 460-158717-3 CFSWP-046-SW 6/19/2018
Vanadium	1.9 U	1.2 U	1.2 U	1.2 U	1.2 U	--	1.2 U	1.2 U	1.2 U	--	1.2 U	1.2 U	--	1.2 U
Zinc	7 U	5.4 U	5.4 U	5.4 U	5.4 U	--	5.4 U	5.4 U	5.4 U	--	5.4 U	5.4 U	--	5.4 U

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
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Table E-42
Summary of Data Used in Risk Assessment
Hunter Areas (surface water) - Current/ Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Chemical	CFSWP-047 460-158717-2 CFSWP-047-SW 6/19/2018	CFSWP-048 460-158804-1 CFSWP-048-SW 6/20/2018	CFSWP-049 460-158804-3 CFSWP-049-SW 6/20/2018	CFSWP-050 460-158910-6 CFSWP-050-SW 6/21/2018	CFSWP-051 460-158910-7 CFSWP-051-SW 6/21/2018	CFSWP-052 460-158618-2 CFSWP-052-SW 6/18/2018	CFSWP-053 460-158618-1 CFSWP-053-SW 6/18/2018
GENERAL CHEMISTRY (µg/L)							
Fluoride	--	--	--	--	--	--	--
Cyanide	--	--	--	--	--	--	--
Cyanide (Free)	--	--	--	--	--	--	--
Cyanide	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Cyanide (Free)	2.4 J	1.8 J	1.5 U	1.5 UJ	1.5 UJ	3.5 J	2.5 J
METALS (µg/L)							
Aluminum	15 U	15 U	15 U	15 U	15 U	15 U	15 U
Antimony	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U
Arsenic	0.86 J	0.77 U	0.77 U	0.79 J	0.77 U	1.5 J	0.77 U
Barium	94.4	106	229	95.3	94.9	198	122
Beryllium	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U
Cadmium	0.61 U	0.61 U	0.61 U	0.61 U	0.61 U	0.61 U	0.61 U
Calcium	50400	47600	59300	51300	51200	66400	50400
Chromium, Total	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
Cobalt	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
Copper	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U
Iron	45.7 U	45.7 U	45.7 U	45.7 U	45.7 U	45.7 U	45.7 U
Lead	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U
Magnesium	10900	10900	15200	11000	11100	16500	11300
Manganese	10.4	2.7 U	7.8 J	5.7 J	8.8	80.5	2.7 U
Mercury	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U
Nickel	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
Potassium	416	477	778	419	416	643	462
Selenium	0.69 U	0.69 U	0.69 U	0.69 U	0.69 U	0.69 U	0.69 U
Silver	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U
Sodium	11000	6400	19700	11000	11800	17500	8530
Thallium	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U
Vanadium	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U
Zinc	5.4 U	5.4 U	5.4 U	5.4 U	5.4 U	5.4 U	5.4 U
Aluminum	34.2 J	16.1 J	17.1 J	66.5	15 U	59.2	47.8
Antimony	0.62 U	2.4	2.7	0.62 U	0.62 U	0.62 U	0.62 U
Arsenic	0.8 J	0.77 U	0.77 U	0.95 J	0.95 J	1.5 J	0.77 U
Barium	101	112	245	89.4	101	190	122
Beryllium	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U
Cadmium	0.61 U	0.61 U	0.61 U	0.61 U	0.61 U	0.61 U	0.61 U
Calcium	52100	50200	64100	42600	50700	65400	49000
Chromium, Total	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
Cobalt	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
Copper	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U
Iron	45.7 U	45.7 U	45.7 U	64.5 J	45.7 U	78.5 J	45.7 U
Lead	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U
Magnesium	12600	11600	16000	10400	12400	17300	12200
Manganese	13.2	3 J	8.5	23.1	10.6	69.5	2.7 U
Mercury	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U
Nickel	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
Potassium	439	573	857	432	468	633	458
Selenium	0.69 U	0.69 U	0.69 U	0.69 U	0.69 U	0.69 U	0.69 U
Silver	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U
Sodium	13000	6740	20900	10400	13100	19600	9390
Thallium	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U

Table E-42
Summary of Data Used in Risk Assessment
Hunter Areas (surface water) - Current/ Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Chemical	CFSWP-047 460-158717-2 CFSWP-047-SW 6/19/2018	CFSWP-048 460-158804-1 CFSWP-048-SW 6/20/2018	CFSWP-049 460-158804-3 CFSWP-049-SW 6/20/2018	CFSWP-050 460-158910-6 CFSWP-050-SW 6/21/2018	CFSWP-051 460-158910-7 CFSWP-051-SW 6/21/2018	CFSWP-052 460-158618-2 CFSWP-052-SW 6/18/2018	CFSWP-053 460-158618-1 CFSWP-053-SW 6/18/2018
Vanadium	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U
Zinc	5.4 U	5.4 U	5.4 U	5.4 U	5.4 U	5.4 U	5.4 U

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-43
Summary of Data Used in Risk Assessment
Hunter Areas (sediment) - Current/ Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Chemical	CFSDP-013 200-35201-8, 460-119741-5 CFSDP-013-SO 9/6/2016	CFSDP-014 200-35201-1, 460-119363-1 CFSDP-014-SD 8/29/2016	CFSDP-014 180-82906-4, 200-45660-3, 460-166608-4 CFSDP-014-SD 10/10/2018	CFSDP-015 200-35201-2, 460-119363-2 CFSDP-015-SD 8/29/2016	CFSDP-015 180-82835-3, 200-45651-3, 460-166517-3 CFSDP-015-SD 10/9/2018	CFSDP-016 200-35201-3, 460-119363-3 CFSDP-016-SD 8/29/2016	CFSDP-016 180-82835-1, 200-45651-1, 460-166517-1 CFSDP-016-SD 10/9/2018	CFSDP-016-DUP 180-82835-4, 460-166517-4 CFSDP-DUP4-SD 10/9/2018	CFSDP-021 200-35201-9, 460-119741-7 CFSDP-021-SO 9/6/2016	CFSDP-021 180-79106-1, 200-44014-1, 460-158719-1 CFSDP-021-SD 6/19/2018	CFSDP-022 200-35201-10, 460-119741-8 CFSDP-022-SO 9/6/2016	CFSDP-022 180-79106-5, 200-44014-3, 460-158806-2 CFSDP-022-SD 6/20/2018	CFSDP-025 180-82906-2, 200-45660-2, 460-166608-2 CFSDP-025-SD 10/10/2018	CFSDP-025-DUP 180-82906-3, 460-166608-3 CFSDP-DUP5-SD 10/10/2018
GENERAL CHEMISTRY (mg/kg)														
Fluoride	1.81	1.63 J+	0.23 U	1.41 J+	0.2 U	1.71 J+	0.21 U	0.24 U	2.6	1.19	3.79	3.53	0.21 U	0.23 U
Cyanide	1.5	0.24 J	0.1 J	0.15 J	0.075 U	0.15 J	0.079 U	0.095 U	0.24	0.07 U	0.84	0.11 U	0.076 U	0.086 U
METALS (mg/kg)														
Aluminum	18400	10300	11100	8250	6900	9100	9260	9660	15500	12100	34700	18700	12600	11300
Antimony	0.46 UJ	0.86 U	0.34 UJ	0.84 U	0.3 UJ	0.93 U	0.32 UJ	0.38 UJ	0.31 UJ	0.36 U	0.44 UJ	0.52 U	0.31 UJ	0.35 UJ
Arsenic	4.1	2.3 J	4.2	2.1 J	1.8	2.3 J	2.5	1.9	7.6	6.9	6.2	5.1	2.5	2.2
Barium	290	173	97.1	151	20.2	165	85.6	106	191	136	905	381	92.8	92
Beryllium	1	0.43 J	0.34 J	0.34 J	0.21 J	0.4 J	0.22 J	0.21 U	0.62	0.39 J	1.1	0.43 J	0.28 J	0.31 J
Cadmium	0.48 U	0.91 U	0.39 U	0.89 U	0.34 U	0.99 U	0.37 U	0.43 U	0.33 U	0.41 U	0.47 U	0.6 U	0.36 U	0.4 U
Calcium	28500	13800	13900	14800	1120	16400	30000 J	52600 J	11000	2500	10900	5230	10500 J	17600 J
Chromium, Total	15	9.7	11.4	7.7	6.9	8.3	9.4	10.3	9.1	8.3	11.3	5.9	13	11.9
Cobalt	7.6	4.2 J	5.2	3.2 J	6.5	3.5 J	5.4	4.4	5.6	5.7	4	3.3 J	5.4	5.9
Copper	27.8	13.6	5.4	12.2	3.3	13.6	4.9	4.1	12.3	10.1	32.1	14	4.9	4.6
Iron	16300	10100	15300	7770	11900	8680	13000	11500	14000	13100	12700	10300	15700	15100
Lead	17.4	7.6	5.8	6.1	6	6.8	5.6	4.3	10.6	9.6	14.6	9.1	4.9	4.7
Magnesium	11500	7710	11800	5410	7430	6010	9000	10200	5690	5460	5590	2990	13700	12400
Manganese	1140	280	571 J-	272	67.3 J-	302	174 J-	228 J-	234	309	175	80.5	125 J-	160 J-
Mercury	0.045	0.032 J	0.014 U	0.036 J	0.013 U	0.044 J	0.013 U	0.014 U	0.012 J	0.012 J	0.025 J	0.016 U	0.013 U	0.014 U
Nickel	18.1 J+	8.6	10.6 J-	6.9	11.9 J-	7.1	10.1 J-	8.9 J-	9.8 J+	9.6	13.3 J+	7.5	11.5 J-	11.8 J-
Potassium	1700	789	621 J+	613	177 J+	672	476 J+	574 J+	1040	774	1180	612	684 J+	597 J+
Selenium	1.4 J	0.8 U	0.34 U	0.78 U	0.3 U	0.87 U	0.32 U	0.37 U	0.29 U	0.35 U	0.81 J	0.52 U	0.31 U	0.34 U
Silver	0.89 U	1.7 U	0.72 U	1.6 U	0.63 U	1.8 U	0.67 U	0.79 U	0.61 U	0.75 U	0.86 U	1.1 U	0.65 U	0.73 U
Sodium	120 J	116 U	40.2 J	128 J	32.1 U	148 J	46.4 J	66.9 J	152	38 U	477	473	33.1 UJ	75.9 J
Thallium	0.18 U	0.34 U	0.14 U	0.33 U	0.13 U	0.37 U	0.14 U	0.16 U	0.12 U	0.15 U	0.17 U	0.22 U	0.13 U	0.15 U
Vanadium	11.6	7.2	8.1	5.4	4.6	5.9	7.4	7.2	11	10.9	13.3	10.3	8.3	7.6
Zinc	89.8	47	50.3	37.3	38.9	48.9	44	42.3	41.6	36.4	41	20.4	48.8	51.2
PESTICIDES (mg/kg)														
Aldrin	0.0015 U	0.0025 U	--	0.0024 U	--	0.0027 U	--	--	0.00093 U	--	0.0013 U	--	--	--
Alpha Bhc (Alpha Hexachlorocyclohexane)	0.0011 U	0.0019 U	--	0.0018 U	--	0.002 U	--	--	0.0007 U	--	0.00097 U	--	--	--
Alpha Endosulfan	0.0017 U	0.0029 U	--	0.0028 U	--	0.0031 U	--	--	0.0011 U	--	0.0015 U	--	--	--
Beta Bhc (Beta Hexachlorocyclohexane)	0.0012 U	0.002 U	--	0.002 U	--	0.0022 U	--	--	0.00075 U	--	0.001 U	--	--	--
Beta Endosulfan	0.0019 U	0.0033 U	--	0.0032 U	--	0.0035 U	--	--	0.0012 U	--	0.0017 U	--	--	--
cis-Chlordane	0.002 U	0.0034 U	--	0.0033 U	--	0.0036 U	--	--	0.0013 U	--	0.0017 U	--	--	--
Delta BHC (Delta Hexachlorocyclohexane)	0.0013 U	0.0023 U	--	0.0022 U	--	0.0024 U	--	--	0.00084 U	--	0.0012 U	--	--	--
Dieldrin	0.0016 U	0.0027 U	--	0.0026 U	--	0.0029 U	--	--	0.001 U	--	0.0014 U	--	--	--
Endosulfan Sulfate	0.0014 U	0.0025 U	--	0.0024 U	--	0.0026 U	--	--	0.0009 U	--	0.0012 U	--	--	--
Endrin	0.0015 U	0.0027 U	--	0.0026 U	--	0.0028 U	--	--	0.00098 U	--	0.0013 U	--	--	--
Endrin Aldehyde	0.0015 U	0.0026 U	--	0.0025 U	--	0.0028 U	--	--	0.00095 U	--	0.0013 U	--	--	--
Endrin Ketone	0.0017 U	0.0029 U	--	0.0028 U	--	0.0031 U	--	--	0.0011 U	--	0.0015 U	--	--	--
Gamma Bhc (Lindane)	0.0011 U	0.0019 U	--	0.0018 U	--	0.002 U	--	--	0.00069 U	--	0.00095 U	--	--	--
Heptachlor	0.0016 U	0.0027 U	--	0.0026 U	--	0.0029 U	--	--	0.00099 U	--	0.0014 U	--	--	--
Heptachlor Epoxide	0.0024 U	0.0041 U	--	0.004 U	--	0.0044 U	--	--	0.0015 U	--	0.0021 U	--	--	--
Methoxychlor	0.0026 U	0.0045 U	--	0.0043 U	--	0.0048 U	--	--	0.0016 U	--	0.0022 U	--	--	--
P,P'-DDD	0.0016 U	0.0028 U	--	0.0027 U	--	0.0029 U	--	--	0.001 U	--	0.0014 U	--	--	--
P,P'-DDE	0.0018 U	0.003 U	--	0.0029 U	--	0.0032 U	--	--	0.0011 U	--	0.0015 U	--	--	--
P,P'-DDT	0.0012 U	0.0022 U	--	0.0021 U	--	0.0023 U	--	--	0.00079 U	--	0.0011 U	--	--	--
Toxaphene	0.035 U	0.061 U	--	0.059 U	--	0.065 U	--	--	0.022 U	--	0.031 U	--	--	--
trans-Chlordane	0.0026 U	0.0046 U	--	0.0044 U	--	0.0049 U	--	--	0.0017 U	--	0.0023 U	--	--	--
POLYCHLORINATED BIPHENYLS (mg/kg)														
PCB-1016 (Aroclor 1016)	0.016 U	0.028 U	--	0.027 U	--	0.03 U	--	--	0.01 U	--	0.014 U	--	--	--
PCB-1221 (Aroclor 1221)	0.016 U	0.028 U	--	0.027 U	--	0.03 U	--	--	0.01 U	--	0.014 U	--	--	--
PCB-1232 (Aroclor 1232)	0.016 U	0.028 U	--	0.027 U	--	0.03 U	--	--	0.01 U	--	0.014 U	--	--	--
PCB-1242 (Aroclor 1242)	0.016 U	0.028 U	--	0.027 U	--	0.03 U	--	--	0.01 U	--	0.014 U	--	--	--
PCB-1248 (Aroclor 1248)	0.016 U	0.028 U	--	0.027 U	--	0.03 U	--	--	0.01 U	--	0.014 U	--	--	--
PCB-1254 (Aroclor 1254)	0.017 U	0.029 U	--	0.028 U	--	0.031 U	--	--	0.011 U	--	0.015 U	--	--	--
PCB-1260 (Aroclor 1260)	0.017 U	0.029 U	--	0.028 U	--	0.031 U	--	--	0.011 U	--	0.015 U	--	--	--
PCB-1262 (Aroclor 1262)	0.017 U	0.029 U	--	0.028 U	--	0.031 U	--	--	0.011 U	--	0.015 U	--	--	--
PCB-1268 (Aroclor 1268)	0.017 U	0.029 U	--	0.028 U	--	0.031 U	--	--	0.011 U	--	0.015 U	--	--	--
Polychlorinated Biphenyl (PCBs)	0.017 U	0.029 U	--	0.028 U	--	0.031 U	--	--	0.011 U	--	0.015 U	--	--	--

Table E-43
Summary of Data Used in Risk Assessment
Hunter Areas (sediment) - Current/ Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Chemical	CFSDP-013 200-35201-8, 460-119741-5 CFSDP-013-SO 9/6/2016	CFSDP-014 200-35201-1, 460-119363-1 CFSDP-014-SD 8/29/2016	CFSDP-014 180-82906-4, 200-45660-3, 460-166608-4 CFSDP-014-SD 10/10/2018	CFSDP-015 200-35201-2, 460-119363-2 CFSDP-015-SD 8/29/2016	CFSDP-015 180-82835-3, 200-45651-3, 460-166517-3 CFSDP-015-SD 10/9/2018	CFSDP-016 200-35201-3, 460-119363-3 CFSDP-016-SD 8/29/2016	CFSDP-016 180-82835-1, 200-45651-1, 460-166517-1 CFSDP-016-SD 10/9/2018	CFSDP-016-DUP 180-82835-4, 460-166517-4 CFSDP-DUP4-SD 10/9/2018	CFSDP-021 200-35201-9, 460-119741-7 CFSDP-021-SO 9/6/2016	CFSDP-021 180-79106-1, 200-44014-1, 460-158719-1 CFSDP-021-SD 6/19/2018	CFSDP-022 200-35201-10, 460-119741-8 CFSDP-022-SO 9/6/2016	CFSDP-022 180-79106-5, 200-44014-3, 460-158806-2 CFSDP-022-SD 6/20/2018	CFSDP-025 180-82906-2, 200-45660-2, 460-166608-2 CFSDP-025-SD 10/10/2018	CFSDP-025-DUP 180-82906-3, 460-166608-3 CFSDP-DUP5-SD 10/10/2018
SEMIVOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,2,4,5-Tetrachlorobenzene	0.044 U	0.077 U	--	0.074 U	--	0.082 U	--	--	0.028 U	0.0018 U	0.039 U	0.0053 U	--	--
1,4-Dioxane (P-Dioxane)	0.16 U	0.28 U	--	0.27 U	--	0.3 U	--	--	0.1 U	0.013 U	0.14 U	0.038 U	--	--
2,3,4,6-Tetrachlorophenol	0.056 UJ	0.098 U	--	0.094 U	--	0.1 U	--	--	0.036 U	0.018 UJ	0.049 U	0.051 UJ	--	--
2,4,5-Trichlorophenol	0.059 UJ	0.1 U	--	0.099 U	--	0.11 U	--	--	0.038 U	0.003 U	0.052 U	0.0087 U	--	--
2,4,6-Trichlorophenol	0.017 UJ	0.03 U	--	0.028 U	--	0.031 U	--	--	0.011 U	0.0023 U	0.015 U	0.0067 U	--	--
2,4-Dichlorophenol	0.014 UJ	0.024 U	--	0.024 U	--	0.026 U	--	--	0.009 U	0.0033 U	0.012 U	0.0094 U	--	--
2,4-Dimethylphenol	0.13 UJ	0.23 U	--	0.22 U	--	0.24 U	--	--	0.083 U	0.0026 U	0.12 U	0.0076 U	--	--
2,4-Dinitrophenol	0.45 UR	0.78 UJ	--	0.75 UJ	--	0.84 UJ	--	--	0.29 UJ	0.11 UJ	0.4 U	0.33 UJ	--	--
2,4-Dinitrotoluene	0.024 UJ	0.041 U	--	0.04 U	--	0.044 U	--	--	0.015 U	0.0021 U	0.021 U	0.0061 U	--	--
2,6-Dinitrotoluene	0.032 UJ	0.055 U	--	0.053 U	--	0.059 U	--	--	0.02 U	0.0026 U	0.028 U	0.0075 U	--	--
2-Chloronaphthalene	0.014 UJ	0.024 U	--	0.023 U	--	0.025 U	--	--	0.0086 U	0.0019 U	0.012 U	0.0056 U	--	--
2-Chlorophenol	0.015 UJ	0.026 U	--	0.025 U	--	0.028 U	--	--	0.0096 U	0.002 U	0.013 U	0.0057 U	--	--
2-Methylnaphthalene	0.013 UJ	0.023 U	--	0.022 U	--	0.024 U	--	--	0.0084 U	0.002 U	0.012 U	0.0058 U	--	--
2-Methylphenol (O-Cresol)	0.026 UJ	0.045 U	--	0.043 U	--	0.048 U	--	--	0.017 U	0.012 U	0.023 U	0.035 U	--	--
2-Nitroaniline	0.02 U	0.034 U	--	0.033 U	--	0.036 U	--	--	0.013 U	0.019 U	0.017 U	0.055 U	--	--
2-Nitrophenol	0.02 UJ	0.035 U	--	0.034 U	--	0.037 U	--	--	0.013 U	0.0024 U	0.018 U	0.007 U	--	--
3- And 4- Methylphenol (Total)	0.016 UJ	0.028 U	--	0.027 U	--	0.029 U	--	--	0.01 U	--	0.014 U	--	--	--
3,3'-Dichlorobenzidine	0.067 UJ	0.12 U	--	0.11 U	--	0.12 U	--	--	0.042 U	0.04 U	0.058 U	0.11 U	--	--
3-Nitroaniline	0.018 U	0.031 U	--	0.03 U	--	0.033 U	--	--	0.011 U	0.011 U	0.016 U	0.031 U	--	--
4,6-Dinitro-2-Methylphenol	0.16 UJ	0.28 U	--	0.27 U	--	0.29 U	--	--	0.1 U	0.073 U	0.14 U	0.21 U	--	--
4-Bromophenyl Phenyl Ether	0.019 U	0.033 U	--	0.031 U	--	0.035 U	--	--	0.012 U	0.003 U	0.016 U	0.0085 U	--	--
4-Chloro-3-Methylphenol	0.026 UJ	0.045 U	--	0.043 U	--	0.047 U	--	--	0.016 U	0.002 U	0.023 U	0.0057 U	--	--
4-Chloroaniline	0.015 U	0.027 U	--	0.026 U	--	0.028 U	--	--	0.0098 U	0.0014 U	0.013 U	0.0041 U	--	--
4-Chlorophenyl Phenyl Ether	0.018 UJ	0.031 U	--	0.03 U	--	0.033 U	--	--	0.011 U	0.0026 U	0.016 U	0.0074 U	--	--
4-Nitroaniline	0.023 UJ	0.039 U	--	0.038 U	--	0.042 U	--	--	0.014 U	0.0021 U	0.02 U	0.0059 U	--	--
4-Nitrophenol	0.29 UJ	0.5 U	--	0.48 U	--	0.53 U	--	--	0.18 UJ	0.03 UJ	0.25 UJ	0.085 UJ	--	--
Acenaphthene	0.014 UJ	0.025 U	--	0.024 U	--	0.027 U	--	--	0.0092 U	0.0024 U	0.013 U	0.007 U	--	--
Acenaphthylene	0.015 UJ	0.027 U	--	0.026 U	--	0.028 U	--	--	0.0098 U	0.0019 U	0.013 U	0.0053 U	--	--
Acetophenone	0.013 U	0.023 U	--	0.022 U	--	0.024 U	--	--	0.0083 U	0.0023 U	0.011 U	0.0066 U	--	--
Anthracene	0.057 UJ	0.099 U	--	0.095 U	--	0.1 U	--	--	0.036 U	0.0022 U	0.05 U	0.0063 U	--	--
Atrazine	0.027 U	0.046 U	--	0.044 U	--	0.049 U	--	--	0.017 U	0.019 UJ	0.023 U	0.053 UJ	--	--
Benzaldehyde	0.046 UJ	0.079 U	--	0.15 J	--	0.17 J	--	--	0.029 U	0.0053 UR	0.04 U	0.015 UR	--	--
Benzo(A)Anthracene	0.093 J-	0.087 U	--	0.083 U	--	0.12	--	--	0.032 U	0.0061 J	0.074	0.021 J	--	--
Benzo(A)Pyrene	0.11 J-	0.031 U	--	0.043 J	--	0.094 J	--	--	0.021 J	0.007 J	0.091	0.023 J	--	--
Benzo(B)Fluoranthene	0.19 J-	0.04 U	--	0.039 U	--	0.12	--	--	0.036 J	0.015	0.15	0.038	--	--
Benzo(G,H,I)Perylene	0.13 J	0.06 U	--	0.057 U	--	0.081 J	--	--	0.027 J	0.0076 J	0.1 J	0.024	--	--
Benzo(K)Fluoranthene	0.051 J-	0.045 U	--	0.043 U	--	0.048 U	--	--	0.017 U	0.0039 J	0.053	0.019 J	--	--
Benzyl Butyl Phthalate	0.018 U	0.032 U	--	0.031 U	--	0.034 U	--	--	0.012 U	0.029 U	0.016 U	0.084 U	--	--
Biphenyl (Diphenyl)	0.051 U	0.089 U	--	0.085 U	--	0.094 U	--	--	0.032 U	0.0018 U	0.045 U	0.0051 U	--	--
Bis(2-Chloroethoxy) Methane	0.019 UJ	0.032 U	--	0.031 U	--	0.034 U	--	--	0.012 U	0.002 U	0.016 U	0.0058 U	--	--
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.014 UJ	0.024 U	--	0.024 U	--	0.026 U	--	--	0.009 U	0.0015 U	0.012 U	0.0044 U	--	--
Bis(2-Chloroisopropyl) Ether	0.025 U	0.043 U	--	0.041 U	--	0.045 U	--	--	0.016 U	0.0032 U	0.022 U	0.0091 U	--	--
Bis(2-Ethylhexyl) Phthalate	0.023 U	0.04 U	--	0.04 J	--	0.043 U	--	--	0.015 U	0.045 U	0.02 U	0.13 U	--	--
Caprolactam	0.043 UJ	0.075 U	--	0.072 U	--	0.08 U	--	--	0.027 UJ	0.028 U	0.038 U	0.08 U	--	--
Carbazole	0.017 J-	0.026 U	--	0.025 U	--	0.027 U	--	--	0.0094 U	0.0023 J	0.013 U	0.0067 J	--	--
Chrysene	0.13 J-	0.038 J	--	0.069 J	--	0.13 J	--	--	0.019 J	0.016	0.13 J	0.054	--	--
Dibenz(A,H)Anthracene	0.031 U	0.054 U	--	0.052 U	--	0.058 U	--	--	0.02 U	0.0019 U	0.027 U	0.0071 J	--	--
Dibenzofuran	0.018 UJ	0.031 U	--	0.03 U	--	0.033 U	--	--	0.011 U	0.0019 U	0.016 U	0.0053 U	--	--
Diethyl Phthalate	0.017 UJ	0.03 U	--	0.028 U	--	0.031 U	--	--	0.011 U	0.013 U	0.015 U	0.037 U	--	--
Dimethyl Phthalate	0.017 UJ	0.03 U	--	0.029 U	--	0.032 U	--	--	0.011 U	0.0015 U	0.015 U	0.0044 U	--	--
Di-N-Butyl Phthalate	0.018 UJ	0.031 U	--	0.03 U	--	0.033 U	--	--	0.011 U	0.019 U	0.016 U	0.053 U	--	--
Di-N-Octylphthalate	0.03 U	0.053 U	--	0.051 U	--	0.056 U	--	--	0.019 U	0.025 U	0.027 U	0.071 U	--	--
Fluoranthene	0.14 J-	0.042 J	--	0.08 J	--	0.19 J	--	--	0.018 J	0.013	0.12 J	0.047	--	--
Fluorene	0.013 UJ	0.023 U	--	0.022 U	--	0.024 U	--	--	0.0083 U	0.0017 U	0.011 U	0.0048 U	--	--
Hexachlorobenzene	0.024 U	0.042 U	--	0.04 U	--	0.045 U	--	--	0.015 U	0.0031 U	0.021 U	0.0088 U	--	--
Hexachlorobutadiene	0.017 UJ	0.029 U	--	0.028 U	--	0.031 U	--	--	0.011 U	0.0025 U	0.015 U	0.0071 U	--	--
Hexachlorocyclopentadiene	0.037 UJ	0.065 U	--	0.062 U	--	0.069 U	--	--	0.024 U	0.0022 UJ	0.033 U	0.0062 UJ	--	--
Hexachloroethane	0.022 UJ	0.038 U	--	0.037 U	--	0.04 U	--	--	0.014 U	0.0022 U	0.019 U	0.0063 U	--	--
Indeno(1,2,3-C,D)Pyrene	0.11	0.069 U	--	0.066 U	--	0.087 J+	--	--	0.025 J	0.0061 J	0.093	0.02 J	--	--

Table E-43
Summary of Data Used in Risk Assessment
Hunter Areas (sediment) - Current/ Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Chemical	CFSDP-013 200-35201-8, 460-119741-5 CFSDP-013-SO 9/6/2016	CFSDP-014 200-35201-1, 460-119363-1 CFSDP-014-SD 8/29/2016	CFSDP-014 180-82906-4, 200-45660-3, 460-166608-4 CFSDP-014-SD 10/10/2018	CFSDP-015 200-35201-2, 460-119363-2 CFSDP-015-SD 8/29/2016	CFSDP-015 180-82835-3, 200-45651-3, 460-166517-3 CFSDP-015-SD 10/9/2018	CFSDP-016 200-35201-3, 460-119363-3 CFSDP-016-SD 8/29/2016	CFSDP-016 180-82835-1, 200-45651-1, 460-166517-1 CFSDP-016-SD 10/9/2018	CFSDP-016-DUP 180-82835-4, 460-166517-4 CFSDP-DUP4-SD 10/9/2018	CFSDP-021 200-35201-9, 460-119741-7 CFSDP-021-SO 9/6/2016	CFSDP-021 180-79106-1, 200-44014-1, 460-158719-1 CFSDP-021-SD 6/19/2018	CFSDP-022 200-35201-10, 460-119741-8 CFSDP-022-SO 9/6/2016	CFSDP-022 180-79106-5, 200-44014-3, 460-158806-2 CFSDP-022-SD 6/20/2018	CFSDP-025 180-82906-2, 200-45660-2, 460-166608-2 CFSDP-025-SD 10/10/2018	CFSDP-025-DUP 180-82906-3, 460-166608-3 CFSDP-DUP5-SD 10/10/2018
Isophorone	0.016 J-	0.078 J	--	0.021 U	--	0.06 J	--	--	0.0081 U	0.0022 U	0.015 J	0.0062 U	--	--
Naphthalene	0.015 UJ	0.026 U	--	0.025 U	--	0.028 U	--	--	0.0096 U	0.0017 U	0.013 U	0.0047 U	--	--
Nitrobenzene	0.019 UJ	0.033 U	--	0.031 U	--	0.035 U	--	--	0.012 U	0.016 U	0.016 U	0.045 U	--	--
N-Nitrosodi-N-Propylamine	0.02 U	0.035 U	--	0.034 U	--	0.037 U	--	--	0.013 U	0.0029 U	0.018 U	0.0082 U	--	--
N-Nitrosodiphenylamine	0.054 U	0.094 U	--	0.091 U	--	0.1 U	--	--	0.034 U	0.014 U	0.048 U	0.041 U	--	--
Pentachlorophenol	0.072 UJ	0.13 U	--	0.12 U	--	0.13 U	--	--	0.046 U	0.068 UJ	0.063 U	0.2 UJ	--	--
Phenanthrene	0.067 J-	0.039 J	--	0.072 J	--	0.17 J	--	--	0.011 J	0.0058 J	0.058 J	0.018 J	--	--
Phenol	0.02 UJ	0.034 U	--	0.033 U	--	0.036 U	--	--	0.012 U	0.013 U	0.017 U	0.037 U	--	--
Pyrene	0.13 J	0.047 U	--	0.069 J	--	0.16 J	--	--	0.027 J	0.011	0.11 J	0.041	--	--
SEMIVOLATILE ORGANIC COMPOUNDS|LOW LEVEL (mg/kg)														
1,2,4,5-Tetrachlorobenzene	--	--	0.0048 U	--	0.0017 U	--	0.0042 U	0.006 UJ	--	--	--	--	0.0031 U	0.0018 U
1,4-Dioxane (P-Dioxane)	--	--	0.035 U	--	0.012 U	--	0.031 U	0.043 UJ	--	--	--	--	0.022 U	0.013 U
2,3,4,6-Tetrachlorophenol	--	--	0.047 U	--	0.017 U	--	0.041 U	0.057 UJ	--	--	--	--	0.029 U	0.017 U
2,4,5-Trichlorophenol	--	--	0.008 U	--	0.0028 U	--	0.007 U	0.0098 UJ	--	--	--	--	0.005 U	0.003 U
2,4,6-Trichlorophenol	--	--	0.0062 U	--	0.0022 U	--	0.0054 U	0.0076 UJ	--	--	--	--	0.0039 U	0.0023 U
2,4-Dichlorophenol	--	--	0.0087 U	--	0.0031 U	--	0.0076 U	0.011 UJ	--	--	--	--	0.0055 U	0.0032 U
2,4-Dimethylphenol	--	--	0.007 U	--	0.0025 U	--	0.0061 U	0.0086 UJ	--	--	--	--	0.0044 U	0.0026 U
2,4-Dinitrophenol	--	--	0.3 U	--	0.11 U	--	0.26 U	0.37 UJ	--	--	--	--	0.19 U	0.11 U
2,4-Dinitrotoluene	--	--	0.0056 U	--	0.002 U	--	0.0049 U	0.0069 UJ	--	--	--	--	0.0035 U	0.0021 U
2,6-Dinitrotoluene	--	--	0.0069 U	--	0.0025 U	--	0.0061 U	0.0085 UJ	--	--	--	--	0.0044 U	0.0026 U
2-Chloronaphthalene	--	--	0.0051 U	--	0.0018 U	--	0.0045 U	0.0063 UJ	--	--	--	--	0.0032 U	0.0019 U
2-Chlorophenol	--	--	0.0052 U	--	0.0019 U	--	0.0046 U	0.0064 UJ	--	--	--	--	0.0033 U	0.0019 U
2-Methylnaphthalene	--	--	0.0054 U	--	0.0019 U	--	0.0047 U	0.0066 UJ	--	--	--	--	0.0034 U	0.002 U
2-Methylphenol (O-Cresol)	--	--	0.032 U	--	0.011 U	--	0.028 U	0.04 UJ	--	--	--	--	0.02 U	0.012 U
2-Nitroaniline	--	--	0.051 U	--	0.018 U	--	0.045 U	0.063 UJ	--	--	--	--	0.032 U	0.019 U
2-Nitrophenol	--	--	0.0064 U	--	0.0023 U	--	0.0056 U	0.0079 UJ	--	--	--	--	0.0041 U	0.0024 U
3,3'-Dichlorobenzidine	--	--	0.1 U	--	0.037 U	--	0.092 U	0.13 UJ	--	--	--	--	0.066 U	0.039 U
3-Nitroaniline	--	--	0.029 U	--	0.01 U	--	0.025 U	0.035 UJ	--	--	--	--	0.018 U	0.011 U
4,6-Dinitro-2-Methylphenol	--	--	0.19 U	--	0.069 U	--	0.17 U	0.24 UJ	--	--	--	--	0.12 U	0.072 U
4-Bromophenyl Phenyl Ether	--	--	0.0079 U	--	0.0028 U	--	0.0069 U	0.0097 UJ	--	--	--	--	0.005 U	0.0029 U
4-Chloro-3-Methylphenol	--	--	0.0053 U	--	0.0019 U	--	0.0046 U	0.0065 UJ	--	--	--	--	0.0033 U	0.002 U
4-Chloroaniline	--	--	0.0037 U	--	0.0013 U	--	0.0033 U	0.0046 UJ	--	--	--	--	0.0024 U	0.0014 U
4-Chlorophenyl Phenyl Ether	--	--	0.0068 U	--	0.0024 U	--	0.0059 U	0.0083 UJ	--	--	--	--	0.0043 U	0.0025 U
4-Nitroaniline	--	--	0.0054 U	--	0.0019 U	--	0.0048 U	0.0067 UJ	--	--	--	--	0.0034 U	0.002 U
4-Nitrophenol	--	--	0.079 U	--	0.028 U	--	0.069 U	0.097 UJ	--	--	--	--	0.05 U	0.029 U
Acenaphthene	--	--	0.0065 U	--	0.0023 U	--	0.0058 J	0.0079 UJ	--	--	--	--	0.0041 U	0.0024 U
Acenaphthylene	--	--	0.0049 U	--	0.0017 U	--	0.011 J	0.006 UJ	--	--	--	--	0.0031 U	0.0018 U
Acetophenone	--	--	0.0061 U	--	0.0022 U	--	0.0053 U	0.0075 UJ	--	--	--	--	0.0038 U	0.0023 U
Anthracene	--	--	0.0058 U	--	0.0021 U	--	0.026 J	0.0072 UJ	--	--	--	--	0.0037 U	0.0022 U
Atrazine	--	--	0.049 UJ	--	0.017 UJ	--	0.043 UJ	0.06 UJ	--	--	--	--	0.031 UJ	0.018 UJ
Benzaldehyde	--	--	0.014 UR	--	0.0049 UR	--	0.012 UR	0.017 J	--	--	--	--	0.0088 UR	0.0052 UR
Benzo(A)Anthracene	--	--	0.0042 U	--	0.0015 U	--	0.052 J	0.011 J	--	--	--	--	0.0034 J	0.0016 UJ
Benzo(A)Pyrene	--	--	0.0049 U	--	0.0017 U	--	0.043 J	0.006 UJ	--	--	--	--	0.0032 J	0.0018 UJ
Benzo(B)Fluoranthene	--	--	0.0055 U	--	0.002 U	--	0.061 J	0.0068 UJ	--	--	--	--	0.0035 J	0.002 UJ
Benzo(G,H,I)Perylene	--	--	0.0048 U	--	0.0017 U	--	0.038 J	0.006 UJ	--	--	--	--	0.0031 U	0.0018 U
Benzo(K)Fluoranthene	--	--	0.0067 U	--	0.0024 U	--	0.029 J	0.0083 UJ	--	--	--	--	0.0042 U	0.0025 U
Benzyl Butyl Phthalate	--	--	0.077 U	--	0.027 U	--	0.068 U	0.095 UJ	--	--	--	--	0.049 U	0.029 U
Biphenyl (Diphenyl)	--	--	0.0047 U	--	0.0017 U	--	0.0041 U	0.0058 UJ	--	--	--	--	0.003 U	0.0017 U
Bis(2-Chloroethoxy) Methane	--	--	0.0053 U	--	0.0019 U	--	0.0047 U	0.0066 UJ	--	--	--	--	0.0034 U	0.002 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	--	--	0.0041 U	--	0.0014 U	--	0.0036 U	0.005 UJ	--	--	--	--	0.0026 U	0.0015 U
Bis(2-Chloroisopropyl) Ether	--	--	0.0083 U	--	0.003 U	--	0.0073 U	0.01 UJ	--	--	--	--	0.0053 U	0.0031 U
Bis(2-Ethylhexyl) Phthalate	--	--	0.12 U	--	0.043 U	--	0.1 U	0.15 UJ	--	--	--	--	0.076 U	0.044 U
Caprolactam	--	--	0.073 U	--	0.026 U	--	0.064 U	0.09 UJ	--	--	--	--	0.046 U	0.027 U
Carbazole	--	--	0.0052 U	--	0.0019 U	--	0.0098 J	0.0064 UJ	--	--	--	--	0.0033 U	0.0019 U
Chrysene	--	--	0.0061 J	--	0.0016 U	--	0.085 J	0.017 J	--	--	--	--	0.0052 J	0.0021 J
Dibenz(A,H)Anthracene	--	--	0.005 U	--	0.0018 U	--	0.0066 J	0.0062 UJ	--	--	--	--	0.0032 U	0.0019 U
Dibenzofuran	--	--	0.0049 U	--	0.0017 U	--	0.0043 U	0.006 UJ	--	--	--	--	0.0031 U	0.0018 U
Diethyl Phthalate	--	--	0.034 U	--	0.012 U	--	0.029 U	0.041 UJ	--	--	--	--	0.021 U	0.012 U
Dimethyl Phthalate	--	--	0.0041 U	--	0.0014 U	--	0.0036 U	0.005 UJ	--	--	--	--	0.0026 U	0.0015 U
Di-N-Butyl Phthalate	--	--	0.049 U	--	0.017 U	--	0.043 U	0.06 UJ	--	--	--	--	0.031 U	0.018 U

Table E-43
Summary of Data Used in Risk Assessment
Hunter Areas (sediment) - Current/ Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Chemical	CFSDP-013 200-35201-8, 460-119741-5 CFSDP-013-SO 9/6/2016	CFSDP-014 200-35201-1, 460-119363-1 CFSDP-014-SD 8/29/2016	CFSDP-014 180-82906-4, 200-45660-3, 460-166608-4 CFSDP-014-SD 10/10/2018	CFSDP-015 200-35201-2, 460-119363-2 CFSDP-015-SD 8/29/2016	CFSDP-015 180-82835-3, 200-45651-3, 460-166517-3 CFSDP-015-SD 10/9/2018	CFSDP-016 200-35201-3, 460-119363-3 CFSDP-016-SD 8/29/2016	CFSDP-016 180-82835-1, 200-45651-1, 460-166517-1 CFSDP-016-SD 10/9/2018	CFSDP-016-DUP 180-82835-4, 460-166517-4 CFSDP-DUP4-SD 10/9/2018	CFSDP-021 200-35201-9, 460-119741-7 CFSDP-021-SO 9/6/2016	CFSDP-021 180-79106-1, 200-44014-1, 460-158719-1 CFSDP-021-SD 6/19/2018	CFSDP-022 200-35201-10, 460-119741-8 CFSDP-022-SO 9/6/2016	CFSDP-022 180-79106-5, 200-44014-3, 460-158806-2 CFSDP-022-SD 6/20/2018	CFSDP-025 180-82906-2, 200-45660-2, 460-166608-2 CFSDP-025-SD 10/10/2018	CFSDP-025-DUP 180-82906-3, 460-166608-3 CFSDP-DUP5-SD 10/10/2018
Di-N-Octylphthalate	--	--	0.065 U	--	0.023 U	--	0.057 U	0.08 UJ	--	--	--	--	0.041 U	0.024 U
Fluoranthene	--	--	0.0079 J	--	0.0023 J	--	0.12 J	0.026 J	--	--	--	--	0.0063 J	0.0023 J
Fluorene	--	--	0.0044 U	--	0.0016 U	--	0.013 J	0.0054 UJ	--	--	--	--	0.0028 U	0.0016 U
Hexachlorobenzene	--	--	0.0081 U	--	0.0029 U	--	0.0071 U	0.0099 UJ	--	--	--	--	0.0051 U	0.003 U
Hexachlorobutadiene	--	--	0.0066 U	--	0.0023 U	--	0.0057 U	0.0081 UJ	--	--	--	--	0.0041 U	0.0024 U
Hexachlorocyclopentadiene	--	--	0.0057 U	--	0.002 U	--	0.005 U	0.007 UJ	--	--	--	--	0.0036 U	0.0021 U
Hexachloroethane	--	--	0.0058 U	--	0.0021 U	--	0.0051 U	0.0071 UJ	--	--	--	--	0.0036 U	0.0021 U
Indeno(1,2,3-C,D)Pyrene	--	--	0.0045 U	--	0.0016 U	--	0.032 J	0.0064 J	--	--	--	--	0.0029 U	0.0017 U
Isophorone	--	--	0.0057 U	--	0.002 U	--	0.005 U	0.007 UJ	--	--	--	--	0.0036 U	0.0021 U
Naphthalene	--	--	0.0044 U	--	0.0016 U	--	0.0038 U	0.0054 UJ	--	--	--	--	0.0028 U	0.0016 U
Nitrobenzene	--	--	0.041 U	--	0.015 U	--	0.036 U	0.05 UJ	--	--	--	--	0.026 U	0.015 U
N-Nitrosodi-N-Propylamine	--	--	0.0076 U	--	0.0027 U	--	0.0066 U	0.0093 UJ	--	--	--	--	0.0048 U	0.0028 U
N-Nitrosodiphenylamine	--	--	0.037 U	--	0.013 U	--	0.033 U	0.046 UJ	--	--	--	--	0.024 U	0.014 U
Pentachlorophenol	--	--	0.18 U	--	0.064 U	--	0.16 U	0.22 UJ	--	--	--	--	0.11 U	0.067 U
Phenanthrene	--	--	0.006 U	--	0.0028 J	--	0.1 J	0.017 J	--	--	--	--	0.0072 J	0.0034 J
Phenol	--	--	0.034 U	--	0.012 U	--	0.03 U	0.042 UJ	--	--	--	--	0.021 U	0.013 U
Pyrene	--	--	0.007 J	--	0.0019 U	--	0.095 J	0.021 J	--	--	--	--	0.0058 J	0.0031 J

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-43
Summary of Data Used in Risk Assessment
Hunter Areas (sediment) - Current/ Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSDP-044	CFSDP-045	CFSDP-046	CFSDP-047	CFSDP-048	CFSDP-049	CFSDP-050	CFSDP-050-DUP	CFSDP-051	CFSDP-052	CFSDP-053
Sample Lab IDs	180-82906-1, 200-45660-1, 460-166608-1	180-82835-2, 200-45651-2, 460-166517-2	180-79106-3, 460-158719-3	180-79106-2, 460-158719-2	180-79106-4, 200-44014-2, 460-158806-1	180-79106-6, 200-44014-4, 460-158806-3	180-79106-7, 460-158918-1	180-79106-9, 460-158918-3	180-79106-8, 460-158918-2	180-78893-2, 200-43929-2, 460-158622-2	180-78893-1, 200-43929-1, 460-158622-1
Sample Name	CFSDP-044-SD	CFSDP-045-SD	CFSDP-046-SD	CFSDP-047-SD	CFSDP-048-SD	CFSDP-049-SD	CFSDP-050-SD	CFSDP-DUP3-SD	CFSDP-051-SD	CFSDP-052-SD	CFSDP-053-SD
Chemical	10/10/2018	10/9/2018	6/19/2018	6/19/2018	6/20/2018	6/20/2018	6/21/2018	6/21/2018	6/21/2018	6/18/2018	6/18/2018
GENERAL CHEMISTRY (mg/kg)											
Fluoride	0.76 U	0.21 U	9.59	8.71	3.71	3.47	2.08	1.49	1.14	2.01	2.39
Cyanide	0.28 U	0.083 U	0.59 J	0.6 J	0.34 J	0.15 J	0.11 J+	0.12 J+	0.078 U	0.088 U	0.11 U
METALS (mg/kg)											
Aluminum	12100	11800	27800	15000	15700	20700	15300	14400	19900	16600	35400
Antimony	1.1 UJ	0.33 UJ	1.1 U	1.2 U	0.59 U	0.43 U	0.38 U	0.3 U	0.32 UJ	0.47 U	0.54 U
Arsenic	3.6 J	2	14.5	13.8	3.7	3.2	8.9	8.4	9.8	3.9	5
Barium	249	71.8	716	340	283	884	171	189	385	375	605
Beryllium	0.68 J	0.33 J	0.75 J	0.67 U	0.32 U	0.7	0.63	0.51	0.62	0.32 J	1.1
Cadmium	1.3 U	0.38 U	1.3 U	1.4 U	0.68 U	0.5 U	0.43 U	0.35 U	0.37 U	0.54 U	0.61 U
Calcium	37000	2500	17800	15200	6680	8740	3910	3500	2590	4890	8390
Chromium, Total	11.6	12.7	19.5	9.4	5.9	12.2	11.7	11.7	8	5	13.4
Cobalt	4.7 J	6.5	6.4 J	4.6 J	1.9 J	5.4	6.6	9.2	5.7	2.8 J	5.4
Copper	20.8	4.5	42.5	32.4	27.4	22.4	10.3	8.7	10.5	11.1	19.6
Iron	12000	16400	25200	14300	7770	14300	20500	19200	14200	8930	15600
Lead	10.3	4.9	17.6	11.7	6.2	14.8	13.8	12.6	11.1	6.1	14.5
Magnesium	8370	12200	13800	5560	2570	7100	11700	12400	5130	2660	7700
Manganese	367 J-	112 J-	988	747	34.1	63.3	641 J	1210 J	370	85.6	83.4
Mercury	0.045 U	0.013 U	0.062 J	0.048 J	0.022 U	0.02 U	0.019 J	0.02 J	0.013 U	0.017 U	0.019 U
Nickel	9.2 J-	13.8 J-	15.2	13	6	13.8	12.4	11.3	9.4	6.6	12.8
Potassium	1230 J+	659 J+	1070	911	452	1200	1130	826	811	530	1190
Selenium	1.8 J	0.33 U	4.4 J	2.5 J	0.59 U	0.57 J	0.37 U	0.3 U	0.32 U	0.47 U	0.53 U
Silver	2.4 U	0.7 U	2.3 U	2.6 U	1.2 U	0.91 U	0.8 U	0.64 U	0.68 U	0.99 U	1.1 U
Sodium	154 J	35.7 U	844	137 J	390	223	51 J	39.9 J	179	549	573
Thallium	0.48 U	0.14 U	0.47 U	0.52 U	0.25 U	0.18 U	0.16 U	0.13 U	0.14 U	0.2 U	0.23 U
Vanadium	8.8	8.1	17.2	11.3	7.9	12.7	13.5	11.4	9.9	8.3	13.2
Zinc	58.5	54.7	45.9	28.6 J	16 J	38.2	65.3	61.3	30.7	16.9	47.7
PESTICIDES (mg/kg)											
Aldrin	--	--	--	--	--	--	--	--	--	--	--
Alpha Bhc (Alpha Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--
Alpha Endosulfan	--	--	--	--	--	--	--	--	--	--	--
Beta Bhc (Beta Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--
Beta Endosulfan	--	--	--	--	--	--	--	--	--	--	--
cis-Chlordane	--	--	--	--	--	--	--	--	--	--	--
Delta BHC (Delta Hexachlorocyclohexane)	--	--	--	--	--	--	--	--	--	--	--
Dieldrin	--	--	--	--	--	--	--	--	--	--	--
Endosulfan Sulfate	--	--	--	--	--	--	--	--	--	--	--
Endrin	--	--	--	--	--	--	--	--	--	--	--
Endrin Aldehyde	--	--	--	--	--	--	--	--	--	--	--
Endrin Ketone	--	--	--	--	--	--	--	--	--	--	--
Gamma Bhc (Lindane)	--	--	--	--	--	--	--	--	--	--	--
Heptachlor	--	--	--	--	--	--	--	--	--	--	--
Heptachlor Epoxide	--	--	--	--	--	--	--	--	--	--	--
Methoxychlor	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDD	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDE	--	--	--	--	--	--	--	--	--	--	--
P,P'-DDT	--	--	--	--	--	--	--	--	--	--	--
Toxaphene	--	--	--	--	--	--	--	--	--	--	--
trans-Chlordane	--	--	--	--	--	--	--	--	--	--	--
POLYCHLORINATED BIPHENYLS (mg/kg)											
PCB-1016 (Aroclor 1016)	--	--	--	--	--	--	--	--	--	--	--
PCB-1221 (Aroclor 1221)	--	--	--	--	--	--	--	--	--	--	--
PCB-1232 (Aroclor 1232)	--	--	--	--	--	--	--	--	--	--	--
PCB-1242 (Aroclor 1242)	--	--	--	--	--	--	--	--	--	--	--
PCB-1248 (Aroclor 1248)	--	--	--	--	--	--	--	--	--	--	--
PCB-1254 (Aroclor 1254)	--	--	--	--	--	--	--	--	--	--	--
PCB-1260 (Aroclor 1260)	--	--	--	--	--	--	--	--	--	--	--
PCB-1262 (Aroclor 1262)	--	--	--	--	--	--	--	--	--	--	--
PCB-1268 (Aroclor 1268)	--	--	--	--	--	--	--	--	--	--	--
Polychlorinated Biphenyl (PCBs)	--	--	--	--	--	--	--	--	--	--	--

Table E-43
Summary of Data Used in Risk Assessment
Hunter Areas (sediment) - Current/ Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSDP-044	CFSDP-045	CFSDP-046	CFSDP-047	CFSDP-048	CFSDP-049	CFSDP-050	CFSDP-050-DUP	CFSDP-051	CFSDP-052	CFSDP-053
Sample Lab IDs	180-82906-1, 200-45660-1, 460-166608-1	180-82835-2, 200-45651-2, 460-166517-2	180-79106-3, 460-158719-3	180-79106-2, 460-158719-2	180-79106-4, 200-44014-2, 460-158806-1	180-79106-6, 200-44014-4, 460-158806-3	180-79106-7, 460-158918-1	180-79106-9, 460-158918-3	180-79106-8, 460-158918-2	180-78893-2, 200-43929-2, 460-158622-2	180-78893-1, 200-43929-1, 460-158622-1
Sample Name	CFSDP-044-SD	CFSDP-045-SD	CFSDP-046-SD	CFSDP-047-SD	CFSDP-048-SD	CFSDP-049-SD	CFSDP-050-SD	CFSDP-DUP3-SD	CFSDP-051-SD	CFSDP-052-SD	CFSDP-053-SD
Chemical	10/10/2018	10/9/2018	6/19/2018	6/19/2018	6/20/2018	6/20/2018	6/21/2018	6/21/2018	6/21/2018	6/18/2018	6/18/2018
SEMIVOLATILE ORGANIC COMPOUNDS (mg/kg)											
1,2,4,5-Tetrachlorobenzene	--	--	0.014 U	0.0071 U	0.0063 U	0.0068 U	0.0049 U	0.0033 U	0.002 U	0.0044 U	0.0051 U
1,4-Dioxane (P-Dioxane)	--	--	0.1 U	0.051 U	0.045 U	0.049 U	0.036 U	0.024 U	0.015 U	0.032 U	0.037 U
2,3,4,6-Tetrachlorophenol	--	--	0.14 UJ	0.068 U	0.061 UJ	0.066 UJ	0.048 UJ	0.032 UJ	0.019 UJ	0.042 U	0.05 U
2,4,5-Trichlorophenol	--	--	0.023 U	0.012 U	0.01 U	0.011 U	0.0081 U	0.0054 U	0.0033 U	0.0073 U	0.0085 U
2,4,6-Trichlorophenol	--	--	0.018 U	0.009 U	0.008 U	0.0087 U	0.0063 U	0.0042 U	0.0026 U	0.0056 U	0.0065 U
2,4-Dichlorophenol	--	--	0.025 U	0.013 U	0.011 U	0.012 U	0.0088 U	0.0059 U	0.0036 U	0.0079 U	0.0092 U
2,4-Dimethylphenol	--	--	0.02 U	0.01 U	0.0091 U	0.0098 U	0.0071 U	0.0048 U	0.0029 UJ	0.0063 UJ	0.0074 UJ
2,4-Dinitrophenol	--	--	0.87 UJ	0.44 U	0.39 UJ	0.42 UJ	0.31 UJ	0.21 UJ	0.13 UJ	0.27 U	0.32 U
2,4-Dinitrotoluene	--	--	0.016 U	0.0081 U	0.0072 U	0.0079 U	0.0057 U	0.0038 U	0.0023 U	0.0051 U	0.0059 U
2,6-Dinitrotoluene	--	--	0.02 U	0.01 U	0.009 U	0.0097 U	0.007 U	0.0047 U	0.0029 U	0.0063 U	0.0073 U
2-Chloronaphthalene	--	--	0.015 U	0.0075 U	0.0067 U	0.0072 U	0.0052 U	0.0035 U	0.0021 U	0.0047 U	0.0054 U
2-Chlorophenol	--	--	0.015 U	0.0076 U	0.0068 U	0.0073 U	0.0053 U	0.0035 U	0.0022 U	0.0047 U	0.0055 U
2-Methylnaphthalene	--	--	0.016 U	0.0078 U	0.007 U	0.0076 U	0.0055 U	0.0037 U	0.0022 U	0.0049 U	0.0057 U
2-Methylphenol (O-Cresol)	--	--	0.093 U	0.047 U	0.042 U	0.045 U	0.033 U	0.022 U	0.013 U	0.029 U	0.034 U
2-Nitroaniline	--	--	0.15 U	0.074 U	0.066 U	0.072 U	0.052 U	0.035 U	0.021 U	0.046 U	0.054 U
2-Nitrophenol	--	--	0.019 U	0.0094 U	0.0083 U	0.009 U	0.0065 U	0.0044 U	0.0027 U	0.0058 U	0.0068 U
3- And 4- Methylphenol (Total)	--	--	--	--	--	--	--	--	--	--	--
3,3'-Dichlorobenzidine	--	--	0.3 U	0.15 U	0.14 U	0.15 U	0.11 U	0.071 U	0.044 UJ	0.095 U	0.11 U
3-Nitroaniline	--	--	0.083 U	0.042 U	0.037 U	0.04 U	0.029 U	0.019 U	0.012 U	0.026 U	0.03 U
4,6-Dinitro-2-Methylphenol	--	--	0.56 U	0.28 U	0.25 U	0.27 U	0.2 U	0.13 U	0.08 U	0.18 U	0.21 U
4-Bromophenyl Phenyl Ether	--	--	0.023 U	0.011 U	0.01 U	0.011 U	0.008 U	0.0054 U	0.0033 U	0.0071 U	0.0083 U
4-Chloro-3-Methylphenol	--	--	0.015 U	0.0077 U	0.0069 U	0.0074 U	0.0054 U	0.0036 U	0.0022 U	0.0048 U	0.0056 U
4-Chloroaniline	--	--	0.011 U	0.0054 U	0.0048 U	0.0053 U	0.0038 U	0.0025 U	0.0015 UJ	0.0034 U	0.004 U
4-Chlorophenyl Phenyl Ether	--	--	0.02 U	0.0099 U	0.0088 U	0.0096 U	0.0069 U	0.0046 U	0.0028 U	0.0062 U	0.0072 U
4-Nitroaniline	--	--	0.016 U	0.0079 U	0.0071 U	0.0077 U	0.0055 U	0.0037 U	0.0023 U	0.0049 U	0.0058 U
4-Nitrophenol	--	--	0.23 UJ	0.11 U	0.1 UJ	0.11 UJ	0.08 UJ	0.054 UJ	0.033 UJ	0.071 U	0.083 U
Acenaphthene	--	--	0.019 U	0.0094 U	0.0084 U	0.0091 U	0.0066 U	0.0044 U	0.0027 U	0.0059 U	0.0068 U
Acenaphthylene	--	--	0.014 U	0.0071 U	0.0064 U	0.0069 U	0.005 U	0.0033 U	0.002 U	0.0045 U	0.0052 U
Acetophenone	--	--	0.018 U	0.0089 U	0.0079 U	0.0093 J	0.0062 U	0.0041 U	0.0025 U	0.0055 U	0.0064 U
Anthracene	--	--	0.017 U	0.012 J	0.0076 U	0.013 J	0.0059 U	0.004 U	0.0024 U	0.0053 U	0.0098 J
Atrazine	--	--	0.14 UJ	0.071 UJ	0.064 UJ	0.069 UJ	0.05 UJ	0.033 UJ	0.02 UJ	0.045 UJ	0.052 UJ
Benzaldehyde	--	--	0.1 J	0.02 UR	0.018 UR	0.039 J	0.014 UR	0.0095 UR	0.0058 UR	0.013 UR	0.015 UR
Benzo(A)Anthracene	--	--	0.069	0.057	0.025 J	0.052	0.028 J	0.015 J	0.0018 U	0.019 J	0.062
Benzo(A)Pyrene	--	--	0.086	0.083	0.033	0.079	0.036 J	0.018 J	0.002 U	0.024	0.071
Benzo(B)Fluoranthene	--	--	0.13	0.11	0.041	0.11	0.052 J	0.029 J	0.0023 U	0.031	0.16
Benzo(G,H,I)Perylene	--	--	0.079	0.082	0.033	0.082	0.04 J	0.02 J	0.002 U	0.023	0.072
Benzo(K)Fluoranthene	--	--	0.045 J	0.047	0.024 J	0.043	0.028 J	0.011 J	0.0028 U	0.017 J	0.057
Benzyl Butyl Phthalate	--	--	0.22 U	0.11 U	0.1 U	0.11 U	0.079 U	0.053 U	0.032 U	0.07 U	0.082 U
Biphenyl (Diphenyl)	--	--	0.014 U	0.0069 U	0.0061 U	0.0066 U	0.0048 U	0.0032 U	0.002 U	0.0043 U	0.005 U
Bis(2-Chloroethoxy) Methane	--	--	0.015 U	0.0078 U	0.0069 U	0.0075 U	0.0054 U	0.0036 U	0.0022 U	0.0048 U	0.0057 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	--	--	0.012 U	0.0059 U	0.0053 U	0.0057 U	0.0041 U	0.0028 U	0.0017 U	0.0037 U	0.0043 U
Bis(2-Chloroisopropyl) Ether	--	--	0.024 U	0.012 U	0.011 U	0.012 U	0.0085 U	0.0057 U	0.0035 U	0.0076 U	0.0088 U
Bis(2-Ethylhexyl) Phthalate	--	--	0.35 U	0.17 U	0.16 U	0.17 U	0.12 U	0.081 U	0.05 U	0.11 U	0.13 U
Caprolactam	--	--	0.21 U	0.11 U	0.095 U	0.1 U	0.075 U	0.05 U	0.03 U	0.066 U	0.078 U
Carbazole	--	--	0.022 J	0.023 J	0.0093 J	0.016 J	0.0086 J	0.0045 J	0.0022 U	0.0053 J	0.021 J
Chrysene	--	--	0.1	0.092	0.044	0.084	0.048	0.03	0.0018 U	0.03	0.2
Dibenz(A,H)Anthracene	--	--	0.021 J	0.017 J	0.0065 U	0.015 J	0.0082 J	0.0043 J	0.0021 U	0.0066 J	0.013 J
Dibenzofuran	--	--	0.014 U	0.0071 U	0.0064 U	0.0069 U	0.005 U	0.0033 U	0.002 U	0.0045 U	0.0052 U
Diethyl Phthalate	--	--	0.097 U	0.049 U	0.044 U	0.047 U	0.034 U	0.023 U	0.014 U	0.03 U	0.036 U
Dimethyl Phthalate	--	--	0.012 U	0.0059 U	0.0053 U	0.0057 U	0.0041 U	0.0028 U	0.0017 U	0.0037 U	0.0043 U
Di-N-Butyl Phthalate	--	--	0.14 U	0.071 U	0.064 U	0.069 U	0.05 U	0.033 U	0.02 U	0.045 U	0.052 U
Di-N-Octylphthalate	--	--	0.19 U	0.095 U	0.085 U	0.092 U	0.066 U	0.044 U	0.027 U	0.059 U	0.069 U
Fluoranthene	--	--	0.11	0.11	0.051	0.1	0.055 J	0.029 J	0.0025 U	0.039	0.15
Fluorene	--	--	0.013 U	0.0064 U	0.0057 U	0.0062 J	0.0045 U	0.003 U	0.0018 U	0.004 U	0.0047 U
Hexachlorobenzene	--	--	0.023 U	0.012 U	0.01 U	0.011 U	0.0082 U	0.0055 U	0.0033 U	0.0073 U	0.0085 U
Hexachlorobutadiene	--	--	0.019 U	0.0095 U	0.0085 U	0.0092 U	0.0067 U	0.0045 U	0.0027 U	0.0059 UJ	0.0069 UJ
Hexachlorocyclopentadiene	--	--	0.017 UJ	0.0083 U	0.0074 UJ	0.008 UJ	0.0058 UJ	0.0039 UJ	0.0024 UJ	0.0052 U	0.0061 U
Hexachloroethane	--	--	0.017 U	0.0084 U	0.0075 U	0.0081 U	0.0059 U	0.0039 U	0.0024 U	0.0052 UJ	0.0061 UJ
Indeno(1,2,3-C,D)Pyrene	--	--	0.062 J	0.058	0.025 J	0.061	0.029 J	0.016 J	0.0019 U	0.018 J	0.057

Table E-43
Summary of Data Used in Risk Assessment
Hunter Areas (sediment) - Current/ Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Chemical	CFSDP-044 180-82906-1, 200-45660-1, 460-166608-1 CFSDP-044-SD 10/10/2018	CFSDP-045 180-82835-2, 200-45651-2, 460-166517-2 CFSDP-045-SD 10/9/2018	CFSDP-046 180-79106-3, 460-158719-3 CFSDP-046-SD 6/19/2018	CFSDP-047 180-79106-2, 460-158719-2 CFSDP-047-SD 6/19/2018	CFSDP-048 180-79106-4, 200-44014-2, 460-158806-1 CFSDP-048-SD 6/20/2018	CFSDP-049 180-79106-6, 200-44014-4, 460-158806-3 CFSDP-049-SD 6/20/2018	CFSDP-050 180-79106-7, 460-158918-1 CFSDP-050-SD 6/21/2018	CFSDP-050-DUP 180-79106-9, 460-158918-3 CFSDP-DUP3-SD 6/21/2018	CFSDP-051 180-79106-8, 460-158918-2 CFSDP-051-SD 6/21/2018	CFSDP-052 180-78893-2, 200-43929-2, 460-158622-2 CFSDP-052-SD 6/18/2018	CFSDP-053 180-78893-1, 200-43929-1, 460-158622-1 CFSDP-053-SD 6/18/2018
Isophorone	--	--	0.017 U	0.0083 U	0.0074 U	0.008 U	0.0058 U	0.0039 U	0.0024 U	0.0052 U	0.0061 U
Naphthalene	--	--	0.013 U	0.0064 U	0.0057 U	0.0062 U	0.0044 U	0.003 U	0.0018 U	0.004 U	0.0046 U
Nitrobenzene	--	--	0.12 U	0.06 U	0.053 U	0.058 U	0.042 U	0.028 U	0.017 U	0.037 U	0.043 U
N-Nitrosodi-N-Propylamine	--	--	0.022 U	0.011 U	0.0099 U	0.011 U	0.0077 U	0.0052 U	0.0032 U	0.0069 U	0.008 U
N-Nitrosodiphenylamine	--	--	0.11 U	0.054 U	0.048 U	0.053 U	0.038 U	0.025 U	0.015 U	0.034 U	0.04 U
Pentachlorophenol	--	--	0.52 UJ	0.26 U	0.23 UJ	0.25 UJ	0.18 UJ	0.12 UJ	0.075 UJ	0.16 U	0.19 U
Phenanthrene	--	--	0.085	0.069	0.045	0.06	0.028 J	0.016 J	0.0025 U	0.026	0.047
Phenol	--	--	0.13 J	0.049 U	0.044 U	0.048 U	0.035 U	0.023 U	0.014 U	0.031 U	0.036 U
Pyrene	--	--	0.1	0.092	0.046	0.087	0.049 J	0.025 J	0.0022 U	0.03	0.12
SEMIVOLATILE ORGANIC COMPOUNDS|LOW LEVEL (mg/kg)											
1,2,4,5-Tetrachlorobenzene	0.027 U	0.0029 U	--	--	--	--	--	--	--	--	--
1,4-Dioxane (P-Dioxane)	0.2 U	0.021 U	--	--	--	--	--	--	--	--	--
2,3,4,6-Tetrachlorophenol	0.26 U	0.028 U	--	--	--	--	--	--	--	--	--
2,4,5-Trichlorophenol	0.045 U	0.0048 U	--	--	--	--	--	--	--	--	--
2,4,6-Trichlorophenol	0.035 U	0.0037 U	--	--	--	--	--	--	--	--	--
2,4-Dichlorophenol	0.049 U	0.0052 U	--	--	--	--	--	--	--	--	--
2,4-Dimethylphenol	0.039 U	0.0042 U	--	--	--	--	--	--	--	--	--
2,4-Dinitrophenol	1.7 U	0.18 U	--	--	--	--	--	--	--	--	--
2,4-Dinitrotoluene	0.031 U	0.0033 U	--	--	--	--	--	--	--	--	--
2,6-Dinitrotoluene	0.039 U	0.0041 U	--	--	--	--	--	--	--	--	--
2-Chloronaphthalene	0.029 U	0.0031 U	--	--	--	--	--	--	--	--	--
2-Chlorophenol	0.029 U	0.0031 U	--	--	--	--	--	--	--	--	--
2-Methylnaphthalene	0.03 U	0.0038 J	--	--	--	--	--	--	--	--	--
2-Methylphenol (O-Cresol)	0.18 U	0.019 U	--	--	--	--	--	--	--	--	--
2-Nitroaniline	0.29 U	0.03 U	--	--	--	--	--	--	--	--	--
2-Nitrophenol	0.036 U	0.0038 U	--	--	--	--	--	--	--	--	--
3,3'-Dichlorobenzidine	0.59 U	0.062 UR	--	--	--	--	--	--	--	--	--
3-Nitroaniline	0.16 U	0.017 U	--	--	--	--	--	--	--	--	--
4,6-Dinitro-2-Methylphenol	1.1 U	0.12 U	--	--	--	--	--	--	--	--	--
4-Bromophenyl Phenyl Ether	0.044 U	0.0047 U	--	--	--	--	--	--	--	--	--
4-Chloro-3-Methylphenol	0.03 U	0.0031 U	--	--	--	--	--	--	--	--	--
4-Chloroaniline	0.021 U	0.0022 U	--	--	--	--	--	--	--	--	--
4-Chlorophenyl Phenyl Ether	0.038 U	0.004 U	--	--	--	--	--	--	--	--	--
4-Nitroaniline	0.031 U	0.0032 U	--	--	--	--	--	--	--	--	--
4-Nitrophenol	0.44 U	0.047 U	--	--	--	--	--	--	--	--	--
Acenaphthene	0.036 U	0.011 J	--	--	--	--	--	--	--	--	--
Acenaphthylene	0.033 J	0.022	--	--	--	--	--	--	--	--	--
Acetophenone	0.034 U	0.0036 U	--	--	--	--	--	--	--	--	--
Anthracene	0.051 J	0.049 J	--	--	--	--	--	--	--	--	--
Atrazine	0.28 UJ	0.029 UJ	--	--	--	--	--	--	--	--	--
Benzaldehyde	0.17 J	0.0083 UR	--	--	--	--	--	--	--	--	--
Benzo(A)Anthracene	0.091 J	0.061 J	--	--	--	--	--	--	--	--	--
Benzo(A)Pyrene	0.094 J	0.051 J	--	--	--	--	--	--	--	--	--
Benzo(B)Fluoranthene	0.096 J	0.044 J	--	--	--	--	--	--	--	--	--
Benzo(G,H,I)Perylene	0.08 J	0.03 J	--	--	--	--	--	--	--	--	--
Benzo(K)Fluoranthene	0.04 J	0.014	--	--	--	--	--	--	--	--	--
Benzyl Butyl Phthalate	0.44 U	0.046 U	--	--	--	--	--	--	--	--	--
Biphenyl (Diphenyl)	0.027 U	0.0028 U	--	--	--	--	--	--	--	--	--
Bis(2-Chloroethoxy) Methane	0.03 U	0.0032 U	--	--	--	--	--	--	--	--	--
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.023 U	0.0024 U	--	--	--	--	--	--	--	--	--
Bis(2-Chloroisopropyl) Ether	0.047 U	0.005 U	--	--	--	--	--	--	--	--	--
Bis(2-Ethylhexyl) Phthalate	0.67 U	0.071 U	--	--	--	--	--	--	--	--	--
Caprolactam	0.41 U	0.044 U	--	--	--	--	--	--	--	--	--
Carbazole	0.03 U	0.0049 J	--	--	--	--	--	--	--	--	--
Chrysene	0.11 J	0.072	--	--	--	--	--	--	--	--	--
Dibenz(A,H)Anthracene	0.028 U	0.0075 J	--	--	--	--	--	--	--	--	--
Dibenzofuran	0.028 U	0.0031 J	--	--	--	--	--	--	--	--	--
Diethyl Phthalate	0.19 U	0.02 U	--	--	--	--	--	--	--	--	--
Dimethyl Phthalate	0.023 U	0.0024 U	--	--	--	--	--	--	--	--	--
Di-N-Butyl Phthalate	0.28 U	0.029 U	--	--	--	--	--	--	--	--	--

Table E-43
Summary of Data Used in Risk Assessment
Hunter Areas (sediment) - Current/ Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Chemical	CFSDP-044 180-82906-1, 200-45660-1, 460-166608-1 CFSDP-044-SD 10/10/2018	CFSDP-045 180-82835-2, 200-45651-2, 460-166517-2 CFSDP-045-SD 10/9/2018	CFSDP-046 180-79106-3, 460-158719-3 CFSDP-046-SD 6/19/2018	CFSDP-047 180-79106-2, 460-158719-2 CFSDP-047-SD 6/19/2018	CFSDP-048 180-79106-4, 200-44014-2, 460-158806-1 CFSDP-048-SD 6/20/2018	CFSDP-049 180-79106-6, 200-44014-4, 460-158806-3 CFSDP-049-SD 6/20/2018	CFSDP-050 180-79106-7, 460-158918-1 CFSDP-050-SD 6/21/2018	CFSDP-050-DUP 180-79106-9, 460-158918-3 CFSDP-DUP3-SD 6/21/2018	CFSDP-051 180-79106-8, 460-158918-2 CFSDP-051-SD 6/21/2018	CFSDP-052 180-78893-2, 200-43929-2, 460-158622-2 CFSDP-052-SD 6/18/2018	CFSDP-053 180-78893-1, 200-43929-1, 460-158622-1 CFSDP-053-SD 6/18/2018
Di-N-Octylphthalate	0.37 U	0.039 U	--	--	--	--	--	--	--	--	--
Fluoranthene	0.18	0.12 J	--	--	--	--	--	--	--	--	--
Fluorene	0.025 U	0.028 J	--	--	--	--	--	--	--	--	--
Hexachlorobenzene	0.045 U	0.0048 U	--	--	--	--	--	--	--	--	--
Hexachlorobutadiene	0.037 U	0.0039 U	--	--	--	--	--	--	--	--	--
Hexachlorocyclopentadiene	0.032 U	0.0034 UJ	--	--	--	--	--	--	--	--	--
Hexachloroethane	0.033 U	0.0034 U	--	--	--	--	--	--	--	--	--
Indeno(1,2,3-C,D)Pyrene	0.056 J	0.022 J	--	--	--	--	--	--	--	--	--
Isophorone	0.032 U	0.0034 U	--	--	--	--	--	--	--	--	--
Naphthalene	0.025 U	0.0026 U	--	--	--	--	--	--	--	--	--
Nitrobenzene	0.23 U	0.024 U	--	--	--	--	--	--	--	--	--
N-Nitrosodi-N-Propylamine	0.043 U	0.0045 U	--	--	--	--	--	--	--	--	--
N-Nitrosodiphenylamine	0.21 U	0.022 U	--	--	--	--	--	--	--	--	--
Pentachlorophenol	1 U	0.11 U	--	--	--	--	--	--	--	--	--
Phenanthrene	0.19	0.21 J-	--	--	--	--	--	--	--	--	--
Phenol	0.19 U	0.02 U	--	--	--	--	--	--	--	--	--
Pyrene	0.16	0.11	--	--	--	--	--	--	--	--	--

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-44
Summary of Data Used in Risk Assessment
Main Plant Area Soil (0-0.5 ft-bgs) - RSD High Adjusted - Current
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Sample Depth Chemical	CFISS-030 240-67693-1 CFISS-030-SO-0-0.5 0-0.5 ft 7/25/2016	CFISS-031 240-67287-1 CFISS-031-S0-0-0.5 0-0.5 ft 7/13/2016	CFISS-032 240-67138-5 CFISS-032-SO-0-0.5 0-0.5 ft 7/12/2016	CFISS-033 240-67138-7 CFISS-033-SO-0-0.5 0-0.5 ft 7/12/2016	CFISS-034 240-67138-1 CFISS-034-SO-0-0.5 0-0.5 ft 7/11/2016	CFISS-035 240-67138-3 CFISS-035-SO-0-0.5 0-0.5 ft 7/11/2016	CFISS-036 240-67353-1 CFISS-036-SO-0-0.5 0-0.5 ft 7/15/2016	CFISS-039 240-67287-7 CFISS-039-S0-0-0.5 0-0.5 ft 7/14/2016	CFISS-040 240-67287-3 CFISS-040-S0-0-0.5 0-0.5 ft 7/13/2016	CFISS-041 240-67353-6 CFISS-41-SO-0-0.5 0-0.5 ft 7/16/2016	CFISS-042 240-67463-3 CFISS-042-SO-0-0.5 0-0.5 ft 7/18/2016
GENERAL CHEMISTRY (mg/kg)											
Fluoride	325.445 J-	471.292	71.4773	655.711	362.811	111.857	67.8612	73.4059	420.667	101.611	761.782
Cyanide	0.560811	1.12162	0.434629	1.13564	0.701014	0.686993	0.182264	0.0672973 J	0.322466	0.266385	0.0420608 J
METALS (mg/kg)											
Chromium, Hexavalent - Estimated	0.547436	0.594782	0.506009	1.00018	0.494172	0.429072	0.461622	0.381726	0.855184	0.60366	0.872939
Chromium, Trivalent - Estimated	19.9068	21.6284	18.4003	36.3702	17.9699	15.6026	16.7863	13.8809	31.0976	21.9513	31.7432
Aluminum	23553.5	30671.9	24914.4	37895	31300	21041.1	15807	15597.7	23030.1	16225.8	25228.4
Antimony	0.537888 J-	0.499467 J-	0.256137 J-	1.28069 J-	2.56137 J-	0.20491 J-	0.307365 J-	0.140875 J-	0.69157 J-	0.678763 J-	4.61047 J-
Arsenic	7.05764	6.26081	7.17148	9.78963	7.05764	5.46398	6.03315	5.12248	6.48848	6.71614	16.9611
Barium	132.122	120.678	254.881 J+	272.566 J+	297.534 J+	201.824 J+	162.291	164.372	124.84	121.719	159.17
Beryllium	0.850555	1.16951	0.98877	1.59479	1.48847	0.924978	0.510333 J	0.637916	0.797395	0.542229 J	1.06319 J
Cadmium	0.448591 J	0.678638 J	0.322066 J	1.84038	0.356573 J	0.299061 J	0.299061 J	0.0943192 J	0.724648 J	0.58662 J	1.02371 J
Calcium	30433.3	19145.3	14718.7	10181.3	10767.9	16600	17928	14608	26006.6	17264	31872
Chromium, Total	20.4542	22.2232	18.9063	37.3704	18.4641	16.0317	17.2479	14.2627	31.9528	22.5549	32.6162
Cobalt	6.52107	6.00352	7.34914	8.48774	6.72808	6.21054	7.03861	6.52107	6.72808	7.34914	7.76317
Copper	29.7529	40.0822	26.1601	104.753	25.9356	25.0374	29.3038	17.7395	33.5703	51.3097	387.349
Iron	16026.9	17474.5	19542.5	23885.2	18094.9	16440.5	18094.9	16647.3	18301.7	20059.5	31330
Lead	49.3068	36.8316	28.5148	125.643	74.2572	23.4653	29.4058	17.8217	67.4255	53.6137	123.415
Magnesium	11001.8	8462.09	9798.76	9613.68	10796.1	10693.3	8369.56	9212.68	10796.1	7896.58	7444.18
Manganese	486.963	408.796	482.738	564.075	448.936	425.697	589.426	507.034	427.81	552.455	496.47
Mercury	0.048031 J	0.011620407 UJ	0.07592 J	0.013169795 U	0.013169795 U	0.0402841 J	0.012395101 UJ	0.020142 J-	0.013169795 UJ	0.012395101 UJ	0.0325371 J
Nickel	46.9356	54.4911	29.993	71.8916	24.727	20.7203	22.7809	15.3399	48.9962	35.6024	63.7637
Potassium	1476.76 J+	1721.12	1402.4	2039.85	1944.23	1296.15	927.493	929.618	1859.24	1051.8	1625.5
Selenium	1.67942 J	1.19959 J	2.51914 J	3.11893 J	2.99897 J	2.15926 J	1.31955 J	1.31955 J	1.31955 J	1.31955 J	1.03165 J
Silver	0.0795912 J	0.0719592 J	0.0686883 J	0.174446 J	0.272573 J	0.0588757 J	0.0719592 J	0.0392505 J	0.59966 J	0.130835 J	0.7523 J
Sodium	887.728	1948.03	268.018 J	3987.58	1778.07	217.029 J	120.543 J	186.959 J	1621.18	177.807 J	3229.29
Thallium	0.125794 J	0.13723 J+	0.114359 J	0.205845 J	0.251589 J	0.125794 J	0.113215 J+	0.099492 J+	0.148666 J+	0.109784 J+	0.160102 J
Vanadium	22.4971	23.9168	21.7327	48.5982	21.6234	14.7433	14.6341	13.4327	21.9511	15.1801	23.48
Zinc	111.81	102.342 J	84.759	178.084	81.4904	71.0082	86.5624 J	54.3269 J	113.839 J	154.415 J	846.463 J+
PESTICIDES (mg/kg)											
Aldrin	0.000395 U	0.00041 U	0.0004 U	0.000395 U	0.000405 U	0.00039 U	0.000405 U	0.000405 U	0.000395 U	0.0004 U	0.00041 U
Alpha Bhc (Alpha Hexachlorocyclohexane)	0.000295 U	0.00031 U	0.0003 U	0.0003 U	0.000305 U	0.000295 U	0.000305 U	0.000305 U	0.0003 U	0.000305 U	0.000305 U
Alpha Endosulfan	0.000455 U	0.000475 U	0.00046 U	0.000455 U	0.000465 U	0.00045 U	0.000465 U	0.000465 U	0.000455 U	0.00046 U	0.00047 U
Beta Bhc (Beta Hexachlorocyclohexane)	0.000315 U	0.00033 U	0.00032 U	0.000315 U	0.000325 U	0.000315 U	0.000325 U	0.000325 U	0.00032 U	0.000325 U	0.00033 U
Beta Endosulfan	0.0005 U	0.00055 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.00055 U	0.00055 U	0.0005 U	0.0005 U	0.00055 U
cis-Chlordane	0.00055 U	0.00055 U	0.00055 U	0.00055 U	0.00055 U	0.00055 U	0.00055 U	0.00055 U	0.00055 U	0.00055 U	0.00055 U
Delta BHC (Delta Hexachlorocyclohexane)	0.000355 U	0.00037 U	0.00036 U	0.000355 U	0.000365 U	0.000355 U	0.000365 U	0.000365 U	0.00036 U	0.000365 U	0.00037 U
Dieldrin	0.000425 U	0.00044 U	0.00043 U	0.000425 U	0.000435 U	0.00042 U	0.000435 U	0.000435 U	0.000425 U	0.00043 U	0.00044 U
Endosulfan Sulfate	0.00038 U	0.000395 U	0.000385 U	0.00038 U	0.00039 U	0.000375 U	0.00039 U	0.00039 U	0.00038 U	0.000385 U	0.000395 U
Endrin Aldehyde	0.000405 U	0.00042 U	0.00041 U	0.000405 U	0.000415 U	0.0004 U	0.000415 U	0.000415 U	0.000405 U	0.00041 U	0.00042 U
Endrin Ketone	0.000455 U	0.000475 U	0.00046 U	0.000455 U	0.000465 U	0.00045 U	0.000465 U	0.000465 U	0.000455 U	0.00046 U	0.00047 U
Endrin	0.000415 U	0.00043 U	0.00042 U	0.000415 U	0.000425 U	0.00041 U	0.000425 U	0.000425 U	0.000415 U	0.00042 U	0.00043 U
Gamma Bhc (Lindane)	0.00029 U	0.000305 U	0.000295 U	0.000295 U	0.0003 U	0.00029 U	0.0003 U	0.0003 U	0.000295 U	0.0003 U	0.0003 U
Heptachlor Epoxide	0.00065 U	0.00065 U	0.00065 U	0.00065 U	0.00065 U	0.00065 U	0.00065 U	0.00065 U	0.00065 U	0.00065 U	0.00065 U
Heptachlor	0.00042 U	0.000435 U	0.000425 U	0.00042 U	0.00043 U	0.000415 U	0.00043 U	0.00043 U	0.00042 U	0.000425 U	0.000435 U
Methoxychlor	0.0007 U	0.0007 U	0.0007 U	0.0007 U	0.0007 U	0.0007 U	0.0007 U	0.0007 U	0.0007 U	0.0007 U	0.0007 U
P,P'-DDD	0.00043 U	0.000445 U	0.000435 U	0.00043 U	0.00044 U	0.000425 U	0.00044 U	0.00044 U	0.00043 U	0.000435 U	0.000445 U
P,P'-DDE	0.000475 U	0.000495 U	0.00048 U	0.000475 U	0.000485 U	0.00047 U	0.000485 U	0.000485 U	0.000475 U	0.00048 U	0.00049 U
P,P'-DDT	0.000335 U	0.00035 U	0.00034 U	0.000335 U	0.000345 U	0.000335 U	0.000345 U	0.000345 U	0.00034 U	0.000345 U	0.00035 U
Toxaphene	0.0095 U	0.01 U	0.0095 U	0.0095 U	0.0095 U	0.0095 U	0.01 U	0.01 U	0.0095 U	0.0095 U	0.01 U
trans-Chlordane	0.0007 U	0.00075 U	0.0007 U	0.0007 U	0.0007 U	0.0007 U	0.00075 U	0.00075 U	0.0007 U	0.0007 U	0.00075 U

Table E-44
Summary of Data Used in Risk Assessment
Main Plant Area Soil (0-0.5 ft-bgs) - RSD High Adjusted - Current
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Sample Depth Chemical	CFISS-030 240-67693-1 CFISS-030-SO-0-0.5 0-0.5 ft 7/25/2016	CFISS-031 240-67287-1 CFISS-031-S0-0-0.5 0-0.5 ft 7/13/2016	CFISS-032 240-67138-5 CFISS-032-SO-0-0.5 0-0.5 ft 7/12/2016	CFISS-033 240-67138-7 CFISS-033-SO-0-0.5 0-0.5 ft 7/12/2016	CFISS-034 240-67138-1 CFISS-034-SO-0-0.5 0-0.5 ft 7/11/2016	CFISS-035 240-67138-3 CFISS-035-SO-0-0.5 0-0.5 ft 7/11/2016	CFISS-036 240-67353-1 CFISS-036-SO-0-0.5 0-0.5 ft 7/15/2016	CFISS-039 240-67287-7 CFISS-039-S0-0-0.5 0-0.5 ft 7/14/2016	CFISS-040 240-67287-3 CFISS-040-S0-0-0.5 0-0.5 ft 7/13/2016	CFISS-041 240-67353-6 CFISS-41-SO-0-0.5 0-0.5 ft 7/16/2016	CFISS-042 240-67463-3 CFISS-042-SO-0-0.5 0-0.5 ft 7/18/2016
POLYCHLORINATED BIPHENYLS (mg/kg)											
PCB-1016 (Aroclor 1016)	0.00435 U	0.0045 U	0.0044 U	0.00435 U	0.00445 U	0.0043 U	0.00445 U	0.00445 U	0.00435 U	0.0044 U	0.0045 U
PCB-1221 (Aroclor 1221)	0.00435 U	0.0045 U	0.0044 U	0.00435 U	0.00445 U	0.0043 U	0.00445 U	0.00445 U	0.00435 U	0.0044 U	0.0045 U
PCB-1232 (Aroclor 1232)	0.00435 U	0.0045 U	0.0044 U	0.00435 U	0.00445 U	0.0043 U	0.00445 U	0.00445 U	0.00435 U	0.0044 U	0.0045 U
PCB-1242 (Aroclor 1242)	0.00435 U	0.0045 U	0.0044 U	0.00435 U	0.00445 U	0.0043 U	0.00445 U	0.00445 U	0.00435 U	0.0044 U	0.0045 U
PCB-1248 (Aroclor 1248)	0.00435 U	0.0045 U	0.0044 U	0.00435 U	0.00445 U	0.0043 U	0.00445 U	0.00445 U	0.00435 U	0.0044 U	0.0045 U
PCB-1254 (Aroclor 1254)	0.010780937 U	0.011260089 U	0.010900725 U	0.010780937 U	0.011020513 U	0.010661149 U	0.011020513 U	0.011020513 U	0.010780937 U	0.010900725 U	0.011140301 U
PCB-1260 (Aroclor 1260)	0.0045 U	0.0047 U	0.00455 U	0.0045 U	0.0046 U	0.00445 U	0.0046 U	0.0046 U	0.0045 U	0.00455 U	0.00465 U
PCB-1262 (Aroclor 1262)	0.0045 U	0.0047 U	0.00455 U	0.0045 U	0.0046 U	0.00445 U	0.0046 U	0.0046 U	0.0045 U	0.00455 U	0.00465 U
PCB-1268 (Aroclor 1268)	0.0045 U	0.0047 U	0.00455 U	0.0045 U	0.0046 U	0.00445 U	0.0046 U	0.0046 U	0.0045 U	0.00455 U	0.00465 U
Polychlorinated Biphenyl (PCBs)	0.010780937 U	0.011260089 U	0.010900725 U	0.010780937 U	0.011020513 U	0.010661149 U	0.011020513 U	0.011020513 U	0.010780937 U	0.010900725 U	0.011140301 U
SEMIVOLATILE ORGANIC COMPOUNDS (mg/kg)											
1,2,4,5-Tetrachlorobenzene	0.024 U	0.012 U	0.0125 U	0.25 U	0.305 U	0.06 U	0.0125 U	0.012 U	0.125 U	0.012 U	0.0245 U
1,4-Dioxane (P-Dioxane)	0.085 U	0.044 U	0.044 U	0.9 U	1.1 U	0.225 U	0.045 U	0.0435 U	0.445 U	0.043 U	0.09 U
2,3,4,6-Tetrachlorophenol	0.0305 U	0.0155 U	0.0155 U	0.315 U	0.385 U	0.08 U	0.016 U	0.0155 U	0.155 U	0.015 U	0.031 U
2,4,5-Trichlorophenol	0.032 U	0.0165 U	0.0165 U	0.335 U	0.405 U	0.085 U	0.0165 U	0.016 U	0.165 U	0.016 U	0.033 U
2,4,6-Trichlorophenol	0.009 U	0.0047 U	0.0047 U	0.095 U	0.115 U	0.0235 U	0.00475 U	0.0046 U	0.047 U	0.0046 U	0.0095 U
2,4-Dichlorophenol	0.0075 U	0.0039 U	0.0039 U	0.08 U	0.095 U	0.0195 U	0.00395 U	0.00385 U	0.039 U	0.0038 U	0.008 U
2,4-Dimethylphenol	0.07 U	0.036 U	0.0365 U	0.75 U	0.9 U	0.185 U	0.037 U	0.0355 U	0.365 U	0.0355 U	0.075 U
2,4-Dinitrophenol	0.245 U	0.125 UJ	0.125 UJ	2.55 UJ	3.1 UJ	0.65 U	0.125 U	0.125 UJ	1.25 U	0.12 U	0.25 U
2,4-Dinitrotoluene	0.0125 U	0.0065 U	0.0065 U	0.135 U	0.16 U	0.033 U	0.0065 U	0.0065 U	0.065 U	0.0065 U	0.013 U
2,6-Dinitrotoluene	0.017 U	0.009 U	0.009 U	0.18 U	0.215 U	0.0445 U	0.009 U	0.0085 U	0.09 U	0.0085 U	0.0175 U
2-Chloronaphthalene	0.0075 U	0.00375 U	0.00375 U	0.075 U	0.09 U	0.019 U	0.0038 U	0.0037 U	0.0375 U	0.00365 U	0.0075 U
2-Chlorophenol	0.008 U	0.0042 U	0.0042 U	0.085 U	0.105 U	0.021 U	0.00425 U	0.00415 U	0.042 U	0.0041 U	0.0085 U
2-Methylnaphthalene	0.0455882 J	0.0161765 J	0.0191176 J	0.110294037 U	0.132352845 U	0.027205863 U	0.132353 J	0.0135294 J	0.67647 J	0.136765 J	0.144118 J
2-Methylphenol (O-Cresol)	0.014 U	0.007 U	0.007 U	0.145 U	0.18 U	0.0365 U	0.0075 U	0.007 U	0.07 U	0.007 U	0.0145 U
2-Nitroaniline	0.0105 U	0.0055 U	0.0055 U	0.11 U	0.135 U	0.0275 U	0.0055 U	0.0055 U	0.055 U	0.0055 U	0.011 U
2-Nitrophenol	0.011 U	0.0055 U	0.0055 U	0.115 U	0.135 U	0.028 U	0.0055 U	0.0055 U	0.055 U	0.0055 U	0.011 UJ
3- And 4- Methylphenol (Total)	0.0085 U	0.0044 U	0.0044 U	0.09 U	0.11 U	0.022 U	0.00445 U	0.00435 U	0.044 U	0.0043 U	0.009 U
3,3'-Dichlorobenzidine	0.036 U	0.0185 U	0.0185 U	0.375 U	0.455 U	0.095 U	0.0185 U	0.018 U	0.185 U	0.018 U	0.037 U
3-Nitroaniline	0.0095 U	0.0049 U	0.0049 U	0.1 U	0.12 U	0.0245 U	0.005 U	0.0048 U	0.049 U	0.0048 U	0.01 U
4,6-Dinitro-2-Methylphenol	0.085 U	0.044 U	0.044 U	0.9 U	1.1 U	0.225 U	0.045 U	0.0435 U	0.44 U	0.043 U	0.09 U
4-Bromophenyl Phenyl Ether	0.01 U	0.005 U	0.005 U	0.105 U	0.13 U	0.0265 U	0.0055 U	0.005 U	0.05 U	0.005 U	0.0105 U
4-Chloro-3-Methylphenol	0.014 U	0.007 U	0.007 U	0.145 U	0.175 U	0.036 U	0.007 U	0.007 U	0.07 U	0.007 U	0.014 U
4-Chloroaniline	0.0085 U	0.00425 U	0.00425 U	0.085 U	0.105 U	0.0215 U	0.0043 U	0.0042 U	0.0425 U	0.00415 U	0.0085 U
4-Chlorophenyl Phenyl Ether	0.0095 U	0.00495 U	0.00495 U	0.1 U	0.12 U	0.025 U	0.005 U	0.00485 U	0.0495 U	0.00485 U	0.01 U
4-Nitroaniline	0.012 U	0.006 U	0.006 U	0.125 U	0.155 U	0.0315 U	0.0065 U	0.006 U	0.065 U	0.006 U	0.0125 U
4-Nitrophenol	0.155 U	0.08 U	0.08 U	1.6 U	1.95 U	0.4 U	0.08 U	0.08 U	0.8 U	0.08 U	0.16 U
Acenaphthene	0.397529 J	0.0567899 J	0.17037 J	2.12962 J	6.53084 J	0.993823 J	0.369134 J	0.0511109 J	5.39504	0.440122 J	0.425924 J
Acenaphthylene	0.011572658 U	0.005786329 U	0.005786329 U	0.115726579 U	0.142956363 U	0.029272017 U	0.0136149 J	0.005718255 U	0.05786329 U	0.00565018 U	0.011572658 U
Acetophenone	0.010111111 U	0.0052 U	0.0052 U	0.108333333 U	0.13 U	0.026 U	0.005272222 U	0.005127778 U	0.052 U	0.005055556 U	0.010111111 U
Anthracene	0.908523	0.178951 J	0.344137 J	6.33213 J	20.6482	5.36854	0.564385	0.0798399 J	6.88275	0.812164	0.688275 J
Atrazine	0.0145 U	0.0075 U	0.0075 U	0.15 U	0.18 U	0.037 U	0.0075 U	0.007 U	0.075 U	0.007 U	0.0145 U
Benzaldehyde	0.0245 U	0.0125 U	0.0125 U	0.255 U	0.31 U	0.065 U	0.013 U	0.0125 U	0.125 U	0.0125 U	0.025 U
Benzo(A)Anthracene	5.94196	0.792262	2.1127	48.8562	132.044	23.7679	1.25441	0.343314	25.0883	3.96131	4.09335
Benzo(A)Pyrene	7.48804	0.803262	2.58678	59.9043	149.761	28.5907	1.49761	0.462897	31.3136	4.76512	5.58199
Benzo(B)Fluoranthene	8.43979	1.29843	2.98639	64.9215	168.796	29.8639	2.33717	0.54534	38.9529	5.71309	7.01152
Benzo(G,H,I)Perylene	9.41591	0.980824 J+	2.09242 J-	48.3873 J-	117.699 J-	23.5398 J-	1.02006	0.549262 J+	34.0019	5.10029	8.23892
Benzo(K)Fluoranthene	3.15075	0.406972	1.15528	27.5691	61.7022	11.684	0.892713	0.21005	12.9969	2.49435	2.88819
Benzyl Butyl Phthalate	0.048 J	0.005 U	0.005 U	0.59 J	0.125 U	0.026 U	0.005 U	0.005 U	0.05 U	0.029 J	0.037 J
Biphenyl (Diphenyl)	0.041168735 U	0.020958629 U	0.020958629 U	0.4266578 U	0.52396572 U	0.104793144 U	0.021707151 U	0.020958629 U	0.209586288 U	0.020958629 U	0.041917258 U
Bis(2-Chloroethoxy) Methane	0.01 U	0.005 U	0.005 U	0.105 U	0.125 U	0.026 U	0.005 U	0.005 U	0.05 U	0.005 U	0.0105 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.0075 U	0.0039 U	0.0039 U	0.08 U	0.095 U	0.0195 U	0.00395 U	0.00385 U	0.039 U	0.0038 U	0.008 U

Table E-44
Summary of Data Used in Risk Assessment
Main Plant Area Soil (0-0.5 ft-bgs) - RSD High Adjusted - Current
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Sample Depth Chemical	CFISS-030 240-67693-1 CFISS-030-SO-0-0.5 0-0.5 ft 7/25/2016	CFISS-031 240-67287-1 CFISS-031-S0-0-0.5 0-0.5 ft 7/13/2016	CFISS-032 240-67138-5 CFISS-032-SO-0-0.5 0-0.5 ft 7/12/2016	CFISS-033 240-67138-7 CFISS-033-SO-0-0.5 0-0.5 ft 7/12/2016	CFISS-034 240-67138-1 CFISS-034-SO-0-0.5 0-0.5 ft 7/11/2016	CFISS-035 240-67138-3 CFISS-035-SO-0-0.5 0-0.5 ft 7/11/2016	CFISS-036 240-67353-1 CFISS-036-SO-0-0.5 0-0.5 ft 7/15/2016	CFISS-039 240-67287-7 CFISS-039-S0-0-0.5 0-0.5 ft 7/14/2016	CFISS-040 240-67287-3 CFISS-040-S0-0-0.5 0-0.5 ft 7/13/2016	CFISS-041 240-67353-6 CFISS-41-SO-0-0.5 0-0.5 ft 7/16/2016	CFISS-042 240-67463-3 CFISS-042-SO-0-0.5 0-0.5 ft 7/18/2016
Bis(2-Chloroisopropyl) Ether	0.013 U	0.007 U	0.007 U	0.14 U	0.17 U	0.0345 U	0.007 UJ	0.0065 U	0.07 U	0.0065 U	0.0135 U
Bis(2-Ethylhexyl) Phthalate	0.058 J	0.0065 U	0.0065 U	0.13 U	0.16 U	0.0325 U	0.0065 U	0.0065 U	0.065 U	0.0065 U	0.013 U
Caprolactam	0.023 U	0.012 U	0.012 U	0.24 U	0.295 U	0.06 U	0.012 U	0.0115 U	0.12 U	0.0115 U	0.024 U
Carbazole	0.678747 J	0.169687 J	0.300215 J	4.1769 J	14.3581	2.48004	0.274109 J	0.0482954 J	4.1769 J	0.574324	0.744011 J
Chrysene	7.60918	1.33161	2.71757	52.9925	135.878	24.4581	2.17405	0.489162	33.9696	5.29925	6.52216
Dibenz(A,H)Anthracene	2.51681	0.265663 J+	0.615219 J-	12.7239 J-	36.3539 J-	6.85131 J-	0.335574	0.132831 J+	7.96989 J+	1.39823	1.95752
Dibenzofuran	0.113476 J	0.0480604 J	0.0493954 J	0.307053 J	0.787657 J	0.133501 J	0.200252 J	0.0173551 J	1.73551 J	0.226952 J	0.129496 J
Diethyl Phthalate	0.009 U	0.0047 U	0.0047 U	0.095 U	0.115 U	0.0235 U	0.00475 U	0.0046 U	0.047 U	0.0046 U	0.0095 U
Dimethyl Phthalate	0.0095 U	0.0048 U	0.0048 U	0.1 U	0.12 U	0.024 U	0.0049 U	0.0047 U	0.048 U	0.0047 U	0.0095 U
Di-N-Butyl Phthalate	0.0095 U	0.00495 U	0.018 J	0.1 U	0.12 U	0.025 U	0.005 U	0.00485 U	0.0495 U	0.019 J	0.01 U
Di-N-Octylphthalate	0.0165 U	0.0085 U	0.0085 U	0.17 U	0.205 U	0.0425 U	0.0085 U	0.0085 U	0.085 U	0.008 U	0.017 U
Fluoranthene	9.06188	2.19682	3.15793	57.6665	164.762	30.2063	3.02063	0.631586	48.0554	6.17856	9.06188
Fluorene	0.228904 J	0.0511667 J	0.106373 J-	0.90215 J-	2.42369 J-	0.390483 J-	0.350088 J	0.0323158 J	3.36623 J	0.350088 J	0.175044 J
Hexachlorobenzene	0.013 U	0.0065 U	0.0065 U	0.135 U	0.165 U	0.034 U	0.007 U	0.0065 U	0.065 U	0.0065 U	0.0135 U
Hexachlorobutadiene	0.009 U	0.00465 U	0.00465 U	0.095 U	0.115 U	0.0235 U	0.0047 U	0.00455 U	0.0465 U	0.00455 U	0.0095 UJ
Hexachlorocyclopentadiene	0.02 U	0.0105 U	0.0105 U	0.21 U	0.255 U	0.05 U	0.0105 U	0.01 U	0.105 U	0.01 U	0.0205 U
Hexachloroethane	0.012 U	0.006 U	0.006 U	0.125 U	0.15 U	0.0305 U	0.006 U	0.006 U	0.06 U	0.006 U	0.012 UJ
Indeno(1,2,3-C,D)Pyrene	9.04751	0.930976 J+	2.2291 J-	52.4493 J-	131.123 J-	24.9134 J-	1.12766	0.498269 J+	32.7808 J+	4.98269	7.21178
Isophorone	0.007 U	0.00355 U	0.00355 U	0.07 U	0.09 U	0.018 U	0.0036 U	0.0035 U	0.0355 U	0.00345 U	0.007 U
Naphthalene	0.0913173 J	0.0260907 J	0.0260907 J	0.123205943 U	0.152195577 U	0.030439115 U	0.449339 J	0.0188433 J	1.88433 J	0.405855 J	0.246412 J-
Nitrobenzene	0.01 U	0.005 U	0.005 U	0.105 U	0.13 U	0.0265 U	0.0055 U	0.005 U	0.05 U	0.005 U	0.0105 U
N-Nitrosodi-N-Propylamine	0.011 U	0.0055 U	0.0055 U	0.115 U	0.135 U	0.028 U	0.0055 U	0.0055 U	0.055 U	0.0055 U	0.011 U
N-Nitrosodiphenylamine	0.029 U	0.015 U	0.015 U	0.305 U	0.37 U	0.075 U	0.015 U	0.0145 U	0.15 U	0.0145 U	0.03 U
Pentachlorophenol	0.039 U	0.02 U	0.02 U	0.405 U	0.495 U	0.1 U	0.1 J	0.0195 U	0.2 U	0.0195 U	0.04 U
Phenanthrene	4.06208	1.31035	1.96552	23.5863	68.1382	11.5311	2.22759	0.393105 J	35.3794	4.06208	4.58622
Phenol	0.0105 U	0.0055 U	0.0055 U	0.11 U	0.135 U	0.0275 U	0.0055 U	0.0055 U	0.055 U	0.0055 U	0.033 J
Pyrene	9.89295	1.53271	4.04078	66.8819	167.205	29.2608	1.95072	0.613084	52.9482	7.80289	8.2209

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-45
Summary of Data Used in Risk Assessment
Main Plant Area Soil (0-2 ft-bgs) - RSD High Adjusted - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFISS-030	CFISS-030	CFISS-031	CFISS-031	CFISS-032	CFISS-032	CFISS-033	CFISS-033	CFISS-034	CFISS-034	CFISS-035	CFISS-035	CFISS-036	CFISS-036
Sample Lab IDs	240-67693-1	240-67693-2	240-67287-1	240-67287-2	240-67138-5	240-67138-6	240-67138-7	240-67138-8	240-67138-1	240-67138-2	240-67138-3	240-67138-4	240-67353-1	240-67353-2
Sample Name	CFISS-030-SO-0-0.5	CFISS-030-SO-0.5-2	CFISS-031-S0-0-0.5	CFISS-031-S0-0.5-2	CFISS-032-SO-0-0.5	CFISS-032-SO-0.5-2	CFISS-033-SO-0-0.5	CFISS-033-SO-0.5-2	CFISS-034-SO-0-0.5	CFISS-034-SO-0.5-2	CFISS-035-SO-0-0.5	CFISS-035-SO-0.5-2	CFISS-036-SO-0-0.5	CFISS-036-SO-0.5-2
Sample Depth	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft
Chemical	7/25/2016	7/25/2016	7/13/2016	7/13/2016	7/12/2016	7/12/2016	7/12/2016	7/12/2016	7/11/2016	7/11/2016	7/11/2016	7/11/2016	7/15/2016	7/15/2016
GENERAL CHEMISTRY (mg/kg)														
Fluoride	325.445 J-	382.459 J-	471.292	123.623	71.4773	668.338	655.711	195.737	362.811	913.009	111.857	298.756	67.8612	112.42
Cyanide	0.560811	0.238802	1.12162	0.318402	0.434629	1.59201	1.13564	0.199002	0.701014	0.90214	0.686993	0.676605	0.182264	0.145934
METALS (mg/kg)														
Chromium, Hexavalent - Estimated	0.547436	0.490245	0.594782	0.490245	0.506009	0.458523	1.00018	0.406615	0.494172	0.481593	0.429072	0.429685	0.461622	0.400847
Chromium, Trivalent - Estimated	19.9068	17.8271	21.6284	17.8271	18.4003	16.6736	36.3702	14.786	17.9699	17.5125	15.6026	15.6249	16.7863	14.5763
Aluminum	23553.5	16941.2	30671.9	18091.6	24914.4	20915.1	37895	15268	31300	21228.8	21041.1	16522.9	15807	24156.9
Antimony	0.537888 J-	0.204539 J-	0.499467 J-	0.204539 J-	0.256137 J-	0.255674 J-	1.28069 J-	0.732933 J-	2.56137 J-	0.374989 J-	0.20491 J-	0.255674 J-	0.307365 J-	0.306809 J-
Arsenic	7.05764	5.05047	6.26081	5.15793	7.17148	5.58775	9.78963	5.4803	7.05764	5.69521	5.46398	6.01758	6.03315	5.05047
Barium	132.122	171.512	120.678	213.025	254.881 J+	175.882 J+	272.566 J+	139.832 J+	297.534 J+	132.185 J+	201.824 J+	134.37 J+	162.291	329.916
Beryllium	0.850555	0.639914	1.16951	0.681876	0.98877	0.891684	1.59479	0.618934	1.48847	0.860213	0.924978	0.78678	0.510333 J	0.681876
Cadmium	0.448591 J	0.169647 J	0.678638 J	0.148441 J	0.322066 J	0.148441 J	1.84038	0.296883 J	0.356573 J	0.127235 J	0.299061 J	0.106029 J	0.299061 J	0.190853 J
Calcium	30433.3	23949.3	19145.3	13701.7	14718.7	20149.6	10181.3	22913	10767.9	26942.9	16600	27288.3	17928	8462.84
Chromium, Total	20.4542	18.3173	22.2232	18.3173	18.9063	17.1321	37.3704	15.1926	18.4641	17.9941	16.0317	16.0546	17.2479	14.9771
Cobalt	6.52107	5.91563	6.00352	6.73157	7.34914	6.22161	8.48774	6.52759	6.72808	5.81363	6.21054	6.22161	7.03861	6.83357
Copper	29.7529	21.7629	40.0822	17.5777	26.1601	32.1212	104.753	17.6823	25.9356	17.6823	25.0374	17.6823	29.3038	18.5194
Iron	16026.9	15564.9	17474.5	17203.3	19542.5	17510.5	23885.2	16793.7	18094.9	15564.9	16440.5	16076.9	18094.9	18022.5
Lead	49.3068	17.3595	36.8316	13.7429	28.5148	12.2963	125.643	12.503	74.2572	11.6763	23.4653	10.643	29.4058	12.813
Magnesium	11001.8	10524.6	8462.09	9104.3	9798.76	10320.3	9613.68	11546.4	10796.1	11546.4	10693.3	11955.1	8369.56	6978.94
Manganese	486.963	529.329	408.796	634.338	482.738	442.537	564.075	461.824	448.936	388.961	425.697	444.68	589.426	735.061
Mercury	0.048031 J	0.0203779 J	0.0116204 UJ	0.0108258 UJ	0.07592 J	0.0108258 U	0.0131698 U	0.0089153 U	0.0131698 U	0.010189 U	0.0402841 J	0.0738699 J	0.0123951 UJ	0.0095521 UJ
Nickel	46.9356	19.823	54.4911	17.4783	29.993	18.6506	71.8916	18.2243	24.727	18.6506	20.7203	15.8797	22.7809	15.1337
Potassium	1476.76 J+	1143.96 J+	1721.12	1101.2	1402.4	1443.32	2039.85	984.662	1944.23	2009.95	1296.15	1347.09	927.493	1079.81
Selenium	1.67942 J	1.66693 J	1.19959 J	1.42879 J	2.51914 J	2.02413 J	3.11893 J	2.14319 J	2.99897 J	1.90506 J	2.15926 J	2.26226 J	1.31955 J	1.30973 J
Silver	0.0795912 J	0.0439321 J	0.0719592 J	0.0439321 J	0.0686883 J	0.0494236 J	0.174446 J	0.036244 J	0.272573 J	0.0417355 J	0.0588757 J	0.0406372 J	0.0719592 J	0.0461287 J
Sodium	887.728	500.052	1948.03	233.681 J	268.018 J	1416.61	3987.58	282.112 J	1778.07	4056.11	217.029 J	570.277	120.543 J	128.343 J
Thallium	0.125794 J	0.0948428 J	0.13723 J+	0.104434 J+	0.114359 J	0.100171 J	0.205845 J	0.0841863 J	0.251589 J	0.117221 J	0.125794 J	0.100171 J	0.113215 J+	0.149191 J+
Vanadium	22.4971	14.877	23.9168	16.0134	21.7327	15.9101	48.5982	13.0173	21.6234	15.6001	14.7433	14.0505	14.6341	17.7697
Zinc	111.81	64.9378	102.342 J	60.4048 J	84.759	89.5003	178.084	54.8176	81.4904	47.2275	71.0082	50.1792	86.5624 J	68.5221 J
PESTICIDES (mg/kg)														
Aldrin	0.000395 U	--	0.00041 U	--	0.0004 U	--	0.000395 U	--	0.000405 U	--	0.00039 U	--	0.000405 U	--
Alpha Bhc (Alpha Hexachlorocyclohexane)	0.000295 U	--	0.00031 U	--	0.0003 U	--	0.0003 U	--	0.000305 U	--	0.000295 U	--	0.000305 U	--
Alpha Endosulfan	0.000455 U	--	0.000475 U	--	0.00046 U	--	0.000455 U	--	0.000465 U	--	0.00045 U	--	0.000465 U	--
Beta Bhc (Beta Hexachlorocyclohexane)	0.000315 U	--	0.00033 U	--	0.00032 U	--	0.000315 U	--	0.000325 U	--	0.000315 U	--	0.000325 U	--
Beta Endosulfan	0.0005 U	--	0.00055 U	--	0.0005 U	--	0.0005 U	--	0.0005 U	--	0.0005 U	--	0.00055 U	--
cis-Chlordane	0.00055 U	--	0.00055 U	--	0.00055 U	--	0.00055 U	--	0.00055 U	--	0.00055 U	--	0.00055 U	--
Delta BHC (Delta Hexachlorocyclohexane)	0.000355 U	--	0.00037 U	--	0.00036 U	--	0.000355 U	--	0.000365 U	--	0.000355 U	--	0.000365 U	--
Dieldrin	0.000425 U	--	0.00044 U	--	0.00043 U	--	0.000425 U	--	0.000435 U	--	0.00042 U	--	0.000435 U	--
Endosulfan Sulfate	0.00038 U	--	0.000395 U	--	0.000385 U	--	0.00038 U	--	0.00039 U	--	0.000375 U	--	0.00039 U	--
Endrin Aldehyde	0.000405 U	--	0.00042 U	--	0.00041 U	--	0.000405 U	--	0.000415 U	--	0.0004 U	--	0.000415 U	--
Endrin Ketone	0.000455 U	--	0.000475 U	--	0.00046 U	--	0.000455 U	--	0.000465 U	--	0.00045 U	--	0.000465 U	--
Endrin	0.000415 U	--	0.00043 U	--	0.00042 U	--	0.000415 U	--	0.000425 U	--	0.00041 U	--	0.000425 U	--
Gamma Bhc (Lindane)	0.00029 U	--	0.000305 U	--	0.000295 U	--	0.000295 U	--	0.0003 U	--	0.00029 U	--	0.0003 U	--
Heptachlor Epoxide	0.00065 U	--	0.00065 U	--	0.00065 U	--	0.00065 U	--	0.00065 U	--	0.00065 U	--	0.00065 U	--
Heptachlor	0.00042 U	--	0.000435 U	--	0.000425 U	--	0.00042 U	--	0.00043 U	--	0.000415 U	--	0.00043 U	--
Methoxychlor	0.0007 U	--	0.0007 U	--	0.0007 U	--	0.0007 U	--	0.0007 U	--	0.0007 U	--	0.0007 U	--
P,P'-DDD	0.00043 U	--	0.000445 U	--	0.000435 U	--	0.00043 U	--	0.00044 U	--	0.000425 U	--	0.00044 U	--
P,P'-DDE	0.000475 U	--	0.000495 U	--	0.00048 U	--	0.000475 U	--	0.000485 U	--	0.00047 U	--	0.000485 U	--
P,P'-DDT	0.000335 U	--	0.00035 U	--	0.00034 U	--	0.000335 U	--	0.000345 U	--	0.000335 U	--	0.000345 U	--
Toxaphene	0.0095 U	--	0.01 U	--	0.0095 U	--	0.0095 U	--	0.0095 U	--	0.0095 U	--	0.01 U	--
trans-Chlordane	0.0007 U	--	0.00075 U	--	0.0007 U	--	0.0007 U	--	0.0007 U	--	0.0007 U	--	0.00075 U	--
POLYCHLORINATED BIPHENYLS (mg/kg)														
PCB-1016 (Aroclor 1016)	0.00435 U	0.0044 U	0.0045 U	0.0045 U	0.0044 U	0.0044 U	0.00435 U	0.00445 U	0.00445 U	0.00435 U	0.0043 U	0.0044 U	0.00445 U	0.0047 U
PCB-1221 (Aroclor 1221)	0.00435 U	0.0044 U	0.0045 U	0.0045 U	0.0044 U	0.0044 U	0.00435 U	0.00445 U	0.00445 U	0.00435 U	0.0043 U	0.0044 U	0.00445 U	0.0047 U
PCB-1232 (Aroclor 1232)	0.00435 U	0.0044 U	0.0045 U	0.0045 U	0.0044 U	0.0044 U	0.00435 U	0.00445 U	0.00445 U	0.00435 U	0.0043 U	0.0044 U	0.00445 U	0.0047 U
PCB-1242 (Aroclor 1242)	0.00435 U	0.0044 U	0.0045 U	0.0045 U	0.0044 U	0.0044 U	0.00435 U	0.00445 U	0.00445 U	0.00435 U	0.0043 U	0.0044 U	0.00445 U	0.0047 U
PCB-1248 (Aroclor 1248)	0.00435 U	0.0044 U	0.0045 U	0.0045 U	0.0044 U	0.0044 U	0.00435 U	0.00445 U	0.00445 U	0.00435 U	0.0043 U	0.0044 U	0.00445 U	0.0047 U
PCB-1254 (Aroclor 1254)	0.0107809 U	0.0058781 U	0.0112601 U	0.0060073 U	0.0109007 U	0.0058781 U	0.0107809 U	0.0059427 U	0.0110205 U	0.0058135 U	0.0106611 U	0.0058781 U	0.0110205 U	0.0063303 U
PCB-1260 (Aroclor 1260)	0.0045 U	0.00455 U	0.0047 U	0.00465 U	0.00455 U	0.00455 U	0.0045 U	0.0046 U	0.0046 U	0.0045 U	0.00445 U	0.00455 U	0.0046 U	0.0049 U
PCB-1262 (Aroclor 1262)	0.0045 U	0.00455 U	0.0047 U	0.00465 U	0.00455 U	0.00455 U	0.0045 U	0.0046 U	0.0046 U	0.0045 U	0.00445 U	0.00455 U	0.0046 U	0.0049 U

Table E-45
Summary of Data Used in Risk Assessment
Main Plant Area Soil (0-2 ft-bgs) - RSD High Adjusted - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Sample Depth Chemical	CFISS-030 240-67693-1 CFISS-030-SO-0-0.5 0-0.5 ft 7/25/2016	CFISS-030 240-67693-2 CFISS-030-SO-0.5-2 0.5-2 ft 7/25/2016	CFISS-031 240-67287-1 CFISS-031-S0-0-0.5 0-0.5 ft 7/13/2016	CFISS-031 240-67287-2 CFISS-031-S0-0.5-2 0.5-2 ft 7/13/2016	CFISS-032 240-67138-5 CFISS-032-SO-0-0.5 0-0.5 ft 7/12/2016	CFISS-032 240-67138-6 CFISS-032-SO-0.5-2 0.5-2 ft 7/12/2016	CFISS-033 240-67138-7 CFISS-033-SO-0-0.5 0-0.5 ft 7/12/2016	CFISS-033 240-67138-8 CFISS-033-SO-0.5-2 0.5-2 ft 7/12/2016	CFISS-034 240-67138-1 CFISS-034-SO-0-0.5 0-0.5 ft 7/11/2016	CFISS-034 240-67138-2 CFISS-034-SO-0.5-2 0.5-2 ft 7/11/2016	CFISS-035 240-67138-3 CFISS-035-SO-0-0.5 0-0.5 ft 7/11/2016	CFISS-035 240-67138-4 CFISS-035-SO-0.5-2 0.5-2 ft 7/11/2016	CFISS-036 240-67353-1 CFISS-036-SO-0-0.5 0-0.5 ft 7/15/2016	CFISS-036 240-67353-2 CFISS-036-SO-0.5-2 0.5-2 ft 7/15/2016
PCB-1268 (Aroclor 1268)	0.0045 U	0.00455 U	0.0047 U	0.00465 U	0.00455 U	0.00455 U	0.0045 U	0.0046 U	0.0046 U	0.0045 U	0.00445 U	0.00455 U	0.0046 U	0.0049 U
Polychlorinated Biphenyl (PCBs)	0.0107809 U	0.0058781 U	0.0112601 U	0.0060073 U	0.0109007 U	0.0058781 U	0.0107809 U	0.0059427 U	0.0110205 U	0.0058135 U	0.0106611 U	0.0058781 U	0.0110205 U	0.0063303 U
SEMIVOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,2,4,5-Tetrachlorobenzene	0.024 U	0.012 U	0.012 U	0.025 U	0.0125 U	0.012 U	0.25 U	0.012 U	0.305 U	0.012 U	0.06 U	0.0125 U	0.0125 U	0.0135 U
1,4-Dioxane (P-Dioxane)	0.085 U	0.0425 U	0.044 U	0.09 U	0.044 U	0.0435 U	0.9 U	0.044 U	1.1 U	0.043 U	0.225 U	0.0445 U	0.045 U	0.0475 U
2,3,4,6-Tetrachlorophenol	0.0305 U	0.015 U	0.0155 U	0.032 U	0.0155 U	0.0155 U	0.315 U	0.0155 U	0.385 U	0.015 U	0.08 U	0.0155 U	0.016 U	0.017 U
2,4,5-Trichlorophenol	0.032 U	0.016 U	0.0165 U	0.0335 U	0.0165 U	0.016 U	0.335 U	0.0165 U	0.405 U	0.016 U	0.085 U	0.0165 U	0.0165 U	0.018 U
2,4,6-Trichlorophenol	0.009 U	0.00455 U	0.0047 U	0.0095 U	0.0047 U	0.00465 U	0.095 U	0.00465 U	0.115 U	0.0046 U	0.0235 U	0.00475 U	0.00475 U	0.005 U
2,4-Dichlorophenol	0.0075 U	0.00375 U	0.0039 U	0.008 U	0.0039 U	0.00385 U	0.08 U	0.00385 U	0.095 U	0.0038 U	0.0195 U	0.00395 U	0.00395 U	0.0042 U
2,4-Dimethylphenol	0.07 U	0.035 U	0.036 U	0.075 U	0.0365 U	0.036 U	0.75 U	0.036 U	0.9 U	0.0355 U	0.185 U	0.0365 U	0.037 U	0.0395 U
2,4-Dinitrophenol	0.245 U	0.12 U	0.125 UJ	0.255 U	0.125 UJ	0.125 UJ	2.55 UJ	0.125 U	3.1 UJ	0.12 U	0.65 U	0.125 UJ	0.125 U	0.135 U
2,4-Dinitrotoluene	0.0125 U	0.0065 U	0.0065 U	0.0135 U	0.0065 U	0.0065 U	0.135 U	0.0065 U	0.16 U	0.0065 U	0.033 U	0.0065 U	0.0065 U	0.007 U
2,6-Dinitrotoluene	0.017 U	0.0085 U	0.009 U	0.018 U	0.009 U	0.0085 U	0.18 U	0.0085 U	0.215 U	0.0085 U	0.0445 U	0.009 U	0.009 U	0.0095 U
2-Chloronaphthalene	0.0075 U	0.0036 U	0.00375 U	0.0075 U	0.00375 U	0.0037 U	0.075 U	0.0037 U	0.09 U	0.00365 U	0.019 U	0.00375 U	0.0038 U	0.00405 U
2-Chlorophenol	0.008 U	0.00405 U	0.0042 U	0.0085 U	0.0042 U	0.00415 U	0.085 U	0.00415 U	0.105 U	0.0041 U	0.021 U	0.00425 U	0.00425 U	0.00455 U
2-Methylnaphthalene	0.0455882 J	0.014477 J	0.0161765 J	0.0110794 U	0.0191176 J	0.017727 J	0.110294 U	0.0053181 U	0.1323528 U	0.0127043 J	0.0272059 U	0.005392 U	0.132353 J	0.0058351 U
2-Methylphenol (O-Cresol)	0.014 U	0.007 U	0.007 U	0.015 U	0.007 U	0.007 U	0.145 U	0.007 U	0.18 U	0.007 U	0.0365 U	0.007 U	0.0075 U	0.008 U
2-Nitroaniline	0.0105 U	0.0055 U	0.0055 U	0.011 U	0.0055 U	0.0055 U	0.11 U	0.0055 U	0.135 U	0.0055 U	0.0275 U	0.0055 U	0.0055 U	0.006 U
2-Nitrophenol	0.011 U	0.0055 U	0.0055 U	0.0115 U	0.0055 U	0.0055 U	0.115 U	0.0055 U	0.135 U	0.0055 U	0.028 U	0.0055 U	0.0055 U	0.006 U
3- And 4- Methylphenol (Total)	0.0085 U	0.00425 U	0.0044 U	0.009 U	0.0044 U	0.00435 U	0.09 U	0.00435 U	0.11 U	0.0043 U	0.022 U	0.00445 U	0.00445 U	0.00475 U
3,3'-Dichlorobenzidine	0.036 U	0.018 U	0.0185 U	0.038 U	0.0185 U	0.018 U	0.375 U	0.0185 U	0.455 U	0.018 U	0.095 U	0.0185 U	0.0185 U	0.02 U
3-Nitroaniline	0.0095 U	0.0047 U	0.0049 U	0.01 U	0.0049 U	0.00485 U	0.1 U	0.00485 U	0.12 U	0.0048 U	0.0245 U	0.00495 U	0.005 U	0.0055 U
4,6-Dinitro-2-Methylphenol	0.085 U	0.0425 U	0.044 U	0.09 U	0.044 U	0.0435 U	0.9 U	0.0435 U	1.1 U	0.043 U	0.225 U	0.0445 U	0.045 U	0.0475 U
4-Bromophenyl Phenyl Ether	0.01 U	0.005 U	0.005 U	0.0105 U	0.005 U	0.005 U	0.105 U	0.005 U	0.13 U	0.005 U	0.0265 U	0.005 U	0.0055 U	0.0055 U
4-Chloro-3-Methylphenol	0.014 U	0.007 U	0.007 U	0.0145 U	0.007 U	0.007 U	0.145 U	0.007 U	0.175 U	0.007 U	0.036 U	0.007 U	0.007 U	0.0075 U
4-Chloroaniline	0.0085 U	0.0041 U	0.00425 U	0.0085 U	0.00425 U	0.0042 U	0.085 U	0.0042 U	0.105 U	0.00415 U	0.0215 U	0.0043 U	0.0043 U	0.0046 U
4-Chlorophenyl Phenyl Ether	0.0095 U	0.00475 U	0.00495 U	0.01 U	0.00495 U	0.0049 U	0.1 U	0.0049 U	0.12 U	0.00485 U	0.025 U	0.005 U	0.005 U	0.0055 U
4-Nitroaniline	0.012 U	0.006 U	0.006 U	0.013 U	0.006 U	0.006 U	0.125 U	0.006 U	0.155 U	0.006 U	0.0315 U	0.0065 U	0.0065 U	0.0065 U
4-Nitrophenol	0.155 U	0.075 U	0.08 U	0.165 U	0.08 U	0.08 U	1.6 U	0.08 U	1.95 U	0.08 U	0.4 U	0.08 U	0.08 U	0.085 U
Acenaphthene	0.397529 J	0.0904708 J	0.0567899 J	0.0723766 J	0.17037 J	0.121231 J	2.12962 J	0.21713 J	6.53084 J	0.0778049 J	0.993823 J	0.0325695 J	0.369134 J	0.0452354 J
Acenaphthylene	0.0115727 U	0.0066751 U	0.0057863 U	0.0138386 U	0.0057863 U	0.0068379 U	0.1157266 U	0.0068379 U	0.1429564 U	0.0067565 U	0.029272 U	0.0070007 U	0.0136149 J	0.0074891 U
Acetophenone	0.0101111 U	0.004869 U	0.0052 U	0.0105848 U	0.0052 U	0.0050101 U	0.1083333 U	0.0050101 U	0.13 U	0.0049396 U	0.026 U	0.0050807 U	0.0052722 U	0.0055041 U
Anthracene	0.908523	0.182369 J	0.178951 J	0.218842 J	0.344137 J	0.310027 J	6.33213 J	0.656527	20.6482	0.218842 J	5.36854	0.093008 J	0.564385	0.0656527 J
Atrazine	0.0145 U	0.007 U	0.0075 U	0.015 U	0.0075 U	0.0075 U	0.15 U	0.0075 U	0.18 U	0.007 U	0.037 U	0.0075 U	0.0075 U	0.008 U
Benzaldehyde	0.0245 U	0.012 U	0.0125 U	0.026 U	0.0125 U	0.0125 U	0.255 U	0.0125 U	0.31 U	0.0125 U	0.065 U	0.0125 U	0.013 U	0.0135 U
Benzo(A)Anthracene	5.94196	1.08014	0.792262	0.962002	2.1127	1.8565	48.8562	4.38808	132.044	1.19828	23.7679	0.540071	1.25441	0.202527
Benzo(A)Pyrene	7.48804	1.47168	0.803262	0.953247	2.58678	2.00684	59.9043	5.5188	149.761	1.4884	28.5907	0.668946	1.49761	0.200684
Benzo(B)Fluoranthene	8.43979	1.92071	1.29843	1.60059	2.98639	2.08077	64.9215	5.60208	168.796	1.76065	29.8639	0.768285	2.33717	0.272101
Benzo(G,H,I)Perylene	9.41591	1.38279	0.980824 J+	1.02905 J+	2.09242 J-	1.57574 J-	48.3873 J-	4.66289 J-	117.699 J-	1.33455 J-	23.5398 J-	0.562763 J-	1.02006	0.131847 J
Benzo(K)Fluoranthene	3.15075	0.625152	0.406972	0.575798	1.15528	1.00353	27.5691	2.46771	61.7022	0.690957	11.684	0.378381	0.892713	0.0937728
Benzyl Butyl Phthalate	0.048 J	0.0065047 U	0.005 U	0.0139387 U	0.005 U	0.0066375 U	0.59 J	0.0066375 U	0.125 U	0.0066375 U	0.026 U	0.0066375 U	0.005 U	0.0073012 U
Biphenyl (Diphenyl)	0.0411687 U	0.026757 U	0.0209586 U	0.0574781 U	0.0209586 U	0.027748 U	0.4266578 U	0.027748 U	0.5239657 U	0.027748 U	0.1047931 U	0.027748 U	0.0217072 U	0.02973 U
Bis(2-Chloroethoxy) Methane	0.01 U	0.00495 U	0.005 U	0.0105 U	0.005 U	0.005 U	0.105 U	0.005 U	0.125 U	0.005 U	0.026 U	0.005 U	0.005 U	0.0055 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.0075 U	0.00375 U	0.0039 U	0.008 U	0.0039 U	0.00385 U	0.08 U	0.00385 U	0.095 U	0.0038 U	0.0195 U	0.00395 U	0.00395 U	0.0042 U
Bis(2-Chloroisopropyl) Ether	0.013 U	0.0065 U	0.007 U	0.014 U	0.007 U	0.0065 U	0.14 U	0.0065 U	0.17 U	0.0065 U	0.0345 U	0.007 U	0.007 UJ	0.0075 UJ
Bis(2-Ethylhexyl) Phthalate	0.058 J	0.006 U	0.0065 U	0.013 U	0.0065 U	0.0065 U	0.13 U	0.0065 U	0.16 U	0.0065 U	0.0325 U	0.0065 U	0.0065 U	0.007 U
Caprolactam	0.023 U	0.0115 U	0.012 U	0.0245 U	0.012 U	0.0115 U	0.24 U	0.012 U	0.295 U	0.0115 U	0.06 U	0.012 U	0.012 U	0.013 U
Carbazole	0.678747 J	0.153202 J	0.169687 J	0.228922 J	0.300215 J	0.228922 J	4.1769 J	0.405016 J	14.3581	0.160246 J	2.48004	0.0651548 J	0.274109 J	0.028175 J
Chrysene	7.60918	1.36867	1.33161	1.49902	2.71757	1.95524	52.9925	4.56223	135.878	1.48273	24.4581	0.602867	2.17405	0.211818 J
Dibenz(A,H)Anthracene	2.51681	0.311317	0.265663 J+	0.213006 J+	0.615219 J-	0.442397 J-	12.7239 J-	1.2125 J-	36.3539 J-	0.376857 J-	6.85131 J-	0.157297 J-	0.335574	0.0458782 J
Dibenzofuran	0.113476 J	0.0357026 J	0.0480604 J	0.0595043 J	0.0493954 J	0.0459033 J	0.307053 J	0.0306022 J	0.787657 J	0.0306022 J	0.133501 J	0.0085006 U	0.200252 J	0.0093507 U
Diethyl Phthalate	0.009 U	0.00455 U	0.0047 U	0.0095 U	0.0047 U	0.00465 U	0.095 U	0.00465 U	0.115 U	0.0046 U	0.0235 U	0.00475 U	0.00475 U	0.005 U
Dimethyl Phthalate	0.0095 U	0.00465 U	0.0048 U	0.01 U	0.0048 U	0.00475 U	0.1 U	0.00475 U	0.12 U	0.0047 U	0.024 U	0.00485 U	0.0049 U	0.005 U
Di-N-Butyl Phthalate	0.0095 U	0.00475 U	0.00495 U	0.01 U	0.018 J	0.023 J	0.1 U	0.025 J	0.12 U	0.025 J	0.025 U	0.021 J	0.005 U	0.0055 U
Di-N-Octylphthalate	0.0165 U	0.008 U	0.0085 U	0.017 U	0.0085 U	0.0085 U	0.17 U	0.0085 U	0.205 U	0.008 U	0.0425 U	0.0085 U	0.0085 U	0.009 U
Fluoranthene	9.06188	1.71425	2.19682	2.39995	3.15793	2.0571	57.6665	4.62848	164.762	1.55997	30.2063	0.702844	3.02063	0.359993 J
Fluorene	0.228904 J	0.0679226 J	0.0511667 J	0.0609561 J	0.106373 J-	0.083597 J-	0.90215 J-	0.0783722 J-	2.42369 J-	0.0609561 J-	0.390483 J-	0.0165452 J-	0.350088 J	0.0383153 J
Hexachlorobenzene	0.013 U	0.0065 U	0.0065 U	0.0135 U	0.0065 U	0.0065 U	0.135 U	0.0065 U	0.165 U	0.0065 U	0.034 U	0.0065 U	0.007 U	0.007 U
Hexachlorobutadiene	0.009 U	0.0045 U	0.00465 U	0.0095 U	0.00465 U	0.0046 U	0.095 U	0.0046 U	0.115 U	0.00455 U	0.0235 U	0.0047 U	0.0047 U	0.005 U
Hexachlorocyclopentadiene	0.02 U	0.01 U	0.0105 U	0.021 U	0.0105 U	0.01 U	0.21 U	0.01 U	0.255 U	0.01 U	0.05 U	0.0105 U	0.0105 U	0.011 U

Table E-45
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Main Plant Area Soil (0-2 ft-bgs) - RSD High Adjusted - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Sample Depth Chemical	CFISS-030 240-67693-1 CFISS-030-SO-0-0.5 0-0.5 ft 7/25/2016	CFISS-030 240-67693-2 CFISS-030-SO-0.5-2 0.5-2 ft 7/25/2016	CFISS-031 240-67287-1 CFISS-031-S0-0-0.5 0-0.5 ft 7/13/2016	CFISS-031 240-67287-2 CFISS-031-S0-0.5-2 0.5-2 ft 7/13/2016	CFISS-032 240-67138-5 CFISS-032-SO-0-0.5 0-0.5 ft 7/12/2016	CFISS-032 240-67138-6 CFISS-032-SO-0.5-2 0.5-2 ft 7/12/2016	CFISS-033 240-67138-7 CFISS-033-SO-0-0.5 0-0.5 ft 7/12/2016	CFISS-033 240-67138-8 CFISS-033-SO-0.5-2 0.5-2 ft 7/12/2016	CFISS-034 240-67138-1 CFISS-034-SO-0-0.5 0-0.5 ft 7/11/2016	CFISS-034 240-67138-2 CFISS-034-SO-0.5-2 0.5-2 ft 7/11/2016	CFISS-035 240-67138-3 CFISS-035-SO-0-0.5 0-0.5 ft 7/11/2016	CFISS-035 240-67138-4 CFISS-035-SO-0.5-2 0.5-2 ft 7/11/2016	CFISS-036 240-67353-1 CFISS-036-SO-0-0.5 0-0.5 ft 7/15/2016	CFISS-036 240-67353-2 CFISS-036-SO-0.5-2 0.5-2 ft 7/15/2016
Hexachloroethane	0.012 U	0.006 U	0.006 U	0.0125 U	0.006 U	0.006 U	0.125 U	0.006 U	0.15 U	0.006 U	0.0305 U	0.006 U	0.006 U	0.0065 U
Indeno(1,2,3-C,D)Pyrene	9.04751	1.42592	0.930976 J+	0.923608 J+	2.2291 J-	1.62037 J-	52.4493 J-	4.8611 J-	131.123 J-	1.3449 J-	24.9134 J-	0.534721 J-	1.12766	0.155555
Isophorone	0.007 U	0.0045049 U	0.00355 U	0.0099372 U	0.00355 U	0.0046374 U	0.07 U	0.0046374 U	0.09 U	0.0045711 U	0.018 U	0.0047036 U	0.0036 U	0.0051011 U
Naphthalene	0.0913173 J	0.025772 J	0.0260907 J	0.0231948 J	0.0260907 J	0.045101 J	0.1232059 U	0.0053477 U	0.1521956 U	0.0206176 J	0.0304391 U	0.0054766 U	0.449339 J	0.0123706 J
Nitrobenzene	0.01 U	0.005 U	0.005 U	0.0105 U	0.005 U	0.005 U	0.105 U	0.005 U	0.13 U	0.005 U	0.0265 U	0.005 U	0.0055 U	0.0055 U
N-Nitrosodi-N-Propylamine	0.011 U	0.0055 U	0.0055 U	0.0115 U	0.0055 U	0.0055 U	0.115 U	0.0055 U	0.135 U	0.0055 U	0.028 U	0.0055 U	0.0055 U	0.006 U
N-Nitrosodiphenylamine	0.029 U	0.0145 U	0.015 U	0.0305 U	0.015 U	0.015 U	0.305 U	0.015 U	0.37 U	0.0145 U	0.075 U	0.015 U	0.015 U	0.016 U
Pentachlorophenol	0.039 U	0.0195 U	0.02 U	0.041 U	0.02 U	0.0195 U	0.405 U	0.02 U	0.495 U	0.0195 U	0.1 U	0.02 U	0.1 J	0.0215 U
Phenanthrene	4.06208	0.997397	1.31035	1.76326	1.96552	1.38923	23.5863	2.31539	68.1382	1.08645	11.5311	0.391835 J	2.22759	0.26716 J
Phenol	0.0105 U	0.005 U	0.0055 U	0.011 U	0.0055 U	0.0055 U	0.11 U	0.0055 U	0.135 U	0.0055 U	0.0275 U	0.0055 U	0.0055 U	0.006 U
Pyrene	9.89295	2.07254	1.53271	2.24525	4.04078	2.9361	66.8819	5.52677	167.205	2.24525	29.2608	0.932643	1.95072	0.431779 J

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-45
Summary of Data Used in Risk Assessment
Main Plant Area Soil (0-2 ft-bgs) - RSD High Adjusted - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Sample Depth Chemical	CFISS-037 240-67353-3 CFISS-037-SO-0-0.5 0-0.5 ft 7/15/2016	CFISS-037 240-67353-5 CFISS-037-SO-0.5-2 0.5-2 ft 7/15/2016	CFISS-038 240-67287-5 CFISS-038-S0-0-0.5 0-0.5 ft 7/14/2016	CFISS-038 240-67287-6 CFISS-038-S0-0.5-2 0.5-2 ft 7/14/2016	CFISS-039 240-67287-7 CFISS-039-S0-0-0.5 0-0.5 ft 7/14/2016	CFISS-039 240-67287-8 CFISS-039-S0-0.5-2 0.5-2 ft 7/14/2016	CFISS-040 240-67287-3 CFISS-040-S0-0-0.5 0-0.5 ft 7/13/2016	CFISS-040 240-67287-4 CFISS-040-S0-0.5-2 0.5-2 ft 7/13/2016	CFISS-041 240-67353-6 CFISS-41-SO-0-0.5 0-0.5 ft 7/16/2016	CFISS-041 240-67353-7 CFISS-41-SO-0.5-2 0.5-2 ft 7/16/2016	CFISS-042 240-67463-3 CFISS-042-SO-0-0.5 0-0.5 ft 7/18/2016	CFISS-042 240-67463-4 CFISS-042-SO-0.5-2 0.5-2 ft 7/18/2016	CFISS-043 240-67463-1 CFISS-043-SO-0-0.5 0-0.5 ft 7/18/2016	CFISS-043 240-67463-2 CFISS-043-SO-0.5-2 0.5-2 ft 7/18/2016
GENERAL CHEMISTRY (mg/kg)														
Fluoride	100.526	112.42	611.113	266.562	73.4059	647.734	420.667	175.133	101.611	101.86	761.782	127.744	643.657	289.742
Cyanide	0.630912	0.464337	0.0294426 J	0.968474	0.0672973 J	0.384736	0.322466	0.108787 J	0.266385	0.185735	0.0420608 J	0.344936	0.378547	0.172468
METALS (mg/kg)														
Chromium, Hexavalent - Estimated	1.06232	0.663272	1.08895	0.50178	0.381726	0.591178	0.855184	0.795927	0.60366	0.438337	0.872939	0.438337	0.70427	0.568107
Chromium, Trivalent - Estimated	38.6299	24.119	39.5984	18.2465	13.8809	21.4974	31.0976	28.9428	21.9513	15.9395	31.7432	15.9395	25.6098	20.6584
Aluminum	18005.4	19241.9	28054.9	15581.7	15597.7	24052.4	23030.1	15686.3	16225.8	22170	25228.4	19346.5	33812.4	18091.6
Antimony	5.63502 J-	1.48291 J-	11.0139 J-	0.818157 J-	0.140875 J-	1.39769 J-	0.69157 J-	0.238629 J-	0.678763 J-	0.426124 J-	4.61047 J-	0.221584 J-	1.66489 J-	0.255674 J-
Arsenic	22.3113	8.81146	35.6297	6.66232	5.12248	6.66232	6.48848	4.7281	6.71614	5.58775	16.9611	4.7281	8.19597	4.40573
Barium	197.663	251.26	229.913	172.605	164.372	126.723	124.84	151.849	121.719	294.958	159.17	279.664	141.485	225.042
Beryllium	0.648548	0.671386	1.0313	0.618934	0.637916	0.828742	0.797395	0.576972 J	0.542229 J	0.744818	1.06319 J	0.828742 J	1.04193 J	0.881194 J
Cadmium	0.782159 J	0.243868 J	0.943192 J	0.318088 J	0.0943192 J	0.487736 J	0.724648 J	0.127235 J	0.58662 J	0.18025 J	1.02371 J	0.243868 J	0.609624 J	0.201456 J
Calcium	35966.6	13241.2	50574.6	26712.6	14608	27173.2	26006.6	13932	17264	11744.3	31872	21070.7	24568	21301
Chromium, Total	39.6922	24.7823	40.6873	18.7483	14.2627	22.0885	31.9528	29.7387	22.5549	16.3778	32.6162	16.3778	26.3141	21.2266
Cobalt	10.8684	6.93556	13.9737	6.11961	6.52107	6.3236	6.72808	6.52759	7.34914	6.73157	7.76317	6.3236	6.62457	6.11961
Copper	535.552	76.4839	995.881	49.9081	17.7395	44.8859	33.5703	16.1129	51.3097	32.1212	387.349	21.6582	116.766	30.6563
Iron	42083.5	20684.9	68967.4	17100.9	16647.3	17817.7	18301.7	16896.1	20059.5	18841.7	31330	16179.3	20679.9	15155.3
Lead	131.138	23.9726	213.861	30.2758	17.8217	54.3517	67.4255	14.5696	53.6137	15.2929	123.415	17.6695	68.6136	16.0162
Magnesium	9377.19	8368.6	9079.02	9840	9212.68	8859.07	10796.1	9615.21	7896.58	7643.12	7444.18	7775.95	8441.53	9349.54
Manganese	669.707	604.336	772.17	507.899	507.034	390.032	427.81	483.254	552.455	705.058	496.47	700.772	445.767	600.05
Mercury	0.0526792 J-	0.0241988 J-	0.0116204 UJ	0.010189 UJ	0.020142 J-	0.0108258 UJ	0.0131698 UJ	0.010189 UJ	0.0123951 UJ	0.0108258 UJ	0.0325371 J	0.0331141 J	0.0356359 J	0.0343877 J
Nickel	53.1174	21.4216	59.0702	19.6098	15.3399	37.621	48.9962	23.9794	35.6024	16.306	63.7637	17.5849	51.1712	21.7413
Potassium	1519.26	1176.03	2241.71	1111.89	929.618	1646.45	1859.24	1186.73	1051.8	1079.81	1625.5	1041.33	1604.26	1101.2
Selenium	1.43951 J	1.30973 J	1.31955 J	1.30973 J	1.31955 J	1.13113 J	1.31955 J	1.15494 J	1.31955 J	1.30973 J	1.03165 J	0.976343 J	0.8757 J	0.95253 J
Silver	0.7523 J	0.186711 J	1.41738	0.296542 J	0.0392505 J	0.285559 J	0.59966 J	0.0318508 J	0.130835 J	0.0647999 J	0.7523 J	0.142779 J	1.19932 J	0.094454 J
Sodium	475.895	273.636 J	2575.59	426.195	186.959 J	1719.31	1621.18	236.102 J	177.807 J	211.887 J	3229.29	410.454	2745.55	650.189
Thallium	0.19441 J+	0.127878 J+	0.251589 J+	0.117221 J+	0.099492 J+	0.127878 J+	0.148666 J+	0.0969741 J+	0.109784 J+	0.117221 J+	0.160102 J	0.104434 J	0.160102 J	0.0959084 J
Vanadium	30.1418	17.6664	42.1548	13.1206	13.4327	19.4227	21.9511	13.9471	15.1801	17.6664	23.48	15.4968	22.8247	14.0505
Zinc	1000.88 J	215.054 J	1938.64 J	129.665 J	54.3269 J	152.857 J	113.839 J	53.658 J	154.415 J	97.0905 J	846.463 J+	73.4767 J+	320.1 J+	73.6876 J+
PESTICIDES (mg/kg)														
Aldrin	0.00039 U	--	0.000395 U	--	0.000405 U	--	0.000395 U	--	0.0004 U	--	0.00041 U	--	0.000395 U	--
Alpha Bhc (Alpha Hexachlorocyclohexane)	0.000295 U	--	0.0003 U	--	0.000305 U	--	0.0003 U	--	0.000305 U	--	0.000305 U	--	0.0003 U	--
Alpha Endosulfan	0.00045 U	--	0.000455 U	--	0.000465 U	--	0.000455 U	--	0.00046 U	--	0.00047 U	--	0.000455 U	--
Beta Bhc (Beta Hexachlorocyclohexane)	0.000315 U	--	0.00032 U	--	0.000325 U	--	0.00032 U	--	0.000325 U	--	0.00033 U	--	0.00032 U	--
Beta Endosulfan	0.0005 U	--	0.0005 U	--	0.00055 U	--	0.0005 U	--	0.0005 U	--	0.00055 U	--	0.0005 U	--
cis-Chlordane	0.00055 U	--	0.00055 U	--	0.00055 U	--	0.00055 U	--	0.00055 U	--	0.00055 U	--	0.00055 U	--
Delta BHC (Delta Hexachlorocyclohexane)	0.00035 U	--	0.00036 U	--	0.000365 U	--	0.00036 U	--	0.000365 U	--	0.00037 U	--	0.00036 U	--
Dieldrin	0.00042 U	--	0.000425 U	--	0.000435 U	--	0.000425 U	--	0.00043 U	--	0.00044 U	--	0.000425 U	--
Endosulfan Sulfate	0.000375 U	--	0.00038 U	--	0.00039 U	--	0.00038 U	--	0.000385 U	--	0.000395 U	--	0.00038 U	--
Endrin Aldehyde	0.0004 U	--	0.000405 U	--	0.000415 U	--	0.000405 U	--	0.00041 U	--	0.00042 U	--	0.000405 U	--
Endrin Ketone	0.00045 U	--	0.000455 U	--	0.000465 U	--	0.000455 U	--	0.00046 U	--	0.00047 U	--	0.000455 U	--
Endrin	0.00041 U	--	0.000415 U	--	0.000425 U	--	0.000415 U	--	0.00042 U	--	0.00043 U	--	0.000415 U	--
Gamma Bhc (Lindane)	0.00029 U	--	0.000295 U	--	0.0003 U	--	0.000295 U	--	0.0003 U	--	0.0003 U	--	0.000295 U	--
Heptachlor Epoxide	0.00065 U	--	0.00065 U	--	0.00065 U	--	0.00065 U	--	0.00065 U	--	0.00065 U	--	0.00065 U	--
Heptachlor	0.000415 U	--	0.00042 U	--	0.00043 U	--	0.00042 U	--	0.000425 U	--	0.000435 U	--	0.00042 U	--
Methoxychlor	0.0007 U	--	0.0007 U	--	0.0007 U	--	0.0007 U	--	0.0007 U	--	0.0007 U	--	0.0007 U	--
P,P'-DDD	0.000425 U	--	0.00043 U	--	0.00044 U	--	0.00043 U	--	0.000435 U	--	0.000445 U	--	0.00043 U	--
P,P'-DDE	0.00047 U	--	0.000475 U	--	0.000485 U	--	0.000475 U	--	0.00048 U	--	0.00049 U	--	0.000475 U	--
P,P'-DDT	0.000335 U	--	0.00034 U	--	0.000345 U	--	0.00034 U	--	0.000345 U	--	0.00035 U	--	0.00034 U	--
Toxaphene	0.0095 U	--	0.0095 U	--	0.01 U	--	0.0095 U	--	0.0095 U	--	0.01 U	--	0.0095 U	--
trans-Chlordane	0.0007 U	--	0.0007 U	--	0.00075 U	--	0.0007 U	--	0.0007 U	--	0.00075 U	--	0.0007 U	--
POLYCHLORINATED BIPHENYLS (mg/kg)														
PCB-1016 (Aroclor 1016)	0.0043 U	0.00455 U	0.00435 U	0.0044 U	0.00445 U	0.0045 U	0.00435 U	0.0045 U	0.0044 U	0.0046 U	0.0045 U	0.00445 U	0.00435 U	0.0045 U
PCB-1221 (Aroclor 1221)	0.0043 U	0.00455 U	0.00435 U	0.0044 U	0.00445 U	0.0045 U	0.00435 U	0.0045 U	0.0044 U	0.0046 U	0.0045 U	0.00445 U	0.00435 U	0.0045 U
PCB-1232 (Aroclor 1232)	0.0043 U	0.00455 U	0.00435 U	0.0044 U	0.00445 U	0.0045 U	0.00435 U	0.0045 U	0.0044 U	0.0046 U	0.0045 U	0.00445 U	0.00435 U	0.0045 U
PCB-1242 (Aroclor 1242)	0.0043 U	0.00455 U	0.00435 U	0.0044 U	0.00445 U	0.0045 U	0.00435 U	0.0045 U	0.0044 U	0.0046 U	0.0045 U	0.00445 U	0.00435 U	0.0045 U
PCB-1248 (Aroclor 1248)	0.0043 U	0.00455 U	0.00435 U	0.0044 U	0.00445 U	0.0045 U	0.00435 U	0.0045 U	0.0044 U	0.0046 U	0.0045 U	0.00445 U	0.00435 U	0.0045 U
PCB-1254 (Aroclor 1254)	0.0106611 U	0.0060719 U	0.0107809 U	0.0058781 U	0.0110205 U	0.0060073 U	0.0107809 U	0.0060073 U	0.0109007 U	0.0062011 U	0.0111403 U	0.0059427 U	0.0107809 U	0.0060073 U
PCB-1260 (Aroclor 1260)	0.00445 U	0.0047 U	0.0045 U	0.00455 U	0.0046 U	0.00465 U	0.0045 U	0.00465 U	0.00455 U	0.0048 U	0.00465 U	0.0046 U	0.0045 U	0.00465 U
PCB-1262 (Aroclor 1262)	0.00445 U	0.0047 U	0.0045 U	0.00455 U	0.0046 U	0.00465 U	0.0045 U	0.00465 U	0.00455 U	0.0048 U	0.00465 U	0.0046 U	0.0045 U	0.00465 U

Table E-45
Summary of Data Used in Risk Assessment
Main Plant Area Soil (0-2 ft-bgs) - RSD High Adjusted - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Sample Depth Chemical	CFISS-037 240-67353-3 CFISS-037-SO-0-0.5 0-0.5 ft 7/15/2016	CFISS-037 240-67353-5 CFISS-037-SO-0.5-2 0.5-2 ft 7/15/2016	CFISS-038 240-67287-5 CFISS-038-S0-0-0.5 0-0.5 ft 7/14/2016	CFISS-038 240-67287-6 CFISS-038-S0-0.5-2 0.5-2 ft 7/14/2016	CFISS-039 240-67287-7 CFISS-039-S0-0-0.5 0-0.5 ft 7/14/2016	CFISS-039 240-67287-8 CFISS-039-S0-0.5-2 0.5-2 ft 7/14/2016	CFISS-040 240-67287-3 CFISS-040-S0-0-0.5 0-0.5 ft 7/13/2016	CFISS-040 240-67287-4 CFISS-040-S0-0.5-2 0.5-2 ft 7/13/2016	CFISS-041 240-67353-6 CFISS-41-SO-0-0.5 0-0.5 ft 7/16/2016	CFISS-041 240-67353-7 CFISS-41-SO-0.5-2 0.5-2 ft 7/16/2016	CFISS-042 240-67463-3 CFISS-042-SO-0-0.5 0-0.5 ft 7/18/2016	CFISS-042 240-67463-4 CFISS-042-SO-0.5-2 0.5-2 ft 7/18/2016	CFISS-043 240-67463-1 CFISS-043-SO-0-0.5 0-0.5 ft 7/18/2016	CFISS-043 240-67463-2 CFISS-043-SO-0.5-2 0.5-2 ft 7/18/2016
PCB-1268 (Aroclor 1268)	0.00445 U	0.0047 U	0.0045 U	0.00455 U	0.0046 U	0.00465 U	0.0045 U	0.00465 U	0.00455 U	0.0048 U	0.00465 U	0.0046 U	0.0045 U	0.00465 U
Polychlorinated Biphenyl (PCBs)	0.0106611 U	0.0060719 U	0.0107809 U	0.0058781 U	0.0110205 U	0.0060073 U	0.0107809 U	0.0060073 U	0.0109007 U	0.0062011 U	0.0111403 U	0.0059427 U	0.0107809 U	0.0060073 U
SEMIVOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,2,4,5-Tetrachlorobenzene	0.0125 U	0.0125 U	0.012 U	0.0125 U	0.012 U	0.024 U	0.125 U	0.012 U	0.012 U	0.0125 U	0.0245 U	0.0125 U	0.0245 U	0.0125 U
1,4-Dioxane (P-Dioxane)	0.044 U	0.0445 U	0.044 U	0.0445 U	0.0435 U	0.085 U	0.445 U	0.0435 U	0.043 U	0.0455 U	0.09 U	0.0455 U	0.085 U	0.044 U
2,3,4,6-Tetrachlorophenol	0.0155 U	0.0155 U	0.0155 U	0.0155 U	0.0155 U	0.03 U	0.155 U	0.0155 U	0.015 U	0.016 U	0.031 U	0.016 U	0.0305 U	0.0155 U
2,4,5-Trichlorophenol	0.0165 U	0.0165 U	0.0165 U	0.0165 U	0.016 U	0.032 U	0.165 U	0.016 U	0.016 U	0.017 U	0.033 U	0.017 U	0.0325 U	0.0165 U
2,4,6-Trichlorophenol	0.0047 U	0.00475 U	0.00465 U	0.00475 U	0.0046 U	0.009 U	0.047 U	0.0046 U	0.0046 U	0.0048 U	0.0095 U	0.0048 U	0.0095 U	0.0047 U
2,4-Dichlorophenol	0.0039 U	0.00395 U	0.00385 U	0.00395 U	0.00385 U	0.0075 U	0.039 U	0.00385 U	0.0038 U	0.004 U	0.008 U	0.004 U	0.0075 U	0.0039 U
2,4-Dimethylphenol	0.0365 U	0.0365 U	0.036 U	0.0365 U	0.0355 U	0.07 U	0.365 U	0.036 U	0.0355 U	0.0375 U	0.075 U	0.0375 U	0.07 U	0.0365 U
2,4-Dinitrophenol	0.125 U	0.125 U	0.125 UJ	0.125 UJ	0.125 UJ	0.24 U	1.25 U	0.125 UJ	0.12 U	0.13 U	0.25 U	0.13 U	0.245 U	0.125 U
2,4-Dinitrotoluene	0.0065 U	0.0065 U	0.0065 U	0.0065 U	0.0065 U	0.0125 U	0.065 U	0.0065 U	0.0065 U	0.0065 U	0.013 U	0.0065 U	0.013 U	0.0065 U
2,6-Dinitrotoluene	0.009 U	0.009 U	0.0085 U	0.009 U	0.0085 U	0.017 U	0.09 U	0.0085 U	0.0085 U	0.009 U	0.0175 U	0.009 U	0.0175 U	0.009 U
2-Chloronaphthalene	0.00375 U	0.0038 U	0.0037 U	0.0038 U	0.0037 U	0.0075 U	0.0375 U	0.0037 U	0.00365 U	0.00385 U	0.0075 U	0.00385 U	0.0075 U	0.00375 U
2-Chlorophenol	0.0042 U	0.00425 U	0.00415 U	0.00425 U	0.00415 U	0.008 U	0.042 U	0.00415 U	0.0041 U	0.0043 U	0.0085 U	0.0043 U	0.0085 U	0.0042 U
2-Methylnaphthalene	0.114706 J	0.0162497 J	0.0647058 J	0.143293 J	0.0135294 J	0.11818 J	0.67647 J	0.141816 J	0.136765 J	0.0116703 J	0.144118 J	0.0457947 J	0.0691176 J	0.0443174 J
2-Methylphenol (O-Cresol)	0.007 U	0.0075 U	0.007 U	0.0075 U	0.007 U	0.014 U	0.07 U	0.007 U	0.007 U	0.0075 U	0.0145 U	0.0075 U	0.014 U	0.007 U
2-Nitroaniline	0.0055 U	0.0055 U	0.0055 U	0.0055 U	0.0055 U	0.0105 U	0.055 U	0.0055 U	0.0055 U	0.0055 U	0.011 U	0.0055 U	0.011 U	0.0055 U
2-Nitrophenol	0.0055 U	0.0055 U	0.0055 U	0.0055 U	0.0055 U	0.0105 U	0.055 U	0.0055 U	0.0055 U	0.0055 U	0.011 UJ	0.0055 UJ	0.011 UJ	0.0055 UJ
3- And 4- Methylphenol (Total)	0.0044 U	0.00445 U	0.00435 U	0.017 J	0.00435 U	0.0085 U	0.044 U	0.00435 U	0.0043 U	0.0045 U	0.009 U	0.0045 U	0.0085 U	0.0044 U
3,3'-Dichlorobenzidine	0.0185 U	0.0185 U	0.0185 U	0.0185 U	0.018 U	0.0355 U	0.185 U	0.018 U	0.018 U	0.019 U	0.037 U	0.019 U	0.0365 U	0.0185 U
3-Nitroaniline	0.0049 U	0.00495 U	0.00485 U	0.00495 U	0.0048 U	0.0095 U	0.049 U	0.0048 U	0.0048 U	0.005 U	0.01 U	0.005 U	0.0095 U	0.0049 U
4,6-Dinitro-2-Methylphenol	0.044 U	0.0445 U	0.044 U	0.0445 U	0.0435 U	0.085 U	0.44 U	0.0435 U	0.043 U	0.045 U	0.09 U	0.045 U	0.085 U	0.044 U
4-Bromophenyl Phenyl Ether	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.01 U	0.05 U	0.005 U	0.005 U	0.0055 U	0.0105 U	0.0055 U	0.0105 U	0.005 U
4-Chloro-3-Methylphenol	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U	0.0135 U	0.07 U	0.007 U	0.007 U	0.0075 U	0.014 U	0.0075 U	0.014 U	0.007 U
4-Chloroaniline	0.00425 U	0.0043 U	0.0042 U	0.0043 U	0.0042 U	0.008 U	0.0425 U	0.0042 U	0.00415 U	0.00435 U	0.0085 U	0.00435 U	0.0085 U	0.00425 U
4-Chlorophenyl Phenyl Ether	0.00495 U	0.005 U	0.0049 U	0.005 U	0.00485 U	0.0095 U	0.0495 U	0.00485 U	0.00485 U	0.005 U	0.01 U	0.005 U	0.01 U	0.00495 U
4-Nitroaniline	0.006 U	0.0065 U	0.006 U	0.0065 U	0.006 U	0.012 U	0.065 U	0.006 U	0.006 U	0.0065 U	0.0125 U	0.0065 U	0.0125 U	0.006 U
4-Nitrophenol	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.155 U	0.8 U	0.08 U	0.08 U	0.08 U	0.16 U	0.08 U	0.155 U	0.08 U
Acenaphthene	0.525307	0.0904708 J	0.369134 J	0.723766	0.0511109 J	1.28469	5.39504	1.5561	0.440122 J	0.0398072 J	0.425924 J	0.289507 J	0.525307 J	0.253318 J
Acenaphthylene	0.0149764 J	0.0070007 U	0.0449291 J	0.0070007 U	0.0057183 U	0.0472139 J	0.0578633 U	0.024421 J	0.0056502 U	0.0070821 U	0.0115727 U	0.0070821 U	0.0115727 U	0.0069193 U
Acetophenone	0.0052 U	0.0051512 U	0.0051278 U	0.0051512 U	0.0051278 U	0.0098791 U	0.052 U	0.0050101 U	0.0050556 U	0.0052218 U	0.0101111 U	0.0169356 J	0.0101111 U	0.0107259 J
Anthracene	0.743337	0.169603 J	0.743337	0.802422	0.0798399 J	2.18842	6.88275	2.55316	0.812164	0.029179 U	0.688275 J	0.382974 J	1.37655	0.510632 J
Atrazine	0.0075 U	0.0075 U	0.0075 U	0.0075 U	0.007 U	0.014 U	0.075 U	0.007 U	0.007 U	0.0075 U	0.0145 U	0.0075 U	0.0145 U	0.0075 U
Benzaldehyde	0.0125 U	0.0125 U	0.0125 U	0.0125 U	0.0125 U	0.0245 U	0.125 U	0.0125 U	0.0125 U	0.013 U	0.025 U	0.013 U	0.025 U	0.0125 U
Benzo(A)Anthracene	5.41379	0.590703	4.62153	3.20667	0.343314	11.3077	25.0883	6.58212	3.96131	0.270036	4.09335	2.02527	8.97897	1.8565
Benzo(A)Pyrene	6.12658	0.652222	5.71814	3.51196	0.462897	13.7134	31.3136	7.3584	4.76512	0.301026	5.58199	2.50855	11.5724	2.17407
Benzo(B)Fluoranthene	9.34869	0.912338	9.34869	4.3216	0.54534	16.0059	38.9529	8.00296	5.71309	0.448166	7.01152	2.88107	12.7246	2.88107
Benzo(G,H,I)Perylene	4.4464	0.771789	7.45426 J+	4.50211	0.549262 J+	19.2947 J+	34.0019	7.71789	5.10029	0.209026 J	8.23892	2.09026	14.3854	1.92947
Benzo(K)Fluoranthene	3.28203	0.394833	3.41332	1.80965	0.21005	5.75798	12.9969	3.29027	2.49435	0.149707	2.88819	1.28321	5.11997	1.03644
Benzyl Butyl Phthalate	0.019 J	0.0252224 J	0.14 J	0.0066375 U	0.005 U	0.11682 J	0.05 U	0.0066375 U	0.029 J	0.0066375 U	0.037 J	0.0066375 U	0.73	0.0066375 U
Biphenyl (Diphenyl)	0.0209586 U	0.027748 U	0.0209586 U	0.027748 U	0.0209586 U	0.0545051 U	0.2095863 U	0.0733341 J	0.0209586 U	0.028739 U	0.0419173 U	0.028739 U	0.0419173 U	0.027748 U
Bis(2-Chloroethoxy) Methane	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.01 U	0.05 U	0.005 U	0.005 U	0.0055 U	0.0105 U	0.0055 U	0.01 U	0.005 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.0039 U	0.00395 U	0.00385 U	0.00395 U	0.00385 U	0.0075 U	0.039 U	0.00385 U	0.0038 U	0.004 U	0.008 U	0.004 U	0.0075 U	0.0039 U
Bis(2-Chloroisopropyl) Ether	0.007 UJ	0.007 U	0.0065 U	0.007 U	0.0065 U	0.013 U	0.07 U	0.0065 U	0.0065 U	0.007 UJ	0.0135 U	0.007 U	0.0135 U	0.007 U
Bis(2-Ethylhexyl) Phthalate	0.059 J	0.0065 U	0.064 J	0.0065 U	0.0065 U	0.0125 U	0.065 U	0.0065 U	0.0065 U	0.0065 U	0.013 U	0.0065 U	0.0125 U	0.0065 U
Caprolactam	0.012 U	0.012 U	0.012 U	0.012 U	0.0115 U	0.023 U	0.12 U	0.0115 U	0.0115 U	0.012 U	0.024 U	0.012 U	0.0235 U	0.012 U
Carbazole	0.783169	0.105656 J	0.626535	0.510673 J	0.0482954 J	1.54963	4.1769 J	1.33831	0.574324	0.0387407 J	0.744011 J	0.352188 J	1.07033	0.334579 J
Chrysene	8.01682	0.863566	8.1527	4.07342	0.489162	13.6867	33.9696	7.00629	5.29925	0.342168 J	6.52216	2.60699	13.5878	2.44405
Dibenz(A,H)Anthracene	1.39823	0.196621	1.81769	0.950335	0.132831 J+	4.26012 J+	7.96989 J+	1.5402	1.39823	0.0147466 U	1.95752	0.524323	3.49556	0.409627
Dibenzofuran	0.173551 J	0.0459033 J	0.126826 J	0.187013 J	0.0173551 J	0.391028 J	1.73551 J	0.612044	0.226952 J	0.0085006 U	0.129496 J	0.0714052 J	0.160201 J	0.110508 J
Diethyl Phthalate	0.0047 U	0.00475 U	0.00465 U	0.00475 U	0.0046 U	0.009 U	0.047 U	0.0046 U	0.0046 U	0.0048 U	0.0095 U	0.0048 U	0.0095 U	0.0047 U
Dimethyl Phthalate	0.0048 U	0.00485 U	0.00475 U	0.00485 U	0.0047 U	0.0095 U	0.048 U	0.0047 U	0.0047 U	0.0049 U	0.0095 U	0.0049 U	0.0095 U	0.0048 U
Di-N-Butyl Phthalate	0.034 J	0.011 J	0.045 J	0.005 U	0.00485 U	0.0095 U	0.0495 U	0.00485 U	0.019 J	0.005 U	0.01 U	0.014 J	0.052 J	0.018 J
Di-N-Octylphthalate	0.0085 U	0.0085 U	0.0085 U	0.0085 U	0.0085 U	0.016 U	0.085 U	0.0085 U	0.008 U	0.0085 U	0.017 U	0.0085 U	0.0165 U	0.0085 U
Fluoranthene	10.1603	1.28569	8.64998	6.34274	0.631586	17.1425	48.0554	12.1712	6.17856	0.479991 J	9.06188	4.11421	13.7301	3.77136
Fluorene	0.215439 J	0.0679226 J	0.188509 J	0.313489 J	0.0323158 J	0.783722 J	3.36623 J	1.20171	0.350088 J	0.0208992 J	0.175044 J	0.149778 J	0.336623 J	0.208992 J
Hexachlorobenzene	0.0065 U	0.007 U	0.0065 U	0.0065 U	0.0065 U	0.013 U	0.065 U	0.0065 U	0.0065 U	0.007 U	0.0135 U	0.007 U	0.013 U	0.0065 U
Hexachlorobutadiene	0.00465 U	0.0047 U	0.0046 U	0.0047 U	0.00455 U	0.009 U	0.0465 U	0.00455 U	0.00455 U	0.00475 U	0.0095 UJ	0.00475 UJ	0.009 UJ	0.00465 UJ
Hexachlorocyclopentadiene	0.0105 U	0.0105 U	0.01 U	0.0105 U	0.01 U	0.02 U	0.105 U	0.01 U	0.01 U	0.0105 U	0.0205 U	0.0105 U	0.0205 U	0.0105 U

Table E-45
Summary of Data Used in Risk Assessment
Main Plant Area Soil (0-2 ft-bgs) - RSD High Adjusted - Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Sample Depth Chemical	CFISS-037 240-67353-3 CFISS-037-SO-0-0.5 0-0.5 ft 7/15/2016	CFISS-037 240-67353-5 CFISS-037-SO-0.5-2 0.5-2 ft 7/15/2016	CFISS-038 240-67287-5 CFISS-038-S0-0-0.5 0-0.5 ft 7/14/2016	CFISS-038 240-67287-6 CFISS-038-S0-0.5-2 0.5-2 ft 7/14/2016	CFISS-039 240-67287-7 CFISS-039-S0-0-0.5 0-0.5 ft 7/14/2016	CFISS-039 240-67287-8 CFISS-039-S0-0.5-2 0.5-2 ft 7/14/2016	CFISS-040 240-67287-3 CFISS-040-S0-0-0.5 0-0.5 ft 7/13/2016	CFISS-040 240-67287-4 CFISS-040-S0-0.5-2 0.5-2 ft 7/13/2016	CFISS-041 240-67353-6 CFISS-41-SO-0-0.5 0-0.5 ft 7/16/2016	CFISS-041 240-67353-7 CFISS-41-SO-0.5-2 0.5-2 ft 7/16/2016	CFISS-042 240-67463-3 CFISS-042-SO-0-0.5 0-0.5 ft 7/18/2016	CFISS-042 240-67463-4 CFISS-042-SO-0.5-2 0.5-2 ft 7/18/2016	CFISS-043 240-67463-1 CFISS-043-SO-0-0.5 0-0.5 ft 7/18/2016	CFISS-043 240-67463-2 CFISS-043-SO-0.5-2 0.5-2 ft 7/18/2016
Hexachloroethane	0.006 U	0.006 U	0.006 U	0.006 U	0.006 U	0.0115 U	0.06 U	0.006 U	0.006 U	0.006 U	0.012 UJ	0.006 UJ	0.012 UJ	0.006 UJ
Indeno(1,2,3-C,D)Pyrene	4.85156	0.729164	7.47403	4.21295 J+	0.498269 J+	17.824 J+	32.7808 J+	7.61572 J+	4.98269	0.226851	7.21178	2.10647	12.4567	2.10647
Isophorone	0.00355 U	0.0047699 U	0.0035 U	0.0047699 U	0.0035 U	0.0092747 U	0.0355 U	0.0046374 U	0.00345 U	0.0048361 U	0.007 U	0.0048361 U	0.007 U	0.0047036 U
Naphthalene	0.142049 J	0.019329 J	0.120307 J	0.112108 J	0.0188433 J	0.25772 J	1.88433 J	0.412352	0.405855 J	0.012886 J	0.246412 J-	0.0528326 J-	0.136251 J-	0.0863363 J-
Nitrobenzene	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.01 U	0.05 U	0.005 U	0.005 U	0.0055 U	0.0105 U	0.0055 U	0.0105 U	0.005 U
N-Nitrosodi-N-Propylamine	0.0055 U	0.0055 U	0.0055 U	0.0055 U	0.0055 U	0.0105 U	0.055 U	0.0055 U	0.0055 U	0.0055 U	0.011 U	0.0055 U	0.011 U	0.0055 U
N-Nitrosodiphenylamine	0.015 U	0.015 U	0.015 U	0.015 U	0.0145 U	0.029 U	0.15 U	0.015 U	0.0145 U	0.0155 U	0.03 U	0.0155 U	0.0295 U	0.015 U
Pentachlorophenol	0.02 U	0.02 U	0.02 U	0.02 U	0.0195 U	0.0385 U	0.2 U	0.0195 U	0.0195 U	0.0205 U	0.04 U	0.0205 U	0.0395 U	0.02 U
Phenanthrene	4.84829	1.08645	3.93105	4.80888	0.393105 J	10.8645	35.3794	11.5769	4.06208	0.320592 J	4.58622	2.31539	5.6345	2.49349
Phenol	0.016 J	0.0055 U	0.0055 U	0.027 J	0.0055 U	0.0105 U	0.055 U	0.0055 U	0.0055 U	0.0055 U	0.033 J	0.0055 U	0.0105 U	0.0055 U
Pyrene	7.94222	1.60622	5.9915	6.39033	0.613084	16.9257	52.9482	11.0535	7.80289	0.518135 J	8.2209	4.4905	13.5157	3.62694

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-46
Summary of Data Used in Risk Assessment
Central Landfills Area - ISM Soil (0-0.5 ft-bgs) - RSD High Adjusted - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Sample Depth Chemical	CFISS-001 240-96124-1 CFISS-01-S0-0-0.5 0-0.5 ft 5/23/2018	CFISS-002 460-115528-32 CFISS-002-SO-0-0.5 0-0.5 ft 6/14/2016	CFISS-002 240-67463-7 CFISS-002-SO-0-0.5 0-0.5 ft 7/19/2016	CFISS-003 240-96052-1 CFISS-03-SO-0-0.5 0-0.5 ft 5/22/2018	CFISS-004 240-95908-21 CFISS-04-SO-0-0.5 0-0.5 ft 5/19/2018	CFISS-005 240-95956-5 CFISS-05-SO-0-0.5 0-0.5 ft 5/22/2018	CFISS-006 460-115731-13 CFISS-006-SO-0-0.5 0-0.5 ft 6/17/2016	CFISS-006-DUP 460-115731-17 CFISS-DUP1-SO 0-0.5 ft 6/17/2016	CFISS-006 240-67463-5 CFISS-006-SO-0-0.5 0-0.5 ft 7/19/2016	CFISS-006-DUP 240-67463-9 CFISS-DUP1-SO 0-0.5 ft 7/19/2016	CFISS-007 240-95908-11 CFISS-07-SO-0-0.5 0-0.5 ft 5/17/2018	CFISS-008 460-115731-18 CFISS-008-SO-0-0.5 0-0.5 ft 6/18/2016	CFISS-008 240-67693-3 CFISS-008-SO-0-0.5 0-0.5 ft 7/26/2016
GENERAL CHEMISTRY (mg/kg)													
Fluoride	223.79	22.4195 J	1176.42	269.999 J+	90.2548 J+	96.0665 J+	71.1157	94.1379 J-	84.6156	88.2317	860.62	395.355 J-	797.942 J-
Cyanide	6.03077 J	40.6588	25.5169 J-	6.16892	4.47914 J	0.392568	0.364527 J	0.134595 J	0.210304 J-	0.294426 J-	0.434629	0.925338	1.35997
METALS (mg/kg)													
Chromium, Hexavalent - Estimated	0.493816	--	0.550396	0.56815	0.43192	0.526723	--	--	0.494172	0.523764	1.08895	--	0.745697
Chromium, Trivalent - Estimated	17.957	--	20.0144	20.66	15.7062	19.1536	--	--	17.9699	19.0459	39.5984	--	27.1163
Aluminum	28199.8	47002.4	39465.2	29520.4	24648	22402	14236.8	15597.7	18110	17900.7	28892.3	23762.9	34231.1
Antimony	0.376183 J	0.24333027 UJ	0.268944 J-	0.24333 JJ	0.318654 J	1.53682 J	0.300961123 UJ	0.281750839 UJ	0.294558 J-	0.268944 J-	0.589115 J-	0.249733698 UJ	0.307365 J-
Arsenic	12.3078	7.62681	5.23632	5.57781	5.56133	6.03315	4.78098	5.46398	5.57781	5.69165	8.53747	5.91931	6.82998
Barium	214.064	176.856	228.873	188.3	213.282	169.574	109.235	127.961	141.485	143.566	136.283	106.114	124.84
Beryllium	1.23067	3.18958	3.93381 J	1.80743 J	1.02728 J	0.850555 J	0.510333	0.55286	0.850555 J	0.818659 J	1.48847	0.850555	0.978138
Cadmium	0.30817 J	0.166783994 U	0.287559 J	0.310563 J	0.239085 J	0.356573 J	0.207042199 U	0.189788682 U	0.253052 J	0.299061 J	0.322066 J	0.172535166 U	0.310563 J
Calcium	13525.3	23572	24346.7	23129.3	8253.5	19920	14718.7 J	12837.3 J	23129.3	22465.3	19256	20362.7 J	23682.7
Chromium, Total	18.4508	14.7049	20.5648	21.2282	16.1381	19.6803	10.7246	10.5035	18.4641	19.5697	40.6873	88.7824	27.862
Cobalt	7.11466	4.24387	5.58948	6.00352	6.23067	6.31405	4.96843 J+	5.07194 J+	6.31405	6.31405	7.03861	6.9351 J+	6.41756
Copper	23.6916	15.7185 J+	18.9745	26.8338	17.8667	427.768	25.5987 J	24.7005 J	43.5628	47.2678	77.2453	21.1077 J	23.6901
Iron	20478	15923.5	15509.9	17784.7	18984	17681.3	12511.3	12201.1	15509.9	15613.3	27607.6	16854.1	17060.9
Lead	252.841 J	21.089 J+	25.693	31.0395	22.0641	99.8016	19.3069	25.396	602.968 J	32.2276 J	36.386	20.6435	25.0989
Magnesium	11226.9	11413	10384.8	11927.1	11166.5	11618.7	10220.3	9109.86	10282	10220.3	11310.2	12338.4	11413
Manganese	684.559	436.26 J	530.273	594.708	902.494	607.384	392.951	392.951	526.047	567.244	548.23	419.359	473.231
Mercury	0.139538 J	0.01007102 U	0.0294384 J	0.0356359 J	0.0404636 J	0.027889 J	0.0325371	0.0263396 J	0.0588767 J	0.0511298 J	0.0449322 J	0.0309878	0.0247902 J
Nickel	40.5257	29.5351	50.9423	30.5654	23.6637	33.9997	22.7809 J-	24.6126 J-	35.3734	35.7168	43.0434	110.127 J-	45.6763
Potassium	1866.8 J+	2581.68	3272.26	2401.07 J+	1780.56 J+	1837.99 J+	1062.42	1200.54	1487.39	1476.76	2358.57	1583.01	2167.34 J+
Selenium	0.411761 J	0.209928051 U	0.887696 J	0.479836 J	0.543521 J	0.599794 J	0.26390955 U	0.245915717 U	0.899692 J	0.935679 J	0.563807 J	0.22192394 U	1.79938 J
Silver	0.06848 J	0.37615022 U	0.0610563 J	0.0654174 J	0.0464604 J	0.0632368 J	0.468824911 U	0.436116197 U	0.0970359 J	0.100307 J	0.0806815 J	0.387053124 U	0.0566951 J
Sodium	984.615	13727.7	11766.6	2889.36	1011.02 J	220.951 J	90.6031 J	100.409 J	156.889 J	154.274 J	3059.33	2091.85	4941.99
Thallium	0.176859 J	0.171538 J	0.19441 J	0.171538 J	0.1728 J	0.148666 J	0.102922732 U	0.097204803 U	0.13723 J	0.13723 J	0.13723 J	0.085768944 U	0.125794 J
Vanadium	25.0555	26.5379	39.0969	26.5379	22.7903	21.2958	12.3407	13.6512	19.0024	19.3301	26.6471	17.5827	20.6406
Zinc	124.635	52.2981	66.7252 J+	77.5455	77.988	131.872	49.7057	58.1591	74.5022 J+	73.2624 J+	74.9531	58.0464	63.7947
PESTICIDES (mg/kg)													
Aldrin	--	0.000455 U	0.000395 U	0.0005 U	--	0.0005 U	0.00047 U	0.000465 U	0.000405 U	0.00041 U	0.00055 U	0.00045 U	0.00041 U
Alpha Bhc (Alpha Hexachlorocyclohexane)	--	0.000345 U	0.000295 U	0.000345 U	--	0.000345 U	0.000355 U	0.00035 U	0.000305 U	0.00031 U	0.00036 U	0.00034 U	0.00031 U
Alpha Endosulfan	--	0.0005 U	0.00045 U	0.0005 U	--	0.0005 U	0.00055 U	0.00055 U	0.000465 U	0.000475 U	0.00055 U	0.0005 U	0.00047 U
Beta Bhc (Beta Hexachlorocyclohexane)	--	0.000365 U	0.000315 U	0.00038 U	--	0.000385 U	0.000375 U	0.000375 U	0.000325 U	0.00033 U	0.000395 U	0.00036 U	0.00033 U
Beta Endosulfan	--	0.0006 U	0.0005 U	0.00085 U	--	0.0009 U	0.0006 U	0.0006 U	0.00055 U	0.00055 U	0.0009 U	0.0006 U	0.00055 U
cis-Chlordane	--	0.0006 U	0.00055 U	0.00055 U	--	0.00055 U	0.00065 U	0.00065 U	0.00055 U	0.00055 U	0.00055 U	0.0006 U	0.00055 U
Delta BHC (Delta Hexachlorocyclohexane)	--	0.00041 U	0.000355 U	0.00021 U	--	0.00021 U	0.000425 U	0.00042 U	0.000365 U	0.00037 U	0.000215 U	0.000405 U	0.00037 U
Dieldrin	--	0.00049 U	0.000425 U	0.00044 U	--	0.000445 U	0.0005 U	0.0005 U	0.000435 U	0.00044 U	0.00046 U	0.000485 U	0.00044 U
Endosulfan Sulfate	--	0.00044 U	0.00038 U	0.000425 U	--	0.00043 U	0.00045 U	0.00045 U	0.00039 U	0.000395 U	0.000445 U	0.000435 U	0.000395 U
Endrin Aldehyde	--	0.00047 U	0.000405 U	0.0008 U	--	0.0008 U	0.00048 U	0.00048 U	0.000415 U	0.00042 U	0.00085 U	0.00046 U	0.00042 U
Endrin Ketone	--	0.0005 U	0.00045 U	0.00065 U	--	0.00065 U	0.00055 U	0.00055 U	0.000465 U	0.000475 U	0.0007 U	0.0005 U	0.00047 U
Endrin	--	0.00048 U	0.000415 U	0.00049 U	--	0.00049 U	0.00049 U	0.00049 U	0.000425 U	0.00043 U	0.0005 U	0.00047 U	0.00043 U
Gamma Bhc (Lindane)	--	0.00034 U	0.00029 U	0.000315 U	--	0.000315 U	0.00035 U	0.000345 U	0.0003 U	0.000305 U	0.000325 U	0.000335 U	0.000305 U
Heptachlor Epoxide	--	0.00075 U	0.00065 U	0.0005 U	--	0.0005 U	0.00075 U	0.00075 U	0.00065 U	0.00065 U	0.00055 U	0.00075 U	0.00065 U
Heptachlor	--	0.000485 U	0.00042 U	0.0004 U	--	0.000405 U	0.0005 U	0.000495 U	0.00043 U	0.000435 U	0.000415 U	0.000475 U	0.000435 U
Methoxychlor	--	0.0008 U	0.0007 U	0.0008 U	--	0.0008 U	0.0008 U	0.0008 U	0.0007 U	0.0007 U	0.0008 U	0.0008 U	0.0007 U
P,P'-DDD	--	0.000495 U	0.00043 U	0.0006 U	--	0.0006 U	0.0005 U	0.0005 U	0.00044 U	0.000445 U	0.0006 U	0.00049 U	0.000445 U
P,P'-DDE	--	0.00055 U	0.00047 U	0.0004 U	--	0.000405 U	0.00055 U	0.00055 U	0.000485 U	0.000495 U	0.000415 U	0.00055 U	0.00049 U
P,P'-DDT	--	0.00039 U	0.000335 U	0.00065 U	--	0.00065 U	0.0004 U	0.0004 U	0.000345 U	0.00035 U	0.00065 U	0.000385 U	0.00035 U
Toxaphene	--	0.011 U	0.0095 U	0.0125 U	--	0.0125 U	0.0115 U	0.0115 U	0.01 U	0.01 U	0.013 U	0.011 U	0.01 U
trans-Chlordane	--	0.0008 U	0.0007 U	0.0006 U	--	0.0006 U	0.00085 U	0.00085 U	0.00075 U	0.00075 U	0.0006 U	0.0008 U	0.00075 U

Table E-46
Summary of Data Used in Risk Assessment
Central Landfills Area - ISM Soil (0-0.5 ft-bgs) - RSD High Adjusted - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Sample Depth Chemical	CFISS-001 240-96124-1 CFISS-01-S0-0-0.5 0-0.5 ft 5/23/2018	CFISS-002 460-115528-32 CFISS-002-SO-0-0.5 0-0.5 ft 6/14/2016	CFISS-002 240-67463-7 CFISS-002-SO-0-0.5 0-0.5 ft 7/19/2016	CFISS-003 240-96052-1 CFISS-03-SO-0-0.5 0-0.5 ft 5/22/2018	CFISS-004 240-95908-21 CFISS-04-SO-0-0.5 0-0.5 ft 5/19/2018	CFISS-005 240-95956-5 CFISS-05-SO-0-0.5 0-0.5 ft 5/22/2018	CFISS-006 460-115731-13 CFISS-006-SO-0-0.5 0-0.5 ft 6/17/2016	CFISS-006-DUP 460-115731-17 CFISS-DUP1-SO 0-0.5 ft 6/17/2016	CFISS-006 240-67463-5 CFISS-006-SO-0-0.5 0-0.5 ft 7/19/2016	CFISS-006-DUP 240-67463-9 CFISS-DUP1-SO 0-0.5 ft 7/19/2016	CFISS-007 240-95908-11 CFISS-07-SO-0-0.5 0-0.5 ft 5/17/2018	CFISS-008 460-115731-18 CFISS-008-SO-0-0.5 0-0.5 ft 6/18/2016	CFISS-008 240-67693-3 CFISS-008-SO-0-0.5 0-0.5 ft 7/26/2016
POLYCHLORINATED BIPHENYLS (mg/kg)													
PCB-1016 (Aroclor 1016)	--	0.005 U	0.00435 U	0.00455 U	--	0.00455 U	0.005 U	0.005 U	0.00445 U	0.0045 U	0.0047 U	0.00495 U	0.0045 U
PCB-1221 (Aroclor 1221)	--	0.005 U	0.00435 U	0.00455 U	--	0.00455 U	0.005 U	0.005 U	0.00445 U	0.0045 U	0.0047 U	0.00495 U	0.0045 U
PCB-1232 (Aroclor 1232)	--	0.005 U	0.00435 U	0.00455 U	--	0.00455 U	0.005 U	0.005 U	0.00445 U	0.0045 U	0.0047 U	0.00495 U	0.0045 U
PCB-1242 (Aroclor 1242)	--	0.005 U	0.00435 U	0.00455 U	--	0.00455 U	0.005 U	0.005 U	0.00445 U	0.0045 U	0.0047 U	0.00495 U	0.0045 U
PCB-1248 (Aroclor 1248)	--	0.005 U	0.00435 U	0.00455 U	--	0.00455 U	0.005 U	0.005 U	0.00445 U	0.0045 U	0.0047 U	0.00495 U	0.0045 U
PCB-1254 (Aroclor 1254)	0.117773 J	0.011978819 U	0.010780937 U	0.011260089 U	--	0.136559 J	0.0131767 U	0.0131767 U	0.011020513 U	0.011140301 U	0.110205 J	0.011978819 U	0.011140301 U
PCB-1260 (Aroclor 1260)	--	0.005 U	0.0045 U	0.0047 U	--	0.0047 U	0.0055 U	0.0055 U	0.0046 U	0.00465 U	0.00485 U	0.005 U	0.00465 U
PCB-1262 (Aroclor 1262)	--	0.005 U	0.0045 U	0.0047 U	--	0.0047 U	0.0055 U	0.0055 U	0.0046 U	0.00465 U	0.00485 U	0.005 U	0.00465 U
PCB-1268 (Aroclor 1268)	--	0.005 U	0.0045 U	0.0047 U	--	0.0047 U	0.0055 U	0.0055 U	0.0046 U	0.00465 U	0.00485 U	0.005 U	0.00465 U
Polychlorinated Biphenyl (PCBs)	0.117773 J	0.011978819 U	0.010780937 U	0.011260089 U	--	0.136559 J	0.0131767 U	0.0131767 U	0.011020513 U	0.011140301 U	0.110205 J	0.011978819 U	0.011140301 U
SEMIVOLATILE ORGANIC COMPOUNDS (mg/kg)													
1,2,4,5-Tetrachlorobenzene	--	0.014 U	0.0125 UJ	0.035 UJ	--	0.018 UJ	0.7 U	0.14 U	0.0125 U	0.0125 U	0.0075 U	0.0135 U	0.012 U
1,4-Dioxane (P-Dioxane)	--	0.05 U	0.0445 UJ	0.255 U	--	0.13 U	2.55 U	0.5 U	0.0445 U	0.044 U	0.055 U	0.049 U	0.0435 U
2,3,4,6-Tetrachlorophenol	--	0.0175 U	0.0155 UJ	0.34 U	--	0.175 U	0.9 U	0.18 U	0.0155 U	0.0155 U	0.075 U	0.017 U	0.0155 U
2,4,5-Trichlorophenol	--	0.0185 U	0.0165 UJ	0.06 U	--	0.03 U	0.95 U	0.19 U	0.0165 U	0.0165 U	0.0125 U	0.018 U	0.016 U
2,4,6-Trichlorophenol	--	0.0055 U	0.00475 UJ	0.0445 U	--	0.023 U	0.27 U	0.055 U	0.00475 U	0.0047 U	0.0095 U	0.005 U	0.0046 U
2,4-Dichlorophenol	--	0.0044 U	0.0039 UJ	0.065 U	--	0.0325 U	0.225 U	0.045 U	0.00395 U	0.0039 U	0.0135 U	0.0043 U	0.00385 U
2,4-Dimethylphenol	--	0.041 U	0.0365 UJ	0.05 U	--	0.026 U	2.1 U	0.42 U	0.037 U	0.0365 U	0.011 U	0.0405 U	0.0355 U
2,4-Dinitrophenol	--	0.14 U	0.125 UJ	2.2 UJ	--	1.15 UJ	7 U	1.45 U	0.125 U	0.125 U	0.475 UJ	0.14 U	0.125 U
2,4-Dinitrotoluene	--	0.0075 U	0.0065 UJ	0.0405 U	--	0.021 U	0.38 U	0.075 U	0.0065 U	0.0065 U	0.009 U	0.0075 U	0.0065 U
2,6-Dinitrotoluene	--	0.01 U	0.009 UJ	0.05 U	--	0.026 U	0.5 U	0.1 U	0.009 U	0.009 U	0.011 U	0.01 U	0.0085 U
2-Chloronaphthalene	--	0.0042 U	0.00375 UJ	0.037 U	--	0.0195 U	0.215 U	0.043 U	0.0038 U	0.00375 U	0.008 U	0.00415 U	0.0037 U
2-Chlorophenol	--	0.00475 U	0.00425 UJ	0.0375 U	--	0.0195 U	0.245 U	0.0485 U	0.00425 U	0.0042 U	0.008 U	0.00465 U	0.00415 U
2-Methylnaphthalene	0.0736667 J	0.0161765 J	0.0161765 J-	0.661764	0.342052 J	0.808823	1.25 J	0.647058 J	0.0264706 J	0.025 J	0.114706	0.0220588 J	0.0116176 J
2-Methylphenol (O-Cresol)	--	0.008 U	0.007 UJ	0.235 U	--	0.12 U	0.415 U	0.085 U	0.0075 U	0.007 U	0.05 U	0.008 U	0.007 U
2-Nitroaniline	--	0.006 U	0.0055 UJ	0.37 U	--	0.19 U	0.315 U	0.065 U	0.0055 U	0.0055 U	0.08 U	0.006 U	0.0055 U
2-Nitrophenol	--	0.0065 U	0.0055 UJ	0.0465 U	--	0.024 U	0.32 U	0.065 U	0.0055 UJ	0.0055 UJ	0.01 U	0.006 U	0.0055 U
3- And 4- Methylphenol (Total)	--	0.00495 U	0.00445 UJ	--	--	--	0.255 U	0.05 U	0.00445 U	0.0044 U	--	0.0049 U	0.0043 U
3,3'-Dichlorobenzidine	--	0.021 U	0.0185 UJ	0.75 U	--	0.395 U	1.05 U	0.215 U	0.0185 U	0.0185 U	0.165 U	0.0205 U	0.018 U
3-Nitroaniline	--	0.0055 U	0.00495 UJ	0.205 U	--	0.105 U	0.285 U	0.055 U	0.00495 U	0.0049 U	0.045 U	0.0055 U	0.0048 U
4,6-Dinitro-2-Methylphenol	--	0.0495 U	0.0445 UJ	1.4 U	--	0.75 U	2.55 U	0.5 U	0.0445 U	0.044 U	0.305 U	0.049 U	0.0435 U
4-Bromophenyl Phenyl Ether	--	0.006 U	0.005 UJ	0.055 U	--	0.0295 U	0.3 U	0.06 U	0.0055 U	0.005 U	0.0125 U	0.006 U	0.005 U
4-Chloro-3-Methylphenol	--	0.008 U	0.007 UJ	0.038 U	--	0.02 U	0.41 U	0.08 U	0.007 U	0.007 U	0.0085 U	0.008 U	0.007 U
4-Chloroaniline	--	0.0048 U	0.0043 UJ	0.027 U	--	0.014 U	0.245 U	0.049 U	0.0043 U	0.00425 U	0.006 U	0.0047 U	0.0042 U
4-Chlorophenyl Phenyl Ether	--	0.0055 U	0.005 UJ	0.049 U	--	0.0255 U	0.285 U	0.055 U	0.005 U	0.00495 U	0.0105 U	0.0055 U	0.00485 U
4-Nitroaniline	--	0.007 U	0.0065 UJ	0.0395 U	--	0.0205 U	0.36 U	0.07 U	0.0065 U	0.006 U	0.0085 U	0.007 U	0.006 U
4-Nitrophenol	--	0.09 U	0.08 UJ	0.55 U	--	0.295 U	4.6 U	0.9 U	0.08 U	0.08 U	0.125 U	0.09 U	0.08 U
Acenaphthene	0.302669 J	0.0638886 J	0.0567899 J-	2.69752	2.26368	3.54937	10.5061 J	4.11727 J	0.198765 J	0.22716 J	0.553702	0.22716 J	0.0951231 J
Acenaphthylene	0.0505414 J	0.006535148 U	0.005854403 UJ	0.0980272 J	0.0476163 J	0.0653515 J	1.07558 J	0.066712969 UJ	0.005854403 U	0.005786329 U	0.0299528 J	0.006398999 U	0.005718255 U
Acetophenone	0.037979328 U	0.00585 U	0.0052 UJ	0.063555556 U	--	0.033222222 U	0.303333333 U	0.059944444 U	0.005272222 U	0.0052 U	0.013722222 U	0.005777778 U	0.005127778 U
Anthracene	0.755234 J	0.114254 J	0.114254 J-	5.09323	4.50082	6.60744	35.7903 J	10.4618 J	0.729571	0.715806	0.991116 J+	0.302841 J	0.122513 J
Atrazine	--	0.0085 U	0.0075 UJ	0.355 UJ	--	0.185 UJ	0.425 U	0.085 U	0.0075 U	0.0075 U	0.075 UJ	0.008 U	0.007 U
Benzaldehyde	--	0.014 U	0.0125 UJ	0.1 UR	--	0.05 UR	0.75 U	0.145 U	0.0125 U	0.0125 U	0.022 UR	0.014 U	0.0125 U
Benzo(A)Anthracene	2.32166	0.541379	0.488562 J-	14.5248	11.4472	18.4861	101.674 J	29.0496 J	2.24474	2.24474	3.69722	1.04314	0.42254
Benzo(A)Pyrene	2.43075	0.612658	0.517355 J-	14.9761	14.7507	14.9761	102.11 J	31.3136 J	2.72292	2.72292	4.62897	1.307	0.517355
Benzo(B)Fluoranthene	4.93723	1.03874	0.973822 J-	20.7749	24.0859	23.3717	129.843 J	38.9529 J	3.37592	3.24607	5.19372	1.68796	0.688167
Benzo(G,H,I)Perylene	3.54231	0.483873	0.44464 J-	11.7699	10.0336	11.6391	64.0805 J	24.8475 J	2.35398	2.09242	4.4464	1.30777	0.470796
Benzo(K)Fluoranthene	1.87255	0.433229	0.341332 J-	6.17022	7.29656	10.2399	47.2613 J	17.0666 J	1.11589	1.29969	2.1005	0.827073	0.21005
Benzyl Butyl Phthalate	--	0.0055 U	0.005 UJ	1.4 J	--	0.29 U	0.295 U	0.06 U	0.005 U	0.005 U	0.12 U	0.0055 U	0.005 U
Biphenyl (Diphenyl)	--	0.023952719 U	0.020958629 UJ	0.209586 J	0.107291 J	0.239527 J	1.19763593 U	0.247012411 U	0.021707151 U	0.020958629 U	0.0359291 J	0.023204196 U	0.020958629 U
Bis(2-Chloroethoxy) Methane	--	0.006 U	0.005 UJ	0.0385 U	--	0.02 U	0.3 U	0.06 U	0.005 U	0.005 U	0.0085 U	0.0055 U	0.005 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	--	0.0044 U	0.0039 UJ	0.0295 U	--	0.0155 U	0.225 U	0.045 U	0.00395 U	0.0039 U	0.0065 U	0.0043 U	0.00385 U
Bis(2-Chloroisopropyl) Ether	--	0.0075 U	0.007 UJ	0.06 U	--	0.031 U	0.395 U	0.08 U	0.007 U	0.007 U	0.013 U	0.0075 U	0.0065 U
Bis(2-Ethylhexyl) Phthalate	--	0.0075 U	0.0065 UJ	0.85 U	--	0.45 U	0.375 U	0.075 U	0.0065 U	0.0065 U	0.19 U	0.007 U	0.0065 U
Caprolactam	--	0.0135 U	0.012 UJ	0.55 U	--	0.275 U	0.7 U	0.135 U	0.012 U	0.012 U	0.115 U	0.013 U	0.0115 U
Carbazole	0.512835 J	0.0978961 J	0.0848433 J-	2.87162	2.82401	3.78532	19.5792 J	5.74324 J	0.404637 J	0.391585 J	0.757064 J+	0.195792 J	0.0770116 J

Table E-46
Summary of Data Used in Risk Assessment
Central Landfills Area - ISM Soil (0-0.5 ft-bgs) - RSD High Adjusted - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Sample Depth Chemical	CFISS-001 240-96124-1 CFISS-01-S0-0-0.5 0-0.5 ft 5/23/2018	CFISS-002 460-115528-32 CFISS-002-SO-0-0.5 0-0.5 ft 6/14/2016	CFISS-002 240-67463-7 CFISS-002-SO-0-0.5 0-0.5 ft 7/19/2016	CFISS-003 240-96052-1 CFISS-03-SO-0-0.5 0-0.5 ft 5/22/2018	CFISS-004 240-95908-21 CFISS-04-SO-0-0.5 0-0.5 ft 5/19/2018	CFISS-005 240-95956-5 CFISS-05-SO-0-0.5 0-0.5 ft 5/22/2018	CFISS-006 460-115731-13 CFISS-006-SO-0-0.5 0-0.5 ft 6/17/2016	CFISS-006-DUP 460-115731-17 CFISS-DUP1-SO 0-0.5 ft 6/17/2016	CFISS-006 240-67463-5 CFISS-006-SO-0-0.5 0-0.5 ft 7/19/2016	CFISS-006-DUP 240-67463-9 CFISS-DUP1-SO 0-0.5 ft 7/19/2016	CFISS-007 240-95908-11 CFISS-07-SO-0-0.5 0-0.5 ft 5/17/2018	CFISS-008 460-115731-18 CFISS-008-SO-0-0.5 0-0.5 ft 6/18/2016	CFISS-008 240-67693-3 CFISS-008-SO-0-0.5 0-0.5 ft 7/26/2016
Chrysene	3.96554	0.923972	0.883209 J-	20.3817	24.7434	27.1757	119.573 J	33.9696 J	2.58169	2.58169	5.16338	1.49466	0.570689
Dibenz(A,H)Anthracene	0.971316	0.111858	0.128637 J-	2.93627	2.884	3.49556	18.1769 J	6.15219 J	0.643184	0.545308	1.21646	0.013283146 U	0.0964776
Dibenzofuran	0.137859 J	0.0253652 J	0.0347103 J-	1.60201 J	1.05508	1.86902	6.00755 J	2.80352 J	0.133501 J	0.146851 J	0.280352 J	0.0614105 J	0.0293703 J
Diethyl Phthalate	--	0.0055 U	0.00475 UJ	0.245 U	--	0.125 U	0.27 U	0.055 U	0.00475 U	0.0047 U	0.055 U	0.005 U	0.0046 U
Dimethyl Phthalate	--	0.0055 U	0.00485 UJ	0.0295 U	--	0.0155 U	0.28 U	0.055 U	0.00485 U	0.0048 U	0.0065 U	0.0055 U	0.0047 U
Di-N-Butyl Phthalate	--	0.0055 U	0.005 UJ	0.355 U	--	0.185 U	0.285 U	0.055 U	0.005 U	0.00495 U	0.075 U	0.059 J	0.00485 U
Di-N-Octylphthalate	--	0.0095 U	0.0085 UJ	0.47 U	--	0.245 U	0.485 U	0.095 U	0.0085 U	0.0085 U	0.105 U	0.0095 U	0.0085 U
Fluoranthene	4.52522	1.19452	1.18079 J-	23.3412	23.2539	32.9523	178.492 J	54.9205 J	4.94285	5.08015	6.86506	2.19682	0.906188
Fluorene	0.247049 J	0.0377018 J	0.0498202 J-	2.55833	1.90738	3.09693	10.6373 J	3.90483 J	0.228904 J	0.228904 J	0.430877	0.134649 J	0.0646316 J
Hexachlorobenzene	--	0.0075 U	0.0065 UJ	0.06 U	--	0.03 U	0.39 U	0.075 U	0.007 U	0.0065 U	0.0125 U	0.0075 U	0.0065 U
Hexachlorobutadiene	--	0.005 U	0.0047 UJ	0.0475 UJ	--	0.0245 UJ	0.27 U	0.055 U	0.0047 UJ	0.00465 UJ	0.0105 UJ	0.005 U	0.00455 U
Hexachlorocyclopentadiene	--	0.0115 U	0.0105 UJ	0.0415 UJ	--	0.0215 UJ	0.6 U	0.12 U	0.0105 U	0.0105 U	0.009 U	0.0115 U	0.01 U
Hexachloroethane	--	0.007 U	0.006 UJ	0.042 U	--	0.0215 U	0.35 U	0.07 U	0.006 UJ	0.006 UJ	0.009 U	0.0065 U	0.006 U
Indeno(1,2,3-C,D)Pyrene	2.67484	0.498269	0.498269 J-	9.44088	7.78705	9.70313	70.8066 J	26.2247 J	2.49134	2.2291	3.40921	1.31123	0.537606
Isophorone	--	0.004 U	0.0072 J-	0.0415 U	--	0.0215 U	0.205 U	0.041 U	0.0036 U	0.00355 U	0.009 U	0.00395 U	0.0035 U
Naphthalene	0.178857 J	0.036237 J	0.0318886 J-	1.73938	0.675826 J	2.17422	3.6237 J	2.46412 J	0.0536308 J-	0.0507319 J-	0.231917	0.0405855 J	0.0202927 J
Nitrobenzene	--	0.006 U	0.005 UJ	0.295 U	--	0.155 U	0.3 U	0.06 U	0.0055 U	0.005 U	0.065 U	0.006 U	0.005 U
N-Nitrosodi-N-Propylamine	--	0.0065 U	0.0055 UJ	0.055 U	--	0.0285 U	0.32 U	0.065 U	0.0055 U	0.0055 U	0.012 U	0.006 U	0.0055 U
N-Nitrosodiphenylamine	--	0.017 U	0.015 UJ	0.27 U	--	0.14 U	0.85 UJ	0.175 UJ	0.015 U	0.015 U	0.06 U	0.0165 UJ	0.0145 U
Pentachlorophenol	--	0.0225 U	0.02 UJ	1.3 U	--	0.7 U	1.15 U	0.23 U	0.02 U	0.02 U	0.285 U	0.022 U	0.0195 U
Phenanthrene	2.6047	0.628968	0.642071 J-	18.3449	19.8649	23.5863	144.138 J	43.2415 J	2.88277	3.0138	4.45519	1.44138	0.615864
Phenol	--	0.006 U	0.0055 UJ	0.245 U	--	0.13 U	0.315 U	0.06 U	0.0055 U	0.0055 U	0.055 U	0.006 U	0.0055 U
Pyrene	4.68747	1.1983	0.975361 J-	23.6873	20.3717	30.6542	195.072 J	61.3084 J	4.45879	4.59813	6.96686	2.50807	0.905692

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-46
Summary of Data Used in Risk Assessment
Central Landfills Area - ISM Soil (0-0.5 ft-bgs) - RSD High Adjusted - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Sample Depth Chemical	CFISS-009 240-95956-1 CFISS-09-SO-0-0.5 0-0.5 ft 5/21/2018	CFISS-010 240-95956-3 CFISS-010-SO-0-0.5 0-0.5 ft 5/21/2018	CFISS-011 240-95908-15 CFISS-011-SO-0.0-0.5 0-0.5 ft 5/19/2018	CFISS-012 240-95908-13 CFISS-012-0.0-0.5 0-0.5 ft 5/18/2018	CFISS-013 240-95908-9 CFISS-013-SO-0-0.5 0-0.5 ft 5/17/2018	CFISS-014 240-95908-7 CFISS-014-SO-0-0.5 0-0.5 ft 5/16/2018	CFISS-015 240-95908-1 CFISS-015-SO-0-0.5 0-0.5 ft 5/15/2018	CFISS-016 240-66446-1 CFISS-016-SO-0-0.5 0-0.5 ft 6/23/2016	CFISS-017 240-66695-1 CFISS-017-SO-0-0.5 0-0.5 ft 6/29/2016	CFISS-018 240-66516-1 CFISS-018-SO-0-0.5 0-0.5 ft 6/24/2016	CFISS-019 240-66516-3 CFISS-019-SO-0-0.5 0-0.5 ft 6/24/2016	CFISS-020 240-66516-5 CFISS-020-SO-0-0.5 0-0.5 ft 6/25/2016	CFISS-020-DUP 240-66516-6 CFISS-DUP2-SO 0-0.5 ft 6/25/2016
GENERAL CHEMISTRY (mg/kg)													
Fluoride	43.5132 J+	70.6336 J+	49.4843 J+	96.6691	302.543	703.925	781.201	33.2677	44.2364	87.8701 J-	259.15 J-	73.7675 J-	72.8032 J-
Cyanide	0.154223 J	0.238345 J	0.179085 J	0.182264 J	0.715034	2.10304	4.71685	0.168243	0.224324	0.210304	0.308446	0.350507	0.350507
METALS (mg/kg)													
Chromium, Hexavalent - Estimated	0.432031	0.651006	0.845369	0.559273	0.739779	1.08895	0.624271	0.541518	0.443867	0.550396	0.529682	0.571109	0.50305
Chromium, Trivalent - Estimated	15.7102	23.6729	30.7407	20.3372	26.9011	39.5984	22.7007	19.6916	16.1406	20.0144	19.2612	20.7676	18.2927
Aluminum	16958.5	17900.7	19025.2	18110	26379.9	27217.4	31907.6	15178.9 J	13399.3	11933.8	16435.1	14969.6	14341.5
Antimony	0.108858279 UJ	0.115261707 UJ	0.315597 J-	0.230523 J-	1.40875 J-	0.601922 J-	0.842326 J-	0.217717 J-	0.192103 J-	0.230523 J-	0.397013 J-	0.332978 J-	0.320171 J-
Arsenic	5.69165	5.46398	5.0817	5.12248	6.26081	7.51297	9.73057	5.80548	4.89482	4.78098	5.80548	5.46398	5.23632
Barium	122.759	115.477	84.4358	84.4748	103.305	134.203	128.587	103.825	80.2094	61.7956	96.6466	97.5829	93.4216
Beryllium	0.627284 J	0.616652 J	0.573717	0.627284	1.06319	0.903714	1.14397	0.627284	0.510333 J	0.55286 J	0.637916	0.595388	0.563492 J
Cadmium	0.138028 J	0.356573 J	0.3248 J	0.368075 J	0.58662 J	0.460094 J	0.430898 J	0.218545 J	0.184038 J	0.207042 J	0.310563 J	0.299061 J	0.322066 J
Calcium	16932	22686.7	26098	22908	27334.6	22465.3	26802.7	18702.7	27334.6	33642.6	28552	33864	32536
Chromium, Total	16.1422	24.3239	31.5861	20.8965	27.6408	40.6873	23.325	20.2331	16.5845 J-	20.5648	19.7908	21.3387	18.7958
Cobalt	6.21054	6.31405	5.928	6.31405	6.41756	7.55616	6.8817	6.31405	5.7965	5.69299	6.21054	6.00352	6.10703
Copper	17.6272	19.3113	32.4785	25.4865	50.2993	73.9893	23.049	21.3323	18.4131	17.7395	24.5883	28.967	28.1811
Iron	17577.9	17681.3	15292	16026.9	20162.9	31536.8	18068	16543.9	15199.7	14372.5	15406.5	16957.5	16440.5
Lead	17.9702	27.1781	59.5077 J	29.8514	53.3166	320.791	21.4107	28.3662	22.5742	20.0494	30.594	32.2276	35.3464
Magnesium	11721.5	12544.1	11017.6	11104.6	10251.2	10261.4	10664	11824.3	11927.1	11927.1	11207.4	11927.1	11824.3
Manganese	544.005	544.005	397.284	404.571	425.697	575.694	428.716	463.724	372.881	360.205	402.458	415.134	403.514
Mercury	0.0325371 J	0.0371853 J	0.030750714 U	0.01626857 U	0.0495804 J	0.0387347 J	0.048690765 U	0.027889 J	0.012395101 U	0.0263396 J	0.0402841 J	0.0371853 J	0.0309878 J
Nickel	20.0335	28.3903	33.5297	38.0064	42.5855	64.2216	85.6771	29.0772	24.727 J-	34.1142	40.5249	35.2589	34.5721
Potassium	1168.66 J+	1274.9 J+	1086.13	1104.92	1625.5	1731.75	3068.65	1328.03	1037.99	876.497	1104.92	1243.03	1073.04
Selenium	0.491831 J	0.563807 J	0.287526 J	0.359877 J	0.419856 J	1.91934 J	5.90849 J	2.0393 J	1.79938 J	1.67942 J	1.55947 J	1.79938 J	1.67942 J
Silver	0.041431 J	0.0556048 J	0.067082 J	0.0686883 J	0.119932 J	0.0872232 J	0.0491761 J	0.059966 J	0.0501534 J	0.0501534 J	0.0632368 J	0.185349 J	0.207155 J
Sodium	45.82452086 U	47.13192516 U	145.944 J	154.274 J	916.49	2693.25	6298.19	83.8046 J	79.8824 J	104.462 J	879.883	355.614 J	241.87 J
Thallium	0.107497 J	0.112071 J	0.07092 J	0.0869125 J	0.114359 J	0.13723 J	0.386554 J	0.104066 J	0.0972048 J	0.0972048 J	0.0949176 J	0.102923 J	0.093774 J
Vanadium	15.6169	16.163	16.8697	17.8011	24.6813	26.2102	32.0277	15.9446	14.088	14.9617	18.6748	18.5656	16.163
Zinc	59.2862	68.8667	100.472	76.5311	99.6369	96.3683	75.6654	67.2887	54.4396	55.0032	73.037	89.4929	86.7878
PESTICIDES (mg/kg)													
Aldrin	0.0005 U	0.0005 U	--	0.0005 U	0.0005 U	0.0005 U	--	0.000395 U	0.0004 U	0.000395 U	0.000405 U	0.0004 U	0.000395 U
Alpha Bhc (Alpha Hexachlorocyclohexane)	0.000345 U	0.000345 U	--	0.00035 U	0.000345 U	0.000345 U	--	0.000295 U	0.000305 U	0.000295 U	0.000305 U	0.0003 U	0.000295 U
Alpha Endosulfan	0.0005 U	0.0005 U	--	0.0005 U	0.0005 U	0.0005 U	--	0.00045 U	0.00046 U	0.000455 U	0.000465 U	0.00046 U	0.00045 U
Beta Bhc (Beta Hexachlorocyclohexane)	0.00038 U	0.000385 U	--	0.000385 U	0.00038 U	0.000385 U	--	0.000315 U	0.000325 U	0.000315 U	0.000325 U	0.00032 U	0.000315 U
Beta Endosulfan	0.0009 U	0.0009 U	--	0.0009 U	0.0009 U	0.0009 U	--	0.0005 U	0.0005 U	0.0005 U	0.00055 U	0.0005 U	0.0005 U
cis-Chlordane	0.00055 U	0.00055 U	--	0.00055 U	0.00055 U	0.00055 U	--	0.00055 U	0.00055 U	0.00055 U	0.00055 U	0.00055 U	0.00055 U
Delta BHC (Delta Hexachlorocyclohexane)	0.00021 U	0.00021 U	--	0.00021 U	0.00021 U	0.00021 U	--	0.000355 U	0.00036 U	0.000355 U	0.000365 U	0.00036 U	0.000355 U
Dieldrin	0.000445 U	0.000445 U	--	0.000445 U	0.000445 U	0.000445 U	--	0.000425 U	0.00043 U	0.000425 U	0.000435 U	0.00043 U	0.000425 U
Endosulfan Sulfate	0.00043 U	0.00043 U	--	0.00043 U	0.000425 U	0.00043 U	--	0.00038 U	0.000385 U	0.00038 U	0.00039 U	0.000385 U	0.00038 U
Endrin Aldehyde	0.0008 U	0.0008 U	--	0.0008 U	0.0008 U	0.0008 U	--	0.000405 U	0.00041 U	0.000405 U	0.000415 U	0.00041 U	0.000405 U
Endrin Ketone	0.00065 U	0.00065 U	--	0.00065 U	0.00065 U	0.00065 U	--	0.00045 U	0.00046 U	0.000455 U	0.000465 U	0.00046 U	0.00045 U
Endrin	0.00049 U	0.00049 U	--	0.00049 U	0.00049 U	0.00049 U	--	0.000415 U	0.00042 U	0.000415 U	0.000425 U	0.00042 U	0.000415 U
Gamma Bhc (Lindane)	0.000315 U	0.000315 U	--	0.000315 U	0.000315 U	0.000315 U	--	0.00029 U	0.0003 U	0.00029 U	0.0003 U	0.000295 U	0.00029 U
Heptachlor Epoxide	0.0005 U	0.0005 U	--	0.0005 U	0.0005 U	0.0005 U	--	0.00065 U	0.00065 U	0.00065 U	0.00065 U	0.00065 U	0.00065 U
Heptachlor	0.000405 U	0.000405 U	--	0.000405 U	0.0004 U	0.000405 U	--	0.00042 U	0.000425 U	0.00042 U	0.00043 U	0.000425 U	0.00042 U
Methoxychlor	0.0008 U	0.0008 U	--	0.0008 U	0.0008 U	0.0008 U	--	0.0007 U	0.0007 U	0.0007 U	0.0007 U	0.0007 U	0.0007 U
P,P'-DDD	0.0006 U	0.0006 U	--	0.0006 U	0.0006 U	0.0006 U	--	0.000425 U	0.000435 U	0.00043 U	0.00044 U	0.000435 U	0.00043 U
P,P'-DDE	0.000405 U	0.000405 U	--	0.000405 U	0.0004 U	0.000405 U	--	0.00047 U	0.00048 U	0.00047 U	0.000485 U	0.00048 U	0.00047 U
P,P'-DDT	0.00065 U	0.00065 U	--	0.00065 U	0.00065 U	0.00065 U	--	0.000335 U	0.000345 U	0.000335 U	0.000345 U	0.00034 U	0.000335 U
Toxaphene	0.0125 U	0.0125 U	--	0.0125 U	0.0125 U	0.0125 U	--	0.0095 U	0.0095 U	0.0095 U	0.01 U	0.0095 U	0.0095 U
trans-Chlordane	0.0006 U	0.0006 U	--	0.0006 U	0.0006 U	0.0006 U	--	0.0007 U	0.0007 U	0.0007 U	0.00075 U	0.0007 U	0.0007 U

Table E-46
Summary of Data Used in Risk Assessment
Central Landfills Area - ISM Soil (0-0.5 ft-bgs) - RSD High Adjusted - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Sample Depth Chemical	CFISS-009 240-95956-1 CFISS-09-SO-0-0.5 0-0.5 ft 5/21/2018	CFISS-010 240-95956-3 CFISS-010-SO-0-0.5 0-0.5 ft 5/21/2018	CFISS-011 240-95908-15 CFISS-011-SO-0.0-0.5 0-0.5 ft 5/19/2018	CFISS-012 240-95908-13 CFISS-012-0.0-0.5 0-0.5 ft 5/18/2018	CFISS-013 240-95908-9 CFISS-013-SO-0-0.5 0-0.5 ft 5/17/2018	CFISS-014 240-95908-7 CFISS-014-SO-0-0.5 0-0.5 ft 5/16/2018	CFISS-015 240-95908-1 CFISS-015-SO-0-0.5 0-0.5 ft 5/15/2018	CFISS-016 240-66446-1 CFISS-016-SO-0-0.5 0-0.5 ft 6/23/2016	CFISS-017 240-66695-1 CFISS-017-SO-0-0.5 0-0.5 ft 6/29/2016	CFISS-018 240-66516-1 CFISS-018-SO-0-0.5 0-0.5 ft 6/24/2016	CFISS-019 240-66516-3 CFISS-019-SO-0-0.5 0-0.5 ft 6/24/2016	CFISS-020 240-66516-5 CFISS-020-SO-0-0.5 0-0.5 ft 6/25/2016	CFISS-020-DUP 240-66516-6 CFISS-DUP2-SO 0-0.5 ft 6/25/2016
POLYCHLORINATED BIPHENYLS (mg/kg)													
PCB-1016 (Aroclor 1016)	0.00455 U	0.00455 U	--	0.00455 U	0.0045 U	0.00455 U	--	0.0043 U	0.0044 U	0.00435 U	0.00445 U	0.0044 U	0.0044 U
PCB-1221 (Aroclor 1221)	0.00455 U	0.00455 U	--	0.00455 U	0.0045 U	0.00455 U	--	0.0043 U	0.0044 U	0.00435 U	0.00445 U	0.0044 U	0.0044 U
PCB-1232 (Aroclor 1232)	0.00455 U	0.00455 U	--	0.00455 U	0.0045 U	0.00455 U	--	0.0043 U	0.0044 U	0.00435 U	0.00445 U	0.0044 U	0.0044 U
PCB-1242 (Aroclor 1242)	0.00455 U	0.00455 U	--	0.00455 U	0.0045 U	0.00455 U	--	0.0043 U	0.0044 U	0.00435 U	0.00445 U	0.0044 U	0.0044 U
PCB-1248 (Aroclor 1248)	0.00455 U	0.00455 U	--	0.00455 U	0.0045 U	0.2	--	0.0043 U	0.0044 U	0.00435 U	0.00445 U	0.0044 U	0.0044 U
PCB-1254 (Aroclor 1254)	0.011260089 U	0.574983	0.101735386 U	0.146142 J	0.646856 J+	0.011260089 U	--	0.010661149 U	0.010900725 U	0.010780937 U	0.011020513 U	0.189265 J	0.010900725 UJ
PCB-1260 (Aroclor 1260)	0.0047 U	0.0047 U	--	0.0047 U	0.0047 U	0.0047 U	--	0.00445 U	0.00455 U	0.0045 U	0.0046 U	0.00455 U	0.00455 U
PCB-1262 (Aroclor 1262)	0.0047 U	0.0047 U	--	0.0047 U	0.0047 U	0.0047 U	--	0.00445 U	0.00455 U	0.0045 U	0.0046 U	0.00455 U	0.00455 U
PCB-1268 (Aroclor 1268)	0.0047 U	0.0047 U	--	0.0047 U	0.0047 U	0.0047 U	--	0.00445 U	0.00455 U	0.0045 U	0.0046 U	0.00455 U	0.00455 U
Polychlorinated Biphenyl (PCBs)	0.011260089 U	0.574983	0.101735386 U	0.146142 J	0.646856 J+	0.479153	--	0.010661149 U	0.010900725 U	0.010780937 U	0.011020513 U	0.189265 J	0.010900725 UJ
SEMIVOLATILE ORGANIC COMPOUNDS (mg/kg)													
1,2,4,5-Tetrachlorobenzene	0.00075 U	0.00365 U	--	0.018 U	0.07 U	0.018 U	--	0.012 U	0.0245 U	0.0125 U	0.012 U	0.125 U	0.125 U
1,4-Dioxane (P-Dioxane)	0.0055 U	0.026 U	--	0.13 U	0.5 U	0.13 U	--	0.0425 U	0.09 U	0.0445 U	0.0435 U	0.44 U	0.445 U
2,3,4,6-Tetrachlorophenol	0.007 U	0.035 U	--	0.175 U	0.7 U	0.175 U	--	0.015 U	0.031 U	0.0155 U	0.0155 U	0.155 U	0.155 U
2,4,5-Trichlorophenol	0.0012 U	0.006 U	--	0.03 U	0.12 U	0.0295 U	--	0.016 U	0.033 U	0.0165 U	0.016 U	0.165 U	0.165 U
2,4,6-Trichlorophenol	0.00095 U	0.0046 U	--	0.023 U	0.09 U	0.023 U	--	0.0045 U	0.0095 U	0.0047 U	0.00465 U	0.047 U	0.047 U
2,4-Dichlorophenol	0.0013 U	0.0065 U	--	0.0325 U	0.13 U	0.032 U	--	0.00375 U	0.008 U	0.0039 U	0.00385 U	0.039 U	0.039 U
2,4-Dimethylphenol	0.00105 U	0.005 U	--	0.026 U	0.25 J	0.026 U	--	0.035 U	0.075 U	0.0365 U	0.036 U	0.365 U	0.365 U
2,4-Dinitrophenol	0.046 U	0.225 U	--	1.15 UJ	4.45 UJ	1.1 UJ	--	0.12 U	0.25 U	0.125 U	0.125 U	1.25 U	1.25 U
2,4-Dinitrotoluene	0.00085 U	0.0042 U	--	0.021 U	0.08 U	0.0205 U	--	0.0065 U	0.013 U	0.0065 U	0.0065 U	0.065 U	0.065 U
2,6-Dinitrotoluene	0.00105 U	0.005 U	--	0.026 U	0.1 U	0.0255 U	--	0.0085 U	0.0175 U	0.009 U	0.0085 U	0.09 U	0.09 U
2-Chloronaphthalene	0.0008 U	0.00385 U	--	0.0195 U	0.075 U	0.019 U	--	0.0036 U	0.0075 U	0.00375 U	0.0037 U	0.0375 U	0.0375 U
2-Chlorophenol	0.0008 U	0.0039 U	--	0.0195 U	0.075 U	0.0195 U	--	0.00405 U	0.0085 U	0.0042 U	0.00415 U	0.042 U	0.042 U
2-Methylnaphthalene	0.017647	0.0220588 J	--	0.397059	13.3823	0.145588 J	0.0100512 J	0.0161765 J	0.0264706 J	0.0141176 J	0.0588235 J	1.91176 J	1.29412 J
2-Methylphenol (O-Cresol)	0.0049 U	0.024 U	--	0.12 U	0.475 U	0.12 U	--	0.007 U	0.0145 U	0.007 U	0.007 U	0.07 U	0.07 U
2-Nitroaniline	0.008 U	0.0385 U	--	0.19 U	0.75 U	0.19 U	--	0.005 U	0.011 U	0.0055 U	0.0055 U	0.055 U	0.055 U
2-Nitrophenol	0.001 U	0.0048 U	--	0.024 U	0.095 U	0.024 U	--	0.0055 U	0.011 U	0.0055 U	0.0055 U	0.055 U	0.055 U
3- And 4- Methylphenol (Total)	--	--	--	--	--	--	--	0.00425 U	0.009 U	0.0044 U	0.00435 U	0.044 U	0.044 U
3,3'-Dichlorobenzidine	0.016 U	0.08 U	--	0.395 U	1.55 U	0.385 U	--	0.0175 U	0.037 U	0.0185 U	0.018 U	0.185 U	0.185 U
3-Nitroaniline	0.00435 U	0.0215 U	--	0.105 U	0.42 U	0.105 U	--	0.0047 U	0.01 U	0.0049 U	0.00485 U	0.049 U	0.049 U
4,6-Dinitro-2-Methylphenol	0.0295 U	0.145 U	--	0.75 U	2.85 U	0.7 U	--	0.0425 U	0.09 U	0.0445 U	0.0435 U	0.44 U	0.445 U
4-Bromophenyl Phenyl Ether	0.0012 U	0.006 U	--	0.0295 U	0.115 U	0.029 U	--	0.005 U	0.0105 U	0.005 U	0.005 U	0.05 U	0.05 U
4-Chloro-3-Methylphenol	0.0008 U	0.00395 U	--	0.02 U	0.08 U	0.0195 U	--	0.007 U	0.0145 U	0.007 U	0.007 U	0.07 U	0.07 U
4-Chloroaniline	0.00055 U	0.0028 U	--	0.014 U	0.055 U	0.014 U	--	0.0041 U	0.0085 U	0.00425 U	0.0042 U	0.0425 U	0.0425 U
4-Chlorophenyl Phenyl Ether	0.00105 U	0.005 U	--	0.0255 U	0.1 U	0.025 U	--	0.00475 U	0.01 U	0.00495 U	0.0049 U	0.0495 U	0.0495 U
4-Nitroaniline	0.00085 U	0.0041 U	--	0.0205 U	0.08 U	0.02 U	--	0.006 U	0.0125 U	0.0065 U	0.006 U	0.06 U	0.065 U
4-Nitrophenol	0.012 UJ	0.06 UJ	--	0.295 U	1.15 U	0.29 U	--	0.075 U	0.16 U	0.08 U	0.08 U	0.8 U	0.8 U
Acenaphthene	0.0894441	0.137716	0.396163	2.12962	53.9504	0.979626	0.0613975	0.0354937 J	0.184567 J	0.103642 J	0.354937 J	7.66664	4.96912
Acenaphthylene	0.00435677 J	0.00503751 U	--	0.136149 J	4.08447	0.0571825 J	0.0422228 J	0.005582106 U	0.011572658 U	0.005786329 U	0.005718255 U	0.272298 J	0.190608 J
Acetophenone	0.00346667 J	0.006572222 U	--	0.033222222 U	0.13 U	0.0325 U	--	0.004983333 U	0.010111111 U	0.0052 U	0.005127778 U	0.052 U	0.052 U
Anthracene	0.165186	0.330372	0.71576 J+	4.12965 J+	97.735 J+	1.37655 J+	0.366163 J+	0.0674509 J	0.344137 J	0.178951 J	0.605682	11.7007	8.2593
Atrazine	0.0075 U	0.037 U	--	0.185 UJ	0.7 UJ	0.18 UJ	--	0.007 U	0.015 U	0.0075 U	0.0075 U	0.075 U	0.075 U
Benzaldehyde	0.0068 J	0.0105 UR	--	0.05 UR	0.205 UR	0.05 UR	--	0.012 U	0.0255 U	0.0125 U	0.0125 U	0.125 U	0.125 U
Benzo(A)Anthracene	0.699831	1.84861	6.12986	12.8082	184.861	5.1497	3.98723	0.42254	2.1127	1.45248	3.69722	30.37	22.4474
Benzo(A)Pyrene	0.748804	1.90605	7.2072	13.3423	176.99	4.76512	1.49719	0.571814	2.85907	1.7699	4.62897	32.6751	24.5063
Benzo(B)Fluoranthene	1.03874	3.6356	8.08575	16.8796	194.764	9.47853	16.2181	0.960838	3.50576	2.59686	5.58325	38.9529	27.267
Benzo(G,H,I)Perylene	0.823892	2.2232	7.37159	12.0314	130.777	4.96951	5.88348	0.562339	2.87708	2.48475	5.36184	27.4631	19.6165
Benzo(K)Fluoranthene	0.4201	1.4441	4.30069	5.6451	66.9535	3.28203	2.59093	0.315075	1.10276	0.879585	2.1005	15.7538	11.4215
Benzyl Butyl Phthalate	0.0115 U	0.06 U	--	0.29 U	1.15 U	0.285 U	--	0.0049 U	0.01 U	0.005 U	0.005 U	0.05 U	0.05 U
Biphenyl (Diphenyl)	0.00583848 J	0.005314509 U	--	0.0943138 J	3.14379 J	0.026198286 U	--	0.020210106 U	0.04266578 U	0.020958629 U	0.020958629 U	0.464084 J	0.209586288 U
Bis(2-Chloroethoxy) Methane	0.0008 U	0.004 U	--	0.02 U	0.08 U	0.02 U	--	0.00495 U	0.0105 U	0.005 U	0.005 U	0.05 U	0.05 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.0006 U	0.00305 U	--	0.0155 U	0.06 U	0.015 U	--	0.00375 U	0.008 U	0.0039 U	0.00385 U	0.039 U	0.039 U
Bis(2-Chloroisopropyl) Ether	0.00125 U	0.006 U	--	0.031 U	0.125 U	0.031 U	--	0.0065 U	0.0135 U	0.007 U	0.0065 U	0.07 U	0.07 U
Bis(2-Ethylhexyl) Phthalate	0.018 U	0.09 U	--	0.45 U	1.75 U	0.44 U	--	0.006 U	0.033 J	0.0065 U	0.0065 U	0.81 J	0.52 J
Caprolactam	0.011 U	0.055 U	--	0.275 U	1.1 U	0.27 U	--	0.0115 U	0.024 U	0.012 U	0.0115 U	0.12 U	0.12 U
Carbazole	0.156634	0.482954	0.738266 J+	2.87162 J+	49.6007 J+	0.691799 J+	0.178427	0.060043 J	0.339373 J	0.195792 J	0.482954	5.61271	4.04637 J

Table E-46
Summary of Data Used in Risk Assessment
Central Landfills Area - ISM Soil (0-0.5 ft-bgs) - RSD High Adjusted - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Sample Depth Chemical	CFISS-009 240-95956-1 CFISS-09-SO-0-0.5 0-0.5 ft 5/21/2018	CFISS-010 240-95956-3 CFISS-010-SO-0-0.5 0-0.5 ft 5/21/2018	CFISS-011 240-95908-15 CFISS-011-SO-0.0-0.5 0-0.5 ft 5/19/2018	CFISS-012 240-95908-13 CFISS-012-0.0-0.5 0-0.5 ft 5/18/2018	CFISS-013 240-95908-9 CFISS-013-SO-0-0.5 0-0.5 ft 5/17/2018	CFISS-014 240-95908-7 CFISS-014-SO-0-0.5 0-0.5 ft 5/16/2018	CFISS-015 240-95908-1 CFISS-015-SO-0-0.5 0-0.5 ft 5/15/2018	CFISS-016 240-66446-1 CFISS-016-SO-0-0.5 0-0.5 ft 6/23/2016	CFISS-017 240-66695-1 CFISS-017-SO-0-0.5 0-0.5 ft 6/29/2016	CFISS-018 240-66516-1 CFISS-018-SO-0-0.5 0-0.5 ft 6/24/2016	CFISS-019 240-66516-3 CFISS-019-SO-0-0.5 0-0.5 ft 6/24/2016	CFISS-020 240-66516-5 CFISS-020-SO-0-0.5 0-0.5 ft 6/25/2016	CFISS-020-DUP 240-66516-6 CFISS-DUP2-SO 0-0.5 ft 6/25/2016
Chrysene	1.04626	3.53284	8.12301	16.3054	217.405	9.10385	17.0136	0.665804	3.1252	2.03817	4.61986	33.9696	25.8169
Dibenz(A,H)Anthracene	0.181769	0.615219	1.975	3.35574	34.9556	1.13256	3.67945 J	0.153805	0.824953	0.587255	1.39823	8.669	6.57166
Dibenzofuran	0.0360453 J	0.0427204 J	0.0826372 J	0.854407 J	22.6952	0.307053 J	0.0204837 J	0.0173551 J	0.0774307 J	0.0307053 J	0.120151 J	3.07053 J	2.00252 J
Diethyl Phthalate	0.005 U	0.025 U	--	0.125 U	0.495 U	0.125 U	--	0.0045 U	0.0095 U	0.0047 U	0.00465 U	0.047 U	0.047 U
Dimethyl Phthalate	0.0006 U	0.00305 U	--	0.0155 U	0.06 U	0.015 U	--	0.0046 U	0.0095 U	0.0048 U	0.00475 U	0.048 U	0.048 U
Di-N-Butyl Phthalate	0.0075 U	0.037 U	--	0.185 U	0.7 U	0.18 U	--	0.00475 U	0.01 U	0.00495 U	0.022 J	0.0495 U	0.0495 U
Di-N-Octylphthalate	0.01 U	0.049 U	--	0.245 U	0.95 U	0.24 U	--	0.008 U	0.017 U	0.0085 U	0.0085 U	0.085 U	0.085 U
Fluoranthene	1.22198	3.29523	7.8909	21.9682	411.904	8.37538	6.1816 J	0.782617	4.11904	2.33412	6.17856	53.5475	41.1904
Fluorene	0.0646316	0.0915615	0.1428 J	1.48114	41.7412	0.673246	0.0377101 J	0.0201974 J	0.127917 J	0.0552062 J	0.201974 J	5.52062	3.63553 J
Hexachlorobenzene	0.0012 U	0.006 U	--	0.03 U	0.12 U	0.03 U	--	0.0065 U	0.0135 U	0.0065 U	0.0065 U	0.065 U	0.065 U
Hexachlorobutadiene	0.001 U	0.0049 U	--	0.0245 UJ	0.095 UJ	0.0245 UJ	--	0.00445 U	0.0095 U	0.00465 U	0.0046 U	0.0465 U	0.0465 U
Hexachlorocyclopentadiene	0.00085 U	0.0043 U	--	0.0215 U	0.085 U	0.021 U	--	0.01 U	0.0205 U	0.0105 U	0.01 U	0.105 U	0.105 U
Hexachloroethane	0.0009 U	0.00435 U	--	0.022 U	0.085 U	0.0215 U	--	0.006 U	0.012 U	0.006 U	0.006 U	0.06 U	0.06 U
Indeno(1,2,3-C,D)Pyrene	0.655617	1.83573	6.11457	9.96537	111.455	3.9337	4.64389	0.537606	3.14696	2.2291	5.24493	28.8471	22.291
Isophorone	0.00085 U	0.0043 U	--	0.0215 U	0.085 U	0.021 U	--	0.047 J	0.086 J	0.00355 U	0.0035 U	0.0355 U	0.0355 U
Naphthalene	0.0434845	0.0405855 J	0.0635333 J	0.710246	24.6412	0.318886	0.014423 J	0.0202927 J	0.0710246 J	0.0231917 J	0.101464 J	3.18886 J	1.73938 J
Nitrobenzene	0.006 U	0.0305 U	--	0.155 U	0.6 U	0.15 U	--	0.005 U	0.0105 U	0.005 U	0.005 U	0.05 U	0.05 U
N-Nitrosodi-N-Propylamine	0.00115 U	0.0055 U	--	0.0285 U	0.11 U	0.028 U	--	0.0055 U	0.011 U	0.0055 U	0.0055 U	0.055 U	0.055 U
N-Nitrosodiphenylamine	0.0055 U	0.028 U	--	0.14 U	0.55 U	0.14 U	--	0.0145 U	0.03 U	0.015 U	0.015 U	0.15 U	0.15 U
Pentachlorophenol	0.0275 UJ	0.135 UJ	--	0.7 U	2.65 U	0.65 U	--	0.019 U	0.04 U	0.02 U	0.0195 U	0.2 U	0.2 U
Phenanthrene	0.760003	1.44138	2.80784	15.7242	353.794	5.37243	0.886404	0.406208 J	2.09656	1.1269	3.14484	41.9312	31.4484
Phenol	0.005 U	0.0255 U	--	0.13 U	0.5 U	0.125 U	--	0.005 U	0.011 U	0.0055 U	0.0055 U	0.055 U	0.055 U
Pyrene	1.26797	3.76211	9.08012	23.6873	404.078	9.47493	6.68027 J	1.0311	3.06542	2.2294	5.29482	55.7349	39.0144

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-46
Summary of Data Used in Risk Assessment
Central Landfills Area - ISM Soil (0-0.5 ft-bgs) - RSD High Adjusted - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Sample Depth Chemical	CFISS-021 240-66516-8 CFISS-021-SO-0-0.5 0-0.5 ft 6/25/2016	CFISS-022 240-66588-1 CFISS-022-SO-0-0.5 0-0.5 ft 6/27/2016	CFISS-023 240-66588-3 CFISS-023-SO-0-0.5 0-0.5 ft 6/27/2016	CFISS-024 240-66695-2 CFISS-024-SO-0-0.5 0-0.5 ft 6/29/2016	CFISS-025 240-66695-5 CFISS-025-SO-0-0.5 0-0.5 ft 6/30/2016	CFISS-026 240-66695-7 CFISS-026-SO-0-0.5 0-0.5 ft 6/30/2016	CFISS-027 240-66695-9 CFISS-027-SO-0-0.5 0-0.5 ft 7/1/2016	CFISS-027-DUP 240-66695-10 CFISS-DUP3-SO 0-0.5 ft 7/1/2016	CFISS-028 240-66695-12 CFISS-028-SO-0-0.5 0-0.5 ft 7/1/2016	CFISS-029 240-66588-5 CFISS-029-SO-0-0.5 0-0.5 ft 6/27/2016
GENERAL CHEMISTRY (mg/kg)										
Fluoride	302.543 J-	882.317 J+	47.3703 J	713.568 J+	84.1335	743.701 J+	294.106 J+	288.079 J+	220.579 J+	48.0935 J
Cyanide	0.785135	0.925338	0.266385	0.434629	0.967399	0.53277	0.602872	0.630912	0.392568	0.378547
METALS (mg/kg)										
Chromium, Hexavalent - Estimated	0.920285	1.49139	0.46754	0.547436	0.541518	0.816716	1.13926	2.04475	0.523764	0.440908
Chromium, Trivalent - Estimated	33.4649	54.2325	17.0015	19.9068	19.6916	29.6988	41.4276	74.3545	19.0459	16.033
Aluminum	23658.2	28787.6 J	18319.4 J	23972.2	25961.2	38837.1	32346.8	30776.6	28159.5	18738.1 J
Antimony	0.806832 J-	1.28069 J-	0.192103 J-	0.281751 J-	0.512274 J-	0.345785 J-	0.397013 J-	0.345785 J-	0.192103 J-	0.307365 J-
Arsenic	9.3343	14.0015	6.03315	6.82998	6.82998	8.19597	9.3343	9.22047	6.03315	6.71614
Barium	117.557	148.767	114.436	101.12	102.681	261.123	304.817	307.938	272.566	124.84
Beryllium	0.967506	1.05256	0.691076	0.861186	0.712339	1.38215	1.16951	1.06319	0.978138	0.616652
Cadmium	1.11573 J	1.38028 J	0.207042 J	0.322066 J	0.437089 J	0.632629 J	0.747652 J	0.770657 J	0.253052 J	0.276056 J
Calcium	22465.3	13944	14718.7	26117.3	30876	10126	7813.06	8488.13	8333.19	20252
Chromium, Total	34.3852	55.7239	17.469	20.4542 J-	20.2331 J-	30.5155 J-	42.5669 J	76.3993 J	19.5697 J-	16.4739
Cobalt	7.97019	9.62633	6.72808	6.52107	6.52107	7.45265	7.86668	8.0737	6.72808	6.52107
Copper	49.4011	53.443	19.5359	22.0059	37.3876	50.7484	45.2469	46.8187	23.1287	73.0911
Iron	25332.8	31433.4	17784.7	17267.7	18094.9	28021.2	26366.8	26987.2	19025.5	17060.9
Lead	69.0592 J	96.3858	21.6831	26.8811	29.2573	55.8414	90.8908	95.7917	24.6534	24.6534
Magnesium	11413	11001.8	11310.2	12132.8	12030	10148.3	10282	10487.7	10384.8	11515.9
Manganese	527.104	595.764	491.189	411.965	421.472	615.834	512.315	528.16	477.457	470.062
Mercury	0.0433829 J	0.0402841 J	0.0309878 J	0.0604261 J	0.011620407 U	0.012395101 U	0.027889 J	0.0294384 J	0.012395101 U	0.0371853 J
Nickel	107.151	162.557	30.1075	58.8412 J-	53.3463 J-	61.9321 J-	89.2921 J-	99.595 J-	28.2758 J-	28.8482
Potassium	1699.87	2284.2	1221.78	1901.73	1784.87	2432.94	2517.94	2156.71	1880.48	1413.02
Selenium	4.55844 J	15.9545	2.15926 J	1.91934 J	2.27922 J	3.71873 J	6.83766 J	6.47778 J	2.75905 J	2.0393 J
Silver	0.130835 J	0.119932 J	0.0523339 J	0.0512437 J	0.0708689 J	0.119932 J	0.104668 J	0.109029 J	0.0686883 J	0.0468825 J
Sodium	1568.89	2183.37	104.462 J	1987.25	407.91	2823.99	966.172	834.124	466.743	114.006 J
Thallium	0.19441 J	0.457434 J	0.112071 J	0.114359 J	0.125794 J	0.19441 J	0.251589 J	0.228717 J	0.13723 J	0.108641 J
Vanadium	38.5509	59.5191	16.709	23.6984	22.8247	30.251	36.8035	35.8207	19.6577	16.0538
Zinc	116.093	99.4115	100.539	87.6895	79.2361	101.44	93.8886	98.6225	72.4734	85.0971
PESTICIDES (mg/kg)										
Aldrin	0.0004 U	0.0004 U	0.000395 U	0.00039 U	0.000395 U	0.0004 U	0.000405 U	0.000415 U	0.000405 U	0.00039 U
Alpha Bhc (Alpha Hexachlorocyclohexane)	0.0003 U	0.0003 U	0.0003 U	0.000295 U	0.0003 U	0.0003 U	0.000305 U	0.00031 U	0.000305 U	0.000295 U
Alpha Endosulfan	0.00046 U	0.00046 U	0.000455 U	0.00045 U	0.000455 U	0.00046 U	0.000465 U	0.000475 U	0.000465 U	0.000445 U
Beta Bhc (Beta Hexachlorocyclohexane)	0.00032 U	0.00032 U	0.00032 U	0.000315 U	0.000315 U	0.00032 U	0.000325 U	0.00033 U	0.000325 U	0.000315 U
Beta Endosulfan	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.00055 U	0.00055 U	0.00055 U	0.0005 U
cis-Chlordane	0.00055 U	0.00055 U	0.00055 U	0.00055 U	0.00055 U	0.00055 U	0.00055 U	0.00055 U	0.00055 U	0.0005 U
Delta BHC (Delta Hexachlorocyclohexane)	0.00036 U	0.00036 U	0.000355 U	0.00035 U	0.000355 U	0.00036 U	0.000365 U	0.000375 U	0.000365 U	0.00035 U
Dieldrin	0.00043 U	0.00043 U	0.000425 U	0.00042 U	0.000425 U	0.00043 U	0.000435 U	0.000445 U	0.000435 U	0.00042 U
Endosulfan Sulfate	0.000385 U	0.000385 U	0.00038 U	0.000375 U	0.00038 U	0.000385 U	0.00039 U	0.0004 U	0.00039 U	0.000375 U
Endrin Aldehyde	0.00041 U	0.00041 U	0.000405 U	0.0004 U	0.000405 U	0.00041 U	0.000415 U	0.000425 U	0.000415 U	0.0004 U
Endrin Ketone	0.00046 U	0.00046 U	0.000455 U	0.00045 U	0.000455 U	0.00046 U	0.000465 U	0.000475 U	0.000465 U	0.000445 U
Endrin	0.00042 U	0.00042 U	0.000415 U	0.00041 U	0.000415 U	0.00042 U	0.000425 U	0.000435 U	0.000425 U	0.00041 U
Gamma Bhc (Lindane)	0.000295 U	0.000295 U	0.000295 U	0.00029 U	0.000295 U	0.000295 U	0.0003 U	0.000305 U	0.0003 U	0.00029 U
Heptachlor Epoxide	0.00065 U	0.00065 U	0.00065 U	0.00065 U	0.00065 U	0.00065 U	0.00065 U	0.00065 U	0.00065 U	0.00065 U
Heptachlor	0.000425 U	0.000425 U	0.00042 U	0.000415 U	0.00042 U	0.000425 U	0.00043 U	0.00044 U	0.00043 U	0.000415 U
Methoxychlor	0.0007 U	0.0007 U	0.0007 U	0.0007 U	0.0007 U	0.0007 U	0.0007 U	0.00075 U	0.0007 U	0.0007 U
P,P'-DDD	0.000435 U	0.000435 U	0.00043 U	0.000425 U	0.00043 U	0.000435 U	0.00044 U	0.00045 U	0.00044 U	0.000425 U
P,P'-DDE	0.00048 U	0.00048 U	0.000475 U	0.00047 U	0.000475 U	0.00048 U	0.000485 U	0.000495 U	0.000485 U	0.000465 U
P,P'-DDT	0.00034 U	0.00034 U	0.00034 U	0.000335 U	0.000335 U	0.00034 U	0.000345 U	0.000355 U	0.000345 U	0.00033 U
Toxaphene	0.0095 U	0.0095 U	0.0095 U	0.0095 U	0.0095 U	0.0095 U	0.01 U	0.01 U	0.01 U	0.0095 U
trans-Chlordane	0.0007 U	0.0007 U	0.0007 U	0.0007 U	0.0007 U	0.0007 U	0.00075 U	0.00075 U	0.00075 U	0.0007 U

Table E-46
Summary of Data Used in Risk Assessment
Central Landfills Area - ISM Soil (0-0.5 ft-bgs) - RSD High Adjusted - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Sample Depth Chemical	CFISS-021 240-66516-8 CFISS-021-SO-0-0.5 0-0.5 ft 6/25/2016	CFISS-022 240-66588-1 CFISS-022-SO-0-0.5 0-0.5 ft 6/27/2016	CFISS-023 240-66588-3 CFISS-023-SO-0-0.5 0-0.5 ft 6/27/2016	CFISS-024 240-66695-2 CFISS-024-SO-0-0.5 0-0.5 ft 6/29/2016	CFISS-025 240-66695-5 CFISS-025-SO-0-0.5 0-0.5 ft 6/30/2016	CFISS-026 240-66695-7 CFISS-026-SO-0-0.5 0-0.5 ft 6/30/2016	CFISS-027 240-66695-9 CFISS-027-SO-0-0.5 0-0.5 ft 7/1/2016	CFISS-027-DUP 240-66695-10 CFISS-DUP3-SO 0-0.5 ft 7/1/2016	CFISS-028 240-66695-12 CFISS-028-SO-0-0.5 0-0.5 ft 7/1/2016	CFISS-029 240-66588-5 CFISS-029-SO-0-0.5 0-0.5 ft 6/27/2016
POLYCHLORINATED BIPHENYLS (mg/kg)										
PCB-1016 (Aroclor 1016)	0.0044 U	0.0044 U	0.00435 U	0.0043 U	0.00435 U	0.0044 U	0.00445 U	0.00455 U	0.00445 U	0.0043 U
PCB-1221 (Aroclor 1221)	0.0044 U	0.0044 U	0.00435 U	0.0043 U	0.00435 U	0.0044 U	0.00445 U	0.00455 U	0.00445 U	0.0043 U
PCB-1232 (Aroclor 1232)	0.0044 U	0.0044 U	0.00435 U	0.0043 U	0.00435 U	0.0044 U	0.00445 U	0.00455 U	0.00445 U	0.0043 U
PCB-1242 (Aroclor 1242)	0.0044 U	0.0044 U	0.00435 U	0.0043 U	0.00435 U	0.0044 U	0.00445 U	0.00455 U	0.00445 U	0.0043 U
PCB-1248 (Aroclor 1248)	0.0044 U	0.0044 U	0.00435 U	0.0043 U	0.00435 U	0.0044 U	0.00445 U	0.00455 U	0.00445 U	0.0043 U
PCB-1254 (Aroclor 1254)	0.010900725 U	0.143746 J	0.010780937 U	0.010661149 U	0.010780937 U	0.010900725 U	0.011020513 U	0.011260089 U	0.011020513 U	0.010661149 U
PCB-1260 (Aroclor 1260)	0.00455 U	0.00455 U	0.0045 U	0.00445 U	0.0045 U	0.00455 U	0.0046 U	0.0047 U	0.0046 U	0.00445 U
PCB-1262 (Aroclor 1262)	0.00455 U	0.00455 U	0.0045 U	0.00445 U	0.0045 U	0.00455 U	0.0046 U	0.0047 U	0.0046 U	0.00445 U
PCB-1268 (Aroclor 1268)	0.00455 U	0.00455 U	0.0045 U	0.00445 U	0.0045 U	0.00455 U	0.0046 U	0.0047 U	0.0046 U	0.00445 U
Polychlorinated Biphenyl (PCBs)	0.010900725 U	0.143746 J	0.010780937 U	0.010661149 U	0.010780937 U	0.010900725 U	0.011020513 U	0.011260089 U	0.011020513 U	0.010661149 U
SEMIVOLATILE ORGANIC COMPOUNDS (mg/kg)										
1,2,4,5-Tetrachlorobenzene	0.0245 U	0.012 U	0.0125 U	0.024 U	0.0245 U	0.0245 U	0.06 U	0.065 U	0.012 U	0.012 U
1,4-Dioxane (P-Dioxane)	0.09 U	0.043 U	0.0445 U	0.085 U	0.09 U	0.09 U	0.215 U	0.225 U	0.0435 U	0.0435 U
2,3,4,6-Tetrachlorophenol	0.031 U	0.015 U	0.0155 U	0.0305 U	0.031 U	0.031 U	0.075 U	0.08 U	0.015 U	0.0155 U
2,4,5-Trichlorophenol	0.033 U	0.016 U	0.0165 U	0.032 U	0.033 U	0.033 U	0.08 U	0.085 U	0.016 U	0.016 U
2,4,6-Trichlorophenol	0.0095 U	0.00455 U	0.00475 U	0.009 U	0.0095 U	0.0095 U	0.023 U	0.024 U	0.0046 U	0.00465 U
2,4-Dichlorophenol	0.008 U	0.0038 U	0.00395 U	0.0075 U	0.008 U	0.008 U	0.019 U	0.02 U	0.0038 U	0.00385 U
2,4-Dimethylphenol	0.075 U	0.0355 U	0.0365 U	0.07 U	0.075 U	0.075 U	0.18 U	0.185 U	0.0355 U	0.036 U
2,4-Dinitrophenol	0.25 U	0.12 U	0.125 U	0.245 U	0.25 U	0.25 U	0.6 U	0.65 U	0.12 U	0.125 U
2,4-Dinitrotoluene	0.013 U	0.0065 U	0.0065 U	0.013 U	0.013 U	0.013 U	0.032 U	0.0335 U	0.0065 U	0.0065 U
2,6-Dinitrotoluene	0.0175 U	0.0085 U	0.009 U	0.017 U	0.0175 U	0.0175 U	0.043 U	0.045 U	0.0085 U	0.0085 U
2-Chloronaphthalene	0.0075 U	0.00365 U	0.0038 U	0.0075 U	0.0075 U	0.0075 U	0.0185 U	0.019 U	0.00365 U	0.0037 U
2-Chlorophenol	0.0085 U	0.0041 U	0.00425 U	0.008 U	0.0085 U	0.0085 U	0.0205 U	0.0215 U	0.0041 U	0.00415 U
2-Methylnaphthalene	0.0514706 J	0.235294 J	0.005441173 U	0.0764705 J	0.0485294 J	0.25 J	0.116176 J	0.133823 J	0.0161765 J	0.0110294 J
2-Methylphenol (O-Cresol)	0.0145 U	0.007 U	0.0075 U	0.014 U	0.0145 U	0.0145 U	0.0355 U	0.0365 U	0.007 U	0.007 U
2-Nitroaniline	0.011 U	0.0055 U	0.0055 U	0.0105 U	0.011 U	0.011 U	0.0265 U	0.0275 U	0.0055 U	0.0055 U
2-Nitrophenol	0.011 U	0.0055 U	0.0055 U	0.011 U	0.011 U	0.011 U	0.027 U	0.028 U	0.0055 U	0.0055 U
3- And 4- Methylphenol (Total)	0.009 U	0.011 J	0.00445 U	0.0085 U	0.009 U	0.009 U	0.0215 U	0.0225 U	0.0043 U	0.00435 U
3,3'-Dichlorobenzidine	0.037 U	0.018 U	0.0185 U	0.036 U	0.037 U	0.037 U	0.09 U	0.095 U	0.018 U	0.018 U
3-Nitroaniline	0.01 U	0.00475 U	0.00495 U	0.0095 U	0.01 U	0.01 U	0.024 U	0.025 U	0.0048 U	0.00485 U
4,6-Dinitro-2-Methylphenol	0.09 U	0.043 U	0.0445 U	0.085 U	0.09 U	0.09 U	0.215 U	0.225 U	0.043 U	0.0435 U
4-Bromophenyl Phenyl Ether	0.0105 U	0.005 U	0.005 U	0.01 U	0.0105 U	0.0105 U	0.0255 U	0.0265 U	0.005 U	0.005 U
4-Chloro-3-Methylphenol	0.014 U	0.007 U	0.007 U	0.014 U	0.0145 U	0.014 U	0.035 U	0.036 U	0.007 U	0.007 U
4-Chloroaniline	0.0085 U	0.00415 U	0.0043 U	0.0085 U	0.0085 U	0.0085 U	0.021 U	0.0215 U	0.00415 U	0.0042 U
4-Chlorophenyl Phenyl Ether	0.01 U	0.0048 U	0.005 U	0.0095 U	0.01 U	0.01 U	0.024 U	0.025 U	0.00485 U	0.0049 U
4-Nitroaniline	0.0125 U	0.006 U	0.0065 U	0.012 U	0.0125 U	0.0125 U	0.0305 U	0.032 U	0.006 U	0.006 U
4-Nitrophenol	0.16 U	0.075 U	0.08 U	0.155 U	0.16 U	0.16 U	0.39 U	0.405 U	0.08 U	0.08 U
Acenaphthene	0.298147 J	1.03642	0.0198765 J	0.496912 J	0.298147 J	0.582097 J	0.184567 J	0.298147 J	0.0496912 J	0.0553702 J
Acenaphthylene	0.011572658 U	0.0353987 J	0.005854403 U	0.011572658 U	0.011572658 U	0.011572658 U	0.028591273 U	0.029272017 U	0.00565018 U	0.005718255 U
Acetophenone	0.010111111 U	0.0102556 J	0.0105444 J	0.010111111 U	0.0288889 J	0.0332222 J	0.025277778 U	0.026722222 U	0.0433333 J	0.0288889 J
Anthracene	0.412965 J	2.20248	0.022024792 U	0.784633 J	0.55062 J	0.798399 J	0.371668 J	0.55062 J	0.108747 J	0.108747 J
Atrazine	0.0145 U	0.007 U	0.0075 U	0.0145 U	0.015 U	0.0145 U	0.036 U	0.0375 U	0.007 U	0.007 U
Benzaldehyde	0.025 U	0.012 U	0.0125 U	0.0245 U	0.051 J	0.025 U	0.06 U	0.065 U	0.038 J	0.0125 U
Benzo(A)Anthracene	3.43314	14.5248	0.330109	3.82927	3.16905	2.24474	3.56518	4.2254	0.620605	0.884693
Benzo(A)Pyrene	3.94824	10.4833	0.490126	4.76512	4.22053	2.45063	2.72292	3.67595	0.830492	1.15724
Benzo(B)Fluoranthene	9.73822	58.4293	1.02576	6.3623	5.97277	5.19372	15.5811	16.8796	1.24649	1.8178
Benzo(G,H,I)Perylene	6.1465	22.232	0.575417	4.96951	6.40805	3.53097	7.97737	8.76203	0.941591	1.43854
Benzo(K)Fluoranthene	3.15075	14.441	0.328203	1.96922	2.36306	1.57538	4.06972	3.93844	0.459485	0.695791
Benzyl Butyl Phthalate	0.43 J	0.00495 U	0.005 U	0.01 U	0.046 J	0.01 U	0.025 U	0.026 U	0.005 U	0.005 U
Biphenyl (Diphenyl)	0.041917258 U	0.0613788 J	0.020958629 U	0.041168735 U	0.04266578 U	0.0868286 J	0.104793144 U	0.104793144 U	0.020958629 U	0.020958629 U
Bis(2-Chloroethoxy) Methane	0.0105 U	0.005 U	0.005 U	0.01 U	0.0105 U	0.0105 U	0.025 U	0.026 U	0.005 U	0.005 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.008 U	0.0038 U	0.00395 U	0.0075 U	0.008 U	0.008 U	0.019 U	0.02 U	0.0038 U	0.00385 U
Bis(2-Chloroisopropyl) Ether	0.0135 U	0.0065 U	0.007 U	0.0135 U	0.0135 U	0.0135 U	0.0335 U	0.0345 U	0.0065 U	0.0065 U
Bis(2-Ethylhexyl) Phthalate	0.086 J	0.0065 U	0.033 J	0.0125 U	0.047 J	0.055 J	0.27 J	0.033 UJ	0.0065 U	0.1 J
Caprolactam	0.024 U	0.0115 U	0.012 U	0.0235 U	0.024 U	0.024 U	0.06 U	0.06 U	0.0115 U	0.0115 U
Carbazole	0.535166 J	1.82739	0.041769 J	0.561271 J	0.456849 J	0.443796 J	0.32632 J	0.469901 J	0.103117 J	0.104423 J

Table E-46
Summary of Data Used in Risk Assessment
Central Landfills Area - ISM Soil (0-0.5 ft-bgs) - RSD High Adjusted - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Sample Depth Chemical	CFISS-021 240-66516-8 CFISS-021-SO-0-0.5 0-0.5 ft 6/25/2016	CFISS-022 240-66588-1 CFISS-022-SO-0-0.5 0-0.5 ft 6/27/2016	CFISS-023 240-66588-3 CFISS-023-SO-0-0.5 0-0.5 ft 6/27/2016	CFISS-024 240-66695-2 CFISS-024-SO-0-0.5 0-0.5 ft 6/29/2016	CFISS-025 240-66695-5 CFISS-025-SO-0-0.5 0-0.5 ft 6/30/2016	CFISS-026 240-66695-7 CFISS-026-SO-0-0.5 0-0.5 ft 6/30/2016	CFISS-027 240-66695-9 CFISS-027-SO-0-0.5 0-0.5 ft 7/1/2016	CFISS-027-DUP 240-66695-10 CFISS-DUP3-SO 0-0.5 ft 7/1/2016	CFISS-028 240-66695-12 CFISS-028-SO-0-0.5 0-0.5 ft 7/1/2016	CFISS-029 240-66588-5 CFISS-029-SO-0-0.5 0-0.5 ft 6/27/2016
Chrysene	7.20155	39.4047	0.62504	5.43513	4.89162	3.94047	8.28858	9.10385	1.0055	1.29084
Dibenz(A,H)Anthracene	2.23716	9.50794	0.153805	1.39823	1.67787	1.20247	3.35574	3.63539	0.265663	0.349556
Dibenzofuran	0.0947858 J	0.400503 J	0.006675057 U	0.186902 J	0.0881108 J	0.347103 J	0.117481 J	0.160201 J	0.0226952 J	0.0200252 J
Diethyl Phthalate	0.0095 U	0.00455 U	0.00475 U	0.009 U	0.0095 U	0.0095 U	0.023 U	0.024 U	0.0046 U	0.00465 U
Dimethyl Phthalate	0.0095 U	0.00465 U	0.00485 U	0.0095 U	0.0095 U	0.0095 U	0.0235 U	0.0245 U	0.0047 U	0.00475 U
Di-N-Butyl Phthalate	0.01 U	0.035 J	0.015 J	0.0095 U	0.01 U	0.021 J	0.024 U	0.025 U	0.012 J	0.067 J
Di-N-Octylphthalate	0.017 U	0.008 U	0.0085 U	0.0165 U	0.017 U	0.017 U	0.041 U	0.0425 U	0.008 U	0.0085 U
Fluoranthene	6.17856	17.8492	0.562935	7.00237	5.49205	4.11904	4.39364	5.62935	1.20825	1.31809
Fluorene	0.188509 J	0.700176	0.0134649 J	0.296228 J	0.175044 J	0.525132 J	0.134649 J	0.215439 J	0.0377018 J	0.0363553 J
Hexachlorobenzene	0.0135 U	0.0065 U	0.0065 U	0.013 U	0.0135 U	0.0135 U	0.033 U	0.034 U	0.0065 U	0.0065 U
Hexachlorobutadiene	0.0095 U	0.0045 U	0.0047 U	0.009 U	0.0095 U	0.0095 U	0.023 U	0.0235 U	0.00455 U	0.0046 U
Hexachlorocyclopentadiene	0.0205 U	0.01 U	0.0105 U	0.02 U	0.0205 U	0.0205 U	0.05 U	0.05 U	0.01 U	0.01 U
Hexachloroethane	0.012 U	0.006 U	0.006 U	0.012 U	0.012 U	0.012 U	0.0295 U	0.031 U	0.006 U	0.006 U
Indeno(1,2,3-C,D)Pyrene	6.29392	22.291	0.576943	5.24493	5.90055	3.9337	8.78526	9.572	1.07521	1.44236
Isophorone	0.007 U	0.024 J	0.0036 U	0.076 J	0.007 U	0.007 U	0.0175 U	0.018 U	0.099 J	0.0035 U
Naphthalene	0.101464 J	0.521813	0.006160297 U	0.159443 J	0.078272 J	0.927668 J	0.075373 J	0.127554 J	0.0275402 J	0.0173938 J
Nitrobenzene	0.0105 U	0.005 U	0.005 U	0.01 U	0.0105 U	0.0105 U	0.0255 U	0.0265 U	0.005 U	0.005 U
N-Nitrosodi-N-Propylamine	0.011 U	0.0055 U	0.0055 U	0.011 U	0.011 U	0.011 U	0.027 U	0.028 U	0.0055 U	0.0055 U
N-Nitrosodiphenylamine	0.03 U	0.0145 U	0.015 U	0.0295 U	0.03 U	0.03 U	0.075 U	0.075 U	0.0145 U	0.015 U
Pentachlorophenol	0.04 U	0.0195 U	0.02 U	0.039 U	0.04 U	0.04 U	0.1 U	0.1 U	0.0195 U	0.0195 U
Phenanthrene	2.75173	8.64831	0.235863 J	3.53794	2.75173	3.40691	1.96552 J	2.88277	0.537243	0.615864
Phenol	0.011 U	0.018 J	0.0055 U	0.0105 U	0.011 U	0.011 U	0.0265 U	0.0275 U	0.015 J	0.012 J
Pyrene	6.40951	22.294	0.808156	4.8768	5.29482	3.76211	3.76211	5.29482	0.905692	1.81138

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-47
Summary of Data Used in Risk Assessment
Central Landfills Area - ISM Soil (0-2 ft-bgs) - RSD High Adjusted - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFISS-001	CFISS-001	CFISS-002	CFISS-002	CFISS-002	CFISS-002	CFISS-003	CFISS-003	CFISS-004	CFISS-004	CFISS-005	CFISS-005	CFISS-006	CFISS-006-DUP
Sample Lab IDs	240-96124-1	240-96124-2	460-115528-32	460-115528-33	240-67463-7	240-67463-8	240-96052-1	240-96052-2	240-95908-21	240-95908-22	240-95956-5	240-95956-6	460-115731-13	460-115731-17
Sample Name	CFISS-01-S0-0-0.5	CFISS-01-S0-0.5-2	CFISS-002-SO-0-0.5	CFISS-002-SO-0.5-2	CFISS-002-SO-0-0.5	CFISS-002-SO-0.5-2	CFISS-03-SO-0-0.5	CFISS-03-SO-0.5-2	CFISS-04-SO-0-0.5	CFISS-04-SO-0.5-2	CFISS-05-SO-0-0.5	CFISS-05-SO-0.5-2	CFISS-006-SO-0-0.5	CFISS-DUP1-SO
Sample Depth	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0-0.5 ft
Chemical	5/23/2018	5/23/2018	6/14/2016	6/14/2016	7/19/2016	7/19/2016	5/22/2018	5/22/2018	5/19/2018	5/19/2018	5/22/2018	5/22/2018	6/17/2016	6/17/2016
GENERAL CHEMISTRY (mg/kg)														
Fluoride	223.79	345.317	22.4195 J	68.6366 J	1176.42	833.169	269.999 J+	388.898 J+	90.2548 J+	111.491 J+	96.0665 J+	93.3612 J+	71.1157	94.1379 J-
Cyanide	6.03077 J	2.55271	40.6588	16.3181	25.5169 J-	5.17404 J-	6.16892	2.91869	4.47914 J	0.520984	0.392568	0.597005	0.364527 J	0.134595 J
METALS (mg/kg)														
Chromium, Hexavalent - Estimated	0.493816	0.461644	--	--	0.550396	0.52485	0.56815	0.568107	0.43192	0.416677	0.526723	0.423918	--	--
Chromium, Trivalent - Estimated	17.957	16.787	--	--	20.0144	19.0855	20.66	20.6584	15.7062	15.1519	19.1536	15.4152	--	--
Aluminum	28199.8	25131.3	47002.4	25621	39465.2	23006.6	29520.4	24575.2	24648	21692	22402	19241.9 J	14236.8	15597.7
Antimony	0.376183 J	0.647684 J	0.2433303 UJ	0.323854 UJ	0.268944 J-	0.187494 J-	0.24333 JJ	0.144882 UJ	0.318654 J	--	1.53682 J	0.144882 UJ	0.3009611 UJ	0.281750839 UJ
Arsenic	12.3078	10.0346	7.62681	7.52198	5.23632	6.87724	5.57781	6.76978	5.56133	7.10784	6.03315	6.01758	4.78098	5.46398
Barium	214.064	193.495	176.856	198.823	228.873	179.16	188.3	161.681	213.282	143.005	169.574	125.63	109.235	127.961
Beryllium	1.23067	0.934293	3.18958	0.744818	3.93381 J	1.15394 J	1.80743 J	1.88827 J	1.02728 J	0.74817 J	0.850555 J	0.660895 J	0.510333	0.55286
Cadmium	0.30817 J	0.113067 J	0.166784 U	0.1537427 U	0.287559 J	0.0848236 J	0.310563 J	0.106029 J	0.239085 J	0.0826341 J	0.356573 J	0.0890648 J	0.2070422 U	0.189788682 U
Calcium	13525.3	7129.17	23572	7518.68	24346.7	7023.58	23129.3	9165.2	8253.5	2885.52	19920	5284.96	14718.7 J	12837.3 J
Chromium, Total	18.4508	17.2487	14.7049	12.4989	20.5648	19.6103	21.2282	21.2266	16.1381	15.5686	19.6803	15.8391	10.7246	10.5035
Cobalt	7.11466	6.63717	4.24387	4.89569	5.58948	6.01762	6.00352	6.11961	6.23067	6.43067	6.31405	6.3236	4.96843 J+	5.07194 J+
Copper	23.6916	16.5404	15.7185 J+	11.2999 J+	18.9745	15.6944	26.8338	18.1008	17.8667	16.7189	427.768	17.3684	25.5987 J	24.7005 J
Iron	20478	20093.5	15923.5	19865.7	15509.9	19968.1	17784.7	19660.9	18984	19990.9	17681.3	18944.1	12511.3	12201.1
Lead	252.841 J	14.6049	21.089 J+	12.6063 J+	25.693	12.503	31.0395	14.1562	22.0641	13.3613	99.8016	14.3629	19.3069	25.396
Magnesium	11226.9	12981.7	11413	15633.6	10384.8	12057.3	11927.1	12363.9	11166.5	12890.9	11618.7	11955.1 J	10220.3	9109.86
Manganese	684.559	616.689	436.26 J	690.057 J	530.273	673.984	594.708	560.403	902.494	547.547	607.384	561.475	392.951	392.951
Mercury	0.139538 J	0.0300784 J	0.010071 U	0.0292932	0.0294384 J	0.0331141 J	0.0356359 J	0.026746 J	0.0404636 J	0.0328758 U	0.027889 J	0.0420294 J	0.0325371	0.0263396 J
Nickel	40.5257	17.5082	29.5351	13.0022	50.9423	16.8389	30.5654	16.7323	23.6637	14.7242	33.9997	15.2402	22.7809 J-	24.6126 J-
Potassium	1866.8 J+	1717.28 J+	2581.68	1838.89	3272.26	1539.54	2401.07 J+	1817.51 J+	1780.56 J+	1169.2 J+	1837.99 J+	1347.09 J+	1062.42	1200.54
Selenium	0.411761 J	0.64495 J	0.2099281 U	0.2083658 U	0.887696 J	1.01206 J	0.479836 J	0.559611 J	0.543521 J	0.694511 J	0.599794 J	0.666771 J	0.2639095 U	0.245915717 U
Silver	0.06848 J	0.0616714 J	0.3761502 U	0.3789145 U	0.0610563 J	0.0384406 J	0.0654174 J	0.0571117 J	0.0464604 J	0.0403067 J	0.0632368 J	0.0527185 J	0.4688249 U	0.436116197 U
Sodium	984.615	903.713	13727.7	1876.71	11766.6	2530.53	2889.36	2118.87	1011.02 J	289.378 J	220.951 J	174.352 J	90.6031 J	100.409 J
Thallium	0.176859 J	0.1728 J	0.171538 J	0.159847 J	0.19441 J	0.138534 J	0.171538 J	0.159847 J	0.1728 J	0.13 J	0.148666 J	0.127878 J	0.1029227 U	0.097204803 U
Vanadium	25.0555	18.8115	26.5379	18.1829	39.0969	22.2121	26.5379	19.3194	22.7903	16.3817	21.2958	14.2571	12.3407	13.6512
Zinc	124.635	57.3289	52.2981	59.1398	66.7252 J+	59.6669 J+	77.5455	54.2906	77.988	57.8364	131.872	55.4502	49.7057	58.1591
PESTICIDES (mg/kg)														
Aldrin	--	--	0.000455 U	--	0.000395 U	--	0.0005 U	--	--	--	0.0005 U	--	0.00047 U	0.000465 U
Alpha Bhc (Alpha Hexachlorocyclohexane)	--	--	0.000345 U	--	0.000295 U	--	0.000345 U	--	--	--	0.000345 U	--	0.000355 U	0.00035 U
Alpha Endosulfan	--	--	0.0005 U	--	0.00045 U	--	0.0005 U	--	--	--	0.0005 U	--	0.00055 U	0.00055 U
Beta Bhc (Beta Hexachlorocyclohexane)	--	--	0.000365 U	--	0.000315 U	--	0.00038 U	--	--	--	0.000385 U	--	0.000375 U	0.000375 U
Beta Endosulfan	--	--	0.0006 U	--	0.0005 U	--	0.00085 U	--	--	--	0.0009 U	--	0.0006 U	0.0006 U
cis-Chlordane	--	--	0.0006 U	--	0.00055 U	--	0.00055 U	--	--	--	0.00055 U	--	0.00065 U	0.00065 U
Delta BHC (Delta Hexachlorocyclohexane)	--	--	0.00041 U	--	0.000355 U	--	0.00021 U	--	--	--	0.00021 U	--	0.000425 U	0.00042 U
Dieldrin	--	--	0.00049 U	--	0.000425 U	--	0.00044 U	--	--	--	0.000445 U	--	0.0005 U	0.0005 U
Endosulfan Sulfate	--	--	0.00044 U	--	0.00038 U	--	0.000425 U	--	--	--	0.00043 U	--	0.00045 U	0.00045 U
Endrin Aldehyde	--	--	0.00047 U	--	0.000405 U	--	0.0008 U	--	--	--	0.0008 U	--	0.00048 U	0.00048 U
Endrin Ketone	--	--	0.0005 U	--	0.00045 U	--	0.00065 U	--	--	--	0.00065 U	--	0.00055 U	0.00055 U
Endrin	--	--	0.00048 U	--	0.000415 U	--	0.00049 U	--	--	--	0.00049 U	--	0.00049 U	0.00049 U
Gamma Bhc (Lindane)	--	--	0.00034 U	--	0.00029 U	--	0.000315 U	--	--	--	0.000315 U	--	0.00035 U	0.000345 U
Heptachlor Epoxide	--	--	0.00075 U	--	0.00065 U	--	0.0005 U	--	--	--	0.0005 U	--	0.00075 U	0.00075 U
Heptachlor	--	--	0.000485 U	--	0.00042 U	--	0.0004 U	--	--	--	0.000405 U	--	0.0005 U	0.000495 U
Methoxychlor	--	--	0.0008 U	--	0.0007 U	--	0.0008 U	--	--	--	0.0008 U	--	0.0008 U	0.0008 U
P,P'-DDD	--	--	0.000495 U	--	0.00043 U	--	0.0006 U	--	--	--	0.0006 U	--	0.0005 U	0.0005 U
P,P'-DDE	--	--	0.00055 U	--	0.00047 U	--	0.0004 U	--	--	--	0.000405 U	--	0.00055 U	0.00055 U
P,P'-DDT	--	--	0.00039 U	--	0.000335 U	--	0.00065 U	--	--	--	0.00065 U	--	0.0004 U	0.0004 U
Toxaphene	--	--	0.011 U	--	0.0095 U	--	0.0125 U	--	--	--	0.0125 U	--	0.0115 U	0.0115 U
trans-Chlordane	--	--	0.0008 U	--	0.0007 U	--	0.0006 U	--	--	--	0.0006 U	--	0.00085 U	0.00085 U
POLYCHLORINATED BIPHENYLS (mg/kg)														
PCB-1016 (Aroclor 1016)	--	--	0.005 U	0.005 U	0.00435 U	0.0045 U	0.00455 U	0.0046 U	--	--	0.00455 U	0.0045 U	0.005 U	0.005 U
PCB-1221 (Aroclor 1221)	--	--	0.005 U	0.005 U	0.00435 U	0.0045 U	0.00455 U	0.0046 U	--	--	0.00455 U	0.0045 U	0.005 U	0.005 U
PCB-1232 (Aroclor 1232)	--	--	0.005 U	0.005 U	0.00435 U	0.0045 U	0.00455 U	0.0046 U	--	--	0.00455 U	0.0045 U	0.005 U	0.005 U
PCB-1242 (Aroclor 1242)	--	--	0.005 U	0.005 U	0.00435 U	0.0045 U	0.00455 U	0.0046 U	--	--	0.00455 U	0.0045 U	0.005 U	0.005 U
PCB-1248 (Aroclor 1248)	--	--	0.005 U	0.005 U	0.00435 U	0.0045 U	0.00455 U	0.0046 U	--	--	0.00455 U	0.0045 U	0.005 U	0.005 U
PCB-1254 (Aroclor 1254)	0.117773 J	--	0.0119788 U	0.0064595 U	0.0107809 U	0.0060073 U	0.0112601 U	0.0061365 U	--	--	0.136559 J	0.0060073 U	0.0131767 U	0.0131767 U

Table E-47
Summary of Data Used in Risk Assessment
Central Landfills Area - ISM Soil (0-2 ft-bgs) - RSD High Adjusted - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFISS-001	CFISS-001	CFISS-002	CFISS-002	CFISS-002	CFISS-002	CFISS-003	CFISS-003	CFISS-004	CFISS-004	CFISS-005	CFISS-005	CFISS-006	CFISS-006-DUP
Sample Lab IDs	240-96124-1	240-96124-2	460-115528-32	460-115528-33	240-67463-7	240-67463-8	240-96052-1	240-96052-2	240-95908-21	240-95908-22	240-95956-5	240-95956-6	460-115731-13	460-115731-17
Sample Name	CFISS-01-S0-0-0.5	CFISS-01-S0-0.5-2	CFISS-002-SO-0-0.5	CFISS-002-SO-0.5-2	CFISS-002-SO-0-0.5	CFISS-002-SO-0.5-2	CFISS-03-SO-0-0.5	CFISS-03-SO-0.5-2	CFISS-04-SO-0-0.5	CFISS-04-SO-0.5-2	CFISS-05-SO-0-0.5	CFISS-05-SO-0.5-2	CFISS-006-SO-0-0.5	CFISS-DUP1-SO
Sample Depth	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0-0.5 ft
Chemical	5/23/2018	5/23/2018	6/14/2016	6/14/2016	7/19/2016	7/19/2016	5/22/2018	5/22/2018	5/19/2018	5/19/2018	5/22/2018	5/22/2018	6/17/2016	6/17/2016
PCB-1260 (Aroclor 1260)	--	--	0.005 U	0.005 U	0.0045 U	0.00465 U	0.0047 U	0.00475 U	--	--	0.0047 U	0.00465 U	0.0055 U	0.0055 U
PCB-1262 (Aroclor 1262)	--	--	0.005 U	0.005 U	0.0045 U	0.00465 U	0.0047 U	0.00475 U	--	--	0.0047 U	0.00465 U	0.0055 U	0.0055 U
PCB-1268 (Aroclor 1268)	--	--	0.005 U	0.005 U	0.0045 U	0.00465 U	0.0047 U	0.00475 U	--	--	0.0047 U	0.00465 U	0.0055 U	0.0055 U
Polychlorinated Biphenyl (PCBs)	0.117773 J	--	0.0119788 U	0.0064595 U	0.0107809 U	0.0060073 U	0.0112601 U	0.0061365 U	--	--	0.136559 J	0.0060073 U	0.0131767 U	0.0131767 U
SEMIVOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,2,4,5-Tetrachlorobenzene	--	--	0.014 U	0.014 U	0.0125 UJ	0.0125 U	0.035 UJ	0.075 UJ	--	--	0.018 UJ	0.0365 UJ	0.7 U	0.14 U
1,4-Dioxane (P-Dioxane)	--	--	0.05 U	0.0495 U	0.0445 UJ	0.0445 U	0.255 U	0.55 U	--	--	0.13 U	0.265 U	2.55 U	0.5 U
2,3,4,6-Tetrachlorophenol	--	--	0.0175 U	0.0175 U	0.0155 UJ	0.0155 U	0.34 U	0.7 U	--	--	0.175 U	0.355 U	0.9 U	0.18 U
2,4,5-Trichlorophenol	--	--	0.0185 U	0.0185 U	0.0165 UJ	0.0165 U	0.06 U	0.12 U	--	--	0.03 U	0.06 U	0.95 U	0.19 U
2,4,6-Trichlorophenol	--	--	0.0055 U	0.0055 U	0.00475 UJ	0.00475 U	0.0445 U	0.09 U	--	--	0.023 U	0.0465 U	0.27 U	0.055 U
2,4-Dichlorophenol	--	--	0.0044 U	0.0044 U	0.0039 UJ	0.00395 U	0.065 U	0.13 U	--	--	0.0325 U	0.065 U	0.225 U	0.045 U
2,4-Dimethylphenol	--	--	0.041 U	0.041 U	0.0365 UJ	0.037 U	0.05 U	0.105 U	--	--	0.026 U	0.055 U	2.1 U	0.42 U
2,4-Dinitrophenol	--	--	0.14 U	0.14 U	0.125 UJ	0.125 U	2.2 UJ	4.55 UJ	--	--	1.15 UJ	2.3 UJ	7 U	1.45 U
2,4-Dinitrotoluene	--	--	0.0075 U	0.0075 U	0.0065 UJ	0.0065 U	0.0405 U	0.085 U	--	--	0.021 U	0.042 U	0.38 U	0.075 U
2,6-Dinitrotoluene	--	--	0.01 U	0.01 U	0.009 UJ	0.009 U	0.05 U	0.105 U	--	--	0.026 U	0.05 U	0.5 U	0.1 U
2-Chloronaphthalene	--	--	0.0042 U	0.0042 U	0.00375 UJ	0.0038 U	0.037 U	0.075 U	--	--	0.0195 U	0.039 U	0.215 U	0.043 U
2-Chlorophenol	--	--	0.00475 U	0.0047 U	0.00425 UJ	0.00425 U	0.0375 U	0.08 U	--	--	0.0195 U	0.0395 U	0.245 U	0.0485 U
2-Methylnaphthalene	0.0736667 J	0.003984 J	0.0161765 J	0.0060567 U	0.0161765 J-	0.0054658 U	0.661764	5.90899	0.342052 J	0.05948 U	0.808823	5.17036	1.25 J	0.647058 J
2-Methylphenol (O-Cresol)	--	--	0.008 U	0.008 U	0.007 UJ	0.0075 U	0.235 U	0.485 U	--	--	0.12 U	0.245 U	0.415 U	0.085 U
2-Nitroaniline	--	--	0.006 U	0.006 U	0.0055 UJ	0.0055 U	0.37 U	0.75 U	--	--	0.19 U	0.385 U	0.315 U	0.065 U
2-Nitrophenol	--	--	0.0065 U	0.006 U	0.0055 UJ	0.0055 UJ	0.0465 U	0.095 U	--	--	0.024 U	0.0485 U	0.32 U	0.065 U
3- And 4- Methylphenol (Total)	--	--	0.00495 U	0.00495 U	0.00445 UJ	0.00445 U	--	--	--	--	--	--	0.255 U	0.05 U
3,3'-Dichlorobenzidine	--	--	0.021 U	0.0205 U	0.0185 UJ	0.0185 U	0.75 U	1.55 U	--	--	0.395 U	0.8 U	1.05 U	0.215 U
3-Nitroaniline	--	--	0.0055 U	0.0055 U	0.00495 UJ	0.00495 U	0.205 U	0.43 U	--	--	0.105 U	0.215 U	0.285 U	0.055 U
4,6-Dinitro-2-Methylphenol	--	--	0.0495 U	0.0495 U	0.0445 UJ	0.0445 U	1.4 U	2.9 U	--	--	0.75 U	1.45 U	2.55 U	0.5 U
4-Bromophenyl Phenyl Ether	--	--	0.006 U	0.006 U	0.005 UJ	0.0055 U	0.055 U	0.12 U	--	--	0.0295 U	0.06 U	0.3 U	0.06 U
4-Chloro-3-Methylphenol	--	--	0.008 U	0.008 U	0.007 UJ	0.007 U	0.038 U	0.08 U	--	--	0.02 U	0.04 U	0.41 U	0.08 U
4-Chloroaniline	--	--	0.0048 U	0.0048 U	0.0043 UJ	0.0043 U	0.027 U	0.055 U	--	--	0.014 U	0.028 U	0.245 U	0.049 U
4-Chlorophenyl Phenyl Ether	--	--	0.0055 U	0.0055 U	0.005 UJ	0.005 U	0.049 U	0.1 U	--	--	0.0255 U	0.05 U	0.285 U	0.055 U
4-Nitroaniline	--	--	0.007 U	0.007 U	0.0065 UJ	0.0065 U	0.0395 U	0.08 U	--	--	0.0205 U	0.041 U	0.36 U	0.07 U
4-Nitrophenol	--	--	0.09 U	0.09 U	0.08 UJ	0.08 U	0.55 U	1.2 U	--	--	0.295 U	0.6 U	4.6 U	0.9 U
Acenaphthene	0.302669 J	0.0151501	0.0638886 J	0.0081424 U	0.0567899 J-	0.0073281 U	2.69752	39.8072	2.26368	2.9716 J	3.54937	28.9507	10.5061 J	4.11727 J
Acenaphthylene	0.0505414 J	--	0.0065351 U	0.0078147 U	0.0058544 UJ	0.0070007 U	0.0980272 J	0.455858 J	0.0476163 J	0.049466 J	0.0653515 J	0.0602384 U	1.07558 J	0.066712969 UJ
Acetophenone	0.0379793 U	0.0165025 J	0.00585 U	0.0057158 U	0.0052 UJ	0.0051512 U	0.0635556 U	0.127017 U	--	0.0106924 U	0.0332222 U	0.0649198 U	0.3033333 U	0.059944444 U
Anthracene	0.755234 J	0.0271442	0.114254 J	0.0319145 U	0.114254 J-	0.029179 U	5.09323	91.1843	4.50082	7.06275 J	6.60744	34.65	35.7903 J	10.4618 J
Atrazine	--	--	0.0085 U	0.0085 U	0.0075 UJ	0.0075 U	0.355 UJ	0.75 UJ	--	--	0.185 UJ	0.37 UJ	0.425 U	0.085 U
Benzaldehyde	--	--	0.014 U	0.014 U	0.0125 UJ	0.0125 U	0.1 UR	0.21 UR	--	--	0.05 UR	0.105 UR	0.75 U	0.145 U
Benzo(A)Anthracene	2.32166	0.138577	0.541379	0.0962002	0.488562 J-	0.0236281 U	14.5248	153.583	11.4472	23.0241 J	18.4861	57.3826	101.674 J	29.0496 J
Benzo(A)Pyrene	2.43075	0.175193	0.612658	0.107031	0.517355 J-	0.0083618 U	14.9761	153.857	14.7507	13.5586 J	14.9761	58.5327	102.11 J	31.3136 J
Benzo(B)Fluoranthene	4.93723	0.245041	1.03874	0.224083	0.973822 J-	0.0624231	20.7749	160.059	24.0859	37.2091 J	23.3717	65.6243	129.843 J	38.9529 J
Benzo(G,H,I)Perylene	3.54231	0.216689	0.483873	0.09165 J	0.44464 J-	0.015275 U	11.7699	99.6895	10.0336	11.6086 J	11.6391	40.1974	64.0805 J	24.8475 J
Benzo(K)Fluoranthene	1.87255	0.0882492	0.433229	0.0855471	0.341332 J-	0.0123385 U	6.17022	64.1603	7.29656	10.2655 J	10.2399	24.6771	47.2613 J	17.0666 J
Benzyl Butyl Phthalate	--	0.0656704	0.0055 U	0.0073012 U	0.005 UJ	0.0066375 U	1.4 J	1.5266194 U	--	--	0.29 U	0.7964971 U	0.295 U	0.06 U
Biphenyl (Diphenyl)	--	--	0.0239527 U	0.031712 U	0.0209586 UJ	0.028739 U	0.209586 J	2.5766 J	0.107291 J	0.0402673 J	0.239527 J	1.72434 J	1.1976359 U	0.247012411 U
Bis(2-Chloroethoxy) Methane	--	--	0.006 U	0.006 U	0.005 UJ	0.005 U	0.0385 U	0.08 U	--	--	0.02 U	0.0405 U	0.3 U	0.06 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	--	--	0.0044 U	0.0044 U	0.0039 UJ	0.00395 U	0.0295 U	0.06 U	--	--	0.0155 U	0.031 U	0.225 U	0.045 U
Bis(2-Chloroisopropyl) Ether	--	--	0.0075 U	0.0075 U	0.007 UJ	0.007 U	0.06 U	0.125 U	--	--	0.031 U	0.065 U	0.395 U	0.08 U
Bis(2-Ethylhexyl) Phthalate	--	--	0.0075 U	0.0075 U	0.0065 UJ	0.0065 U	0.85 U	1.8 U	--	--	0.45 U	0.9 U	0.375 U	0.075 U
Caprolactam	--	--	0.0135 U	0.0135 U	0.012 UJ	0.012 U	0.55 U	1.1 U	--	--	0.275 U	0.55 U	0.7 U	0.135 U
Carbazole	0.512835 J	0.0291107	0.0978961 J	0.0081003 U	0.0848433 J-	0.0073079 U	2.87162	45.7844	2.82401	4.05413 J	3.78532	22.8922	19.5792 J	5.74324 J
Chrysene	3.96554	0.226774	0.923972	0.162937 J	0.883209 J-	0.0374755 J	20.3817	158.049	24.7434	42.5836 J	27.1757	68.4335	119.573 J	33.9696 J
Dibenz(A,H)Anthracene	0.971316	0.0536168	0.111858	0.0155658 U	0.128637 J-	0.0139273 U	2.93627	27.8546	2.884	3.87894 J	3.49556	11.9611	18.1769 J	6.15219 J
Dibenzofuran	0.137859 J	0.0080764 J	0.0253652 J	0.0093507 U	0.0347103 J-	0.0085006 U	1.60201 J	22.1016	1.05508	1.12829 J	1.86902	14.9611	6.00755 J	2.80352 J
Diethyl Phthalate	--	--	0.0055 U	0.0055 U	0.00475 UJ	0.00475 U	0.245 U	0.5 U	--	--	0.125 U	0.255 U	0.27 U	0.055 U
Dimethyl Phthalate	--	--	0.0055 U	0.0055 U	0.00485 UJ	0.00485 U	0.0295 U	0.06 U	--	--	0.0155 U	0.031 U	0.28 U	0.055 U
Di-N-Butyl Phthalate	--	--	0.0055 U	0.0055 U	0.005 UJ	0.005 U	0.355 U	0.75 U	--	--	0.185 U	0.37 U	0.285 U	0.055 U
Di-N-Octylphthalate	--	--	0.0095 U	0.0095 U	0.0085 UJ	0.0085 U	0.47 U	1 U	--	--	0.245 U	0.495 U	0.485 U	0.095 U
Fluoranthene	4.52522	0.254287	1.19452	0.188568 J	1.18079 J-	0.0359993 J	23.3412	308.566	23.2539	47.869 J	32.9523	106.284	178.492 J	54.9205 J

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Central Landfills Area - ISM Soil (0-2 ft-bgs) - RSD High Adjusted - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFISS-001	CFISS-001	CFISS-002	CFISS-002	CFISS-002	CFISS-002	CFISS-003	CFISS-003	CFISS-004	CFISS-004	CFISS-005	CFISS-005	CFISS-006	CFISS-006-DUP
Sample Lab IDs	240-96124-1	240-96124-2	460-115528-32	460-115528-33	240-67463-7	240-67463-8	240-96052-1	240-96052-2	240-95908-21	240-95908-22	240-95956-5	240-95956-6	460-115731-13	460-115731-17
Sample Name	CFISS-01-S0-0-0.5	CFISS-01-S0-0.5-2	CFISS-002-SO-0-0.5	CFISS-002-SO-0.5-2	CFISS-002-SO-0-0.5	CFISS-002-SO-0.5-2	CFISS-03-SO-0-0.5	CFISS-03-SO-0.5-2	CFISS-04-SO-0-0.5	CFISS-04-SO-0.5-2	CFISS-05-SO-0-0.5	CFISS-05-SO-0.5-2	CFISS-006-SO-0-0.5	CFISS-DUP1-SO
Sample Depth	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0-0.5 ft
Chemical	5/23/2018	5/23/2018	6/14/2016	6/14/2016	7/19/2016	7/19/2016	5/22/2018	5/22/2018	5/19/2018	5/19/2018	5/22/2018	5/22/2018	6/17/2016	6/17/2016
Fluorene	0.247049 J	0.0108794	0.0377018 J	0.0070535 U	0.0498202 J-	0.0063569 U	2.55833	38.3153	1.90738	2.44147 J	3.09693	27.8657	10.6373 J	3.90483 J
Hexachlorobenzene	--	--	0.0075 U	0.0075 U	0.0065 UJ	0.007 U	0.06 U	0.12 U	--	--	0.03 U	0.06 U	0.39 U	0.075 U
Hexachlorobutadiene	--	--	0.005 U	0.005 U	0.0047 UJ	0.0047 UJ	0.0475 UJ	0.1 UJ	--	--	0.0245 UJ	0.0495 UJ	0.27 U	0.055 U
Hexachlorocyclopentadiene	--	--	0.0115 U	0.0115 U	0.0105 UJ	0.0105 U	0.0415 UJ	0.085 UJ	--	--	0.0215 UJ	0.043 UJ	0.6 U	0.12 U
Hexachloroethane	--	--	0.007 U	0.007 U	0.006 UJ	0.006 UJ	0.042 U	0.085 U	--	--	0.0215 U	0.0435 U	0.35 U	0.07 U
Indeno(1,2,3-C,D)Pyrene	2.67484	0.172261	0.498269	0.0907405	0.498269 J-	0.017824 U	9.44088	85.8794	7.78705	9.85286 J	9.70313	32.4073	70.8066 J	26.2247 J
Isophorone	--	0.0064835 J	0.004 U	0.0052998 U	0.0072 J-	0.0047699 U	0.0415 U	0.1126216 U	--	--	0.0215 U	0.0569733 U	0.205 U	0.041 U
Naphthalene	0.178857 J	0.006565 J	0.036237 J	0.0060564 U	0.0318886 J-	0.0054766 UJ	1.73938	15.4632	0.675826 J	0.104533 J	2.17422	6.95844	3.6237 J	2.46412 J
Nitrobenzene	--	--	0.006 U	0.006 U	0.005 UJ	0.0055 U	0.295 U	0.6 U	--	--	0.155 U	0.31 U	0.3 U	0.06 U
N-Nitrosodi-N-Propylamine	--	--	0.0065 U	0.006 U	0.0055 UJ	0.0055 U	0.055 U	0.115 U	--	--	0.0285 U	0.055 U	0.32 U	0.065 U
N-Nitrosodiphenylamine	--	--	0.017 U	0.017 U	0.015 UJ	0.015 U	0.27 U	0.55 U	--	--	0.14 U	0.28 U	0.85 UJ	0.175 UJ
Pentachlorophenol	--	--	0.0225 U	0.0225 U	0.02 UJ	0.02 U	1.3 U	2.7 U	--	--	0.7 U	1.35 U	1.15 U	0.23 U
Phenanthrene	2.6047	0.143028	0.628968	0.0997397 J	0.642071 J-	0.0195917 J	18.3449	320.592	19.8649	33.5915 J	23.5863	156.734	144.138 J	43.2415 J
Phenol	--	--	0.006 U	0.006 U	0.0055 UJ	0.0055 U	0.245 U	0.5 U	--	--	0.13 U	0.255 U	0.315 U	0.06 U
Pyrene	4.68747	0.257689	1.1983	0.160622 J	0.975361 J-	0.029361 J	23.6873	276.339	20.3717	40.751 J	30.6542	105.354	195.072 J	61.3084 J

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-47
Summary of Data Used in Risk Assessment
Central Landfills Area - ISM Soil (0-2 ft-bgs) - RSD High Adjusted - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFISS-006	CFISS-006	CFISS-006-DUP	CFISS-006	CFISS-007	CFISS-007	CFISS-008	CFISS-008	CFISS-008	CFISS-008	CFISS-009	CFISS-009	CFISS-010	CFISS-010
Sample Lab IDs	460-115731-14	240-67463-5	240-67463-9	240-67463-6	240-95908-11	240-95908-12	460-115731-18	460-115731-19	240-67693-3	240-67693-4	240-95956-1	240-95956-2	240-95956-3	240-95956-4
Sample Name	CFISS-006-SO-0.5-2	CFISS-006-SO-0-0.5	CFISS-DUP1-SO	CFISS-006-SO-0.5-2	CFISS-07-SO-0-0.5	CFISS-07-SO-0.5-2	CFISS-008-SO-0-0.5	CFISS-008-SO-0.5-2	CFISS-008-SO-0-0.5	CFISS-008-SO-0.5-2	CFISS-09-SO-0-0.5	CFISS-09-SO-0.5-2	CFISS-010-SO-0-0.5	CFISS-010-SO-0.5-2
Sample Depth	0.5-2 ft	0-0.5 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft
Chemical	6/17/2016	7/19/2016	7/19/2016	7/19/2016	5/17/2018	5/17/2018	6/18/2016	6/18/2016	7/26/2016	7/26/2016	5/21/2018	5/21/2018	5/21/2018	5/21/2018
GENERAL CHEMISTRY (mg/kg)														
Fluoride	97.8683 J-	84.6156	88.2317	109.973	860.62	252.397	395.355 J-	412.077 J-	797.942 J-	654.173 J-	43.5132 J+	52.7974 J+	70.6336 J+	59.7512 J+
Cyanide	0.0915407 J	0.210304 J-	0.294426 J-	0.199002 J-	0.434629	0.199002 J	0.925338	2.65335	1.35997	2.12268	0.154223 J	0.132668 J	0.238345 J	0.0444437 U
METALS (mg/kg)														
Chromium, Hexavalent - Estimated	--	0.494172	0.523764	0.516199	1.08895	0.573875	--	--	0.745697	0.576759	0.432031	0.41815	0.651006	0.435453
Chromium, Trivalent - Estimated	--	17.9699	19.0459	18.7709	39.5984	20.8682	--	--	27.1163	20.973	15.7102	15.2055	23.6729	15.8346
Aluminum	15372.6	18110	17900.7	15790.9	28892.3	15686.3	23762.9	15686.3	34231.1	19869.3	16958.5	19241.9	17900.7	20705.9 J
Antimony	0.3835113 UJ	0.294558 J-	0.268944 J-	3.23854 J-	0.589115 J-	0.144882 UJ	0.2497337 UJ	0.3408989 UJ	0.307365 J-	0.238629 J-	0.1088583 UJ	0.144882 UJ	0.1152617 UJ	0.144882 UJ
Arsenic	5.58775	5.57781	5.69165	5.05047	8.53747	4.83556	5.91931	5.91012	6.82998	6.23249	5.69165	6.55486	5.46398	5.91012
Barium	119.076	141.485	143.566	176.975	136.283	148.571	106.114	116.891	124.84	128.907	122.759	123.445	115.477	132.185
Beryllium	0.503539	0.850555 J	0.818659 J	0.702857	1.48847	0.713347	0.850555	0.702857	0.978138	0.839232	0.627284 J	0.618934 J	0.616652 J	0.650405 J
Cadmium	0.1802501 U	0.253052 J	0.299061 J	0.116632 J	0.322066 J	0.148441 J	0.1725352 U	0.1590442 U	0.310563 J	0.137838 J	0.138028 J	0.0710397 J	0.356573 J	0.0848236 J
Calcium	6701.19 J	23129.3	22465.3	12204.9	19256	21531.3	20362.7 J	28785.2 J	23682.7	26021.8	16932	14277.4	22686.7	9913.61
Chromium, Total	10.7749	18.4641	19.5697	19.2871	40.6873	21.442	88.7824	11.7446	27.862	21.5498	16.1422	15.6236	24.3239	16.2701
Cobalt	5.20167 J+	6.31405	6.31405	6.01762	7.03861	6.11961	6.9351 J+	5.91563 J+	6.41756	6.3236	6.21054	6.01762	6.31405	5.81363
Copper	24.274 J	43.5628	47.2678	754.376	77.2453	23.2277	21.1077 J	14.7527 J	23.6901	17.8916	17.6272	15.9036	19.3113	17.1592
Iron	16076.9	15509.9	15613.3	16281.7	27607.6	17203.3	16854.1	15564.9	17060.9	16998.5	17577.9	19148.9	17681.3	18944.1
Lead	11.6763	602.968 J	32.2276 J	29.2425	36.386	14.0529	20.6435	10.643	25.0989	13.9496	17.9702	11.573	27.1781	54.8684
Magnesium	9931.97	10282	10220.3	9788.91	11310.2	10626.8	12338.4	12772.6	11413	12977	11721.5	13590	12544.1	12159.5 J
Manganese	408.248	526.047	567.244	602.193	548.23	583.977	419.359	432.893	473.231	536.83	544.005	536.83	544.005	487.54
Mercury	0.0191043 J	0.0588767 J	0.0511298 J	0.0318405 J	0.0449322 J	0.0318405 J	0.0309878	0.0624073	0.0247902 J	0.0292932 J	0.0325371 J	0.0382086 J	0.0371853 J	0.0407558 J
Nickel	14.7074 J-	35.3734	35.7168	16.0928	43.0434	18.0112	110.127 J-	14.3876 J-	45.6763	22.9136	20.0335	14.7074	28.3903	14.4942
Potassium	961.141	1487.39	1476.76	1122.58	2358.57	1186.73	1583.01	1272.26	2167.34 J+	1635.76 J+	1168.66 J+	1111.89 J+	1274.9 J+	1165.34 J+
Selenium	0.250039 U	0.899692 J	0.935679 J	0.976343 J	0.563807 J	0.226226 J	0.2219239 U	0.2202725 U	1.79938 J	1.90506 J	0.491831 J	0.607238 J	0.563807 J	0.631051 J
Silver	0.4503042 U	0.0970359 J	0.100307 J	0.094454 J	0.0806815 J	0.0669965 J	0.3870531 U	0.4008805 U	0.0566951 J	0.0461287 J	0.041431 J	0.0417355 J	0.0556048 J	0.0527185 J
Sodium	50.7317 J	156.889 J	154.274 J	90.082 J	3059.33	163.455 J	2091.85	1767.74	4941.99	1876.71	45.824521 U	85.4811 J	47.131925 U	92.1404 J
Thallium	0.0905802 U	0.13723 J	0.13723 J	0.117221 J	0.13723 J	0.0852519 J	0.0857689 U	0.0799237 U	0.125794 J	0.0969741 J	0.107497 J	0.105499 J	0.112071 J	0.127878 J
Vanadium	12.7074	19.0024	19.3301	12.914	26.6471	14.0505	17.5827	10.7445	20.6406	14.877	15.6169	12.6041	16.163	14.1538
Zinc	54.396	74.5022 J+	73.2624 J+	225.596 J+	74.9531	97.723	58.0464	41.9566	63.7947	54.5014	59.2862	53.2364	68.8667	53.7635
PESTICIDES (mg/kg)														
Aldrin	--	0.000405 U	0.00041 U	--	0.00055 U	--	0.00045 U	--	0.00041 U	--	0.0005 U	--	0.0005 U	--
Alpha Bhc (Alpha Hexachlorocyclohexane)	--	0.000305 U	0.00031 U	--	0.00036 U	--	0.00034 U	--	0.00031 U	--	0.000345 U	--	0.000345 U	--
Alpha Endosulfan	--	0.000465 U	0.000475 U	--	0.00055 U	--	0.0005 U	--	0.00047 U	--	0.0005 U	--	0.0005 U	--
Beta Bhc (Beta Hexachlorocyclohexane)	--	0.000325 U	0.00033 U	--	0.000395 U	--	0.00036 U	--	0.00033 U	--	0.00038 U	--	0.000385 U	--
Beta Endosulfan	--	0.00055 U	0.00055 U	--	0.0009 U	--	0.0006 U	--	0.00055 U	--	0.0009 U	--	0.0009 U	--
cis-Chlordane	--	0.00055 U	0.00055 U	--	0.00055 U	--	0.0006 U	--	0.00055 U	--	0.00055 U	--	0.00055 U	--
Delta BHC (Delta Hexachlorocyclohexane)	--	0.000365 U	0.00037 U	--	0.000215 U	--	0.000405 U	--	0.00037 U	--	0.00021 U	--	0.00021 U	--
Dieldrin	--	0.000435 U	0.00044 U	--	0.00046 U	--	0.000485 U	--	0.00044 U	--	0.000445 U	--	0.000445 U	--
Endosulfan Sulfate	--	0.00039 U	0.000395 U	--	0.000445 U	--	0.000435 U	--	0.000395 U	--	0.00043 U	--	0.00043 U	--
Endrin Aldehyde	--	0.000415 U	0.00042 U	--	0.00085 U	--	0.00046 U	--	0.00042 U	--	0.0008 U	--	0.0008 U	--
Endrin Ketone	--	0.000465 U	0.000475 U	--	0.0007 U	--	0.0005 U	--	0.00047 U	--	0.00065 U	--	0.00065 U	--
Endrin	--	0.000425 U	0.00043 U	--	0.0005 U	--	0.00047 U	--	0.00043 U	--	0.00049 U	--	0.00049 U	--
Gamma Bhc (Lindane)	--	0.0003 U	0.000305 U	--	0.000325 U	--	0.000335 U	--	0.000305 U	--	0.000315 U	--	0.000315 U	--
Heptachlor Epoxide	--	0.00065 U	0.00065 U	--	0.00055 U	--	0.00075 U	--	0.00065 U	--	0.0005 U	--	0.0005 U	--
Heptachlor	--	0.00043 U	0.000435 U	--	0.000415 U	--	0.000475 U	--	0.000435 U	--	0.000405 U	--	0.000405 U	--
Methoxychlor	--	0.0007 U	0.0007 U	--	0.0008 U	--	0.0008 U	--	0.0007 U	--	0.0008 U	--	0.0008 U	--
P,P'-DDD	--	0.00044 U	0.000445 U	--	0.0006 U	--	0.00049 U	--	0.000445 U	--	0.0006 U	--	0.0006 U	--
P,P'-DDE	--	0.000485 U	0.000495 U	--	0.000415 U	--	0.00055 U	--	0.00049 U	--	0.000405 U	--	0.000405 U	--
P,P'-DDT	--	0.000345 U	0.00035 U	--	0.00065 U	--	0.000385 U	--	0.00035 U	--	0.00065 U	--	0.00065 U	--
Toxaphene	--	0.01 U	0.01 U	--	0.013 U	--	0.011 U	--	0.01 U	--	0.0125 U	--	0.0125 U	--
trans-Chlordane	--	0.00075 U	0.00075 U	--	0.0006 U	--	0.0008 U	--	0.00075 U	--	0.0006 U	--	0.0006 U	--
POLYCHLORINATED BIPHENYLS (mg/kg)														
PCB-1016 (Aroclor 1016)	0.005 U	0.00445 U	0.0045 U	0.0045 U	0.0047 U	0.00465 U	0.00495 U	0.00475 U	0.0045 U	0.0044 U	0.00455 U	0.0045 U	0.00455 U	0.0045 U
PCB-1221 (Aroclor 1221)	0.005 U	0.00445 U	0.0045 U	0.0045 U	0.0047 U	0.00465 U	0.00495 U	0.00475 U	0.0045 U	0.0044 U	0.00455 U	0.0045 U	0.00455 U	0.0045 U
PCB-1232 (Aroclor 1232)	0.005 U	0.00445 U	0.0045 U	0.0045 U	0.0047 U	0.00465 U	0.00495 U	0.00475 U	0.0045 U	0.0044 U	0.00455 U	0.0045 U	0.00455 U	0.0045 U
PCB-1242 (Aroclor 1242)	0.005 U	0.00445 U	0.0045 U	0.0045 U	0.0047 U	0.00465 U	0.00495 U	0.00475 U	0.0045 U	0.0044 U	0.00455 U	0.0045 U	0.00455 U	0.0045 U
PCB-1248 (Aroclor 1248)	0.005 U	0.00445 U	0.0045 U	0.0045 U	0.0047 U	0.00465 U	0.00495 U	0.00475 U	0.0045 U	0.0044 U	0.00455 U	0.0045 U	0.00455 U	0.0045 U
PCB-1254 (Aroclor 1254)	0.0071054 U	0.0110205 U	0.011140301 U	0.0060073 U	0.110205 J	0.749297	0.0119788 U	0.0063949 U	0.0111403 U	0.0058781 U	0.0112601 U	0.0060073 U	0.574983	0.0060073 U

Table E-47
Summary of Data Used in Risk Assessment
Central Landfills Area - ISM Soil (0-2 ft-bgs) - RSD High Adjusted - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFISS-006	CFISS-006	CFISS-006-DUP	CFISS-006	CFISS-007	CFISS-007	CFISS-008	CFISS-008	CFISS-008	CFISS-008	CFISS-009	CFISS-009	CFISS-010	CFISS-010
Sample Lab IDs	460-115731-14	240-67463-5	240-67463-9	240-67463-6	240-95908-11	240-95908-12	460-115731-18	460-115731-19	240-67693-3	240-67693-4	240-95956-1	240-95956-2	240-95956-3	240-95956-4
Sample Name	CFISS-006-SO-0.5-2	CFISS-006-SO-0-0.5	CFISS-DUP1-SO	CFISS-006-SO-0.5-2	CFISS-07-SO-0-0.5	CFISS-07-SO-0.5-2	CFISS-008-SO-0-0.5	CFISS-008-SO-0.5-2	CFISS-008-SO-0-0.5	CFISS-008-SO-0.5-2	CFISS-09-SO-0-0.5	CFISS-09-SO-0.5-2	CFISS-010-SO-0-0.5	CFISS-010-SO-0.5-2
Sample Depth	0.5-2 ft	0-0.5 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft
Chemical	6/17/2016	7/19/2016	7/19/2016	7/19/2016	5/17/2018	5/17/2018	6/18/2016	6/18/2016	7/26/2016	7/26/2016	5/21/2018	5/21/2018	5/21/2018	5/21/2018
PCB-1260 (Aroclor 1260)	0.0055 U	0.0046 U	0.00465 U	0.00465 U	0.00485 U	0.00485 U	0.005 U	0.00495 U	0.00465 U	0.00455 U	0.0047 U	0.00465 U	0.0047 U	0.00465 U
PCB-1262 (Aroclor 1262)	0.0055 U	0.0046 U	0.00465 U	0.00465 U	0.00485 U	0.00485 U	0.005 U	0.00495 U	0.00465 U	0.00455 U	0.0047 U	0.00465 U	0.0047 U	0.00465 U
PCB-1268 (Aroclor 1268)	0.0055 U	0.0046 U	0.00465 U	0.00465 U	0.00485 U	0.00485 U	0.005 U	0.00495 U	0.00465 U	0.00455 U	0.0047 U	0.00465 U	0.0047 U	0.00465 U
Polychlorinated Biphenyl (PCBs)	0.0071054 U	0.0110205 U	0.011140301 U	0.0060073 U	0.110205 J	0.749297	0.0119788 U	0.0063949 U	0.0111403 U	0.0058781 U	0.0112601 U	0.0060073 U	0.574983	0.0060073 U
SEMIVOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,2,4,5-Tetrachlorobenzene	0.0145 U	0.0125 U	0.0125 U	0.06 U	0.0075 U	0.00375 U	0.0135 U	0.013 U	0.012 U	0.012 U	0.00075 U	0.0007 U	0.00365 U	0.0006 U
1,4-Dioxane (P-Dioxane)	0.05 UJ	0.0445 U	0.044 U	0.22 U	0.055 U	0.027 U	0.049 U	0.0475 U	0.0435 U	0.044 U	0.0055 U	0.00495 U	0.026 U	0.0045 U
2,3,4,6-Tetrachlorophenol	0.018 U	0.0155 U	0.0155 U	0.075 U	0.075 U	0.0365 U	0.017 U	0.0165 U	0.0155 U	0.0155 U	0.007 U	0.0065 U	0.035 U	0.006 U
2,4,5-Trichlorophenol	0.019 UJ	0.0165 U	0.0165 U	0.08 U	0.0125 U	0.006 U	0.018 U	0.0175 U	0.016 U	0.0165 U	0.0012 U	0.00115 U	0.006 U	0.00105 U
2,4,6-Trichlorophenol	0.0055 UJ	0.00475 U	0.0047 U	0.0235 U	0.0095 U	0.0048 U	0.005 U	0.005 U	0.0046 U	0.00465 U	0.00095 U	0.00085 U	0.0046 U	0.0008 U
2,4-Dichlorophenol	0.00455 UJ	0.00395 U	0.0039 U	0.0195 U	0.0135 U	0.0065 U	0.0043 U	0.0042 U	0.00385 U	0.00385 U	0.0013 U	0.00125 U	0.0065 U	0.0011 U
2,4-Dimethylphenol	0.0425 UJ	0.037 U	0.0365 U	0.18 U	0.011 U	0.0055 U	0.0405 U	0.039 U	0.0355 U	0.036 U	0.00105 U	0.001 U	0.005 U	0.0009 U
2,4-Dinitrophenol	0.145 UJ	0.125 U	0.125 U	0.6 UJ	0.475 UJ	0.235 UJ	0.14 U	0.135 U	0.125 U	0.125 UJ	0.046 U	0.043 U	0.225 U	0.039 U
2,4-Dinitrotoluene	0.0075 U	0.0065 U	0.0065 U	0.0325 U	0.009 U	0.00435 U	0.0075 U	0.007 U	0.0065 U	0.0065 U	0.00085 U	0.0008 U	0.0042 U	0.0007 U
2,6-Dinitrotoluene	0.0105 U	0.009 U	0.009 U	0.0435 U	0.011 U	0.0055 U	0.01 U	0.0095 U	0.0085 U	0.0085 U	0.00105 U	0.001 U	0.005 U	0.0009 U
2-Chloronaphthalene	0.0044 UJ	0.0038 U	0.00375 U	0.0185 U	0.008 U	0.004 U	0.00415 U	0.004 U	0.0037 U	0.0037 U	0.0008 U	0.00075 U	0.00385 U	0.00065 U
2-Chlorophenol	0.0049 UJ	0.00425 U	0.0042 U	0.021 U	0.008 U	0.00405 U	0.00465 U	0.0045 U	0.00415 U	0.00415 U	0.0008 U	0.00075 U	0.0039 U	0.00065 U
2-Methylnaphthalene	0.0502264 J-	0.0264706 J	0.025 J	0.0989755 J	0.114706	0.135907	0.0220588 J	0.0057613 U	0.0116176 J	0.0121134 J	0.017647	0.0104885	0.0220588 J	0.0048749 J
2-Methylphenol (O-Cresol)	0.0085 UJ	0.0075 U	0.007 U	0.036 U	0.05 U	0.025 U	0.008 U	0.0075 U	0.007 U	0.007 U	0.0049 U	0.00455 U	0.024 U	0.00415 U
2-Nitroaniline	0.0065 U	0.0055 U	0.0055 U	0.027 U	0.08 U	0.0395 U	0.006 U	0.006 U	0.0055 U	0.0055 U	0.008 U	0.007 U	0.0385 U	0.0065 U
2-Nitrophenol	0.0065 UJ	0.0055 UJ	0.0055 UJ	0.0275 UJ	0.01 U	0.005 U	0.006 U	0.006 U	0.0055 U	0.0055 U	0.001 U	0.0009 U	0.0048 U	0.00085 U
3- And 4- Methylphenol (Total)	0.005 UJ	0.00445 U	0.0044 U	0.022 U	--	--	0.0049 U	0.0047 U	0.0043 U	0.00435 U	--	--	--	--
3,3'-Dichlorobenzidine	0.0215 U	0.0185 U	0.0185 U	0.09 U	0.165 U	0.08 U	0.0205 U	0.02 U	0.018 U	0.0185 U	0.016 U	0.015 U	0.08 U	0.0135 U
3-Nitroaniline	0.0055 U	0.00495 U	0.0049 U	0.0245 U	0.045 U	0.022 U	0.0055 U	0.005 U	0.0048 U	0.00485 U	0.00435 U	0.00405 U	0.0215 U	0.0037 U
4,6-Dinitro-2-Methylphenol	0.05 UJ	0.0445 U	0.044 U	0.22 U	0.305 U	0.15 U	0.049 U	0.047 U	0.0435 U	0.044 U	0.0295 U	0.0275 U	0.145 U	0.025 U
4-Bromophenyl Phenyl Ether	0.006 UJ	0.0055 U	0.005 U	0.026 U	0.0125 U	0.006 U	0.006 U	0.0055 U	0.005 U	0.005 U	0.0012 U	0.0011 U	0.006 U	0.001 U
4-Chloro-3-Methylphenol	0.0085 U	0.007 U	0.007 U	0.0355 U	0.0085 U	0.0041 U	0.008 U	0.0075 U	0.007 U	0.007 U	0.0008 U	0.00075 U	0.00395 U	0.0007 U
4-Chloroaniline	0.00495 U	0.0043 U	0.00425 U	0.021 U	0.006 U	0.0029 U	0.0047 U	0.00455 U	0.0042 U	0.0042 U	0.00055 U	0.00055 U	0.0028 U	0.00048 U
4-Chlorophenyl Phenyl Ether	0.006 UJ	0.005 U	0.00495 U	0.0245 U	0.0105 U	0.0055 U	0.0055 U	0.0055 U	0.00485 U	0.0049 U	0.00105 U	0.00095 U	0.005 U	0.0009 U
4-Nitroaniline	0.0075 U	0.0065 U	0.006 U	0.031 UJ	0.0085 U	0.00425 U	0.007 U	0.0065 U	0.006 U	0.006 U	0.00085 U	0.00075 U	0.0041 U	0.0007 U
4-Nitrophenol	0.095 U	0.08 U	0.08 U	0.395 U	0.125 U	0.06 U	0.09 U	0.085 U	0.08 U	0.08 U	0.012 UJ	0.011 UJ	0.06 UJ	0.01 UJ
Acenaphthene	0.470448 J	0.198765 J	0.22716 J	1.13993 J	0.553702	0.940896	0.22716 J	0.0343789 J	0.0951231 J	0.133897 J	0.0894441	0.0325695	0.137716	0.0271412
Acenaphthylene	0.0080589 UJ	0.0058544 U	0.005786329 U	0.0341894 U	0.0299528 J	0.0293052 J	0.006399 U	0.0074077 U	0.0057183 U	0.0068379 U	0.0043568 J	0.0011396 U	0.0050375 U	0.0022793 J
Acetophenone	0.0059275 U	0.0052722 U	0.0052 U	0.0254034 U	0.0137222 U	0.0067037 U	0.0057778 U	0.0054335 U	0.0051278 U	0.0050101 U	0.0034667 J	0.0409277 J	0.0065722 U	0.0395164 J
Anthracene	1.1854 J-	0.729571	0.715806	3.64737	0.991116 J+	2.18842 J+	0.302841 J	0.0310027 U	0.122513 J	0.171426 J	0.165186	0.0547106	0.330372	0.0528869
Atrazine	0.0085 U	0.0075 U	0.0075 U	0.0365 U	0.075 UJ	0.038 UJ	0.008 U	0.008 U	0.007 U	0.0075 U	0.0075 U	0.007 U	0.037 U	0.0065 U
Benzaldehyde	0.0145 UJ	0.0125 U	0.0125 U	0.065 U	0.022 UR	0.011 UR	0.014 U	0.0135 U	0.0125 U	0.0125 U	0.0068 J	0.015 J	0.0105 UR	0.0099 J
Benzo(A)Anthracene	3.0379 J-	2.24474	2.24474	9.95757	3.69722	4.8944	1.04314	0.18565	0.42254	0.438808	0.699831	0.151895	1.84861	0.141769
Benzo(A)Pyrene	3.17749 J-	2.72292	2.72292	10.8704	4.62897	4.68262	1.307	0.200684	0.517355	0.501709	0.748804	0.160547	1.90605	0.14884
Benzo(B)Fluoranthene	3.84142 J-	3.37592	3.24607	12.6447	5.19372	4.64172	1.68796	0.320119	0.688167	0.656243	1.03874	0.176065	3.6356	0.176065
Benzo(G,H,I)Perylene	2.41184	2.35398	2.09242	9.80816 J+	4.4464	3.53737	1.30777	0.155966 J	0.470796	0.369816 J+	0.823892	0.146318	2.2232	0.151142
Benzo(K)Fluoranthene	1.52998	1.11589	1.29969	4.60638	2.1005	2.30319	0.827073	0.139837	0.21005	0.296125	0.4201	0.0789666	1.4441	0.0888374
Benzyl Butyl Phthalate	0.007965 UJ	0.005 U	0.005 U	0.0338511 U	0.12 U	0.0796497 U	0.0055 U	0.0073012 U	0.005 U	0.0066375 U	0.0115 U	0.0146024 U	0.06 U	0.013275 U
Biphenyl (Diphenyl)	0.032703 UJ	0.0217072 U	0.020958629 U	0.1387401 U	0.0359291 J	0.0574781 J	0.0232042 U	0.02973 U	0.0209586 U	0.027748 U	0.0058385 J	0.0041622 J	0.0053145 U	0.0025766 J
Bis(2-Chloroethoxy) Methane	0.006 UJ	0.005 U	0.005 U	0.0255 U	0.0085 U	0.00415 U	0.0055 U	0.0055 U	0.005 U	0.005 U	0.0008 U	0.00075 U	0.004 U	0.0007 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.00455 UJ	0.00395 U	0.0039 U	0.0195 U	0.0065 U	0.00315 U	0.0043 U	0.0042 U	0.00385 U	0.00385 U	0.0006 U	0.0006 U	0.00305 U	0.0005 U
Bis(2-Chloroisopropyl) Ether	0.008 U	0.007 U	0.007 U	0.034 U	0.013 U	0.0065 U	0.0075 U	0.0075 U	0.0065 U	0.0065 U	0.00125 U	0.0012 U	0.006 U	0.00105 U
Bis(2-Ethylhexyl) Phthalate	0.0075 UJ	0.0065 U	0.0065 U	0.032 U	0.19 U	0.095 U	0.007 U	0.007 U	0.0065 U	0.0065 U	0.018 U	0.017 U	0.09 U	0.0155 U
Caprolactam	0.014 UJ	0.012 U	0.012 U	0.06 U	0.115 U	0.055 U	0.013 U	0.0125 U	0.0115 U	0.012 U	0.011 U	0.0105 U	0.055 U	0.0095 U
Carbazole	0.774813	0.404637 J	0.391585 J	1.76094 J	0.757064 J+	1.3031 J+	0.195792 J	0.0369797 J	0.0770116 J	0.088047 J	0.156634	0.0369797	0.482954	0.0405016
Chrysene	3.25874 J-	2.58169	2.58169	10.5909	5.16338	5.21398	1.49466	0.293286 J	0.570689	0.586573	1.04626	0.179231	3.53284	0.162937
Dibenz(A,H)Anthracene	0.573478 J	0.643184	0.545308	2.62161	1.21646	0.770099	0.0132831 U	0.0393242 J	0.0964776	0.104865	0.181769	0.0344087	0.615219	0.0344087
Dibenzofuran	0.289021 J-	0.133501 J	0.146851 J	0.765055 J	0.280352 J	0.476034	0.0614105 J	0.0093507 U	0.0293703 J	0.0459033 J	0.0360453 J	0.0159812 J	0.0427204 J	0.013261 J
Diethyl Phthalate	0.0055 U	0.00475 U	0.0047 U	0.0235 U	0.055 U	0.026 U	0.005 U	0.005 U	0.0046 U	0.00465 U	0.005 U	0.015 J	0.025 U	0.014 J
Dimethyl Phthalate	0.0055 UJ	0.00485 U	0.0048 U	0.024 U	0.0065 U	0.00315 U	0.0055 U	0.005 U	0.0047 U	0.00475 U	0.0006 U	0.0006 U	0.00305 U	0.0005 U
Di-N-Butyl Phthalate	0.006 U	0.005 U	0.00495 U	0.0245 U	0.075 U	0.038 U	0.059 J	0.0055 U	0.00485 U	0.0049 U	0.0075 U	0.007 U	0.037 U	0.0065 U
Di-N-Octylphthalate	0.01 U	0.0085 U	0.0085 U	0.0415 U	0.105 U	0.05 U	0.0095 U	0.009 U	0.0085 U	0.0085 U	0.01 U	0.0095 U	0.049 U	0.0085 U
Fluoranthene	6.85701 J-	4.94285	5.08015	17.1425	6.86506	10.1141	2.19682	0.428563 J	0.906188	0.959982	1.22198	0.274281	3.29523	0.257138

Table E-47
Summary of Data Used in Risk Assessment
Central Landfills Area - ISM Soil (0-2 ft-bgs) - RSD High Adjusted - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFISS-006	CFISS-006	CFISS-006-DUP	CFISS-006	CFISS-007	CFISS-007	CFISS-008	CFISS-008	CFISS-008	CFISS-008	CFISS-009	CFISS-009	CFISS-010	CFISS-010
Sample Lab IDs	460-115731-14	240-67463-5	240-67463-9	240-67463-6	240-95908-11	240-95908-12	460-115731-18	460-115731-19	240-67693-3	240-67693-4	240-95956-1	240-95956-2	240-95956-3	240-95956-4
Sample Name	CFISS-006-SO-0.5-2	CFISS-006-SO-0-0.5	CFISS-DUP1-SO	CFISS-006-SO-0.5-2	CFISS-07-SO-0-0.5	CFISS-07-SO-0.5-2	CFISS-008-SO-0-0.5	CFISS-008-SO-0.5-2	CFISS-008-SO-0-0.5	CFISS-008-SO-0.5-2	CFISS-09-SO-0-0.5	CFISS-09-SO-0.5-2	CFISS-010-SO-0-0.5	CFISS-010-SO-0.5-2
Sample Depth	0.5-2 ft	0-0.5 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft
Chemical	6/17/2016	7/19/2016	7/19/2016	7/19/2016	5/17/2018	5/17/2018	6/18/2016	6/18/2016	7/26/2016	7/26/2016	5/21/2018	5/21/2018	5/21/2018	5/21/2018
Fluorene	0.487649 J-	0.228904 J	0.228904 J	1.18429 J	0.430877	0.783722	0.134649 J	0.0243825 J	0.0646316 J	0.0940466 J	0.0646316	0.0261241	0.0915615	0.0226409
Hexachlorobenzene	0.008 UJ	0.007 U	0.0065 U	0.0335 U	0.0125 U	0.006 U	0.0075 U	0.007 U	0.0065 U	0.0065 U	0.0012 U	0.00115 U	0.006 U	0.00105 U
Hexachlorobutadiene	0.0055 UJ	0.0047 UJ	0.00465 UJ	0.023 UJ	0.0105 UJ	0.005 UJ	0.005 U	0.005 U	0.00455 U	0.0046 U	0.001 U	0.00095 U	0.0049 U	0.00085 U
Hexachlorocyclopentadiene	0.012 U	0.0105 U	0.0105 U	0.05 U	0.009 U	0.00445 U	0.0115 U	0.011 U	0.01 U	0.01 U	0.00085 U	0.0008 U	0.0043 U	0.00075 U
Hexachloroethane	0.007 UJ	0.006 UJ	0.006 UJ	0.03 UJ	0.009 U	0.0045 U	0.0065 U	0.0065 U	0.006 U	0.006 U	0.0009 U	0.0008 U	0.00435 U	0.00075 U
Indeno(1,2,3-C,D)Pyrene	2.43055	2.49134	2.2291	10.3703	3.40921	2.91666	1.31123	0.158796	0.537606	0.421295	0.655617	0.123148	1.83573	0.124768
Isophorone	0.0054986 UJ	0.0036 U	0.00355 U	0.0231868 U	0.009 U	0.0058961 U	0.00395 U	0.0050348 U	0.0035 U	0.0046374 U	0.00085 U	0.0132496 J	0.0043 U	0.0127196 J
Naphthalene	0.219062 J-	0.0536308 J-	0.0507319 J-	0.231948 J-	0.231917	0.244834	0.0405855 J	0.0057987 U	0.0202927 J	0.0206176 J	0.0434845	0.0180404	0.0405855 J	0.0099222
Nitrobenzene	0.006 UJ	0.0055 U	0.005 U	0.026 U	0.065 U	0.032 U	0.006 U	0.0055 U	0.005 U	0.005 U	0.006 U	0.006 U	0.0305 U	0.0055 U
N-Nitrosodi-N-Propylamine	0.0065 U	0.0055 U	0.0055 U	0.0275 U	0.012 U	0.006 U	0.006 U	0.006 U	0.0055 U	0.0055 U	0.00115 U	0.0011 U	0.0055 U	0.001 U
N-Nitrosodiphenylamine	0.0175 UJ	0.015 U	0.015 U	0.075 U	0.06 U	0.029 U	0.0165 UJ	0.016 UJ	0.0145 U	0.015 U	0.0055 U	0.0055 U	0.028 U	0.0048 U
Pentachlorophenol	0.0235 UJ	0.02 U	0.02 U	0.1 U	0.285 U	0.14 U	0.022 U	0.0215 U	0.0195 U	0.02 U	0.0275 UJ	0.0255 UJ	0.135 UJ	0.023 UJ
Phenanthrene	4.98699 J-	2.88277	3.0138	14.7829	4.45519	8.37101	1.44138	0.320592 J	0.615864	0.872723	0.760003	0.249349	1.44138	0.213728
Phenol	0.0065 UJ	0.0055 U	0.0055 U	0.027 U	0.055 U	0.0265 U	0.006 U	0.006 U	0.0055 U	0.0055 U	0.005 U	0.014 J	0.0255 U	0.0044 U
Pyrene	4.83592 J-	4.45879	4.59813	20.7254	6.96686	8.981	2.50807	0.431779 J	0.905692	1.10535	1.26797	0.259067	3.76211	0.259067

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-47
Summary of Data Used in Risk Assessment
Central Landfills Area - ISM Soil (0-2 ft-bgs) - RSD High Adjusted - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFISS-011	CFISS-011	CFISS-012	CFISS-012	CFISS-013	CFISS-013	CFISS-014	CFISS-014	CFISS-015	CFISS-015	CFISS-016	CFISS-016	CFISS-017	CFISS-017
Sample Lab IDs	240-95908-15	240-95908-16	240-95908-13	240-95908-14	240-95908-9	240-95908-10	240-95908-7	240-95908-8	240-95908-1	240-95908-2	240-66446-1	240-66588-7	240-66446-4	240-66695-1
Sample Name	CFISS-011-SO-0.0-0.5	CFISS-011-SO-0.5-2	CFISS-012-0.0-0.5	CFISS-012-0.5-2	CFISS-013-SO-0-0.5	CFISS-013-SO-0.5-2	CFISS-014-SO-0-0.5	CFISS-014-SO-0.5-2	CFISS-015-SO-0-0.5	CFISS-015-SO-0.5-2	CFISS-016-SO-0-0.5	CFISS-016-SO-0.5-2	CFISS-017-SO-0.5-2	CFISS-017-SO-0-0.5
Sample Depth	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0.5-2 ft	0-0.5 ft
Chemical	5/19/2018	5/19/2018	5/18/2018	5/18/2018	5/17/2018	5/17/2018	5/16/2018	5/16/2018	5/15/2018	5/15/2018	6/23/2016	6/28/2016	6/23/2016	6/29/2016
GENERAL CHEMISTRY (mg/kg)														
Fluoride	49.4843 J+	37.6325 J+	96.6691	61.6828	302.543	741.739	703.925	982.547	781.201	683.081	33.2677	47.3889 J	36.8294	44.2364
Cyanide	0.179085 J	0.1207981 U	0.182264 J	0.199002 J	0.715034	0.517404	2.10304	5.43937	4.71685	1.80383	0.168243	0.159201	0.0583738 J	0.224324
METALS (mg/kg)														
Chromium, Hexavalent - Estimated	0.845369	0.402754	0.559273	0.484477	0.739779	1.39864	1.08895	0.824765	0.624271	0.822541	0.541518	0.392196	0.490245	0.443867
Chromium, Trivalent - Estimated	30.7407	14.6456	20.3372	17.6174	26.9011	50.8596	39.5984	29.9914	22.7007	29.9106	19.6916	14.2617	17.8271	16.1406
Aluminum	19025.2	13090.9	18110	12444.5	26379.9	28549.1	27217.4	22483.7	31907.6	21341.5	15178.9 J	13804 J	12653.6 J	13399.3
Antimony	0.315597 J-	--	0.230523 J-	0.144882 UJ	1.40875 J-	1.05679 J-	0.601922 J-	0.374989 J-	0.842326 J-	0.2528799 UJ	0.217717 J-	0.204539 J-	0.204539 J-	0.192103 J-
Arsenic	5.0817	4.46859	5.12248	5.05047	6.26081	7.30706	7.51297	5.69521	9.73057	5.756	5.80548	5.37284	5.05047	4.89482
Barium	84.4358	121.397	84.4748	111.428	103.305	125.63	134.203	163.865	128.587	140.14	103.825	114.706	119.076	80.2094
Beryllium	0.573717	0.4964 J	0.627284	0.493049 J	1.06319	2.20298	0.903714	0.954626	1.14397	0.792528	0.627284	0.555991	0.503539 J	0.510333 J
Cadmium	0.3248 J	0.101892 J	0.368075 J	0.0954265 J	0.58662 J	0.922456 J	0.460094 J	0.169647 J	0.430898 J	0.0763717 J	0.218545 J	0.090125 J	0.0572559 J	0.184038 J
Calcium	26098	25028.4	22908	30051.7	27334.6	29476	22465.3	23373.6	26802.7	31706.8	18702.7	26712.6	35002.8	27334.6
Chromium, Total	31.5861	15.0484	20.8965	18.1018	27.6408	52.2583	40.6873	30.8162	23.325	30.7331	20.2331	14.6539	18.3173	16.5845 J-
Cobalt	5.928	5.864	6.31405	6.11961	6.41756	7.8535	7.55616	6.42559	6.8817	6.292	6.31405	6.01762	5.71164	5.7965
Copper	32.4785	18.06	25.4865	19.9842	50.2993	109.861	73.9893	19.1471	23.049	16.2716	21.3323	17.787	14.7527	18.4131
Iron	15292	17225.5	16026.9	16076.9	20162.9	27750.6	31536.8	17612.9	18068	16634.8	16543.9	16486.5	15667.3	15199.7
Lead	59.5077 J	11.6952	29.8514	11.0563	53.3166	57.865	320.791	18.4961	21.4107	11.03	28.3662	10.953	9.71305	22.5742
Magnesium	11017.6	11458.7	11104.6	11853	10251.2	10422.4	10261.4	11444.2	10664	11717.6	11824.3	12772.6	12977	11927.1
Manganese	397.284	494.916	404.571	480.04	425.697	555.046	575.694	515.4	428.716	556.686	463.724	491.826	475.754	372.881
Mercury	0.0307507 U	0.0361689 J	0.0162686 U	0.026746 J	0.0495804 J	0.043303 J	0.0387347 J	0.0305669 J	0.0486908 U	0.0290576 J	0.027889 J	0.0229251 J	0.0229251 J	0.0123951 U
Nickel	33.5297	14.376	38.0064	14.8139	42.5855	66.3963	64.2216	28.4556	85.6771	19.1442	29.0772	14.3876	14.9205	24.727 J-
Potassium	1086.13	1055.85	1104.92	981.455	1625.5	2138.25	1731.75	2480.36	3068.65	2462.26	1328.03	1208.11	1090.51	1037.99
Selenium	0.287526 J	0.254604 J	0.359877 J	0.214319 J	0.419856 J	0.511985 J	1.91934 J	0.321479 J	5.90849 J	0.287256 J	2.0393 J	2.14319 J	2.02413 J	1.79938 J
Silver	0.067082 J	0.0467526 J	0.0686883 J	0.0647999 J	0.119932 J	0.104339 J	0.0872232 J	0.0428338 J	0.0491761 J	0.0433485 J	0.059966 J	0.0406372 J	0.0329491 J	0.0501534 J
Sodium	145.944 J	--	154.274 J	42.437842 U	916.49	2857.44	2693.25	4407.24	6298.19	3410.17	83.8046 J	65.8664 J	70.2252 J	79.8824 J
Thallium	0.07092 J	0.0757256 J	0.0869125 J	0.0745954 J	0.114359 J	0.159847 J	0.13723 J	0.127878 J	0.386554 J	0.116206 J	0.104066 J	0.100171 J	0.0841863 J	0.0972048 J
Vanadium	16.8697	11.5686	17.8011	11.6743	24.6813	55.8919	26.2102	18.0796	32.0277	15.0356	15.9446	11.4677	11.3643	14.088
Zinc	100.472	76.6927	76.5311	67.5733	99.6369	102.678	96.3683	77.4826	75.6654	50.9577	67.2887	50.0738	46.8058	54.4396
PESTICIDES (mg/kg)														
Aldrin	--	--	0.0005 U	--	0.0005 U	--	0.0005 U	--	--	--	0.000395 U	--	--	0.0004 U
Alpha Bhc (Alpha Hexachlorocyclohexane)	--	--	0.00035 U	--	0.000345 U	--	0.000345 U	--	--	--	0.000295 U	--	--	0.000305 U
Alpha Endosulfan	--	--	0.0005 U	--	0.0005 U	--	0.0005 U	--	--	--	0.00045 U	--	--	0.00046 U
Beta Bhc (Beta Hexachlorocyclohexane)	--	--	0.000385 U	--	0.00038 U	--	0.000385 U	--	--	--	0.000315 U	--	--	0.000325 U
Beta Endosulfan	--	--	0.0009 U	--	0.0009 U	--	0.0009 U	--	--	--	0.0005 U	--	--	0.0005 U
cis-Chlordane	--	--	0.00055 U	--	0.00055 U	--	0.00055 U	--	--	--	0.00055 U	--	--	0.00055 U
Delta BHC (Delta Hexachlorocyclohexane)	--	--	0.00021 U	--	0.00021 U	--	0.00021 U	--	--	--	0.000355 U	--	--	0.00036 U
Dieldrin	--	--	0.000445 U	--	0.000445 U	--	0.000445 U	--	--	--	0.000425 U	--	--	0.00043 U
Endosulfan Sulfate	--	--	0.00043 U	--	0.000425 U	--	0.00043 U	--	--	--	0.00038 U	--	--	0.000385 U
Endrin Aldehyde	--	--	0.0008 U	--	0.0008 U	--	0.0008 U	--	--	--	0.000405 U	--	--	0.00041 U
Endrin Ketone	--	--	0.00065 U	--	0.00065 U	--	0.00065 U	--	--	--	0.00045 U	--	--	0.00046 U
Endrin	--	--	0.00049 U	--	0.00049 U	--	0.00049 U	--	--	--	0.000415 U	--	--	0.00042 U
Gamma Bhc (Lindane)	--	--	0.000315 U	--	0.000315 U	--	0.000315 U	--	--	--	0.00029 U	--	--	0.0003 U
Heptachlor Epoxide	--	--	0.0005 U	--	0.0005 U	--	0.0005 U	--	--	--	0.00065 U	--	--	0.00065 U
Heptachlor	--	--	0.000405 U	--	0.0004 U	--	0.000405 U	--	--	--	0.00042 U	--	--	0.000425 U
Methoxychlor	--	--	0.0008 U	--	0.0008 U	--	0.0008 U	--	--	--	0.0007 U	--	--	0.0007 U
P,P'-DDD	--	--	0.0006 U	--	0.0006 U	--	0.0006 U	--	--	--	0.000425 U	--	--	0.000435 U
P,P'-DDE	--	--	0.000405 U	--	0.0004 U	--	0.000405 U	--	--	--	0.00047 U	--	--	0.00048 U
P,P'-DDT	--	--	0.00065 U	--	0.00065 U	--	0.00065 U	--	--	--	0.000335 U	--	--	0.000345 U
Toxaphene	--	--	0.0125 U	--	0.0125 U	--	0.0125 U	--	--	--	0.0095 U	--	--	0.0095 U
trans-Chlordane	--	--	0.0006 U	--	0.0006 U	--	0.0006 U	--	--	--	0.0007 U	--	--	0.0007 U
POLYCHLORINATED BIPHENYLS (mg/kg)														
PCB-1016 (Aroclor 1016)	--	--	0.00455 U	0.00455 U	0.0045 U	0.0046 U	0.00455 U	0.00465 U	--	--	0.0043 U	0.00425 U	0.00425 U	0.0044 U
PCB-1221 (Aroclor 1221)	--	--	0.00455 U	0.00455 U	0.0045 U	0.0046 U	0.00455 U	0.00465 U	--	--	0.0043 U	0.00425 U	0.00425 U	0.0044 U
PCB-1232 (Aroclor 1232)	--	--	0.00455 U	0.00455 U	0.0045 U	0.0046 U	0.00455 U	0.00465 U	--	--	0.0043 U	0.00425 U	0.00425 U	0.0044 U
PCB-1242 (Aroclor 1242)	--	--	0.00455 U	0.00455 U	0.0045 U	0.0046 U	0.00455 U	0.00465 U	--	--	0.0043 U	0.00425 U	0.00425 U	0.0044 U
PCB-1248 (Aroclor 1248)	--	--	0.00455 U	0.00455 U	0.0045 U	0.0046 U	0.2	0.00465 U	--	--	0.0043 U	0.00425 U	0.00425 U	0.0044 U
PCB-1254 (Aroclor 1254)	0.1017354 U	1.72879	0.146142 J	0.258378	0.646856 J+	0.82681	0.0112601 U	0.129189	--	--	0.0106611 U	0.0056843 U	0.0056843 U	0.0109007 U

Table E-47
Summary of Data Used in Risk Assessment
Central Landfills Area - ISM Soil (0-2 ft-bgs) - RSD High Adjusted - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFISS-011	CFISS-011	CFISS-012	CFISS-012	CFISS-013	CFISS-013	CFISS-014	CFISS-014	CFISS-015	CFISS-015	CFISS-016	CFISS-016	CFISS-017	CFISS-017
Sample Lab IDs	240-95908-15	240-95908-16	240-95908-13	240-95908-14	240-95908-9	240-95908-10	240-95908-7	240-95908-8	240-95908-1	240-95908-2	240-66446-1	240-66588-7	240-66446-4	240-66695-1
Sample Name	CFISS-011-SO-0.0-0.5	CFISS-011-SO-0.5-2	CFISS-012-0.0-0.5	CFISS-012-0.5-2	CFISS-013-SO-0-0.5	CFISS-013-SO-0.5-2	CFISS-014-SO-0-0.5	CFISS-014-SO-0.5-2	CFISS-015-SO-0-0.5	CFISS-015-SO-0.5-2	CFISS-016-SO-0-0.5	CFISS-016-SO-0.5-2	CFISS-017-SO-0.5-2	CFISS-017-SO-0-0.5
Sample Depth	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0.5-2 ft	0-0.5 ft
Chemical	5/19/2018	5/19/2018	5/18/2018	5/18/2018	5/17/2018	5/17/2018	5/16/2018	5/16/2018	5/15/2018	5/15/2018	6/23/2016	6/28/2016	6/23/2016	6/29/2016
PCB-1260 (Aroclor 1260)	--	--	0.0047 U	0.0047 U	0.0047 U	0.00475 U	0.0047 U	0.0048 U	--	--	0.00445 U	0.0044 U	0.0044 U	0.00455 U
PCB-1262 (Aroclor 1262)	--	--	0.0047 U	0.0047 U	0.0047 U	0.00475 U	0.0047 U	0.0048 U	--	--	0.00445 U	0.0044 U	0.0044 U	0.00455 U
PCB-1268 (Aroclor 1268)	--	--	0.0047 U	0.0047 U	0.0047 U	0.00475 U	0.0047 U	0.0048 U	--	--	0.00445 U	0.0044 U	0.0044 U	0.00455 U
Polychlorinated Biphenyl (PCBs)	0.1017354 U	1.72879	0.146142 J	0.258378	0.646856 J+	0.82681	0.479153	0.129189	--	--	0.0106611 U	0.0056843 U	0.0056843 U	0.0109007 U
SEMIVOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,2,4,5-Tetrachlorobenzene	--	--	0.018 U	0.0185 U	0.07 U	0.145 U	0.018 U	0.0015 U	--	--	0.012 U	0.012 U	0.0115 U	0.0245 U
1,4-Dioxane (P-Dioxane)	--	--	0.13 U	0.13 U	0.5 U	1.05 U	0.13 U	0.011 U	--	--	0.0425 U	0.043 U	0.042 U	0.09 U
2,3,4,6-Tetrachlorophenol	--	--	0.175 U	0.175 U	0.7 U	1.4 U	0.175 U	0.0145 U	--	--	0.015 U	0.015 U	0.015 U	0.031 U
2,4,5-Trichlorophenol	--	--	0.03 U	0.03 U	0.12 U	0.24 U	0.0295 U	0.0025 U	--	--	0.016 U	0.016 U	0.0155 U	0.033 U
2,4,6-Trichlorophenol	--	--	0.023 U	0.023 U	0.09 U	0.185 U	0.023 U	0.0019 U	--	--	0.0045 U	0.00455 U	0.0045 U	0.0095 U
2,4-Dichlorophenol	--	--	0.0325 U	0.0325 U	0.13 U	0.255 U	0.032 U	0.0027 U	--	--	0.00375 U	0.0038 U	0.00375 U	0.008 U
2,4-Dimethylphenol	--	--	0.026 U	0.0265 U	0.25 J	0.71 J	0.026 U	0.00215 U	--	--	0.035 U	0.035 U	0.0345 U	0.075 U
2,4-Dinitrophenol	--	--	1.15 UJ	1.15 UJ	4.45 UJ	9 UJ	1.1 UJ	0.095 UJ	--	--	0.12 U	0.12 U	0.12 U	0.25 U
2,4-Dinitrotoluene	--	--	0.021 U	0.021 U	0.08 U	0.165 U	0.0205 U	0.00175 U	--	--	0.0065 U	0.0065 U	0.0065 U	0.013 U
2,6-Dinitrotoluene	--	--	0.026 U	0.026 U	0.1 U	0.205 U	0.0255 U	0.00215 U	--	--	0.0085 U	0.0085 U	0.0085 U	0.0175 U
2-Chloronaphthalene	--	--	0.0195 U	0.0195 U	0.075 U	0.155 U	0.019 U	0.0016 U	--	--	0.0036 U	0.00365 U	0.0036 U	0.0075 U
2-Chlorophenol	--	--	0.0195 U	0.0195 U	0.075 U	0.155 U	0.0195 U	0.0016 U	--	--	0.00405 U	0.00405 U	0.004 U	0.0085 U
2-Methylnaphthalene	--	0.0218775 J	0.397059	1.62497	13.3823	39.8857	0.145588 J	0.011818 J	0.0100512 J	0.0034429 J	0.0161765 J	0.0221587 J	0.017727 J	0.0264706 J
2-Methylphenol (O-Cresol)	--	--	0.12 U	0.12 U	0.475 U	0.95 U	0.12 U	0.01 U	--	--	0.007 U	0.007 U	0.007 U	0.0145 U
2-Nitroaniline	--	--	0.19 U	0.195 U	0.75 U	1.5 U	0.19 U	0.016 U	--	--	0.005 U	0.0055 U	0.005 U	0.011 U
2-Nitrophenol	--	--	0.024 U	0.024 U	0.095 U	0.19 U	0.024 U	0.002 U	--	--	0.0055 U	0.0055 U	0.0055 U	0.011 U
3- And 4- Methylphenol (Total)	--	--	--	--	--	--	--	--	--	--	0.00425 U	0.00425 U	0.0042 U	0.009 U
3,3'-Dichlorobenzidine	--	--	0.395 U	0.395 U	1.55 U	3.1 U	0.385 U	0.0325 U	--	--	0.0175 U	0.018 U	0.0175 U	0.037 U
3-Nitroaniline	--	--	0.105 U	0.11 U	0.42 U	0.85 U	0.105 U	0.009 U	--	--	0.0047 U	0.00475 U	0.0047 U	0.01 U
4,6-Dinitro-2-Methylphenol	--	--	0.75 U	0.75 U	2.85 U	5.5 U	0.7 U	0.06 U	--	--	0.0425 U	0.043 U	0.042 U	0.09 U
4-Bromophenyl Phenyl Ether	--	--	0.0295 U	0.0295 U	0.115 U	0.235 U	0.029 U	0.00245 U	--	--	0.005 U	0.005 U	0.00495 U	0.0105 U
4-Chloro-3-Methylphenol	--	--	0.02 U	0.02 U	0.08 U	0.155 U	0.0195 U	0.00165 U	--	--	0.007 U	0.007 U	0.007 U	0.0145 U
4-Chloroaniline	--	--	0.014 U	0.014 U	0.055 U	0.11 U	0.014 U	0.00115 U	--	--	0.0041 U	0.0041 U	0.00405 U	0.0085 U
4-Chlorophenyl Phenyl Ether	--	--	0.0255 U	0.0255 U	0.1 U	0.2 U	0.025 U	0.0021 U	--	--	0.00475 U	0.0048 U	0.00475 U	0.01 U
4-Nitroaniline	--	--	0.0205 U	0.0205 U	0.08 U	0.16 U	0.02 U	0.0017 U	--	--	0.006 U	0.006 U	0.006 U	0.0125 U
4-Nitrophenol	--	--	0.295 U	0.295 U	1.15 U	2.35 U	0.29 U	0.0245 U	--	--	0.075 U	0.075 U	0.075 U	0.16 U
Acenaphthene	0.396163	0.206829 J	2.12962	8.86614	53.9504	199.036	0.979626	0.0741861	0.0613975	0.0212363 J	0.0354937 J	0.065139 J	0.0068758 U	0.184567 J
Acenaphthylene	--	0.004834 U	0.136149 J	0.276771	4.08447	5.047	0.0571825 J	0.0068379 J	0.0422228 J	0.0015 J	0.0055821 U	0.0066751 U	0.0065937 U	0.0115727 U
Acetophenone	--	0.0060373 U	0.0332222 U	0.0324599 U	0.13 U	0.254034 U	0.0325 U	0.0026815 U	--	0.0039518 J	0.0049833 U	0.0211695 J	0.0124194 J	0.0101111 U
Anthracene	0.71576 J+	0.397157 J	4.12965 J+	16.4132 J+	97.735 J+	273.553 J+	1.37655 J+	0.1386 J+	0.366163 J+	0.0533975 J	0.0674509 J	0.120363 J	0.0273553 U	0.344137 J
Atrazine	--	--	0.185 UJ	0.185 UJ	0.7 UJ	1.45 UJ	0.18 UJ	0.0155 UJ	--	--	0.007 U	0.007 U	0.007 U	0.015 U
Benzaldehyde	--	--	0.05 UR	0.055 UR	0.205 UR	0.415 UR	0.05 UR	0.00435 UR	--	--	0.012 U	0.012 U	0.012 U	0.0255 U
Benzo(A)Anthracene	6.12986	0.826667	12.8082	37.1299	184.861	405.053	5.1497	0.472562	3.98723	0.149211	0.42254	0.405053	0.0219404 U	2.1127
Benzo(A)Pyrene	7.2072	0.718948	13.3423	38.4644	176.99	401.367	4.76512	0.451538	1.49719	0.137066	0.571814	0.384644	0.0301026 J	2.85907
Benzo(B)Fluoranthene	8.08575	0.86	16.8796	49.6184	194.764	432.16	9.47853	0.704261	16.2181	0.234837	0.960838	0.608225	0.035213 J	3.50576
Benzo(G,H,I)Perylene	7.37159	0.439195	12.0314	27.3342	130.777	353.737	4.96951	0.546684	5.88348	0.13368	0.562339	0.401974 J	0.0401974 J	2.87708
Benzo(K)Fluoranthene	4.30069	0.339767	5.6451	13.3256	66.9535	213.868	3.28203	0.394833	2.59093	0.127741	0.315075	0.230319	0.0246771 J	1.10276
Benzyl Butyl Phthalate	--	--	0.29 U	0.3849736 U	1.15 U	3.0532389 U	0.285 U	0.0318599 U	--	--	0.0049 U	0.0065711 U	0.0064384 U	0.01 U
Biphenyl (Diphenyl)	--	--	0.0943138 J	0.495501 J	3.14379 J	14.0722	0.0261983 U	0.0063424 J	--	--	0.0202101 U	0.026757 U	0.026757 U	0.0426658 U
Bis(2-Chloroethoxy) Methane	--	--	0.02 U	0.02 U	0.08 U	0.16 U	0.02 U	0.00165 U	--	--	0.00495 U	0.005 U	0.0049 U	0.0105 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	--	--	0.0155 U	0.0155 U	0.06 U	0.12 U	0.015 U	0.00125 U	--	--	0.00375 U	0.0038 U	0.00375 U	0.008 U
Bis(2-Chloroisopropyl) Ether	--	--	0.031 U	0.0315 U	0.125 U	0.245 U	0.031 U	0.0026 U	--	--	0.0065 U	0.0065 U	0.0065 U	0.0135 U
Bis(2-Ethylhexyl) Phthalate	--	--	0.45 U	0.45 U	1.75 U	3.55 U	0.44 U	0.037 U	--	--	0.006 U	0.0065 U	0.006 U	0.033 J
Caprolactam	--	--	0.275 U	0.275 U	1.1 U	2.15 U	0.27 U	0.0225 U	--	--	0.0115 U	0.0115 U	0.0115 U	0.024 U
Carbazole	0.738266 J+	0.261731 J	2.87162 J+	9.15689 J+	49.6007 J+	137.353 J+	0.691799 J+	0.100374 J+	0.178427	0.0324231	0.060043 J	0.086286 J	0.0068677 U	0.339373 J
Chrysene	8.12301	0.893493	16.3054	40.7342	217.405	407.342	9.10385	0.733216	17.0136	0.210859	0.665804	0.488811 J	0.0358461 J	3.1252
Dibenz(A,H)Anthracene	1.975	0.142663	3.35574	6.55403	34.9556	83.5639	1.13256	0.114696	3.67945 J	0.0491475	0.153805	0.111419	0.0131081 U	0.824953
Dibenzofuran	0.0826372 J	0.0798341 J	0.854407 J	3.91028	22.6952	93.5067	0.307053 J	0.0306022 J	0.0204837 J	0.0063243 J	0.0173551 J	0.0510037 J	0.0081606 U	0.0774307 J
Diethyl Phthalate	--	--	0.125 U	0.125 U	0.495 U	1 U	0.125 U	0.0105 U	--	--	0.0045 U	0.00455 U	0.0045 U	0.0095 U
Dimethyl Phthalate	--	--	0.0155 U	0.0155 U	0.06 U	0.12 U	0.015 U	0.00125 U	--	--	0.0046 U	0.00465 U	0.0046 U	0.0095 U
Di-N-Butyl Phthalate	--	--	0.185 U	0.185 U	0.7 U	1.45 U	0.18 U	0.0155 U	--	--	0.00475 U	0.019 J	0.00475 U	0.01 U
Di-N-Octylphthalate	--	--	0.245 U	0.245 U	0.95 U	1.95 U	0.24 U	0.0205 U	--	--	0.008 U	0.008 U	0.008 U	0.017 U
Fluoranthene	7.8909	1.61633 J	21.9682	73.7129	411.904	754.271	8.37538	0.874269	6.1816 J	0.276982	0.782617	0.839984	0.0514276 J	4.11904

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Sample Location ID	CFISS-011	CFISS-011	CFISS-012	CFISS-012	CFISS-013	CFISS-013	CFISS-014	CFISS-014	CFISS-015	CFISS-015	CFISS-016	CFISS-016	CFISS-017	CFISS-017
Sample Lab IDs	240-95908-15	240-95908-16	240-95908-13	240-95908-14	240-95908-9	240-95908-10	240-95908-7	240-95908-8	240-95908-1	240-95908-2	240-66446-1	240-66588-7	240-66446-4	240-66695-1
Sample Name	CFISS-011-SO-0.0-0.5	CFISS-011-SO-0.5-2	CFISS-012-0.0-0.5	CFISS-012-0.5-2	CFISS-013-SO-0-0.5	CFISS-013-SO-0.5-2	CFISS-014-SO-0-0.5	CFISS-014-SO-0.5-2	CFISS-015-SO-0-0.5	CFISS-015-SO-0.5-2	CFISS-016-SO-0-0.5	CFISS-016-SO-0.5-2	CFISS-017-SO-0.5-2	CFISS-017-SO-0-0.5
Sample Depth	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0.5-2 ft	0-0.5 ft
Chemical	5/19/2018	5/19/2018	5/18/2018	5/18/2018	5/17/2018	5/17/2018	5/16/2018	5/16/2018	5/15/2018	5/15/2018	6/23/2016	6/28/2016	6/23/2016	6/29/2016
Fluorene	0.1428 J	0.103211 J	1.48114	7.14058	41.7412	163.711	0.673246	0.0470233	0.0377101 J	0.0165858 J	0.0201974 J	0.0539897 J	0.0060085 U	0.127917 J
Hexachlorobenzene	--	--	0.03 U	0.0305 U	0.12 U	0.24 U	0.03 U	0.0025 U	--	--	0.0065 U	0.0065 U	0.0065 U	0.0135 U
Hexachlorobutadiene	--	--	0.0245 UJ	0.0245 UJ	0.095 UJ	0.195 UJ	0.0245 UJ	0.00205 UJ	--	--	0.00445 U	0.0045 U	0.00445 U	0.0095 U
Hexachlorocyclopentadiene	--	--	0.0215 U	0.0215 U	0.085 U	0.17 U	0.021 U	0.0018 U	--	--	0.01 U	0.01 U	0.01 U	0.0205 U
Hexachloroethane	--	--	0.022 U	0.022 U	0.085 U	0.17 U	0.0215 U	0.0018 U	--	--	0.006 U	0.006 U	0.006 U	0.012 U
Indeno(1,2,3-C,D)Pyrene	6.11457	0.453428	9.96537	22.6851	111.455	275.462	3.9337	0.405091	4.64389	0.10956	0.537606	0.405091	0.0170138 U	3.14696
Isophorone	--	--	0.0215 U	0.0284866 U	0.085 U	0.2252431 U	0.021 U	0.0023849 U	--	--	0.047 J	0.0045711 U	0.0490235 J	0.086 J
Naphthalene	0.0635333 J	0.0189192 J	0.710246	2.5772	24.6412	87.6249	0.318886	0.0167518 J	0.014423 J	0.0050975 J	0.0202927 J	0.0206176 J	0.0051544 U	0.0710246 J
Nitrobenzene	--	--	0.155 U	0.155 U	0.6 U	1.2 U	0.15 U	0.013 U	--	--	0.005 U	0.005 U	0.00495 U	0.0105 U
N-Nitrosodi-N-Propylamine	--	--	0.0285 U	0.0285 U	0.11 U	0.225 U	0.028 U	0.00235 U	--	--	0.0055 U	0.0055 U	0.0055 U	0.011 U
N-Nitrosodiphenylamine	--	--	0.14 U	0.14 U	0.55 U	1.1 U	0.14 U	0.0115 U	--	--	0.0145 U	0.0145 U	0.0145 U	0.03 U
Pentachlorophenol	--	--	0.7 U	0.7 U	2.65 U	5.5 U	0.65 U	0.055 U	--	--	0.019 U	0.0195 U	0.019 U	0.04 U
Phenanthrene	2.80784	1.71743 J	15.7242	71.2427	353.794	801.48	5.37243	0.623373	0.886404	0.187912 J	0.406208 J	0.819291	0.0463077 J	2.09656
Phenol	--	--	0.13 U	0.13 U	0.5 U	1 U	0.125 U	0.0105 U	--	--	0.005 U	0.005 U	0.005 U	0.011 U
Pyrene	9.08012	1.60036	23.6873	69.0846	404.078	708.118	9.47493	0.8981	6.68027 J	0.276982	1.0311	1.00173	0.044905 J	3.06542

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-47
Summary of Data Used in Risk Assessment
Central Landfills Area - ISM Soil (0-2 ft-bgs) - RSD High Adjusted - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFISS-018	CFISS-018	CFISS-019	CFISS-019	CFISS-020	CFISS-020-DUP	CFISS-020	CFISS-021	CFISS-021	CFISS-022	CFISS-022	CFISS-023	CFISS-023	CFISS-024
Sample Lab IDs	240-66516-1	240-66516-2	240-66516-3	240-66516-4	240-66516-5	240-66516-6	240-66516-7	240-66516-8	240-66516-10	240-66588-1	240-66588-2	240-66588-3	240-66588-4	240-66695-2
Sample Name	CFISS-018-SO-0-0.5	CFISS-018-SO-0.5-2	CFISS-019-SO-0-0.5	CFISS-019-SO-0.5-2	CFISS-020-SO-0-0.5	CFISS-DUP2-SO	CFISS-020-SO-0.5-2	CFISS-021-SO-0-0.5	CFISS-021-SO-0.5-2	CFISS-022-SO-0-0.5	CFISS-022-SO-0.5-2	CFISS-023-SO-0-0.5	CFISS-023-SO-0.5-2	CFISS-024-SO-0-0.5
Sample Depth	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft
Chemical	6/24/2016	6/24/2016	6/24/2016	6/24/2016	6/25/2016	6/25/2016	6/25/2016	6/25/2016	6/25/2016	6/27/2016	6/27/2016	6/27/2016	6/27/2016	6/29/2016
GENERAL CHEMISTRY (mg/kg)														
Fluoride	87.8701 J-	21.3765 J-	259.15 J-	90.7858 J-	73.7675 J-	72.8032 J-	47.2601 J-	302.543 J-	175.133 J-	882.317 J+	363.143 J+	47.3703 J	57.4333 J	713.568 J+
Cyanide	0.210304	0.0225535 J	0.308446	0.0968474 J	0.350507	0.350507	0.102154 J	0.785135	0.477604	0.925338	0.835806	0.266385	0.145934	0.434629
METALS (mg/kg)														
Chromium, Hexavalent - Estimated	0.550396	0.513315	0.529682	0.660389	0.571109	0.50305	0.426801	0.920285	0.637318	1.49139	0.576759	0.46754	0.446988	0.547436
Chromium, Trivalent - Estimated	20.0144	18.666	19.2612	24.0141	20.7676	18.2927	15.52	33.4649	23.1752	54.2325	20.973	17.0015	16.2541	19.9068
Aluminum	11933.8	9014.4	16435.1	12235.3	14969.6	14341.5	11189.6	23658.2	13071.9	28787.6 J	18509.9 J	18319.4 J	15790.9 J	23972.2
Antimony	0.230523 J-	0.156814 J-	0.397013 J-	0.426124 J-	0.332978 J-	0.320171 J-	0.238629 J-	0.806832 J-	0.272719 J-	1.28069 J-	0.272719 J-	0.192103 J-	0.221584 J-	0.281751 J-
Arsenic	4.78098	5.26538	5.80548	5.26538	5.46398	5.23632	5.37284	9.3343	5.4803	14.0015	6.23249	6.03315	6.01758	6.82998
Barium	61.7956	81.7142	96.6466	130	97.5829	93.4216	108.588	117.557	123.445	148.767	183.529	114.436	150.756	101.12
Beryllium	0.55286 J	0.419616 J	0.637916	0.51403 J	0.595388	0.563492 J	0.461578 J	0.967506	0.555991 J	1.05256	0.933646	0.691076	0.597953	0.861186
Cadmium	0.207042 J	0.0858839 J	0.310563 J	0.137838 J	0.299061 J	0.322066 J	0.254471 J	1.11573 J	0.159044 J	1.38028 J	0.137838 J	0.207042 J	0.0975471 J	0.322066 J
Calcium	33642.6	37305.6	28552	27979.2	33864	32536	29821.4	22465.3	25561.2	13944	12780.6	14718.7	20264.8	26117.3
Chromium, Total	20.5648	19.1793	19.7908	24.6745	21.3387	18.7958	15.9469	34.3852	23.8125	55.7239	21.5498	17.469	16.7011	20.4542 J-
Cobalt	5.69299	5.60964	6.21054	6.22161	6.00352	6.10703	6.01762	7.97019	6.22161	9.62633	6.62958	6.72808	6.62958	6.52107
Copper	17.7395	16.636	24.5883	26.3665	28.967	28.1811	20.9258	49.4011	22.7045	53.443	18.624	19.5359	17.3684	22.0059
Iron	14372.5	14438.5	15406.5	15257.7	16957.5	16440.5	16281.7	25332.8	17612.9	31433.4	18227.3	17784.7	17612.9	17267.7
Lead	20.0494	8.8864	30.594	15.3962	32.2276	35.3464	15.7062	69.0592 J	15.8095	96.3858	15.4995	21.6831	13.2263	26.8811
Magnesium	11927.1	12159.5	11207.4	11853	11927.1	11824.3	11853	11413	11342.1	11001.8	10933.3	11310.2	11342.1	12132.8
Manganese	360.205	413.606	402.458	478.968	415.134	403.514	508.971	527.104	511.114	595.764	603.264	491.189	536.83	411.965
Mercury	0.0263396 J	0.0356613 J	0.0402841 J	0.0343877 J	0.0371853 J	0.0309878 J	0.0216515 J	0.0433829 J	0.0331141 J	0.0402841 J	0.026746 J	0.0309878 J	0.026746 J	0.0604261 J
Nickel	34.1142	16.1994	40.5249	20.3558	35.2589	34.5721	14.8139	107.151	21.8479	162.557	19.823	30.1075	15.2402	58.8412 J-
Potassium	876.497	770.837	1104.92	1090.51	1243.03	1073.04	860.644	1699.87	1111.89	2284.2	1368.48	1221.78	1293.64	1901.73
Selenium	1.67942 J	1.78599 J	1.55947 J	1.90506 J	1.79938 J	1.67942 J	1.78599 J	4.55844 J	2.14319 J	15.9545	2.26226 J	2.15926 J	2.26226 J	1.91934 J
Silver	0.0501534 J	0.0329491 J	0.0632368 J	0.0604067 J	0.185349 J	0.207155 J	0.208678 J	0.130835 J	0.0549151 J	0.119932 J	0.0516202 J	0.0523339 J	0.047227 J	0.0512437 J
Sodium	104.462 J	55.817 J	879.883	86.3286 J	355.614 J	241.87 J	86.0865 J	1568.89	348.705	2183.37	558.17	104.462 J	97.2256 J	1987.25
Thallium	0.0972048 J	0.0639389 J	0.0949176 J	0.0799237 J	0.102923 J	0.093774 J	0.101237 J	0.19441 J	0.0884489 J	0.457434 J	0.117221 J	0.112071 J	0.104434 J	0.114359 J
Vanadium	14.9617	8.88485	18.6748	12.7074	18.5656	16.163	10.6412	38.5509	12.5008	59.5191	16.22	16.709	13.4306	23.6984
Zinc	55.0032	54.0797	73.037	57.2423	89.4929	86.7878	79.3802	116.093	77.7989	99.4115	58.0856	100.539	53.2364	87.6895
PESTICIDES (mg/kg)														
Aldrin	0.000395 U	--	0.000405 U	--	0.0004 U	0.000395 U	--	0.0004 U	--	0.0004 U	--	0.000395 U	--	0.00039 U
Alpha Bhc (Alpha Hexachlorocyclohexane)	0.000295 U	--	0.000305 U	--	0.0003 U	0.000295 U	--	0.0003 U	--	0.0003 U	--	0.0003 U	--	0.000295 U
Alpha Endosulfan	0.000455 U	--	0.000465 U	--	0.00046 U	0.00045 U	--	0.00046 U	--	0.00046 U	--	0.000455 U	--	0.00045 U
Beta Bhc (Beta Hexachlorocyclohexane)	0.000315 U	--	0.000325 U	--	0.00032 U	0.000315 U	--	0.00032 U	--	0.00032 U	--	0.00032 U	--	0.000315 U
Beta Endosulfan	0.0005 U	--	0.00055 U	--	0.0005 U	0.0005 U	--	0.0005 U	--	0.0005 U	--	0.0005 U	--	0.0005 U
cis-Chlordane	0.00055 U	--	0.00055 U	--	0.00055 U	0.00055 U	--	0.00055 U	--	0.00055 U	--	0.00055 U	--	0.00055 U
Delta BHC (Delta Hexachlorocyclohexane)	0.000355 U	--	0.000365 U	--	0.00036 U	0.000355 U	--	0.00036 U	--	0.00036 U	--	0.000355 U	--	0.00035 U
Dieldrin	0.000425 U	--	0.000435 U	--	0.00043 U	0.000425 U	--	0.00043 U	--	0.00043 U	--	0.000425 U	--	0.00042 U
Endosulfan Sulfate	0.00038 U	--	0.00039 U	--	0.000385 U	0.00038 U	--	0.000385 U	--	0.000385 U	--	0.00038 U	--	0.000375 U
Endrin Aldehyde	0.000405 U	--	0.000415 U	--	0.00041 U	0.000405 U	--	0.00041 U	--	0.00041 U	--	0.000405 U	--	0.0004 U
Endrin Ketone	0.000455 U	--	0.000465 U	--	0.00046 U	0.00045 U	--	0.00046 U	--	0.00046 U	--	0.000455 U	--	0.00045 U
Endrin	0.000415 U	--	0.000425 U	--	0.00042 U	0.000415 U	--	0.00042 U	--	0.00042 U	--	0.000415 U	--	0.00041 U
Gamma Bhc (Lindane)	0.00029 U	--	0.0003 U	--	0.000295 U	0.00029 U	--	0.000295 U	--	0.000295 U	--	0.000295 U	--	0.00029 U
Heptachlor Epoxide	0.00065 U	--	0.00065 U	--	0.00065 U	0.00065 U	--	0.00065 U	--	0.00065 U	--	0.00065 U	--	0.00065 U
Heptachlor	0.00042 U	--	0.00043 U	--	0.000425 U	0.00042 U	--	0.000425 U	--	0.000425 U	--	0.00042 U	--	0.000415 U
Methoxychlor	0.0007 U	--	0.0007 U	--	0.0007 U	0.0007 U	--	0.0007 U	--	0.0007 U	--	0.0007 U	--	0.0007 U
P,P'-DDD	0.00043 U	--	0.00044 U	--	0.000435 U	0.00043 U	--	0.000435 U	--	0.000435 U	--	0.00043 U	--	0.000425 U
P,P'-DDE	0.00047 U	--	0.000485 U	--	0.00048 U	0.00047 U	--	0.00048 U	--	0.00048 U	--	0.000475 U	--	0.00047 U
P,P'-DDT	0.000335 U	--	0.000345 U	--	0.00034 U	0.000335 U	--	0.00034 U	--	0.00034 U	--	0.00034 U	--	0.000335 U
Toxaphene	0.0095 U	--	0.01 U	--	0.0095 U	0.0095 U	--	0.0095 U	--	0.0095 U	--	0.0095 U	--	0.0095 U
trans-Chlordane	0.0007 U	--	0.00075 U	--	0.0007 U	0.0007 U	--	0.0007 U	--	0.0007 U	--	0.0007 U	--	0.0007 U
POLYCHLORINATED BIPHENYLS (mg/kg)														
PCB-1016 (Aroclor 1016)	0.00435 U	0.00435 U	0.00445 U	0.0044 U	0.0044 U	0.0044 U	0.00435 U	0.0044 U	0.0045 U	0.0044 U	0.0045 U	0.00435 U	0.00445 U	0.0043 U
PCB-1221 (Aroclor 1221)	0.00435 U	0.00435 U	0.00445 U	0.0044 U	0.0044 U	0.0044 U	0.00435 U	0.0044 U	0.0045 U	0.0044 U	0.0045 U	0.00435 U	0.00445 U	0.0043 U
PCB-1232 (Aroclor 1232)	0.00435 U	0.00435 U	0.00445 U	0.0044 U	0.0044 U	0.0044 U	0.00435 U	0.0044 U	0.0045 U	0.0044 U	0.0045 U	0.00435 U	0.00445 U	0.0043 U
PCB-1242 (Aroclor 1242)	0.00435 U	0.00435 U	0.00445 U	0.0044 U	0.0044 U	0.0044 U	0.00435 U	0.0044 U	0.0045 U	0.0044 U	0.0045 U	0.00435 U	0.00445 U	0.0043 U
PCB-1248 (Aroclor 1248)	0.00435 U	0.00435 U	0.00445 U	0.0044 U	0.0044 U	0.0044 U	0.00435 U	0.0044 U	0.0045 U	0.0044 U	0.0045 U	0.00435 U	0.00445 U	0.0043 U
PCB-1254 (Aroclor 1254)	0.0107809 U	0.0057489 U	0.0110205 U	0.0058781 U	0.189265 J	0.0109007 UJ	0.206703	0.0109007 U	0.0060073 U	0.143746 J	0.0060073 U	0.0107809 U	0.0059427 U	0.0106611 U

Table E-47
Summary of Data Used in Risk Assessment
Central Landfills Area - ISM Soil (0-2 ft-bgs) - RSD High Adjusted - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFISS-018	CFISS-018	CFISS-019	CFISS-019	CFISS-020	CFISS-020-DUP	CFISS-020	CFISS-021	CFISS-021	CFISS-022	CFISS-022	CFISS-023	CFISS-023	CFISS-024
Sample Lab IDs	240-66516-1	240-66516-2	240-66516-3	240-66516-4	240-66516-5	240-66516-6	240-66516-7	240-66516-8	240-66516-10	240-66588-1	240-66588-2	240-66588-3	240-66588-4	240-66695-2
Sample Name	CFISS-018-SO-0-0.5	CFISS-018-SO-0.5-2	CFISS-019-SO-0-0.5	CFISS-019-SO-0.5-2	CFISS-020-SO-0-0.5	CFISS-DUP2-SO	CFISS-020-SO-0.5-2	CFISS-021-SO-0-0.5	CFISS-021-SO-0.5-2	CFISS-022-SO-0-0.5	CFISS-022-SO-0.5-2	CFISS-023-SO-0-0.5	CFISS-023-SO-0.5-2	CFISS-024-SO-0-0.5
Sample Depth	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft
Chemical	6/24/2016	6/24/2016	6/24/2016	6/24/2016	6/25/2016	6/25/2016	6/25/2016	6/25/2016	6/25/2016	6/27/2016	6/27/2016	6/27/2016	6/27/2016	6/29/2016
PCB-1260 (Aroclor 1260)	0.0045 U	0.00445 U	0.0046 U	0.00455 U	0.00455 U	0.00455 U	0.0045 U	0.00455 U	0.00465 U	0.00455 U	0.00465 U	0.0045 U	0.0046 U	0.00445 U
PCB-1262 (Aroclor 1262)	0.0045 U	0.00445 U	0.0046 U	0.00455 U	0.00455 U	0.00455 U	0.0045 U	0.00455 U	0.00465 U	0.00455 U	0.00465 U	0.0045 U	0.0046 U	0.00445 U
PCB-1268 (Aroclor 1268)	0.0045 U	0.00445 U	0.0046 U	0.00455 U	0.00455 U	0.00455 U	0.0045 U	0.00455 U	0.00465 U	0.00455 U	0.00465 U	0.0045 U	0.0046 U	0.00445 U
Polychlorinated Biphenyl (PCBs)	0.0107809 U	0.0057489 U	0.0110205 U	0.0058781 U	0.189265 J	0.0109007 UJ	0.206703	0.0109007 U	0.0060073 U	0.143746 J	0.0060073 U	0.0107809 U	0.0059427 U	0.0106611 U
SEMIVOLATILE ORGANIC COMPOUNDS (mg/kg)														
1,2,4,5-Tetrachlorobenzene	0.0125 U	0.0125 U	0.012 U	0.0245 U	0.125 U	0.125 U	0.12 U	0.0245 U	0.0115 U	0.012 U	0.0125 U	0.0125 U	0.012 U	0.024 U
1,4-Dioxane (P-Dioxane)	0.0445 U	0.044 U	0.0435 U	0.09 U	0.44 U	0.445 U	0.425 U	0.09 U	0.042 U	0.043 U	0.0445 U	0.0445 U	0.0425 U	0.085 U
2,3,4,6-Tetrachlorophenol	0.0155 U	0.0155 U	0.0155 U	0.031 U	0.155 U	0.155 U	0.15 U	0.031 U	0.015 U	0.015 U	0.0155 U	0.0155 U	0.015 U	0.0305 U
2,4,5-Trichlorophenol	0.0165 U	0.0165 U	0.016 U	0.033 U	0.165 U	0.165 U	0.16 U	0.033 U	0.0155 U	0.016 U	0.0165 U	0.0165 U	0.016 U	0.032 U
2,4,6-Trichlorophenol	0.0047 U	0.0047 U	0.00465 U	0.0095 U	0.047 U	0.047 U	0.045 U	0.0095 U	0.00445 U	0.00455 U	0.00475 U	0.00475 U	0.0045 U	0.009 U
2,4-Dichlorophenol	0.0039 U	0.0039 U	0.00385 U	0.008 U	0.039 U	0.039 U	0.0375 U	0.008 U	0.0037 U	0.0038 U	0.0039 U	0.00395 U	0.00375 U	0.0075 U
2,4-Dimethylphenol	0.0365 U	0.036 U	0.036 U	0.075 U	0.365 U	0.365 U	0.35 U	0.075 U	0.0345 U	0.0355 U	0.0365 U	0.0365 U	0.035 U	0.07 U
2,4-Dinitrophenol	0.125 U	0.125 U	0.125 U	0.25 U	1.25 U	1.25 U	1.2 U	0.25 U	0.12 U	0.12 U	0.125 U	0.125 U	0.12 U	0.245 U
2,4-Dinitrotoluene	0.0065 U	0.0065 U	0.0065 U	0.013 U	0.065 U	0.065 U	0.065 U	0.013 U	0.006 U	0.0065 U	0.0065 U	0.0065 U	0.0065 U	0.013 U
2,6-Dinitrotoluene	0.009 U	0.009 U	0.0085 U	0.0175 U	0.09 U	0.09 U	0.085 U	0.0175 U	0.0085 U	0.0085 U	0.009 U	0.009 U	0.0085 U	0.017 U
2-Chloronaphthalene	0.00375 U	0.00375 U	0.0037 U	0.0075 U	0.0375 U	0.0375 U	0.036 U	0.0075 U	0.00355 U	0.00365 U	0.00375 U	0.0038 U	0.0036 U	0.0075 U
2-Chlorophenol	0.0042 U	0.0042 U	0.00415 U	0.0085 U	0.042 U	0.042 U	0.0405 U	0.0085 U	0.004 U	0.0041 U	0.00425 U	0.00425 U	0.004 U	0.008 U
2-Methylnaphthalene	0.0141176 J	0.005392 U	0.0588235 J	0.119657 J	1.91176 J	1.29412 J	0.635216 J	0.0514706 J	0.0050965 U	0.235294 J	0.0206815 J	0.0054412 U	0.0109316 J	0.0764705 J
2-Methylphenol (O-Cresol)	0.007 U	0.007 U	0.007 U	0.0145 U	0.07 U	0.07 U	0.07 U	0.0145 U	0.007 U	0.007 U	0.007 U	0.0075 U	0.007 U	0.014 U
2-Nitroaniline	0.0055 U	0.0055 U	0.0055 U	0.011 U	0.055 U	0.055 U	0.05 U	0.011 U	0.005 U	0.0055 U	0.0055 U	0.0055 U	0.005 U	0.0105 U
2-Nitrophenol	0.0055 U	0.0055 U	0.0055 U	0.011 U	0.055 U	0.055 U	0.055 U	0.011 U	0.0055 U	0.0055 U	0.0055 U	0.0055 U	0.0055 U	0.011 U
3- And 4- Methylphenol (Total)	0.0044 U	0.0044 U	0.00435 U	0.009 U	0.044 U	0.044 U	0.0425 U	0.009 U	0.0042 U	0.011 J	0.00445 U	0.00445 U	0.0042 U	0.0085 U
3,3'-Dichlorobenzidine	0.0185 U	0.0185 U	0.018 U	0.037 U	0.185 U	0.185 U	0.175 U	0.037 U	0.0175 U	0.018 U	0.0185 U	0.0185 U	0.0175 U	0.036 U
3-Nitroaniline	0.0049 U	0.0049 U	0.00485 U	0.01 U	0.049 U	0.049 U	0.047 U	0.01 U	0.00465 U	0.00475 U	0.00495 U	0.00495 U	0.0047 U	0.0095 U
4,6-Dinitro-2-Methylphenol	0.0445 U	0.044 U	0.0435 U	0.09 U	0.44 U	0.445 U	0.425 U	0.09 U	0.042 U	0.043 U	0.0445 U	0.0445 U	0.0425 U	0.085 U
4-Bromophenyl Phenyl Ether	0.005 U	0.005 U	0.005 U	0.0105 U	0.05 U	0.05 U	0.05 U	0.0105 U	0.00495 U	0.005 U	0.005 U	0.005 U	0.005 U	0.01 U
4-Chloro-3-Methylphenol	0.007 U	0.007 U	0.007 U	0.014 U	0.07 U	0.07 U	0.07 U	0.014 U	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U	0.014 U
4-Chloroaniline	0.00425 U	0.00425 U	0.0042 U	0.0085 U	0.0425 U	0.0425 U	0.041 U	0.0085 U	0.00405 U	0.00415 U	0.0043 U	0.0043 U	0.00405 U	0.0085 U
4-Chlorophenyl Phenyl Ether	0.00495 U	0.00495 U	0.0049 U	0.01 U	0.0495 U	0.0495 U	0.0475 U	0.01 U	0.0047 U	0.0048 U	0.005 U	0.005 U	0.00475 U	0.0095 U
4-Nitroaniline	0.0065 U	0.006 U	0.006 U	0.0125 U	0.06 U	0.065 U	0.06 U	0.0125 U	0.006 U	0.006 U	0.0065 U	0.0065 U	0.006 U	0.012 U
4-Nitrophenol	0.08 U	0.08 U	0.08 U	0.16 U	0.8 U	0.8 U	0.75 U	0.16 U	0.075 U	0.075 U	0.08 U	0.08 U	0.075 U	0.155 U
Acenaphthene	0.103642 J	0.0144753 J	0.354937 J	0.759955 J	7.66664	4.96912	4.16166 J	0.298147 J	0.0597107 J	1.03642	0.106756 J	0.0198765 J	0.0343789 J	0.496912 J
Acenaphthylene	0.0057863 U	0.0069193 U	0.0057183 U	0.0138386 U	0.272298 J	0.190608 J	0.162806 J	0.0115727 U	0.0065937 U	0.0353987 J	0.0070007 U	0.0058544 U	0.0065937 U	0.0115727 U
Acetophenone	0.0052 U	0.0050807 U	0.0051278 U	0.0098791 U	0.052 U	0.052 U	0.0486899 U	0.0101111 U	0.004869 U	0.0102556 J	0.0103025 J	0.0105444 J	0.004869 U	0.0101111 U
Anthracene	0.178951 J	0.0282671 U	0.605682	1.33129	11.7007	8.2593	7.65948	0.412965 J	0.437685 J	2.20248	0.175074 J	0.0220248 U	0.0601816 J	0.784633 J
Atrazine	0.0075 U	0.0075 U	0.0075 U	0.0145 U	0.075 U	0.075 U	0.07 U	0.0145 U	0.007 U	0.007 U	0.0075 U	0.0075 U	0.007 U	0.0145 U
Benzaldehyde	0.0125 U	0.0125 U	0.0125 U	0.025 U	0.125 U	0.125 U	0.12 U	0.025 U	0.012 U	0.012 U	0.0125 U	0.0125 U	0.012 U	0.0245 U
Benzo(A)Anthracene	1.45248	0.153583	3.69722	3.20667	30.37	22.4474	20.2527	3.43314	0.455685	14.5248	0.506317	0.330109	0.202527	3.82927
Benzo(A)Pyrene	1.7699	0.158875	4.62897	3.84644	32.6751	24.5063	18.396	3.94824	0.501709	10.4833	0.55188	0.490126	0.200684	4.76512
Benzo(B)Fluoranthene	2.59686	0.240089	5.58325	4.3216	38.9529	27.267	20.8077	9.73822	0.688255	58.4293	1.04039	1.02576	0.256095	6.3623
Benzo(G,H,I)Perylene	2.48475	0.155966 J	5.36184	2.73342	27.4631	19.6165	9.96895	6.1465	0.482368 J	22.232	0.498447 J	0.575417	0.241184 J	4.96951
Benzo(K)Fluoranthene	0.879585	0.0871923	2.1005	1.61223	15.7538	11.4215	8.06117	3.15075	0.230319	14.441	0.329027	0.328203	0.126676	1.96922
Benzyl Butyl Phthalate	0.005 U	0.0066375 U	0.005 U	0.013275 U	0.05 U	0.05 U	0.0650473 U	0.43 J	0.0131422 J	0.00495 U	0.0185849 J	0.005 U	0.0065047 U	0.01 U
Biphenyl (Diphenyl)	0.0209586 U	0.027748 U	0.0209586 U	0.0554961 U	0.464084 J	0.2095863 U	0.2675703 U	0.0419173 U	0.026757 U	0.0613788 J	0.027748 U	0.0209586 U	0.026757 U	0.0411687 U
Bis(2-Chloroethoxy) Methane	0.005 U	0.005 U	0.005 U	0.0105 U	0.05 U	0.05 U	0.0495 U	0.0105 U	0.0049 U	0.005 U	0.005 U	0.005 U	0.00495 U	0.01 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.0039 U	0.0039 U	0.00385 U	0.008 U	0.039 U	0.039 U	0.0375 U	0.008 U	0.0037 U	0.0038 U	0.0039 U	0.00395 U	0.00375 U	0.0075 U
Bis(2-Chloroisopropyl) Ether	0.007 U	0.007 U	0.0065 U	0.0135 U	0.07 U	0.07 U	0.065 U	0.0135 U	0.0065 U	0.0065 U	0.007 U	0.007 U	0.0065 U	0.0135 U
Bis(2-Ethylhexyl) Phthalate	0.0065 U	0.0065 U	0.0065 U	0.013 U	0.81 J	0.52 J	0.06 U	0.086 J	0.006 U	0.0065 U	0.035 J	0.033 J	0.014 J	0.0125 U
Caprolactam	0.012 U	0.012 U	0.0115 U	0.024 U	0.12 U	0.12 U	0.115 U	0.024 U	0.0115 U	0.0115 U	0.012 U	0.012 U	0.0115 U	0.0235 U
Carbazole	0.195792 J	0.0211313 J	0.482954	0.686767 J	5.61271	4.04637 J	4.22626 J	0.535166 J	0.228922 J	1.82739	0.088047 J	0.041769 J	0.0316969 J	0.561271 J
Chrysene	2.03817	0.195524 J	4.61986	3.91049	33.9696	25.8169	19.5524	7.20155	0.716922	39.4047	0.700629	0.62504	0.228112 J	5.43513
Dibenz(A,H)Anthracene	0.587255	0.0442397 J	1.39823	0.884795	8.669	6.57166	3.93242	2.23716	0.129442	9.50794	0.14255	0.153805	0.0131081 U	1.39823
Dibenzofuran	0.0307053 J	0.0085006 U	0.120151 J	0.391028 J	3.07053 J	2.00252 J	1.87013 J	0.0947858 J	0.0221016 J	0.400503 J	0.0476034 J	0.0066751 U	0.0187013 J	0.186902 J
Diethyl Phthalate	0.0047 U	0.0047 U	0.00465 U	0.0095 U	0.047 U	0.047 U	0.045 U	0.0095 U	0.00445 U	0.00455 U	0.00475 U	0.00475 U	0.0045 U	0.009 U
Dimethyl Phthalate	0.0048 U	0.0048 U	0.00475 U	0.0095 U	0.048 U	0.048 U	0.046 U	0.0095 U	0.00455 U	0.00465 U	0.00485 U	0.00485 U	0.0046 U	0.0095 U
Di-N-Butyl Phthalate	0.00495 U	0.00495 U	0.022 J	0.01 U	0.0495 U	0.0495 U	0.0475 U	0.01 U	0.0047 U	0.035 J	0.005 U	0.015 J	0.011 J	0.0095 U
Di-N-Octylphthalate	0.0085 U	0.0085 U	0.0085 U	0.017 U	0.085 U	0.085 U	0.08 U	0.017 U	0.008 U	0.008 U	0.0085 U	0.0085 U	0.008 U	0.0165 U
Fluoranthene	2.33412	0.274281 J	6.17856	5.65704	53.5475	41.1904	37.7136	6.17856	0.839984	17.8492	1.01141	0.562935	0.325708 J	7.00237

Table E-47
Summary of Data Used in Risk Assessment
Central Landfills Area - ISM Soil (0-2 ft-bgs) - RSD High Adjusted - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFISS-018	CFISS-018	CFISS-019	CFISS-019	CFISS-020	CFISS-020-DUP	CFISS-020	CFISS-021	CFISS-021	CFISS-022	CFISS-022	CFISS-023	CFISS-023	CFISS-024
Sample Lab IDs	240-66516-1	240-66516-2	240-66516-3	240-66516-4	240-66516-5	240-66516-6	240-66516-7	240-66516-8	240-66516-10	240-66588-1	240-66588-2	240-66588-3	240-66588-4	240-66695-2
Sample Name	CFISS-018-SO-0-0.5	CFISS-018-SO-0.5-2	CFISS-019-SO-0-0.5	CFISS-019-SO-0.5-2	CFISS-020-SO-0-0.5	CFISS-DUP2-SO	CFISS-020-SO-0.5-2	CFISS-021-SO-0-0.5	CFISS-021-SO-0.5-2	CFISS-022-SO-0-0.5	CFISS-022-SO-0.5-2	CFISS-023-SO-0-0.5	CFISS-023-SO-0.5-2	CFISS-024-SO-0-0.5
Sample Depth	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft
Chemical	6/24/2016	6/24/2016	6/24/2016	6/24/2016	6/25/2016	6/25/2016	6/25/2016	6/25/2016	6/25/2016	6/27/2016	6/27/2016	6/27/2016	6/27/2016	6/29/2016
Fluorene	0.0552062 J	0.0062698 U	0.201974 J	0.592145 J	5.52062	3.63553 J	2.96073 J	0.188509 J	0.0539897 J	0.700176	0.0975298 J	0.0134649 J	0.0348321 J	0.296228 J
Hexachlorobenzene	0.0065 U	0.0065 U	0.0065 U	0.0135 U	0.065 U	0.065 U	0.065 U	0.0135 U	0.0065 U	0.0065 U	0.0065 U	0.0065 U	0.0065 U	0.013 U
Hexachlorobutadiene	0.00465 U	0.00465 U	0.0046 U	0.0095 U	0.0465 U	0.0465 U	0.0445 U	0.0095 U	0.0044 U	0.0045 U	0.0047 U	0.0047 U	0.00445 U	0.009 U
Hexachlorocyclopentadiene	0.0105 U	0.0105 U	0.01 U	0.0205 U	0.105 U	0.105 U	0.1 U	0.0205 U	0.01 U	0.01 U	0.0105 U	0.0105 U	0.01 U	0.02 U
Hexachloroethane	0.006 U	0.006 U	0.006 U	0.012 U	0.06 U	0.06 U	0.06 U	0.012 U	0.006 U	0.006 U	0.006 U	0.006 U	0.006 U	0.012 U
Indeno(1,2,3-C,D)Pyrene	2.2291	0.162037	5.24493	3.24073	28.8471	22.291	12.9629	6.29392	0.583331	22.291	0.534721	0.576943	0.194444	5.24493
Isophorone	0.00355 U	0.0047036 U	0.0035 U	0.0092747 U	0.0355 U	0.0355 U	0.0450486 U	0.007 U	0.0145746 J	0.024 J	0.0047036 U	0.0036 U	0.0045049 U	0.076 J
Naphthalene	0.0231917 J	0.0054121 U	0.101464 J	0.231948 J	3.18886 J	1.73938 J	1.12108 J	0.101464 J	0.012886 J	0.521813	0.0309264 J	0.0061603 U	0.0180404 J	0.159443 J
Nitrobenzene	0.005 U	0.005 U	0.005 U	0.0105 U	0.05 U	0.05 U	0.05 U	0.0105 U	0.00495 U	0.005 U	0.005 U	0.005 U	0.005 U	0.01 U
N-Nitrosodi-N-Propylamine	0.0055 U	0.0055 U	0.0055 U	0.011 U	0.055 U	0.055 U	0.055 U	0.011 U	0.0055 U	0.0055 U	0.0055 U	0.0055 U	0.0055 U	0.011 U
N-Nitrosodiphenylamine	0.015 U	0.015 U	0.015 U	0.03 U	0.15 U	0.15 U	0.145 U	0.03 U	0.0145 U	0.0145 U	0.015 U	0.015 U	0.0145 U	0.0295 U
Pentachlorophenol	0.02 U	0.02 U	0.0195 U	0.04 U	0.2 U	0.2 U	0.19 U	0.04 U	0.019 U	0.0195 U	0.02 U	0.02 U	0.019 U	0.039 U
Phenanthrene	1.1269	0.213728 J	3.14484	4.98699	41.9312	31.4484	30.2781	2.75173	0.552131	8.64831	0.819291	0.235863 J	0.320592 J	3.53794
Phenol	0.0055 U	0.0055 U	0.0055 U	0.011 U	0.055 U	0.055 U	0.05 U	0.011 U	0.005 U	0.018 J	0.0055 U	0.0055 U	0.005 U	0.0105 U
Pyrene	2.2294	0.328152 J	5.29482	4.4905	55.7349	39.0144	25.9067	6.40951	0.863558	22.294	1.27807	0.808156	0.44905 J	4.8768

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Table E-47
Summary of Data Used in Risk Assessment
Central Landfills Area - ISM Soil (0-2 ft-bgs) - RSD High Adjusted - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFISS-024	CFISS-025	CFISS-025	CFISS-026	CFISS-026	CFISS-027	CFISS-027-DUP	CFISS-027	CFISS-028	CFISS-028	CFISS-029	CFISS-029
Sample Lab IDs	240-66695-4	240-66695-5	240-66695-6	240-66695-7	240-66695-8	240-66695-9	240-66695-10	240-66695-11	240-66695-12	240-66695-14	240-66588-5	240-66588-6
Sample Name	CFISS-024-SO-0.5-2	CFISS-025-SO-0-0.5	CFISS-025-SO-0.5-2	CFISS-026-SO-0-0.5	CFISS-026-SO-0.5-2	CFISS-027-SO-0-0.5	CFISS-DUP3-SO	CFISS-027-SO-0.5-2	CFISS-028-SO-0-0.5	CFISS-028-SO-0.5-2	CFISS-029-SO-0-0.5	CFISS-029-SO-0.5-2
Sample Depth	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft
Chemical	6/29/2016	6/30/2016	6/30/2016	6/30/2016	6/30/2016	7/1/2016	7/1/2016	7/1/2016	7/1/2016	7/1/2016	6/27/2016	6/27/2016
GENERAL CHEMISTRY (mg/kg)												
Fluoride	262.699 J+	84.1335	202.175 J+	743.701 J+	813.852 J+	294.106 J+	288.079 J+	1218.2	220.579 J+	1108.75 J+	48.0935 J	68.2503 J
Cyanide	0.185735 J-	0.967399	0.212268	0.53277	0.344936	0.602872	0.630912	0.570471	0.392568	1.02154	0.378547	0.199002
METALS (mg/kg)												
Chromium, Hexavalent - Estimated	0.458523	0.541518	0.455639	0.816716	0.545037	1.13926	2.04475	1.56878	0.523764	0.556572	0.440908	0.493129
Chromium, Trivalent - Estimated	16.6736	19.6916	16.5687	29.6988	19.8195	41.4276	74.3545	57.0467	19.0459	20.239	16.033	17.9319
Aluminum	13804	25961.2	14536	38837.1	23424.9	32346.8	30776.6	26039.3	28159.5	26771.3	18738.1 J	16313.8 J
Antimony	0.238629 J-	0.512274 J-	0.238629 J-	0.345785 J-	0.272719 J-	0.397013 J-	0.345785 J-	0.357944 J-	0.192103 J-	0.289764 J-	0.307365 J-	0.289764 J-
Arsenic	5.37284	6.82998	4.83556	8.19597	6.01758	9.3343	9.22047	6.23249	6.03315	6.33995	6.71614	6.87724
Barium	134.37	102.681	103.454	261.123	172.605	304.817	307.938	180.252	272.566	196.638	124.84	147.479
Beryllium	0.587462	0.712339	0.566482	1.38215	0.860213	1.16951	1.06319	1.25885	0.978138	0.944136	0.616652	0.555991
Cadmium	0.106029 J	0.437089 J	0.104969 J	0.632629 J	0.18025 J	0.747652 J	0.770657 J	0.201456 J	0.253052 J	0.137838 J	0.276056 J	0.148441 J
Calcium	29245.7	30876	30972.8	10126	21646.4	7813.06	8488.13	21991.9	8333.19	22452.4	20252	19919.3
Chromium, Total	17.1321 J-	20.2331 J-	17.0243 J-	30.5155 J-	20.3646 J-	42.5669 J	76.3993 J	58.6154 J-	19.5697 J-	20.7956 J-	16.4739	18.4251
Cobalt	6.22161	6.52107	5.81363	7.45265	6.22161	7.86668	8.0737	6.42559	6.72808	6.22161	6.52107	6.52759
Copper	18.5194	37.3876	16.3221	50.7484	18.8332	45.2469	46.8187	19.5657	23.1287	16.8453	73.0911	416.424
Iron	15769.7	18094.9	15974.5	28021.2	17612.9	26366.8	26987.2	17612.9	19025.5	16691.3	17060.9	17715.3
Lead	12.813	29.2573	11.4697	55.8414	13.4329	90.8908	95.7917	14.3629	24.6534	14.3629	24.6534	16.6362
Magnesium	11955.1	12030	12057.3	10148.3	11648.6	10282	10487.7	10933.3	10384.8	11239.9	11515.9	11342.1
Manganese	468.253	421.472	431.821	615.834	487.54	512.315	528.16	480.04	477.457	486.469	470.062	551.831
Mercury	0.026746 J	0.0116204 U	0.0203779 J	0.0123951 U	0.0216515 J	0.027889 J	0.0294384 J	0.0095521 U	0.0123951 U	0.010189 U	0.0371853 J	0.0305669 J
Nickel	20.2493 J-	53.3463 J-	19.823 J-	61.9321 J-	22.5939 J-	89.2921 J-	99.595 J-	41.0314 J-	28.2758 J-	19.823 J-	28.8482	16.4126
Potassium	1357.79	1784.87	1293.64	2432.94	2330.69	2517.94	2156.71	2651.42	1880.48	2662.12	1413.02	1176.03
Selenium	1.78599 J	2.27922 J	1.78599 J	3.71873 J	2.38132 J	6.83766 J	6.47778 J	2.14319 J	2.75905 J	2.26226 J	2.0393 J	2.02413 J
Silver	0.0538168 J	0.0708689 J	0.0373423 J	0.119932 J	0.0549151 J	0.104668 J	0.109029 J	0.05821 J	0.0686883 J	0.05821 J	0.0468825 J	0.05821 J
Sodium	214.308 J	407.91	113.087 J	2823.99	2445.78	966.172	834.124	3341.75	466.743	3971.36	114.006 J	93.7144 J
Thallium	0.0873832 J	0.125794 J	0.082055 J	0.19441 J	0.127878 J	0.251589 J	0.228717 J	0.159847 J	0.13723 J	0.138534 J	0.108641 J	0.0948428 J
Vanadium	13.8438	22.8247	13.0173	30.251	18.8028	36.8035	35.8207	32.2334	19.6577	18.5962	16.0538	13.0173
Zinc	55.2393	79.2361	50.2846	101.44	59.8777	93.8886	98.6225	56.2935	72.4734	55.9772	85.0971	57.9802
PESTICIDES (mg/kg)												
Aldrin	--	0.000395 U	--	0.0004 U	--	0.000405 U	0.000415 U	--	0.000405 U	--	0.00039 U	--
Alpha Bhc (Alpha Hexachlorocyclohexane)	--	0.0003 U	--	0.0003 U	--	0.000305 U	0.00031 U	--	0.000305 U	--	0.000295 U	--
Alpha Endosulfan	--	0.000455 U	--	0.00046 U	--	0.000465 U	0.000475 U	--	0.000465 U	--	0.000445 U	--
Beta Bhc (Beta Hexachlorocyclohexane)	--	0.000315 U	--	0.00032 U	--	0.000325 U	0.00033 U	--	0.000325 U	--	0.000315 U	--
Beta Endosulfan	--	0.0005 U	--	0.0005 U	--	0.00055 U	0.00055 U	--	0.00055 U	--	0.0005 U	--
cis-Chlordane	--	0.00055 U	--	0.00055 U	--	0.00055 U	0.00055 U	--	0.00055 U	--	0.0005 U	--
Delta BHC (Delta Hexachlorocyclohexane)	--	0.000355 U	--	0.00036 U	--	0.000365 U	0.000375 U	--	0.000365 U	--	0.00035 U	--
Dieldrin	--	0.000425 U	--	0.00043 U	--	0.000435 U	0.000445 U	--	0.000435 U	--	0.00042 U	--
Endosulfan Sulfate	--	0.00038 U	--	0.000385 U	--	0.00039 U	0.0004 U	--	0.00039 U	--	0.000375 U	--
Endrin Aldehyde	--	0.000405 U	--	0.00041 U	--	0.000415 U	0.000425 U	--	0.000415 U	--	0.0004 U	--
Endrin Ketone	--	0.000455 U	--	0.00046 U	--	0.000465 U	0.000475 U	--	0.000465 U	--	0.000445 U	--
Endrin	--	0.000415 U	--	0.00042 U	--	0.000425 U	0.000435 U	--	0.000425 U	--	0.00041 U	--
Gamma Bhc (Lindane)	--	0.000295 U	--	0.000295 U	--	0.0003 U	0.000305 U	--	0.0003 U	--	0.00029 U	--
Heptachlor Epoxide	--	0.00065 U	--	0.00065 U	--	0.00065 U	0.00065 U	--	0.00065 U	--	0.00065 U	--
Heptachlor	--	0.00042 U	--	0.000425 U	--	0.00043 U	0.00044 U	--	0.00043 U	--	0.000415 U	--
Methoxychlor	--	0.0007 U	--	0.0007 U	--	0.0007 U	0.00075 U	--	0.0007 U	--	0.0007 U	--
P,P'-DDD	--	0.00043 U	--	0.000435 U	--	0.00044 U	0.00045 U	--	0.00044 U	--	0.000425 U	--
P,P'-DDE	--	0.000475 U	--	0.00048 U	--	0.000485 U	0.000495 U	--	0.000485 U	--	0.000465 U	--
P,P'-DDT	--	0.000335 U	--	0.00034 U	--	0.000345 U	0.000355 U	--	0.000345 U	--	0.00033 U	--
Toxaphene	--	0.0095 U	--	0.0095 U	--	0.01 U	0.01 U	--	0.01 U	--	0.0095 U	--
trans-Chlordane	--	0.0007 U	--	0.0007 U	--	0.00075 U	0.00075 U	--	0.00075 U	--	0.0007 U	--
POLYCHLORINATED BIPHENYLS (mg/kg)												
PCB-1016 (Aroclor 1016)	0.0043 U	0.00435 U	0.00435 U	0.0044 U	0.00435 U	0.00445 U	0.00455 U	0.0000445 UJ	0.00445 U	0.0044 U	0.0043 U	0.00435 U
PCB-1221 (Aroclor 1221)	0.0043 U	0.00435 U	0.00435 U	0.0044 U	0.00435 U	0.00445 U	0.00455 U	0.0000445 UJ	0.00445 U	0.0044 U	0.0043 U	0.00435 U
PCB-1232 (Aroclor 1232)	0.0043 U	0.00435 U	0.00435 U	0.0044 U	0.00435 U	0.00445 U	0.00455 U	0.0000445 UJ	0.00445 U	0.0044 U	0.0043 U	0.00435 U
PCB-1242 (Aroclor 1242)	0.0043 U	0.00435 U	0.00435 U	0.0044 U	0.00435 U	0.00445 U	0.00455 U	0.0000445 U	0.00445 U	0.0044 U	0.0043 U	0.00435 U
PCB-1248 (Aroclor 1248)	0.0043 U	0.00435 U	0.00435 U	0.0044 U	0.00435 U	0.00445 U	0.00455 U	0.0000445 U	0.00445 U	0.0044 U	0.0043 U	0.00435 U
PCB-1254 (Aroclor 1254)	0.0057489 U	0.0107809 U	0.0058135 U	0.0109007 U	0.0058135 U	0.0110205 U	0.011260089 U	5.94E-05 U	0.0110205 U	0.0058781 U	0.0106611 U	0.00581351 U

Table E-47
Summary of Data Used in Risk Assessment
Central Landfills Area - ISM Soil (0-2 ft-bgs) - RSD High Adjusted - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFISS-024	CFISS-025	CFISS-025	CFISS-026	CFISS-026	CFISS-027	CFISS-027-DUP	CFISS-027	CFISS-028	CFISS-028	CFISS-029	CFISS-029
Sample Lab IDs	240-66695-4	240-66695-5	240-66695-6	240-66695-7	240-66695-8	240-66695-9	240-66695-10	240-66695-11	240-66695-12	240-66695-14	240-66588-5	240-66588-6
Sample Name	CFISS-024-SO-0.5-2	CFISS-025-SO-0-0.5	CFISS-025-SO-0.5-2	CFISS-026-SO-0-0.5	CFISS-026-SO-0.5-2	CFISS-027-SO-0-0.5	CFISS-DUP3-SO	CFISS-027-SO-0.5-2	CFISS-028-SO-0-0.5	CFISS-028-SO-0.5-2	CFISS-029-SO-0-0.5	CFISS-029-SO-0.5-2
Sample Depth	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft
Chemical	6/29/2016	6/30/2016	6/30/2016	6/30/2016	6/30/2016	7/1/2016	7/1/2016	7/1/2016	7/1/2016	7/1/2016	6/27/2016	6/27/2016
PCB-1260 (Aroclor 1260)	0.00445 U	0.0045 U	0.0045 U	0.00455 U	0.0045 U	0.0046 U	0.0047 U	0.000046 U	0.0046 U	0.00455 U	0.00445 U	0.0045 U
PCB-1262 (Aroclor 1262)	0.00445 U	0.0045 U	0.0045 U	0.00455 U	0.0045 U	0.0046 U	0.0047 U	0.000046 U	0.0046 U	0.00455 U	0.00445 U	0.0045 U
PCB-1268 (Aroclor 1268)	0.00445 U	0.0045 U	0.0045 U	0.00455 U	0.0045 U	0.0046 U	0.0047 U	0.000046 U	0.0046 U	0.00455 U	0.00445 U	0.0045 U
Polychlorinated Biphenyl (PCBs)	0.0057489 U	0.0107809 U	0.0058135 U	0.0109007 U	0.0058135 U	0.0110205 U	0.011260089 U	5.94E-05 UJ	0.0110205 U	0.0058781 U	0.0106611 U	0.00581351 U
SEMIVOLATILE ORGANIC COMPOUNDS (mg/kg)												
1,2,4,5-Tetrachlorobenzene	0.025 U	0.0245 U	0.012 U	0.0245 U	0.012 U	0.06 U	0.065 U	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U
1,4-Dioxane (P-Dioxane)	0.09 U	0.09 U	0.0435 U	0.09 U	0.0425 U	0.215 U	0.225 U	0.0425 U	0.0435 U	0.043 U	0.0435 U	0.0435 U
2,3,4,6-Tetrachlorophenol	0.0315 U	0.031 U	0.015 U	0.031 U	0.015 U	0.075 U	0.08 U	0.015 UJ	0.015 U	0.015 U	0.0155 U	0.0155 U
2,4,5-Trichlorophenol	0.033 U	0.033 U	0.016 U	0.033 U	0.016 U	0.08 U	0.085 U	0.016 U	0.016 U	0.016 U	0.016 U	0.016 U
2,4,6-Trichlorophenol	0.0095 U	0.0095 U	0.0046 U	0.0095 U	0.00455 U	0.023 U	0.024 U	0.0045 U	0.0046 U	0.00455 U	0.00465 U	0.0046 U
2,4-Dichlorophenol	0.008 U	0.008 U	0.0038 U	0.008 U	0.00375 U	0.019 U	0.02 U	0.00375 U	0.0038 U	0.0038 U	0.00385 U	0.00385 U
2,4-Dimethylphenol	0.075 U	0.075 U	0.0355 U	0.075 U	0.035 U	0.18 U	0.185 U	0.035 U	0.0355 U	0.0355 U	0.036 U	0.0355 U
2,4-Dinitrophenol	0.25 U	0.25 U	0.12 U	0.25 U	0.12 U	0.6 U	0.65 U	0.12 UR	0.12 U	0.12 U	0.125 U	0.125 U
2,4-Dinitrotoluene	0.013 U	0.013 U	0.0065 U	0.013 U	0.0065 U	0.032 U	0.0335 U	0.0065 U	0.0065 U	0.0065 U	0.0065 U	0.0065 U
2,6-Dinitrotoluene	0.0175 U	0.0175 U	0.0085 U	0.0175 U	0.0085 U	0.043 U	0.045 U	0.0085 U	0.0085 U	0.0085 U	0.0085 U	0.0085 U
2-Chloronaphthalene	0.0075 U	0.0075 U	0.00365 U	0.0075 U	0.0036 U	0.0185 U	0.019 U	0.0036 U	0.00365 U	0.00365 U	0.0037 U	0.0037 U
2-Chlorophenol	0.0085 U	0.0085 U	0.0041 U	0.0085 U	0.00405 U	0.0205 U	0.0215 U	0.00405 U	0.0041 U	0.0041 U	0.00415 U	0.00415 U
2-Methylnaphthalene	0.0546581 J	0.0485294 J	0.0251132 J	0.25 J	0.0280677 J	0.116176 J	0.133823 J	0.0797713 J	0.0161765 J	0.0251132 J	0.0110294 J	0.005318089 U
2-Methylphenol (O-Cresol)	0.0145 U	0.0145 U	0.007 U	0.0145 U	0.007 U	0.0355 U	0.0365 U	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U
2-Nitroaniline	0.011 U	0.011 U	0.0055 U	0.011 U	0.0055 U	0.0265 U	0.0275 U	0.005 U	0.0055 U	0.0055 U	0.0055 U	0.0055 U
2-Nitrophenol	0.011 U	0.011 U	0.0055 U	0.011 U	0.0055 U	0.027 U	0.028 U	0.0055 U	0.0055 U	0.0055 U	0.0055 U	0.0055 U
3- And 4- Methylphenol (Total)	0.009 U	0.009 U	0.0043 U	0.009 U	0.00425 U	0.0215 U	0.0225 U	0.0042 U	0.0043 U	0.00425 U	0.00435 U	0.0043 U
3,3'-Dichlorobenzidine	0.037 U	0.037 U	0.018 U	0.037 U	0.018 U	0.09 U	0.095 U	0.0175 U	0.018 U	0.018 U	0.018 U	0.018 U
3-Nitroaniline	0.01 U	0.01 U	0.0048 U	0.01 U	0.00475 U	0.024 U	0.025 U	0.0047 U	0.0048 U	0.00475 U	0.00485 U	0.0048 U
4,6-Dinitro-2-Methylphenol	0.09 U	0.09 U	0.043 U	0.09 U	0.0425 U	0.215 U	0.225 U	0.0425 UJ	0.043 U	0.043 U	0.0435 U	0.0435 U
4-Bromophenyl Phenyl Ether	0.0105 U	0.0105 U	0.005 U	0.0105 U	0.005 U	0.0255 U	0.0265 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
4-Chloro-3-Methylphenol	0.0145 U	0.0145 U	0.007 U	0.014 U	0.007 U	0.035 U	0.036 U	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U
4-Chloroaniline	0.0085 U	0.0085 U	0.00415 U	0.0085 U	0.0041 U	0.021 U	0.0215 U	0.0041 U	0.00415 U	0.00415 U	0.0042 U	0.0042 U
4-Chlorophenyl Phenyl Ether	0.01 U	0.01 U	0.00485 U	0.01 U	0.0048 U	0.024 U	0.025 U	0.00475 U	0.00485 U	0.0048 U	0.0049 U	0.00485 U
4-Nitroaniline	0.0125 U	0.0125 U	0.006 U	0.0125 U	0.006 U	0.0305 U	0.032 U	0.006 U	0.006 U	0.006 U	0.006 U	0.006 U
4-Nitrophenol	0.16 U	0.16 U	0.08 U	0.16 U	0.075 U	0.39 U	0.405 U	0.075 U	0.08 U	0.075 U	0.08 U	0.08 U
Acenaphthene	0.560919 J	0.298147 J	0.180942 J	0.582097 J	0.139325 J	0.184567 J	0.298147 J	0.524731 J	0.0496912 J	0.171895 J	0.0553702 J	0.0253318 J
Acenaphthylene	0.0138386 U	0.0115727 U	0.0067565 U	0.0115727 U	0.0066751 U	0.0285913 U	0.029272017 U	0.0066751 U	0.0056502 U	0.0067565 U	0.0057183 U	0.006837873 U
Acetophenone	0.0105848 U	0.0288889 J	0.0169356 J	0.0332222 J	0.0239921 J	0.0252778 U	0.026722222 U	0.028226 J	0.0433333 J	0.0296373 J	0.0288889 J	0.0211695 J
Anthracene	0.966553 J	0.55062 J	0.3465 J	0.798399 J	0.29179 J	0.371668 J	0.55062 J	1.05774	0.108747 J	0.419448 J	0.108747 J	0.028267126 U
Atrazine	0.015 U	0.015 U	0.007 U	0.0145 U	0.007 U	0.036 U	0.0375 U	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U
Benzaldehyde	0.0255 U	0.051 J	0.0125 U	0.025 U	0.012 U	0.06 U	0.065 U	0.026 J-	0.038 J	0.032 J	0.0125 U	0.0125 U
Benzo(A)Anthracene	4.05053	3.16905	1.46832	2.24474	1.68772	3.56518	4.2254	5.06317	0.620605	2.53158	0.884693	0.236281
Benzo(A)Pyrene	5.18433	4.22053	1.8396	2.45063	2.17407	2.72292	3.67595	6.52222	0.830492	3.01026	1.15724	0.284302
Benzo(B)Fluoranthene	5.44202	5.97277	2.24083	5.19372	2.72101	15.5811	16.8796	7.84291	1.24649	3.68136	1.8178	0.384142
Benzo(G,H,I)Perylene	4.66289	6.40805	2.25105	3.53097	2.09026	7.97737	8.76203	6.75316	0.941591	2.73342	1.43854	0.289421 J
Benzo(K)Fluoranthene	1.97416	2.36306	0.822568	1.57538	0.987082	4.06972	3.93844	2.79673 J-	0.459485	1.29966	0.695791	0.156288
Benzyl Butyl Phthalate	0.0139387 U	0.046 J	0.0066375 U	0.01 U	0.0065047 U	0.025 U	0.026 U	0.0065047 U	0.005 U	0.0159299 J	0.005 U	0.006637476 U
Biphenyl (Diphenyl)	0.0564871 U	0.0426658 U	0.027748 U	0.0868286 J	0.026757 U	0.1047931 U	0.104793144 U	0.026757 U	0.0209586 U	0.026757 U	0.0209586 U	0.02774803 U
Bis(2-Chloroethoxy) Methane	0.0105 U	0.0105 U	0.005 U	0.0105 U	0.00495 U	0.025 U	0.026 U	0.00495 U	0.005 U	0.005 U	0.005 U	0.005 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	0.008 U	0.008 U	0.0038 U	0.008 U	0.00375 U	0.019 U	0.02 U	0.00375 U	0.0038 U	0.0038 U	0.00385 U	0.00385 U
Bis(2-Chloroisopropyl) Ether	0.0135 U	0.0135 U	0.0065 U	0.0135 U	0.0065 U	0.0335 U	0.0345 U	0.0065 U	0.0065 U	0.0065 U	0.0065 U	0.0065 U
Bis(2-Ethylhexyl) Phthalate	0.013 U	0.047 J	0.0065 U	0.055 J	0.006 U	0.27 J	0.033 UJ	0.074 J	0.0065 U	0.046 J	0.1 J	0.049 J
Caprolactam	0.024 U	0.024 U	0.0115 U	0.024 U	0.0115 U	0.06 U	0.06 U	0.0115 UJ	0.0115 U	0.0115 U	0.0115 U	0.0115 U
Carbazole	0.792423 J	0.456849 J	0.264141 J	0.443796 J	0.228922 J	0.32632 J	0.469901 J	0.845251	0.103117 J	0.387407 J	0.104423 J	0.0440235 J
Chrysene	5.05104	4.89162	1.95524	3.94047	2.11818	8.28858	9.10385	7.00629	1.0055	3.25874	1.29084	0.276993 J
Dibenz(A,H)Anthracene	1.13057	1.67787	0.524323	1.20247	0.622633	3.35574	3.63539	1.80236	0.265663	0.753714	0.349556	0.090118
Dibenzofuran	0.151311 J	0.0881108 J	0.0595043 J	0.347103 J	0.0595043 J	0.117481 J	0.160201 J	0.187013 J	0.0226952 J	0.069705 J	0.0200252 J	0.008330601 U
Diethyl Phthalate	0.0095 U	0.0095 U	0.0046 U	0.0095 U	0.00455 U	0.023 U	0.024 U	0.0045 U	0.0046 U	0.00455 U	0.00465 U	0.0046 U
Dimethyl Phthalate	0.0095 U	0.0095 U	0.0047 U	0.0095 U	0.00465 U	0.0235 U	0.0245 U	0.0046 U	0.0047 U	0.00465 U	0.00475 U	0.0047 U
Di-N-Butyl Phthalate	0.01 U	0.01 U	0.00485 U	0.021 J	0.0048 U	0.024 U	0.025 U	0.00475 U	0.012 J	0.019 J	0.067 J	0.023 J
Di-N-Octylphthalate	0.017 U	0.017 U	0.008 U	0.017 U	0.008 U	0.041 U	0.0425 U	0.008 U	0.008 U	0.008 U	0.0085 U	0.0085 U
Fluoranthene	7.54271	5.49205	3.08566	4.11904	2.74281	4.39364	5.62935	9.25697	1.20825	4.62848	1.31809	0.377136 J

Table E-47
Summary of Data Used in Risk Assessment
Central Landfills Area - ISM Soil (0-2 ft-bgs) - RSD High Adjusted - Current/Future
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFISS-024	CFISS-025	CFISS-025	CFISS-026	CFISS-026	CFISS-027	CFISS-027-DUP	CFISS-027	CFISS-028	CFISS-028	CFISS-029	CFISS-029
Sample Lab IDs	240-66695-4	240-66695-5	240-66695-6	240-66695-7	240-66695-8	240-66695-9	240-66695-10	240-66695-11	240-66695-12	240-66695-14	240-66588-5	240-66588-6
Sample Name	CFISS-024-SO-0.5-2	CFISS-025-SO-0-0.5	CFISS-025-SO-0.5-2	CFISS-026-SO-0-0.5	CFISS-026-SO-0.5-2	CFISS-027-SO-0-0.5	CFISS-DUP3-SO	CFISS-027-SO-0.5-2	CFISS-028-SO-0-0.5	CFISS-028-SO-0.5-2	CFISS-029-SO-0-0.5	CFISS-029-SO-0.5-2
Sample Depth	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft
Chemical	6/29/2016	6/30/2016	6/30/2016	6/30/2016	6/30/2016	7/1/2016	7/1/2016	7/1/2016	7/1/2016	7/1/2016	6/27/2016	6/27/2016
Fluorene	0.348321 J	0.175044 J	0.118429 J	0.525132 J	0.111463 J	0.134649 J	0.215439 J	0.383153 J	0.0377018 J	0.135845 J	0.0363553 J	0.0208992 J
Hexachlorobenzene	0.0135 U	0.0135 U	0.0065 U	0.0135 U	0.0065 U	0.033 U	0.034 U	0.0065 U	0.0065 U	0.0065 U	0.0065 U	0.0065 U
Hexachlorobutadiene	0.0095 U	0.0095 U	0.00455 U	0.0095 U	0.0045 U	0.023 U	0.0235 U	0.00445 U	0.00455 U	0.0045 U	0.0046 U	0.00455 U
Hexachlorocyclopentadiene	0.021 U	0.0205 U	0.01 U	0.0205 U	0.01 U	0.05 U	0.05 U	0.01 UJ	0.01 U	0.01 U	0.01 U	0.01 U
Hexachloroethane	0.012 U	0.012 U	0.006 U	0.012 U	0.006 U	0.0295 U	0.031 U	0.006 UJ	0.006 U	0.006 U	0.006 U	0.006 U
Indeno(1,2,3-C,D)Pyrene	4.8611	5.90055	2.26851	3.9337	2.26851	8.78526	9.572	6.31942	1.07521	2.91666	1.44236	0.291666
Isophorone	0.0092747 U	0.007 U	0.0046374 U	0.007 U	0.132496 J	0.0175 U	0.018 U	0.145746 J	0.099 J	0.0045711 U	0.0035 U	0.004637359 U
Naphthalene	0.077316 J	0.078272 J	0.0347922 J	0.927668 J	0.0592756 J	0.075373 J	0.127554 J	0.101799 J	0.0275402 J	0.0425238 J	0.0173938 J	0.005347693 U
Nitrobenzene	0.0105 U	0.0105 U	0.005 U	0.0105 U	0.005 U	0.0255 U	0.0265 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
N-Nitrosodi-N-Propylamine	0.011 U	0.011 U	0.0055 U	0.011 U	0.0055 U	0.027 U	0.028 U	0.0055 U	0.0055 U	0.0055 U	0.0055 U	0.0055 U
N-Nitrosodiphenylamine	0.03 U	0.03 U	0.0145 U	0.03 U	0.0145 U	0.075 U	0.075 U	0.0145 U	0.0145 U	0.0145 U	0.015 U	0.0145 U
Pentachlorophenol	0.0405 U	0.04 U	0.0195 U	0.04 U	0.0195 U	0.1 U	0.1 U	0.019 UJ	0.0195 U	0.0195 U	0.0195 U	0.0195 U
Phenanthrene	4.80888	2.75173	1.78107	3.40691	1.46047	1.96552 J	2.88277	4.80888	0.537243	2.31539	0.615864	0.249349 J
Phenol	0.011 U	0.011 U	0.0055 U	0.011 U	0.005 U	0.0265 U	0.0275 U	0.017 J	0.015 J	0.014 J	0.012 J	0.0055 U
Pyrene	6.56304	5.29482	2.41796	3.76211	2.24525	3.76211	5.29482	7.94473	0.905692	3.62694	1.81138	0.483592 J

Footnotes:
J=Estimated value
J-=Estimated Low Bias
J+=Estimated High Bias
R=Result is Rejected
U=Indicates that analyte was not detected at the limit reported
D=A secondary analysis after dilution due to exceedance
B=The analyte was found in an associated blank as well as in the sample
E=Indicates value exceeded calibration range
T=LCS or LCSD is outside acceptance limits

Appendix F ProUCL Output

ProUCL Output
Main Plant Area Soil (0-0.5 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

UCL Statistics for Data Sets with Non-Detects	
User Selected Options	
Date/Time of Computation	ProUCL 5.11/30/2019 2:46:33 PM
From File	20190130_MPA_noBuildingCover_ProUCL_input 2.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Bis2EthylhexylPhthalate

General Statistics			
Total Number of Observations	77	Number of Distinct Observations	45
		Number of Missing Observations	18
Number of Detects	29	Number of Non-Detects	48
Number of Distinct Detects	25	Number of Distinct Non-Detects	23
Minimum Detect	0.016	Minimum Non-Detect	0.013
Maximum Detect	5.8	Maximum Non-Detect	1.9
Variance Detects	1.221	Percent Non-Detects	62.34%
Mean Detects	0.39	SD Detects	1.105
Median Detects	0.096	CV Detects	2.834
Skewness Detects	4.601	Kurtosis Detects	22.3
Mean of Logged Detects	-2.227	SD of Logged Detects	1.331

Normal GOF Test on Detects Only		
Shapiro Wilk Test Statistic	0.351	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.926	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.384	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.161	Detected Data Not Normal at 5% Significance Level
Detected Data Not Normal at 5% Significance Level		

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.161	KM Standard Error of Mean	0.0802
KM SD	0.69	95% KM (BCA) UCL	0.31
95% KM (t) UCL	0.294	95% KM (Percentile Bootstrap) UCL	0.305
95% KM (z) UCL	0.293	95% KM Bootstrap t UCL	0.919
90% KM Chebyshev UCL	0.401	95% KM Chebyshev UCL	0.51
97.5% KM Chebyshev UCL	0.661	99% KM Chebyshev UCL	0.959

Gamma GOF Tests on Detected Observations Only		
A-D Test Statistic	3.062	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.813	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.266	**Kolmogorov-Smirnov GOF**
5% K-S Critical Value	0.172	Detected Data Not Gamma Distributed at 5% Significance Level
Detected Data Not Gamma Distributed at 5% Significance Level		

Gamma Statistics on Detected Data Only			
k hat (MLE)	0.495	k star (bias corrected MLE)	0.467
Theta hat (MLE)	0.787	Theta star (bias corrected MLE)	0.835
nu hat (MLE)	28.71	nu star (bias corrected)	27.08
Mean (detects)	0.39		

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	0.153
Maximum	5.8	Median	0.01
SD	0.696	CV	4.546
k hat (MLE)	0.365	k star (bias corrected MLE)	0.359
Theta hat (MLE)	0.42	Theta star (bias corrected MLE)	0.426
nu hat (MLE)	56.14	nu star (bias corrected)	55.28
Adjusted Level of Significance (β)	0.0469		
Approximate Chi Square Value (55.28, α)	39.2	Adjusted Chi Square Value (55.28, β)	38.94
95% Gamma Approximate UCL (use when n>=50)	0.216	95% Gamma Adjusted UCL (use when n<50)	0.217
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.161	SD (KM)	0.69
Variance (KM)	0.477	SE of Mean (KM)	0.0802
k hat (KM)	0.0542	k star (KM)	0.0608
nu hat (KM)	8.352	nu star (KM)	9.36
theta hat (KM)	2.965	theta star (KM)	2.646
80% gamma percentile (KM)	0.0402	90% gamma percentile (KM)	0.306
95% gamma percentile (KM)	0.904	99% gamma percentile (KM)	3.226
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (9.36, α)	3.546	Adjusted Chi Square Value (9.36, β)	3.478
95% Gamma Approximate KM-UCL (use when n>=50)	0.424	95% Gamma Adjusted KM-UCL (use when n<50)	0.433
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.917	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.926	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.125	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.161	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Approximate Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.151	Mean in Log Scale	-4.166
SD in Original Scale	0.696	SD in Log Scale	1.898
95% t UCL (assumes normality of ROS data)	0.283	95% Percentile Bootstrap UCL	0.292
95% BCA Bootstrap UCL	0.421	95% Bootstrap t UCL	0.944
95% H-UCL (Log ROS)	0.192		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-3.42	KM Geo Mean	0.0327
KM SD (logged)	1.309	95% Critical H Value (KM-Log)	2.586
KM Standard Error of Mean (logged)	0.16	95% H-UCL (KM -Log)	0.114
KM SD (logged)	1.309	95% Critical H Value (KM-Log)	2.586
KM Standard Error of Mean (logged)	0.16		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.212	Mean in Log Scale	-3.231
SD in Original Scale	0.709	SD in Log Scale	1.664

95% t UCL (Assumes normality)	0.346	95% H-Stat UCL	0.28
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Approximate Lognormal Distributed at 5% Significance Level			
Suggested UCL to Use			
KM H-UCL	0.114		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Pyrene			
General Statistics			
Total Number of Observations	77	Number of Distinct Observations	67
		Number of Missing Observations	18
Number of Detects	76	Number of Non-Detects	1
Number of Distinct Detects	66	Number of Distinct Non-Detects	1
Minimum Detect	0.039	Minimum Non-Detect	0.018
Maximum Detect	220	Maximum Non-Detect	0.018
Variance Detects	817.1	Percent Non-Detects	1.299%
Mean Detects	9.566	SD Detects	28.59
Median Detects	0.865	CV Detects	2.988
Skewness Detects	5.851	Kurtosis Detects	40.27
Mean of Logged Detects	0.225	SD of Logged Detects	1.993
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.377	**Normal GOF Test on Detected Observations Only**	
5% Shapiro Wilk P Value	0	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.369	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.102	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	9.442	KM Standard Error of Mean	3.239
KM SD	28.23	95% KM (BCA) UCL	15.7
95% KM (t) UCL	14.84	95% KM (Percentile Bootstrap) UCL	15.22
95% KM (z) UCL	14.77	95% KM Bootstrap t UCL	21.71
90% KM Chebyshev UCL	19.16	95% KM Chebyshev UCL	23.56
97.5% KM Chebyshev UCL	29.67	99% KM Chebyshev UCL	41.67
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	5.115	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.857	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.224	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.111	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.333	k star (bias corrected MLE)	0.329

Theta hat (MLE)	28.7	Theta star (bias corrected MLE)	29.08
nu hat (MLE)	50.67	nu star (bias corrected)	50
Mean (detects)	9.566		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	9.442
Maximum	220	Median	0.85
SD	28.42	CV	3.01
k hat (MLE)	0.327	k star (bias corrected MLE)	0.322
Theta hat (MLE)	28.92	Theta star (bias corrected MLE)	29.28
nu hat (MLE)	50.28	nu star (bias corrected)	49.66
Adjusted Level of Significance (β)	0.0469		
Approximate Chi Square Value (49.66, α)	34.48	Adjusted Chi Square Value (49.66, β)	34.24
95% Gamma Approximate UCL (use when n>=50)	13.6	95% Gamma Adjusted UCL (use when n<50)	13.69
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	9.442	SD (KM)	28.23
Variance (KM)	797.1	SE of Mean (KM)	3.239
k hat (KM)	0.112	k star (KM)	0.116
nu hat (KM)	17.23	nu star (KM)	17.89
theta hat (KM)	84.42	theta star (KM)	81.29
80% gamma percentile (KM)	7.975	90% gamma percentile (KM)	26.5
95% gamma percentile (KM)	54.09	99% gamma percentile (KM)	139
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (17.89, α)	9.31	Adjusted Chi Square Value (17.89, β)	9.191
95% Gamma Approximate KM-UCL (use when n>=50)	18.14	95% Gamma Adjusted KM-UCL (use when n<50)	18.38
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Approximate Test Statistic	0.956	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	0.0305	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.124	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.102	Detected Data Not Lognormal at 5% Significance Level	
Detected Data Not Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	9.442	Mean in Log Scale	0.156
SD in Original Scale	28.42	SD in Log Scale	2.071
95% t UCL (assumes normality of ROS data)	14.83	95% Percentile Bootstrap UCL	15.44
95% BCA Bootstrap UCL	18.12	95% Bootstrap t UCL	21.32
95% H-UCL (Log ROS)	23.05		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	0.17	KM Geo Mean	1.185
KM SD (logged)	2.025	95% Critical H Value (KM-Log)	3.462
KM Standard Error of Mean (logged)	0.232	95% H-UCL (KM -Log)	20.57
KM SD (logged)	2.025	95% Critical H Value (KM-Log)	3.462
KM Standard Error of Mean (logged)	0.232		

DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	9.442	Mean in Log Scale	0.161
SD in Original Scale	28.42	SD in Log Scale	2.058
95% t UCL (Assumes normality)	14.83	95% H-Stat UCL	22.35
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution at 5% Significance Level			
Suggested UCL to Use			
95% KM (Chebyshev) UCL	23.56		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Fluoride			
General Statistics			
Total Number of Observations	77	Number of Distinct Observations	76
		Number of Missing Observations	18
Minimum	1.97	Mean	68.39
Maximum	571	Median	36.3
SD	89.71	Std. Error of Mean	10.22
Coefficient of Variation	1.312	Skewness	3.113
Normal GOF Test			
Shapiro Wilk Test Statistic	0.673	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	0	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.23	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.101	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	85.41	95% Adjusted-CLT UCL (Chen-1995)	89.08
		95% Modified-t UCL (Johnson-1978)	86.01
Gamma GOF Test			
A-D Test Statistic	1.222	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.784	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.115	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.105	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	0.947	k star (bias corrected MLE)	0.918
Theta hat (MLE)	72.25	Theta star (bias corrected MLE)	74.47
nu hat (MLE)	145.8	nu star (bias corrected)	141.4

MLE Mean (bias corrected)	68.39	MLE Sd (bias corrected)	71.36
		Approximate Chi Square Value (0.05)	114.9
Adjusted Level of Significance	0.0469	Adjusted Chi Square Value	114.5
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	84.14	95% Adjusted Gamma UCL (use when n<50)	84.47
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.99	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk P Value	0.968	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.0431	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.101	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	0.678	Mean of logged Data	3.611
Maximum of Logged Data	6.347	SD of logged Data	1.137
Assuming Lognormal Distribution			
95% H-UCL	96.61	90% Chebyshev (MVUE) UCL	103.2
95% Chebyshev (MVUE) UCL	118.4	97.5% Chebyshev (MVUE) UCL	139.5
99% Chebyshev (MVUE) UCL	181		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	85.2	95% Jackknife UCL	85.41
95% Standard Bootstrap UCL	85.07	95% Bootstrap-t UCL	91.09
95% Hall's Bootstrap UCL	95.59	95% Percentile Bootstrap UCL	86.03
95% BCA Bootstrap UCL	89.74		
90% Chebyshev(Mean, Sd) UCL	99.06	95% Chebyshev(Mean, Sd) UCL	112.9
97.5% Chebyshev(Mean, Sd) UCL	132.2	99% Chebyshev(Mean, Sd) UCL	170.1
Suggested UCL to Use			
95% H-UCL	96.61		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
ProUCL computes and outputs H-statistic based UCLs for historical reasons only.			
H-statistic often results in unstable (both high and low) values of UCL95 as shown in examples in the Technical Guide.			
It is therefore recommended to avoid the use of H-statistic based 95% UCLs.			
Use of nonparametric methods are preferred to compute UCL95 for skewed data sets which do not follow a gamma distribution.			
Cyanide			
General Statistics			
Total Number of Observations	77	Number of Distinct Observations	60
		Number of Missing Observations	19
Number of Detects	70	Number of Non-Detects	7

Number of Distinct Detects	56	Number of Distinct Non-Detects	7
Minimum Detect	0.018	Minimum Non-Detect	0.015
Maximum Detect	0.99	Maximum Non-Detect	0.069
Variance Detects	0.039	Percent Non-Detects	9.091%
Mean Detects	0.151	SD Detects	0.197
Median Detects	0.087	CV Detects	1.304
Skewness Detects	2.757	Kurtosis Detects	7.701
Mean of Logged Detects	-2.411	SD of Logged Detects	0.975
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.629	**Normal GOF Test on Detected Observations Only**	
5% Shapiro Wilk P Value	0	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.266	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.106	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.14	KM Standard Error of Mean	0.0218
KM SD	0.19	95% KM (BCA) UCL	0.178
95% KM (t) UCL	0.177	95% KM (Percentile Bootstrap) UCL	0.179
95% KM (z) UCL	0.176	95% KM Bootstrap t UCL	0.19
90% KM Chebyshev UCL	0.206	95% KM Chebyshev UCL	0.235
97.5% KM Chebyshev UCL	0.277	99% KM Chebyshev UCL	0.358
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	2.266	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.778	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.147	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.109	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	1.093	k star (bias corrected MLE)	1.055
Theta hat (MLE)	0.139	Theta star (bias corrected MLE)	0.143
nu hat (MLE)	153	nu star (bias corrected)	147.8
Mean (detects)	0.151		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	0.139
Maximum	0.99	Median	0.077
SD	0.193	CV	1.389
k hat (MLE)	0.92	k star (bias corrected MLE)	0.893
Theta hat (MLE)	0.151	Theta star (bias corrected MLE)	0.155
nu hat (MLE)	141.7	nu star (bias corrected)	137.5
Adjusted Level of Significance (β)	0.0469		
Approximate Chi Square Value (137.50, α)	111.4	Adjusted Chi Square Value (137.50, β)	111
95% Gamma Approximate UCL (use when n>=50)	0.171	95% Gamma Adjusted UCL (use when n<50)	0.172

Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.14	SD (KM)	0.19
Variance (KM)	0.0362	SE of Mean (KM)	0.0218
k hat (KM)	0.544	k star (KM)	0.531
nu hat (KM)	83.78	nu star (KM)	81.85
theta hat (KM)	0.258	theta star (KM)	0.264
80% gamma percentile (KM)	0.231	90% gamma percentile (KM)	0.375
95% gamma percentile (KM)	0.527	99% gamma percentile (KM)	0.9
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (81.85, α)	62	Adjusted Chi Square Value (81.85, β)	61.67
95% Gamma Approximate KM-UCL (use when n>=50)	0.185	95% Gamma Adjusted KM-UCL (use when n<50)	0.186
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Approximate Test Statistic	0.955	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	0.033	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.0671	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.106	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Approximate Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.14	Mean in Log Scale	-2.539
SD in Original Scale	0.192	SD in Log Scale	1.034
95% t UCL (assumes normality of ROS data)	0.176	95% Percentile Bootstrap UCL	0.178
95% BCA Bootstrap UCL	0.183	95% Bootstrap t UCL	0.19
95% H-UCL (Log ROS)	0.177		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-2.524	KM Geo Mean	0.0801
KM SD (logged)	1.001	95% Critical H Value (KM-Log)	2.264
KM Standard Error of Mean (logged)	0.116	95% H-UCL (KM -Log)	0.172
KM SD (logged)	1.001	95% Critical H Value (KM-Log)	2.264
KM Standard Error of Mean (logged)	0.116		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.14	Mean in Log Scale	-2.54
SD in Original Scale	0.192	SD in Log Scale	1.033
95% t UCL (Assumes normality)	0.176	95% H-Stat UCL	0.177
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Approximate Lognormal Distributed at 5% Significance Level			
Suggested UCL to Use			
KM H-UCL	0.172		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			

Aluminum

General Statistics			
Total Number of Observations	77	Number of Distinct Observations	67
		Number of Missing Observations	18
Minimum	5610	Mean	14337
Maximum	51200	Median	12700
SD	7577	Std. Error of Mean	863.5
Coefficient of Variation	0.528	Skewness	2.162
Normal GOF Test			
Shapiro Wilk Test Statistic	0.821	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	5.309E-13	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.203	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.101	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	15775	95% Adjusted-CLT UCL (Chen-1995)	15985
		95% Modified-t UCL (Johnson-1978)	15811
Gamma GOF Test			
A-D Test Statistic	1.203	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.755	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.137	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.102	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	4.859	k star (bias corrected MLE)	4.679
Theta hat (MLE)	2951	Theta star (bias corrected MLE)	3064
nu hat (MLE)	748.3	nu star (bias corrected)	720.5
MLE Mean (bias corrected)	14337	MLE Sd (bias corrected)	6628
		Approximate Chi Square Value (0.05)	659.2
Adjusted Level of Significance	0.0469	Adjusted Chi Square Value	658.1
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	15670	95% Adjusted Gamma UCL (use when n<50)	15697
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.969	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk P Value	0.186	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.104	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.101	Data Not Lognormal at 5% Significance Level	
Data appear Approximate Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	8.632	Mean of logged Data	9.464
Maximum of Logged Data	10.84	SD of logged Data	0.447
Assuming Lognormal Distribution			
95% H-UCL	15638	90% Chebyshev (MVUE) UCL	16488

95% Chebyshev (MVUE) UCL	17515	97.5% Chebyshev (MVUE) UCL	18940
99% Chebyshev (MVUE) UCL	21738		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	15758	95% Jackknife UCL	15775
95% Standard Bootstrap UCL	15721	95% Bootstrap-t UCL	16095
95% Hall's Bootstrap UCL	16200	95% Percentile Bootstrap UCL	15839
95% BCA Bootstrap UCL	16037		
90% Chebyshev(Mean, Sd) UCL	16928	95% Chebyshev(Mean, Sd) UCL	18101
97.5% Chebyshev(Mean, Sd) UCL	19730	99% Chebyshev(Mean, Sd) UCL	22929

Suggested UCL to Use

95% Student's-t UCL	15775	or 95% Modified-t UCL	15811
or 95% H-UCL	15638		

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

ProUCL computes and outputs H-statistic based UCLs for historical reasons only.

H-statistic often results in unstable (both high and low) values of UCL95 as shown in examples in the Technical Guide.

It is therefore recommended to avoid the use of H-statistic based 95% UCLs.

Use of nonparametric methods are preferred to compute UCL95 for skewed data sets which do not follow a gamma distribution.

Iron

General Statistics

Total Number of Observations	77	Number of Distinct Observations	65
		Number of Missing Observations	18
Minimum	6170	Mean	13364
Maximum	21500	Median	13200
SD	3123	Std. Error of Mean	355.9
Coefficient of Variation	0.234	Skewness	0.25

Normal GOF Test

Shapiro Wilk Test Statistic	0.985	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	0.831	Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.0543	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.101	Data appear Normal at 5% Significance Level	

Data appear Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	13957	95% Adjusted-CLT UCL (Chen-1995)	13960
		95% Modified-t UCL (Johnson-1978)	13958

Gamma GOF Test

A-D Test Statistic	0.173	**Anderson-Darling Gamma GOF Test**	

5% A-D Critical Value	0.75	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.0566	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.102	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	18	k star (bias corrected MLE)	17.31
Theta hat (MLE)	742.5	Theta star (bias corrected MLE)	772.2
nu hat (MLE)	2772	nu star (bias corrected)	2665
MLE Mean (bias corrected)	13364	MLE Sd (bias corrected)	3212
		Approximate Chi Square Value (0.05)	2546
Adjusted Level of Significance	0.0469	Adjusted Chi Square Value	2544
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	13988	95% Adjusted Gamma UCL (use when n<50)	14000
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.982	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk P Value	0.712	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.0728	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.101	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	8.727	Mean of logged Data	9.472
Maximum of Logged Data	9.976	SD of logged Data	0.242
Assuming Lognormal Distribution			
95% H-UCL	14038	90% Chebyshev (MVUE) UCL	14499
95% Chebyshev (MVUE) UCL	15007	97.5% Chebyshev (MVUE) UCL	15713
99% Chebyshev (MVUE) UCL	17099		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	13949	95% Jackknife UCL	13957
95% Standard Bootstrap UCL	13949	95% Bootstrap-t UCL	13968
95% Hall's Bootstrap UCL	13965	95% Percentile Bootstrap UCL	13927
95% BCA Bootstrap UCL	13933		
90% Chebyshev(Mean, Sd) UCL	14432	95% Chebyshev(Mean, Sd) UCL	14915
97.5% Chebyshev(Mean, Sd) UCL	15586	99% Chebyshev(Mean, Sd) UCL	16905
Suggested UCL to Use			
95% Student's-t UCL	13957		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Manganese			

General Statistics			
Total Number of Observations	77	Number of Distinct Observations	68
		Number of Missing Observations	18
Minimum	178	Mean	425.8
Maximum	1270	Median	379
SD	158.7	Std. Error of Mean	18.08
Coefficient of Variation	0.373	Skewness	2.472
Normal GOF Test			
Shapiro Wilk Test Statistic	0.818	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	3.341E-13	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.156	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.101	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	455.9	95% Adjusted-CLT UCL (Chen-1995)	461
		95% Modified-t UCL (Johnson-1978)	456.8
Gamma GOF Test			
A-D Test Statistic	1.714	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.751	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.122	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.102	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	9.552	k star (bias corrected MLE)	9.188
Theta hat (MLE)	44.58	Theta star (bias corrected MLE)	46.34
nu hat (MLE)	1471	nu star (bias corrected)	1415
MLE Mean (bias corrected)	425.8	MLE Sd (bias corrected)	140.5
		Approximate Chi Square Value (0.05)	1329
Adjusted Level of Significance	0.0469	Adjusted Chi Square Value	1327
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	453.5	95% Adjusted Gamma UCL (use when n<50)	454
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.963	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk P Value	0.0852	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.102	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.101	Data Not Lognormal at 5% Significance Level	
Data appear Approximate Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	5.182	Mean of logged Data	6.001
Maximum of Logged Data	7.147	SD of logged Data	0.316
Assuming Lognormal Distribution			
95% H-UCL	452.3	90% Chebyshev (MVUE) UCL	471
95% Chebyshev (MVUE) UCL	492.2	97.5% Chebyshev (MVUE) UCL	521.6

99% Chebyshev (MVUE) UCL	579.5		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	455.6	95% Jackknife UCL	455.9
95% Standard Bootstrap UCL	454.4	95% Bootstrap-t UCL	465.5
95% Hall's Bootstrap UCL	467.3	95% Percentile Bootstrap UCL	456.4
95% BCA Bootstrap UCL	461.6		
90% Chebyshev(Mean, Sd) UCL	480.1	95% Chebyshev(Mean, Sd) UCL	504.6
97.5% Chebyshev(Mean, Sd) UCL	538.8	99% Chebyshev(Mean, Sd) UCL	605.7
Suggested UCL to Use			
95% Student's-t UCL	455.9	or 95% Modified-t UCL	456.8
or 95% H-UCL	452.3		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
ProUCL computes and outputs H-statistic based UCLs for historical reasons only.			
H-statistic often results in unstable (both high and low) values of UCL95 as shown in examples in the Technical Guide.			
It is therefore recommended to avoid the use of H-statistic based 95% UCLs.			
Use of nonparametric methods are preferred to compute UCL95 for skewed data sets which do not follow a gamma distribution.			
Mercury			
General Statistics			
Total Number of Observations	77	Number of Distinct Observations	24
		Number of Missing Observations	18
Number of Detects	69	Number of Non-Detects	8
Number of Distinct Detects	24	Number of Distinct Non-Detects	3
Minimum Detect	0.01	Minimum Non-Detect	0.01
Maximum Detect	0.069	Maximum Non-Detect	0.014
Variance Detects	6.9361E-5	Percent Non-Detects	10.39%
Mean Detects	0.0211	SD Detects	0.00833
Median Detects	0.02	CV Detects	0.394
Skewness Detects	3.077	Kurtosis Detects	15.43
Mean of Logged Detects	-3.912	SD of Logged Detects	0.319
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.778	**Normal GOF Test on Detected Observations Only**	
5% Shapiro Wilk P Value	3.886E-14	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.14	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.107	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.0201	KM Standard Error of Mean	9.7238E-4
KM SD	0.00846	95% KM (BCA) UCL	0.0218
95% KM (t) UCL	0.0217	95% KM (Percentile Bootstrap) UCL	0.0218

95% KM (z) UCL	0.0217	95% KM Bootstrap t UCL	0.0222
90% KM Chebyshev UCL	0.023	95% KM Chebyshev UCL	0.0243
97.5% KM Chebyshev UCL	0.0261	99% KM Chebyshev UCL	0.0297
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	0.921	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.751	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.0916	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.107	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data follow Appr. Gamma Distribution at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	9.17	k star (bias corrected MLE)	8.781
Theta hat (MLE)	0.00231	Theta star (bias corrected MLE)	0.00241
nu hat (MLE)	1265	nu star (bias corrected)	1212
Mean (detects)	0.0211		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	0.02
Maximum	0.069	Median	0.019
SD	0.00859	CV	0.43
k hat (MLE)	7.19	k star (bias corrected MLE)	6.918
Theta hat (MLE)	0.00278	Theta star (bias corrected MLE)	0.00289
nu hat (MLE)	1107	nu star (bias corrected)	1065
Adjusted Level of Significance (β)	0.0469		
Approximate Chi Square Value (N/A, α)	990.6	Adjusted Chi Square Value (N/A, β)	989.2
95% Gamma Approximate UCL (use when n>=50)	0.0215	95% Gamma Adjusted UCL (use when n<50)	0.0215
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.0201	SD (KM)	0.00846
Variance (KM)	7.1583E-5	SE of Mean (KM)	9.7238E-4
k hat (KM)	5.619	k star (KM)	5.409
nu hat (KM)	865.4	nu star (KM)	833
theta hat (KM)	0.00357	theta star (KM)	0.00371
80% gamma percentile (KM)	0.0267	90% gamma percentile (KM)	0.0316
95% gamma percentile (KM)	0.036	99% gamma percentile (KM)	0.0453
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (832.98, α)	767	Adjusted Chi Square Value (832.98, β)	765.8
95% Gamma Approximate KM-UCL (use when n>=50)	0.0218	95% Gamma Adjusted KM-UCL (use when n<50)	0.0218
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Approximate Test Statistic	0.965	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	0.134	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.0863	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.107	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			

Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.02	Mean in Log Scale	-3.982
SD in Original Scale	0.00857	SD in Log Scale	0.368
95% t UCL (assumes normality of ROS data)	0.0216	95% Percentile Bootstrap UCL	0.0218
95% BCA Bootstrap UCL	0.0218	95% Bootstrap t UCL	0.022
95% H-UCL (Log ROS)	0.0215		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-3.978	KM Geo Mean	0.0187
KM SD (logged)	0.358	95% Critical H Value (KM-Log)	1.776
KM Standard Error of Mean (logged)	0.0413	95% H-UCL (KM -Log)	0.0215
KM SD (logged)	0.358	95% Critical H Value (KM-Log)	1.776
KM Standard Error of Mean (logged)	0.0413		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.0196	Mean in Log Scale	-4.035
SD in Original Scale	0.00912	SD in Log Scale	0.473
95% t UCL (Assumes normality)	0.0213	95% H-Stat UCL	0.0219
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Approximate Gamma Distributed at 5% Significance Level			
Suggested UCL to Use			
95% KM Approximate Gamma UCL	0.0218	95% GROS Approximate Gamma UCL	0.0215
When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test			
When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Nickel			
General Statistics			
Total Number of Observations	77	Number of Distinct Observations	66
		Number of Missing Observations	18
Minimum	6.3	Mean	20.89
Maximum	140	Median	14.1
SD	19.54	Std. Error of Mean	2.227
Coefficient of Variation	0.936	Skewness	3.899
Normal GOF Test			
Shapiro Wilk Test Statistic	0.583	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	0	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.269	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.101	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			

Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	24.6	95% Adjusted-CLT UCL (Chen-1995)	25.61
		95% Modified-t UCL (Johnson-1978)	24.76
Gamma GOF Test			
A-D Test Statistic	5.326	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.761	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.216	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.103	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	2.537	k star (bias corrected MLE)	2.447
Theta hat (MLE)	8.231	Theta star (bias corrected MLE)	8.535
nu hat (MLE)	390.8	nu star (bias corrected)	376.9
MLE Mean (bias corrected)	20.89	MLE Sd (bias corrected)	13.35
		Approximate Chi Square Value (0.05)	332.9
Adjusted Level of Significance	0.0469	Adjusted Chi Square Value	332.1
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	23.65	95% Adjusted Gamma UCL (use when n<50)	23.7
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.88	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk P Value	3.2852E-8	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.169	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.101	Data Not Lognormal at 5% Significance Level	
Data Not Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	1.841	Mean of logged Data	2.829
Maximum of Logged Data	4.942	SD of logged Data	0.568
Assuming Lognormal Distribution			
95% H-UCL	22.51	90% Chebyshev (MVUE) UCL	23.96
95% Chebyshev (MVUE) UCL	25.83	97.5% Chebyshev (MVUE) UCL	28.41
99% Chebyshev (MVUE) UCL	33.5		
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution (0.05)			
Nonparametric Distribution Free UCLs			
95% CLT UCL	24.55	95% Jackknife UCL	24.6
95% Standard Bootstrap UCL	24.64	95% Bootstrap-t UCL	26.75
95% Hall's Bootstrap UCL	27.95	95% Percentile Bootstrap UCL	24.8
95% BCA Bootstrap UCL	25.62		
90% Chebyshev(Mean, Sd) UCL	27.57	95% Chebyshev(Mean, Sd) UCL	30.6
97.5% Chebyshev(Mean, Sd) UCL	34.8	99% Chebyshev(Mean, Sd) UCL	43.05
Suggested UCL to Use			
95% Chebyshev (Mean, Sd) UCL	30.6		

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Antimony

General Statistics

Total Number of Observations	77	Number of Distinct Observations	29
		Number of Missing Observations	18
Number of Detects	6	Number of Non-Detects	71
Number of Distinct Detects	5	Number of Distinct Non-Detects	27
Minimum Detect	0.35	Minimum Non-Detect	0.23
Maximum Detect	0.61	Maximum Non-Detect	0.54
Variance Detects	0.00862	Percent Non-Detects	92.21%
Mean Detects	0.488	SD Detects	0.0928
Median Detects	0.48	CV Detects	0.19
Skewness Detects	-0.156	Kurtosis Detects	-0.261
Mean of Logged Detects	-0.733	SD of Logged Detects	0.197

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.963	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.788	Detected Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.202	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.325	Detected Data appear Normal at 5% Significance Level

Detected Data appear Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	0.253	KM Standard Error of Mean	0.00994
KM SD	0.075	95% KM (BCA) UCL	0.287
95% KM (t) UCL	0.269	95% KM (Percentile Bootstrap) UCL	0.278
95% KM (z) UCL	0.269	95% KM Bootstrap t UCL	0.262
90% KM Chebyshev UCL	0.283	95% KM Chebyshev UCL	0.296
97.5% KM Chebyshev UCL	0.315	99% KM Chebyshev UCL	0.352

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.257	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.697	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.182	**Kolmogorov-Smirnov GOF**
5% K-S Critical Value	0.332	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	31.87	k star (bias corrected MLE)	16.05
Theta hat (MLE)	0.0153	Theta star (bias corrected MLE)	0.0304
nu hat (MLE)	382.5	nu star (bias corrected)	192.6
Mean (detects)	0.488		

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)

For such situations, GROS method may yield incorrect values of UCLs and BTVs

This is especially true when the sample size is small.

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	0.116
Maximum	0.61	Median	0.0647
SD	0.134	CV	1.157
k hat (MLE)	0.821	k star (bias corrected MLE)	0.798
Theta hat (MLE)	0.141	Theta star (bias corrected MLE)	0.145
nu hat (MLE)	126.5	nu star (bias corrected)	122.9
Adjusted Level of Significance (β)	0.0469		
Approximate Chi Square Value (122.91, α)	98.31	Adjusted Chi Square Value (122.91, β)	97.89
95% Gamma Approximate UCL (use when n>=50)	0.145	95% Gamma Adjusted UCL (use when n<50)	0.145
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.253	SD (KM)	0.075
Variance (KM)	0.00563	SE of Mean (KM)	0.00994
k hat (KM)	11.36	k star (KM)	10.92
nu hat (KM)	1749	nu star (KM)	1682
theta hat (KM)	0.0223	theta star (KM)	0.0232
80% gamma percentile (KM)	0.314	90% gamma percentile (KM)	0.354
95% gamma percentile (KM)	0.39	99% gamma percentile (KM)	0.464
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (N/A, α)	1588	Adjusted Chi Square Value (N/A, β)	1586
95% Gamma Approximate KM-UCL (use when n>=50)	0.268	95% Gamma Adjusted KM-UCL (use when n<50)	0.268
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.951	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.788	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.17	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.325	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.208	Mean in Log Scale	-1.65
SD in Original Scale	0.0977	SD in Log Scale	0.378
95% t UCL (assumes normality of ROS data)	0.226	95% Percentile Bootstrap UCL	0.226
95% BCA Bootstrap UCL	0.23	95% Bootstrap t UCL	0.23
95% H-UCL (Log ROS)	0.223		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-1.403	KM Geo Mean	0.246
KM SD (logged)	0.212	95% Critical H Value (KM-Log)	1.712
KM Standard Error of Mean (logged)	0.0287	95% H-UCL (KM -Log)	0.262
KM SD (logged)	0.212	95% Critical H Value (KM-Log)	1.712
KM Standard Error of Mean (logged)	0.0287		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.21	Mean in Log Scale	-1.621
SD in Original Scale	0.0914	SD in Log Scale	0.326
95% t UCL (Assumes normality)	0.228	95% H-Stat UCL	0.223
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			

Detected Data appear Normal Distributed at 5% Significance Level			
Suggested UCL to Use			
95% KM (t) UCL	0.269		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Arsenic			
General Statistics			
Total Number of Observations	77	Number of Distinct Observations	38
		Number of Missing Observations	18
Minimum	2.3	Mean	4.605
Maximum	7.6	Median	4.5
SD	1.242	Std. Error of Mean	0.142
Coefficient of Variation	0.27	Skewness	0.427
Normal GOF Test			
Shapiro Wilk Test Statistic	0.96	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	0.0527	Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.0668	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.101	Data appear Normal at 5% Significance Level	
Data appear Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	4.841	95% Adjusted-CLT UCL (Chen-1995)	4.845
		95% Modified-t UCL (Johnson-1978)	4.842
Gamma GOF Test			
A-D Test Statistic	0.351	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.75	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.0722	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.102	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	13.81	k star (bias corrected MLE)	13.28
Theta hat (MLE)	0.333	Theta star (bias corrected MLE)	0.347
nu hat (MLE)	2127	nu star (bias corrected)	2045
MLE Mean (bias corrected)	4.605	MLE Sd (bias corrected)	1.264
		Approximate Chi Square Value (0.05)	1941
Adjusted Level of Significance	0.0469	Adjusted Chi Square Value	1939
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	4.852	95% Adjusted Gamma UCL (use when n<50)	4.857
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.968	**Shapiro Wilk Lognormal GOF Test**	

5% Shapiro Wilk P Value	0.178	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.0903	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.101	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	0.833	Mean of logged Data	1.491
Maximum of Logged Data	2.028	SD of logged Data	0.276
Assuming Lognormal Distribution			
95% H-UCL	4.872	90% Chebyshev (MVUE) UCL	5.051
95% Chebyshev (MVUE) UCL	5.251	97.5% Chebyshev (MVUE) UCL	5.529
99% Chebyshev (MVUE) UCL	6.075		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	4.838	95% Jackknife UCL	4.841
95% Standard Bootstrap UCL	4.835	95% Bootstrap-t UCL	4.848
95% Hall's Bootstrap UCL	4.848	95% Percentile Bootstrap UCL	4.857
95% BCA Bootstrap UCL	4.849		
90% Chebyshev(Mean, Sd) UCL	5.03	95% Chebyshev(Mean, Sd) UCL	5.222
97.5% Chebyshev(Mean, Sd) UCL	5.489	99% Chebyshev(Mean, Sd) UCL	6.014
Suggested UCL to Use			
95% Student's-t UCL	4.841		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
ChromiumVI_EST			
General Statistics			
Total Number of Observations	75	Number of Distinct Observations	47
		Number of Missing Observations	20
Minimum	0.142	Mean	0.343
Maximum	2.163	Median	0.268
SD	0.325	Std. Error of Mean	0.0376
Coefficient of Variation	0.947	Skewness	4.539
Normal GOF Test			
Shapiro Wilk Test Statistic	0.427	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	0	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.367	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.102	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	

95% Student's-t UCL	0.406	95% Adjusted-CLT UCL (Chen-1995)	0.426
		95% Modified-t UCL (Johnson-1978)	0.409
Gamma GOF Test			
A-D Test Statistic	9.087	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.758	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.302	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.104	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	3.172	k star (bias corrected MLE)	3.054
Theta hat (MLE)	0.108	Theta star (bias corrected MLE)	0.112
nu hat (MLE)	475.8	nu star (bias corrected)	458.1
MLE Mean (bias corrected)	0.343	MLE Sd (bias corrected)	0.196
		Approximate Chi Square Value (0.05)	409.5
Adjusted Level of Significance	0.0468	Adjusted Chi Square Value	408.6
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	0.384	95% Adjusted Gamma UCL (use when n<50)	0.385
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.746	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk P Value	0	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.242	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.102	Data Not Lognormal at 5% Significance Level	
Data Not Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	-1.953	Mean of logged Data	-1.235
Maximum of Logged Data	0.771	SD of logged Data	0.467
Assuming Lognormal Distribution			
95% H-UCL	0.358	90% Chebyshev (MVUE) UCL	0.379
95% Chebyshev (MVUE) UCL	0.404	97.5% Chebyshev (MVUE) UCL	0.438
99% Chebyshev (MVUE) UCL	0.506		
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution (0.05)			
Nonparametric Distribution Free UCLs			
95% CLT UCL	0.405	95% Jackknife UCL	0.406
95% Standard Bootstrap UCL	0.404	95% Bootstrap-t UCL	0.453
95% Hall's Bootstrap UCL	0.466	95% Percentile Bootstrap UCL	0.412
95% BCA Bootstrap UCL	0.435		
90% Chebyshev(Mean, Sd) UCL	0.456	95% Chebyshev(Mean, Sd) UCL	0.507
97.5% Chebyshev(Mean, Sd) UCL	0.578	99% Chebyshev(Mean, Sd) UCL	0.717
Suggested UCL to Use			
95% Student's-t UCL	0.406	or 95% Modified-t UCL	0.409
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Cobalt

General Statistics

Total Number of Observations	77	Number of Distinct Observations	35
		Number of Missing Observations	18
Minimum	2.8	Mean	5.126
Maximum	7.8	Median	5.1
SD	0.949	Std. Error of Mean	0.108
Coefficient of Variation	0.185	Skewness	0.115

Normal GOF Test

Shapiro Wilk Test Statistic	0.992	**Shapiro Wilk GOF Test**
5% Shapiro Wilk P Value	0.984	Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.0533	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.101	Data appear Normal at 5% Significance Level

Data appear Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	5.306	95% Adjusted-CLT UCL (Chen-1995)	5.305
		95% Modified-t UCL (Johnson-1978)	5.306

Gamma GOF Test

A-D Test Statistic	0.205	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.75	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.0473	**Kolmogorov-Smirnov Gamma GOF Test**
5% K-S Critical Value	0.101	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	28.6	k star (bias corrected MLE)	27.49
Theta hat (MLE)	0.179	Theta star (bias corrected MLE)	0.186
nu hat (MLE)	4404	nu star (bias corrected)	4233
MLE Mean (bias corrected)	5.126	MLE Sd (bias corrected)	0.978
		Approximate Chi Square Value (0.05)	4083
Adjusted Level of Significance	0.0469	Adjusted Chi Square Value	4080

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	5.315	95% Adjusted Gamma UCL (use when n<50)	5.318

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.982	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk P Value	0.714	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.0581	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.101	Data appear Lognormal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	1.03	Mean of logged Data	1.617

Maximum of Logged Data	2.054	SD of logged Data	0.191
Assuming Lognormal Distribution			
95% H-UCL	5.325	90% Chebyshev (MVUE) UCL	5.467
95% Chebyshev (MVUE) UCL	5.62	97.5% Chebyshev (MVUE) UCL	5.833
99% Chebyshev (MVUE) UCL	6.251		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	5.304	95% Jackknife UCL	5.306
95% Standard Bootstrap UCL	5.307	95% Bootstrap-t UCL	5.307
95% Hall's Bootstrap UCL	5.302	95% Percentile Bootstrap UCL	5.3
95% BCA Bootstrap UCL	5.304		
90% Chebyshev(Mean, Sd) UCL	5.451	95% Chebyshev(Mean, Sd) UCL	5.598
97.5% Chebyshev(Mean, Sd) UCL	5.802	99% Chebyshev(Mean, Sd) UCL	6.203
Suggested UCL to Use			
95% Student's-t UCL	5.306		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Copper			
General Statistics			
Total Number of Observations	77	Number of Distinct Observations	63
		Number of Missing Observations	18
Minimum	7.4	Mean	15.4
Maximum	34.5	Median	14.7
SD	5.119	Std. Error of Mean	0.583
Coefficient of Variation	0.332	Skewness	0.987
Normal GOF Test			
Shapiro Wilk Test Statistic	0.943	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	0.00327	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.0923	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.101	Data appear Normal at 5% Significance Level	
Data appear Approximate Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	16.37	95% Adjusted-CLT UCL (Chen-1995)	16.43
		95% Modified-t UCL (Johnson-1978)	16.38
Gamma GOF Test			
A-D Test Statistic	0.268	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.751	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.0496	**Kolmogorov-Smirnov Gamma GOF Test**	

5% K-S Critical Value	0.102	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	9.813	k star (bias corrected MLE)	9.439
Theta hat (MLE)	1.569	Theta star (bias corrected MLE)	1.631
nu hat (MLE)	1511	nu star (bias corrected)	1454
MLE Mean (bias corrected)	15.4	MLE Sd (bias corrected)	5.011
		Approximate Chi Square Value (0.05)	1366
Adjusted Level of Significance	0.0469	Adjusted Chi Square Value	1365
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	16.38	95% Adjusted Gamma UCL (use when n<50)	16.4
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.983	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk P Value	0.725	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.0457	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.101	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	2.001	Mean of logged Data	2.682
Maximum of Logged Data	3.541	SD of logged Data	0.324
Assuming Lognormal Distribution			
95% H-UCL	16.44	90% Chebyshev (MVUE) UCL	17.13
95% Chebyshev (MVUE) UCL	17.92	97.5% Chebyshev (MVUE) UCL	19.02
99% Chebyshev (MVUE) UCL	21.17		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	16.36	95% Jackknife UCL	16.37
95% Standard Bootstrap UCL	16.35	95% Bootstrap-t UCL	16.53
95% Hall's Bootstrap UCL	16.45	95% Percentile Bootstrap UCL	16.34
95% BCA Bootstrap UCL	16.45		
90% Chebyshev(Mean, Sd) UCL	17.15	95% Chebyshev(Mean, Sd) UCL	17.94
97.5% Chebyshev(Mean, Sd) UCL	19.04	99% Chebyshev(Mean, Sd) UCL	21.2
Suggested UCL to Use			
95% Student's-t UCL	16.37		
When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test			
When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			

Vanadium

General Statistics			
Total Number of Observations	77	Number of Distinct Observations	57
		Number of Missing Observations	18
Minimum	4.1	Mean	12.7
Maximum	31.6	Median	11.8
SD	5.004	Std. Error of Mean	0.57
Coefficient of Variation	0.394	Skewness	1.135
Normal GOF Test			
Shapiro Wilk Test Statistic	0.934	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	6.9163E-4	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.137	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.101	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	13.65	95% Adjusted-CLT UCL (Chen-1995)	13.72
		95% Modified-t UCL (Johnson-1978)	13.67
Gamma GOF Test			
A-D Test Statistic	0.301	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.753	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.0866	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.102	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	7.053	k star (bias corrected MLE)	6.787
Theta hat (MLE)	1.801	Theta star (bias corrected MLE)	1.872
nu hat (MLE)	1086	nu star (bias corrected)	1045
MLE Mean (bias corrected)	12.7	MLE Sd (bias corrected)	4.876
		Approximate Chi Square Value (0.05)	971.1
Adjusted Level of Significance	0.0469	Adjusted Chi Square Value	969.8
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50)	13.67	95% Adjusted Gamma UCL (use when n<50)	13.69
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.99	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk P Value	0.967	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.0654	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.101	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	1.411	Mean of logged Data	2.469
Maximum of Logged Data	3.453	SD of logged Data	0.385
Assuming Lognormal Distribution			
95% H-UCL	13.77	90% Chebyshev (MVUE) UCL	14.44

95% Chebyshev (MVUE) UCL	15.22	97.5% Chebyshev (MVUE) UCL	16.31
99% Chebyshev (MVUE) UCL	18.45		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	13.64	95% Jackknife UCL	13.65
95% Standard Bootstrap UCL	13.62	95% Bootstrap-t UCL	13.72
95% Hall's Bootstrap UCL	13.73	95% Percentile Bootstrap UCL	13.61
95% BCA Bootstrap UCL	13.76		
90% Chebyshev(Mean, Sd) UCL	14.41	95% Chebyshev(Mean, Sd) UCL	15.19
97.5% Chebyshev(Mean, Sd) UCL	16.26	99% Chebyshev(Mean, Sd) UCL	18.38

Suggested UCL to Use

95% Approximate Gamma UCL	13.67		

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Zinc

General Statistics

Total Number of Observations	77	Number of Distinct Observations	72
		Number of Missing Observations	18
Minimum	22.2	Mean	56.79
Maximum	238	Median	48
SD	31.79	Std. Error of Mean	3.623
Coefficient of Variation	0.56	Skewness	3.148

Normal GOF Test

Shapiro Wilk Test Statistic	0.733	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	0	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.2	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.101	Data Not Normal at 5% Significance Level	

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	62.82	95% Adjusted-CLT UCL (Chen-1995)	64.13
		95% Modified-t UCL (Johnson-1978)	63.04

Gamma GOF Test

A-D Test Statistic	1.827	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.754	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.125	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.102	Data Not Gamma Distributed at 5% Significance Level	

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	5.069	k star (bias corrected MLE)	4.88
Theta hat (MLE)	11.2	Theta star (bias corrected MLE)	11.64
nu hat (MLE)	780.7	nu star (bias corrected)	751.6
MLE Mean (bias corrected)	56.79	MLE Sd (bias corrected)	25.7
		Approximate Chi Square Value (0.05)	689
Adjusted Level of Significance	0.0469	Adjusted Chi Square Value	687.8
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	61.95	95% Adjusted Gamma UCL (use when n<50)	62.05
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.959	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk P Value	0.0439	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.0934	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.101	Data appear Lognormal at 5% Significance Level	
Data appear Approximate Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	3.1	Mean of logged Data	3.937
Maximum of Logged Data	5.472	SD of logged Data	0.425
Assuming Lognormal Distribution			
95% H-UCL	61.32	90% Chebyshev (MVUE) UCL	64.53
95% Chebyshev (MVUE) UCL	68.36	97.5% Chebyshev (MVUE) UCL	73.68
99% Chebyshev (MVUE) UCL	84.13		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	62.75	95% Jackknife UCL	62.82
95% Standard Bootstrap UCL	62.61	95% Bootstrap-t UCL	65.55
95% Hall's Bootstrap UCL	66.79	95% Percentile Bootstrap UCL	63.05
95% BCA Bootstrap UCL	63.73		
90% Chebyshev(Mean, Sd) UCL	67.65	95% Chebyshev(Mean, Sd) UCL	72.58
97.5% Chebyshev(Mean, Sd) UCL	79.41	99% Chebyshev(Mean, Sd) UCL	92.83
Suggested UCL to Use			
95% Student's-t UCL	62.82	or 95% Modified-t UCL	63.04
or 95% H-UCL	61.32		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
ProUCL computes and outputs H-statistic based UCLs for historical reasons only.			
H-statistic often results in unstable (both high and low) values of UCL95 as shown in examples in the Technical Guide.			
It is therefore recommended to avoid the use of H-statistic based 95% UCLs.			
Use of nonparametric methods are preferred to compute UCL95 for skewed data sets which do not follow a gamma distribution.			
Selenium			

ProUCL Output
Main Plant Area Soil (0-0.5 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

General Statistics			
Total Number of Observations	77	Number of Distinct Observations	25
		Number of Missing Observations	18
Number of Detects	4	Number of Non-Detects	73
Number of Distinct Detects	4	Number of Distinct Non-Detects	23
Minimum Detect	0.42	Minimum Non-Detect	0.23
Maximum Detect	0.66	Maximum Non-Detect	0.5
Variance Detects	0.0156	Percent Non-Detects	94.81%
Mean Detects	0.538	SD Detects	0.125
Median Detects	0.535	CV Detects	0.233
Skewness Detects	0.0275	Kurtosis Detects	-5.59
Mean of Logged Detects	-0.642	SD of Logged Detects	0.236
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.826	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.748	Detected Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.282	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.375	Detected Data appear Normal at 5% Significance Level	
Detected Data appear Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.246	KM Standard Error of Mean	0.00972
KM SD	0.0731	95% KM (BCA) UCL	N/A
95% KM (t) UCL	0.263	95% KM (Percentile Bootstrap) UCL	N/A
95% KM (z) UCL	0.262	95% KM Bootstrap t UCL	N/A
90% KM Chebyshev UCL	0.276	95% KM Chebyshev UCL	0.289
97.5% KM Chebyshev UCL	0.307	99% KM Chebyshev UCL	0.343
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	0.528	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.657	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.312	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.394	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	24.34	k star (bias corrected MLE)	6.252
Theta hat (MLE)	0.0221	Theta star (bias corrected MLE)	0.086
nu hat (MLE)	194.7	nu star (bias corrected)	50.02
Mean (detects)	0.538		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	0.051
Maximum	0.66	Median	0.01
SD	0.122	CV	2.391
k hat (MLE)	0.587	k star (bias corrected MLE)	0.572
Theta hat (MLE)	0.0869	Theta star (bias corrected MLE)	0.0891
nu hat (MLE)	90.34	nu star (bias corrected)	88.15

Adjusted Level of Significance (β)	0.0469		
Approximate Chi Square Value (88.15, α)	67.51	Adjusted Chi Square Value (88.15, β)	67.16
95% Gamma Approximate UCL (use when n>=50)	0.0666	95% Gamma Adjusted UCL (use when n<50)	N/A
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.246	SD (KM)	0.0731
Variance (KM)	0.00535	SE of Mean (KM)	0.00972
k hat (KM)	11.36	k star (KM)	10.93
nu hat (KM)	1750	nu star (KM)	1683
theta hat (KM)	0.0217	theta star (KM)	0.0226
80% gamma percentile (KM)	0.306	90% gamma percentile (KM)	0.346
95% gamma percentile (KM)	0.381	99% gamma percentile (KM)	0.452
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (N/A, α)	1589	Adjusted Chi Square Value (N/A, β)	1587
95% Gamma Approximate KM-UCL (use when n>=50)	0.261	95% Gamma Adjusted KM-UCL (use when n<50)	0.261
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.825	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.748	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.277	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.375	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.149	Mean in Log Scale	-2.066
SD in Original Scale	0.107	SD in Log Scale	0.526
95% t UCL (assumes normality of ROS data)	0.169	95% Percentile Bootstrap UCL	0.17
95% BCA Bootstrap UCL	0.175	95% Bootstrap t UCL	0.176
95% H-UCL (Log ROS)	0.163		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-1.425	KM Geo Mean	0.24
KM SD (logged)	0.192	95% Critical H Value (KM-Log)	1.705
KM Standard Error of Mean (logged)	0.0256	95% H-UCL (KM -Log)	0.254
KM SD (logged)	0.192	95% Critical H Value (KM-Log)	1.705
KM Standard Error of Mean (logged)	0.0256		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.195	Mean in Log Scale	-1.693
SD in Original Scale	0.0895	SD in Log Scale	0.306
95% t UCL (Assumes normality)	0.212	95% H-Stat UCL	0.205
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Normal Distributed at 5% Significance Level			
Suggested UCL to Use			
95% KM (t) UCL	0.263		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Naphthalene

General Statistics

Total Number of Observations	77	Number of Distinct Observations	54
		Number of Missing Observations	18
Number of Detects	52	Number of Non-Detects	25
Number of Distinct Detects	42	Number of Distinct Non-Detects	16
Minimum Detect	0.0017	Minimum Non-Detect	0.0013
Maximum Detect	4	Maximum Non-Detect	0.013
Variance Detects	0.508	Percent Non-Detects	32.47%
Mean Detects	0.285	SD Detects	0.713
Median Detects	0.0245	CV Detects	2.504
Skewness Detects	4.077	Kurtosis Detects	17.89
Mean of Logged Detects	-2.993	SD of Logged Detects	1.82

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.441	**Normal GOF Test on Detected Observations Only**
5% Shapiro Wilk P Value	0	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.346	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.122	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	0.193	KM Standard Error of Mean	0.0684
KM SD	0.595	95% KM (BCA) UCL	0.319
95% KM (t) UCL	0.307	95% KM (Percentile Bootstrap) UCL	0.31
95% KM (z) UCL	0.306	95% KM Bootstrap t UCL	0.453
90% KM Chebyshev UCL	0.398	95% KM Chebyshev UCL	0.491
97.5% KM Chebyshev UCL	0.621	99% KM Chebyshev UCL	0.874

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	3.702	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.843	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.214	**Kolmogorov-Smirnov GOF**
5% K-S Critical Value	0.132	Detected Data Not Gamma Distributed at 5% Significance Level

Detected Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	0.382	k star (bias corrected MLE)	0.373
Theta hat (MLE)	0.745	Theta star (bias corrected MLE)	0.764
nu hat (MLE)	39.71	nu star (bias corrected)	38.75
Mean (detects)	0.285		

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)

For such situations, GROS method may yield incorrect values of UCLs and BTVs

This is especially true when the sample size is small.

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.0017	Mean	0.195

Maximum	4	Median	0.014
SD	0.598	CV	3.06
k hat (MLE)	0.356	k star (bias corrected MLE)	0.351
Theta hat (MLE)	0.549	Theta star (bias corrected MLE)	0.557
nu hat (MLE)	54.82	nu star (bias corrected)	54.01
Adjusted Level of Significance (β)	0.0469		
Approximate Chi Square Value (54.01, α)	38.13	Adjusted Chi Square Value (54.01, β)	37.87
95% Gamma Approximate UCL (use when n>=50)	0.277	95% Gamma Adjusted UCL (use when n<50)	0.279
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.193	SD (KM)	0.595
Variance (KM)	0.354	SE of Mean (KM)	0.0684
k hat (KM)	0.105	k star (KM)	0.11
nu hat (KM)	16.23	nu star (KM)	16.93
theta hat (KM)	1.832	theta star (KM)	1.756
80% gamma percentile (KM)	0.152	90% gamma percentile (KM)	0.533
95% gamma percentile (KM)	1.113	99% gamma percentile (KM)	2.924
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (16.93, α)	8.624	Adjusted Chi Square Value (16.93, β)	8.51
95% Gamma Approximate KM-UCL (use when n>=50)	0.379	95% Gamma Adjusted KM-UCL (use when n<50)	0.384
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Approximate Test Statistic	0.941	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	0.0188	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.168	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.122	Detected Data Not Lognormal at 5% Significance Level	
Detected Data Not Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.193	Mean in Log Scale	-4.209
SD in Original Scale	0.599	SD in Log Scale	2.351
95% t UCL (assumes normality of ROS data)	0.306	95% Percentile Bootstrap UCL	0.308
95% BCA Bootstrap UCL	0.367	95% Bootstrap t UCL	0.467
95% H-UCL (Log ROS)	0.673		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-4.003	KM Geo Mean	0.0183
KM SD (logged)	2.111	95% Critical H Value (KM-Log)	3.573
KM Standard Error of Mean (logged)	0.254	95% H-UCL (KM -Log)	0.403
KM SD (logged)	2.111	95% Critical H Value (KM-Log)	3.573
KM Standard Error of Mean (logged)	0.254		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.194	Mean in Log Scale	-3.832
SD in Original Scale	0.599	SD in Log Scale	1.958
95% t UCL (Assumes normality)	0.307	95% H-Stat UCL	0.314
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution at 5% Significance Level			

Suggested UCL to Use			
95% KM (Chebyshev) UCL	0.491		

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

BenzoAAnthracene

General Statistics			
Total Number of Observations	77	Number of Distinct Observations	61
		Number of Missing Observations	18
Number of Detects	73	Number of Non-Detects	4
Number of Distinct Detects	58	Number of Distinct Non-Detects	3
Minimum Detect	0.019	Minimum Non-Detect	0.031
Maximum Detect	110	Maximum Non-Detect	0.033
Variance Detects	216.4	Percent Non-Detects	5.195%
Mean Detects	5.173	SD Detects	14.71
Median Detects	0.45	CV Detects	2.844
Skewness Detects	5.595	Kurtosis Detects	36.91
Mean of Logged Detects	-0.246	SD of Logged Detects	1.909

Normal GOF Test on Detects Only		
Shapiro Wilk Test Statistic	0.393	**Normal GOF Test on Detected Observations Only**
5% Shapiro Wilk P Value	0	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.363	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.104	Detected Data Not Normal at 5% Significance Level
Detected Data Not Normal at 5% Significance Level		

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	4.906	KM Standard Error of Mean	1.638
KM SD	14.27	95% KM (BCA) UCL	7.918
95% KM (t) UCL	7.633	95% KM (Percentile Bootstrap) UCL	7.757
95% KM (z) UCL	7.599	95% KM Bootstrap t UCL	10.27
90% KM Chebyshev UCL	9.819	95% KM Chebyshev UCL	12.04
97.5% KM Chebyshev UCL	15.13	99% KM Chebyshev UCL	21.2

Gamma GOF Tests on Detected Observations Only		
A-D Test Statistic	4.881	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.852	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.229	**Kolmogorov-Smirnov GOF**
5% K-S Critical Value	0.113	Detected Data Not Gamma Distributed at 5% Significance Level
Detected Data Not Gamma Distributed at 5% Significance Level		

Gamma Statistics on Detected Data Only			
k hat (MLE)	0.355	k star (bias corrected MLE)	0.35
Theta hat (MLE)	14.57	Theta star (bias corrected MLE)	14.8
nu hat (MLE)	51.83	nu star (bias corrected)	51.03
Mean (detects)	5.173		

Gamma ROS Statistics using Imputed Non-Detects
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	4.905
Maximum	110	Median	0.44
SD	14.37	CV	2.929
k hat (MLE)	0.329	k star (bias corrected MLE)	0.325
Theta hat (MLE)	14.9	Theta star (bias corrected MLE)	15.09
nu hat (MLE)	50.7	nu star (bias corrected)	50.05
Adjusted Level of Significance (β)	0.0469		
Approximate Chi Square Value (50.05, α)	34.81	Adjusted Chi Square Value (50.05, β)	34.57
95% Gamma Approximate UCL (use when n>=50)	7.053	95% Gamma Adjusted UCL (use when n<50)	7.103
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	4.906	SD (KM)	14.27
Variance (KM)	203.7	SE of Mean (KM)	1.638
k hat (KM)	0.118	k star (KM)	0.122
nu hat (KM)	18.19	nu star (KM)	18.82
theta hat (KM)	41.52	theta star (KM)	40.14
80% gamma percentile (KM)	4.39	90% gamma percentile (KM)	13.97
95% gamma percentile (KM)	27.93	99% gamma percentile (KM)	70.35
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (18.82, α)	9.985	Adjusted Chi Square Value (18.82, β)	9.862
95% Gamma Approximate KM-UCL (use when n>=50)	9.245	95% Gamma Adjusted KM-UCL (use when n<50)	9.361
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Approximate Test Statistic	0.955	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	0.0323	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.132	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.104	Detected Data Not Lognormal at 5% Significance Level	
Detected Data Not Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	4.905	Mean in Log Scale	-0.465
SD in Original Scale	14.37	SD in Log Scale	2.083
95% t UCL (assumes normality of ROS data)	7.631	95% Percentile Bootstrap UCL	7.849
95% BCA Bootstrap UCL	9.095	95% Bootstrap t UCL	10.77
95% H-UCL (Log ROS)	12.81		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-0.44	KM Geo Mean	0.644
KM SD (logged)	2.022	95% Critical H Value (KM-Log)	3.457
KM Standard Error of Mean (logged)	0.232	95% H-UCL (KM -Log)	11.09
KM SD (logged)	2.022	95% Critical H Value (KM-Log)	3.457
KM Standard Error of Mean (logged)	0.232		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	4.905	Mean in Log Scale	-0.449
SD in Original Scale	14.37	SD in Log Scale	2.052
95% t UCL (Assumes normality)	7.631	95% H-Stat UCL	11.92

DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution at 5% Significance Level			
Suggested UCL to Use			
95% KM (Chebyshev) UCL	12.04		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
BenzoAPyrene			
General Statistics			
Total Number of Observations	77	Number of Distinct Observations	67
		Number of Missing Observations	18
Number of Detects	75	Number of Non-Detects	2
Number of Distinct Detects	66	Number of Distinct Non-Detects	1
Minimum Detect	0.027	Minimum Non-Detect	0.012
Maximum Detect	130	Maximum Non-Detect	0.012
Variance Detects	281.9	Percent Non-Detects	2.597%
Mean Detects	5.891	SD Detects	16.79
Median Detects	0.58	CV Detects	2.851
Skewness Detects	5.895	Kurtosis Detects	41.22
Mean of Logged Detects	-0.0934	SD of Logged Detects	1.912
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.389	**Normal GOF Test on Detected Observations Only**	
5% Shapiro Wilk P Value	0	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.363	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.102	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	5.738	KM Standard Error of Mean	1.892
KM SD	16.49	95% KM (BCA) UCL	9.418
95% KM (t) UCL	8.888	95% KM (Percentile Bootstrap) UCL	9.086
95% KM (z) UCL	8.849	95% KM Bootstrap t UCL	12.58
90% KM Chebyshev UCL	11.41	95% KM Chebyshev UCL	13.98
97.5% KM Chebyshev UCL	17.55	99% KM Chebyshev UCL	24.56
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	4.707	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.851	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.221	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.111	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.359	k star (bias corrected MLE)	0.353
Theta hat (MLE)	16.42	Theta star (bias corrected MLE)	16.67

nu hat (MLE)	53.81	nu star (bias corrected)	53
Mean (detects)	5.891		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	5.738
Maximum	130	Median	0.56
SD	16.6	CV	2.892
k hat (MLE)	0.344	k star (bias corrected MLE)	0.34
Theta hat (MLE)	16.66	Theta star (bias corrected MLE)	16.89
nu hat (MLE)	53.04	nu star (bias corrected)	52.3
Adjusted Level of Significance (β)	0.0469		
Approximate Chi Square Value (52.30, α)	36.69	Adjusted Chi Square Value (52.30, β)	36.44
95% Gamma Approximate UCL (use when n>=50)	8.179	95% Gamma Adjusted UCL (use when n<50)	8.235
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	5.738	SD (KM)	16.49
Variance (KM)	271.8	SE of Mean (KM)	1.892
k hat (KM)	0.121	k star (KM)	0.125
nu hat (KM)	18.65	nu star (KM)	19.26
theta hat (KM)	47.37	theta star (KM)	45.88
80% gamma percentile (KM)	5.266	90% gamma percentile (KM)	16.43
95% gamma percentile (KM)	32.56	99% gamma percentile (KM)	81.3
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (19.26, α)	10.31	Adjusted Chi Square Value (19.26, β)	10.18
95% Gamma Approximate KM-UCL (use when n>=50)	10.72	95% Gamma Adjusted KM-UCL (use when n<50)	10.85
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Approximate Test Statistic	0.958	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	0.0432	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.116	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.102	Detected Data Not Lognormal at 5% Significance Level	
Detected Data Not Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	5.738	Mean in Log Scale	-0.219
SD in Original Scale	16.6	SD in Log Scale	2.039
95% t UCL (assumes normality of ROS data)	8.887	95% Percentile Bootstrap UCL	9.215
95% BCA Bootstrap UCL	10.79	95% Bootstrap t UCL	12.09
95% H-UCL (Log ROS)	14.49		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-0.206	KM Geo Mean	0.814
KM SD (logged)	1.997	95% Critical H Value (KM-Log)	3.425
KM Standard Error of Mean (logged)	0.229	95% H-UCL (KM -Log)	13.1
KM SD (logged)	1.997	95% Critical H Value (KM-Log)	3.425
KM Standard Error of Mean (logged)	0.229		

DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	5.738	Mean in Log Scale	-0.224
SD in Original Scale	16.6	SD in Log Scale	2.051
95% t UCL (Assumes normality)	8.887	95% H-Stat UCL	14.9
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution at 5% Significance Level			
Suggested UCL to Use			
95% KM (Chebyshev) UCL	13.98		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
BenzoBFluoranthene			
General Statistics			
Total Number of Observations	77	Number of Distinct Observations	64
		Number of Missing Observations	18
Number of Detects	76	Number of Non-Detects	1
Number of Distinct Detects	63	Number of Distinct Non-Detects	1
Minimum Detect	0.028	Minimum Non-Detect	0.016
Maximum Detect	150	Maximum Non-Detect	0.016
Variance Detects	394.9	Percent Non-Detects	1.299%
Mean Detects	7.425	SD Detects	19.87
Median Detects	1.05	CV Detects	2.676
Skewness Detects	5.508	Kurtosis Detects	36.32
Mean of Logged Detects	0.333	SD of Logged Detects	1.824
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.411	**Normal GOF Test on Detected Observations Only**	
5% Shapiro Wilk P Value	0	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.355	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.102	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	7.329	KM Standard Error of Mean	2.252
KM SD	19.63	95% KM (BCA) UCL	11.79
95% KM (t) UCL	11.08	95% KM (Percentile Bootstrap) UCL	11.56
95% KM (z) UCL	11.03	95% KM Bootstrap t UCL	14.97
90% KM Chebyshev UCL	14.08	95% KM Chebyshev UCL	17.14
97.5% KM Chebyshev UCL	21.39	99% KM Chebyshev UCL	29.73
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	4.214	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.843	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.209	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.11	Detected Data Not Gamma Distributed at 5% Significance Level	

Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.395	k star (bias corrected MLE)	0.388
Theta hat (MLE)	18.82	Theta star (bias corrected MLE)	19.15
nu hat (MLE)	59.97	nu star (bias corrected)	58.94
Mean (detects)	7.425		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	7.329
Maximum	150	Median	1
SD	19.76	CV	2.696
k hat (MLE)	0.384	k star (bias corrected MLE)	0.378
Theta hat (MLE)	19.06	Theta star (bias corrected MLE)	19.38
nu hat (MLE)	59.21	nu star (bias corrected)	58.23
Adjusted Level of Significance (β)	0.0469		
Approximate Chi Square Value (58.23, α)	41.69	Adjusted Chi Square Value (58.23, β)	41.42
95% Gamma Approximate UCL (use when n>=50)	10.24	95% Gamma Adjusted UCL (use when n<50)	10.3
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	7.329	SD (KM)	19.63
Variance (KM)	385.3	SE of Mean (KM)	2.252
k hat (KM)	0.139	k star (KM)	0.143
nu hat (KM)	21.47	nu star (KM)	21.96
theta hat (KM)	52.57	theta star (KM)	51.38
80% gamma percentile (KM)	7.643	90% gamma percentile (KM)	21.57
95% gamma percentile (KM)	40.72	99% gamma percentile (KM)	96.89
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (21.96, α)	12.31	Adjusted Chi Square Value (21.96, β)	12.17
95% Gamma Approximate KM-UCL (use when n>=50)	13.07	95% Gamma Adjusted KM-UCL (use when n<50)	13.22
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Approximate Test Statistic	0.973	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	0.296	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.118	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.102	Detected Data Not Lognormal at 5% Significance Level	
Detected Data appear Approximate Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	7.329	Mean in Log Scale	0.27
SD in Original Scale	19.76	SD in Log Scale	1.896
95% t UCL (assumes normality of ROS data)	11.08	95% Percentile Bootstrap UCL	11.35
95% BCA Bootstrap UCL	13.18	95% Bootstrap t UCL	14.75
95% H-UCL (Log ROS)	16.18		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	0.275	KM Geo Mean	1.317

KM SD (logged)	1.87	95% Critical H Value (KM-Log)	3.262
KM Standard Error of Mean (logged)	0.215	95% H-UCL (KM -Log)	15.23
KM SD (logged)	1.87	95% Critical H Value (KM-Log)	3.262
KM Standard Error of Mean (logged)	0.215		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	7.329	Mean in Log Scale	0.266
SD in Original Scale	19.76	SD in Log Scale	1.905
95% t UCL (Assumes normality)	11.08	95% H-Stat UCL	16.5

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Approximate Lognormal Distributed at 5% Significance Level

Suggested UCL to Use

KM H-UCL	15.23		

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

BenzoKFluoranthene

General Statistics

Total Number of Observations	77	Number of Distinct Observations	64
		Number of Missing Observations	18
Number of Detects	73	Number of Non-Detects	4
Number of Distinct Detects	62	Number of Distinct Non-Detects	3
Minimum Detect	0.016	Minimum Non-Detect	0.016
Maximum Detect	68	Maximum Non-Detect	0.019
Variance Detects	76.87	Percent Non-Detects	5.195%
Mean Detects	3.099	SD Detects	8.767
Median Detects	0.38	CV Detects	2.829
Skewness Detects	6.048	Kurtosis Detects	42.77
Mean of Logged Detects	-0.561	SD of Logged Detects	1.815

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.382	**Normal GOF Test on Detected Observations Only**	
5% Shapiro Wilk P Value	0	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.363	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.104	Detected Data Not Normal at 5% Significance Level	

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	2.939	KM Standard Error of Mean	0.976
KM SD	8.505	95% KM (BCA) UCL	5.063
95% KM (t) UCL	4.564	95% KM (Percentile Bootstrap) UCL	4.878
95% KM (z) UCL	4.544	95% KM Bootstrap t UCL	6.609
90% KM Chebyshev UCL	5.867	95% KM Chebyshev UCL	7.193
97.5% KM Chebyshev UCL	9.034	99% KM Chebyshev UCL	12.65

Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	4.236	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.844	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.207	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.112	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.39	k star (bias corrected MLE)	0.383
Theta hat (MLE)	7.937	Theta star (bias corrected MLE)	8.08
nu hat (MLE)	57	nu star (bias corrected)	55.99
Mean (detects)	3.099		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	2.938
Maximum	68	Median	0.35
SD	8.561	CV	2.914
k hat (MLE)	0.362	k star (bias corrected MLE)	0.356
Theta hat (MLE)	8.123	Theta star (bias corrected MLE)	8.247
nu hat (MLE)	55.7	nu star (bias corrected)	54.87
Adjusted Level of Significance (β)	0.0469		
Approximate Chi Square Value (54.87, α)	38.85	Adjusted Chi Square Value (54.87, β)	38.59
95% Gamma Approximate UCL (use when n>=50)	4.15	95% Gamma Adjusted UCL (use when n<50)	4.178
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	2.939	SD (KM)	8.505
Variance (KM)	72.34	SE of Mean (KM)	0.976
k hat (KM)	0.119	k star (KM)	0.123
nu hat (KM)	18.38	nu star (KM)	19
theta hat (KM)	24.62	theta star (KM)	23.82
80% gamma percentile (KM)	2.658	90% gamma percentile (KM)	8.387
95% gamma percentile (KM)	16.71	99% gamma percentile (KM)	41.93
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (19.00, α)	10.12	Adjusted Chi Square Value (19.00, β)	9.993
95% Gamma Approximate KM-UCL (use when n>=50)	5.519	95% Gamma Adjusted KM-UCL (use when n<50)	5.587
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Approximate Test Statistic	0.965	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	0.129	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.114	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.104	Detected Data Not Lognormal at 5% Significance Level	
Detected Data appear Approximate Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	2.938	Mean in Log Scale	-0.774
SD in Original Scale	8.561	SD in Log Scale	1.992
95% t UCL (assumes normality of ROS data)	4.563	95% Percentile Bootstrap UCL	4.646

95% BCA Bootstrap UCL	5.709	95% Bootstrap t UCL	6.586
95% H-UCL (Log ROS)	7.329		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-0.747	KM Geo Mean	0.474
KM SD (logged)	1.926	95% Critical H Value (KM-Log)	3.334
KM Standard Error of Mean (logged)	0.221	95% H-UCL (KM -Log)	6.33
KM SD (logged)	1.926	95% Critical H Value (KM-Log)	3.334
KM Standard Error of Mean (logged)	0.221		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	2.938	Mean in Log Scale	-0.779
SD in Original Scale	8.561	SD in Log Scale	2
95% t UCL (Assumes normality)	4.563	95% H-Stat UCL	7.447
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Approximate Lognormal Distributed at 5% Significance Level			
Suggested UCL to Use			
KM H-UCL	6.33		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Chrysene			
General Statistics			
Total Number of Observations	77	Number of Distinct Observations	68
		Number of Missing Observations	18
Number of Detects	76	Number of Non-Detects	1
Number of Distinct Detects	67	Number of Distinct Non-Detects	1
Minimum Detect	0.022	Minimum Non-Detect	0.011
Maximum Detect	130	Maximum Non-Detect	0.011
Variance Detects	299.4	Percent Non-Detects	1.299%
Mean Detects	6.293	SD Detects	17.3
Median Detects	0.735	CV Detects	2.749
Skewness Detects	5.491	Kurtosis Detects	35.95
Mean of Logged Detects	0.0479	SD of Logged Detects	1.872
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.405	**Normal GOF Test on Detected Observations Only**	
5% Shapiro Wilk P Value	0	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.359	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.102	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	6.212	KM Standard Error of Mean	1.961
KM SD	17.09	95% KM (BCA) UCL	9.887

95% KM (t) UCL	9.477	95% KM (Percentile Bootstrap) UCL	9.593
95% KM (z) UCL	9.437	95% KM Bootstrap t UCL	12.61
90% KM Chebyshev UCL	12.09	95% KM Chebyshev UCL	14.76
97.5% KM Chebyshev UCL	18.46	99% KM Chebyshev UCL	25.72
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	4.706	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.848	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.227	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.11	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.372	k star (bias corrected MLE)	0.366
Theta hat (MLE)	16.93	Theta star (bias corrected MLE)	17.21
nu hat (MLE)	56.5	nu star (bias corrected)	55.6
Mean (detects)	6.293		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	6.212
Maximum	130	Median	0.72
SD	17.2	CV	2.769
k hat (MLE)	0.363	k star (bias corrected MLE)	0.358
Theta hat (MLE)	17.09	Theta star (bias corrected MLE)	17.36
nu hat (MLE)	55.97	nu star (bias corrected)	55.12
Adjusted Level of Significance (β)	0.0469		
Approximate Chi Square Value (55.12, α)	39.06	Adjusted Chi Square Value (55.12, β)	38.8
95% Gamma Approximate UCL (use when n>=50)	8.766	95% Gamma Adjusted UCL (use when n<50)	8.824
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	6.212	SD (KM)	17.09
Variance (KM)	292.1	SE of Mean (KM)	1.961
k hat (KM)	0.132	k star (KM)	0.136
nu hat (KM)	20.34	nu star (KM)	20.88
theta hat (KM)	47.03	theta star (KM)	45.81
80% gamma percentile (KM)	6.185	90% gamma percentile (KM)	18.11
95% gamma percentile (KM)	34.82	99% gamma percentile (KM)	84.35
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (20.88, α)	11.5	Adjusted Chi Square Value (20.88, β)	11.37
95% Gamma Approximate KM-UCL (use when n>=50)	11.28	95% Gamma Adjusted KM-UCL (use when n<50)	11.41
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Approximate Test Statistic	0.966	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	0.133	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.137	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.102	Detected Data Not Lognormal at 5% Significance Level	
Detected Data appear Approximate Lognormal at 5% Significance Level			

Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	6.212	Mean in Log Scale	-0.0173
SD in Original Scale	17.2	SD in Log Scale	1.945
95% t UCL (assumes normality of ROS data)	9.476	95% Percentile Bootstrap UCL	9.665
95% BCA Bootstrap UCL	11.12	95% Bootstrap t UCL	13.2
95% H-UCL (Log ROS)	13.8		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-0.0113	KM Geo Mean	0.989
KM SD (logged)	1.918	95% Critical H Value (KM-Log)	3.324
KM Standard Error of Mean (logged)	0.22	95% H-UCL (KM -Log)	12.93
KM SD (logged)	1.918	95% Critical H Value (KM-Log)	3.324
KM Standard Error of Mean (logged)	0.22		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	6.212	Mean in Log Scale	-0.0203
SD in Original Scale	17.2	SD in Log Scale	1.953
95% t UCL (Assumes normality)	9.476	95% H-Stat UCL	14.05
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Approximate Lognormal Distributed at 5% Significance Level			
Suggested UCL to Use			
KM H-UCL	12.93		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
DibenzAHAnthracene			
General Statistics			
Total Number of Observations	77	Number of Distinct Observations	58
		Number of Missing Observations	18
Number of Detects	68	Number of Non-Detects	9
Number of Distinct Detects	55	Number of Distinct Non-Detects	4
Minimum Detect	0.0073	Minimum Non-Detect	0.019
Maximum Detect	28	Maximum Non-Detect	0.023
Variance Detects	14.38	Percent Non-Detects	11.69%
Mean Detects	1.467	SD Detects	3.792
Median Detects	0.19	CV Detects	2.584
Skewness Detects	5.525	Kurtosis Detects	36.5
Mean of Logged Detects	-1.187	SD of Logged Detects	1.754
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.418	**Normal GOF Test on Detected Observations Only**	
5% Shapiro Wilk P Value	0	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.35	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.107	Detected Data Not Normal at 5% Significance Level	

Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	1.297	KM Standard Error of Mean	0.41
KM SD	3.568	95% KM (BCA) UCL	1.986
95% KM (t) UCL	1.979	95% KM (Percentile Bootstrap) UCL	2.032
95% KM (z) UCL	1.971	95% KM Bootstrap t UCL	2.689
90% KM Chebyshev UCL	2.526	95% KM Chebyshev UCL	3.083
97.5% KM Chebyshev UCL	3.855	99% KM Chebyshev UCL	5.373
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	3.727	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.837	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.192	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.116	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.416	k star (bias corrected MLE)	0.408
Theta hat (MLE)	3.525	Theta star (bias corrected MLE)	3.599
nu hat (MLE)	56.62	nu star (bias corrected)	55.46
Mean (detects)	1.467		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.0073	Mean	1.297
Maximum	28	Median	0.16
SD	3.591	CV	2.769
k hat (MLE)	0.362	k star (bias corrected MLE)	0.357
Theta hat (MLE)	3.582	Theta star (bias corrected MLE)	3.636
nu hat (MLE)	55.77	nu star (bias corrected)	54.93
Adjusted Level of Significance (β)	0.0469		
Approximate Chi Square Value (54.93, α)	38.9	Adjusted Chi Square Value (54.93, β)	38.64
95% Gamma Approximate UCL (use when n>=50)	1.832	95% Gamma Adjusted UCL (use when n<50)	1.844
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	1.297	SD (KM)	3.568
Variance (KM)	12.73	SE of Mean (KM)	0.41
k hat (KM)	0.132	k star (KM)	0.136
nu hat (KM)	20.36	nu star (KM)	20.9
theta hat (KM)	9.813	theta star (KM)	9.559
80% gamma percentile (KM)	1.292	90% gamma percentile (KM)	3.783
95% gamma percentile (KM)	7.27	99% gamma percentile (KM)	17.61
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (20.90, α)	11.52	Adjusted Chi Square Value (20.90, β)	11.38
95% Gamma Approximate KM-UCL (use when n>=50)	2.354	95% Gamma Adjusted KM-UCL (use when n<50)	2.382
Lognormal GOF Test on Detected Observations Only			

Shapiro Wilk Approximate Test Statistic	0.968	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	0.203	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.121	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.107	Detected Data Not Lognormal at 5% Significance Level	
Detected Data appear Approximate Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	1.297	Mean in Log Scale	-1.609
SD in Original Scale	3.591	SD in Log Scale	2.025
95% t UCL (assumes normality of ROS data)	1.978	95% Percentile Bootstrap UCL	2.035
95% BCA Bootstrap UCL	2.328	95% Bootstrap t UCL	2.671
95% H-UCL (Log ROS)	3.478		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-1.581	KM Geo Mean	0.206
KM SD (logged)	1.967	95% Critical H Value (KM-Log)	3.386
KM Standard Error of Mean (logged)	0.228	95% H-UCL (KM -Log)	3.053
KM SD (logged)	1.967	95% Critical H Value (KM-Log)	3.386
KM Standard Error of Mean (logged)	0.228		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	1.297	Mean in Log Scale	-1.587
SD in Original Scale	3.591	SD in Log Scale	1.984
95% t UCL (Assumes normality)	1.978	95% H-Stat UCL	3.182
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Approximate Lognormal Distributed at 5% Significance Level			
Suggested UCL to Use			
KM H-UCL	3.053		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Indeno123CDPyrene			
General Statistics			
Total Number of Observations	77	Number of Distinct Observations	65
		Number of Missing Observations	18
Number of Detects	76	Number of Non-Detects	1
Number of Distinct Detects	64	Number of Distinct Non-Detects	1
Minimum Detect	0.028	Minimum Non-Detect	0.027
Maximum Detect	100	Maximum Non-Detect	0.027
Variance Detects	176.7	Percent Non-Detects	1.299%
Mean Detects	5.068	SD Detects	13.29
Median Detects	0.6	CV Detects	2.623
Skewness Detects	5.41	Kurtosis Detects	35.46
Mean of Logged Detects	-0.0886	SD of Logged Detects	1.871

Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.421	**Normal GOF Test on Detected Observations Only**	
5% Shapiro Wilk P Value	0	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.352	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.102	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	5.002	KM Standard Error of Mean	1.506
KM SD	13.13	95% KM (BCA) UCL	8.131
95% KM (t) UCL	7.51	95% KM (Percentile Bootstrap) UCL	7.646
95% KM (z) UCL	7.48	95% KM Bootstrap t UCL	9.759
90% KM Chebyshev UCL	9.521	95% KM Chebyshev UCL	11.57
97.5% KM Chebyshev UCL	14.41	99% KM Chebyshev UCL	19.99
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	3.892	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.845	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.193	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.11	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.387	k star (bias corrected MLE)	0.38
Theta hat (MLE)	13.11	Theta star (bias corrected MLE)	13.33
nu hat (MLE)	58.76	nu star (bias corrected)	57.78
Mean (detects)	5.068		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	5.002
Maximum	100	Median	0.6
SD	13.22	CV	2.642
k hat (MLE)	0.378	k star (bias corrected MLE)	0.372
Theta hat (MLE)	13.23	Theta star (bias corrected MLE)	13.45
nu hat (MLE)	58.2	nu star (bias corrected)	57.27
Adjusted Level of Significance (β)	0.0469		
Approximate Chi Square Value (57.27, α)	40.87	Adjusted Chi Square Value (57.27, β)	40.61
95% Gamma Approximate UCL (use when n>=50)	7.008	95% Gamma Adjusted UCL (use when n<50)	7.054
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	5.002	SD (KM)	13.13
Variance (KM)	172.4	SE of Mean (KM)	1.506
k hat (KM)	0.145	k star (KM)	0.148
nu hat (KM)	22.35	nu star (KM)	22.81
theta hat (KM)	34.46	theta star (KM)	33.77
80% gamma percentile (KM)	5.39	90% gamma percentile (KM)	14.81
95% gamma percentile (KM)	27.6	99% gamma percentile (KM)	64.81

Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (22.81, α)	12.95	Adjusted Chi Square Value (22.81, β)	12.81
95% Gamma Approximate KM-UCL (use when n>=50)	8.812	95% Gamma Adjusted KM-UCL (use when n<50)	8.91
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Approximate Test Statistic	0.967	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	0.153	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.107	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.102	Detected Data Not Lognormal at 5% Significance Level	
Detected Data appear Approximate Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	5.002	Mean in Log Scale	-0.154
SD in Original Scale	13.22	SD in Log Scale	1.946
95% t UCL (assumes normality of ROS data)	7.51	95% Percentile Bootstrap UCL	7.744
95% BCA Bootstrap UCL	9.031	95% Bootstrap t UCL	9.72
95% H-UCL (Log ROS)	12.04		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-0.134	KM Geo Mean	0.874
KM SD (logged)	1.89	95% Critical H Value (KM-Log)	3.287
KM Standard Error of Mean (logged)	0.217	95% H-UCL (KM -Log)	10.62
KM SD (logged)	1.89	95% Critical H Value (KM-Log)	3.287
KM Standard Error of Mean (logged)	0.217		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	5.002	Mean in Log Scale	-0.143
SD in Original Scale	13.22	SD in Log Scale	1.92
95% t UCL (Assumes normality)	7.51	95% H-Stat UCL	11.39
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Approximate Lognormal Distributed at 5% Significance Level			
Suggested UCL to Use			
KM H-UCL	10.62		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			

ProUCL Output
Main Plant Area Soil (0-12 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

UCL Statistics for Data Sets with Non-Detects			
User Selected Options			
Date/Time of Computation	ProUCL 5.12/11/2019 11:59:24 AM		
From File	20190211_MPA_ProUCL_input_a.xls		
Full Precision	OFF		
Confidence Coefficient	95%		
Number of Bootstrap Operations	2000		
Bis2EthylhexylPhthalate			
General Statistics			
Total Number of Observations	275	Number of Distinct Observations	78
		Number of Missing Observations	37
Number of Detects	65	Number of Non-Detects	210
Number of Distinct Detects	49	Number of Distinct Non-Detects	38
Minimum Detect	0.015	Minimum Non-Detect	0.013
Maximum Detect	5.8	Maximum Non-Detect	7.8
Variance Detects	1.419	Percent Non-Detects	76.36%
Mean Detects	0.478	SD Detects	1.191
Median Detects	0.072	CV Detects	2.489
Skewness Detects	3.314	Kurtosis Detects	10.51
Mean of Logged Detects	-2.257	SD of Logged Detects	1.485
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.429	**Normal GOF Test on Detected Observations Only**	
5% Shapiro Wilk P Value	0	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.396	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.11	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.125	KM Standard Error of Mean	0.0371
KM SD	0.609	95% KM (BCA) UCL	0.196
95% KM (t) UCL	0.186	95% KM (Percentile Bootstrap) UCL	0.189
95% KM (z) UCL	0.186	95% KM Bootstrap t UCL	0.22
90% KM Chebyshev UCL	0.236	95% KM Chebyshev UCL	0.287
97.5% KM Chebyshev UCL	0.357	99% KM Chebyshev UCL	0.494
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	7.851	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.834	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.307	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.118	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.428	k star (bias corrected MLE)	0.419
Theta hat (MLE)	1.117	Theta star (bias corrected MLE)	1.143
nu hat (MLE)	55.67	nu star (bias corrected)	54.43

Mean (detects)	0.478		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	0.121
Maximum	5.8	Median	0.01
SD	0.609	CV	5.046
k hat (MLE)	0.348	k star (bias corrected MLE)	0.346
Theta hat (MLE)	0.347	Theta star (bias corrected MLE)	0.349
nu hat (MLE)	191.2	nu star (bias corrected)	190.5
Adjusted Level of Significance (β)	0.0491		
Approximate Chi Square Value (190.48, α)	159.6	Adjusted Chi Square Value (190.48, β)	159.4
95% Gamma Approximate UCL (use when n>=50)	0.144	95% Gamma Adjusted UCL (use when n<50)	0.144
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.125	SD (KM)	0.609
Variance (KM)	0.371	SE of Mean (KM)	0.0371
k hat (KM)	0.0422	k star (KM)	0.0441
nu hat (KM)	23.2	nu star (KM)	24.28
theta hat (KM)	2.964	theta star (KM)	2.832
80% gamma percentile (KM)	0.0105	90% gamma percentile (KM)	0.16
95% gamma percentile (KM)	0.631	99% gamma percentile (KM)	2.852
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (24.28, α)	14.06	Adjusted Chi Square Value (24.28, β)	14.02
95% Gamma Approximate KM-UCL (use when n>=50)	0.216	95% Gamma Adjusted KM-UCL (use when n<50)	0.216
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Approximate Test Statistic	0.871	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	1.9402E-7	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.176	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.11	Detected Data Not Lognormal at 5% Significance Level	
Detected Data Not Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.115	Mean in Log Scale	-5.844
SD in Original Scale	0.61	SD in Log Scale	2.644
95% t UCL (assumes normality of ROS data)	0.176	95% Percentile Bootstrap UCL	0.179
95% BCA Bootstrap UCL	0.196	95% Bootstrap t UCL	0.214
95% H-UCL (Log ROS)	0.177		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-3.804	KM Geo Mean	0.0223
KM SD (logged)	1.149	95% Critical H Value (KM-Log)	2.26
KM Standard Error of Mean (logged)	0.0716	95% H-UCL (KM -Log)	0.0505
KM SD (logged)	1.149	95% Critical H Value (KM-Log)	2.26

KM Standard Error of Mean (logged)	0.0716		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.157	Mean in Log Scale	-3.806
SD in Original Scale	0.655	SD in Log Scale	1.486
95% t UCL (Assumes normality)	0.223	95% H-Stat UCL	0.0845

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution at 5% Significance Level

Suggested UCL to Use

95% KM (Chebyshev) UCL	0.287		

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Pyrene

General Statistics

Total Number of Observations	275	Number of Distinct Observations	153
		Number of Missing Observations	37
Number of Detects	224	Number of Non-Detects	51
Number of Distinct Detects	151	Number of Distinct Non-Detects	6
Minimum Detect	0.0017	Minimum Non-Detect	0.0016
Maximum Detect	730	Maximum Non-Detect	0.018
Variance Detects	3219	Percent Non-Detects	18.55%
Mean Detects	10.35	SD Detects	56.74
Median Detects	0.4	CV Detects	5.481
Skewness Detects	10.4	Kurtosis Detects	122.4
Mean of Logged Detects	-0.81	SD of Logged Detects	2.478

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.199	**Normal GOF Test on Detected Observations Only**	
5% Shapiro Wilk P Value	0	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.428	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.0596	Detected Data Not Normal at 5% Significance Level	

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	8.433	KM Standard Error of Mean	3.098
KM SD	51.25	95% KM (BCA) UCL	13.95
95% KM (t) UCL	13.55	95% KM (Percentile Bootstrap) UCL	14.27
95% KM (z) UCL	13.53	95% KM Bootstrap t UCL	23.45
90% KM Chebyshev UCL	17.73	95% KM Chebyshev UCL	21.93
97.5% KM Chebyshev UCL	27.78	99% KM Chebyshev UCL	39.25

Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	18.95	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.906	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.231	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.0672	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.229	k star (bias corrected MLE)	0.229
Theta hat (MLE)	45.23	Theta star (bias corrected MLE)	45.25
nu hat (MLE)	102.5	nu star (bias corrected)	102.5
Mean (detects)	10.35		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.0017	Mean	8.434
Maximum	730	Median	0.2
SD	51.34	CV	6.088
k hat (MLE)	0.202	k star (bias corrected MLE)	0.202
Theta hat (MLE)	41.84	Theta star (bias corrected MLE)	41.8
nu hat (MLE)	110.9	nu star (bias corrected)	111
Adjusted Level of Significance (β)	0.0491		
Approximate Chi Square Value (110.99, α)	87.67	Adjusted Chi Square Value (110.99, β)	87.56
95% Gamma Approximate UCL (use when n>=50)	10.68	95% Gamma Adjusted UCL (use when n<50)	10.69
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	8.433	SD (KM)	51.25
Variance (KM)	2627	SE of Mean (KM)	3.098
k hat (KM)	0.0271	k star (KM)	0.0292
nu hat (KM)	14.89	nu star (KM)	16.06
theta hat (KM)	311.5	theta star (KM)	288.8
80% gamma percentile (KM)	0.0798	90% gamma percentile (KM)	4.57
95% gamma percentile (KM)	31.82	99% gamma percentile (KM)	219.3
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (16.06, α)	8.006	Adjusted Chi Square Value (16.06, β)	7.976
95% Gamma Approximate KM-UCL (use when n>=50)	16.92	95% Gamma Adjusted KM-UCL (use when n<50)	16.98
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Approximate Test Statistic	0.976	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	0.0909	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.0593	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.0596	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			

Mean in Original Scale	8.433	Mean in Log Scale	-1.806
SD in Original Scale	51.34	SD in Log Scale	3.11
95% t UCL (assumes normality of ROS data)	13.54	95% Percentile Bootstrap UCL	14.15
95% BCA Bootstrap UCL	17.02	95% Bootstrap t UCL	21.42
95% H-UCL (Log ROS)	47.55		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-1.796	KM Geo Mean	0.166
KM SD (logged)	3.051	95% Critical H Value (KM-Log)	4.359
KM Standard Error of Mean (logged)	0.186	95% H-UCL (KM -Log)	38.93
KM SD (logged)	3.051	95% Critical H Value (KM-Log)	4.359
KM Standard Error of Mean (logged)	0.186		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	8.434	Mean in Log Scale	-1.679
SD in Original Scale	51.34	SD in Log Scale	2.92
95% t UCL (Assumes normality)	13.54	95% H-Stat UCL	27.8
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Lognormal Distributed at 5% Significance Level			
Suggested UCL to Use			
KM H-UCL	38.93		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Fluoride			
General Statistics			
Total Number of Observations	275	Number of Distinct Observations	250
		Number of Missing Observations	37
Number of Detects	271	Number of Non-Detects	4
Number of Distinct Detects	247	Number of Distinct Non-Detects	3
Minimum Detect	0.59	Minimum Non-Detect	0.16
Maximum Detect	896	Maximum Non-Detect	0.19
Variance Detects	11955	Percent Non-Detects	1.455%
Mean Detects	55.96	SD Detects	109.3
Median Detects	20.1	CV Detects	1.954
Skewness Detects	4.577	Kurtosis Detects	26.71
Mean of Logged Detects	2.973	SD of Logged Detects	1.5
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.506	**Normal GOF Test on Detected Observations Only**	
5% Shapiro Wilk P Value	0	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.306	**Lilliefors GOF Test**	

5% Lilliefors Critical Value	0.0542	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	55.15	KM Standard Error of Mean	6.558
KM SD	108.5	95% KM (BCA) UCL	66.22
95% KM (t) UCL	65.97	95% KM (Percentile Bootstrap) UCL	65.92
95% KM (z) UCL	65.93	95% KM Bootstrap t UCL	69.36
90% KM Chebyshev UCL	74.82	95% KM Chebyshev UCL	83.73
97.5% KM Chebyshev UCL	96.1	99% KM Chebyshev UCL	120.4
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	6.506	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.813	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.123	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.0583	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.589	k star (bias corrected MLE)	0.585
Theta hat (MLE)	94.97	Theta star (bias corrected MLE)	95.63
nu hat (MLE)	319.4	nu star (bias corrected)	317.2
Mean (detects)	55.96		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	55.15
Maximum	896	Median	19.5
SD	108.7	CV	1.972
k hat (MLE)	0.546	k star (bias corrected MLE)	0.543
Theta hat (MLE)	100.9	Theta star (bias corrected MLE)	101.6
nu hat (MLE)	300.5	nu star (bias corrected)	298.5
Adjusted Level of Significance (β)	0.0491		
Approximate Chi Square Value (298.52, α)	259.5	Adjusted Chi Square Value (298.52, β)	259.3
95% Gamma Approximate UCL (use when n>=50)	63.44	95% Gamma Adjusted UCL (use when n<50)	63.48
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	55.15	SD (KM)	108.5
Variance (KM)	11783	SE of Mean (KM)	6.558
k hat (KM)	0.258	k star (KM)	0.258
nu hat (KM)	142	nu star (KM)	141.7
theta hat (KM)	213.7	theta star (KM)	214
80% gamma percentile (KM)	80.94	90% gamma percentile (KM)	165.2
95% gamma percentile (KM)	264.5	99% gamma percentile (KM)	527.9
Gamma Kaplan-Meier (KM) Statistics			

Approximate Chi Square Value (141.74, α)	115.2	Adjusted Chi Square Value (141.74, β)	115.1
95% Gamma Approximate KM-UCL (use when n>=50)	67.84	95% Gamma Adjusted KM-UCL (use when n<50)	67.91
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Approximate Test Statistic	0.976	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	0.0513	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.0359	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.0542	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	55.15	Mean in Log Scale	2.916
SD in Original Scale	108.7	SD in Log Scale	1.562
95% t UCL (assumes normality of ROS data)	65.97	95% Percentile Bootstrap UCL	66.94
95% BCA Bootstrap UCL	67.25	95% Bootstrap t UCL	69.05
95% H-UCL (Log ROS)	80.33		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	2.903	KM Geo Mean	18.23
KM SD (logged)	1.594	95% Critical H Value (KM-Log)	2.688
KM Standard Error of Mean (logged)	0.0963	95% H-UCL (KM -Log)	84.09
KM SD (logged)	1.594	95% Critical H Value (KM-Log)	2.688
KM Standard Error of Mean (logged)	0.0963		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	55.15	Mean in Log Scale	2.894
SD in Original Scale	108.7	SD in Log Scale	1.626
95% t UCL (Assumes normality)	65.97	95% H-Stat UCL	88.47
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Lognormal Distributed at 5% Significance Level			
Suggested UCL to Use			
KM H-UCL	84.09		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Indeno123CDPyrene			
General Statistics			
Total Number of Observations	275	Number of Distinct Observations	147
		Number of Missing Observations	37
Number of Detects	206	Number of Non-Detects	69
Number of Distinct Detects	143	Number of Distinct Non-Detects	8
Minimum Detect	0.0015	Minimum Non-Detect	0.0013

Maximum Detect	360	Maximum Non-Detect	0.027
Variance Detects	758.5	Percent Non-Detects	25.09%
Mean Detects	5.711	SD Detects	27.54
Median Detects	0.315	CV Detects	4.822
Skewness Detects	10.88	Kurtosis Detects	135.7
Mean of Logged Detects	-0.938	SD of Logged Detects	2.304
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.225	**Normal GOF Test on Detected Observations Only**	
5% Shapiro Wilk P Value	0	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.418	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.0622	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	4.279	KM Standard Error of Mean	1.445
KM SD	23.91	95% KM (BCA) UCL	7.171
95% KM (t) UCL	6.664	95% KM (Percentile Bootstrap) UCL	6.843
95% KM (z) UCL	6.656	95% KM Bootstrap t UCL	10.04
90% KM Chebyshev UCL	8.614	95% KM Chebyshev UCL	10.58
97.5% KM Chebyshev UCL	13.3	99% KM Chebyshev UCL	18.66
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	15.1	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.888	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.213	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.069	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.263	k star (bias corrected MLE)	0.262
Theta hat (MLE)	21.73	Theta star (bias corrected MLE)	21.78
nu hat (MLE)	108.3	nu star (bias corrected)	108
Mean (detects)	5.711		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.0015	Mean	4.281
Maximum	360	Median	0.13
SD	23.95	CV	5.595
k hat (MLE)	0.219	k star (bias corrected MLE)	0.219
Theta hat (MLE)	19.54	Theta star (bias corrected MLE)	19.54
nu hat (MLE)	120.5	nu star (bias corrected)	120.5
Adjusted Level of Significance (β)	0.0491		
Approximate Chi Square Value (120.48, α)	96.13	Adjusted Chi Square Value (120.48, β)	96.02
95% Gamma Approximate UCL (use when n>=50)	5.365	95% Gamma Adjusted UCL (use when n<50)	5.371

Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	4.279	SD (KM)	23.91
Variance (KM)	571.5	SE of Mean (KM)	1.445
k hat (KM)	0.032	k star (KM)	0.0341
nu hat (KM)	17.62	nu star (KM)	18.76
theta hat (KM)	133.6	theta star (KM)	125.4
80% gamma percentile (KM)	0.105	90% gamma percentile (KM)	3.386
95% gamma percentile (KM)	18.47	99% gamma percentile (KM)	106.5
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (18.76, α)	9.944	Adjusted Chi Square Value (18.76, β)	9.91
95% Gamma Approximate KM-UCL (use when n>=50)	8.074	95% Gamma Adjusted KM-UCL (use when n<50)	8.101
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Approximate Test Statistic	0.978	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	0.222	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.0585	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.0622	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	4.279	Mean in Log Scale	-2.204
SD in Original Scale	23.95	SD in Log Scale	3.039
95% t UCL (assumes normality of ROS data)	6.663	95% Percentile Bootstrap UCL	6.94
95% BCA Bootstrap UCL	8.816	95% Bootstrap t UCL	10.32
95% H-UCL (Log ROS)	24.84		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-2.246	KM Geo Mean	0.106
KM SD (logged)	3.043	95% Critical H Value (KM-Log)	4.349
KM Standard Error of Mean (logged)	0.188	95% H-UCL (KM -Log)	24.14
KM SD (logged)	3.043	95% Critical H Value (KM-Log)	4.349
KM Standard Error of Mean (logged)	0.188		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	4.28	Mean in Log Scale	-2.033
SD in Original Scale	23.95	SD in Log Scale	2.827
95% t UCL (Assumes normality)	6.664	95% H-Stat UCL	14.29
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Lognormal Distributed at 5% Significance Level			
Suggested UCL to Use			
KM H-UCL	24.14		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

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General Statistics

Total Number of Observations	275	Number of Distinct Observations	149
		Number of Missing Observations	37
Number of Detects	221	Number of Non-Detects	54
Number of Distinct Detects	144	Number of Distinct Non-Detects	7
Minimum Detect	0.0017	Minimum Non-Detect	0.0016
Maximum Detect	570	Maximum Non-Detect	0.016
Variance Detects	1777	Percent Non-Detects	19.64%
Mean Detects	7.948	SD Detects	42.15
Median Detects	0.43	CV Detects	5.303
Skewness Detects	11.35	Kurtosis Detects	146.2
Mean of Logged Detects	-0.739	SD of Logged Detects	2.349

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.204	**Normal GOF Test on Detected Observations Only**
5% Shapiro Wilk P Value	0	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.425	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.06	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	6.388	KM Standard Error of Mean	2.287
KM SD	37.83	95% KM (BCA) UCL	10.92
95% KM (t) UCL	10.16	95% KM (Percentile Bootstrap) UCL	10.43
95% KM (z) UCL	10.15	95% KM Bootstrap t UCL	16.96
90% KM Chebyshev UCL	13.25	95% KM Chebyshev UCL	16.36
97.5% KM Chebyshev UCL	20.67	99% KM Chebyshev UCL	29.14

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	16.79	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.894	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.225	**Kolmogorov-Smirnov GOF**
5% K-S Critical Value	0.0673	Detected Data Not Gamma Distributed at 5% Significance Level

Detected Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	0.252	k star (bias corrected MLE)	0.252
Theta hat (MLE)	31.51	Theta star (bias corrected MLE)	31.56
nu hat (MLE)	111.5	nu star (bias corrected)	111.3
Mean (detects)	7.948		

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)

For such situations, GROS method may yield incorrect values of UCLs and BTVs

This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.0017	Mean	6.39
Maximum	570	Median	0.22
SD	37.9	CV	5.932
k hat (MLE)	0.217	k star (bias corrected MLE)	0.217
Theta hat (MLE)	29.48	Theta star (bias corrected MLE)	29.47
nu hat (MLE)	119.2	nu star (bias corrected)	119.2
Adjusted Level of Significance (β)	0.0491		
Approximate Chi Square Value (119.25, α)	95.03	Adjusted Chi Square Value (119.25, β)	94.92
95% Gamma Approximate UCL (use when n>=50)	8.018	95% Gamma Adjusted UCL (use when n<50)	8.027
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	6.388	SD (KM)	37.83
Variance (KM)	1431	SE of Mean (KM)	2.287
k hat (KM)	0.0285	k star (KM)	0.0306
nu hat (KM)	15.68	nu star (KM)	16.84
theta hat (KM)	224.1	theta star (KM)	208.6
80% gamma percentile (KM)	0.0822	90% gamma percentile (KM)	3.919
95% gamma percentile (KM)	25.2	99% gamma percentile (KM)	164
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (16.84, α)	8.56	Adjusted Chi Square Value (16.84, β)	8.529
95% Gamma Approximate KM-UCL (use when n>=50)	12.57	95% Gamma Adjusted KM-UCL (use when n<50)	12.62
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Approximate Test Statistic	0.981	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	0.355	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.0491	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.06	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	6.389	Mean in Log Scale	-1.753
SD in Original Scale	37.9	SD in Log Scale	2.99
95% t UCL (assumes normality of ROS data)	10.16	95% Percentile Bootstrap UCL	10.45
95% BCA Bootstrap UCL	12.62	95% Bootstrap t UCL	16.03
95% H-UCL (Log ROS)	32.84		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-1.808	KM Geo Mean	0.164
KM SD (logged)	3.025	95% Critical H Value (KM-Log)	4.328
KM Standard Error of Mean (logged)	0.184	95% H-UCL (KM -Log)	35.12
KM SD (logged)	3.025	95% Critical H Value (KM-Log)	4.328
KM Standard Error of Mean (logged)	0.184		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	6.389	Mean in Log Scale	-1.708
SD in Original Scale	37.9	SD in Log Scale	2.912

95% t UCL (Assumes normality)	10.16	95% H-Stat UCL	26.27
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Lognormal Distributed at 5% Significance Level			
Suggested UCL to Use			
KM H-UCL	35.12		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
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General Statistics			
Total Number of Observations	275	Number of Distinct Observations	160
		Number of Missing Observations	37
Number of Detects	228	Number of Non-Detects	47
Number of Distinct Detects	157	Number of Distinct Non-Detects	7
Minimum Detect	0.0019	Minimum Non-Detect	0.0017
Maximum Detect	1000	Maximum Non-Detect	0.012
Variance Detects	5573	Percent Non-Detects	17.09%
Mean Detects	11.75	SD Detects	74.65
Median Detects	0.37	CV Detects	6.352
Skewness Detects	11.4	Kurtosis Detects	142.4
Mean of Logged Detects	-0.888	SD of Logged Detects	2.507
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.168	**Normal GOF Test on Detected Observations Only**	
5% Shapiro Wilk P Value	0	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.437	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.0591	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	9.744	KM Standard Error of Mean	4.108
KM SD	67.97	95% KM (BCA) UCL	16.99
95% KM (t) UCL	16.52	95% KM (Percentile Bootstrap) UCL	17.28
95% KM (z) UCL	16.5	95% KM Bootstrap t UCL	37.25
90% KM Chebyshev UCL	22.07	95% KM Chebyshev UCL	27.65
97.5% KM Chebyshev UCL	35.4	99% KM Chebyshev UCL	50.62
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	20.87	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.912	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.232	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.0669	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			

Gamma Statistics on Detected Data Only			
k hat (MLE)	0.217	k star (bias corrected MLE)	0.217
Theta hat (MLE)	54.22	Theta star (bias corrected MLE)	54.2
nu hat (MLE)	98.85	nu star (bias corrected)	98.88
Mean (detects)	11.75		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.0019	Mean	9.746
Maximum	1000	Median	0.21
SD	68.1	CV	6.987
k hat (MLE)	0.194	k star (bias corrected MLE)	0.195
Theta hat (MLE)	50.11	Theta star (bias corrected MLE)	50.03
nu hat (MLE)	107	nu star (bias corrected)	107.1
Adjusted Level of Significance (β)	0.0491		
Approximate Chi Square Value (107.14, α)	84.25	Adjusted Chi Square Value (107.14, β)	84.14
95% Gamma Approximate UCL (use when n>=50)	12.39	95% Gamma Adjusted UCL (use when n<50)	12.41
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	9.744	SD (KM)	67.97
Variance (KM)	4620	SE of Mean (KM)	4.108
k hat (KM)	0.0206	k star (KM)	0.0228
nu hat (KM)	11.3	nu star (KM)	12.51
theta hat (KM)	474.1	theta star (KM)	428.3
80% gamma percentile (KM)	0.0135	90% gamma percentile (KM)	2.401
95% gamma percentile (KM)	27.33	99% gamma percentile (KM)	267.3
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (12.51, α)	5.567	Adjusted Chi Square Value (12.51, β)	5.543
95% Gamma Approximate KM-UCL (use when n>=50)	21.9	95% Gamma Adjusted KM-UCL (use when n<50)	22
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Approximate Test Statistic	0.976	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	0.0902	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.0567	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.0591	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	9.745	Mean in Log Scale	-1.821
SD in Original Scale	68.1	SD in Log Scale	3.115
95% t UCL (assumes normality of ROS data)	16.52	95% Percentile Bootstrap UCL	17.31
95% BCA Bootstrap UCL	22.15	95% Bootstrap t UCL	37.67
95% H-UCL (Log ROS)	47.75		

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-1.781	KM Geo Mean	0.169
KM SD (logged)	3.015	95% Critical H Value (KM-Log)	4.315
KM Standard Error of Mean (logged)	0.183	95% H-UCL (KM -Log)	34.82
KM SD (logged)	3.015	95% Critical H Value (KM-Log)	4.315
KM Standard Error of Mean (logged)	0.183		

DL/2 Statistics			
DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	9.745	Mean in Log Scale	-1.725
SD in Original Scale	68.1	SD in Log Scale	2.953
95% t UCL (Assumes normality)	16.52	95% H-Stat UCL	29.74

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Lognormal Distributed at 5% Significance Level

Suggested UCL to Use

KM H-UCL	34.82		

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

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General Statistics

Total Number of Observations	275	Number of Distinct Observations	129
		Number of Missing Observations	37
Number of Detects	193	Number of Non-Detects	82
Number of Distinct Detects	124	Number of Distinct Non-Detects	7
Minimum Detect	0.0023	Minimum Non-Detect	0.002
Maximum Detect	210	Maximum Non-Detect	0.019
Variance Detects	283.9	Percent Non-Detects	29.82%
Mean Detects	3.467	SD Detects	16.85
Median Detects	0.2	CV Detects	4.86
Skewness Detects	10.27	Kurtosis Detects	120.3
Mean of Logged Detects	-1.293	SD of Logged Detects	2.15

Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.223	**Normal GOF Test on Detected Observations Only**	
5% Shapiro Wilk P Value	0	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.419	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.0642	Detected Data Not Normal at 5% Significance Level	

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	2.434	KM Standard Error of Mean	0.857
KM SD	14.17	95% KM (BCA) UCL	3.97

95% KM (t) UCL	3.848	95% KM (Percentile Bootstrap) UCL	4.007
95% KM (z) UCL	3.843	95% KM Bootstrap t UCL	6.251
90% KM Chebyshev UCL	5.004	95% KM Chebyshev UCL	6.168
97.5% KM Chebyshev UCL	7.783	99% KM Chebyshev UCL	10.96
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	15.45	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.881	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.221	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.0715	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.276	k star (bias corrected MLE)	0.275
Theta hat (MLE)	12.57	Theta star (bias corrected MLE)	12.61
nu hat (MLE)	106.4	nu star (bias corrected)	106.1
Mean (detects)	3.467		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.0023	Mean	2.436
Maximum	210	Median	0.077
SD	14.19	CV	5.827
k hat (MLE)	0.227	k star (bias corrected MLE)	0.227
Theta hat (MLE)	10.71	Theta star (bias corrected MLE)	10.71
nu hat (MLE)	125.1	nu star (bias corrected)	125.1
Adjusted Level of Significance (β)	0.0491		
Approximate Chi Square Value (125.06, α)	100.2	Adjusted Chi Square Value (125.06, β)	100.1
95% Gamma Approximate UCL (use when n>=50)	3.039	95% Gamma Adjusted UCL (use when n<50)	3.043
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	2.434	SD (KM)	14.17
Variance (KM)	200.7	SE of Mean (KM)	0.857
k hat (KM)	0.0295	k star (KM)	0.0316
nu hat (KM)	16.23	nu star (KM)	17.39
theta hat (KM)	82.47	theta star (KM)	76.98
80% gamma percentile (KM)	0.0382	90% gamma percentile (KM)	1.616
95% gamma percentile (KM)	9.877	99% gamma percentile (KM)	61.94
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (17.39, α)	8.95	Adjusted Chi Square Value (17.39, β)	8.918
95% Gamma Approximate KM-UCL (use when n>=50)	4.728	95% Gamma Adjusted KM-UCL (use when n<50)	4.745
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Approximate Test Statistic	0.974	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	0.0716	Detected Data appear Lognormal at 5% Significance Level	

Lilliefors Test Statistic	0.0702	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.0642	Detected Data Not Lognormal at 5% Significance Level	
Detected Data appear Approximate Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	2.434	Mean in Log Scale	-2.745
SD in Original Scale	14.19	SD in Log Scale	2.965
95% t UCL (assumes normality of ROS data)	3.847	95% Percentile Bootstrap UCL	4.012
95% BCA Bootstrap UCL	4.731	95% Bootstrap t UCL	5.941
95% H-UCL (Log ROS)	11.17		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-2.68	KM Geo Mean	0.0686
KM SD (logged)	2.803	95% Critical H Value (KM-Log)	4.058
KM Standard Error of Mean (logged)	0.172	95% H-UCL (KM -Log)	6.928
KM SD (logged)	2.803	95% Critical H Value (KM-Log)	4.058
KM Standard Error of Mean (logged)	0.172		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	2.435	Mean in Log Scale	-2.524
SD in Original Scale	14.19	SD in Log Scale	2.658
95% t UCL (Assumes normality)	3.847	95% H-Stat UCL	5.113
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Approximate Lognormal Distributed at 5% Significance Level			
Suggested UCL to Use			
KM H-UCL	6.928		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Chrysene			
General Statistics			
Total Number of Observations	275	Number of Distinct Observations	167
		Number of Missing Observations	37
Number of Detects	225	Number of Non-Detects	50
Number of Distinct Detects	157	Number of Distinct Non-Detects	13
Minimum Detect	0.0014	Minimum Non-Detect	0.0013
Maximum Detect	500	Maximum Non-Detect	0.011
Variance Detects	1753	Percent Non-Detects	18.18%
Mean Detects	7.802	SD Detects	41.87
Median Detects	0.33	CV Detects	5.366
Skewness Detects	9.574	Kurtosis Detects	101.2
Mean of Logged Detects	-1.047	SD of Logged Detects	2.449

Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.201	**Normal GOF Test on Detected Observations Only**	
5% Shapiro Wilk P Value	0	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.426	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.0595	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	6.384	KM Standard Error of Mean	2.291
KM SD	37.91	95% KM (BCA) UCL	10.73
95% KM (t) UCL	10.17	95% KM (Percentile Bootstrap) UCL	10.33
95% KM (z) UCL	10.15	95% KM Bootstrap t UCL	16.1
90% KM Chebyshev UCL	13.26	95% KM Chebyshev UCL	16.37
97.5% KM Chebyshev UCL	20.69	99% KM Chebyshev UCL	29.18
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	19.08	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.904	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.232	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.0671	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.232	k star (bias corrected MLE)	0.232
Theta hat (MLE)	33.66	Theta star (bias corrected MLE)	33.68
nu hat (MLE)	104.3	nu star (bias corrected)	104.3
Mean (detects)	7.802		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.0014	Mean	6.386
Maximum	500	Median	0.17
SD	37.97	CV	5.947
k hat (MLE)	0.206	k star (bias corrected MLE)	0.207
Theta hat (MLE)	30.94	Theta star (bias corrected MLE)	30.91
nu hat (MLE)	113.5	nu star (bias corrected)	113.6
Adjusted Level of Significance (β)	0.0491		
Approximate Chi Square Value (113.62, α)	90.01	Adjusted Chi Square Value (113.62, β)	89.9
95% Gamma Approximate UCL (use when n>=50)	8.06	95% Gamma Adjusted UCL (use when n<50)	8.07
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	6.384	SD (KM)	37.91
Variance (KM)	1437	SE of Mean (KM)	2.291
k hat (KM)	0.0284	k star (KM)	0.0305
nu hat (KM)	15.6	nu star (KM)	16.76

theta hat (KM)	225.1	theta star (KM)	209.4
80% gamma percentile (KM)	0.0798	90% gamma percentile (KM)	3.87
95% gamma percentile (KM)	25.08	99% gamma percentile (KM)	164.1
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (16.76, α)	8.505	Adjusted Chi Square Value (16.76, β)	8.474
95% Gamma Approximate KM-UCL (use when n>=50)	12.59	95% Gamma Adjusted KM-UCL (use when n<50)	12.63
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Approximate Test Statistic	0.978	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	0.155	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.0568	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.0595	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	6.384	Mean in Log Scale	-2
SD in Original Scale	37.97	SD in Log Scale	3.035
95% t UCL (assumes normality of ROS data)	10.16	95% Percentile Bootstrap UCL	10.56
95% BCA Bootstrap UCL	12.62	95% Bootstrap t UCL	18.12
95% H-UCL (Log ROS)	30.05		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-2.015	KM Geo Mean	0.133
KM SD (logged)	3.024	95% Critical H Value (KM-Log)	4.327
KM Standard Error of Mean (logged)	0.184	95% H-UCL (KM -Log)	28.48
KM SD (logged)	3.024	95% Critical H Value (KM-Log)	4.327
KM Standard Error of Mean (logged)	0.184		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	6.384	Mean in Log Scale	-1.933
SD in Original Scale	37.97	SD in Log Scale	2.931
95% t UCL (Assumes normality)	10.16	95% H-Stat UCL	22.4
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Lognormal Distributed at 5% Significance Level			
Suggested UCL to Use			
KM H-UCL	28.48		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
BenzoAPyrene			
General Statistics			

ProUCL Output
Main Plant Area Soil (0-12 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Total Number of Observations	275	Number of Distinct Observations	152
		Number of Missing Observations	37
Number of Detects	217	Number of Non-Detects	58
Number of Distinct Detects	148	Number of Distinct Non-Detects	6
Minimum Detect	0.0015	Minimum Non-Detect	0.0014
Maximum Detect	450	Maximum Non-Detect	0.012
Variance Detects	1082	Percent Non-Detects	21.09%
Mean Detects	5.972	SD Detects	32.9
Median Detects	0.3	CV Detects	5.509
Skewness Detects	11.84	Kurtosis Detects	156
Mean of Logged Detects	-1.121	SD of Logged Detects	2.377
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.194	**Normal GOF Test on Detected Observations Only**	
5% Shapiro Wilk P Value	0	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.428	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.0606	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	4.713	KM Standard Error of Mean	1.768
KM SD	29.26	95% KM (BCA) UCL	9.06
95% KM (t) UCL	7.632	95% KM (Percentile Bootstrap) UCL	7.862
95% KM (z) UCL	7.622	95% KM Bootstrap t UCL	13.24
90% KM Chebyshev UCL	10.02	95% KM Chebyshev UCL	12.42
97.5% KM Chebyshev UCL	15.76	99% KM Chebyshev UCL	22.31
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	17.09	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.897	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.224	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.0679	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.245	k star (bias corrected MLE)	0.245
Theta hat (MLE)	24.38	Theta star (bias corrected MLE)	24.41
nu hat (MLE)	106.3	nu star (bias corrected)	106.2
Mean (detects)	5.972		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.0015	Mean	4.715
Maximum	450	Median	0.14
SD	29.31	CV	6.218
k hat (MLE)	0.214	k star (bias corrected MLE)	0.214

Theta hat (MLE)	22.05	Theta star (bias corrected MLE)	22.05
nu hat (MLE)	117.6	nu star (bias corrected)	117.6
Adjusted Level of Significance (β)	0.0491		
Approximate Chi Square Value (117.62, α)	93.58	Adjusted Chi Square Value (117.62, β)	93.47
95% Gamma Approximate UCL (use when n>=50)	5.926	95% Gamma Adjusted UCL (use when n<50)	5.933
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	4.713	SD (KM)	29.26
Variance (KM)	856.1	SE of Mean (KM)	1.768
k hat (KM)	0.0259	k star (KM)	0.0281
nu hat (KM)	14.27	nu star (KM)	15.45
theta hat (KM)	181.7	theta star (KM)	167.8
80% gamma percentile (KM)	0.0342	90% gamma percentile (KM)	2.294
95% gamma percentile (KM)	17.09	99% gamma percentile (KM)	123.8
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (15.45, α)	7.574	Adjusted Chi Square Value (15.45, β)	7.544
95% Gamma Approximate KM-UCL (use when n>=50)	9.612	95% Gamma Adjusted KM-UCL (use when n<50)	9.65
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Approximate Test Statistic	0.977	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	0.125	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.0641	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.0606	Detected Data Not Lognormal at 5% Significance Level	
Detected Data appear Approximate Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	4.713	Mean in Log Scale	-2.23
SD in Original Scale	29.31	SD in Log Scale	3.068
95% t UCL (assumes normality of ROS data)	7.63	95% Percentile Bootstrap UCL	8.01
95% BCA Bootstrap UCL	10.05	95% Bootstrap t UCL	12.99
95% H-UCL (Log ROS)	26.83		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-2.213	KM Geo Mean	0.109
KM SD (logged)	2.993	95% Critical H Value (KM-Log)	4.289
KM Standard Error of Mean (logged)	0.182	95% H-UCL (KM -Log)	20.96
KM SD (logged)	2.993	95% Critical H Value (KM-Log)	4.289
KM Standard Error of Mean (logged)	0.182		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	4.713	Mean in Log Scale	-2.131
SD in Original Scale	29.31	SD in Log Scale	2.909
95% t UCL (Assumes normality)	7.631	95% H-Stat UCL	17.03
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Approximate Lognormal Distributed at 5% Significance Level			

Suggested UCL to Use			
KM H-UCL	20.96		

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

DibenzAHAnthracene

General Statistics			
Total Number of Observations	275	Number of Distinct Observations	120
		Number of Missing Observations	37
Number of Detects	160	Number of Non-Detects	115
Number of Distinct Detects	115	Number of Distinct Non-Detects	11
Minimum Detect	0.0016	Minimum Non-Detect	0.0015
Maximum Detect	28	Maximum Non-Detect	6.3
Variance Detects	13.46	Percent Non-Detects	41.82%
Mean Detects	1.311	SD Detects	3.669
Median Detects	0.135	CV Detects	2.797
Skewness Detects	5.039	Kurtosis Detects	28.87
Mean of Logged Detects	-1.671	SD of Logged Detects	1.984

Normal GOF Test on Detects Only		
Shapiro Wilk Test Statistic	0.399	**Normal GOF Test on Detected Observations Only**
5% Shapiro Wilk P Value	0	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.361	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.0704	Detected Data Not Normal at 5% Significance Level
Detected Data Not Normal at 5% Significance Level		

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.766	KM Standard Error of Mean	0.173
KM SD	2.863	95% KM (BCA) UCL	1.052
95% KM (t) UCL	1.051	95% KM (Percentile Bootstrap) UCL	1.077
95% KM (z) UCL	1.05	95% KM Bootstrap t UCL	1.177
90% KM Chebyshev UCL	1.285	95% KM Chebyshev UCL	1.521
97.5% KM Chebyshev UCL	1.847	99% KM Chebyshev UCL	2.489

Gamma GOF Tests on Detected Observations Only		
A-D Test Statistic	9.515	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.857	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.19	**Kolmogorov-Smirnov GOF**
5% K-S Critical Value	0.0798	Detected Data Not Gamma Distributed at 5% Significance Level
Detected Data Not Gamma Distributed at 5% Significance Level		

Gamma Statistics on Detected Data Only			
k hat (MLE)	0.347	k star (bias corrected MLE)	0.344
Theta hat (MLE)	3.781	Theta star (bias corrected MLE)	3.807
nu hat (MLE)	111	nu star (bias corrected)	110.2
Mean (detects)	1.311		

Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.0016	Mean	0.767
Maximum	28	Median	0.025
SD	2.868	CV	3.738
k hat (MLE)	0.267	k star (bias corrected MLE)	0.266
Theta hat (MLE)	2.874	Theta star (bias corrected MLE)	2.879
nu hat (MLE)	146.8	nu star (bias corrected)	146.5
Adjusted Level of Significance (β)	0.0491		
Approximate Chi Square Value (146.55, α)	119.6	Adjusted Chi Square Value (146.55, β)	119.4
95% Gamma Approximate UCL (use when n>=50)	0.94	95% Gamma Adjusted UCL (use when n<50)	0.941
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.766	SD (KM)	2.863
Variance (KM)	8.2	SE of Mean (KM)	0.173
k hat (KM)	0.0715	k star (KM)	0.0731
nu hat (KM)	39.31	nu star (KM)	40.21
theta hat (KM)	10.71	theta star (KM)	10.47
80% gamma percentile (KM)	0.302	90% gamma percentile (KM)	1.707
95% gamma percentile (KM)	4.424	99% gamma percentile (KM)	14.14
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (40.21, α)	26.68	Adjusted Chi Square Value (40.21, β)	26.62
95% Gamma Approximate KM-UCL (use when n>=50)	1.154	95% Gamma Adjusted KM-UCL (use when n<50)	1.156
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Approximate Test Statistic	0.969	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	0.0351	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.0834	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.0704	Detected Data Not Lognormal at 5% Significance Level	
Detected Data Not Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.765	Mean in Log Scale	-3.629
SD in Original Scale	2.868	SD in Log Scale	2.939
95% t UCL (assumes normality of ROS data)	1.05	95% Percentile Bootstrap UCL	1.071
95% BCA Bootstrap UCL	1.134	95% Bootstrap t UCL	1.215
95% H-UCL (Log ROS)	4.215		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-3.559	KM Geo Mean	0.0285
KM SD (logged)	2.733	95% Critical H Value (KM-Log)	3.975
KM Standard Error of Mean (logged)	0.171	95% H-UCL (KM -Log)	2.297
KM SD (logged)	2.733	95% Critical H Value (KM-Log)	3.975
KM Standard Error of Mean (logged)	0.171		

DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.777	Mean in Log Scale	-3.193
SD in Original Scale	2.871	SD in Log Scale	2.486
95% t UCL (Assumes normality)	1.063	95% H-Stat UCL	1.569
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution at 5% Significance Level			
Suggested UCL to Use			
95% KM (Chebyshev) UCL	1.521		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
BenzoAAnthracene			
General Statistics			
Total Number of Observations	275	Number of Distinct Observations	135
		Number of Missing Observations	37
Number of Detects	201	Number of Non-Detects	74
Number of Distinct Detects	130	Number of Distinct Non-Detects	9
Minimum Detect	0.0013	Minimum Non-Detect	0.0012
Maximum Detect	400	Maximum Non-Detect	0.033
Variance Detects	984.7	Percent Non-Detects	26.91%
Mean Detects	6.04	SD Detects	31.38
Median Detects	0.26	CV Detects	5.196
Skewness Detects	10.56	Kurtosis Detects	127
Mean of Logged Detects	-1.079	SD of Logged Detects	2.359
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.21	**Normal GOF Test on Detected Observations Only**	
5% Shapiro Wilk P Value	0	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.424	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.0629	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	4.416	KM Standard Error of Mean	1.626
KM SD	26.89	95% KM (BCA) UCL	7.746
95% KM (t) UCL	7.099	95% KM (Percentile Bootstrap) UCL	7.237
95% KM (z) UCL	7.09	95% KM Bootstrap t UCL	11.46
90% KM Chebyshev UCL	9.293	95% KM Chebyshev UCL	11.5
97.5% KM Chebyshev UCL	14.57	99% KM Chebyshev UCL	20.59
Gamma GOF Tests on Detected Observations Only			

A-D Test Statistic	16.79	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.896	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.226	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.0699	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.247	k star (bias corrected MLE)	0.247
Theta hat (MLE)	24.43	Theta star (bias corrected MLE)	24.46
nu hat (MLE)	99.4	nu star (bias corrected)	99.25
Mean (detects)	6.04		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.0013	Mean	4.417
Maximum	400	Median	0.12
SD	26.94	CV	6.1
k hat (MLE)	0.208	k star (bias corrected MLE)	0.208
Theta hat (MLE)	21.22	Theta star (bias corrected MLE)	21.21
nu hat (MLE)	114.5	nu star (bias corrected)	114.6
Adjusted Level of Significance (β)	0.0491		
Approximate Chi Square Value (114.56, α)	90.85	Adjusted Chi Square Value (114.56, β)	90.74
95% Gamma Approximate UCL (use when n>=50)	5.57	95% Gamma Adjusted UCL (use when n<50)	5.577
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	4.416	SD (KM)	26.89
Variance (KM)	723.3	SE of Mean (KM)	1.626
k hat (KM)	0.027	k star (KM)	0.0291
nu hat (KM)	14.83	nu star (KM)	16
theta hat (KM)	163.8	theta star (KM)	151.8
80% gamma percentile (KM)	0.0407	90% gamma percentile (KM)	2.368
95% gamma percentile (KM)	16.59	99% gamma percentile (KM)	114.9
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (16.00, α)	7.961	Adjusted Chi Square Value (16.00, β)	7.931
95% Gamma Approximate KM-UCL (use when n>=50)	8.874	95% Gamma Adjusted KM-UCL (use when n<50)	8.907
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Approximate Test Statistic	0.974	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	0.0673	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.0844	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.0629	Detected Data Not Lognormal at 5% Significance Level	
Detected Data appear Approximate Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	4.416	Mean in Log Scale	-2.43

SD in Original Scale	26.94	SD in Log Scale	3.098
95% t UCL (assumes normality of ROS data)	7.097	95% Percentile Bootstrap UCL	7.438
95% BCA Bootstrap UCL	8.765	95% Bootstrap t UCL	11.71
95% H-UCL (Log ROS)	24.38		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-2.429	KM Geo Mean	0.0881
KM SD (logged)	3.045	95% Critical H Value (KM-Log)	4.352
KM Standard Error of Mean (logged)	0.19	95% H-UCL (KM -Log)	20.26
KM SD (logged)	3.045	95% Critical H Value (KM-Log)	4.352
KM Standard Error of Mean (logged)	0.19		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	4.418	Mean in Log Scale	-2.126
SD in Original Scale	26.94	SD in Log Scale	2.745
95% t UCL (Assumes normality)	7.099	95% H-Stat UCL	9.99
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Approximate Lognormal Distributed at 5% Significance Level			
Suggested UCL to Use			
KM H-UCL	20.26		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Cyanide			
General Statistics			
Total Number of Observations	274	Number of Distinct Observations	107
		Number of Missing Observations	39
Number of Detects	186	Number of Non-Detects	88
Number of Distinct Detects	101	Number of Distinct Non-Detects	24
Minimum Detect	0.017	Minimum Non-Detect	0.014
Maximum Detect	15.3	Maximum Non-Detect	0.072
Variance Detects	1.436	Percent Non-Detects	32.12%
Mean Detects	0.277	SD Detects	1.198
Median Detects	0.0675	CV Detects	4.325
Skewness Detects	11.02	Kurtosis Detects	135.6
Mean of Logged Detects	-2.508	SD of Logged Detects	1.198
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.216	**Normal GOF Test on Detected Observations Only**	
5% Shapiro Wilk P Value	0	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.414	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.0654	Detected Data Not Normal at 5% Significance Level	

Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.194	KM Standard Error of Mean	0.0601
KM SD	0.992	95% KM (BCA) UCL	0.311
95% KM (t) UCL	0.294	95% KM (Percentile Bootstrap) UCL	0.305
95% KM (z) UCL	0.293	95% KM Bootstrap t UCL	0.47
90% KM Chebyshev UCL	0.375	95% KM Chebyshev UCL	0.456
97.5% KM Chebyshev UCL	0.57	99% KM Chebyshev UCL	0.792
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	19.6	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.819	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.273	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.0711	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.516	k star (bias corrected MLE)	0.512
Theta hat (MLE)	0.537	Theta star (bias corrected MLE)	0.542
nu hat (MLE)	192.1	nu star (bias corrected)	190.3
Mean (detects)	0.277		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	0.191
Maximum	15.3	Median	0.036
SD	0.994	CV	5.198
k hat (MLE)	0.426	k star (bias corrected MLE)	0.424
Theta hat (MLE)	0.449	Theta star (bias corrected MLE)	0.451
nu hat (MLE)	233.7	nu star (bias corrected)	232.5
Adjusted Level of Significance (β)	0.0491		
Approximate Chi Square Value (232.47, α)	198.2	Adjusted Chi Square Value (232.47, β)	198
95% Gamma Approximate UCL (use when n>=50)	0.224	95% Gamma Adjusted UCL (use when n<50)	0.225
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.194	SD (KM)	0.992
Variance (KM)	0.984	SE of Mean (KM)	0.0601
k hat (KM)	0.0384	k star (KM)	0.0404
nu hat (KM)	21.06	nu star (KM)	22.16
theta hat (KM)	5.06	theta star (KM)	4.808
80% gamma percentile (KM)	0.0112	90% gamma percentile (KM)	0.215
95% gamma percentile (KM)	0.939	99% gamma percentile (KM)	4.578
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (22.16, α)	12.46	Adjusted Chi Square Value (22.16, β)	12.42

95% Gamma Approximate KM-UCL (use when n>=50)	0.346	95% Gamma Adjusted KM-UCL (use when n<50)	0.347
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Approximate Test Statistic	0.902	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	0	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.116	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.0654	Detected Data Not Lognormal at 5% Significance Level	
Detected Data Not Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.192	Mean in Log Scale	-3.216
SD in Original Scale	0.994	SD in Log Scale	1.502
95% t UCL (assumes normality of ROS data)	0.291	95% Percentile Bootstrap UCL	0.3
95% BCA Bootstrap UCL	0.378	95% Bootstrap t UCL	0.473
95% H-UCL (Log ROS)	0.157		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-2.996	KM Geo Mean	0.05
KM SD (logged)	1.236	95% Critical H Value (KM-Log)	2.338
KM Standard Error of Mean (logged)	0.076	95% H-UCL (KM -Log)	0.128
KM SD (logged)	1.236	95% Critical H Value (KM-Log)	2.338
KM Standard Error of Mean (logged)	0.076		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.194	Mean in Log Scale	-3.045
SD in Original Scale	0.994	SD in Log Scale	1.31
95% t UCL (Assumes normality)	0.293	95% H-Stat UCL	0.136
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution at 5% Significance Level			
Suggested UCL to Use			
95% KM (Chebyshev) UCL	0.456		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Aluminum			
General Statistics			
Total Number of Observations	275	Number of Distinct Observations	216
		Number of Missing Observations	37
Minimum	2840	Mean	12391
Maximum	102000	Median	9430
SD	12406	Std. Error of Mean	748.1

Coefficient of Variation	1.001	Skewness	5.103
Normal GOF Test			
Shapiro Wilk Test Statistic	0.475	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	0	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.265	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.0538	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	13625	95% Adjusted-CLT UCL (Chen-1995)	13867
		95% Modified-t UCL (Johnson-1978)	13664
Gamma GOF Test			
A-D Test Statistic	14.82	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.761	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.151	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.0554	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	2.728	k star (bias corrected MLE)	2.701
Theta hat (MLE)	4541	Theta star (bias corrected MLE)	4587
nu hat (MLE)	1501	nu star (bias corrected)	1486
MLE Mean (bias corrected)	12391	MLE Sd (bias corrected)	7539
		Approximate Chi Square Value (0.05)	1397
Adjusted Level of Significance	0.0491	Adjusted Chi Square Value	1397
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	13176	95% Adjusted Gamma UCL (use when n<50)	13180
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.894	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk P Value	0	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.101	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.0538	Data Not Lognormal at 5% Significance Level	
Data Not Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	7.952	Mean of logged Data	9.23
Maximum of Logged Data	11.53	SD of logged Data	0.531
Assuming Lognormal Distribution			
95% H-UCL	12455	90% Chebyshev (MVUE) UCL	12947
95% Chebyshev (MVUE) UCL	13492	97.5% Chebyshev (MVUE) UCL	14249
99% Chebyshev (MVUE) UCL	15735		
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution (0.05)			

Nonparametric Distribution Free UCLs			
95% CLT UCL	13621	95% Jackknife UCL	13625
95% Standard Bootstrap UCL	13604	95% Bootstrap-t UCL	14054
95% Hall's Bootstrap UCL	13941	95% Percentile Bootstrap UCL	13619
95% BCA Bootstrap UCL	13988		
90% Chebyshev(Mean, Sd) UCL	14635	95% Chebyshev(Mean, Sd) UCL	15652
97.5% Chebyshev(Mean, Sd) UCL	17063	99% Chebyshev(Mean, Sd) UCL	19834
Suggested UCL to Use			
95% Chebyshev (Mean, Sd) UCL	15652		

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Iron

General Statistics			
Total Number of Observations	275	Number of Distinct Observations	123
		Number of Missing Observations	37
Minimum	4860	Mean	13140
Maximum	43800	Median	13100
SD	3448	Std. Error of Mean	207.9
Coefficient of Variation	0.262	Skewness	2.698
Normal GOF Test			
Shapiro Wilk Test Statistic	0.887	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	0	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.0875	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.0538	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	13483	95% Adjusted-CLT UCL (Chen-1995)	13518
		95% Modified-t UCL (Johnson-1978)	13488
Gamma GOF Test			
A-D Test Statistic	1.009	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.752	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.055	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.0549	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	16.86	k star (bias corrected MLE)	16.68
Theta hat (MLE)	779.4	Theta star (bias corrected MLE)	787.8

nu hat (MLE)	9273	nu star (bias corrected)	9173
MLE Mean (bias corrected)	13140	MLE Sd (bias corrected)	3217
		Approximate Chi Square Value (0.05)	8951
Adjusted Level of Significance	0.0491	Adjusted Chi Square Value	8950
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	13465	95% Adjusted Gamma UCL (use when n<50)	13467
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.986	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk P Value	0.721	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.0565	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.0538	Data Not Lognormal at 5% Significance Level	
Data appear Approximate Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	8.489	Mean of logged Data	9.453
Maximum of Logged Data	10.69	SD of logged Data	0.244
Assuming Lognormal Distribution			
95% H-UCL	13468	90% Chebyshev (MVUE) UCL	13722
95% Chebyshev (MVUE) UCL	13988	97.5% Chebyshev (MVUE) UCL	14357
99% Chebyshev (MVUE) UCL	15082		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	13482	95% Jackknife UCL	13483
95% Standard Bootstrap UCL	13484	95% Bootstrap-t UCL	13538
95% Hall's Bootstrap UCL	13543	95% Percentile Bootstrap UCL	13478
95% BCA Bootstrap UCL	13518		
90% Chebyshev(Mean, Sd) UCL	13763	95% Chebyshev(Mean, Sd) UCL	14046
97.5% Chebyshev(Mean, Sd) UCL	14438	99% Chebyshev(Mean, Sd) UCL	15209
Suggested UCL to Use			
95% Student's-t UCL	13483	or 95% Modified-t UCL	13488
or 95% H-UCL	13468		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
ProUCL computes and outputs H-statistic based UCLs for historical reasons only.			
H-statistic often results in unstable (both high and low) values of UCL95 as shown in examples in the Technical Guide.			
It is therefore recommended to avoid the use of H-statistic based 95% UCLs.			
Use of nonparametric methods are preferred to compute UCL95 for skewed data sets which do not follow a gamma distribution.			

Manganese			
General Statistics			
Total Number of Observations	275	Number of Distinct Observations	185
		Number of Missing Observations	37
Minimum	73.4	Mean	387
Maximum	1270	Median	365
SD	131.1	Std. Error of Mean	7.903
Coefficient of Variation	0.339	Skewness	1.9
Normal GOF Test			
Shapiro Wilk Test Statistic	0.897	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	0	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.135	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.0538	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	400	95% Adjusted-CLT UCL (Chen-1995)	400.9
		95% Modified-t UCL (Johnson-1978)	400.2
Gamma GOF Test			
A-D Test Statistic	3.003	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.754	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.0909	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.055	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	9.912	k star (bias corrected MLE)	9.806
Theta hat (MLE)	39.04	Theta star (bias corrected MLE)	39.46
nu hat (MLE)	5452	nu star (bias corrected)	5394
MLE Mean (bias corrected)	387	MLE Sd (bias corrected)	123.6
		Approximate Chi Square Value (0.05)	5224
Adjusted Level of Significance	0.0491	Adjusted Chi Square Value	5223
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	399.5	95% Adjusted Gamma UCL (use when n<50)	399.6
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.974	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk P Value	0.0292	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.086	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.0538	Data Not Lognormal at 5% Significance Level	
Data Not Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	4.296	Mean of logged Data	5.907
Maximum of Logged Data	7.147	SD of logged Data	0.323

Assuming Lognormal Distribution			
95% H-UCL	400.5	90% Chebyshev (MVUE) UCL	410.4
95% Chebyshev (MVUE) UCL	420.9	97.5% Chebyshev (MVUE) UCL	435.4
99% Chebyshev (MVUE) UCL	464.1		
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution (0.05)			
Nonparametric Distribution Free UCLs			
95% CLT UCL	400	95% Jackknife UCL	400
95% Standard Bootstrap UCL	400.1	95% Bootstrap-t UCL	400.6
95% Hall's Bootstrap UCL	401.3	95% Percentile Bootstrap UCL	400.6
95% BCA Bootstrap UCL	400.9		
90% Chebyshev(Mean, Sd) UCL	410.7	95% Chebyshev(Mean, Sd) UCL	421.4
97.5% Chebyshev(Mean, Sd) UCL	436.3	99% Chebyshev(Mean, Sd) UCL	465.6
Suggested UCL to Use			
95% Student's-t UCL	400	or 95% Modified-t UCL	400.2

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Mercury

General Statistics			
Total Number of Observations	275	Number of Distinct Observations	40
		Number of Missing Observations	37
Number of Detects	234	Number of Non-Detects	41
Number of Distinct Detects	36	Number of Distinct Non-Detects	10
Minimum Detect	0.0094	Minimum Non-Detect	0.0093
Maximum Detect	0.27	Maximum Non-Detect	0.021
Variance Detects	4.0002E-4	Percent Non-Detects	14.91%
Mean Detects	0.0213	SD Detects	0.02
Median Detects	0.018	CV Detects	0.938
Skewness Detects	9.38	Kurtosis Detects	108
Mean of Logged Detects	-3.973	SD of Logged Detects	0.412
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.379	**Normal GOF Test on Detected Observations Only**	
5% Shapiro Wilk P Value	0	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.277	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.0583	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.0197	KM Standard Error of Mean	0.00114
KM SD	0.0188	95% KM (BCA) UCL	0.0218

95% KM (t) UCL	0.0215	95% KM (Percentile Bootstrap) UCL	0.0217
95% KM (z) UCL	0.0215	95% KM Bootstrap t UCL	0.0232
90% KM Chebyshev UCL	0.0231	95% KM Chebyshev UCL	0.0246
97.5% KM Chebyshev UCL	0.0268	99% KM Chebyshev UCL	0.031
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	4.274E+28	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.757	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.158	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.06	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	4.164	k star (bias corrected MLE)	4.114
Theta hat (MLE)	0.00512	Theta star (bias corrected MLE)	0.00518
nu hat (MLE)	1949	nu star (bias corrected)	1925
Mean (detects)	0.0213		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.0094	Mean	0.0196
Maximum	0.27	Median	0.016
SD	0.0189	CV	0.961
k hat (MLE)	3.822	k star (bias corrected MLE)	3.783
Theta hat (MLE)	0.00514	Theta star (bias corrected MLE)	0.00519
nu hat (MLE)	2102	nu star (bias corrected)	2081
Adjusted Level of Significance (β)	0.0491		
Approximate Chi Square Value (N/A, α)	1976	Adjusted Chi Square Value (N/A, β)	1975
95% Gamma Approximate UCL (use when n>=50)	0.0207	95% Gamma Adjusted UCL (use when n<50)	0.0207
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.0197	SD (KM)	0.0188
Variance (KM)	3.5501E-4	SE of Mean (KM)	0.00114
k hat (KM)	1.088	k star (KM)	1.079
nu hat (KM)	598.6	nu star (KM)	593.4
theta hat (KM)	0.0181	theta star (KM)	0.0182
80% gamma percentile (KM)	0.0314	90% gamma percentile (KM)	0.0444
95% gamma percentile (KM)	0.0573	99% gamma percentile (KM)	0.0871
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (593.40, α)	537.9	Adjusted Chi Square Value (593.40, β)	537.6
95% Gamma Approximate KM-UCL (use when n>=50)	0.0217	95% Gamma Adjusted KM-UCL (use when n<50)	0.0217
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Approximate Test Statistic	0.879	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	0	Detected Data Not Lognormal at 5% Significance Level	

Lilliefors Test Statistic	0.116	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.0583	Detected Data Not Lognormal at 5% Significance Level	
Detected Data Not Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.0194	Mean in Log Scale	-4.09
SD in Original Scale	0.019	SD in Log Scale	0.479
95% t UCL (assumes normality of ROS data)	0.0213	95% Percentile Bootstrap UCL	0.0214
95% BCA Bootstrap UCL	0.0221	95% Bootstrap t UCL	0.0231
95% H-UCL (Log ROS)	0.0198		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-4.066	KM Geo Mean	0.0171
KM SD (logged)	0.441	95% Critical H Value (KM-Log)	1.769
KM Standard Error of Mean (logged)	0.0268	95% H-UCL (KM -Log)	0.0198
KM SD (logged)	0.441	95% Critical H Value (KM-Log)	1.769
KM Standard Error of Mean (logged)	0.0268		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.019	Mean in Log Scale	-4.143
SD in Original Scale	0.0192	SD in Log Scale	0.56
95% t UCL (Assumes normality)	0.021	95% H-Stat UCL	0.0197
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution at 5% Significance Level			
Suggested UCL to Use			
95% KM (t) UCL	0.0215	KM H-UCL	0.0198
95% KM (BCA) UCL	0.0218		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Nickel			
General Statistics			
Total Number of Observations	275	Number of Distinct Observations	132
		Number of Missing Observations	37
Minimum	4.5	Mean	19.77
Maximum	754	Median	11.3
SD	50.47	Std. Error of Mean	3.043
Coefficient of Variation	2.552	Skewness	11.94
Normal GOF Test			
Shapiro Wilk Test Statistic	0.228	**Shapiro Wilk GOF Test**	

5% Shapiro Wilk P Value	0	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.384	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.0538	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	24.8	95% Adjusted-CLT UCL (Chen-1995)	27.12
		95% Modified-t UCL (Johnson-1978)	25.16
Gamma GOF Test			
A-D Test Statistic	3.636E+28	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.775	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.298	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.0562	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	1.363	k star (bias corrected MLE)	1.351
Theta hat (MLE)	14.51	Theta star (bias corrected MLE)	14.64
nu hat (MLE)	749.8	nu star (bias corrected)	742.9
MLE Mean (bias corrected)	19.77	MLE Sd (bias corrected)	17.01
		Approximate Chi Square Value (0.05)	680.7
Adjusted Level of Significance	0.0491	Adjusted Chi Square Value	680.4
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	21.58	95% Adjusted Gamma UCL (use when n<50)	21.59
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.753	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk P Value	0	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.208	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.0538	Data Not Lognormal at 5% Significance Level	
Data Not Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	1.504	Mean of logged Data	2.575
Maximum of Logged Data	6.625	SD of logged Data	0.631
Assuming Lognormal Distribution			
95% H-UCL	17.2	90% Chebyshev (MVUE) UCL	17.99
95% Chebyshev (MVUE) UCL	18.9	97.5% Chebyshev (MVUE) UCL	20.15
99% Chebyshev (MVUE) UCL	22.61		
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution (0.05)			
Nonparametric Distribution Free UCLs			
95% CLT UCL	24.78	95% Jackknife UCL	24.8
95% Standard Bootstrap UCL	24.74	95% Bootstrap-t UCL	31.62

95% Hall's Bootstrap UCL	44.08	95% Percentile Bootstrap UCL	25.36
95% BCA Bootstrap UCL	29.55		
90% Chebyshev(Mean, Sd) UCL	28.9	95% Chebyshev(Mean, Sd) UCL	33.04
97.5% Chebyshev(Mean, Sd) UCL	38.78	99% Chebyshev(Mean, Sd) UCL	50.05
Suggested UCL to Use			
95% Chebyshev (Mean, Sd) UCL	33.04		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Thallium			
General Statistics			
Total Number of Observations	275	Number of Distinct Observations	14
		Number of Missing Observations	37
Number of Detects	5	Number of Non-Detects	270
Number of Distinct Detects	4	Number of Distinct Non-Detects	13
Minimum Detect	0.13	Minimum Non-Detect	0.098
Maximum Detect	2.2	Maximum Non-Detect	0.26
Variance Detects	0.841	Percent Non-Detects	98.18%
Mean Detects	0.56	SD Detects	0.917
Median Detects	0.15	CV Detects	1.638
Skewness Detects	2.232	Kurtosis Detects	4.986
Mean of Logged Detects	-1.37	SD of Logged Detects	1.217
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.574	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.762	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.457	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.343	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.107	KM Standard Error of Mean	0.00855
KM SD	0.127	95% KM (BCA) UCL	N/A
95% KM (t) UCL	0.121	95% KM (Percentile Bootstrap) UCL	N/A
95% KM (z) UCL	0.121	95% KM Bootstrap t UCL	N/A
90% KM Chebyshev UCL	0.132	95% KM Chebyshev UCL	0.144
97.5% KM Chebyshev UCL	0.16	99% KM Chebyshev UCL	0.192
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	1.107	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.698	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.451	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.367	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			

Gamma Statistics on Detected Data Only			
k hat (MLE)	0.757	k star (bias corrected MLE)	0.436
Theta hat (MLE)	0.74	Theta star (bias corrected MLE)	1.284
nu hat (MLE)	7.567	nu star (bias corrected)	4.36
Mean (detects)	0.56		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	0.02
Maximum	2.2	Median	0.01
SD	0.133	CV	6.652
k hat (MLE)	0.919	k star (bias corrected MLE)	0.912
Theta hat (MLE)	0.0218	Theta star (bias corrected MLE)	0.0219
nu hat (MLE)	505.6	nu star (bias corrected)	501.4
Adjusted Level of Significance (β)	0.0491		
Approximate Chi Square Value (501.39, α)	450.5	Adjusted Chi Square Value (501.39, β)	450.2
95% Gamma Approximate UCL (use when n>=50)	0.0223	95% Gamma Adjusted UCL (use when n<50)	0.0223
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.107	SD (KM)	0.127
Variance (KM)	0.0161	SE of Mean (KM)	0.00855
k hat (KM)	0.71	k star (KM)	0.704
nu hat (KM)	390.3	nu star (KM)	387.3
theta hat (KM)	0.15	theta star (KM)	0.152
80% gamma percentile (KM)	0.175	90% gamma percentile (KM)	0.268
95% gamma percentile (KM)	0.362	99% gamma percentile (KM)	0.589
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (387.33, α)	342.7	Adjusted Chi Square Value (387.33, β)	342.5
95% Gamma Approximate KM-UCL (use when n>=50)	0.121	95% Gamma Adjusted KM-UCL (use when n<50)	0.121
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.657	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.762	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.394	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.343	Detected Data Not Lognormal at 5% Significance Level	
Detected Data Not Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.0125	Mean in Log Scale	-8.463
SD in Original Scale	0.134	SD in Log Scale	2.751
95% t UCL (assumes normality of ROS data)	0.0258	95% Percentile Bootstrap UCL	0.0283
95% BCA Bootstrap UCL	0.038	95% Bootstrap t UCL	0.107
95% H-UCL (Log ROS)	0.018		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			

KM Mean (logged)	-2.303	KM Geo Mean	0.1
KM SD (logged)	0.196	95% Critical H Value (KM-Log)	1.682
KM Standard Error of Mean (logged)	0.0135	95% H-UCL (KM -Log)	0.104
KM SD (logged)	0.196	95% Critical H Value (KM-Log)	1.682
KM Standard Error of Mean (logged)	0.0135		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.0794	Mean in Log Scale	-2.64
SD in Original Scale	0.129	SD in Log Scale	0.272
95% t UCL (Assumes normality)	0.0923	95% H-Stat UCL	0.0762

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution at 5% Significance Level

Suggested UCL to Use

95% KM (Chebyshev) UCL	0.144		

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Antimony

General Statistics

Total Number of Observations	275	Number of Distinct Observations	36
		Number of Missing Observations	37
Number of Detects	15	Number of Non-Detects	260
Number of Distinct Detects	12	Number of Distinct Non-Detects	29
Minimum Detect	0.31	Minimum Non-Detect	0.23
Maximum Detect	3.3	Maximum Non-Detect	0.54
Variance Detects	0.631	Percent Non-Detects	94.55%
Mean Detects	0.812	SD Detects	0.795
Median Detects	0.48	CV Detects	0.978
Skewness Detects	2.648	Kurtosis Detects	7.252
Mean of Logged Detects	-0.467	SD of Logged Detects	0.655

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.62	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.881	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.304	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.22	Detected Data Not Normal at 5% Significance Level	

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	0.264	KM Standard Error of Mean	0.014
KM SD	0.223	95% KM (BCA) UCL	0.295
95% KM (t) UCL	0.287	95% KM (Percentile Bootstrap) UCL	0.29

95% KM (z) UCL	0.287	95% KM Bootstrap t UCL	0.321
90% KM Chebyshev UCL	0.306	95% KM Chebyshev UCL	0.325
97.5% KM Chebyshev UCL	0.351	99% KM Chebyshev UCL	0.403
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	1.33	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.747	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.246	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.224	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	2.086	k star (bias corrected MLE)	1.714
Theta hat (MLE)	0.389	Theta star (bias corrected MLE)	0.474
nu hat (MLE)	62.59	nu star (bias corrected)	51.41
Mean (detects)	0.812		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	0.0537
Maximum	3.3	Median	0.01
SD	0.256	CV	4.764
k hat (MLE)	0.444	k star (bias corrected MLE)	0.442
Theta hat (MLE)	0.121	Theta star (bias corrected MLE)	0.122
nu hat (MLE)	244.4	nu star (bias corrected)	243.1
Adjusted Level of Significance (β)	0.0491		
Approximate Chi Square Value (243.10, α)	208	Adjusted Chi Square Value (243.10, β)	207.8
95% Gamma Approximate UCL (use when n>=50)	0.0628	95% Gamma Adjusted UCL (use when n<50)	0.0629
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.264	SD (KM)	0.223
Variance (KM)	0.0497	SE of Mean (KM)	0.014
k hat (KM)	1.399	k star (KM)	1.386
nu hat (KM)	769.4	nu star (KM)	762.3
theta hat (KM)	0.189	theta star (KM)	0.19
80% gamma percentile (KM)	0.411	90% gamma percentile (KM)	0.56
95% gamma percentile (KM)	0.705	99% gamma percentile (KM)	1.035
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (762.33, α)	699.3	Adjusted Chi Square Value (762.33, β)	698.9
95% Gamma Approximate KM-UCL (use when n>=50)	0.287	95% Gamma Adjusted KM-UCL (use when n<50)	0.288
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.851	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.881	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.193	**Lilliefors GOF Test**	

5% Lilliefors Critical Value	0.22	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Approximate Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.0732	Mean in Log Scale	-4.057
SD in Original Scale	0.255	SD in Log Scale	1.577
95% t UCL (assumes normality of ROS data)	0.0986	95% Percentile Bootstrap UCL	0.102
95% BCA Bootstrap UCL	0.114	95% Bootstrap t UCL	0.122
95% H-UCL (Log ROS)	0.0774		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-1.408	KM Geo Mean	0.245
KM SD (logged)	0.275	95% Critical H Value (KM-Log)	1.705
KM Standard Error of Mean (logged)	0.0178	95% H-UCL (KM -Log)	0.261
KM SD (logged)	0.275	95% Critical H Value (KM-Log)	1.705
KM Standard Error of Mean (logged)	0.0178		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.215	Mean in Log Scale	-1.657
SD in Original Scale	0.232	SD in Log Scale	0.368
95% t UCL (Assumes normality)	0.238	95% H-Stat UCL	0.212
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Approximate Lognormal Distributed at 5% Significance Level			
Suggested UCL to Use			
KM H-UCL	0.261		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Arsenic			
General Statistics			
Total Number of Observations	275	Number of Distinct Observations	56
		Number of Missing Observations	37
Minimum	1.6	Mean	4.443
Maximum	34.2	Median	4.1
SD	2.604	Std. Error of Mean	0.157
Coefficient of Variation	0.586	Skewness	7.65
Normal GOF Test			
Shapiro Wilk Test Statistic	0.503	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	0	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.215	**Lilliefors GOF Test**	

5% Lilliefors Critical Value	0.0538	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	4.702	95% Adjusted-CLT UCL (Chen-1995)	4.778
		95% Modified-t UCL (Johnson-1978)	4.714
Gamma GOF Test			
A-D Test Statistic	7.346	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.756	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.126	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.0551	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	6.866	k star (bias corrected MLE)	6.793
Theta hat (MLE)	0.647	Theta star (bias corrected MLE)	0.654
nu hat (MLE)	3776	nu star (bias corrected)	3736
MLE Mean (bias corrected)	4.443	MLE Sd (bias corrected)	1.704
		Approximate Chi Square Value (0.05)	3595
Adjusted Level of Significance	0.0491	Adjusted Chi Square Value	3595
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	4.617	95% Adjusted Gamma UCL (use when n<50)	4.618
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.926	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk P Value	0	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.0868	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.0538	Data Not Lognormal at 5% Significance Level	
Data Not Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	0.47	Mean of logged Data	1.417
Maximum of Logged Data	3.532	SD of logged Data	0.345
Assuming Lognormal Distribution			
95% H-UCL	4.537	90% Chebyshev (MVUE) UCL	4.656
95% Chebyshev (MVUE) UCL	4.784	97.5% Chebyshev (MVUE) UCL	4.96
99% Chebyshev (MVUE) UCL	5.307		
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution (0.05)			
Nonparametric Distribution Free UCLs			
95% CLT UCL	4.701	95% Jackknife UCL	4.702
95% Standard Bootstrap UCL	4.698	95% Bootstrap-t UCL	4.864
95% Hall's Bootstrap UCL	5.997	95% Percentile Bootstrap UCL	4.716
95% BCA Bootstrap UCL	4.801		

90% Chebyshev(Mean, Sd) UCL	4.914	95% Chebyshev(Mean, Sd) UCL	5.127
97.5% Chebyshev(Mean, Sd) UCL	5.423	99% Chebyshev(Mean, Sd) UCL	6.005
Suggested UCL to Use			
95% Student's-t UCL	4.702	or 95% Modified-t UCL	4.714
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Beryllium			
General Statistics			
Total Number of Observations	275	Number of Distinct Observations	70
		Number of Missing Observations	37
Minimum	0.097	Mean	0.567
Maximum	32.7	Median	0.4
SD	1.966	Std. Error of Mean	0.119
Coefficient of Variation	3.47	Skewness	16.06
Normal GOF Test			
Shapiro Wilk Test Statistic	0.118	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	0	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.416	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.0538	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	0.762	95% Adjusted-CLT UCL (Chen-1995)	0.884
		95% Modified-t UCL (Johnson-1978)	0.782
Gamma GOF Test			
A-D Test Statistic	3.636E+28	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.769	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.236	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.0559	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	1.729	k star (bias corrected MLE)	1.712
Theta hat (MLE)	0.328	Theta star (bias corrected MLE)	0.331
nu hat (MLE)	950.9	nu star (bias corrected)	941.9
MLE Mean (bias corrected)	0.567	MLE Sd (bias corrected)	0.433
		Approximate Chi Square Value (0.05)	871.6
Adjusted Level of Significance	0.0491	Adjusted Chi Square Value	871.3
Assuming Gamma Distribution			

95% Approximate Gamma UCL (use when n>=50))	0.612	95% Adjusted Gamma UCL (use when n<50)	0.613
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.835	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk P Value	0	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.124	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.0538	Data Not Lognormal at 5% Significance Level	
Data Not Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	-2.333	Mean of logged Data	-0.884
Maximum of Logged Data	3.487	SD of logged Data	0.485
Assuming Lognormal Distribution			
95% H-UCL	0.49	90% Chebyshev (MVUE) UCL	0.507
95% Chebyshev (MVUE) UCL	0.527	97.5% Chebyshev (MVUE) UCL	0.554
99% Chebyshev (MVUE) UCL	0.607		
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution (0.05)			
Nonparametric Distribution Free UCLs			
95% CLT UCL	0.762	95% Jackknife UCL	0.762
95% Standard Bootstrap UCL	0.768	95% Bootstrap-t UCL	1.848
95% Hall's Bootstrap UCL	1.451	95% Percentile Bootstrap UCL	0.805
95% BCA Bootstrap UCL	1.026		
90% Chebyshev(Mean, Sd) UCL	0.922	95% Chebyshev(Mean, Sd) UCL	1.084
97.5% Chebyshev(Mean, Sd) UCL	1.307	99% Chebyshev(Mean, Sd) UCL	1.746
Suggested UCL to Use			
95% Student's-t UCL	0.762	or 95% Modified-t UCL	0.782
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Cadmium			
General Statistics			
Total Number of Observations	275	Number of Distinct Observations	31
		Number of Missing Observations	37
Number of Detects	29	Number of Non-Detects	246
Number of Distinct Detects	21	Number of Distinct Non-Detects	17
Minimum Detect	0.29	Minimum Non-Detect	0.23
Maximum Detect	8	Maximum Non-Detect	0.39
Variance Detects	2.314	Percent Non-Detects	89.45%
Mean Detects	1.023	SD Detects	1.521
Median Detects	0.52	CV Detects	1.486
Skewness Detects	3.833	Kurtosis Detects	16.57

Mean of Logged Detects	-0.444	SD of Logged Detects	0.837
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.509	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.926	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.315	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.161	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.316	KM Standard Error of Mean	0.0333
KM SD	0.543	95% KM (BCA) UCL	0.388
95% KM (t) UCL	0.371	95% KM (Percentile Bootstrap) UCL	0.377
95% KM (z) UCL	0.37	95% KM Bootstrap t UCL	0.436
90% KM Chebyshev UCL	0.416	95% KM Chebyshev UCL	0.461
97.5% KM Chebyshev UCL	0.524	99% KM Chebyshev UCL	0.647
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	2.388	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.769	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.243	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.167	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	1.21	k star (bias corrected MLE)	1.108
Theta hat (MLE)	0.846	Theta star (bias corrected MLE)	0.924
nu hat (MLE)	70.17	nu star (bias corrected)	64.24
Mean (detects)	1.023		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	0.117
Maximum	8	Median	0.01
SD	0.578	CV	4.942
k hat (MLE)	0.335	k star (bias corrected MLE)	0.334
Theta hat (MLE)	0.349	Theta star (bias corrected MLE)	0.35
nu hat (MLE)	184.4	nu star (bias corrected)	183.7
Adjusted Level of Significance (β)	0.0491		
Approximate Chi Square Value (183.73, α)	153.4	Adjusted Chi Square Value (183.73, β)	153.2
95% Gamma Approximate UCL (use when n>=50)	0.14	95% Gamma Adjusted UCL (use when n<50)	0.14
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.316	SD (KM)	0.543
Variance (KM)	0.295	SE of Mean (KM)	0.0333
k hat (KM)	0.338	k star (KM)	0.337

nu hat (KM)	185.8	nu star (KM)	185.2
theta hat (KM)	0.934	theta star (KM)	0.937
80% gamma percentile (KM)	0.496	90% gamma percentile (KM)	0.917
95% gamma percentile (KM)	1.39	99% gamma percentile (KM)	2.604
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (185.15, α)	154.7	Adjusted Chi Square Value (185.15, β)	154.5
95% Gamma Approximate KM-UCL (use when n>=50)	0.378	95% Gamma Adjusted KM-UCL (use when n<50)	0.378
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.851	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.926	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.176	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.161	Detected Data Not Lognormal at 5% Significance Level	
Detected Data Not Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.138	Mean in Log Scale	-3.931
SD in Original Scale	0.575	SD in Log Scale	1.905
95% t UCL (assumes normality of ROS data)	0.195	95% Percentile Bootstrap UCL	0.2
95% BCA Bootstrap UCL	0.23	95% Bootstrap t UCL	0.252
95% H-UCL (Log ROS)	0.171		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-1.354	KM Geo Mean	0.258
KM SD (logged)	0.413	95% Critical H Value (KM-Log)	1.756
KM Standard Error of Mean (logged)	0.0256	95% H-UCL (KM -Log)	0.294
KM SD (logged)	0.413	95% Critical H Value (KM-Log)	1.756
KM Standard Error of Mean (logged)	0.0256		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.244	Mean in Log Scale	-1.736
SD in Original Scale	0.555	SD in Log Scale	0.532
95% t UCL (Assumes normality)	0.3	95% H-Stat UCL	0.215
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution at 5% Significance Level			
Suggested UCL to Use			
95% KM (Chebyshev) UCL	0.461		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
ChromiumVI_EST			

General Statistics			
Total Number of Observations	271	Number of Distinct Observations	106
		Number of Missing Observations	41
Minimum	0.136	Mean	0.335
Maximum	9.715	Median	0.26
SD	0.607	Std. Error of Mean	0.0369
Coefficient of Variation	1.81	Skewness	13.97
Normal GOF Test			
Shapiro Wilk Test Statistic	0.197	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	0	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.372	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.0542	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	0.396	95% Adjusted-CLT UCL (Chen-1995)	0.43
		95% Modified-t UCL (Johnson-1978)	0.402
Gamma GOF Test			
A-D Test Statistic	3.690E+28	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.761	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.279	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.0559	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	2.74	k star (bias corrected MLE)	2.712
Theta hat (MLE)	0.122	Theta star (bias corrected MLE)	0.124
nu hat (MLE)	1485	nu star (bias corrected)	1470
MLE Mean (bias corrected)	0.335	MLE Sd (bias corrected)	0.204
		Approximate Chi Square Value (0.05)	1382
Adjusted Level of Significance	0.0491	Adjusted Chi Square Value	1382
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	0.357	95% Adjusted Gamma UCL (use when n<50)	0.357
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.766	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk P Value	0	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.19	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.0542	Data Not Lognormal at 5% Significance Level	
Data Not Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	-1.991	Mean of logged Data	-1.286
Maximum of Logged Data	2.274	SD of logged Data	0.435

Assuming Lognormal Distribution			
95% H-UCL	0.318	90% Chebyshev (MVUE) UCL	0.329
95% Chebyshev (MVUE) UCL	0.34	97.5% Chebyshev (MVUE) UCL	0.356
99% Chebyshev (MVUE) UCL	0.387		
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution (0.05)			
Nonparametric Distribution Free UCLs			
95% CLT UCL	0.396	95% Jackknife UCL	0.396
95% Standard Bootstrap UCL	0.397	95% Bootstrap-t UCL	0.51
95% Hall's Bootstrap UCL	0.606	95% Percentile Bootstrap UCL	0.401
95% BCA Bootstrap UCL	0.452		
90% Chebyshev(Mean, Sd) UCL	0.446	95% Chebyshev(Mean, Sd) UCL	0.496
97.5% Chebyshev(Mean, Sd) UCL	0.566	99% Chebyshev(Mean, Sd) UCL	0.702
Suggested UCL to Use			
95% Student's-t UCL	0.396	or 95% Modified-t UCL	0.402
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Cobalt			
General Statistics			
Total Number of Observations	275	Number of Distinct Observations	50
		Number of Missing Observations	37
Minimum	1.9	Mean	5.123
Maximum	18.1	Median	5
SD	1.35	Std. Error of Mean	0.0814
Coefficient of Variation	0.264	Skewness	3.475
Normal GOF Test			
Shapiro Wilk Test Statistic	0.839	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	0	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.114	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.0538	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	5.257	95% Adjusted-CLT UCL (Chen-1995)	5.275
		95% Modified-t UCL (Johnson-1978)	5.26
Gamma GOF Test			
A-D Test Statistic	2.36	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.752	Data Not Gamma Distributed at 5% Significance Level	

K-S Test Statistic	0.0752	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.0549	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	17.64	k star (bias corrected MLE)	17.45
Theta hat (MLE)	0.29	Theta star (bias corrected MLE)	0.294
nu hat (MLE)	9703	nu star (bias corrected)	9598
MLE Mean (bias corrected)	5.123	MLE Sd (bias corrected)	1.226
		Approximate Chi Square Value (0.05)	9372
Adjusted Level of Significance	0.0491	Adjusted Chi Square Value	9371
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	5.246	95% Adjusted Gamma UCL (use when n<50)	5.247
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.969	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk P Value	0.00256	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.0766	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.0538	Data Not Lognormal at 5% Significance Level	
Data Not Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	0.642	Mean of logged Data	1.605
Maximum of Logged Data	2.896	SD of logged Data	0.237
Assuming Lognormal Distribution			
95% H-UCL	5.245	90% Chebyshev (MVUE) UCL	5.341
95% Chebyshev (MVUE) UCL	5.441	97.5% Chebyshev (MVUE) UCL	5.581
99% Chebyshev (MVUE) UCL	5.855		
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution (0.05)			
Nonparametric Distribution Free UCLs			
95% CLT UCL	5.256	95% Jackknife UCL	5.257
95% Standard Bootstrap UCL	5.255	95% Bootstrap-t UCL	5.278
95% Hall's Bootstrap UCL	5.302	95% Percentile Bootstrap UCL	5.264
95% BCA Bootstrap UCL	5.281		
90% Chebyshev(Mean, Sd) UCL	5.367	95% Chebyshev(Mean, Sd) UCL	5.477
97.5% Chebyshev(Mean, Sd) UCL	5.631	99% Chebyshev(Mean, Sd) UCL	5.933
Suggested UCL to Use			
95% Student's-t UCL	5.257	or 95% Modified-t UCL	5.26
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			

Copper

General Statistics

Total Number of Observations	275	Number of Distinct Observations	132
		Number of Missing Observations	37
Minimum	4.1	Mean	15.12
Maximum	74.8	Median	13.4
SD	8.436	Std. Error of Mean	0.509
Coefficient of Variation	0.558	Skewness	3.854

Normal GOF Test

Shapiro Wilk Test Statistic	0.653	**Shapiro Wilk GOF Test**
5% Shapiro Wilk P Value	0	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.207	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.0538	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	15.96	95% Adjusted-CLT UCL (Chen-1995)	16.08
		95% Modified-t UCL (Johnson-1978)	15.98

Gamma GOF Test

A-D Test Statistic	8.779	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.756	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.14	**Kolmogorov-Smirnov Gamma GOF Test**
5% K-S Critical Value	0.0551	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	5.577	k star (bias corrected MLE)	5.519
Theta hat (MLE)	2.71	Theta star (bias corrected MLE)	2.739
nu hat (MLE)	3068	nu star (bias corrected)	3035
MLE Mean (bias corrected)	15.12	MLE Sd (bias corrected)	6.435
		Approximate Chi Square Value (0.05)	2908
Adjusted Level of Significance	0.0491	Adjusted Chi Square Value	2908

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	15.78	95% Adjusted Gamma UCL (use when n<50)	15.78

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.933	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk P Value	0	Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.103	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.0538	Data Not Lognormal at 5% Significance Level

Data Not Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	1.411	Mean of logged Data	2.624

Maximum of Logged Data	4.315	SD of logged Data	0.398
Assuming Lognormal Distribution			
95% H-UCL	15.56	90% Chebyshev (MVUE) UCL	16.03
95% Chebyshev (MVUE) UCL	16.53	97.5% Chebyshev (MVUE) UCL	17.23
99% Chebyshev (MVUE) UCL	18.6		
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution (0.05)			
Nonparametric Distribution Free UCLs			
95% CLT UCL	15.95	95% Jackknife UCL	15.96
95% Standard Bootstrap UCL	15.95	95% Bootstrap-t UCL	16.11
95% Hall's Bootstrap UCL	16.11	95% Percentile Bootstrap UCL	15.98
95% BCA Bootstrap UCL	16.1		
90% Chebyshev(Mean, Sd) UCL	16.64	95% Chebyshev(Mean, Sd) UCL	17.33
97.5% Chebyshev(Mean, Sd) UCL	18.29	99% Chebyshev(Mean, Sd) UCL	20.18
Suggested UCL to Use			
95% Student's-t UCL	15.96	or 95% Modified-t UCL	15.98
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Vanadium			
General Statistics			
Total Number of Observations	275	Number of Distinct Observations	128
		Number of Missing Observations	37
Minimum	3.2	Mean	12.16
Maximum	221	Median	9.4
SD	16.98	Std. Error of Mean	1.024
Coefficient of Variation	1.397	Skewness	9.766
Normal GOF Test			
Shapiro Wilk Test Statistic	0.299	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	0	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.31	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.0538	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	13.85	95% Adjusted-CLT UCL (Chen-1995)	14.48
		95% Modified-t UCL (Johnson-1978)	13.95
Gamma GOF Test			

ProUCL Output
Main Plant Area Soil (0-12 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

A-D Test Statistic	3.636E+28	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.762	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.163	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.0555	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	2.653	k star (bias corrected MLE)	2.626
Theta hat (MLE)	4.583	Theta star (bias corrected MLE)	4.629
nu hat (MLE)	1459	nu star (bias corrected)	1444
MLE Mean (bias corrected)	12.16	MLE Sd (bias corrected)	7.501
		Approximate Chi Square Value (0.05)	1357
Adjusted Level of Significance	0.0491	Adjusted Chi Square Value	1357
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	12.94	95% Adjusted Gamma UCL (use when n<50)	12.94
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.892	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk P Value	0	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.0802	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.0538	Data Not Lognormal at 5% Significance Level	
Data Not Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	1.163	Mean of logged Data	2.298
Maximum of Logged Data	5.398	SD of logged Data	0.499
Assuming Lognormal Distribution			
95% H-UCL	11.9	90% Chebyshev (MVUE) UCL	12.34
95% Chebyshev (MVUE) UCL	12.83	97.5% Chebyshev (MVUE) UCL	13.51
99% Chebyshev (MVUE) UCL	14.84		
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution (0.05)			
Nonparametric Distribution Free UCLs			
95% CLT UCL	13.84	95% Jackknife UCL	13.85
95% Standard Bootstrap UCL	13.8	95% Bootstrap-t UCL	16.58
95% Hall's Bootstrap UCL	21.94	95% Percentile Bootstrap UCL	14
95% BCA Bootstrap UCL	14.79		
90% Chebyshev(Mean, Sd) UCL	15.23	95% Chebyshev(Mean, Sd) UCL	16.62
97.5% Chebyshev(Mean, Sd) UCL	18.55	99% Chebyshev(Mean, Sd) UCL	22.35
Suggested UCL to Use			
95% Student's-t UCL	13.85	or 95% Modified-t UCL	13.95
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Zinc

General Statistics

Total Number of Observations	275	Number of Distinct Observations	212
		Number of Missing Observations	37
Minimum	11.3	Mean	52.14
Maximum	685	Median	38.1
SD	60.34	Std. Error of Mean	3.639
Coefficient of Variation	1.157	Skewness	6.495

Normal GOF Test

Shapiro Wilk Test Statistic	0.419	**Shapiro Wilk GOF Test**
5% Shapiro Wilk P Value	0	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.3	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.0538	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	58.14	95% Adjusted-CLT UCL (Chen-1995)	59.64
		95% Modified-t UCL (Johnson-1978)	58.38

Gamma GOF Test

A-D Test Statistic	22.86	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.763	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.205	**Kolmogorov-Smirnov Gamma GOF Test**
5% K-S Critical Value	0.0555	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	2.547	k star (bias corrected MLE)	2.522
Theta hat (MLE)	20.47	Theta star (bias corrected MLE)	20.67
nu hat (MLE)	1401	nu star (bias corrected)	1387
MLE Mean (bias corrected)	52.14	MLE Sd (bias corrected)	32.83
		Approximate Chi Square Value (0.05)	1301
Adjusted Level of Significance	0.0491	Adjusted Chi Square Value	1301

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	55.56	95% Adjusted Gamma UCL (use when n<50)	55.58

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.847	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk P Value	0	Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.134	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.0538	Data Not Lognormal at 5% Significance Level

Data Not Lognormal at 5% Significance Level

Lognormal Statistics			
Minimum of Logged Data	2.425	Mean of logged Data	3.745
Maximum of Logged Data	6.529	SD of logged Data	0.525
Assuming Lognormal Distribution			
95% H-UCL	51.41	90% Chebyshev (MVUE) UCL	53.42
95% Chebyshev (MVUE) UCL	55.64	97.5% Chebyshev (MVUE) UCL	58.72
99% Chebyshev (MVUE) UCL	64.78		
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution (0.05)			
Nonparametric Distribution Free UCLs			
95% CLT UCL	58.12	95% Jackknife UCL	58.14
95% Standard Bootstrap UCL	58.16	95% Bootstrap-t UCL	60.86
95% Hall's Bootstrap UCL	61.5	95% Percentile Bootstrap UCL	58.14
95% BCA Bootstrap UCL	59.68		
90% Chebyshev(Mean, Sd) UCL	63.05	95% Chebyshev(Mean, Sd) UCL	68
97.5% Chebyshev(Mean, Sd) UCL	74.86	99% Chebyshev(Mean, Sd) UCL	88.34
Suggested UCL to Use			
95% Chebyshev (Mean, Sd) UCL	68		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Selenium			
General Statistics			
Total Number of Observations	275	Number of Distinct Observations	32
		Number of Missing Observations	37
Number of Detects	12	Number of Non-Detects	263
Number of Distinct Detects	10	Number of Distinct Non-Detects	26
Minimum Detect	0.32	Minimum Non-Detect	0.23
Maximum Detect	1.4	Maximum Non-Detect	0.5
Variance Detects	0.144	Percent Non-Detects	95.64%
Mean Detects	0.662	SD Detects	0.379
Median Detects	0.505	CV Detects	0.573
Skewness Detects	1.393	Kurtosis Detects	0.8
Mean of Logged Detects	-0.538	SD of Logged Detects	0.499
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.783	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.859	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.252	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.243	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.25	KM Standard Error of Mean	0.00738
KM SD	0.117	95% KM (BCA) UCL	0.267
95% KM (t) UCL	0.262	95% KM (Percentile Bootstrap) UCL	0.264
95% KM (z) UCL	0.262	95% KM Bootstrap t UCL	0.269
90% KM Chebyshev UCL	0.272	95% KM Chebyshev UCL	0.282
97.5% KM Chebyshev UCL	0.296	99% KM Chebyshev UCL	0.323
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	0.704	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.735	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.202	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.246	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	4.167	k star (bias corrected MLE)	3.181
Theta hat (MLE)	0.159	Theta star (bias corrected MLE)	0.208
nu hat (MLE)	100	nu star (bias corrected)	76.34
Mean (detects)	0.662		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	0.0384
Maximum	1.4	Median	0.01
SD	0.153	CV	3.993
k hat (MLE)	0.537	k star (bias corrected MLE)	0.534
Theta hat (MLE)	0.0715	Theta star (bias corrected MLE)	0.072
nu hat (MLE)	295.6	nu star (bias corrected)	293.7
Adjusted Level of Significance (β)	0.0491		
Approximate Chi Square Value (293.68, α)	255	Adjusted Chi Square Value (293.68, β)	254.8
95% Gamma Approximate UCL (use when n>=50)	0.0443	95% Gamma Adjusted UCL (use when n<50)	0.0443
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.25	SD (KM)	0.117
Variance (KM)	0.0136	SE of Mean (KM)	0.00738
k hat (KM)	4.589	k star (KM)	4.542
nu hat (KM)	2524	nu star (KM)	2498
theta hat (KM)	0.0544	theta star (KM)	0.055
80% gamma percentile (KM)	0.339	90% gamma percentile (KM)	0.406
95% gamma percentile (KM)	0.468	99% gamma percentile (KM)	0.599
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (N/A, α)	2383	Adjusted Chi Square Value (N/A, β)	2382
95% Gamma Approximate KM-UCL (use when n>=50)	0.262	95% Gamma Adjusted KM-UCL (use when n<50)	0.262

Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.895	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.859	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.184	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.243	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.0664	Mean in Log Scale	-3.689
SD in Original Scale	0.154	SD in Log Scale	1.325
95% t UCL (assumes normality of ROS data)	0.0817	95% Percentile Bootstrap UCL	0.0825
95% BCA Bootstrap UCL	0.0861	95% Bootstrap t UCL	0.0879
95% H-UCL (Log ROS)	0.0729		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-1.426	KM Geo Mean	0.24
KM SD (logged)	0.217	95% Critical H Value (KM-Log)	1.687
KM Standard Error of Mean (logged)	0.0139	95% H-UCL (KM -Log)	0.251
KM SD (logged)	0.217	95% Critical H Value (KM-Log)	1.687
KM Standard Error of Mean (logged)	0.0139		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.192	Mean in Log Scale	-1.725
SD in Original Scale	0.129	SD in Log Scale	0.316
95% t UCL (Assumes normality)	0.205	95% H-Stat UCL	0.194
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Gamma Distributed at 5% Significance Level			
Suggested UCL to Use			
95% KM Approximate Gamma UCL	0.262	95% GROS Approximate Gamma UCL	0.0443
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Naphthalene			
General Statistics			
Total Number of Observations	275	Number of Distinct Observations	98
		Number of Missing Observations	37
Number of Detects	115	Number of Non-Detects	160
Number of Distinct Detects	81	Number of Distinct Non-Detects	25
Minimum Detect	0.0017	Minimum Non-Detect	0.0013
Maximum Detect	8	Maximum Non-Detect	0.026
Variance Detects	1.011	Percent Non-Detects	58.18%
Mean Detects	0.378	SD Detects	1.005

Median Detects	0.038	CV Detects	2.663
Skewness Detects	5.194	Kurtosis Detects	32.47
Mean of Logged Detects	-2.778	SD of Logged Detects	1.873
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.422	**Normal GOF Test on Detected Observations Only**	
5% Shapiro Wilk P Value	0	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.354	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.0829	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.159	KM Standard Error of Mean	0.0408
KM SD	0.673	95% KM (BCA) UCL	0.233
95% KM (t) UCL	0.226	95% KM (Percentile Bootstrap) UCL	0.229
95% KM (z) UCL	0.226	95% KM Bootstrap t UCL	0.278
90% KM Chebyshev UCL	0.281	95% KM Chebyshev UCL	0.337
97.5% KM Chebyshev UCL	0.414	99% KM Chebyshev UCL	0.565
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	7.258	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.851	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.188	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.0921	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.369	k star (bias corrected MLE)	0.366
Theta hat (MLE)	1.022	Theta star (bias corrected MLE)	1.033
nu hat (MLE)	84.97	nu star (bias corrected)	84.08
Mean (detects)	0.378		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.0017	Mean	0.164
Maximum	8	Median	0.01
SD	0.673	CV	4.114
k hat (MLE)	0.334	k star (bias corrected MLE)	0.332
Theta hat (MLE)	0.491	Theta star (bias corrected MLE)	0.492
nu hat (MLE)	183.5	nu star (bias corrected)	182.8
Adjusted Level of Significance (β)	0.0491		
Approximate Chi Square Value (182.81, α)	152.5	Adjusted Chi Square Value (182.81, β)	152.4
95% Gamma Approximate UCL (use when n>=50)	0.196	95% Gamma Adjusted UCL (use when n<50)	0.196
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.159	SD (KM)	0.673

Variance (KM)	0.453	SE of Mean (KM)	0.0408
k hat (KM)	0.0557	k star (KM)	0.0575
nu hat (KM)	30.62	nu star (KM)	31.62
theta hat (KM)	2.853	theta star (KM)	2.763
80% gamma percentile (KM)	0.0339	90% gamma percentile (KM)	0.286
95% gamma percentile (KM)	0.882	99% gamma percentile (KM)	3.264
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (31.62, α)	19.77	Adjusted Chi Square Value (31.62, β)	19.72
95% Gamma Approximate KM-UCL (use when n>=50)	0.254	95% Gamma Adjusted KM-UCL (use when n<50)	0.255
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Approximate Test Statistic	0.941	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	6.6477E-5	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.139	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.0829	Detected Data Not Lognormal at 5% Significance Level	
Detected Data Not Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.158	Mean in Log Scale	-5.742
SD in Original Scale	0.675	SD in Log Scale	3.082
95% t UCL (assumes normality of ROS data)	0.226	95% Percentile Bootstrap UCL	0.228
95% BCA Bootstrap UCL	0.255	95% Bootstrap t UCL	0.269
95% H-UCL (Log ROS)	0.841		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-4.943	KM Geo Mean	0.00713
KM SD (logged)	2.219	95% Critical H Value (KM-Log)	3.371
KM Standard Error of Mean (logged)	0.138	95% H-UCL (KM -Log)	0.131
KM SD (logged)	2.219	95% Critical H Value (KM-Log)	3.371
KM Standard Error of Mean (logged)	0.138		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.16	Mean in Log Scale	-4.589
SD in Original Scale	0.674	SD in Log Scale	2.059
95% t UCL (Assumes normality)	0.227	95% H-Stat UCL	0.126
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution at 5% Significance Level			
Suggested UCL to Use			
95% KM (Chebyshev) UCL	0.337		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			

Dibenzofuran			
General Statistics			
Total Number of Observations	275	Number of Distinct Observations	82
		Number of Missing Observations	37
Number of Detects	112	Number of Non-Detects	163
Number of Distinct Detects	77	Number of Distinct Non-Detects	10
Minimum Detect	0.0017	Minimum Non-Detect	0.0014
Maximum Detect	15	Maximum Non-Detect	0.32
Variance Detects	2.357	Percent Non-Detects	59.27%
Mean Detects	0.405	SD Detects	1.535
Median Detects	0.0385	CV Detects	3.794
Skewness Detects	8.189	Kurtosis Detects	75.43
Mean of Logged Detects	-2.865	SD of Logged Detects	1.884
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.28	**Normal GOF Test on Detected Observations Only**	
5% Shapiro Wilk P Value	0	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.396	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.084	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.166	KM Standard Error of Mean	0.0603
KM SD	0.995	95% KM (BCA) UCL	0.271
95% KM (t) UCL	0.266	95% KM (Percentile Bootstrap) UCL	0.27
95% KM (z) UCL	0.265	95% KM Bootstrap t UCL	0.413
90% KM Chebyshev UCL	0.347	95% KM Chebyshev UCL	0.429
97.5% KM Chebyshev UCL	0.543	99% KM Chebyshev UCL	0.766
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	7.518	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.857	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.198	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.0932	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.344	k star (bias corrected MLE)	0.341
Theta hat (MLE)	1.177	Theta star (bias corrected MLE)	1.188
nu hat (MLE)	77.04	nu star (bias corrected)	76.31
Mean (detects)	0.405		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.0017	Mean	0.171

Maximum	15	Median	0.01
SD	0.996	CV	5.835
k hat (MLE)	0.32	k star (bias corrected MLE)	0.319
Theta hat (MLE)	0.533	Theta star (bias corrected MLE)	0.535
nu hat (MLE)	176.2	nu star (bias corrected)	175.6
Adjusted Level of Significance (β)	0.0491		
Approximate Chi Square Value (175.65, α)	146	Adjusted Chi Square Value (175.65, β)	145.9
95% Gamma Approximate UCL (use when n>=50)	0.205	95% Gamma Adjusted UCL (use when n<50)	0.206
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.166	SD (KM)	0.995
Variance (KM)	0.99	SE of Mean (KM)	0.0603
k hat (KM)	0.0279	k star (KM)	0.03
nu hat (KM)	15.32	nu star (KM)	16.49
theta hat (KM)	5.962	theta star (KM)	5.541
80% gamma percentile (KM)	0.00187	90% gamma percentile (KM)	0.0965
95% gamma percentile (KM)	0.643	99% gamma percentile (KM)	4.29
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (16.49, α)	8.309	Adjusted Chi Square Value (16.49, β)	8.278
95% Gamma Approximate KM-UCL (use when n>=50)	0.33	95% Gamma Adjusted KM-UCL (use when n<50)	0.331
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Approximate Test Statistic	0.961	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	0.0156	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.115	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.084	Detected Data Not Lognormal at 5% Significance Level	
Detected Data Not Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.166	Mean in Log Scale	-5.819
SD in Original Scale	0.997	SD in Log Scale	3.119
95% t UCL (assumes normality of ROS data)	0.265	95% Percentile Bootstrap UCL	0.272
95% BCA Bootstrap UCL	0.339	95% Bootstrap t UCL	0.417
95% H-UCL (Log ROS)	0.889		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-4.924	KM Geo Mean	0.00727
KM SD (logged)	2.122	95% Critical H Value (KM-Log)	3.262
KM Standard Error of Mean (logged)	0.135	95% H-UCL (KM -Log)	0.105
KM SD (logged)	2.122	95% Critical H Value (KM-Log)	3.262
KM Standard Error of Mean (logged)	0.135		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.168	Mean in Log Scale	-4.515
SD in Original Scale	0.997	SD in Log Scale	1.943
95% t UCL (Assumes normality)	0.267	95% H-Stat UCL	0.104
DL/2 is not a recommended method, provided for comparisons and historical reasons			

ProUCL Output
Main Plant Area Soil (0-12 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution at 5% Significance Level			
Suggested UCL to Use			
95% KM (Chebyshev) UCL	0.429		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			

ProUCL Output
North Percolation Pond Area Soil (0-0.5 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

UCL Statistics for Data Sets with Non-Detects	
User Selected Options	
Date/Time of Computation	ProUCL 5.11/28/2019 8:13:14 AM
From File	20190127_NorthPerc_ProUCL_input.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Bis2EthylhexylPhthalate

General Statistics			
Total Number of Observations	20	Number of Distinct Observations	20
		Number of Missing Observations	6
Number of Detects	1	Number of Non-Detects	19
Number of Distinct Detects	1	Number of Distinct Non-Detects	19

Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set!

It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable Bis2EthylhexylPhthalate was not processed!

Pyrene

General Statistics			
Total Number of Observations	25	Number of Distinct Observations	25
		Number of Missing Observations	1
Minimum	0.058	Mean	320.1
Maximum	3200	Median	21
SD	731.9	Std. Error of Mean	146.4
Coefficient of Variation	2.286	Skewness	3.262

Normal GOF Test		
Shapiro Wilk Test Statistic	0.493	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.918	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.331	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.173	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	570.6	95% Adjusted-CLT UCL (Chen-1995)	663
		95% Modified-t UCL (Johnson-1978)	586.5

Gamma GOF Test		
A-D Test Statistic	1.157	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.854	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.21	**Kolmogorov-Smirnov Gamma GOF Test**

5% K-S Critical Value	0.19	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	0.296	k star (bias corrected MLE)	0.287
Theta hat (MLE)	1082	Theta star (bias corrected MLE)	1116
nu hat (MLE)	14.79	nu star (bias corrected)	14.35
MLE Mean (bias corrected)	320.1	MLE Sd (bias corrected)	597.6
		Approximate Chi Square Value (0.05)	6.811
Adjusted Level of Significance	0.0395	Adjusted Chi Square Value	6.458
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	674.4	95% Adjusted Gamma UCL (use when n<50)	711.3
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.958	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.918	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.12	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.173	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	-2.847	Mean of logged Data	3.432
Maximum of Logged Data	8.071	SD of logged Data	2.575
Assuming Lognormal Distribution			
95% H-UCL	11369	90% Chebyshev (MVUE) UCL	1663
95% Chebyshev (MVUE) UCL	2167	97.5% Chebyshev (MVUE) UCL	2866
99% Chebyshev (MVUE) UCL	4240		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	560.9	95% Jackknife UCL	570.6
95% Standard Bootstrap UCL	562	95% Bootstrap-t UCL	1193
95% Hall's Bootstrap UCL	1625	95% Percentile Bootstrap UCL	570.4
95% BCA Bootstrap UCL	683.1		
90% Chebyshev(Mean, Sd) UCL	759.3	95% Chebyshev(Mean, Sd) UCL	958.2
97.5% Chebyshev(Mean, Sd) UCL	1234	99% Chebyshev(Mean, Sd) UCL	1777
Suggested UCL to Use			
99% Chebyshev (Mean, Sd) UCL	1777		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Dibenzofuran			

ProUCL Output
North Percolation Pond Area Soil (0-0.5 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

General Statistics			
Total Number of Observations	20	Number of Distinct Observations	20
		Number of Missing Observations	6
Number of Detects	19	Number of Non-Detects	1
Number of Distinct Detects	19	Number of Distinct Non-Detects	1
Minimum Detect	0.036	Minimum Non-Detect	8.7
Maximum Detect	28	Maximum Non-Detect	8.7
Variance Detects	41.13	Percent Non-Detects	5%
Mean Detects	2.837	SD Detects	6.413
Median Detects	0.6	CV Detects	2.26
Skewness Detects	3.722	Kurtosis Detects	14.86
Mean of Logged Detects	-0.621	SD of Logged Detects	1.95
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.471	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.901	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.331	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.197	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	2.767	KM Standard Error of Mean	1.407
KM SD	6.108	95% KM (BCA) UCL	5.287
95% KM (t) UCL	5.201	95% KM (Percentile Bootstrap) UCL	5.163
95% KM (z) UCL	5.082	95% KM Bootstrap t UCL	10.42
90% KM Chebyshev UCL	6.989	95% KM Chebyshev UCL	8.901
97.5% KM Chebyshev UCL	11.56	99% KM Chebyshev UCL	16.77
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	0.898	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.824	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.167	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.213	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data follow Appr. Gamma Distribution at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.396	k star (bias corrected MLE)	0.369
Theta hat (MLE)	7.164	Theta star (bias corrected MLE)	7.697
nu hat (MLE)	15.05	nu star (bias corrected)	14.01
Mean (detects)	2.837		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.036	Mean	2.703
Maximum	28	Median	0.45

SD	6.271	CV	2.32
k hat (MLE)	0.393	k star (bias corrected MLE)	0.368
Theta hat (MLE)	6.87	Theta star (bias corrected MLE)	7.35
nu hat (MLE)	15.74	nu star (bias corrected)	14.71
Adjusted Level of Significance (β)	0.038		
Approximate Chi Square Value (14.71, α)	7.061	Adjusted Chi Square Value (14.71, β)	6.645
95% Gamma Approximate UCL (use when n>=50)	5.632	95% Gamma Adjusted UCL (use when n<50)	5.985
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	2.767	SD (KM)	6.108
Variance (KM)	37.31	SE of Mean (KM)	1.407
k hat (KM)	0.205	k star (KM)	0.208
nu hat (KM)	8.21	nu star (KM)	8.312
theta hat (KM)	13.48	theta star (KM)	13.32
80% gamma percentile (KM)	3.718	90% gamma percentile (KM)	8.369
95% gamma percentile (KM)	14.12	99% gamma percentile (KM)	29.84
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (8.31, α)	2.917	Adjusted Chi Square Value (8.31, β)	2.67
95% Gamma Approximate KM-UCL (use when n>=50)	7.885	95% Gamma Adjusted KM-UCL (use when n<50)	8.616
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.946	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.901	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.147	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.197	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	2.718	Mean in Log Scale	-0.63
SD in Original Scale	6.265	SD in Log Scale	1.898
95% t UCL (assumes normality of ROS data)	5.14	95% Percentile Bootstrap UCL	5.322
95% BCA Bootstrap UCL	7.129	95% Bootstrap t UCL	10.62
95% H-UCL (Log ROS)	19.41		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-0.632	KM Geo Mean	0.531
KM SD (logged)	1.889	95% Critical H Value (KM-Log)	4.105
KM Standard Error of Mean (logged)	0.443	95% H-UCL (KM -Log)	18.72
KM SD (logged)	1.889	95% Critical H Value (KM-Log)	4.105
KM Standard Error of Mean (logged)	0.443		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	2.913	Mean in Log Scale	-0.517
SD in Original Scale	6.251	SD in Log Scale	1.954
95% t UCL (Assumes normality)	5.33	95% H-Stat UCL	26.74
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			

Detected Data appear Approximate Gamma Distributed at 5% Significance Level			
Suggested UCL to Use			
Adjusted KM-UCL (use when k<=1 and 15 < n < 50 but k<=1)	8.616		
When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test			
When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Fluoride			
General Statistics			
Total Number of Observations	20	Number of Distinct Observations	20
		Number of Missing Observations	6
Minimum	2.42	Mean	91.91
Maximum	241	Median	52.05
SD	79.44	Std. Error of Mean	17.76
Coefficient of Variation	0.864	Skewness	0.622
Normal GOF Test			
Shapiro Wilk Test Statistic	0.88	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.905	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.239	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.192	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	122.6	95% Adjusted-CLT UCL (Chen-1995)	123.8
		95% Modified-t UCL (Johnson-1978)	123
Gamma GOF Test			
A-D Test Statistic	0.393	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.767	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.128	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.199	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	1.068	k star (bias corrected MLE)	0.941
Theta hat (MLE)	86.1	Theta star (bias corrected MLE)	97.7
nu hat (MLE)	42.7	nu star (bias corrected)	37.63
MLE Mean (bias corrected)	91.91	MLE Sd (bias corrected)	94.76
		Approximate Chi Square Value (0.05)	24.58
Adjusted Level of Significance	0.038	Adjusted Chi Square Value	23.75

Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50)	140.7	95% Adjusted Gamma UCL (use when n<50)	145.6
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.926	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.905	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.136	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.192	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	0.884	Mean of logged Data	3.984
Maximum of Logged Data	5.485	SD of logged Data	1.244
Assuming Lognormal Distribution			
95% H-UCL	274.4	90% Chebyshev (MVUE) UCL	215.2
95% Chebyshev (MVUE) UCL	263.2	97.5% Chebyshev (MVUE) UCL	329.7
99% Chebyshev (MVUE) UCL	460.4		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	121.1	95% Jackknife UCL	122.6
95% Standard Bootstrap UCL	120	95% Bootstrap-t UCL	125.6
95% Hall's Bootstrap UCL	121.6	95% Percentile Bootstrap UCL	120.7
95% BCA Bootstrap UCL	122.2		
90% Chebyshev(Mean, Sd) UCL	145.2	95% Chebyshev(Mean, Sd) UCL	169.3
97.5% Chebyshev(Mean, Sd) UCL	202.8	99% Chebyshev(Mean, Sd) UCL	268.7
Suggested UCL to Use			
95% Adjusted Gamma UCL	145.6		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Indeno123CDPyrene			
General Statistics			
Total Number of Observations	25	Number of Distinct Observations	25
		Number of Missing Observations	1
Number of Detects	24	Number of Non-Detects	1
Number of Distinct Detects	24	Number of Distinct Non-Detects	1
Minimum Detect	1.3	Minimum Non-Detect	0.026
Maximum Detect	2000	Maximum Non-Detect	0.026
Variance Detects	223467	Percent Non-Detects	4%
Mean Detects	186.6	SD Detects	472.7

Median Detects	15.5	CV Detects	2.533
Skewness Detects	3.263	Kurtosis Detects	10.55
Mean of Logged Detects	3.204	SD of Logged Detects	1.949
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.442	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.916	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.413	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.177	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	179.2	KM Standard Error of Mean	92.94
KM SD	454.9	95% KM (BCA) UCL	363.3
95% KM (t) UCL	338.2	95% KM (Percentile Bootstrap) UCL	347
95% KM (z) UCL	332	95% KM Bootstrap t UCL	827
90% KM Chebyshev UCL	458	95% KM Chebyshev UCL	584.3
97.5% KM Chebyshev UCL	759.5	99% KM Chebyshev UCL	1104
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	2.143	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.843	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.266	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.192	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.334	k star (bias corrected MLE)	0.32
Theta hat (MLE)	558	Theta star (bias corrected MLE)	582.4
nu hat (MLE)	16.05	nu star (bias corrected)	15.38
Mean (detects)	186.6		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	179.2
Maximum	2000	Median	14
SD	464.3	CV	2.591
k hat (MLE)	0.3	k star (bias corrected MLE)	0.291
Theta hat (MLE)	596.8	Theta star (bias corrected MLE)	616
nu hat (MLE)	15.01	nu star (bias corrected)	14.54
Adjusted Level of Significance (β)	0.0395		
Approximate Chi Square Value (14.54, α)	6.944	Adjusted Chi Square Value (14.54, β)	6.587
95% Gamma Approximate UCL (use when n>=50)	375.2	95% Gamma Adjusted UCL (use when n<50)	395.5
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	179.2	SD (KM)	454.9

Variance (KM)	206926	SE of Mean (KM)	92.94
k hat (KM)	0.155	k star (KM)	0.163
nu hat (KM)	7.756	nu star (KM)	8.159
theta hat (KM)	1155	theta star (KM)	1098
80% gamma percentile (KM)	208.1	90% gamma percentile (KM)	536.5
95% gamma percentile (KM)	969.2	99% gamma percentile (KM)	2204
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (8.16, α)	2.827	Adjusted Chi Square Value (8.16, β)	2.617
95% Gamma Approximate KM-UCL (use when n>=50)	517	95% Gamma Adjusted KM-UCL (use when n<50)	558.5
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.937	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.916	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.118	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.177	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	179.2	Mean in Log Scale	3.011
SD in Original Scale	464.3	SD in Log Scale	2.137
95% t UCL (assumes normality of ROS data)	338	95% Percentile Bootstrap UCL	345.4
95% BCA Bootstrap UCL	408.6	95% Bootstrap t UCL	906.3
95% H-UCL (Log ROS)	1243		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	2.93	KM Geo Mean	18.72
KM SD (logged)	2.302	95% Critical H Value (KM-Log)	4.47
KM Standard Error of Mean (logged)	0.47	95% H-UCL (KM -Log)	2162
KM SD (logged)	2.302	95% Critical H Value (KM-Log)	4.47
KM Standard Error of Mean (logged)	0.47		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	179.2	Mean in Log Scale	2.902
SD in Original Scale	464.3	SD in Log Scale	2.433
95% t UCL (Assumes normality)	338	95% H-Stat UCL	3600
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Lognormal Distributed at 5% Significance Level			
Suggested UCL to Use			
95% KM (Chebyshev) UCL	584.3		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			

BenzoBFluoranthene			
General Statistics			
Total Number of Observations	25	Number of Distinct Observations	23
		Number of Missing Observations	1
Number of Detects	24	Number of Non-Detects	1
Number of Distinct Detects	22	Number of Distinct Non-Detects	1
Minimum Detect	4.1	Minimum Non-Detect	0.015
Maximum Detect	3000	Maximum Non-Detect	0.015
Variance Detects	529287	Percent Non-Detects	4%
Mean Detects	314.6	SD Detects	727.5
Median Detects	27	CV Detects	2.312
Skewness Detects	3.058	Kurtosis Detects	9.139
Mean of Logged Detects	3.838	SD of Logged Detects	1.982
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.483	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.916	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.391	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.177	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	302.1	KM Standard Error of Mean	143.1
KM SD	700.5	95% KM (BCA) UCL	542.7
95% KM (t) UCL	546.9	95% KM (Percentile Bootstrap) UCL	545.2
95% KM (z) UCL	537.5	95% KM Bootstrap t UCL	1159
90% KM Chebyshev UCL	731.4	95% KM Chebyshev UCL	925.9
97.5% KM Chebyshev UCL	1196	99% KM Chebyshev UCL	1726
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	1.733	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.84	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.204	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.192	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.351	k star (bias corrected MLE)	0.335
Theta hat (MLE)	896	Theta star (bias corrected MLE)	939.1
nu hat (MLE)	16.86	nu star (bias corrected)	16.08
Mean (detects)	314.6		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	302.1

Maximum	3000	Median	24
SD	715	CV	2.367
k hat (MLE)	0.31	k star (bias corrected MLE)	0.3
Theta hat (MLE)	973.7	Theta star (bias corrected MLE)	1008
nu hat (MLE)	15.51	nu star (bias corrected)	14.98
Adjusted Level of Significance (β)	0.0395		
Approximate Chi Square Value (14.98, α)	7.25	Adjusted Chi Square Value (14.98, β)	6.884
95% Gamma Approximate UCL (use when n>=50)	624.3	95% Gamma Adjusted UCL (use when n<50)	657.4
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	302.1	SD (KM)	700.5
Variance (KM)	490746	SE of Mean (KM)	143.1
k hat (KM)	0.186	k star (KM)	0.19
nu hat (KM)	9.296	nu star (KM)	9.514
theta hat (KM)	1625	theta star (KM)	1587
80% gamma percentile (KM)	387.3	90% gamma percentile (KM)	912.9
95% gamma percentile (KM)	1576	99% gamma percentile (KM)	3418
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (9.51, α)	3.64	Adjusted Chi Square Value (9.51, β)	3.396
95% Gamma Approximate KM-UCL (use when n>=50)	789.4	95% Gamma Adjusted KM-UCL (use when n<50)	846.3
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.92	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.916	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.142	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.177	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	302.1	Mean in Log Scale	3.642
SD in Original Scale	715	SD in Log Scale	2.173
95% t UCL (assumes normality of ROS data)	546.7	95% Percentile Bootstrap UCL	555.7
95% BCA Bootstrap UCL	673.3	95% Bootstrap t UCL	1161
95% H-UCL (Log ROS)	2673		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	3.516	KM Geo Mean	33.65
KM SD (logged)	2.469	95% Critical H Value (KM-Log)	4.749
KM Standard Error of Mean (logged)	0.504	95% H-UCL (KM -Log)	7753
KM SD (logged)	2.469	95% Critical H Value (KM-Log)	4.749
KM Standard Error of Mean (logged)	0.504		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	302.1	Mean in Log Scale	3.488
SD in Original Scale	715	SD in Log Scale	2.61
95% t UCL (Assumes normality)	546.7	95% H-Stat UCL	14063
DL/2 is not a recommended method, provided for comparisons and historical reasons			

Nonparametric Distribution Free UCL Statistics			
Detected Data appear Lognormal Distributed at 5% Significance Level			
Suggested UCL to Use			
95% KM (Chebyshev) UCL	925.9		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Fluoranthene			
General Statistics			
Total Number of Observations	25	Number of Distinct Observations	23
		Number of Missing Observations	1
Minimum	0.029	Mean	359.9
Maximum	3700	Median	19
SD	836.2	Std. Error of Mean	167.2
Coefficient of Variation	2.323	Skewness	3.329
Normal GOF Test			
Shapiro Wilk Test Statistic	0.486	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.918	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.333	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.173	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	646	95% Adjusted-CLT UCL (Chen-1995)	753.9
		95% Modified-t UCL (Johnson-1978)	664.6
Gamma GOF Test			
A-D Test Statistic	1.132	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.86	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.209	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.19	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	0.283	k star (bias corrected MLE)	0.275
Theta hat (MLE)	1273	Theta star (bias corrected MLE)	1306
nu hat (MLE)	14.14	nu star (bias corrected)	13.77
MLE Mean (bias corrected)	359.9	MLE Sd (bias corrected)	685.7
		Approximate Chi Square Value (0.05)	6.417
Adjusted Level of Significance	0.0395	Adjusted Chi Square Value	6.076
Assuming Gamma Distribution			

95% Approximate Gamma UCL (use when n>=50))	772.5	95% Adjusted Gamma UCL (use when n<50)	815.8
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.952	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.918	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.127	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.173	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	-3.54	Mean of logged Data	3.423
Maximum of Logged Data	8.216	SD of logged Data	2.714
Assuming Lognormal Distribution			
95% H-UCL	21319	90% Chebyshev (MVUE) UCL	2276
95% Chebyshev (MVUE) UCL	2976	97.5% Chebyshev (MVUE) UCL	3948
99% Chebyshev (MVUE) UCL	5857		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	635	95% Jackknife UCL	646
95% Standard Bootstrap UCL	632.9	95% Bootstrap-t UCL	1309
95% Hall's Bootstrap UCL	1801	95% Percentile Bootstrap UCL	654.2
95% BCA Bootstrap UCL	788		
90% Chebyshev(Mean, Sd) UCL	861.6	95% Chebyshev(Mean, Sd) UCL	1089
97.5% Chebyshev(Mean, Sd) UCL	1404	99% Chebyshev(Mean, Sd) UCL	2024
Suggested UCL to Use			
99% Chebyshev (Mean, Sd) UCL	2024		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
BenzoKFluoranthene			
General Statistics			
Total Number of Observations	25	Number of Distinct Observations	23
		Number of Missing Observations	1
Number of Detects	24	Number of Non-Detects	1
Number of Distinct Detects	22	Number of Distinct Non-Detects	1
Minimum Detect	1.7	Minimum Non-Detect	0.017
Maximum Detect	2400	Maximum Non-Detect	0.017
Variance Detects	291583	Percent Non-Detects	4%
Mean Detects	190.7	SD Detects	540
Median Detects	14.5	CV Detects	2.832
Skewness Detects	3.629	Kurtosis Detects	13.41

Mean of Logged Detects	3.019	SD of Logged Detects	1.998
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.394	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.916	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.415	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.177	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	183.1	KM Standard Error of Mean	106.1
KM SD	519.3	95% KM (BCA) UCL	387.8
95% KM (t) UCL	364.6	95% KM (Percentile Bootstrap) UCL	378.7
95% KM (z) UCL	357.6	95% KM Bootstrap t UCL	1512
90% KM Chebyshev UCL	501.3	95% KM Chebyshev UCL	645.5
97.5% KM Chebyshev UCL	845.6	99% KM Chebyshev UCL	1239
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	2.36	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.849	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.259	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.193	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.308	k star (bias corrected MLE)	0.297
Theta hat (MLE)	619.7	Theta star (bias corrected MLE)	642
nu hat (MLE)	14.77	nu star (bias corrected)	14.26
Mean (detects)	190.7		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	183.1
Maximum	2400	Median	12
SD	530	CV	2.895
k hat (MLE)	0.279	k star (bias corrected MLE)	0.273
Theta hat (MLE)	655	Theta star (bias corrected MLE)	671.5
nu hat (MLE)	13.97	nu star (bias corrected)	13.63
Adjusted Level of Significance (β)	0.0395		
Approximate Chi Square Value (13.63, α)	6.319	Adjusted Chi Square Value (13.63, β)	5.981
95% Gamma Approximate UCL (use when n>=50)	394.9	95% Gamma Adjusted UCL (use when n<50)	417.2
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	183.1	SD (KM)	519.3
Variance (KM)	269652	SE of Mean (KM)	106.1
k hat (KM)	0.124	k star (KM)	0.136

nu hat (KM)	6.214	nu star (KM)	6.801
theta hat (KM)	1473	theta star (KM)	1346
80% gamma percentile (KM)	182.8	90% gamma percentile (KM)	534.1
95% gamma percentile (KM)	1026	99% gamma percentile (KM)	2482
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (6.80, α)	2.062	Adjusted Chi Square Value (6.80, β)	1.889
95% Gamma Approximate KM-UCL (use when n>=50)	603.7	95% Gamma Adjusted KM-UCL (use when n<50)	659
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.922	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.916	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.126	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.177	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	183.1	Mean in Log Scale	2.822
SD in Original Scale	530	SD in Log Scale	2.189
95% t UCL (assumes normality of ROS data)	364.4	95% Percentile Bootstrap UCL	368.3
95% BCA Bootstrap UCL	477.3	95% Bootstrap t UCL	1420
95% H-UCL (Log ROS)	1253		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	2.735	KM Geo Mean	15.41
KM SD (logged)	2.368	95% Critical H Value (KM-Log)	4.58
KM Standard Error of Mean (logged)	0.484	95% H-UCL (KM -Log)	2325
KM SD (logged)	2.368	95% Critical H Value (KM-Log)	4.58
KM Standard Error of Mean (logged)	0.484		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	183.1	Mean in Log Scale	2.707
SD in Original Scale	530	SD in Log Scale	2.5
95% t UCL (Assumes normality)	364.4	95% H-Stat UCL	3962
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Lognormal Distributed at 5% Significance Level			
Suggested UCL to Use			
95% KM (Chebyshev) UCL	645.5		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Chrysene			

ProUCL Output
North Percolation Pond Area Soil (0-0.5 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

General Statistics			
Total Number of Observations	25	Number of Distinct Observations	23
		Number of Missing Observations	1
Number of Detects	24	Number of Non-Detects	1
Number of Distinct Detects	22	Number of Distinct Non-Detects	1
Minimum Detect	1.8	Minimum Non-Detect	0.011
Maximum Detect	2800	Maximum Non-Detect	0.011
Variance Detects	417761	Percent Non-Detects	4%
Mean Detects	272.4	SD Detects	646.3
Median Detects	15.5	CV Detects	2.373
Skewness Detects	3.305	Kurtosis Detects	11.14
Mean of Logged Detects	3.496	SD of Logged Detects	2.178
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.473	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.916	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.338	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.177	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	261.5	KM Standard Error of Mean	127.1
KM SD	622.2	95% KM (BCA) UCL	467.9
95% KM (t) UCL	479	95% KM (Percentile Bootstrap) UCL	482.9
95% KM (z) UCL	470.6	95% KM Bootstrap t UCL	1135
90% KM Chebyshev UCL	642.9	95% KM Chebyshev UCL	815.6
97.5% KM Chebyshev UCL	1055	99% KM Chebyshev UCL	1526
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	1.507	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.846	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.232	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.193	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.323	k star (bias corrected MLE)	0.31
Theta hat (MLE)	843.8	Theta star (bias corrected MLE)	878
nu hat (MLE)	15.49	nu star (bias corrected)	14.89
Mean (detects)	272.4		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	261.5
Maximum	2800	Median	15
SD	635.1	CV	2.429

k hat (MLE)	0.29	k star (bias corrected MLE)	0.282
Theta hat (MLE)	902.7	Theta star (bias corrected MLE)	928.6
nu hat (MLE)	14.48	nu star (bias corrected)	14.08
Adjusted Level of Significance (β)	0.0395		
Approximate Chi Square Value (14.08, α)	6.626	Adjusted Chi Square Value (14.08, β)	6.278
95% Gamma Approximate UCL (use when n>=50)	555.6	95% Gamma Adjusted UCL (use when n<50)	586.4
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	261.5	SD (KM)	622.2
Variance (KM)	387189	SE of Mean (KM)	127.1
k hat (KM)	0.177	k star (KM)	0.182
nu hat (KM)	8.829	nu star (KM)	9.103
theta hat (KM)	1481	theta star (KM)	1436
80% gamma percentile (KM)	326.7	90% gamma percentile (KM)	789
95% gamma percentile (KM)	1379	99% gamma percentile (KM)	3031
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (9.10, α)	3.389	Adjusted Chi Square Value (9.10, β)	3.155
95% Gamma Approximate KM-UCL (use when n>=50)	702.3	95% Gamma Adjusted KM-UCL (use when n<50)	754.5
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.931	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.916	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.172	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.177	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	261.5	Mean in Log Scale	3.28
SD in Original Scale	635.1	SD in Log Scale	2.39
95% t UCL (assumes normality of ROS data)	478.8	95% Percentile Bootstrap UCL	481.5
95% BCA Bootstrap UCL	602.6	95% Bootstrap t UCL	1160
95% H-UCL (Log ROS)	4402		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	3.176	KM Geo Mean	23.95
KM SD (logged)	2.613	95% Critical H Value (KM-Log)	4.991
KM Standard Error of Mean (logged)	0.534	95% H-UCL (KM -Log)	10414
KM SD (logged)	2.613	95% Critical H Value (KM-Log)	4.991
KM Standard Error of Mean (logged)	0.534		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	261.5	Mean in Log Scale	3.148
SD in Original Scale	635.1	SD in Log Scale	2.752
95% t UCL (Assumes normality)	478.8	95% H-Stat UCL	19363
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Lognormal Distributed at 5% Significance Level			

Suggested UCL to Use			
97.5% KM (Chebyshev) UCL	1055		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
BenzoAPyrene			
General Statistics			
Total Number of Observations	25	Number of Distinct Observations	23
		Number of Missing Observations	1
Number of Detects	24	Number of Non-Detects	1
Number of Distinct Detects	22	Number of Distinct Non-Detects	1
Minimum Detect	1.5	Minimum Non-Detect	0.012
Maximum Detect	3100	Maximum Non-Detect	0.012
Variance Detects	519420	Percent Non-Detects	4%
Mean Detects	271.7	SD Detects	720.7
Median Detects	14.5	CV Detects	2.652
Skewness Detects	3.38	Kurtosis Detects	11.45
Mean of Logged Detects	3.267	SD of Logged Detects	2.15
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.427	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.916	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.406	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.177	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	260.8	KM Standard Error of Mean	141.6
KM SD	693.3	95% KM (BCA) UCL	527.2
95% KM (t) UCL	503.2	95% KM (Percentile Bootstrap) UCL	506.2
95% KM (z) UCL	493.8	95% KM Bootstrap t UCL	1466
90% KM Chebyshev UCL	685.8	95% KM Chebyshev UCL	878.3
97.5% KM Chebyshev UCL	1145	99% KM Chebyshev UCL	1670
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	2.116	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.853	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.228	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.193	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.296	k star (bias corrected MLE)	0.287
Theta hat (MLE)	918.8	Theta star (bias corrected MLE)	948.3
nu hat (MLE)	14.19	nu star (bias corrected)	13.75

Mean (detects)	271.7		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	260.8
Maximum	3100	Median	14
SD	707.6	CV	2.713
k hat (MLE)	0.269	k star (bias corrected MLE)	0.263
Theta hat (MLE)	970.3	Theta star (bias corrected MLE)	991
nu hat (MLE)	13.44	nu star (bias corrected)	13.16
Adjusted Level of Significance (β)	0.0395		
Approximate Chi Square Value (13.16, α)	6.001	Adjusted Chi Square Value (13.16, β)	5.673
95% Gamma Approximate UCL (use when n>=50)	572.1	95% Gamma Adjusted UCL (use when n<50)	605.1
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	260.8	SD (KM)	693.3
Variance (KM)	480701	SE of Mean (KM)	141.6
k hat (KM)	0.142	k star (KM)	0.151
nu hat (KM)	7.077	nu star (KM)	7.561
theta hat (KM)	1843	theta star (KM)	1725
80% gamma percentile (KM)	285.8	90% gamma percentile (KM)	774.4
95% gamma percentile (KM)	1433	99% gamma percentile (KM)	3343
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (7.56, α)	2.484	Adjusted Chi Square Value (7.56, β)	2.29
95% Gamma Approximate KM-UCL (use when n>=50)	794.1	95% Gamma Adjusted KM-UCL (use when n<50)	861.4
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.926	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.916	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.149	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.177	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	260.9	Mean in Log Scale	3.055
SD in Original Scale	707.6	SD in Log Scale	2.357
95% t UCL (assumes normality of ROS data)	503	95% Percentile Bootstrap UCL	525.9
95% BCA Bootstrap UCL	646.5	95% Bootstrap t UCL	1459
95% H-UCL (Log ROS)	3066		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	2.96	KM Geo Mean	19.29
KM SD (logged)	2.554	95% Critical H Value (KM-Log)	4.893
KM Standard Error of Mean (logged)	0.522	95% H-UCL (KM -Log)	6459
KM SD (logged)	2.554	95% Critical H Value (KM-Log)	4.893

KM Standard Error of Mean (logged)	0.522		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	260.8	Mean in Log Scale	2.932
SD in Original Scale	707.6	SD in Log Scale	2.691
95% t UCL (Assumes normality)	503	95% H-Stat UCL	11699
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Lognormal Distributed at 5% Significance Level			
Suggested UCL to Use			
97.5% KM (Chebyshev) UCL	1145		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
DibenzAHAnthracene			
General Statistics			
Total Number of Observations	25	Number of Distinct Observations	21
		Number of Missing Observations	1
Number of Detects	24	Number of Non-Detects	1
Number of Distinct Detects	20	Number of Distinct Non-Detects	1
Minimum Detect	0.4	Minimum Non-Detect	0.02
Maximum Detect	740	Maximum Non-Detect	0.02
Variance Detects	30859	Percent Non-Detects	4%
Mean Detects	66.09	SD Detects	175.7
Median Detects	3.95	CV Detects	2.658
Skewness Detects	3.31	Kurtosis Detects	10.73
Mean of Logged Detects	1.985	SD of Logged Detects	2.02
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.422	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.916	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.417	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.177	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	63.45	KM Standard Error of Mean	34.53
KM SD	169	95% KM (BCA) UCL	129
95% KM (t) UCL	122.5	95% KM (Percentile Bootstrap) UCL	128.2
95% KM (z) UCL	120.2	95% KM Bootstrap t UCL	386.4
90% KM Chebyshev UCL	167	95% KM Chebyshev UCL	213.9
97.5% KM Chebyshev UCL	279.1	99% KM Chebyshev UCL	407

Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	2.321	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.849	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.268	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.193	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.311	k star (bias corrected MLE)	0.3
Theta hat (MLE)	212.6	Theta star (bias corrected MLE)	220.5
nu hat (MLE)	14.92	nu star (bias corrected)	14.39
Mean (detects)	66.09		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	63.45
Maximum	740	Median	3.7
SD	172.5	CV	2.718
k hat (MLE)	0.286	k star (bias corrected MLE)	0.278
Theta hat (MLE)	221.7	Theta star (bias corrected MLE)	227.9
nu hat (MLE)	14.31	nu star (bias corrected)	13.92
Adjusted Level of Significance (β)	0.0395		
Approximate Chi Square Value (13.92, α)	6.519	Adjusted Chi Square Value (13.92, β)	6.175
95% Gamma Approximate UCL (use when n>=50)	135.5	95% Gamma Adjusted UCL (use when n<50)	143.1
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	63.45	SD (KM)	169
Variance (KM)	28558	SE of Mean (KM)	34.53
k hat (KM)	0.141	k star (KM)	0.151
nu hat (KM)	7.049	nu star (KM)	7.536
theta hat (KM)	450.1	theta star (KM)	421
80% gamma percentile (KM)	69.34	90% gamma percentile (KM)	188.3
95% gamma percentile (KM)	348.9	99% gamma percentile (KM)	814.5
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (7.54, α)	2.469	Adjusted Chi Square Value (7.54, β)	2.276
95% Gamma Approximate KM-UCL (use when n>=50)	193.6	95% Gamma Adjusted KM-UCL (use when n<50)	210.1
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.929	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.916	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.149	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.177	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			

Mean in Original Scale	63.45	Mean in Log Scale	1.786
SD in Original Scale	172.5	SD in Log Scale	2.214
95% t UCL (assumes normality of ROS data)	122.5	95% Percentile Bootstrap UCL	122.9
95% BCA Bootstrap UCL	147.4	95% Bootstrap t UCL	384.2
95% H-UCL (Log ROS)	488.4		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	1.749	KM Geo Mean	5.751
KM SD (logged)	2.256	95% Critical H Value (KM-Log)	4.395
KM Standard Error of Mean (logged)	0.461	95% H-UCL (KM -Log)	554.9
KM SD (logged)	2.256	95% Critical H Value (KM-Log)	4.395
KM Standard Error of Mean (logged)	0.461		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	63.45	Mean in Log Scale	1.722
SD in Original Scale	172.5	SD in Log Scale	2.377
95% t UCL (Assumes normality)	122.5	95% H-Stat UCL	876.1
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Lognormal Distributed at 5% Significance Level			
Suggested UCL to Use			
97.5% KM (Chebyshev) UCL	279.1		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
BenzoAAnthracene			
General Statistics			
Total Number of Observations	25	Number of Distinct Observations	25
		Number of Missing Observations	1
Number of Detects	24	Number of Non-Detects	1
Number of Distinct Detects	24	Number of Distinct Non-Detects	1
Minimum Detect	1.4	Minimum Non-Detect	0.032
Maximum Detect	2700	Maximum Non-Detect	0.032
Variance Detects	398797	Percent Non-Detects	4%
Mean Detects	248.1	SD Detects	631.5
Median Detects	12	CV Detects	2.545
Skewness Detects	3.317	Kurtosis Detects	11
Mean of Logged Detects	3.179	SD of Logged Detects	2.241
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.445	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.916	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.37	**Lilliefors GOF Test**	

5% Lilliefors Critical Value	0.177	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	238.2	KM Standard Error of Mean	124.1
KM SD	607.7	95% KM (BCA) UCL	486.2
95% KM (t) UCL	450.6	95% KM (Percentile Bootstrap) UCL	468.3
95% KM (z) UCL	442.4	95% KM Bootstrap t UCL	1134
90% KM Chebyshev UCL	610.6	95% KM Chebyshev UCL	779.3
97.5% KM Chebyshev UCL	1013	99% KM Chebyshev UCL	1473
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	1.788	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.853	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.218	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.193	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.296	k star (bias corrected MLE)	0.287
Theta hat (MLE)	838.3	Theta star (bias corrected MLE)	865.3
nu hat (MLE)	14.2	nu star (bias corrected)	13.76
Mean (detects)	248.1		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	238.2
Maximum	2700	Median	11
SD	620.2	CV	2.604
k hat (MLE)	0.269	k star (bias corrected MLE)	0.264
Theta hat (MLE)	884.4	Theta star (bias corrected MLE)	903.3
nu hat (MLE)	13.47	nu star (bias corrected)	13.18
Adjusted Level of Significance (β)	0.0395		
Approximate Chi Square Value (13.18, α)	6.016	Adjusted Chi Square Value (13.18, β)	5.688
95% Gamma Approximate UCL (use when n>=50)	521.9	95% Gamma Adjusted UCL (use when n<50)	552.1
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	238.2	SD (KM)	607.7
Variance (KM)	369257	SE of Mean (KM)	124.1
k hat (KM)	0.154	k star (KM)	0.162
nu hat (KM)	7.681	nu star (KM)	8.093
theta hat (KM)	1550	theta star (KM)	1472
80% gamma percentile (KM)	275	90% gamma percentile (KM)	712.7
95% gamma percentile (KM)	1291	99% gamma percentile (KM)	2943
Gamma Kaplan-Meier (KM) Statistics			

Approximate Chi Square Value (8.09, α)	2.789	Adjusted Chi Square Value (8.09, β)	2.58
95% Gamma Approximate KM-UCL (use when n>=50)	691.1	95% Gamma Adjusted KM-UCL (use when n<50)	747
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.927	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.916	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.15	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.177	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	238.2	Mean in Log Scale	2.957
SD in Original Scale	620.2	SD in Log Scale	2.459
95% t UCL (assumes normality of ROS data)	450.4	95% Percentile Bootstrap UCL	458.8
95% BCA Bootstrap UCL	562.2	95% Bootstrap t UCL	1216
95% H-UCL (Log ROS)	4246		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	2.914	KM Geo Mean	18.42
KM SD (logged)	2.511	95% Critical H Value (KM-Log)	4.82
KM Standard Error of Mean (logged)	0.513	95% H-UCL (KM -Log)	5097
KM SD (logged)	2.511	95% Critical H Value (KM-Log)	4.82
KM Standard Error of Mean (logged)	0.513		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	238.2	Mean in Log Scale	2.886
SD in Original Scale	620.2	SD in Log Scale	2.637
95% t UCL (Assumes normality)	450.4	95% H-Stat UCL	8701
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Lognormal Distributed at 5% Significance Level			
Suggested UCL to Use			
97.5% KM (Chebyshev) UCL	1013		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Cyanide			
General Statistics			
Total Number of Observations	20	Number of Distinct Observations	19
		Number of Missing Observations	6
Minimum	0.19	Mean	13.38
Maximum	137	Median	3.15

SD	32.23	Std. Error of Mean	7.207
Coefficient of Variation	2.408	Skewness	3.495
Normal GOF Test			
Shapiro Wilk Test Statistic	0.427	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.905	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.447	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.192	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	25.84	95% Adjusted-CLT UCL (Chen-1995)	31.26
		95% Modified-t UCL (Johnson-1978)	26.78
Gamma GOF Test			
A-D Test Statistic	1.755	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.809	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.288	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.206	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	0.468	k star (bias corrected MLE)	0.431
Theta hat (MLE)	28.61	Theta star (bias corrected MLE)	31.05
nu hat (MLE)	18.71	nu star (bias corrected)	17.24
MLE Mean (bias corrected)	13.38	MLE Sd (bias corrected)	20.39
		Approximate Chi Square Value (0.05)	8.843
Adjusted Level of Significance	0.038	Adjusted Chi Square Value	8.369
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	26.09	95% Adjusted Gamma UCL (use when n<50)	27.56
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.954	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.905	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.151	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.192	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	-1.661	Mean of logged Data	1.222
Maximum of Logged Data	4.92	SD of logged Data	1.549
Assuming Lognormal Distribution			
95% H-UCL	39.26	90% Chebyshev (MVUE) UCL	22.59
95% Chebyshev (MVUE) UCL	28.28	97.5% Chebyshev (MVUE) UCL	36.16
99% Chebyshev (MVUE) UCL	51.66		
Nonparametric Distribution Free UCL Statistics			

Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	25.24	95% Jackknife UCL	25.84
95% Standard Bootstrap UCL	24.8	95% Bootstrap-t UCL	122.8
95% Hall's Bootstrap UCL	89.08	95% Percentile Bootstrap UCL	26.64
95% BCA Bootstrap UCL	33.85		
90% Chebyshev(Mean, Sd) UCL	35	95% Chebyshev(Mean, Sd) UCL	44.8
97.5% Chebyshev(Mean, Sd) UCL	58.39	99% Chebyshev(Mean, Sd) UCL	85.09
Suggested UCL to Use			
95% Chebyshev (Mean, Sd) UCL	44.8		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Aluminum			
General Statistics			
Total Number of Observations	20	Number of Distinct Observations	20
		Number of Missing Observations	6
Minimum	7520	Mean	34491
Maximum	106000	Median	26450
SD	25014	Std. Error of Mean	5593
Coefficient of Variation	0.725	Skewness	1.524
Normal GOF Test			
Shapiro Wilk Test Statistic	0.846	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.905	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.223	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.192	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	44163	95% Adjusted-CLT UCL (Chen-1995)	45728
		95% Modified-t UCL (Johnson-1978)	44480
Gamma GOF Test			
A-D Test Statistic	0.337	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.751	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.135	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.196	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	2.381	k star (bias corrected MLE)	2.057

Theta hat (MLE)	14488	Theta star (bias corrected MLE)	16768
nu hat (MLE)	95.23	nu star (bias corrected)	82.28
MLE Mean (bias corrected)	34491	MLE Sd (bias corrected)	24049
		Approximate Chi Square Value (0.05)	62.37
Adjusted Level of Significance	0.038	Adjusted Chi Square Value	61.01
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50)	45497	95% Adjusted Gamma UCL (use when n<50)	46518
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.983	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.905	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.0962	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.192	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	8.925	Mean of logged Data	10.22
Maximum of Logged Data	11.57	SD of logged Data	0.69
Assuming Lognormal Distribution			
95% H-UCL	49702	90% Chebyshev (MVUE) UCL	51450
95% Chebyshev (MVUE) UCL	59145	97.5% Chebyshev (MVUE) UCL	69826
99% Chebyshev (MVUE) UCL	90805		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	43691	95% Jackknife UCL	44163
95% Standard Bootstrap UCL	43376	95% Bootstrap-t UCL	48416
95% Hall's Bootstrap UCL	46920	95% Percentile Bootstrap UCL	44019
95% BCA Bootstrap UCL	45386		
90% Chebyshev(Mean, Sd) UCL	51271	95% Chebyshev(Mean, Sd) UCL	58871
97.5% Chebyshev(Mean, Sd) UCL	69421	99% Chebyshev(Mean, Sd) UCL	90143
Suggested UCL to Use			
95% Adjusted Gamma UCL	46518		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Iron			
General Statistics			
Total Number of Observations	20	Number of Distinct Observations	19
		Number of Missing Observations	6

Minimum	1330	Mean	8125
Maximum	15400	Median	7640
SD	3964	Std. Error of Mean	886.4
Coefficient of Variation	0.488	Skewness	0.134
Normal GOF Test			
Shapiro Wilk Test Statistic	0.968	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.905	Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.11	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.192	Data appear Normal at 5% Significance Level	
Data appear Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	9657	95% Adjusted-CLT UCL (Chen-1995)	9611
		95% Modified-t UCL (Johnson-1978)	9662
Gamma GOF Test			
A-D Test Statistic	0.31	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.746	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.125	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.195	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	3.519	k star (bias corrected MLE)	3.024
Theta hat (MLE)	2309	Theta star (bias corrected MLE)	2687
nu hat (MLE)	140.7	nu star (bias corrected)	121
MLE Mean (bias corrected)	8125	MLE Sd (bias corrected)	4672
		Approximate Chi Square Value (0.05)	96.57
Adjusted Level of Significance	0.038	Adjusted Chi Square Value	94.85
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	10177	95% Adjusted Gamma UCL (use when n<50)	10362
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.919	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.905	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.142	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.192	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	7.193	Mean of logged Data	8.854
Maximum of Logged Data	9.642	SD of logged Data	0.617
Assuming Lognormal Distribution			
95% H-UCL	11461	90% Chebyshev (MVUE) UCL	12023
95% Chebyshev (MVUE) UCL	13677	97.5% Chebyshev (MVUE) UCL	15971
99% Chebyshev (MVUE) UCL	20478		

Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	9582	95% Jackknife UCL	9657
95% Standard Bootstrap UCL	9552	95% Bootstrap-t UCL	9688
95% Hall's Bootstrap UCL	9577	95% Percentile Bootstrap UCL	9483
95% BCA Bootstrap UCL	9623		
90% Chebyshev(Mean, Sd) UCL	10784	95% Chebyshev(Mean, Sd) UCL	11988
97.5% Chebyshev(Mean, Sd) UCL	13660	99% Chebyshev(Mean, Sd) UCL	16944
Suggested UCL to Use			
95% Student's-t UCL	9657		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Manganese			
General Statistics			
Total Number of Observations	20	Number of Distinct Observations	20
		Number of Missing Observations	6
Minimum	12.8	Mean	148.4
Maximum	479	Median	89.5
SD	143.7	Std. Error of Mean	32.14
Coefficient of Variation	0.969	Skewness	1.18
Normal GOF Test			
Shapiro Wilk Test Statistic	0.813	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.905	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.297	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.192	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	203.9	95% Adjusted-CLT UCL (Chen-1995)	210.3
		95% Modified-t UCL (Johnson-1978)	205.4
Gamma GOF Test			
A-D Test Statistic	0.56	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.765	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.194	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.199	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			

Gamma Statistics			
k hat (MLE)	1.158	k star (bias corrected MLE)	1.018
Theta hat (MLE)	128.1	Theta star (bias corrected MLE)	145.7
nu hat (MLE)	46.34	nu star (bias corrected)	40.72
MLE Mean (bias corrected)	148.4	MLE Sd (bias corrected)	147
		Approximate Chi Square Value (0.05)	27.1
Adjusted Level of Significance	0.038	Adjusted Chi Square Value	26.22
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50)	223	95% Adjusted Gamma UCL (use when n<50)	230.4
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.948	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.905	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.133	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.192	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	2.549	Mean of logged Data	4.51
Maximum of Logged Data	6.172	SD of logged Data	1.08
Assuming Lognormal Distribution			
95% H-UCL	321.8	90% Chebyshev (MVUE) UCL	283.8
95% Chebyshev (MVUE) UCL	341.8	97.5% Chebyshev (MVUE) UCL	422.2
99% Chebyshev (MVUE) UCL	580.2		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	201.2	95% Jackknife UCL	203.9
95% Standard Bootstrap UCL	199.6	95% Bootstrap-t UCL	216.5
95% Hall's Bootstrap UCL	203.1	95% Percentile Bootstrap UCL	201.8
95% BCA Bootstrap UCL	208.9		
90% Chebyshev(Mean, Sd) UCL	244.8	95% Chebyshev(Mean, Sd) UCL	288.5
97.5% Chebyshev(Mean, Sd) UCL	349.1	99% Chebyshev(Mean, Sd) UCL	468.2
Suggested UCL to Use			
95% Adjusted Gamma UCL	230.4		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Mercury			
General Statistics			
Total Number of Observations	20	Number of Distinct Observations	14

		Number of Missing Observations	6
Number of Detects	16	Number of Non-Detects	4
Number of Distinct Detects	12	Number of Distinct Non-Detects	4
Minimum Detect	0.014	Minimum Non-Detect	0.0099
Maximum Detect	0.12	Maximum Non-Detect	0.028
Variance Detects	8.5543E-4	Percent Non-Detects	20%
Mean Detects	0.0367	SD Detects	0.0292
Median Detects	0.027	CV Detects	0.797
Skewness Detects	2.044	Kurtosis Detects	3.962
Mean of Logged Detects	-3.517	SD of Logged Detects	0.625
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.733	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.887	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.267	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.213	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.032	KM Standard Error of Mean	0.00626
KM SD	0.027	95% KM (BCA) UCL	0.0428
95% KM (t) UCL	0.0429	95% KM (Percentile Bootstrap) UCL	0.0427
95% KM (z) UCL	0.0423	95% KM Bootstrap t UCL	0.0528
90% KM Chebyshev UCL	0.0508	95% KM Chebyshev UCL	0.0593
97.5% KM Chebyshev UCL	0.0711	99% KM Chebyshev UCL	0.0943
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	0.825	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.747	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.206	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.217	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data follow Appr. Gamma Distribution at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	2.518	k star (bias corrected MLE)	2.087
Theta hat (MLE)	0.0146	Theta star (bias corrected MLE)	0.0176
nu hat (MLE)	80.57	nu star (bias corrected)	66.8
Mean (detects)	0.0367		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	0.0314
Maximum	0.12	Median	0.023
SD	0.0282	CV	0.898
k hat (MLE)	2.001	k star (bias corrected MLE)	1.734
Theta hat (MLE)	0.0157	Theta star (bias corrected MLE)	0.0181

nu hat (MLE)	80.03	nu star (bias corrected)	69.36
Adjusted Level of Significance (β)	0.038		
Approximate Chi Square Value (69.36, α)	51.19	Adjusted Chi Square Value (69.36, β)	49.96
95% Gamma Approximate UCL (use when n>=50)	0.0425	95% Gamma Adjusted UCL (use when n<50)	0.0436
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.032	SD (KM)	0.027
Variance (KM)	7.3147E-4	SE of Mean (KM)	0.00626
k hat (KM)	1.403	k star (KM)	1.226
nu hat (KM)	56.12	nu star (KM)	49.03
theta hat (KM)	0.0228	theta star (KM)	0.0261
80% gamma percentile (KM)	0.0506	90% gamma percentile (KM)	0.0701
95% gamma percentile (KM)	0.0894	99% gamma percentile (KM)	0.133
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (49.03, α)	33.96	Adjusted Chi Square Value (49.03, β)	32.97
95% Gamma Approximate KM-UCL (use when n>=50)	0.0463	95% Gamma Adjusted KM-UCL (use when n<50)	0.0476
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.915	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.887	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.16	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.213	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.0316	Mean in Log Scale	-3.724
SD in Original Scale	0.0281	SD in Log Scale	0.717
95% t UCL (assumes normality of ROS data)	0.0424	95% Percentile Bootstrap UCL	0.0421
95% BCA Bootstrap UCL	0.0465	95% Bootstrap t UCL	0.0508
95% H-UCL (Log ROS)	0.0452		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-3.684	KM Geo Mean	0.0251
KM SD (logged)	0.648	95% Critical H Value (KM-Log)	2.176
KM Standard Error of Mean (logged)	0.152	95% H-UCL (KM -Log)	0.0428
KM SD (logged)	0.648	95% Critical H Value (KM-Log)	2.176
KM Standard Error of Mean (logged)	0.152		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.0312	Mean in Log Scale	-3.765
SD in Original Scale	0.0284	SD in Log Scale	0.774
95% t UCL (Assumes normality)	0.0422	95% H-Stat UCL	0.0472
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Approximate Gamma Distributed at 5% Significance Level			
Suggested UCL to Use			

95% KM Adjusted Gamma UCL	0.0476	95% GROS Adjusted Gamma UCL	0.0436

When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test

When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Nickel

General Statistics

Total Number of Observations	20	Number of Distinct Observations	20
		Number of Missing Observations	6
Minimum	17.9	Mean	215
Maximum	1250	Median	144.5
SD	275	Std. Error of Mean	61.48
Coefficient of Variation	1.279	Skewness	3.165

Normal GOF Test

Shapiro Wilk Test Statistic	0.604	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.905	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.303	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.192	Data Not Normal at 5% Significance Level	

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	321.3	95% Adjusted-CLT UCL (Chen-1995)	362.6
		95% Modified-t UCL (Johnson-1978)	328.6

Gamma GOF Test

A-D Test Statistic	0.73	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.763	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.201	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.198	Data Not Gamma Distributed at 5% Significance Level	

Detected data follow Appr. Gamma Distribution at 5% Significance Level

Gamma Statistics

k hat (MLE)	1.226	k star (bias corrected MLE)	1.075
Theta hat (MLE)	175.4	Theta star (bias corrected MLE)	199.9
nu hat (MLE)	49.04	nu star (bias corrected)	43.02
MLE Mean (bias corrected)	215	MLE Sd (bias corrected)	207.3
		Approximate Chi Square Value (0.05)	28.98
Adjusted Level of Significance	0.038	Adjusted Chi Square Value	28.07

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50)	319.2	95% Adjusted Gamma UCL (use when n<50)	329.5

Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.977	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.905	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.13	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.192	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	2.885	Mean of logged Data	4.91
Maximum of Logged Data	7.131	SD of logged Data	0.944
Assuming Lognormal Distribution			
95% H-UCL	368	90% Chebyshev (MVUE) UCL	349.6
95% Chebyshev (MVUE) UCL	414.9	97.5% Chebyshev (MVUE) UCL	505.6
99% Chebyshev (MVUE) UCL	683.6		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	316.1	95% Jackknife UCL	321.3
95% Standard Bootstrap UCL	315.6	95% Bootstrap-t UCL	483.4
95% Hall's Bootstrap UCL	736.8	95% Percentile Bootstrap UCL	320.3
95% BCA Bootstrap UCL	378.3		
90% Chebyshev(Mean, Sd) UCL	399.4	95% Chebyshev(Mean, Sd) UCL	483
97.5% Chebyshev(Mean, Sd) UCL	599	99% Chebyshev(Mean, Sd) UCL	826.8
Suggested UCL to Use			
95% Adjusted Gamma UCL	329.5		
When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test			
When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			

Thallium

General Statistics			
Total Number of Observations	20	Number of Distinct Observations	19
		Number of Missing Observations	6
Number of Detects	17	Number of Non-Detects	3
Number of Distinct Detects	16	Number of Distinct Non-Detects	3
Minimum Detect	0.14	Minimum Non-Detect	0.11
Maximum Detect	4.6	Maximum Non-Detect	0.18
Variance Detects	1.831	Percent Non-Detects	15%
Mean Detects	0.869	SD Detects	1.353

Median Detects	0.31	CV Detects	1.557
Skewness Detects	2.466	Kurtosis Detects	5
Mean of Logged Detects	-0.801	SD of Logged Detects	1.036
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.545	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.892	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.35	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.207	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.757	KM Standard Error of Mean	0.286
KM SD	1.239	95% KM (BCA) UCL	1.346
95% KM (t) UCL	1.251	95% KM (Percentile Bootstrap) UCL	1.245
95% KM (z) UCL	1.227	95% KM Bootstrap t UCL	2.941
90% KM Chebyshev UCL	1.614	95% KM Chebyshev UCL	2.002
97.5% KM Chebyshev UCL	2.541	99% KM Chebyshev UCL	3.599
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	1.675	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.771	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.22	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.216	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.887	k star (bias corrected MLE)	0.77
Theta hat (MLE)	0.98	Theta star (bias corrected MLE)	1.129
nu hat (MLE)	30.15	nu star (bias corrected)	26.17
Mean (detects)	0.869		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	0.74
Maximum	4.6	Median	0.28
SD	1.281	CV	1.731
k hat (MLE)	0.58	k star (bias corrected MLE)	0.526
Theta hat (MLE)	1.276	Theta star (bias corrected MLE)	1.406
nu hat (MLE)	23.2	nu star (bias corrected)	21.06
Adjusted Level of Significance (β)	0.038		
Approximate Chi Square Value (21.06, α)	11.63	Adjusted Chi Square Value (21.06, β)	11.08
95% Gamma Approximate UCL (use when n>=50)	1.339	95% Gamma Adjusted UCL (use when n<50)	1.406
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.757	SD (KM)	1.239

Variance (KM)	1.536	SE of Mean (KM)	0.286
k hat (KM)	0.373	k star (KM)	0.351
nu hat (KM)	14.93	nu star (KM)	14.02
theta hat (KM)	2.029	theta star (KM)	2.16
80% gamma percentile (KM)	1.199	90% gamma percentile (KM)	2.185
95% gamma percentile (KM)	3.29	99% gamma percentile (KM)	6.108
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (14.02, α)	6.586	Adjusted Chi Square Value (14.02, β)	6.186
95% Gamma Approximate KM-UCL (use when n>=50)	1.612	95% Gamma Adjusted KM-UCL (use when n<50)	1.716
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.867	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.892	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.169	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.207	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Approximate Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.748	Mean in Log Scale	-1.105
SD in Original Scale	1.276	SD in Log Scale	1.215
95% t UCL (assumes normality of ROS data)	1.241	95% Percentile Bootstrap UCL	1.216
95% BCA Bootstrap UCL	1.415	95% Bootstrap t UCL	2.799
95% H-UCL (Log ROS)	1.579		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-0.996	KM Geo Mean	0.369
KM SD (logged)	1.037	95% Critical H Value (KM-Log)	2.689
KM Standard Error of Mean (logged)	0.239	95% H-UCL (KM -Log)	1.199
KM SD (logged)	1.037	95% Critical H Value (KM-Log)	2.689
KM Standard Error of Mean (logged)	0.239		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.75	Mean in Log Scale	-1.073
SD in Original Scale	1.275	SD in Log Scale	1.162
95% t UCL (Assumes normality)	1.243	95% H-Stat UCL	1.447
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Approximate Lognormal Distributed at 5% Significance Level			
Suggested UCL to Use			
95% KM (Chebyshev) UCL	2.002		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			

Antimony			
General Statistics			
Total Number of Observations	20	Number of Distinct Observations	17
		Number of Missing Observations	6
Number of Detects	6	Number of Non-Detects	14
Number of Distinct Detects	6	Number of Distinct Non-Detects	12
Minimum Detect	0.43	Minimum Non-Detect	0.25
Maximum Detect	2.6	Maximum Non-Detect	0.7
Variance Detects	0.741	Percent Non-Detects	70%
Mean Detects	1.263	SD Detects	0.861
Median Detects	1.01	CV Detects	0.681
Skewness Detects	0.832	Kurtosis Detects	-0.806
Mean of Logged Detects	0.0303	SD of Logged Detects	0.71
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.897	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.788	Detected Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.242	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.325	Detected Data appear Normal at 5% Significance Level	
Detected Data appear Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.557	KM Standard Error of Mean	0.155
KM SD	0.632	95% KM (BCA) UCL	0.818
95% KM (t) UCL	0.825	95% KM (Percentile Bootstrap) UCL	0.818
95% KM (z) UCL	0.812	95% KM Bootstrap t UCL	0.955
90% KM Chebyshev UCL	1.022	95% KM Chebyshev UCL	1.233
97.5% KM Chebyshev UCL	1.525	99% KM Chebyshev UCL	2.099
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	0.271	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.702	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.176	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.335	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	2.612	k star (bias corrected MLE)	1.417
Theta hat (MLE)	0.484	Theta star (bias corrected MLE)	0.891
nu hat (MLE)	31.34	nu star (bias corrected)	17.01
Mean (detects)	1.263		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	0.386

Maximum	2.6	Median	0.01
SD	0.736	CV	1.908
k hat (MLE)	0.304	k star (bias corrected MLE)	0.292
Theta hat (MLE)	1.269	Theta star (bias corrected MLE)	1.323
nu hat (MLE)	12.16	nu star (bias corrected)	11.67
Adjusted Level of Significance (β)	0.038		
Approximate Chi Square Value (11.67, α)	5.012	Adjusted Chi Square Value (11.67, β)	4.671
95% Gamma Approximate UCL (use when n>=50)	0.899	95% Gamma Adjusted UCL (use when n<50)	0.965
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.557	SD (KM)	0.632
Variance (KM)	0.4	SE of Mean (KM)	0.155
k hat (KM)	0.777	k star (KM)	0.693
nu hat (KM)	31.06	nu star (KM)	27.74
theta hat (KM)	0.717	theta star (KM)	0.803
80% gamma percentile (KM)	0.916	90% gamma percentile (KM)	1.402
95% gamma percentile (KM)	1.903	99% gamma percentile (KM)	3.1
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (27.74, α)	16.72	Adjusted Chi Square Value (27.74, β)	16.05
95% Gamma Approximate KM-UCL (use when n>=50)	0.924	95% Gamma Adjusted KM-UCL (use when n<50)	0.963
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.948	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.788	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.159	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.325	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.446	Mean in Log Scale	-1.669
SD in Original Scale	0.705	SD in Log Scale	1.228
95% t UCL (assumes normality of ROS data)	0.718	95% Percentile Bootstrap UCL	0.72
95% BCA Bootstrap UCL	0.802	95% Bootstrap t UCL	1.024
95% H-UCL (Log ROS)	0.927		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-0.952	KM Geo Mean	0.386
KM SD (logged)	0.738	95% Critical H Value (KM-Log)	2.282
KM Standard Error of Mean (logged)	0.182	95% H-UCL (KM -Log)	0.746
KM SD (logged)	0.738	95% Critical H Value (KM-Log)	2.282
KM Standard Error of Mean (logged)	0.182		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.515	Mean in Log Scale	-1.166
SD in Original Scale	0.671	SD in Log Scale	0.91
95% t UCL (Assumes normality)	0.774	95% H-Stat UCL	0.796
DL/2 is not a recommended method, provided for comparisons and historical reasons			

Nonparametric Distribution Free UCL Statistics			
Detected Data appear Normal Distributed at 5% Significance Level			
Suggested UCL to Use			
95% KM (t) UCL	0.825		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Arsenic			
General Statistics			
Total Number of Observations	20	Number of Distinct Observations	18
		Number of Missing Observations	6
Minimum	2.5	Mean	9.94
Maximum	22.7	Median	8.6
SD	5.471	Std. Error of Mean	1.223
Coefficient of Variation	0.55	Skewness	0.859
Normal GOF Test			
Shapiro Wilk Test Statistic	0.924	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.905	Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.168	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.192	Data appear Normal at 5% Significance Level	
Data appear Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	12.06	95% Adjusted-CLT UCL (Chen-1995)	12.2
		95% Modified-t UCL (Johnson-1978)	12.09
Gamma GOF Test			
A-D Test Statistic	0.296	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.747	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.115	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.195	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	3.321	k star (bias corrected MLE)	2.856
Theta hat (MLE)	2.993	Theta star (bias corrected MLE)	3.48
nu hat (MLE)	132.9	nu star (bias corrected)	114.3
MLE Mean (bias corrected)	9.94	MLE Sd (bias corrected)	5.881
		Approximate Chi Square Value (0.05)	90.58
Adjusted Level of Significance	0.038	Adjusted Chi Square Value	88.92
Assuming Gamma Distribution			

95% Approximate Gamma UCL (use when n>=50))	12.54	95% Adjusted Gamma UCL (use when n<50)	12.77
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.948	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.905	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.153	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.192	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	0.916	Mean of logged Data	2.139
Maximum of Logged Data	3.122	SD of logged Data	0.608
Assuming Lognormal Distribution			
95% H-UCL	13.74	90% Chebyshev (MVUE) UCL	14.43
95% Chebyshev (MVUE) UCL	16.39	97.5% Chebyshev (MVUE) UCL	19.12
99% Chebyshev (MVUE) UCL	24.47		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	11.95	95% Jackknife UCL	12.06
95% Standard Bootstrap UCL	11.85	95% Bootstrap-t UCL	12.26
95% Hall's Bootstrap UCL	12.53	95% Percentile Bootstrap UCL	11.87
95% BCA Bootstrap UCL	12.02		
90% Chebyshev(Mean, Sd) UCL	13.61	95% Chebyshev(Mean, Sd) UCL	15.27
97.5% Chebyshev(Mean, Sd) UCL	17.58	99% Chebyshev(Mean, Sd) UCL	22.11
Suggested UCL to Use			
95% Student's-t UCL	12.06		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Beryllium			
General Statistics			
Total Number of Observations	20	Number of Distinct Observations	16
		Number of Missing Observations	6
Minimum	0.34	Mean	2.581
Maximum	17.2	Median	1.25
SD	3.713	Std. Error of Mean	0.83
Coefficient of Variation	1.439	Skewness	3.513
Normal GOF Test			
Shapiro Wilk Test Statistic	0.559	**Shapiro Wilk GOF Test**	

5% Shapiro Wilk Critical Value	0.905	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.273	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.192	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	4.016	95% Adjusted-CLT UCL (Chen-1995)	4.643
		95% Modified-t UCL (Johnson-1978)	4.125
Gamma GOF Test			
A-D Test Statistic	0.761	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.767	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.213	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.199	Data Not Gamma Distributed at 5% Significance Level	
Detected data follow Appr. Gamma Distribution at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	1.051	k star (bias corrected MLE)	0.927
Theta hat (MLE)	2.456	Theta star (bias corrected MLE)	2.785
nu hat (MLE)	42.03	nu star (bias corrected)	37.06
MLE Mean (bias corrected)	2.581	MLE Sd (bias corrected)	2.681
		Approximate Chi Square Value (0.05)	24.13
Adjusted Level of Significance	0.038	Adjusted Chi Square Value	23.3
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50)	3.964	95% Adjusted Gamma UCL (use when n<50)	4.105
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.955	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.905	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.155	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.192	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	-1.079	Mean of logged Data	0.402
Maximum of Logged Data	2.845	SD of logged Data	1.008
Assuming Lognormal Distribution			
95% H-UCL	4.585	90% Chebyshev (MVUE) UCL	4.215
95% Chebyshev (MVUE) UCL	5.038	97.5% Chebyshev (MVUE) UCL	6.18
99% Chebyshev (MVUE) UCL	8.424		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	3.946	95% Jackknife UCL	4.016
95% Standard Bootstrap UCL	3.918	95% Bootstrap-t UCL	5.862

95% Hall's Bootstrap UCL	9.083	95% Percentile Bootstrap UCL	3.994
95% BCA Bootstrap UCL	4.908		
90% Chebyshev(Mean, Sd) UCL	5.071	95% Chebyshev(Mean, Sd) UCL	6.199
97.5% Chebyshev(Mean, Sd) UCL	7.765	99% Chebyshev(Mean, Sd) UCL	10.84
Suggested UCL to Use			
95% Adjusted Gamma UCL	4.105		
When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test			
When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Cadmium			
General Statistics			
Total Number of Observations	20	Number of Distinct Observations	18
		Number of Missing Observations	6
Number of Detects	19	Number of Non-Detects	1
Number of Distinct Detects	17	Number of Distinct Non-Detects	1
Minimum Detect	0.29	Minimum Non-Detect	0.27
Maximum Detect	8.3	Maximum Non-Detect	0.27
Variance Detects	3.65	Percent Non-Detects	5%
Mean Detects	2.268	SD Detects	1.91
Median Detects	1.7	CV Detects	0.842
Skewness Detects	2.03	Kurtosis Detects	4.956
Mean of Logged Detects	0.526	SD of Logged Detects	0.807
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.799	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.901	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.232	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.197	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	2.168	KM Standard Error of Mean	0.428
KM SD	1.864	95% KM (BCA) UCL	2.862
95% KM (t) UCL	2.908	95% KM (Percentile Bootstrap) UCL	2.904
95% KM (z) UCL	2.872	95% KM Bootstrap t UCL	3.333
90% KM Chebyshev UCL	3.453	95% KM Chebyshev UCL	4.035
97.5% KM Chebyshev UCL	4.842	99% KM Chebyshev UCL	6.429
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	0.252	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.753	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.137	**Kolmogorov-Smirnov GOF**	

5% K-S Critical Value	0.201	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	1.859	k star (bias corrected MLE)	1.6
Theta hat (MLE)	1.22	Theta star (bias corrected MLE)	1.417
nu hat (MLE)	70.63	nu star (bias corrected)	60.82
Mean (detects)	2.268		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	2.155
Maximum	8.3	Median	1.65
SD	1.927	CV	0.894
k hat (MLE)	1.142	k star (bias corrected MLE)	1.004
Theta hat (MLE)	1.887	Theta star (bias corrected MLE)	2.147
nu hat (MLE)	45.67	nu star (bias corrected)	40.16
Adjusted Level of Significance (β)	0.038		
Approximate Chi Square Value (40.16, α)	26.64	Adjusted Chi Square Value (40.16, β)	25.77
95% Gamma Approximate UCL (use when n>=50)	3.249	95% Gamma Adjusted UCL (use when n<50)	3.358
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	2.168	SD (KM)	1.864
Variance (KM)	3.474	SE of Mean (KM)	0.428
k hat (KM)	1.353	k star (KM)	1.183
nu hat (KM)	54.12	nu star (KM)	47.33
theta hat (KM)	1.602	theta star (KM)	1.832
80% gamma percentile (KM)	3.437	90% gamma percentile (KM)	4.789
95% gamma percentile (KM)	6.123	99% gamma percentile (KM)	9.184
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (47.33, α)	32.54	Adjusted Chi Square Value (47.33, β)	31.57
95% Gamma Approximate KM-UCL (use when n>=50)	3.153	95% Gamma Adjusted KM-UCL (use when n<50)	3.25
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.986	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.901	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.108	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.197	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	2.166	Mean in Log Scale	0.427
SD in Original Scale	1.914	SD in Log Scale	0.902
95% t UCL (assumes normality of ROS data)	2.906	95% Percentile Bootstrap UCL	2.894
95% BCA Bootstrap UCL	3.113	95% Bootstrap t UCL	3.3

95% H-UCL (Log ROS)	3.856		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	0.435	KM Geo Mean	1.544
KM SD (logged)	0.863	95% Critical H Value (KM-Log)	2.443
KM Standard Error of Mean (logged)	0.198	95% H-UCL (KM -Log)	3.637
KM SD (logged)	0.863	95% Critical H Value (KM-Log)	2.443
KM Standard Error of Mean (logged)	0.198		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	2.161	Mean in Log Scale	0.4
SD in Original Scale	1.92	SD in Log Scale	0.968
95% t UCL (Assumes normality)	2.903	95% H-Stat UCL	4.23
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Gamma Distributed at 5% Significance Level			
Suggested UCL to Use			
95% KM Adjusted Gamma UCL	3.25	95% GROS Adjusted Gamma UCL	3.358
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
ChromiumVI			
General Statistics			
Total Number of Observations	3	Number of Distinct Observations	3
		Number of Missing Observations	24
Number of Detects	1	Number of Non-Detects	2
Number of Distinct Detects	1	Number of Distinct Non-Detects	2
Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set!			
It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).			
The data set for variable ChromiumVI was not processed!			
ChromiumVI_EST			
General Statistics			
Total Number of Observations	19	Number of Distinct Observations	17
		Number of Missing Observations	7
Minimum	0.206	Mean	0.613
Maximum	1.271	Median	0.559
SD	0.279	Std. Error of Mean	0.0641

Coefficient of Variation	0.456	Skewness	0.753
Normal GOF Test			
Shapiro Wilk Test Statistic	0.945	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.901	Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.154	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.197	Data appear Normal at 5% Significance Level	
Data appear Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	0.724	95% Adjusted-CLT UCL (Chen-1995)	0.73
		95% Modified-t UCL (Johnson-1978)	0.726
Gamma GOF Test			
A-D Test Statistic	0.187	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.742	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.104	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.199	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	5.15	k star (bias corrected MLE)	4.372
Theta hat (MLE)	0.119	Theta star (bias corrected MLE)	0.14
nu hat (MLE)	195.7	nu star (bias corrected)	166.1
MLE Mean (bias corrected)	0.613	MLE Sd (bias corrected)	0.293
		Approximate Chi Square Value (0.05)	137.3
Adjusted Level of Significance	0.0369	Adjusted Chi Square Value	135
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	0.742	95% Adjusted Gamma UCL (use when n<50)	0.754
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.984	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.901	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.105	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.197	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	-1.579	Mean of logged Data	-0.59
Maximum of Logged Data	0.24	SD of logged Data	0.469
Assuming Lognormal Distribution			
95% H-UCL	0.77	90% Chebyshev (MVUE) UCL	0.82
95% Chebyshev (MVUE) UCL	0.912	97.5% Chebyshev (MVUE) UCL	1.041
99% Chebyshev (MVUE) UCL	1.294		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			

Nonparametric Distribution Free UCLs			
95% CLT UCL	0.718	95% Jackknife UCL	0.724
95% Standard Bootstrap UCL	0.717	95% Bootstrap-t UCL	0.739
95% Hall's Bootstrap UCL	0.739	95% Percentile Bootstrap UCL	0.715
95% BCA Bootstrap UCL	0.726		
90% Chebyshev(Mean, Sd) UCL	0.805	95% Chebyshev(Mean, Sd) UCL	0.892
97.5% Chebyshev(Mean, Sd) UCL	1.013	99% Chebyshev(Mean, Sd) UCL	1.251
Suggested UCL to Use			
95% Student's-t UCL	0.724		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Cobalt			
General Statistics			
Total Number of Observations	20	Number of Distinct Observations	19
		Number of Missing Observations	6
Minimum	1.2	Mean	6.735
Maximum	27.4	Median	5.25
SD	5.465	Std. Error of Mean	1.222
Coefficient of Variation	0.811	Skewness	3.118
Normal GOF Test			
Shapiro Wilk Test Statistic	0.646	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.905	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.273	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.192	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	8.848	95% Adjusted-CLT UCL (Chen-1995)	9.655
		95% Modified-t UCL (Johnson-1978)	8.99
Gamma GOF Test			
A-D Test Statistic	0.928	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.749	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.177	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.195	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data follow Appr. Gamma Distribution at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	2.669	k star (bias corrected MLE)	2.302
Theta hat (MLE)	2.523	Theta star (bias corrected MLE)	2.925

nu hat (MLE)	106.8	nu star (bias corrected)	92.09
MLE Mean (bias corrected)	6.735	MLE Sd (bias corrected)	4.439
		Approximate Chi Square Value (0.05)	70.96
Adjusted Level of Significance	0.038	Adjusted Chi Square Value	69.5
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50)	8.74	95% Adjusted Gamma UCL (use when n<50)	8.925
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.928	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.905	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.18	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.192	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	0.182	Mean of logged Data	1.708
Maximum of Logged Data	3.311	SD of logged Data	0.623
Assuming Lognormal Distribution			
95% H-UCL	9.109	90% Chebyshev (MVUE) UCL	9.547
95% Chebyshev (MVUE) UCL	10.87	97.5% Chebyshev (MVUE) UCL	12.71
99% Chebyshev (MVUE) UCL	16.31		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	8.745	95% Jackknife UCL	8.848
95% Standard Bootstrap UCL	8.701	95% Bootstrap-t UCL	11.47
95% Hall's Bootstrap UCL	18.39	95% Percentile Bootstrap UCL	8.955
95% BCA Bootstrap UCL	9.865		
90% Chebyshev(Mean, Sd) UCL	10.4	95% Chebyshev(Mean, Sd) UCL	12.06
97.5% Chebyshev(Mean, Sd) UCL	14.37	99% Chebyshev(Mean, Sd) UCL	18.89
Suggested UCL to Use			
95% Adjusted Gamma UCL	8.925		
When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test			
When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Copper			
General Statistics			

Total Number of Observations	20	Number of Distinct Observations	20
		Number of Missing Observations	6
Minimum	6.4	Mean	32.89
Maximum	71.6	Median	28.45
SD	19.57	Std. Error of Mean	4.377
Coefficient of Variation	0.595	Skewness	0.57
Normal GOF Test			
Shapiro Wilk Test Statistic	0.93	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.905	Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.167	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.192	Data appear Normal at 5% Significance Level	
Data appear Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	40.45	95% Adjusted-CLT UCL (Chen-1995)	40.68
		95% Modified-t UCL (Johnson-1978)	40.55
Gamma GOF Test			
A-D Test Statistic	0.304	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.749	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.117	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.195	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	2.607	k star (bias corrected MLE)	2.249
Theta hat (MLE)	12.61	Theta star (bias corrected MLE)	14.62
nu hat (MLE)	104.3	nu star (bias corrected)	89.98
MLE Mean (bias corrected)	32.89	MLE Sd (bias corrected)	21.93
		Approximate Chi Square Value (0.05)	69.11
Adjusted Level of Significance	0.038	Adjusted Chi Square Value	67.66
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	42.82	95% Adjusted Gamma UCL (use when n<50)	43.73
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.935	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.905	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.158	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.192	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	1.856	Mean of logged Data	3.289
Maximum of Logged Data	4.271	SD of logged Data	0.707
Assuming Lognormal Distribution			
95% H-UCL	49.54	90% Chebyshev (MVUE) UCL	51.09

95% Chebyshev (MVUE) UCL	58.86	97.5% Chebyshev (MVUE) UCL	69.66
99% Chebyshev (MVUE) UCL	90.87		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	40.08	95% Jackknife UCL	40.45
95% Standard Bootstrap UCL	40.02	95% Bootstrap-t UCL	41.17
95% Hall's Bootstrap UCL	40.46	95% Percentile Bootstrap UCL	39.57
95% BCA Bootstrap UCL	40.35		
90% Chebyshev(Mean, Sd) UCL	46.02	95% Chebyshev(Mean, Sd) UCL	51.96
97.5% Chebyshev(Mean, Sd) UCL	60.22	99% Chebyshev(Mean, Sd) UCL	76.43

Suggested UCL to Use

95% Student's-t UCL	40.45		

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Vanadium

General Statistics

Total Number of Observations	20	Number of Distinct Observations	20
		Number of Missing Observations	6
Minimum	13.3	Mean	69.28
Maximum	348	Median	46.25
SD	77.09	Std. Error of Mean	17.24
Coefficient of Variation	1.113	Skewness	2.821

Normal GOF Test

Shapiro Wilk Test Statistic	0.658	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.905	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.293	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.192	Data Not Normal at 5% Significance Level	

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	99.09	95% Adjusted-CLT UCL (Chen-1995)	109.3
		95% Modified-t UCL (Johnson-1978)	100.9

Gamma GOF Test

A-D Test Statistic	0.743	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.758	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.2	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.197	Data Not Gamma Distributed at 5% Significance Level	

Detected data follow Appr. Gamma Distribution at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	1.503	k star (bias corrected MLE)	1.311
Theta hat (MLE)	46.1	Theta star (bias corrected MLE)	52.86
nu hat (MLE)	60.11	nu star (bias corrected)	52.43
MLE Mean (bias corrected)	69.28	MLE Sd (bias corrected)	60.51
		Approximate Chi Square Value (0.05)	36.8
Adjusted Level of Significance	0.038	Adjusted Chi Square Value	35.76
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50)	98.71	95% Adjusted Gamma UCL (use when n<50)	101.6
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.963	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.905	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.135	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.192	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	2.588	Mean of logged Data	3.87
Maximum of Logged Data	5.852	SD of logged Data	0.821
Assuming Lognormal Distribution			
95% H-UCL	105.2	90% Chebyshev (MVUE) UCL	105
95% Chebyshev (MVUE) UCL	122.8	97.5% Chebyshev (MVUE) UCL	147.6
99% Chebyshev (MVUE) UCL	196.1		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	97.63	95% Jackknife UCL	99.09
95% Standard Bootstrap UCL	96.44	95% Bootstrap-t UCL	132.8
95% Hall's Bootstrap UCL	212.6	95% Percentile Bootstrap UCL	98.55
95% BCA Bootstrap UCL	108.7		
90% Chebyshev(Mean, Sd) UCL	121	95% Chebyshev(Mean, Sd) UCL	144.4
97.5% Chebyshev(Mean, Sd) UCL	176.9	99% Chebyshev(Mean, Sd) UCL	240.8
Suggested UCL to Use			
95% Adjusted Gamma UCL	101.6		
When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test			
When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			

Selenium

General Statistics

Total Number of Observations	20	Number of Distinct Observations	16
		Number of Missing Observations	6
Number of Detects	14	Number of Non-Detects	6
Number of Distinct Detects	12	Number of Distinct Non-Detects	5
Minimum Detect	0.34	Minimum Non-Detect	0.25
Maximum Detect	3.3	Maximum Non-Detect	0.45
Variance Detects	0.655	Percent Non-Detects	30%
Mean Detects	1.098	SD Detects	0.81
Median Detects	0.895	CV Detects	0.737
Skewness Detects	1.925	Kurtosis Detects	3.683
Mean of Logged Detects	-0.1	SD of Logged Detects	0.618

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.772	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.874	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.334	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.226	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	0.847	KM Standard Error of Mean	0.176
KM SD	0.757	95% KM (BCA) UCL	1.196
95% KM (t) UCL	1.151	95% KM (Percentile Bootstrap) UCL	1.139
95% KM (z) UCL	1.136	95% KM Bootstrap t UCL	1.359
90% KM Chebyshev UCL	1.374	95% KM Chebyshev UCL	1.613
97.5% KM Chebyshev UCL	1.944	99% KM Chebyshev UCL	2.596

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.592	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.743	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.265	**Kolmogorov-Smirnov GOF**
5% K-S Critical Value	0.231	Detected Data Not Gamma Distributed at 5% Significance Level

Detected data follow Appr. Gamma Distribution at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	2.736	k star (bias corrected MLE)	2.197
Theta hat (MLE)	0.401	Theta star (bias corrected MLE)	0.5
nu hat (MLE)	76.61	nu star (bias corrected)	61.52
Mean (detects)	1.098		

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)

For such situations, GROS method may yield incorrect values of UCLs and BTVs

This is especially true when the sample size is small.

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	0.772
Maximum	3.3	Median	0.68
SD	0.843	CV	1.092
k hat (MLE)	0.528	k star (bias corrected MLE)	0.482
Theta hat (MLE)	1.461	Theta star (bias corrected MLE)	1.6
nu hat (MLE)	21.13	nu star (bias corrected)	19.29
Adjusted Level of Significance (β)	0.038		
Approximate Chi Square Value (19.29, α)	10.33	Adjusted Chi Square Value (19.29, β)	9.814
95% Gamma Approximate UCL (use when n>=50)	1.441	95% Gamma Adjusted UCL (use when n<50)	1.517
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.847	SD (KM)	0.757
Variance (KM)	0.573	SE of Mean (KM)	0.176
k hat (KM)	1.251	k star (KM)	1.097
nu hat (KM)	50.05	nu star (KM)	43.87
theta hat (KM)	0.677	theta star (KM)	0.772
80% gamma percentile (KM)	1.352	90% gamma percentile (KM)	1.906
95% gamma percentile (KM)	2.456	99% gamma percentile (KM)	3.724
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (43.87, α)	29.68	Adjusted Chi Square Value (43.87, β)	28.76
95% Gamma Approximate KM-UCL (use when n>=50)	1.252	95% Gamma Adjusted KM-UCL (use when n<50)	1.292
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.952	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.874	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.221	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.226	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.834	Mean in Log Scale	-0.531
SD in Original Scale	0.787	SD in Log Scale	0.851
95% t UCL (assumes normality of ROS data)	1.138	95% Percentile Bootstrap UCL	1.127
95% BCA Bootstrap UCL	1.196	95% Bootstrap t UCL	1.298
95% H-UCL (Log ROS)	1.356		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-0.475	KM Geo Mean	0.622
KM SD (logged)	0.76	95% Critical H Value (KM-Log)	2.309
KM Standard Error of Mean (logged)	0.177	95% H-UCL (KM -Log)	1.243
KM SD (logged)	0.76	95% Critical H Value (KM-Log)	2.309
KM Standard Error of Mean (logged)	0.177		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.823	Mean in Log Scale	-0.59
SD in Original Scale	0.797	SD in Log Scale	0.928
95% t UCL (Assumes normality)	1.131	95% H-Stat UCL	1.462
DL/2 is not a recommended method, provided for comparisons and historical reasons			

Nonparametric Distribution Free UCL Statistics			
Detected Data appear Approximate Gamma Distributed at 5% Significance Level			
Suggested UCL to Use			
95% KM Adjusted Gamma UCL	1.292	95% GROS Adjusted Gamma UCL	1.517
When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test			
When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Naphthalene			
General Statistics			
Total Number of Observations	25	Number of Distinct Observations	25
		Number of Missing Observations	1
Number of Detects	18	Number of Non-Detects	7
Number of Distinct Detects	18	Number of Distinct Non-Detects	7
Minimum Detect	0.038	Minimum Non-Detect	0.056
Maximum Detect	12	Maximum Non-Detect	39
Variance Detects	9.426	Percent Non-Detects	28%
Mean Detects	1.663	SD Detects	3.07
Median Detects	0.38	CV Detects	1.846
Skewness Detects	2.722	Kurtosis Detects	7.75
Mean of Logged Detects	-0.875	SD of Logged Detects	1.757
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.59	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.897	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.299	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.202	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	1.307	KM Standard Error of Mean	0.567
KM SD	2.68	95% KM (BCA) UCL	2.44
95% KM (t) UCL	2.277	95% KM (Percentile Bootstrap) UCL	2.279
95% KM (z) UCL	2.239	95% KM Bootstrap t UCL	3.867
90% KM Chebyshev UCL	3.008	95% KM Chebyshev UCL	3.779
97.5% KM Chebyshev UCL	4.848	99% KM Chebyshev UCL	6.949
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	0.877	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.808	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.21	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.216	Detected data appear Gamma Distributed at 5% Significance Level	

Detected data follow Appr. Gamma Distribution at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.465	k star (bias corrected MLE)	0.424
Theta hat (MLE)	3.579	Theta star (bias corrected MLE)	3.92
nu hat (MLE)	16.72	nu star (bias corrected)	15.27
Mean (detects)	1.663		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	1.203
Maximum	12	Median	0.11
SD	2.691	CV	2.238
k hat (MLE)	0.335	k star (bias corrected MLE)	0.322
Theta hat (MLE)	3.589	Theta star (bias corrected MLE)	3.74
nu hat (MLE)	16.76	nu star (bias corrected)	16.08
Adjusted Level of Significance (β)	0.0395		
Approximate Chi Square Value (16.08, α)	8.019	Adjusted Chi Square Value (16.08, β)	7.632
95% Gamma Approximate UCL (use when n>=50)	2.412	95% Gamma Adjusted UCL (use when n<50)	2.534
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	1.307	SD (KM)	2.68
Variance (KM)	7.181	SE of Mean (KM)	0.567
k hat (KM)	0.238	k star (KM)	0.236
nu hat (KM)	11.89	nu star (KM)	11.79
theta hat (KM)	5.496	theta star (KM)	5.539
80% gamma percentile (KM)	1.857	90% gamma percentile (KM)	3.936
95% gamma percentile (KM)	6.434	99% gamma percentile (KM)	13.14
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (11.79, α)	5.092	Adjusted Chi Square Value (11.79, β)	4.794
95% Gamma Approximate KM-UCL (use when n>=50)	3.027	95% Gamma Adjusted KM-UCL (use when n<50)	3.215
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.943	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.897	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.162	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.202	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	1.234	Mean in Log Scale	-1.283
SD in Original Scale	2.678	SD in Log Scale	1.685
95% t UCL (assumes normality of ROS data)	2.15	95% Percentile Bootstrap UCL	2.168
95% BCA Bootstrap UCL	2.641	95% Bootstrap t UCL	3.665
95% H-UCL (Log ROS)	3.787		

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-1.267	KM Geo Mean	0.282
KM SD (logged)	1.712	95% Critical H Value (KM-Log)	3.519
KM Standard Error of Mean (logged)	0.372	95% H-UCL (KM -Log)	4.167
KM SD (logged)	1.712	95% Critical H Value (KM-Log)	3.519
KM Standard Error of Mean (logged)	0.372		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	2.183	Mean in Log Scale	-0.905
SD in Original Scale	4.506	SD in Log Scale	1.929
95% t UCL (Assumes normality)	3.725	95% H-Stat UCL	11.9
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Approximate Gamma Distributed at 5% Significance Level			
Suggested UCL to Use			
Adjusted KM-UCL (use when k<=1 and 15 < n < 50 but k<=1)	3.215		
When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test			
When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			

ProUCL Output
North Percolation Pond Area Soil (0-2 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

UCL Statistics for Data Sets with Non-Detects	
User Selected Options	
Date/Time of Computation	ProUCL 5.11/31/2019 9:12:24 AM
From File	20190127_NorthPerc_ProUCL_input_a.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Bis2EthylhexylPhthalate

General Statistics

Total Number of Observations	38	Number of Distinct Observations	35
		Number of Missing Observations	14
Number of Detects	3	Number of Non-Detects	35
Number of Distinct Detects	3	Number of Distinct Non-Detects	32
Minimum Detect	0.17	Minimum Non-Detect	0.014
Maximum Detect	5.9	Maximum Non-Detect	210
Variance Detects	10.79	Percent Non-Detects	92.11%
Mean Detects	2.107	SD Detects	3.285
Median Detects	0.25	CV Detects	1.56
Skewness Detects	1.731	Kurtosis Detects	N/A
Mean of Logged Detects	-0.461	SD of Logged Detects	1.946

Warning: Data set has only 3 Detected Values.
This is not enough to compute meaningful or reliable statistics and estimates.

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.76	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.767	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.381	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.425	Detected Data appear Normal at 5% Significance Level

Detected Data appear Approximate Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	0.225	KM Standard Error of Mean	0.222
KM SD	1.022	95% KM (BCA) UCL	N/A
95% KM (t) UCL	0.599	95% KM (Percentile Bootstrap) UCL	N/A
95% KM (z) UCL	0.59	95% KM Bootstrap t UCL	N/A
90% KM Chebyshev UCL	0.89	95% KM Chebyshev UCL	1.192
97.5% KM Chebyshev UCL	1.61	99% KM Chebyshev UCL	2.431

Gamma GOF Tests on Detected Observations Only
Not Enough Data to Perform GOF Test

Gamma Statistics on Detected Data Only

k hat (MLE)	0.523	k star (bias corrected MLE)	N/A
Theta hat (MLE)	4.028	Theta star (bias corrected MLE)	N/A
nu hat (MLE)	3.138	nu star (bias corrected)	N/A

Mean (detects)	2.107		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	0.176
Maximum	5.9	Median	0.01
SD	0.955	CV	5.44
k hat (MLE)	0.275	k star (bias corrected MLE)	0.271
Theta hat (MLE)	0.637	Theta star (bias corrected MLE)	0.647
nu hat (MLE)	20.94	nu star (bias corrected)	20.62
Adjusted Level of Significance (β)	0.0434		
Approximate Chi Square Value (20.62, α)	11.31	Adjusted Chi Square Value (20.62, β)	11.02
95% Gamma Approximate UCL (use when n>=50)	0.32	95% Gamma Adjusted UCL (use when n<50)	N/A
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.225	SD (KM)	1.022
Variance (KM)	1.044	SE of Mean (KM)	0.222
k hat (KM)	0.0485	k star (KM)	0.0622
nu hat (KM)	3.685	nu star (KM)	4.727
theta hat (KM)	4.64	theta star (KM)	3.616
80% gamma percentile (KM)	0.06	90% gamma percentile (KM)	0.438
95% gamma percentile (KM)	1.27	99% gamma percentile (KM)	4.468
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (4.73, α)	1.028	Adjusted Chi Square Value (4.73, β)	0.96
95% Gamma Approximate KM-UCL (use when n>=50)	1.034	95% Gamma Adjusted KM-UCL (use when n<50)	1.107
95% Gamma Adjusted KM-UCL (use when k<=1 and 15 < n < 50)			
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.83	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.767	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.349	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.425	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.168	Mean in Log Scale	-5.957
SD in Original Scale	0.956	SD in Log Scale	1.825
95% t UCL (assumes normality of ROS data)	0.43	95% Percentile Bootstrap UCL	0.478
95% BCA Bootstrap UCL	0.785	95% Bootstrap t UCL	5.847
95% H-UCL (Log ROS)	0.0389		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-3.706	KM Geo Mean	0.0246
KM SD (logged)	1.353	95% Critical H Value (KM-Log)	2.831
KM Standard Error of Mean (logged)	0.369	95% H-UCL (KM -Log)	0.115

KM SD (logged)	1.353	95% Critical H Value (KM-Log)	2.831
KM Standard Error of Mean (logged)	0.369		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	6.64	Mean in Log Scale	-1.045
SD in Original Scale	19.47	SD in Log Scale	2.573
95% t UCL (Assumes normality)	11.97	95% H-Stat UCL	67.72

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Approximate Normal Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (t) UCL	0.599		

When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test

When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Dibenzofuran

General Statistics

Total Number of Observations	38	Number of Distinct Observations	36
		Number of Missing Observations	14
Number of Detects	35	Number of Non-Detects	3
Number of Distinct Detects	33	Number of Distinct Non-Detects	3
Minimum Detect	0.019	Minimum Non-Detect	0.0016
Maximum Detect	28	Maximum Non-Detect	8.7
Variance Detects	29.79	Percent Non-Detects	7.895%
Mean Detects	2.832	SD Detects	5.458
Median Detects	0.6	CV Detects	1.927
Skewness Detects	3.405	Kurtosis Detects	13.56
Mean of Logged Detects	-0.568	SD of Logged Detects	2.024

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.566	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.934	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.303	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.148	Detected Data Not Normal at 5% Significance Level	

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	2.645	KM Standard Error of Mean	0.86
KM SD	5.216	95% KM (BCA) UCL	4.267
95% KM (t) UCL	4.097	95% KM (Percentile Bootstrap) UCL	4.169

95% KM (z) UCL	4.06	95% KM Bootstrap t UCL	5.375
90% KM Chebyshev UCL	5.226	95% KM Chebyshev UCL	6.395
97.5% KM Chebyshev UCL	8.018	99% KM Chebyshev UCL	11.21
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	0.963	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.833	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.146	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.159	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data follow Appr. Gamma Distribution at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.408	k star (bias corrected MLE)	0.392
Theta hat (MLE)	6.945	Theta star (bias corrected MLE)	7.226
nu hat (MLE)	28.55	nu star (bias corrected)	27.43
Mean (detects)	2.832		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	2.614
Maximum	28	Median	0.375
SD	5.287	CV	2.022
k hat (MLE)	0.376	k star (bias corrected MLE)	0.364
Theta hat (MLE)	6.956	Theta star (bias corrected MLE)	7.188
nu hat (MLE)	28.56	nu star (bias corrected)	27.64
Adjusted Level of Significance (β)	0.0434		
Approximate Chi Square Value (27.64, α)	16.65	Adjusted Chi Square Value (27.64, β)	16.29
95% Gamma Approximate UCL (use when n>=50)	4.34	95% Gamma Adjusted UCL (use when n<50)	4.435
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	2.645	SD (KM)	5.216
Variance (KM)	27.21	SE of Mean (KM)	0.86
k hat (KM)	0.257	k star (KM)	0.254
nu hat (KM)	19.54	nu star (KM)	19.33
theta hat (KM)	10.29	theta star (KM)	10.4
80% gamma percentile (KM)	3.865	90% gamma percentile (KM)	7.929
95% gamma percentile (KM)	12.74	99% gamma percentile (KM)	25.5
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (19.33, α)	10.36	Adjusted Chi Square Value (19.33, β)	10.09
95% Gamma Approximate KM-UCL (use when n>=50)	4.936	95% Gamma Adjusted KM-UCL (use when n<50)	5.069
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.957	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.934	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.109	**Lilliefors GOF Test**	

5% Lilliefors Critical Value	0.148	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	2.618	Mean in Log Scale	-0.829
SD in Original Scale	5.285	SD in Log Scale	2.215
95% t UCL (assumes normality of ROS data)	4.064	95% Percentile Bootstrap UCL	4.064
95% BCA Bootstrap UCL	4.779	95% Bootstrap t UCL	5.595
95% H-UCL (Log ROS)	22.28		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-0.893	KM Geo Mean	0.409
KM SD (logged)	2.347	95% Critical H Value (KM-Log)	4.266
KM Standard Error of Mean (logged)	0.391	95% H-UCL (KM -Log)	33.34
KM SD (logged)	2.347	95% Critical H Value (KM-Log)	4.266
KM Standard Error of Mean (logged)	0.391		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	2.723	Mean in Log Scale	-0.809
SD in Original Scale	5.278	SD in Log Scale	2.358
95% t UCL (Assumes normality)	4.168	95% H-Stat UCL	37.83
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Approximate Gamma Distributed at 5% Significance Level			
Suggested UCL to Use			
Adjusted KM-UCL (use when k<=1 and 15 < n < 50 but k<=1)	5.069		
When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test			
When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Fluoride			
General Statistics			
Total Number of Observations	40	Number of Distinct Observations	40
		Number of Missing Observations	12
Minimum	2.42	Mean	84.19
Maximum	306	Median	52.05
SD	81.4	Std. Error of Mean	12.87
Coefficient of Variation	0.967	Skewness	1.073
Normal GOF Test			

Shapiro Wilk Test Statistic	0.86	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.94	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.197	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.139	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	105.9	95% Adjusted-CLT UCL (Chen-1995)	107.7
		95% Modified-t UCL (Johnson-1978)	106.2
Gamma GOF Test			
A-D Test Statistic	0.385	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.781	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.0885	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.144	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	0.933	k star (bias corrected MLE)	0.88
Theta hat (MLE)	90.2	Theta star (bias corrected MLE)	95.67
nu hat (MLE)	74.67	nu star (bias corrected)	70.4
MLE Mean (bias corrected)	84.19	MLE Sd (bias corrected)	89.75
		Approximate Chi Square Value (0.05)	52.09
Adjusted Level of Significance	0.044	Adjusted Chi Square Value	51.5
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50)	113.8	95% Adjusted Gamma UCL (use when n<50)	115.1
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.944	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.94	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.107	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.139	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	0.884	Mean of logged Data	3.81
Maximum of Logged Data	5.724	SD of logged Data	1.294
Assuming Lognormal Distribution			
95% H-UCL	185	90% Chebyshev (MVUE) UCL	177.3
95% Chebyshev (MVUE) UCL	212.1	97.5% Chebyshev (MVUE) UCL	260.5
99% Chebyshev (MVUE) UCL	355.4		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	105.4	95% Jackknife UCL	105.9

95% Standard Bootstrap UCL	105.3	95% Bootstrap-t UCL	108.1
95% Hall's Bootstrap UCL	107.8	95% Percentile Bootstrap UCL	105.6
95% BCA Bootstrap UCL	107		
90% Chebyshev(Mean, Sd) UCL	122.8	95% Chebyshev(Mean, Sd) UCL	140.3
97.5% Chebyshev(Mean, Sd) UCL	164.6	99% Chebyshev(Mean, Sd) UCL	212.3
Suggested UCL to Use			
95% Adjusted Gamma UCL	115.1		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Indeno123CDPyrene			
General Statistics			
Total Number of Observations	47	Number of Distinct Observations	44
		Number of Missing Observations	5
Number of Detects	45	Number of Non-Detects	2
Number of Distinct Detects	42	Number of Distinct Non-Detects	2
Minimum Detect	0.095	Minimum Non-Detect	0.024
Maximum Detect	2000	Maximum Non-Detect	0.026
Variance Detects	149870	Percent Non-Detects	4.255%
Mean Detects	157.8	SD Detects	387.1
Median Detects	16	CV Detects	2.454
Skewness Detects	3.525	Kurtosis Detects	13.1
Mean of Logged Detects	3.01	SD of Logged Detects	2.167
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.464	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.945	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.387	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.131	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	151	KM Standard Error of Mean	55.45
KM SD	375.9	95% KM (BCA) UCL	250.5
95% KM (t) UCL	244.1	95% KM (Percentile Bootstrap) UCL	245.6
95% KM (z) UCL	242.3	95% KM Bootstrap t UCL	332.1
90% KM Chebyshev UCL	317.4	95% KM Chebyshev UCL	392.8
97.5% KM Chebyshev UCL	497.4	99% KM Chebyshev UCL	702.8
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	2.374	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.854	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.201	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.143	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			

Gamma Statistics on Detected Data Only			
k hat (MLE)	0.331	k star (bias corrected MLE)	0.324
Theta hat (MLE)	476.7	Theta star (bias corrected MLE)	487.4
nu hat (MLE)	29.78	nu star (bias corrected)	29.13
Mean (detects)	157.8		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	151
Maximum	2000	Median	16
SD	380	CV	2.516
k hat (MLE)	0.296	k star (bias corrected MLE)	0.292
Theta hat (MLE)	509.6	Theta star (bias corrected MLE)	517.9
nu hat (MLE)	27.86	nu star (bias corrected)	27.41
Adjusted Level of Significance (β)	0.0449		
Approximate Chi Square Value (27.41, α)	16.47	Adjusted Chi Square Value (27.41, β)	16.2
95% Gamma Approximate UCL (use when n>=50)	251.4	95% Gamma Adjusted UCL (use when n<50)	255.6
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	151	SD (KM)	375.9
Variance (KM)	141318	SE of Mean (KM)	55.45
k hat (KM)	0.161	k star (KM)	0.165
nu hat (KM)	15.18	nu star (KM)	15.54
theta hat (KM)	935.6	theta star (KM)	913.6
80% gamma percentile (KM)	177.1	90% gamma percentile (KM)	452.9
95% gamma percentile (KM)	814.8	99% gamma percentile (KM)	1845
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (15.54, α)	7.639	Adjusted Chi Square Value (15.54, β)	7.463
95% Gamma Approximate KM-UCL (use when n>=50)	307.3	95% Gamma Adjusted KM-UCL (use when n<50)	314.5
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.982	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.945	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.071	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.131	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	151	Mean in Log Scale	2.788
SD in Original Scale	380	SD in Log Scale	2.373
95% t UCL (assumes normality of ROS data)	244.1	95% Percentile Bootstrap UCL	246.5
95% BCA Bootstrap UCL	275.3	95% Bootstrap t UCL	315.8
95% H-UCL (Log ROS)	1146		

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	2.723	KM Geo Mean	15.23
KM SD (logged)	2.499	95% Critical H Value (KM-Log)	4.301
KM Standard Error of Mean (logged)	0.369	95% H-UCL (KM -Log)	1689
KM SD (logged)	2.499	95% Critical H Value (KM-Log)	4.301
KM Standard Error of Mean (logged)	0.369		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	151	Mean in Log Scale	2.696
SD in Original Scale	380	SD in Log Scale	2.601
95% t UCL (Assumes normality)	244.1	95% H-Stat UCL	2405
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Lognormal Distributed at 5% Significance Level			
Suggested UCL to Use			
97.5% KM (Chebyshev) UCL	497.4		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
BenzoBFluoranthene			
General Statistics			
Total Number of Observations	47	Number of Distinct Observations	44
		Number of Missing Observations	5
Number of Detects	45	Number of Non-Detects	2
Number of Distinct Detects	42	Number of Distinct Non-Detects	2
Minimum Detect	0.18	Minimum Non-Detect	0.014
Maximum Detect	3000	Maximum Non-Detect	0.015
Variance Detects	366490	Percent Non-Detects	4.255%
Mean Detects	271.4	SD Detects	605.4
Median Detects	30	CV Detects	2.23
Skewness Detects	3.237	Kurtosis Detects	10.87
Mean of Logged Detects	3.658	SD of Logged Detects	2.182
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.506	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.945	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.35	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.131	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	259.9	KM Standard Error of Mean	86.78
KM SD	588.3	95% KM (BCA) UCL	420.6

95% KM (t) UCL	405.6	95% KM (Percentile Bootstrap) UCL	406.4
95% KM (z) UCL	402.6	95% KM Bootstrap t UCL	516.1
90% KM Chebyshev UCL	520.2	95% KM Chebyshev UCL	638.2
97.5% KM Chebyshev UCL	801.9	99% KM Chebyshev UCL	1123
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	1.865	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.851	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.152	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.142	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.346	k star (bias corrected MLE)	0.338
Theta hat (MLE)	784.1	Theta star (bias corrected MLE)	803.3
nu hat (MLE)	31.16	nu star (bias corrected)	30.41
Mean (detects)	271.4		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	259.9
Maximum	3000	Median	26
SD	594.7	CV	2.288
k hat (MLE)	0.305	k star (bias corrected MLE)	0.3
Theta hat (MLE)	851.9	Theta star (bias corrected MLE)	866.9
nu hat (MLE)	28.68	nu star (bias corrected)	28.18
Adjusted Level of Significance (β)	0.0449		
Approximate Chi Square Value (28.18, α)	17.07	Adjusted Chi Square Value (28.18, β)	16.79
95% Gamma Approximate UCL (use when n>=50)	429.1	95% Gamma Adjusted UCL (use when n<50)	436.1
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	259.9	SD (KM)	588.3
Variance (KM)	346099	SE of Mean (KM)	86.78
k hat (KM)	0.195	k star (KM)	0.197
nu hat (KM)	18.35	nu star (KM)	18.51
theta hat (KM)	1332	theta star (KM)	1320
80% gamma percentile (KM)	339.6	90% gamma percentile (KM)	785.9
95% gamma percentile (KM)	1345	99% gamma percentile (KM)	2887
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (18.51, α)	9.759	Adjusted Chi Square Value (18.51, β)	9.557
95% Gamma Approximate KM-UCL (use when n>=50)	492.9	95% Gamma Adjusted KM-UCL (use when n<50)	503.3
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.976	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.945	Detected Data appear Lognormal at 5% Significance Level	

Lilliefors Test Statistic	0.085	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.131	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	259.9	Mean in Log Scale	3.434
SD in Original Scale	594.7	SD in Log Scale	2.389
95% t UCL (assumes normality of ROS data)	405.5	95% Percentile Bootstrap UCL	408.1
95% BCA Bootstrap UCL	474.7	95% Bootstrap t UCL	543.6
95% H-UCL (Log ROS)	2314		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	3.321	KM Geo Mean	27.68
KM SD (logged)	2.649	95% Critical H Value (KM-Log)	4.519
KM Standard Error of Mean (logged)	0.391	95% H-UCL (KM -Log)	5399
KM SD (logged)	2.649	95% Critical H Value (KM-Log)	4.519
KM Standard Error of Mean (logged)	0.391		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	259.9	Mean in Log Scale	3.293
SD in Original Scale	594.7	SD in Log Scale	2.761
95% t UCL (Assumes normality)	405.5	95% H-Stat UCL	8185
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Lognormal Distributed at 5% Significance Level			
Suggested UCL to Use			
97.5% KM (Chebyshev) UCL	801.9		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Fluoranthene			
General Statistics			
Total Number of Observations	47	Number of Distinct Observations	44
		Number of Missing Observations	5
Number of Detects	46	Number of Non-Detects	1
Number of Distinct Detects	43	Number of Distinct Non-Detects	1
Minimum Detect	0.029	Minimum Non-Detect	0.011
Maximum Detect	3700	Maximum Non-Detect	0.011
Variance Detects	529646	Percent Non-Detects	2.128%
Mean Detects	339.8	SD Detects	727.8
Median Detects	20.5	CV Detects	2.142
Skewness Detects	3.177	Kurtosis Detects	10.93
Mean of Logged Detects	3.394	SD of Logged Detects	2.739

Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.537	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.945	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.32	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.129	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	332.6	KM Standard Error of Mean	105.3
KM SD	713.8	95% KM (BCA) UCL	509.8
95% KM (t) UCL	509.3	95% KM (Percentile Bootstrap) UCL	510.2
95% KM (z) UCL	505.7	95% KM Bootstrap t UCL	639.4
90% KM Chebyshev UCL	648.4	95% KM Chebyshev UCL	791.4
97.5% KM Chebyshev UCL	990	99% KM Chebyshev UCL	1380
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	1.424	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.869	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.168	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.142	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.286	k star (bias corrected MLE)	0.281
Theta hat (MLE)	1190	Theta star (bias corrected MLE)	1207
nu hat (MLE)	26.27	nu star (bias corrected)	25.89
Mean (detects)	339.8		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	332.6
Maximum	3700	Median	19
SD	721.5	CV	2.17
k hat (MLE)	0.271	k star (bias corrected MLE)	0.268
Theta hat (MLE)	1226	Theta star (bias corrected MLE)	1240
nu hat (MLE)	25.51	nu star (bias corrected)	25.21
Adjusted Level of Significance (β)	0.0449		
Approximate Chi Square Value (25.21, α)	14.78	Adjusted Chi Square Value (25.21, β)	14.52
95% Gamma Approximate UCL (use when n>=50)	567.5	95% Gamma Adjusted UCL (use when n<50)	577.4
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	332.6	SD (KM)	713.8
Variance (KM)	509512	SE of Mean (KM)	105.3
k hat (KM)	0.217	k star (KM)	0.217
nu hat (KM)	20.4	nu star (KM)	20.43

theta hat (KM)	1532	theta star (KM)	1530
80% gamma percentile (KM)	456.5	90% gamma percentile (KM)	1005
95% gamma percentile (KM)	1676	99% gamma percentile (KM)	3498
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (20.43, α)	11.17	Adjusted Chi Square Value (20.43, β)	10.95
95% Gamma Approximate KM-UCL (use when n>=50)	608.3	95% Gamma Adjusted KM-UCL (use when n<50)	620.4
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.961	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.945	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.104	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.129	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	332.6	Mean in Log Scale	3.244
SD in Original Scale	721.5	SD in Log Scale	2.897
95% t UCL (assumes normality of ROS data)	509.2	95% Percentile Bootstrap UCL	510.9
95% BCA Bootstrap UCL	563.3	95% Bootstrap t UCL	621
95% H-UCL (Log ROS)	13707		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	3.226	KM Geo Mean	25.18
KM SD (logged)	2.913	95% Critical H Value (KM-Log)	4.908
KM Standard Error of Mean (logged)	0.43	95% H-UCL (KM -Log)	14396
KM SD (logged)	2.913	95% Critical H Value (KM-Log)	4.908
KM Standard Error of Mean (logged)	0.43		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	332.6	Mean in Log Scale	3.211
SD in Original Scale	721.5	SD in Log Scale	2.985
95% t UCL (Assumes normality)	509.2	95% H-Stat UCL	19417
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Lognormal Distributed at 5% Significance Level			
Suggested UCL to Use			
97.5% KM (Chebyshev) UCL	990		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
BenzoKFluoranthene			
General Statistics			

ProUCL Output
North Percolation Pond Area Soil (0-2 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Total Number of Observations	47	Number of Distinct Observations	44
		Number of Missing Observations	5
Number of Detects	45	Number of Non-Detects	2
Number of Distinct Detects	42	Number of Distinct Non-Detects	2
Minimum Detect	0.057	Minimum Non-Detect	0.016
Maximum Detect	2400	Maximum Non-Detect	0.017
Variance Detects	190074	Percent Non-Detects	4.255%
Mean Detects	156.4	SD Detects	436
Median Detects	14	CV Detects	2.788
Skewness Detects	3.996	Kurtosis Detects	17.18
Mean of Logged Detects	2.842	SD of Logged Detects	2.169
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.409	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.945	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.387	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.131	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	149.7	KM Standard Error of Mean	62.4
KM SD	423	95% KM (BCA) UCL	263.7
95% KM (t) UCL	254.5	95% KM (Percentile Bootstrap) UCL	265.2
95% KM (z) UCL	252.4	95% KM Bootstrap t UCL	364.2
90% KM Chebyshev UCL	336.9	95% KM Chebyshev UCL	421.7
97.5% KM Chebyshev UCL	539.4	99% KM Chebyshev UCL	770.6
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	3.054	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.859	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.204	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.143	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.31	k star (bias corrected MLE)	0.304
Theta hat (MLE)	504	Theta star (bias corrected MLE)	513.7
nu hat (MLE)	27.93	nu star (bias corrected)	27.4
Mean (detects)	156.4		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	149.7
Maximum	2400	Median	12
SD	427.6	CV	2.856
k hat (MLE)	0.281	k star (bias corrected MLE)	0.277

Theta hat (MLE)	533.5	Theta star (bias corrected MLE)	540.7
nu hat (MLE)	26.38	nu star (bias corrected)	26.03
Adjusted Level of Significance (β)	0.0449		
Approximate Chi Square Value (26.03, α)	15.41	Adjusted Chi Square Value (26.03, β)	15.15
95% Gamma Approximate UCL (use when n>=50)	253	95% Gamma Adjusted UCL (use when n<50)	257.4
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	149.7	SD (KM)	423
Variance (KM)	178938	SE of Mean (KM)	62.4
k hat (KM)	0.125	k star (KM)	0.131
nu hat (KM)	11.78	nu star (KM)	12.36
theta hat (KM)	1195	theta star (KM)	1139
80% gamma percentile (KM)	144.7	90% gamma percentile (KM)	433.8
95% gamma percentile (KM)	843.4	99% gamma percentile (KM)	2067
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (12.36, α)	5.465	Adjusted Chi Square Value (12.36, β)	5.319
95% Gamma Approximate KM-UCL (use when n>=50)	338.7	95% Gamma Adjusted KM-UCL (use when n<50)	347.9
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.98	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.945	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.0722	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.131	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	149.7	Mean in Log Scale	2.621
SD in Original Scale	427.6	SD in Log Scale	2.372
95% t UCL (assumes normality of ROS data)	254.4	95% Percentile Bootstrap UCL	259.9
95% BCA Bootstrap UCL	306.4	95% Bootstrap t UCL	388
95% H-UCL (Log ROS)	967.7		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	2.545	KM Geo Mean	12.75
KM SD (logged)	2.527	95% Critical H Value (KM-Log)	4.342
KM Standard Error of Mean (logged)	0.373	95% H-UCL (KM -Log)	1566
KM SD (logged)	2.527	95% Critical H Value (KM-Log)	4.342
KM Standard Error of Mean (logged)	0.373		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	149.7	Mean in Log Scale	2.517
SD in Original Scale	427.6	SD in Log Scale	2.632
95% t UCL (Assumes normality)	254.4	95% H-Stat UCL	2266
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Lognormal Distributed at 5% Significance Level			

Suggested UCL to Use			
97.5% KM (Chebyshev) UCL	539.4		

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Chrysene

General Statistics			
Total Number of Observations	47	Number of Distinct Observations	42
		Number of Missing Observations	5
Number of Detects	46	Number of Non-Detects	1
Number of Distinct Detects	42	Number of Distinct Non-Detects	1
Minimum Detect	0.011	Minimum Non-Detect	0.011
Maximum Detect	2800	Maximum Non-Detect	0.011
Variance Detects	269427	Percent Non-Detects	2.128%
Mean Detects	227.2	SD Detects	519.1
Median Detects	19	CV Detects	2.285
Skewness Detects	3.619	Kurtosis Detects	14.49
Mean of Logged Detects	3.175	SD of Logged Detects	2.608

Normal GOF Test on Detects Only		
Shapiro Wilk Test Statistic	0.499	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.945	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.331	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.129	Detected Data Not Normal at 5% Significance Level
Detected Data Not Normal at 5% Significance Level		

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	222.3	KM Standard Error of Mean	75.06
KM SD	509	95% KM (BCA) UCL	347.5
95% KM (t) UCL	348.3	95% KM (Percentile Bootstrap) UCL	355.1
95% KM (z) UCL	345.8	95% KM Bootstrap t UCL	474.1
90% KM Chebyshev UCL	447.5	95% KM Chebyshev UCL	549.5
97.5% KM Chebyshev UCL	691.1	99% KM Chebyshev UCL	969.2

Gamma GOF Tests on Detected Observations Only		
A-D Test Statistic	1.321	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.861	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.156	**Kolmogorov-Smirnov GOF**
5% K-S Critical Value	0.142	Detected Data Not Gamma Distributed at 5% Significance Level
Detected Data Not Gamma Distributed at 5% Significance Level		

Gamma Statistics on Detected Data Only			
k hat (MLE)	0.305	k star (bias corrected MLE)	0.3
Theta hat (MLE)	743.8	Theta star (bias corrected MLE)	757.3
nu hat (MLE)	28.1	nu star (bias corrected)	27.6
Mean (detects)	227.2		

Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	222.3
Maximum	2800	Median	16
SD	514.5	CV	2.314
k hat (MLE)	0.29	k star (bias corrected MLE)	0.285
Theta hat (MLE)	767.9	Theta star (bias corrected MLE)	779.5
nu hat (MLE)	27.22	nu star (bias corrected)	26.81
Adjusted Level of Significance (β)	0.0449		
Approximate Chi Square Value (26.81, α)	16.01	Adjusted Chi Square Value (26.81, β)	15.74
95% Gamma Approximate UCL (use when n>=50)	372.5	95% Gamma Adjusted UCL (use when n<50)	378.7
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	222.3	SD (KM)	509
Variance (KM)	259037	SE of Mean (KM)	75.06
k hat (KM)	0.191	k star (KM)	0.193
nu hat (KM)	17.94	nu star (KM)	18.13
theta hat (KM)	1165	theta star (KM)	1153
80% gamma percentile (KM)	287.3	90% gamma percentile (KM)	672.2
95% gamma percentile (KM)	1156	99% gamma percentile (KM)	2498
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (18.13, α)	9.484	Adjusted Chi Square Value (18.13, β)	9.285
95% Gamma Approximate KM-UCL (use when n>=50)	425	95% Gamma Adjusted KM-UCL (use when n<50)	434.1
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.968	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.945	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.0791	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.129	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	222.3	Mean in Log Scale	3.033
SD in Original Scale	514.5	SD in Log Scale	2.756
95% t UCL (assumes normality of ROS data)	348.3	95% Percentile Bootstrap UCL	351.1
95% BCA Bootstrap UCL	392.1	95% Bootstrap t UCL	450.2
95% H-UCL (Log ROS)	6199		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	3.011	KM Geo Mean	20.31
KM SD (logged)	2.782	95% Critical H Value (KM-Log)	4.715
KM Standard Error of Mean (logged)	0.41	95% H-UCL (KM -Log)	6739
KM SD (logged)	2.782	95% Critical H Value (KM-Log)	4.715
KM Standard Error of Mean (logged)	0.41		

DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	222.3	Mean in Log Scale	2.996
SD in Original Scale	514.5	SD in Log Scale	2.854
95% t UCL (Assumes normality)	348.3	95% H-Stat UCL	8939
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Lognormal Distributed at 5% Significance Level			
Suggested UCL to Use			
97.5% KM (Chebyshev) UCL	691.1		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
BenzoAPyrene			
General Statistics			
Total Number of Observations	47	Number of Distinct Observations	45
		Number of Missing Observations	5
Number of Detects	45	Number of Non-Detects	2
Number of Distinct Detects	43	Number of Distinct Non-Detects	2
Minimum Detect	0.078	Minimum Non-Detect	0.011
Maximum Detect	3100	Maximum Non-Detect	0.012
Variance Detects	349313	Percent Non-Detects	4.255%
Mean Detects	228.9	SD Detects	591
Median Detects	15	CV Detects	2.582
Skewness Detects	3.636	Kurtosis Detects	14.02
Mean of Logged Detects	3.082	SD of Logged Detects	2.352
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.446	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.945	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.384	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.131	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	219.2	KM Standard Error of Mean	84.63
KM SD	573.7	95% KM (BCA) UCL	399.9
95% KM (t) UCL	361.3	95% KM (Percentile Bootstrap) UCL	374.6
95% KM (z) UCL	358.4	95% KM Bootstrap t UCL	482.1
90% KM Chebyshev UCL	473.1	95% KM Chebyshev UCL	588.1
97.5% KM Chebyshev UCL	747.7	99% KM Chebyshev UCL	1061
Gamma GOF Tests on Detected Observations Only			

A-D Test Statistic	2.523	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.865	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.186	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.143	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.294	k star (bias corrected MLE)	0.289
Theta hat (MLE)	778.1	Theta star (bias corrected MLE)	791
nu hat (MLE)	26.48	nu star (bias corrected)	26.05
Mean (detects)	228.9		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	219.2
Maximum	3100	Median	14
SD	579.9	CV	2.646
k hat (MLE)	0.267	k star (bias corrected MLE)	0.264
Theta hat (MLE)	821.7	Theta star (bias corrected MLE)	830.6
nu hat (MLE)	25.08	nu star (bias corrected)	24.81
Adjusted Level of Significance (β)	0.0449		
Approximate Chi Square Value (24.81, α)	14.47	Adjusted Chi Square Value (24.81, β)	14.21
95% Gamma Approximate UCL (use when n>=50)	375.9	95% Gamma Adjusted UCL (use when n<50)	382.6
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	219.2	SD (KM)	573.7
Variance (KM)	329152	SE of Mean (KM)	84.63
k hat (KM)	0.146	k star (KM)	0.151
nu hat (KM)	13.72	nu star (KM)	14.18
theta hat (KM)	1502	theta star (KM)	1453
80% gamma percentile (KM)	239.7	90% gamma percentile (KM)	650.5
95% gamma percentile (KM)	1205	99% gamma percentile (KM)	2813
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (14.18, α)	6.695	Adjusted Chi Square Value (14.18, β)	6.531
95% Gamma Approximate KM-UCL (use when n>=50)	464.3	95% Gamma Adjusted KM-UCL (use when n<50)	475.9
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.974	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.945	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.0911	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.131	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	219.2	Mean in Log Scale	2.841

SD in Original Scale	579.9	SD in Log Scale	2.575
95% t UCL (assumes normality of ROS data)	361.2	95% Percentile Bootstrap UCL	366.2
95% BCA Bootstrap UCL	426.4	95% Bootstrap t UCL	495.5
95% H-UCL (Log ROS)	2520		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	2.759	KM Geo Mean	15.79
KM SD (logged)	2.744	95% Critical H Value (KM-Log)	4.658
KM Standard Error of Mean (logged)	0.405	95% H-UCL (KM -Log)	4479
KM SD (logged)	2.744	95% Critical H Value (KM-Log)	4.658
KM Standard Error of Mean (logged)	0.405		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	219.2	Mean in Log Scale	2.732
SD in Original Scale	579.9	SD in Log Scale	2.849
95% t UCL (Assumes normality)	361.2	95% H-Stat UCL	6727
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Lognormal Distributed at 5% Significance Level			
Suggested UCL to Use			
97.5% KM (Chebyshev) UCL	747.7		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
DibenzAHAnthracene			
General Statistics			
Total Number of Observations	47	Number of Distinct Observations	40
		Number of Missing Observations	5
Number of Detects	45	Number of Non-Detects	2
Number of Distinct Detects	38	Number of Distinct Non-Detects	2
Minimum Detect	0.021	Minimum Non-Detect	0.019
Maximum Detect	740	Maximum Non-Detect	0.02
Variance Detects	20364	Percent Non-Detects	4.255%
Mean Detects	54.6	SD Detects	142.7
Median Detects	4.2	CV Detects	2.614
Skewness Detects	3.634	Kurtosis Detects	13.78
Mean of Logged Detects	1.794	SD of Logged Detects	2.226
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.437	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.945	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.393	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.131	Detected Data Not Normal at 5% Significance Level	

Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	52.28	KM Standard Error of Mean	20.43
KM SD	138.5	95% KM (BCA) UCL	88.61
95% KM (t) UCL	86.58	95% KM (Percentile Bootstrap) UCL	87.25
95% KM (z) UCL	85.89	95% KM Bootstrap t UCL	117.8
90% KM Chebyshev UCL	113.6	95% KM Chebyshev UCL	141.3
97.5% KM Chebyshev UCL	179.9	99% KM Chebyshev UCL	255.6
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	2.706	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.859	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.217	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.143	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.311	k star (bias corrected MLE)	0.305
Theta hat (MLE)	175.7	Theta star (bias corrected MLE)	179.1
nu hat (MLE)	27.97	nu star (bias corrected)	27.43
Mean (detects)	54.6		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	52.28
Maximum	740	Median	4.2
SD	140	CV	2.678
k hat (MLE)	0.285	k star (bias corrected MLE)	0.281
Theta hat (MLE)	183.1	Theta star (bias corrected MLE)	185.8
nu hat (MLE)	26.83	nu star (bias corrected)	26.45
Adjusted Level of Significance (β)	0.0449		
Approximate Chi Square Value (26.45, α)	15.73	Adjusted Chi Square Value (26.45, β)	15.47
95% Gamma Approximate UCL (use when n>=50)	87.92	95% Gamma Adjusted UCL (use when n<50)	89.42
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	52.28	SD (KM)	138.5
Variance (KM)	19186	SE of Mean (KM)	20.43
k hat (KM)	0.142	k star (KM)	0.148
nu hat (KM)	13.39	nu star (KM)	13.87
theta hat (KM)	367	theta star (KM)	354.3
80% gamma percentile (KM)	56.13	90% gamma percentile (KM)	154.7
95% gamma percentile (KM)	288.7	99% gamma percentile (KM)	678.8
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (13.87, α)	6.482	Adjusted Chi Square Value (13.87, β)	6.321

95% Gamma Approximate KM-UCL (use when n>=50)	111.9	95% Gamma Adjusted KM-UCL (use when n<50)	114.7
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.98	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.945	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.0751	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.131	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	52.28	Mean in Log Scale	1.565
SD in Original Scale	140	SD in Log Scale	2.437
95% t UCL (assumes normality of ROS data)	86.56	95% Percentile Bootstrap UCL	88.44
95% BCA Bootstrap UCL	102.7	95% Bootstrap t UCL	123.6
95% H-UCL (Log ROS)	423.1		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	1.549	KM Geo Mean	4.705
KM SD (logged)	2.448	95% Critical H Value (KM-Log)	4.226
KM Standard Error of Mean (logged)	0.361	95% H-UCL (KM -Log)	432.2
KM SD (logged)	2.448	95% Critical H Value (KM-Log)	4.226
KM Standard Error of Mean (logged)	0.361		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	52.28	Mean in Log Scale	1.52
SD in Original Scale	140	SD in Log Scale	2.541
95% t UCL (Assumes normality)	86.56	95% H-Stat UCL	592.6
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Lognormal Distributed at 5% Significance Level			
Suggested UCL to Use			
97.5% KM (Chebyshev) UCL	179.9		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
BenzoAAnthracene			
General Statistics			
Total Number of Observations	47	Number of Distinct Observations	45
		Number of Missing Observations	5
Number of Detects	45	Number of Non-Detects	2
Number of Distinct Detects	43	Number of Distinct Non-Detects	2
Minimum Detect	0.062	Minimum Non-Detect	0.03
Maximum Detect	2700	Maximum Non-Detect	0.032

Variance Detects	257606	Percent Non-Detects	4.255%
Mean Detects	204.2	SD Detects	507.5
Median Detects	13	CV Detects	2.485
Skewness Detects	3.681	Kurtosis Detects	14.61
Mean of Logged Detects	3.004	SD of Logged Detects	2.405
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.463	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.945	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.362	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.131	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	195.5	KM Standard Error of Mean	72.7
KM SD	492.8	95% KM (BCA) UCL	313.8
95% KM (t) UCL	317.6	95% KM (Percentile Bootstrap) UCL	318.3
95% KM (z) UCL	315.1	95% KM Bootstrap t UCL	451.3
90% KM Chebyshev UCL	413.6	95% KM Chebyshev UCL	512.4
97.5% KM Chebyshev UCL	649.5	99% KM Chebyshev UCL	918.9
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	2.11	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.863	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.177	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.143	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.298	k star (bias corrected MLE)	0.293
Theta hat (MLE)	685	Theta star (bias corrected MLE)	696.9
nu hat (MLE)	26.83	nu star (bias corrected)	26.38
Mean (detects)	204.2		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	195.5
Maximum	2700	Median	12
SD	498.1	CV	2.547
k hat (MLE)	0.27	k star (bias corrected MLE)	0.267
Theta hat (MLE)	723.6	Theta star (bias corrected MLE)	731.9
nu hat (MLE)	25.4	nu star (bias corrected)	25.11
Adjusted Level of Significance (β)	0.0449		
Approximate Chi Square Value (25.11, α)	14.7	Adjusted Chi Square Value (25.11, β)	14.45
95% Gamma Approximate UCL (use when n>=50)	334.1	95% Gamma Adjusted UCL (use when n<50)	340

Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	195.5	SD (KM)	492.8
Variance (KM)	242862	SE of Mean (KM)	72.7
k hat (KM)	0.157	k star (KM)	0.162
nu hat (KM)	14.8	nu star (KM)	15.19
theta hat (KM)	1242	theta star (KM)	1210
80% gamma percentile (KM)	225.5	90% gamma percentile (KM)	585
95% gamma percentile (KM)	1060	99% gamma percentile (KM)	2418
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (15.19, α)	7.393	Adjusted Chi Square Value (15.19, β)	7.22
95% Gamma Approximate KM-UCL (use when n>=50)	401.7	95% Gamma Adjusted KM-UCL (use when n<50)	411.4
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.972	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.945	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.0929	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.131	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	195.5	Mean in Log Scale	2.757
SD in Original Scale	498.1	SD in Log Scale	2.633
95% t UCL (assumes normality of ROS data)	317.5	95% Percentile Bootstrap UCL	313.9
95% BCA Bootstrap UCL	357.5	95% Bootstrap t UCL	452.4
95% H-UCL (Log ROS)	2887		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	2.727	KM Geo Mean	15.29
KM SD (logged)	2.672	95% Critical H Value (KM-Log)	4.553
KM Standard Error of Mean (logged)	0.394	95% H-UCL (KM -Log)	3266
KM SD (logged)	2.672	95% Critical H Value (KM-Log)	4.553
KM Standard Error of Mean (logged)	0.394		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	195.5	Mean in Log Scale	2.699
SD in Original Scale	498.1	SD in Log Scale	2.77
95% t UCL (Assumes normality)	317.5	95% H-Stat UCL	4691
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Lognormal Distributed at 5% Significance Level			
Suggested UCL to Use			
97.5% KM (Chebyshev) UCL	649.5		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Cyanide

General Statistics

Total Number of Observations	40	Number of Distinct Observations	34
		Number of Missing Observations	12
Number of Detects	39	Number of Non-Detects	1
Number of Distinct Detects	33	Number of Distinct Non-Detects	1
Minimum Detect	0.078	Minimum Non-Detect	0.064
Maximum Detect	137	Maximum Non-Detect	0.064
Variance Detects	1008	Percent Non-Detects	2.5%
Mean Detects	14.11	SD Detects	31.75
Median Detects	2	CV Detects	2.25
Skewness Detects	3.004	Kurtosis Detects	8.736
Mean of Logged Detects	0.931	SD of Logged Detects	1.866

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.487	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.939	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.403	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.14	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	13.76	KM Standard Error of Mean	4.97
KM SD	31.03	95% KM (BCA) UCL	23.1
95% KM (t) UCL	22.13	95% KM (Percentile Bootstrap) UCL	22.5
95% KM (z) UCL	21.93	95% KM Bootstrap t UCL	27.66
90% KM Chebyshev UCL	28.67	95% KM Chebyshev UCL	35.42
97.5% KM Chebyshev UCL	44.8	99% KM Chebyshev UCL	63.21

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	2.686	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.838	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.223	**Kolmogorov-Smirnov GOF**
5% K-S Critical Value	0.152	Detected Data Not Gamma Distributed at 5% Significance Level

Detected Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	0.386	k star (bias corrected MLE)	0.373
Theta hat (MLE)	36.59	Theta star (bias corrected MLE)	37.82
nu hat (MLE)	30.08	nu star (bias corrected)	29.1
Mean (detects)	14.11		

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)

For such situations, GROS method may yield incorrect values of UCLs and BTVs

This is especially true when the sample size is small.

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	13.76
Maximum	137	Median	2
SD	31.42	CV	2.284
k hat (MLE)	0.365	k star (bias corrected MLE)	0.354
Theta hat (MLE)	37.69	Theta star (bias corrected MLE)	38.83
nu hat (MLE)	29.2	nu star (bias corrected)	28.35
Adjusted Level of Significance (β)	0.044		
Approximate Chi Square Value (28.35, α)	17.2	Adjusted Chi Square Value (28.35, β)	16.87
95% Gamma Approximate UCL (use when n>=50)	22.68	95% Gamma Adjusted UCL (use when n<50)	23.12
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	13.76	SD (KM)	31.03
Variance (KM)	962.6	SE of Mean (KM)	4.97
k hat (KM)	0.197	k star (KM)	0.199
nu hat (KM)	15.74	nu star (KM)	15.89
theta hat (KM)	69.96	theta star (KM)	69.28
80% gamma percentile (KM)	18.07	90% gamma percentile (KM)	41.62
95% gamma percentile (KM)	71.03	99% gamma percentile (KM)	152.1
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (15.89, α)	7.884	Adjusted Chi Square Value (15.89, β)	7.672
95% Gamma Approximate KM-UCL (use when n>=50)	27.73	95% Gamma Adjusted KM-UCL (use when n<50)	28.5
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.961	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.939	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.0878	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.14	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	13.76	Mean in Log Scale	0.812
SD in Original Scale	31.42	SD in Log Scale	1.99
95% t UCL (assumes normality of ROS data)	22.13	95% Percentile Bootstrap UCL	22.28
95% BCA Bootstrap UCL	24.14	95% Bootstrap t UCL	28.56
95% H-UCL (Log ROS)	54.1		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	0.839	KM Geo Mean	2.313
KM SD (logged)	1.908	95% Critical H Value (KM-Log)	3.637
KM Standard Error of Mean (logged)	0.306	95% H-UCL (KM -Log)	43.35
KM SD (logged)	1.908	95% Critical H Value (KM-Log)	3.637
KM Standard Error of Mean (logged)	0.306		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	13.76	Mean in Log Scale	0.821
SD in Original Scale	31.42	SD in Log Scale	1.968
95% t UCL (Assumes normality)	22.13	95% H-Stat UCL	50.99

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Lognormal Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (Chebyshev) UCL	35.42		

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Aluminum

General Statistics

Total Number of Observations	40	Number of Distinct Observations	40
		Number of Missing Observations	12
Minimum	6290	Mean	33846
Maximum	123000	Median	22800
SD	31037	Std. Error of Mean	4907
Coefficient of Variation	0.917	Skewness	1.723

Normal GOF Test

Shapiro Wilk Test Statistic	0.752	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.94	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.257	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.139	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	42115	95% Adjusted-CLT UCL (Chen-1995)	43347
		95% Modified-t UCL (Johnson-1978)	42337

Gamma GOF Test

A-D Test Statistic	1.341	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.763	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.182	**Kolmogorov-Smirnov Gamma GOF Test**
5% K-S Critical Value	0.142	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	1.675	k star (bias corrected MLE)	1.566
Theta hat (MLE)	20209	Theta star (bias corrected MLE)	21615
nu hat (MLE)	134	nu star (bias corrected)	125.3
MLE Mean (bias corrected)	33846	MLE Sd (bias corrected)	27048
		Approximate Chi Square Value (0.05)	100.4
Adjusted Level of Significance	0.044	Adjusted Chi Square Value	99.59

Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	42222	95% Adjusted Gamma UCL (use when n<50)	42575
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.95	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.94	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.126	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.139	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	8.747	Mean of logged Data	10.1
Maximum of Logged Data	11.72	SD of logged Data	0.795
Assuming Lognormal Distribution			
95% H-UCL	44213	90% Chebyshev (MVUE) UCL	47031
95% Chebyshev (MVUE) UCL	53327	97.5% Chebyshev (MVUE) UCL	62065
99% Chebyshev (MVUE) UCL	79231		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	41918	95% Jackknife UCL	42115
95% Standard Bootstrap UCL	41738	95% Bootstrap-t UCL	43657
95% Hall's Bootstrap UCL	42893	95% Percentile Bootstrap UCL	42062
95% BCA Bootstrap UCL	43250		
90% Chebyshev(Mean, Sd) UCL	48568	95% Chebyshev(Mean, Sd) UCL	55237
97.5% Chebyshev(Mean, Sd) UCL	64493	99% Chebyshev(Mean, Sd) UCL	82674
Suggested UCL to Use			
95% H-UCL	44213		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
ProUCL computes and outputs H-statistic based UCLs for historical reasons only.			
H-statistic often results in unstable (both high and low) values of UCL95 as shown in examples in the Technical Guide.			
It is therefore recommended to avoid the use of H-statistic based 95% UCLs.			
Use of nonparametric methods are preferred to compute UCL95 for skewed data sets which do not follow a gamma distribution.			
Iron			
General Statistics			
Total Number of Observations	40	Number of Distinct Observations	37
		Number of Missing Observations	12

Minimum	1330	Mean	9876
Maximum	23600	Median	10400
SD	4226	Std. Error of Mean	668.2
Coefficient of Variation	0.428	Skewness	0.495
Normal GOF Test			
Shapiro Wilk Test Statistic	0.965	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.94	Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.0773	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.139	Data appear Normal at 5% Significance Level	
Data appear Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	11001	95% Adjusted-CLT UCL (Chen-1995)	11030
		95% Modified-t UCL (Johnson-1978)	11010
Gamma GOF Test			
A-D Test Statistic	0.855	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.752	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.129	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.14	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data follow Appr. Gamma Distribution at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	4.536	k star (bias corrected MLE)	4.213
Theta hat (MLE)	2177	Theta star (bias corrected MLE)	2344
nu hat (MLE)	362.9	nu star (bias corrected)	337
MLE Mean (bias corrected)	9876	MLE Sd (bias corrected)	4811
		Approximate Chi Square Value (0.05)	295.5
Adjusted Level of Significance	0.044	Adjusted Chi Square Value	294
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	11264	95% Adjusted Gamma UCL (use when n<50)	11319
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.898	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.94	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.148	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.139	Data Not Lognormal at 5% Significance Level	
Data Not Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	7.193	Mean of logged Data	9.084
Maximum of Logged Data	10.07	SD of logged Data	0.538
Assuming Lognormal Distribution			
95% H-UCL	12040	90% Chebyshev (MVUE) UCL	12864
95% Chebyshev (MVUE) UCL	14100	97.5% Chebyshev (MVUE) UCL	15814
99% Chebyshev (MVUE) UCL	19182		

Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	10975	95% Jackknife UCL	11001
95% Standard Bootstrap UCL	10959	95% Bootstrap-t UCL	11049
95% Hall's Bootstrap UCL	11056	95% Percentile Bootstrap UCL	10963
95% BCA Bootstrap UCL	10997		
90% Chebyshev(Mean, Sd) UCL	11880	95% Chebyshev(Mean, Sd) UCL	12788
97.5% Chebyshev(Mean, Sd) UCL	14049	99% Chebyshev(Mean, Sd) UCL	16524
Suggested UCL to Use			
95% Student's-t UCL	11001		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Manganese			
General Statistics			
Total Number of Observations	40	Number of Distinct Observations	40
		Number of Missing Observations	12
Minimum	12.8	Mean	182.6
Maximum	762	Median	102.2
SD	165.7	Std. Error of Mean	26.2
Coefficient of Variation	0.908	Skewness	1.471
Normal GOF Test			
Shapiro Wilk Test Statistic	0.834	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.94	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.229	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.139	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	226.7	95% Adjusted-CLT UCL (Chen-1995)	232.2
		95% Modified-t UCL (Johnson-1978)	227.7
Gamma GOF Test			
A-D Test Statistic	0.674	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.77	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.146	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.143	Data Not Gamma Distributed at 5% Significance Level	
Detected data follow Appr. Gamma Distribution at 5% Significance Level			

Gamma Statistics			
k hat (MLE)	1.335	k star (bias corrected MLE)	1.251
Theta hat (MLE)	136.8	Theta star (bias corrected MLE)	145.9
nu hat (MLE)	106.8	nu star (bias corrected)	100.1
MLE Mean (bias corrected)	182.6	MLE Sd (bias corrected)	163.2
		Approximate Chi Square Value (0.05)	78.03
Adjusted Level of Significance	0.044	Adjusted Chi Square Value	77.3
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50)	234.2	95% Adjusted Gamma UCL (use when n<50)	236.4
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.962	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.94	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.092	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.139	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	2.549	Mean of logged Data	4.788
Maximum of Logged Data	6.636	SD of logged Data	0.987
Assuming Lognormal Distribution			
95% H-UCL	285.2	90% Chebyshev (MVUE) UCL	296.5
95% Chebyshev (MVUE) UCL	343.8	97.5% Chebyshev (MVUE) UCL	409.5
99% Chebyshev (MVUE) UCL	538.5		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	225.6	95% Jackknife UCL	226.7
95% Standard Bootstrap UCL	224.6	95% Bootstrap-t UCL	233.9
95% Hall's Bootstrap UCL	236.8	95% Percentile Bootstrap UCL	224.4
95% BCA Bootstrap UCL	231.4		
90% Chebyshev(Mean, Sd) UCL	261.2	95% Chebyshev(Mean, Sd) UCL	296.8
97.5% Chebyshev(Mean, Sd) UCL	346.2	99% Chebyshev(Mean, Sd) UCL	443.2
Suggested UCL to Use			
95% Adjusted Gamma UCL	236.4		
When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test			
When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Mercury			

General Statistics			
Total Number of Observations	40	Number of Distinct Observations	23
		Number of Missing Observations	12
Number of Detects	30	Number of Non-Detects	10
Number of Distinct Detects	21	Number of Distinct Non-Detects	7
Minimum Detect	0.012	Minimum Non-Detect	0.0099
Maximum Detect	0.12	Maximum Non-Detect	0.028
Variance Detects	5.3372E-4	Percent Non-Detects	25%
Mean Detects	0.0333	SD Detects	0.0231
Median Detects	0.0275	CV Detects	0.694
Skewness Detects	2.364	Kurtosis Detects	6.668
Mean of Logged Detects	-3.568	SD of Logged Detects	0.551
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.754	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.927	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.207	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.159	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.0278	KM Standard Error of Mean	0.00353
KM SD	0.0219	95% KM (BCA) UCL	0.0343
95% KM (t) UCL	0.0337	95% KM (Percentile Bootstrap) UCL	0.0339
95% KM (z) UCL	0.0336	95% KM Bootstrap t UCL	0.0361
90% KM Chebyshev UCL	0.0384	95% KM Chebyshev UCL	0.0432
97.5% KM Chebyshev UCL	0.0498	99% KM Chebyshev UCL	0.0629
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	0.742	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.752	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.153	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.161	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	3.19	k star (bias corrected MLE)	2.893
Theta hat (MLE)	0.0104	Theta star (bias corrected MLE)	0.0115
nu hat (MLE)	191.4	nu star (bias corrected)	173.6
Mean (detects)	0.0333		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	0.0275
Maximum	0.12	Median	0.0215

SD	0.0224	CV	0.815
k hat (MLE)	2.31	k star (bias corrected MLE)	2.153
Theta hat (MLE)	0.0119	Theta star (bias corrected MLE)	0.0127
nu hat (MLE)	184.8	nu star (bias corrected)	172.3
Adjusted Level of Significance (β)	0.044		
Approximate Chi Square Value (172.27, α)	142.9	Adjusted Chi Square Value (172.27, β)	141.9
95% Gamma Approximate UCL (use when n>=50)	0.0331	95% Gamma Adjusted UCL (use when n<50)	0.0333
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.0278	SD (KM)	0.0219
Variance (KM)	4.7909E-4	SE of Mean (KM)	0.00353
k hat (KM)	1.614	k star (KM)	1.509
nu hat (KM)	129.1	nu star (KM)	120.7
theta hat (KM)	0.0172	theta star (KM)	0.0184
80% gamma percentile (KM)	0.043	90% gamma percentile (KM)	0.0579
95% gamma percentile (KM)	0.0723	99% gamma percentile (KM)	0.105
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (120.74, α)	96.36	Adjusted Chi Square Value (120.74, β)	95.55
95% Gamma Approximate KM-UCL (use when n>=50)	0.0348	95% Gamma Adjusted KM-UCL (use when n<50)	0.0351
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.956	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.927	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.113	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.159	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.0274	Mean in Log Scale	-3.842
SD in Original Scale	0.0225	SD in Log Scale	0.691
95% t UCL (assumes normality of ROS data)	0.0334	95% Percentile Bootstrap UCL	0.034
95% BCA Bootstrap UCL	0.0349	95% Bootstrap t UCL	0.0357
95% H-UCL (Log ROS)	0.0343		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-3.802	KM Geo Mean	0.0223
KM SD (logged)	0.63	95% Critical H Value (KM-Log)	2.027
KM Standard Error of Mean (logged)	0.102	95% H-UCL (KM -Log)	0.0334
KM SD (logged)	0.63	95% Critical H Value (KM-Log)	2.027
KM Standard Error of Mean (logged)	0.102		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.027	Mean in Log Scale	-3.897
SD in Original Scale	0.0228	SD in Log Scale	0.767
95% t UCL (Assumes normality)	0.033	95% H-Stat UCL	0.0355
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			

Detected Data appear Gamma Distributed at 5% Significance Level			
Suggested UCL to Use			
95% KM Adjusted Gamma UCL	0.0351	95% GROS Adjusted Gamma UCL	0.0333
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Nickel			
General Statistics			
Total Number of Observations	40	Number of Distinct Observations	39
		Number of Missing Observations	12
Minimum	10.3	Mean	174.2
Maximum	1250	Median	93.95
SD	228	Std. Error of Mean	36.05
Coefficient of Variation	1.309	Skewness	3.292
Normal GOF Test			
Shapiro Wilk Test Statistic	0.629	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.94	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.263	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.139	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	234.9	95% Adjusted-CLT UCL (Chen-1995)	253.5
		95% Modified-t UCL (Johnson-1978)	238
Gamma GOF Test			
A-D Test Statistic	0.863	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.777	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.133	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.143	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data follow Appr. Gamma Distribution at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	1.082	k star (bias corrected MLE)	1.018
Theta hat (MLE)	161	Theta star (bias corrected MLE)	171.2
nu hat (MLE)	86.56	nu star (bias corrected)	81.4
MLE Mean (bias corrected)	174.2	MLE Sd (bias corrected)	172.7
		Approximate Chi Square Value (0.05)	61.61
Adjusted Level of Significance	0.044	Adjusted Chi Square Value	60.97
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50)	230.1	95% Adjusted Gamma UCL (use when n<50)	232.6

Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.983	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.94	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.0818	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.139	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	2.332	Mean of logged Data	4.631
Maximum of Logged Data	7.131	SD of logged Data	1.037
Assuming Lognormal Distribution			
95% H-UCL	264.2	90% Chebyshev (MVUE) UCL	272.1
95% Chebyshev (MVUE) UCL	317.3	97.5% Chebyshev (MVUE) UCL	379.9
99% Chebyshev (MVUE) UCL	503.1		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	233.5	95% Jackknife UCL	234.9
95% Standard Bootstrap UCL	233.2	95% Bootstrap-t UCL	277.5
95% Hall's Bootstrap UCL	471.5	95% Percentile Bootstrap UCL	237
95% BCA Bootstrap UCL	255.1		
90% Chebyshev(Mean, Sd) UCL	282.3	95% Chebyshev(Mean, Sd) UCL	331.3
97.5% Chebyshev(Mean, Sd) UCL	399.3	99% Chebyshev(Mean, Sd) UCL	532.8
Suggested UCL to Use			
95% Adjusted Gamma UCL	232.6		
When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test			
When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Thallium			
General Statistics			
Total Number of Observations	40	Number of Distinct Observations	34
		Number of Missing Observations	12
Number of Detects	33	Number of Non-Detects	7
Number of Distinct Detects	28	Number of Distinct Non-Detects	6
Minimum Detect	0.14	Minimum Non-Detect	0.099
Maximum Detect	4.6	Maximum Non-Detect	0.18
Variance Detects	1.769	Percent Non-Detects	17.5%
Mean Detects	0.961	SD Detects	1.33

Median Detects	0.31	CV Detects	1.384
Skewness Detects	1.92	Kurtosis Detects	2.482
Mean of Logged Detects	-0.725	SD of Logged Detects	1.096
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.634	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.931	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.312	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.152	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.811	KM Standard Error of Mean	0.198
KM SD	1.233	95% KM (BCA) UCL	1.142
95% KM (t) UCL	1.145	95% KM (Percentile Bootstrap) UCL	1.156
95% KM (z) UCL	1.137	95% KM Bootstrap t UCL	1.271
90% KM Chebyshev UCL	1.405	95% KM Chebyshev UCL	1.674
97.5% KM Chebyshev UCL	2.048	99% KM Chebyshev UCL	2.781
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	2.706	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.782	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.227	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.159	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.859	k star (bias corrected MLE)	0.801
Theta hat (MLE)	1.119	Theta star (bias corrected MLE)	1.2
nu hat (MLE)	56.69	nu star (bias corrected)	52.87
Mean (detects)	0.961		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	0.795
Maximum	4.6	Median	0.27
SD	1.259	CV	1.585
k hat (MLE)	0.536	k star (bias corrected MLE)	0.512
Theta hat (MLE)	1.484	Theta star (bias corrected MLE)	1.552
nu hat (MLE)	42.84	nu star (bias corrected)	40.96
Adjusted Level of Significance (β)	0.044		
Approximate Chi Square Value (40.96, α)	27.3	Adjusted Chi Square Value (40.96, β)	26.88
95% Gamma Approximate UCL (use when n>=50)	1.192	95% Gamma Adjusted UCL (use when n<50)	1.211
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.811	SD (KM)	1.233

Variance (KM)	1.521	SE of Mean (KM)	0.198
k hat (KM)	0.433	k star (KM)	0.417
nu hat (KM)	34.61	nu star (KM)	33.35
theta hat (KM)	1.875	theta star (KM)	1.946
80% gamma percentile (KM)	1.315	90% gamma percentile (KM)	2.274
95% gamma percentile (KM)	3.322	99% gamma percentile (KM)	5.946
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (33.35, α)	21.15	Adjusted Chi Square Value (33.35, β)	20.78
95% Gamma Approximate KM-UCL (use when n>=50)	1.279	95% Gamma Adjusted KM-UCL (use when n<50)	1.302
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.865	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.931	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.173	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.152	Detected Data Not Lognormal at 5% Significance Level	
Detected Data Not Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.802	Mean in Log Scale	-1.128
SD in Original Scale	1.255	SD in Log Scale	1.336
95% t UCL (assumes normality of ROS data)	1.136	95% Percentile Bootstrap UCL	1.141
95% BCA Bootstrap UCL	1.188	95% Bootstrap t UCL	1.279
95% H-UCL (Log ROS)	1.448		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-0.994	KM Geo Mean	0.37
KM SD (logged)	1.143	95% Critical H Value (KM-Log)	2.579
KM Standard Error of Mean (logged)	0.184	95% H-UCL (KM -Log)	1.14
KM SD (logged)	1.143	95% Critical H Value (KM-Log)	2.579
KM Standard Error of Mean (logged)	0.184		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.804	Mean in Log Scale	-1.084
SD in Original Scale	1.253	SD in Log Scale	1.273
95% t UCL (Assumes normality)	1.138	95% H-Stat UCL	1.33
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution at 5% Significance Level			
Suggested UCL to Use			
95% KM (Chebyshev) UCL	1.674		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			

Antimony

General Statistics			
Total Number of Observations	40	Number of Distinct Observations	33
		Number of Missing Observations	12
Number of Detects	9	Number of Non-Detects	31
Number of Distinct Detects	8	Number of Distinct Non-Detects	26
Minimum Detect	0.43	Minimum Non-Detect	0.23
Maximum Detect	2.6	Maximum Non-Detect	0.8
Variance Detects	0.734	Percent Non-Detects	77.5%
Mean Detects	1.318	SD Detects	0.857
Median Detects	1	CV Detects	0.65
Skewness Detects	0.761	Kurtosis Detects	-1.179
Mean of Logged Detects	0.0835	SD of Logged Detects	0.664

Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.844	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.829	Detected Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.267	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.274	Detected Data appear Normal at 5% Significance Level	
Detected Data appear Normal at 5% Significance Level			

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.478	KM Standard Error of Mean	0.0997
KM SD	0.594	95% KM (BCA) UCL	0.688
95% KM (t) UCL	0.646	95% KM (Percentile Bootstrap) UCL	0.644
95% KM (z) UCL	0.642	95% KM Bootstrap t UCL	0.727
90% KM Chebyshev UCL	0.777	95% KM Chebyshev UCL	0.912
97.5% KM Chebyshev UCL	1.1	99% KM Chebyshev UCL	1.47

Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	0.419	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.728	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.201	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.282	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			

Gamma Statistics on Detected Data Only			
k hat (MLE)	2.754	k star (bias corrected MLE)	1.91
Theta hat (MLE)	0.479	Theta star (bias corrected MLE)	0.69
nu hat (MLE)	49.56	nu star (bias corrected)	34.38
Mean (detects)	1.318		

Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	0.304

Maximum	2.6	Median	0.01
SD	0.676	CV	2.221
k hat (MLE)	0.293	k star (bias corrected MLE)	0.288
Theta hat (MLE)	1.038	Theta star (bias corrected MLE)	1.057
nu hat (MLE)	23.46	nu star (bias corrected)	23.03
Adjusted Level of Significance (β)	0.044		
Approximate Chi Square Value (23.03, α)	13.12	Adjusted Chi Square Value (23.03, β)	12.83
95% Gamma Approximate UCL (use when n>=50)	0.534	95% Gamma Adjusted UCL (use when n<50)	0.546
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.478	SD (KM)	0.594
Variance (KM)	0.353	SE of Mean (KM)	0.0997
k hat (KM)	0.647	k star (KM)	0.615
nu hat (KM)	51.74	nu star (KM)	49.19
theta hat (KM)	0.738	theta star (KM)	0.777
80% gamma percentile (KM)	0.787	90% gamma percentile (KM)	1.235
95% gamma percentile (KM)	1.703	99% gamma percentile (KM)	2.833
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (49.19, α)	34.09	Adjusted Chi Square Value (49.19, β)	33.62
95% Gamma Approximate KM-UCL (use when n>=50)	0.689	95% Gamma Adjusted KM-UCL (use when n<50)	0.699
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.925	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.829	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.16	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.274	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.371	Mean in Log Scale	-1.845
SD in Original Scale	0.647	SD in Log Scale	1.14
95% t UCL (assumes normality of ROS data)	0.543	95% Percentile Bootstrap UCL	0.549
95% BCA Bootstrap UCL	0.589	95% Bootstrap t UCL	0.643
95% H-UCL (Log ROS)	0.485		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-1.112	KM Geo Mean	0.329
KM SD (logged)	0.714	95% Critical H Value (KM-Log)	2.104
KM Standard Error of Mean (logged)	0.12	95% H-UCL (KM -Log)	0.54
KM SD (logged)	0.714	95% Critical H Value (KM-Log)	2.104
KM Standard Error of Mean (logged)	0.12		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.445	Mean in Log Scale	-1.295
SD in Original Scale	0.617	SD in Log Scale	0.849
95% t UCL (Assumes normality)	0.609	95% H-Stat UCL	0.532
DL/2 is not a recommended method, provided for comparisons and historical reasons			

Nonparametric Distribution Free UCL Statistics			
Detected Data appear Normal Distributed at 5% Significance Level			
Suggested UCL to Use			
95% KM (t) UCL	0.646		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Arsenic			
General Statistics			
Total Number of Observations	40	Number of Distinct Observations	36
		Number of Missing Observations	12
Minimum	2.4	Mean	10.72
Maximum	34.1	Median	8.6
SD	7.22	Std. Error of Mean	1.142
Coefficient of Variation	0.674	Skewness	1.731
Normal GOF Test			
Shapiro Wilk Test Statistic	0.827	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.94	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.172	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.139	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	12.64	95% Adjusted-CLT UCL (Chen-1995)	12.93
		95% Modified-t UCL (Johnson-1978)	12.69
Gamma GOF Test			
A-D Test Statistic	0.539	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.756	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.104	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.141	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	2.783	k star (bias corrected MLE)	2.591
Theta hat (MLE)	3.852	Theta star (bias corrected MLE)	4.137
nu hat (MLE)	222.6	nu star (bias corrected)	207.3
MLE Mean (bias corrected)	10.72	MLE Sd (bias corrected)	6.659
		Approximate Chi Square Value (0.05)	174.9
Adjusted Level of Significance	0.044	Adjusted Chi Square Value	173.8
Assuming Gamma Distribution			

95% Approximate Gamma UCL (use when n>=50)	12.7	95% Adjusted Gamma UCL (use when n<50)	12.78
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.971	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.94	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.0813	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.139	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	0.875	Mean of logged Data	2.182
Maximum of Logged Data	3.529	SD of logged Data	0.626
Assuming Lognormal Distribution			
95% H-UCL	13.2	90% Chebyshev (MVUE) UCL	14.13
95% Chebyshev (MVUE) UCL	15.68	97.5% Chebyshev (MVUE) UCL	17.83
99% Chebyshev (MVUE) UCL	22.04		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	12.6	95% Jackknife UCL	12.64
95% Standard Bootstrap UCL	12.58	95% Bootstrap-t UCL	13.24
95% Hall's Bootstrap UCL	13	95% Percentile Bootstrap UCL	12.68
95% BCA Bootstrap UCL	12.95		
90% Chebyshev(Mean, Sd) UCL	14.14	95% Chebyshev(Mean, Sd) UCL	15.69
97.5% Chebyshev(Mean, Sd) UCL	17.85	99% Chebyshev(Mean, Sd) UCL	22.08
Suggested UCL to Use			
95% Adjusted Gamma UCL	12.78		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Barium			
General Statistics			
Total Number of Observations	40	Number of Distinct Observations	37
		Number of Missing Observations	12
Minimum	19.6	Mean	201
Maximum	1560	Median	133
SD	249	Std. Error of Mean	39.37
Coefficient of Variation	1.239	Skewness	4.446
Normal GOF Test			
Shapiro Wilk Test Statistic	0.543	**Shapiro Wilk GOF Test**	

5% Shapiro Wilk Critical Value	0.94	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.269	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.139	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	267.3	95% Adjusted-CLT UCL (Chen-1995)	295.3
		95% Modified-t UCL (Johnson-1978)	271.9
Gamma GOF Test			
A-D Test Statistic	1.114	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.765	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.136	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.142	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data follow Appr. Gamma Distribution at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	1.554	k star (bias corrected MLE)	1.454
Theta hat (MLE)	129.3	Theta star (bias corrected MLE)	138.2
nu hat (MLE)	124.3	nu star (bias corrected)	116.3
MLE Mean (bias corrected)	201	MLE Sd (bias corrected)	166.7
		Approximate Chi Square Value (0.05)	92.44
Adjusted Level of Significance	0.044	Adjusted Chi Square Value	91.64
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50)	253	95% Adjusted Gamma UCL (use when n<50)	255.2
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.982	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.94	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.084	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.139	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	2.976	Mean of logged Data	4.948
Maximum of Logged Data	7.352	SD of logged Data	0.794
Assuming Lognormal Distribution			
95% H-UCL	254.9	90% Chebyshev (MVUE) UCL	271.2
95% Chebyshev (MVUE) UCL	307.4	97.5% Chebyshev (MVUE) UCL	357.7
99% Chebyshev (MVUE) UCL	456.5		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	265.7	95% Jackknife UCL	267.3
95% Standard Bootstrap UCL	263.2	95% Bootstrap-t UCL	337.3

95% Hall's Bootstrap UCL	528.9	95% Percentile Bootstrap UCL	270.1
95% BCA Bootstrap UCL	305.8		
90% Chebyshev(Mean, Sd) UCL	319.1	95% Chebyshev(Mean, Sd) UCL	372.6
97.5% Chebyshev(Mean, Sd) UCL	446.8	99% Chebyshev(Mean, Sd) UCL	592.7
Suggested UCL to Use			
95% Adjusted Gamma UCL	255.2		
When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test			
When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Beryllium			
General Statistics			
Total Number of Observations	40	Number of Distinct Observations	31
		Number of Missing Observations	12
Minimum	0.31	Mean	2.699
Maximum	17.2	Median	1.2
SD	3.902	Std. Error of Mean	0.617
Coefficient of Variation	1.446	Skewness	2.631
Normal GOF Test			
Shapiro Wilk Test Statistic	0.616	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.94	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.286	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.139	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	3.738	95% Adjusted-CLT UCL (Chen-1995)	3.987
		95% Modified-t UCL (Johnson-1978)	3.781
Gamma GOF Test			
A-D Test Statistic	2.029	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.783	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.222	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.144	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	0.899	k star (bias corrected MLE)	0.848
Theta hat (MLE)	3.003	Theta star (bias corrected MLE)	3.183
nu hat (MLE)	71.89	nu star (bias corrected)	67.83

MLE Mean (bias corrected)	2.699	MLE Sd (bias corrected)	2.931
		Approximate Chi Square Value (0.05)	49.87
Adjusted Level of Significance	0.044	Adjusted Chi Square Value	49.3
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	3.67	95% Adjusted Gamma UCL (use when n<50)	3.713
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.934	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.94	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.154	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.139	Data Not Lognormal at 5% Significance Level	
Data Not Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	-1.171	Mean of logged Data	0.342
Maximum of Logged Data	2.845	SD of logged Data	1.076
Assuming Lognormal Distribution			
95% H-UCL	3.862	90% Chebyshev (MVUE) UCL	3.944
95% Chebyshev (MVUE) UCL	4.618	97.5% Chebyshev (MVUE) UCL	5.553
99% Chebyshev (MVUE) UCL	7.39		
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution (0.05)			
Nonparametric Distribution Free UCLs			
95% CLT UCL	3.713	95% Jackknife UCL	3.738
95% Standard Bootstrap UCL	3.706	95% Bootstrap-t UCL	4.281
95% Hall's Bootstrap UCL	4.299	95% Percentile Bootstrap UCL	3.689
95% BCA Bootstrap UCL	3.996		
90% Chebyshev(Mean, Sd) UCL	4.549	95% Chebyshev(Mean, Sd) UCL	5.388
97.5% Chebyshev(Mean, Sd) UCL	6.551	99% Chebyshev(Mean, Sd) UCL	8.837
Suggested UCL to Use			
95% Chebyshev (Mean, Sd) UCL	5.388		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Cadmium			
General Statistics			
Total Number of Observations	40	Number of Distinct Observations	29
		Number of Missing Observations	12
Number of Detects	34	Number of Non-Detects	6
Number of Distinct Detects	24	Number of Distinct Non-Detects	5
Minimum Detect	0.29	Minimum Non-Detect	0.27

Maximum Detect	9.6	Maximum Non-Detect	0.39
Variance Detects	5.086	Percent Non-Detects	15%
Mean Detects	2.329	SD Detects	2.255
Median Detects	1.5	CV Detects	0.968
Skewness Detects	1.849	Kurtosis Detects	3.135
Mean of Logged Detects	0.468	SD of Logged Detects	0.877
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.769	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.933	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.24	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.15	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	2.021	KM Standard Error of Mean	0.349
KM SD	2.176	95% KM (BCA) UCL	2.632
95% KM (t) UCL	2.609	95% KM (Percentile Bootstrap) UCL	2.619
95% KM (z) UCL	2.595	95% KM Bootstrap t UCL	2.819
90% KM Chebyshev UCL	3.068	95% KM Chebyshev UCL	3.543
97.5% KM Chebyshev UCL	4.201	99% KM Chebyshev UCL	5.495
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	0.804	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.766	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.154	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.154	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data follow Appr. Gamma Distribution at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	1.47	k star (bias corrected MLE)	1.359
Theta hat (MLE)	1.585	Theta star (bias corrected MLE)	1.713
nu hat (MLE)	99.93	nu star (bias corrected)	92.44
Mean (detects)	2.329		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	1.981
Maximum	9.6	Median	1.1
SD	2.238	CV	1.13
k hat (MLE)	0.628	k star (bias corrected MLE)	0.598
Theta hat (MLE)	3.152	Theta star (bias corrected MLE)	3.313
nu hat (MLE)	50.28	nu star (bias corrected)	47.84
Adjusted Level of Significance (β)	0.044		
Approximate Chi Square Value (47.84, α)	32.96	Adjusted Chi Square Value (47.84, β)	32.5
95% Gamma Approximate UCL (use when n>=50)	2.875	95% Gamma Adjusted UCL (use when n<50)	2.916

Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	2.021	SD (KM)	2.176
Variance (KM)	4.735	SE of Mean (KM)	0.349
k hat (KM)	0.862	k star (KM)	0.814
nu hat (KM)	68.99	nu star (KM)	65.15
theta hat (KM)	2.343	theta star (KM)	2.481
80% gamma percentile (KM)	3.299	90% gamma percentile (KM)	4.892
95% gamma percentile (KM)	6.513	99% gamma percentile (KM)	10.34
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (65.15, α)	47.58	Adjusted Chi Square Value (65.15, β)	47.01
95% Gamma Approximate KM-UCL (use when n>=50)	2.767	95% Gamma Adjusted KM-UCL (use when n<50)	2.8
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.972	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.933	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.106	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.15	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	2.015	Mean in Log Scale	0.181
SD in Original Scale	2.208	SD in Log Scale	1.067
95% t UCL (assumes normality of ROS data)	2.604	95% Percentile Bootstrap UCL	2.586
95% BCA Bootstrap UCL	2.661	95% Bootstrap t UCL	2.794
95% H-UCL (Log ROS)	3.235		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	0.204	KM Geo Mean	1.226
KM SD (logged)	1.016	95% Critical H Value (KM-Log)	2.426
KM Standard Error of Mean (logged)	0.163	95% H-UCL (KM -Log)	3.046
KM SD (logged)	1.016	95% Critical H Value (KM-Log)	2.426
KM Standard Error of Mean (logged)	0.163		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	2.002	Mean in Log Scale	0.114
SD in Original Scale	2.219	SD in Log Scale	1.176
95% t UCL (Assumes normality)	2.593	95% H-Stat UCL	3.666
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Approximate Gamma Distributed at 5% Significance Level			
Suggested UCL to Use			
95% KM Adjusted Gamma UCL	2.8	95% GROS Adjusted Gamma UCL	2.916
When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test			
When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL			

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

ChromiumVI

General Statistics

Total Number of Observations	6	Number of Distinct Observations	6
		Number of Missing Observations	43
Number of Detects	1	Number of Non-Detects	5
Number of Distinct Detects	1	Number of Distinct Non-Detects	5

Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set!

It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable ChromiumVI was not processed!

ChromiumVI_EST

General Statistics

Total Number of Observations	38	Number of Distinct Observations	35
		Number of Missing Observations	14
Minimum	0.195	Mean	0.561
Maximum	1.378	Median	0.475
SD	0.284	Std. Error of Mean	0.0461
Coefficient of Variation	0.506	Skewness	1.141

Normal GOF Test

Shapiro Wilk Test Statistic	0.904	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.938	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.144	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.142	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	0.639	95% Adjusted-CLT UCL (Chen-1995)	0.646
		95% Modified-t UCL (Johnson-1978)	0.64

Gamma GOF Test

A-D Test Statistic	0.293	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.752	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.0962	**Kolmogorov-Smirnov Gamma GOF Test**
5% K-S Critical Value	0.144	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics			
k hat (MLE)	4.468	k star (bias corrected MLE)	4.133
Theta hat (MLE)	0.126	Theta star (bias corrected MLE)	0.136
nu hat (MLE)	339.6	nu star (bias corrected)	314.1
MLE Mean (bias corrected)	0.561	MLE Sd (bias corrected)	0.276
		Approximate Chi Square Value (0.05)	274
Adjusted Level of Significance	0.0434	Adjusted Chi Square Value	272.5
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50)	0.643	95% Adjusted Gamma UCL (use when n<50)	0.647
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.981	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.938	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.0665	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.142	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	-1.633	Mean of logged Data	-0.694
Maximum of Logged Data	0.321	SD of logged Data	0.487
Assuming Lognormal Distribution			
95% H-UCL	0.655	90% Chebyshev (MVUE) UCL	0.699
95% Chebyshev (MVUE) UCL	0.762	97.5% Chebyshev (MVUE) UCL	0.849
99% Chebyshev (MVUE) UCL	1.021		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	0.637	95% Jackknife UCL	0.639
95% Standard Bootstrap UCL	0.636	95% Bootstrap-t UCL	0.645
95% Hall's Bootstrap UCL	0.649	95% Percentile Bootstrap UCL	0.634
95% BCA Bootstrap UCL	0.638		
90% Chebyshev(Mean, Sd) UCL	0.699	95% Chebyshev(Mean, Sd) UCL	0.762
97.5% Chebyshev(Mean, Sd) UCL	0.849	99% Chebyshev(Mean, Sd) UCL	1.019
Suggested UCL to Use			
95% Adjusted Gamma UCL	0.647		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Cobalt			
General Statistics			

Total Number of Observations	40	Number of Distinct Observations	32
		Number of Missing Observations	12
Minimum	1.2	Mean	6.378
Maximum	27.4	Median	5.45
SD	4.307	Std. Error of Mean	0.681
Coefficient of Variation	0.675	Skewness	3.501
Normal GOF Test			
Shapiro Wilk Test Statistic	0.637	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.94	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.256	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.139	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	7.525	95% Adjusted-CLT UCL (Chen-1995)	7.9
		95% Modified-t UCL (Johnson-1978)	7.588
Gamma GOF Test			
A-D Test Statistic	2.069	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.753	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.17	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.14	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	3.878	k star (bias corrected MLE)	3.603
Theta hat (MLE)	1.645	Theta star (bias corrected MLE)	1.77
nu hat (MLE)	310.2	nu star (bias corrected)	288.3
MLE Mean (bias corrected)	6.378	MLE Sd (bias corrected)	3.36
		Approximate Chi Square Value (0.05)	249.9
Adjusted Level of Significance	0.044	Adjusted Chi Square Value	248.6
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	7.355	95% Adjusted Gamma UCL (use when n<50)	7.395
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.911	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.94	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.167	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.139	Data Not Lognormal at 5% Significance Level	
Data Not Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	0.182	Mean of logged Data	1.718
Maximum of Logged Data	3.311	SD of logged Data	0.496
Assuming Lognormal Distribution			
95% H-UCL	7.345	90% Chebyshev (MVUE) UCL	7.834

95% Chebyshev (MVUE) UCL	8.536	97.5% Chebyshev (MVUE) UCL	9.511
99% Chebyshev (MVUE) UCL	11.42		

Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution (0.05)

Nonparametric Distribution Free UCLs

95% CLT UCL	7.498	95% Jackknife UCL	7.525
95% Standard Bootstrap UCL	7.506	95% Bootstrap-t UCL	8.548
95% Hall's Bootstrap UCL	13.03	95% Percentile Bootstrap UCL	7.625
95% BCA Bootstrap UCL	8.103		
90% Chebyshev(Mean, Sd) UCL	8.421	95% Chebyshev(Mean, Sd) UCL	9.346
97.5% Chebyshev(Mean, Sd) UCL	10.63	99% Chebyshev(Mean, Sd) UCL	13.15

Suggested UCL to Use

95% Student's-t UCL	7.525	or 95% Modified-t UCL	7.588

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Copper

General Statistics

Total Number of Observations	40	Number of Distinct Observations	40
		Number of Missing Observations	12
Minimum	6.4	Mean	30.42
Maximum	202	Median	22.85
SD	32.3	Std. Error of Mean	5.108
Coefficient of Variation	1.062	Skewness	4.094

Normal GOF Test

Shapiro Wilk Test Statistic	0.594	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.94	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.244	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.139	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	39.02	95% Adjusted-CLT UCL (Chen-1995)	42.35
		95% Modified-t UCL (Johnson-1978)	39.57

Gamma GOF Test

A-D Test Statistic	0.935	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.761	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.134	**Kolmogorov-Smirnov Gamma GOF Test**
5% K-S Critical Value	0.141	Detected data appear Gamma Distributed at 5% Significance Level

Detected data follow Appr. Gamma Distribution at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	1.884	k star (bias corrected MLE)	1.759
Theta hat (MLE)	16.14	Theta star (bias corrected MLE)	17.29
nu hat (MLE)	150.7	nu star (bias corrected)	140.8
MLE Mean (bias corrected)	30.42	MLE Sd (bias corrected)	22.93
		Approximate Chi Square Value (0.05)	114.3
Adjusted Level of Significance	0.044	Adjusted Chi Square Value	113.5
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50)	37.44	95% Adjusted Gamma UCL (use when n<50)	37.74
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.971	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.94	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.0737	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.139	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	1.856	Mean of logged Data	3.127
Maximum of Logged Data	5.308	SD of logged Data	0.714
Assuming Lognormal Distribution			
95% H-UCL	37.4	90% Chebyshev (MVUE) UCL	39.97
95% Chebyshev (MVUE) UCL	44.86	97.5% Chebyshev (MVUE) UCL	51.64
99% Chebyshev (MVUE) UCL	64.97		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	38.82	95% Jackknife UCL	39.02
95% Standard Bootstrap UCL	38.54	95% Bootstrap-t UCL	46.53
95% Hall's Bootstrap UCL	75.22	95% Percentile Bootstrap UCL	39.1
95% BCA Bootstrap UCL	44.88		
90% Chebyshev(Mean, Sd) UCL	45.74	95% Chebyshev(Mean, Sd) UCL	52.68
97.5% Chebyshev(Mean, Sd) UCL	62.31	99% Chebyshev(Mean, Sd) UCL	81.24
Suggested UCL to Use			
95% Adjusted Gamma UCL	37.74		
When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test			
When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			

Vanadium

General Statistics

Total Number of Observations	40	Number of Distinct Observations	40
		Number of Missing Observations	12
Minimum	6.1	Mean	58.65
Maximum	348	Median	38.85
SD	63.71	Std. Error of Mean	10.07
Coefficient of Variation	1.086	Skewness	2.864

Normal GOF Test

Shapiro Wilk Test Statistic	0.699	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.94	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.235	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.139	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	75.62	95% Adjusted-CLT UCL (Chen-1995)	80.09
		95% Modified-t UCL (Johnson-1978)	76.38

Gamma GOF Test

A-D Test Statistic	0.843	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.768	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.121	**Kolmogorov-Smirnov Gamma GOF Test**
5% K-S Critical Value	0.142	Detected data appear Gamma Distributed at 5% Significance Level

Detected data follow Appr. Gamma Distribution at 5% Significance Level

Gamma Statistics

k hat (MLE)	1.422	k star (bias corrected MLE)	1.332
Theta hat (MLE)	41.24	Theta star (bias corrected MLE)	44.03
nu hat (MLE)	113.8	nu star (bias corrected)	106.6
MLE Mean (bias corrected)	58.65	MLE Sd (bias corrected)	50.82
		Approximate Chi Square Value (0.05)	83.74
Adjusted Level of Significance	0.044	Adjusted Chi Square Value	82.98

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50)	74.63	95% Adjusted Gamma UCL (use when n<50)	75.32

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.988	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.94	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.0821	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.139	Data appear Lognormal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	1.808	Mean of logged Data	3.68
Maximum of Logged Data	5.852	SD of logged Data	0.868
Assuming Lognormal Distribution			
95% H-UCL	79.12	90% Chebyshev (MVUE) UCL	83.62
95% Chebyshev (MVUE) UCL	95.64	97.5% Chebyshev (MVUE) UCL	112.3
99% Chebyshev (MVUE) UCL	145.1		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	75.22	95% Jackknife UCL	75.62
95% Standard Bootstrap UCL	74.62	95% Bootstrap-t UCL	81.89
95% Hall's Bootstrap UCL	100.1	95% Percentile Bootstrap UCL	76.05
95% BCA Bootstrap UCL	80.69		
90% Chebyshev(Mean, Sd) UCL	88.87	95% Chebyshev(Mean, Sd) UCL	102.6
97.5% Chebyshev(Mean, Sd) UCL	121.6	99% Chebyshev(Mean, Sd) UCL	158.9
Suggested UCL to Use			
95% Adjusted Gamma UCL	75.32		
When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test			
When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Selenium			
General Statistics			
Total Number of Observations	40	Number of Distinct Observations	34
		Number of Missing Observations	12
Number of Detects	24	Number of Non-Detects	16
Number of Distinct Detects	21	Number of Distinct Non-Detects	14
Minimum Detect	0.34	Minimum Non-Detect	0.23
Maximum Detect	3.3	Maximum Non-Detect	0.52
Variance Detects	0.583	Percent Non-Detects	40%
Mean Detects	1.134	SD Detects	0.764
Median Detects	0.875	CV Detects	0.674
Skewness Detects	1.614	Kurtosis Detects	2.092
Mean of Logged Detects	-0.0495	SD of Logged Detects	0.582
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.807	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.916	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.278	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.177	Detected Data Not Normal at 5% Significance Level	

Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.775	KM Standard Error of Mean	0.118
KM SD	0.727	95% KM (BCA) UCL	0.998
95% KM (t) UCL	0.973	95% KM (Percentile Bootstrap) UCL	0.975
95% KM (z) UCL	0.968	95% KM Bootstrap t UCL	1.042
90% KM Chebyshev UCL	1.127	95% KM Chebyshev UCL	1.287
97.5% KM Chebyshev UCL	1.509	99% KM Chebyshev UCL	1.944
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	0.831	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.751	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.216	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.179	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	3.013	k star (bias corrected MLE)	2.664
Theta hat (MLE)	0.376	Theta star (bias corrected MLE)	0.426
nu hat (MLE)	144.6	nu star (bias corrected)	127.9
Mean (detects)	1.134		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	0.684
Maximum	3.3	Median	0.6
SD	0.809	CV	1.183
k hat (MLE)	0.435	k star (bias corrected MLE)	0.419
Theta hat (MLE)	1.573	Theta star (bias corrected MLE)	1.633
nu hat (MLE)	34.8	nu star (bias corrected)	33.53
Adjusted Level of Significance (β)	0.044		
Approximate Chi Square Value (33.53, α)	21.29	Adjusted Chi Square Value (33.53, β)	20.92
95% Gamma Approximate UCL (use when n>=50)	1.078	95% Gamma Adjusted UCL (use when n<50)	1.097
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.775	SD (KM)	0.727
Variance (KM)	0.529	SE of Mean (KM)	0.118
k hat (KM)	1.135	k star (KM)	1.067
nu hat (KM)	90.8	nu star (KM)	85.33
theta hat (KM)	0.683	theta star (KM)	0.726
80% gamma percentile (KM)	1.24	90% gamma percentile (KM)	1.756
95% gamma percentile (KM)	2.269	99% gamma percentile (KM)	3.455
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (85.33, α)	65.04	Adjusted Chi Square Value (85.33, β)	64.37

95% Gamma Approximate KM-UCL (use when n>=50)	1.017	95% Gamma Adjusted KM-UCL (use when n<50)	1.027
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.956	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.916	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.174	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.177	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.774	Mean in Log Scale	-0.612
SD in Original Scale	0.737	SD in Log Scale	0.832
95% t UCL (assumes normality of ROS data)	0.971	95% Percentile Bootstrap UCL	0.979
95% BCA Bootstrap UCL	0.992	95% Bootstrap t UCL	1.03
95% H-UCL (Log ROS)	1.031		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-0.609	KM Geo Mean	0.544
KM SD (logged)	0.817	95% Critical H Value (KM-Log)	2.208
KM Standard Error of Mean (logged)	0.132	95% H-UCL (KM -Log)	1.014
KM SD (logged)	0.817	95% Critical H Value (KM-Log)	2.208
KM Standard Error of Mean (logged)	0.132		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.749	Mean in Log Scale	-0.743
SD in Original Scale	0.756	SD in Log Scale	0.981
95% t UCL (Assumes normality)	0.951	95% H-Stat UCL	1.119
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Lognormal Distributed at 5% Significance Level			
Suggested UCL to Use			
KM H-UCL	1.014		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Naphthalene			
General Statistics			
Total Number of Observations	47	Number of Distinct Observations	46
		Number of Missing Observations	5
Number of Detects	34	Number of Non-Detects	13
Number of Distinct Detects	34	Number of Distinct Non-Detects	13
Minimum Detect	0.0015	Minimum Non-Detect	0.0091
Maximum Detect	12	Maximum Non-Detect	39

Variance Detects	6.324	Percent Non-Detects	27.66%
Mean Detects	1.588	SD Detects	2.515
Median Detects	0.58	CV Detects	1.583
Skewness Detects	2.634	Kurtosis Detects	8.318
Mean of Logged Detects	-0.908	SD of Logged Detects	2.025
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.667	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.933	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.264	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.15	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	1.235	KM Standard Error of Mean	0.344
KM SD	2.259	95% KM (BCA) UCL	1.853
95% KM (t) UCL	1.812	95% KM (Percentile Bootstrap) UCL	1.842
95% KM (z) UCL	1.801	95% KM Bootstrap t UCL	2.191
90% KM Chebyshev UCL	2.267	95% KM Chebyshev UCL	2.734
97.5% KM Chebyshev UCL	3.382	99% KM Chebyshev UCL	4.657
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	0.427	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.819	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.128	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.16	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.468	k star (bias corrected MLE)	0.446
Theta hat (MLE)	3.393	Theta star (bias corrected MLE)	3.558
nu hat (MLE)	31.83	nu star (bias corrected)	30.35
Mean (detects)	1.588		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.0015	Mean	1.164
Maximum	12	Median	0.2
SD	2.241	CV	1.926
k hat (MLE)	0.354	k star (bias corrected MLE)	0.346
Theta hat (MLE)	3.282	Theta star (bias corrected MLE)	3.362
nu hat (MLE)	33.32	nu star (bias corrected)	32.53
Adjusted Level of Significance (β)	0.0449		
Approximate Chi Square Value (32.53, α)	20.49	Adjusted Chi Square Value (32.53, β)	20.19
95% Gamma Approximate UCL (use when n>=50)	1.847	95% Gamma Adjusted UCL (use when n<50)	1.875

Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	1.235	SD (KM)	2.259
Variance (KM)	5.103	SE of Mean (KM)	0.344
k hat (KM)	0.299	k star (KM)	0.294
nu hat (KM)	28.09	nu star (KM)	27.63
theta hat (KM)	4.132	theta star (KM)	4.201
80% gamma percentile (KM)	1.884	90% gamma percentile (KM)	3.651
95% gamma percentile (KM)	5.686	99% gamma percentile (KM)	10.99
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (27.63, α)	16.64	Adjusted Chi Square Value (27.63, β)	16.37
95% Gamma Approximate KM-UCL (use when n>=50)	2.05	95% Gamma Adjusted KM-UCL (use when n<50)	2.084
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.969	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.933	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.0939	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.15	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	1.168	Mean in Log Scale	-1.571
SD in Original Scale	2.238	SD in Log Scale	2.125
95% t UCL (assumes normality of ROS data)	1.716	95% Percentile Bootstrap UCL	1.733
95% BCA Bootstrap UCL	1.891	95% Bootstrap t UCL	2.094
95% H-UCL (Log ROS)	6.479		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-1.726	KM Geo Mean	0.178
KM SD (logged)	2.479	95% Critical H Value (KM-Log)	4.272
KM Standard Error of Mean (logged)	0.403	95% H-UCL (KM -Log)	18.32
KM SD (logged)	2.479	95% Critical H Value (KM-Log)	4.272
KM Standard Error of Mean (logged)	0.403		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	1.9	Mean in Log Scale	-1.183
SD in Original Scale	3.705	SD in Log Scale	2.251
95% t UCL (Assumes normality)	2.807	95% H-Stat UCL	14.3
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Gamma Distributed at 5% Significance Level			
Suggested UCL to Use			
Adjusted KM-UCL (use when k<=1 and 15 < n < 50 but k<=1)	2.084		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Pyrene

General Statistics

Total Number of Observations	47	Number of Distinct Observations	45
		Number of Missing Observations	5
Number of Detects	46	Number of Non-Detects	1
Number of Distinct Detects	44	Number of Distinct Non-Detects	1
Minimum Detect	0.058	Minimum Non-Detect	0.016
Maximum Detect	3200	Maximum Non-Detect	0.016
Variance Detects	413162	Percent Non-Detects	2.128%
Mean Detects	300.9	SD Detects	642.8
Median Detects	21.5	CV Detects	2.136
Skewness Detects	3.113	Kurtosis Detects	10.27
Mean of Logged Detects	3.379	SD of Logged Detects	2.609

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.537	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.945	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.32	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.129	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	294.5	KM Standard Error of Mean	92.98
KM SD	630.4	95% KM (BCA) UCL	458.7
95% KM (t) UCL	450.5	95% KM (Percentile Bootstrap) UCL	451.6
95% KM (z) UCL	447.4	95% KM Bootstrap t UCL	566.6
90% KM Chebyshev UCL	573.4	95% KM Chebyshev UCL	699.7
97.5% KM Chebyshev UCL	875.1	99% KM Chebyshev UCL	1220

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	1.49	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.864	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.166	**Kolmogorov-Smirnov GOF**
5% K-S Critical Value	0.142	Detected Data Not Gamma Distributed at 5% Significance Level

Detected Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	0.297	k star (bias corrected MLE)	0.292
Theta hat (MLE)	1014	Theta star (bias corrected MLE)	1031
nu hat (MLE)	27.3	nu star (bias corrected)	26.85
Mean (detects)	300.9		

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)

For such situations, GROS method may yield incorrect values of UCLs and BTVs

This is especially true when the sample size is small.

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	294.5
Maximum	3200	Median	21
SD	637.3	CV	2.164
k hat (MLE)	0.281	k star (bias corrected MLE)	0.278
Theta hat (MLE)	1047	Theta star (bias corrected MLE)	1061
nu hat (MLE)	26.45	nu star (bias corrected)	26.09
Adjusted Level of Significance (β)	0.0449		
Approximate Chi Square Value (26.09, α)	15.45	Adjusted Chi Square Value (26.09, β)	15.19
95% Gamma Approximate UCL (use when n>=50)	497.3	95% Gamma Adjusted UCL (use when n<50)	505.8
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	294.5	SD (KM)	630.4
Variance (KM)	397466	SE of Mean (KM)	92.98
k hat (KM)	0.218	k star (KM)	0.218
nu hat (KM)	20.51	nu star (KM)	20.53
theta hat (KM)	1350	theta star (KM)	1348
80% gamma percentile (KM)	405.1	90% gamma percentile (KM)	889.8
95% gamma percentile (KM)	1482	99% gamma percentile (KM)	3089
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (20.53, α)	11.24	Adjusted Chi Square Value (20.53, β)	11.03
95% Gamma Approximate KM-UCL (use when n>=50)	537.7	95% Gamma Adjusted KM-UCL (use when n<50)	548.4
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.964	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.945	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.0975	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.129	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	294.5	Mean in Log Scale	3.235
SD in Original Scale	637.3	SD in Log Scale	2.761
95% t UCL (assumes normality of ROS data)	450.5	95% Percentile Bootstrap UCL	445.9
95% BCA Bootstrap UCL	491.6	95% Bootstrap t UCL	575.2
95% H-UCL (Log ROS)	7741		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	3.219	KM Geo Mean	25
KM SD (logged)	2.774	95% Critical H Value (KM-Log)	4.702
KM Standard Error of Mean (logged)	0.409	95% H-UCL (KM -Log)	8018
KM SD (logged)	2.774	95% Critical H Value (KM-Log)	4.702
KM Standard Error of Mean (logged)	0.409		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	294.5	Mean in Log Scale	3.204
SD in Original Scale	637.3	SD in Log Scale	2.845
95% t UCL (Assumes normality)	450.5	95% H-Stat UCL	10588

DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Lognormal Distributed at 5% Significance Level			
Suggested UCL to Use			
97.5% KM (Chebyshev) UCL	875.1		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			

ProUCL Output
Central Landfill Area Soil (0-0.5 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

UCL Statistics for Data Sets with Non-Detects	
User Selected Options	
Date/Time of Computation	ProUCL 5.11/28/2019 11:03:50 AM
From File	20190128_CenLF_ProUCL_input.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

PCB1254Aroclor1254

General Statistics			
Total Number of Observations	35	Number of Distinct Observations	11
		Number of Missing Observations	34
Number of Detects	2	Number of Non-Detects	33
Number of Distinct Detects	2	Number of Distinct Non-Detects	9
Minimum Detect	0.062	Minimum Non-Detect	0.0094
Maximum Detect	1.2	Maximum Non-Detect	0.013
Variance Detects	0.648	Percent Non-Detects	94.29%
Mean Detects	0.631	SD Detects	0.805
Median Detects	0.631	CV Detects	1.275
Skewness Detects	N/A	Kurtosis Detects	N/A
Mean of Logged Detects	-1.299	SD of Logged Detects	2.095

Warning: Data set has only 2 Detected Values.
This is not enough to compute meaningful or reliable statistics and estimates.

Normal GOF Test on Detects Only
Not Enough Data to Perform GOF Test

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.0449	KM Standard Error of Mean	0.0474
KM SD	0.198	95% KM (BCA) UCL	N/A
95% KM (t) UCL	0.125	95% KM (Percentile Bootstrap) UCL	N/A
95% KM (z) UCL	0.123	95% KM Bootstrap t UCL	N/A
90% KM Chebyshev UCL	0.187	95% KM Chebyshev UCL	0.252
97.5% KM Chebyshev UCL	0.341	99% KM Chebyshev UCL	0.517

Gamma GOF Tests on Detected Observations Only
Not Enough Data to Perform GOF Test

Gamma Statistics on Detected Data Only			
k hat (MLE)	0.718	k star (bias corrected MLE)	N/A
Theta hat (MLE)	0.879	Theta star (bias corrected MLE)	N/A
nu hat (MLE)	2.872	nu star (bias corrected)	N/A
Mean (detects)	0.631		

Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.0449	SD (KM)	0.198
Variance (KM)	0.0393	SE of Mean (KM)	0.0474

k hat (KM)	0.0513	k star (KM)	0.066
nu hat (KM)	3.592	nu star (KM)	4.618
theta hat (KM)	0.875	theta star (KM)	0.681
80% gamma percentile (KM)	0.0139	90% gamma percentile (KM)	0.0923
95% gamma percentile (KM)	0.256	99% gamma percentile (KM)	0.869
Gamma Kaplan-Meier (KM) Statistics			
		Adjusted Level of Significance (β)	0.0425
Approximate Chi Square Value (4.62, α)	0.98	Adjusted Chi Square Value (4.62, β)	0.905
95% Gamma Approximate KM-UCL (use when n>=50)	0.212	95% Gamma Adjusted KM-UCL (use when n<50)	0.229
95% Gamma Adjusted KM-UCL (use when k<=1 and 15 < n < 50)			
Lognormal GOF Test on Detected Observations Only			
Not Enough Data to Perform GOF Test			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.0361	Mean in Log Scale	-20.02
SD in Original Scale	0.203	SD in Log Scale	7.781
95% t UCL (assumes normality of ROS data)	0.094	95% Percentile Bootstrap UCL	0.105
95% BCA Bootstrap UCL	0.141	95% Bootstrap t UCL	316.1
95% H-UCL (Log ROS)	2.465E+12		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-4.475	KM Geo Mean	0.0114
KM SD (logged)	0.858	95% Critical H Value (KM-Log)	2.291
KM Standard Error of Mean (logged)	0.205	95% H-UCL (KM -Log)	0.0231
KM SD (logged)	0.858	95% Critical H Value (KM-Log)	2.291
KM Standard Error of Mean (logged)	0.205		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.041	Mean in Log Scale	-5.031
SD in Original Scale	0.202	SD in Log Scale	1.002
95% t UCL (Assumes normality)	0.0987	95% H-Stat UCL	0.0165
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution at 5% Significance Level			
Suggested UCL to Use			
97.5% KM (Chebyshev) UCL	0.341		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Bis2EthylhexylPhthalate			
General Statistics			
Total Number of Observations	57	Number of Distinct Observations	33

		Number of Missing Observations	11
Number of Detects	13	Number of Non-Detects	44
Number of Distinct Detects	13	Number of Distinct Non-Detects	22
Minimum Detect	0.045	Minimum Non-Detect	0.014
Maximum Detect	2.5	Maximum Non-Detect	0.72
Variance Detects	0.447	Percent Non-Detects	77.19%
Mean Detects	0.283	SD Detects	0.668
Median Detects	0.079	CV Detects	2.363
Skewness Detects	3.562	Kurtosis Detects	12.77
Mean of Logged Detects	-2.196	SD of Logged Detects	1.058
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.378	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.866	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.455	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.234	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.0783	KM Standard Error of Mean	0.0451
KM SD	0.327	95% KM (BCA) UCL	0.168
95% KM (t) UCL	0.154	95% KM (Percentile Bootstrap) UCL	0.162
95% KM (z) UCL	0.152	95% KM Bootstrap t UCL	0.52
90% KM Chebyshev UCL	0.213	95% KM Chebyshev UCL	0.275
97.5% KM Chebyshev UCL	0.36	99% KM Chebyshev UCL	0.527
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	2.362	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.778	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.32	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.247	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.654	k star (bias corrected MLE)	0.554
Theta hat (MLE)	0.433	Theta star (bias corrected MLE)	0.51
nu hat (MLE)	17	nu star (bias corrected)	14.41
Mean (detects)	0.283		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	0.0722
Maximum	2.5	Median	0.01
SD	0.33	CV	4.573
k hat (MLE)	0.452	k star (bias corrected MLE)	0.44
Theta hat (MLE)	0.16	Theta star (bias corrected MLE)	0.164
nu hat (MLE)	51.53	nu star (bias corrected)	50.15

Adjusted Level of Significance (β)	0.0458		
Approximate Chi Square Value (50.15, α)	34.89	Adjusted Chi Square Value (50.15, β)	34.56
95% Gamma Approximate UCL (use when n>=50)	0.104	95% Gamma Adjusted UCL (use when n<50)	0.105
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.0783	SD (KM)	0.327
Variance (KM)	0.107	SE of Mean (KM)	0.0451
k hat (KM)	0.0574	k star (KM)	0.0661
nu hat (KM)	6.545	nu star (KM)	7.534
theta hat (KM)	1.363	theta star (KM)	1.184
80% gamma percentile (KM)	0.0244	90% gamma percentile (KM)	0.161
95% gamma percentile (KM)	0.447	99% gamma percentile (KM)	1.513
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (7.53, α)	2.468	Adjusted Chi Square Value (7.53, β)	2.394
95% Gamma Approximate KM-UCL (use when n>=50)	0.239	95% Gamma Adjusted KM-UCL (use when n<50)	0.246
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.734	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.866	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.232	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.234	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Approximate Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.0704	Mean in Log Scale	-4.467
SD in Original Scale	0.331	SD in Log Scale	1.507
95% t UCL (assumes normality of ROS data)	0.144	95% Percentile Bootstrap UCL	0.156
95% BCA Bootstrap UCL	0.203	95% Bootstrap t UCL	0.546
95% H-UCL (Log ROS)	0.0666		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-3.716	KM Geo Mean	0.0243
KM SD (logged)	1.02	95% Critical H Value (KM-Log)	2.365
KM Standard Error of Mean (logged)	0.149	95% H-UCL (KM -Log)	0.0565
KM SD (logged)	1.02	95% Critical H Value (KM-Log)	2.365
KM Standard Error of Mean (logged)	0.149		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.0921	Mean in Log Scale	-3.511
SD in Original Scale	0.33	SD in Log Scale	1.221
95% t UCL (Assumes normality)	0.165	95% H-Stat UCL	0.0978
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Approximate Lognormal Distributed at 5% Significance Level			
Suggested UCL to Use			
KM H-UCL	0.0565		

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Dibenzofuran

General Statistics

Total Number of Observations	57	Number of Distinct Observations	36
		Number of Missing Observations	11
Number of Detects	37	Number of Non-Detects	20
Number of Distinct Detects	32	Number of Distinct Non-Detects	10
Minimum Detect	0.0016	Minimum Non-Detect	0.0015
Maximum Detect	10	Maximum Non-Detect	0.014
Variance Detects	2.689	Percent Non-Detects	35.09%
Mean Detects	0.321	SD Detects	1.64
Median Detects	0.013	CV Detects	5.112
Skewness Detects	6.031	Kurtosis Detects	36.56
Mean of Logged Detects	-4.102	SD of Logged Detects	1.793

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.201	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.936	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.447	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.144	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	0.209	KM Standard Error of Mean	0.176
KM SD	1.312	95% KM (BCA) UCL	0.564
95% KM (t) UCL	0.504	95% KM (Percentile Bootstrap) UCL	0.557
95% KM (z) UCL	0.499	95% KM Bootstrap t UCL	4.636
90% KM Chebyshev UCL	0.738	95% KM Chebyshev UCL	0.977
97.5% KM Chebyshev UCL	1.31	99% KM Chebyshev UCL	1.962

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	6.673	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.887	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.349	**Kolmogorov-Smirnov GOF**
5% K-S Critical Value	0.159	Detected Data Not Gamma Distributed at 5% Significance Level

Detected Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	0.241	k star (bias corrected MLE)	0.239
Theta hat (MLE)	1.331	Theta star (bias corrected MLE)	1.34
nu hat (MLE)	17.83	nu star (bias corrected)	17.72
Mean (detects)	0.321		

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)

For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.0016	Mean	0.212
Maximum	10	Median	0.01
SD	1.323	CV	6.25
k hat (MLE)	0.259	k star (bias corrected MLE)	0.257
Theta hat (MLE)	0.817	Theta star (bias corrected MLE)	0.823
nu hat (MLE)	29.53	nu star (bias corrected)	29.31
Adjusted Level of Significance (β)	0.0458		
Approximate Chi Square Value (29.31, α)	17.95	Adjusted Chi Square Value (29.31, β)	17.72
95% Gamma Approximate UCL (use when n>=50)	0.346	95% Gamma Adjusted UCL (use when n<50)	0.35
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.209	SD (KM)	1.312
Variance (KM)	1.722	SE of Mean (KM)	0.176
k hat (KM)	0.0254	k star (KM)	0.0358
nu hat (KM)	2.901	nu star (KM)	4.082
theta hat (KM)	8.225	theta star (KM)	5.846
80% gamma percentile (KM)	0.00665	90% gamma percentile (KM)	0.184
95% gamma percentile (KM)	0.936	99% gamma percentile (KM)	5.132
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (4.08, α)	0.754	Adjusted Chi Square Value (4.08, β)	0.72
95% Gamma Approximate KM-UCL (use when n>=50)	1.133	95% Gamma Adjusted KM-UCL (use when n<50)	1.187
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.872	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.936	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.147	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.144	Detected Data Not Lognormal at 5% Significance Level	
Detected Data Not Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.209	Mean in Log Scale	-4.986
SD in Original Scale	1.324	SD in Log Scale	1.983
95% t UCL (assumes normality of ROS data)	0.502	95% Percentile Bootstrap UCL	0.558
95% BCA Bootstrap UCL	0.74	95% Bootstrap t UCL	4.638
95% H-UCL (Log ROS)	0.132		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-4.741	KM Geo Mean	0.00873
KM SD (logged)	1.697	95% Critical H Value (KM-Log)	3.351
KM Standard Error of Mean (logged)	0.233	95% H-UCL (KM -Log)	0.0787
KM SD (logged)	1.697	95% Critical H Value (KM-Log)	3.351
KM Standard Error of Mean (logged)	0.233		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.21	Mean in Log Scale	-4.668
SD in Original Scale	1.324	SD in Log Scale	1.693

95% t UCL (Assumes normality)	0.503	95% H-Stat UCL	0.084
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution at 5% Significance Level			
Suggested UCL to Use			
95% KM (Chebyshev) UCL	0.977		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Fluoride			
General Statistics			
Total Number of Observations	57	Number of Distinct Observations	57
		Number of Missing Observations	11
Minimum	1.51	Mean	61.16
Maximum	796	Median	22.4
SD	128.7	Std. Error of Mean	17.05
Coefficient of Variation	2.105	Skewness	4.584
Normal GOF Test			
Shapiro Wilk Test Statistic	0.443	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	0	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.322	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.117	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	89.68	95% Adjusted-CLT UCL (Chen-1995)	100.3
		95% Modified-t UCL (Johnson-1978)	91.4
Gamma GOF Test			
A-D Test Statistic	2.132	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.801	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.169	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.123	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	0.66	k star (bias corrected MLE)	0.637
Theta hat (MLE)	92.73	Theta star (bias corrected MLE)	96.08
nu hat (MLE)	75.19	nu star (bias corrected)	72.56
MLE Mean (bias corrected)	61.16	MLE Sd (bias corrected)	76.66
		Approximate Chi Square Value (0.05)	53.95
Adjusted Level of Significance	0.0458	Adjusted Chi Square Value	53.53

Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	82.26	95% Adjusted Gamma UCL (use when n<50)	82.9
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.984	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk P Value	0.828	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.0602	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.117	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	0.412	Mean of logged Data	3.189
Maximum of Logged Data	6.68	SD of logged Data	1.302
Assuming Lognormal Distribution			
95% H-UCL	92.8	90% Chebyshev (MVUE) UCL	91.61
95% Chebyshev (MVUE) UCL	108.1	97.5% Chebyshev (MVUE) UCL	131
99% Chebyshev (MVUE) UCL	176		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	89.2	95% Jackknife UCL	89.68
95% Standard Bootstrap UCL	89.3	95% Bootstrap-t UCL	144.9
95% Hall's Bootstrap UCL	221.6	95% Percentile Bootstrap UCL	91.18
95% BCA Bootstrap UCL	101.1		
90% Chebyshev(Mean, Sd) UCL	112.3	95% Chebyshev(Mean, Sd) UCL	135.5
97.5% Chebyshev(Mean, Sd) UCL	167.6	99% Chebyshev(Mean, Sd) UCL	230.8
Suggested UCL to Use			
95% H-UCL	92.8		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
ProUCL computes and outputs H-statistic based UCLs for historical reasons only.			
H-statistic often results in unstable (both high and low) values of UCL95 as shown in examples in the Technical Guide.			
It is therefore recommended to avoid the use of H-statistic based 95% UCLs.			
Use of nonparametric methods are preferred to compute UCL95 for skewed data sets which do not follow a gamma distribution.			
Indeno123CDPyrene			
General Statistics			
Total Number of Observations	57	Number of Distinct Observations	48
		Number of Missing Observations	11
Number of Detects	55	Number of Non-Detects	2
Number of Distinct Detects	46	Number of Distinct Non-Detects	2

Minimum Detect	0.045	Minimum Non-Detect	0.024
Maximum Detect	76	Maximum Non-Detect	0.027
Variance Detects	112.8	Percent Non-Detects	3.509%
Mean Detects	2.466	SD Detects	10.62
Median Detects	0.26	CV Detects	4.308
Skewness Detects	6.508	Kurtosis Detects	44.64
Mean of Logged Detects	-1.073	SD of Logged Detects	1.506
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.244	**Normal GOF Test on Detected Observations Only**	
5% Shapiro Wilk P Value	0	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.424	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.119	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	2.38	KM Standard Error of Mean	1.383
KM SD	10.35	95% KM (BCA) UCL	5.003
95% KM (t) UCL	4.694	95% KM (Percentile Bootstrap) UCL	4.953
95% KM (z) UCL	4.656	95% KM Bootstrap t UCL	17.49
90% KM Chebyshev UCL	6.53	95% KM Chebyshev UCL	8.41
97.5% KM Chebyshev UCL	11.02	99% KM Chebyshev UCL	16.15
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	8.055	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.853	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.31	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.13	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.342	k star (bias corrected MLE)	0.335
Theta hat (MLE)	7.217	Theta star (bias corrected MLE)	7.357
nu hat (MLE)	37.58	nu star (bias corrected)	36.87
Mean (detects)	2.466		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	2.38
Maximum	76	Median	0.25
SD	10.44	CV	4.388
k hat (MLE)	0.329	k star (bias corrected MLE)	0.323
Theta hat (MLE)	7.232	Theta star (bias corrected MLE)	7.357
nu hat (MLE)	37.51	nu star (bias corrected)	36.87
Adjusted Level of Significance (β)	0.0458		
Approximate Chi Square Value (36.87, α)	23.97	Adjusted Chi Square Value (36.87, β)	23.7
95% Gamma Approximate UCL (use when n>=50)	3.66	95% Gamma Adjusted UCL (use when n<50)	3.702

Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	2.38	SD (KM)	10.35
Variance (KM)	107.1	SE of Mean (KM)	1.383
k hat (KM)	0.0529	k star (KM)	0.0618
nu hat (KM)	6.029	nu star (KM)	7.045
theta hat (KM)	45	theta star (KM)	38.51
80% gamma percentile (KM)	0.623	90% gamma percentile (KM)	4.609
95% gamma percentile (KM)	13.42	99% gamma percentile (KM)	47.41
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (7.05, α)	2.195	Adjusted Chi Square Value (7.05, β)	2.126
95% Gamma Approximate KM-UCL (use when n>=50)	7.638	95% Gamma Adjusted KM-UCL (use when n<50)	7.887
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Approximate Test Statistic	0.886	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	1.8779E-5	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.144	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.119	Detected Data Not Lognormal at 5% Significance Level	
Detected Data Not Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	2.38	Mean in Log Scale	-1.197
SD in Original Scale	10.44	SD in Log Scale	1.617
95% t UCL (assumes normality of ROS data)	4.693	95% Percentile Bootstrap UCL	4.86
95% BCA Bootstrap UCL	6.836	95% Bootstrap t UCL	17.63
95% H-UCL (Log ROS)	2.252		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-1.167	KM Geo Mean	0.311
KM SD (logged)	1.545	95% Critical H Value (KM-Log)	3.147
KM Standard Error of Mean (logged)	0.207	95% H-UCL (KM -Log)	1.968
KM SD (logged)	1.545	95% Critical H Value (KM-Log)	3.147
KM Standard Error of Mean (logged)	0.207		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	2.38	Mean in Log Scale	-1.189
SD in Original Scale	10.44	SD in Log Scale	1.6
95% t UCL (Assumes normality)	4.693	95% H-Stat UCL	2.182
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution at 5% Significance Level			
Suggested UCL to Use			
95% KM (Chebyshev) UCL	8.41		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

BenzoBFluoranthene

General Statistics

Total Number of Observations	57	Number of Distinct Observations	45
		Number of Missing Observations	11
Number of Detects	55	Number of Non-Detects	2
Number of Distinct Detects	43	Number of Distinct Non-Detects	2
Minimum Detect	0.015	Minimum Non-Detect	0.0018
Maximum Detect	120	Maximum Non-Detect	0.016
Variance Detects	272.8	Percent Non-Detects	3.509%
Mean Detects	3.745	SD Detects	16.52
Median Detects	0.41	CV Detects	4.41
Skewness Detects	6.767	Kurtosis Detects	47.76
Mean of Logged Detects	-0.559	SD of Logged Detects	1.508

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.232	**Normal GOF Test on Detected Observations Only**
5% Shapiro Wilk P Value	0	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.424	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.119	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	3.614	KM Standard Error of Mean	2.151
KM SD	16.09	95% KM (BCA) UCL	7.047
95% KM (t) UCL	7.211	95% KM (Percentile Bootstrap) UCL	7.685
95% KM (z) UCL	7.151	95% KM Bootstrap t UCL	30
90% KM Chebyshev UCL	10.07	95% KM Chebyshev UCL	12.99
97.5% KM Chebyshev UCL	17.05	99% KM Chebyshev UCL	25.01

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	7.373	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.849	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.284	**Kolmogorov-Smirnov GOF**
5% K-S Critical Value	0.129	Detected Data Not Gamma Distributed at 5% Significance Level

Detected Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	0.357	k star (bias corrected MLE)	0.349
Theta hat (MLE)	10.5	Theta star (bias corrected MLE)	10.72
nu hat (MLE)	39.23	nu star (bias corrected)	38.43
Mean (detects)	3.745		

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)

For such situations, GROS method may yield incorrect values of UCLs and BTVs

This is especially true when the sample size is small.

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	3.614
Maximum	120	Median	0.4
SD	16.23	CV	4.492
k hat (MLE)	0.34	k star (bias corrected MLE)	0.334
Theta hat (MLE)	10.62	Theta star (bias corrected MLE)	10.82
nu hat (MLE)	38.78	nu star (bias corrected)	38.07
Adjusted Level of Significance (β)	0.0458		
Approximate Chi Square Value (38.07, α)	24.94	Adjusted Chi Square Value (38.07, β)	24.67
95% Gamma Approximate UCL (use when n>=50)	5.516	95% Gamma Adjusted UCL (use when n<50)	5.578
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	3.614	SD (KM)	16.09
Variance (KM)	258.9	SE of Mean (KM)	2.151
k hat (KM)	0.0504	k star (KM)	0.0595
nu hat (KM)	5.751	nu star (KM)	6.782
theta hat (KM)	71.63	theta star (KM)	60.75
80% gamma percentile (KM)	0.852	90% gamma percentile (KM)	6.74
95% gamma percentile (KM)	20.22	99% gamma percentile (KM)	73.17
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (6.78, α)	2.052	Adjusted Chi Square Value (6.78, β)	1.985
95% Gamma Approximate KM-UCL (use when n>=50)	11.95	95% Gamma Adjusted KM-UCL (use when n<50)	12.35
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Approximate Test Statistic	0.933	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	0.0054	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.128	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.119	Detected Data Not Lognormal at 5% Significance Level	
Detected Data Not Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	3.614	Mean in Log Scale	-0.682
SD in Original Scale	16.23	SD in Log Scale	1.618
95% t UCL (assumes normality of ROS data)	7.21	95% Percentile Bootstrap UCL	7.545
95% BCA Bootstrap UCL	10.56	95% Bootstrap t UCL	27.93
95% H-UCL (Log ROS)	3.773		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-0.743	KM Geo Mean	0.476
KM SD (logged)	1.764	95% Critical H Value (KM-Log)	3.442
KM Standard Error of Mean (logged)	0.237	95% H-UCL (KM -Log)	5.076
KM SD (logged)	1.764	95% Critical H Value (KM-Log)	3.442
KM Standard Error of Mean (logged)	0.237		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	3.614	Mean in Log Scale	-0.747
SD in Original Scale	16.23	SD in Log Scale	1.796
95% t UCL (Assumes normality)	7.21	95% H-Stat UCL	5.493
DL/2 is not a recommended method, provided for comparisons and historical reasons			

Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution at 5% Significance Level			
Suggested UCL to Use			
95% KM (Chebyshev) UCL	12.99		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
BenzoKFluoranthene			
General Statistics			
Total Number of Observations	57	Number of Distinct Observations	42
		Number of Missing Observations	11
Number of Detects	51	Number of Non-Detects	6
Number of Distinct Detects	39	Number of Distinct Non-Detects	3
Minimum Detect	0.032	Minimum Non-Detect	0.016
Maximum Detect	50	Maximum Non-Detect	0.018
Variance Detects	51.89	Percent Non-Detects	10.53%
Mean Detects	1.606	SD Detects	7.204
Median Detects	0.14	CV Detects	4.487
Skewness Detects	6.411	Kurtosis Detects	42.95
Mean of Logged Detects	-1.638	SD of Logged Detects	1.518
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.234	**Normal GOF Test on Detected Observations Only**	
5% Shapiro Wilk P Value	0	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.438	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.123	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	1.438	KM Standard Error of Mean	0.905
KM SD	6.764	95% KM (BCA) UCL	2.977
95% KM (t) UCL	2.952	95% KM (Percentile Bootstrap) UCL	3.175
95% KM (z) UCL	2.927	95% KM Bootstrap t UCL	14.76
90% KM Chebyshev UCL	4.153	95% KM Chebyshev UCL	5.383
97.5% KM Chebyshev UCL	7.089	99% KM Chebyshev UCL	10.44
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	8.181	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.857	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.307	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.134	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.323	k star (bias corrected MLE)	0.317
Theta hat (MLE)	4.976	Theta star (bias corrected MLE)	5.069

nu hat (MLE)	32.91	nu star (bias corrected)	32.31
Mean (detects)	1.606		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	1.438
Maximum	50	Median	0.12
SD	6.825	CV	4.747
k hat (MLE)	0.298	k star (bias corrected MLE)	0.294
Theta hat (MLE)	4.819	Theta star (bias corrected MLE)	4.884
nu hat (MLE)	34.01	nu star (bias corrected)	33.55
Adjusted Level of Significance (β)	0.0458		
Approximate Chi Square Value (33.55, α)	21.31	Adjusted Chi Square Value (33.55, β)	21.05
95% Gamma Approximate UCL (use when n>=50)	2.264	95% Gamma Adjusted UCL (use when n<50)	2.291
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	1.438	SD (KM)	6.764
Variance (KM)	45.76	SE of Mean (KM)	0.905
k hat (KM)	0.0452	k star (KM)	0.0545
nu hat (KM)	5.153	nu star (KM)	6.216
theta hat (KM)	31.81	theta star (KM)	26.38
80% gamma percentile (KM)	0.261	90% gamma percentile (KM)	2.441
95% gamma percentile (KM)	7.867	99% gamma percentile (KM)	30.21
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (6.22, α)	1.751	Adjusted Chi Square Value (6.22, β)	1.691
95% Gamma Approximate KM-UCL (use when n>=50)	5.105	95% Gamma Adjusted KM-UCL (use when n<50)	5.288
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Approximate Test Statistic	0.862	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	3.5142E-6	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.173	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.123	Detected Data Not Lognormal at 5% Significance Level	
Detected Data Not Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	1.437	Mean in Log Scale	-1.985
SD in Original Scale	6.825	SD in Log Scale	1.764
95% t UCL (assumes normality of ROS data)	2.949	95% Percentile Bootstrap UCL	3.186
95% BCA Bootstrap UCL	4.275	95% Bootstrap t UCL	14.9
95% H-UCL (Log ROS)	1.464		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-1.901	KM Geo Mean	0.149
KM SD (logged)	1.615	95% Critical H Value (KM-Log)	3.24
KM Standard Error of Mean (logged)	0.216	95% H-UCL (KM -Log)	1.108
KM SD (logged)	1.615	95% Critical H Value (KM-Log)	3.24

KM Standard Error of Mean (logged)	0.216		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	1.437	Mean in Log Scale	-1.97
SD in Original Scale	6.825	SD in Log Scale	1.735
95% t UCL (Assumes normality)	2.949	95% H-Stat UCL	1.381

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution at 5% Significance Level

Suggested UCL to Use

95% KM (Chebyshev) UCL	5.383		

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Chrysene

General Statistics

Total Number of Observations	57	Number of Distinct Observations	46
		Number of Missing Observations	11
Minimum	0.011	Mean	3.14
Maximum	110	Median	0.29
SD	14.83	Std. Error of Mean	1.964
Coefficient of Variation	4.723	Skewness	6.975

Normal GOF Test

Shapiro Wilk Test Statistic	0.218	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	0	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.431	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.117	Data Not Normal at 5% Significance Level	

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	6.425	95% Adjusted-CLT UCL (Chen-1995)	8.309
		95% Modified-t UCL (Johnson-1978)	6.727

Gamma GOF Test

A-D Test Statistic	7.857	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.856	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.285	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.127	Data Not Gamma Distributed at 5% Significance Level	

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	0.328	k star (bias corrected MLE)	0.322
Theta hat (MLE)	9.572	Theta star (bias corrected MLE)	9.737
nu hat (MLE)	37.39	nu star (bias corrected)	36.76
MLE Mean (bias corrected)	3.14	MLE Sd (bias corrected)	5.529
		Approximate Chi Square Value (0.05)	23.88
Adjusted Level of Significance	0.0458	Adjusted Chi Square Value	23.61
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	4.833	95% Adjusted Gamma UCL (use when n<50)	4.888
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.936	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk P Value	0.00692	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.121	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.117	Data Not Lognormal at 5% Significance Level	
Data Not Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	-4.51	Mean of logged Data	-0.928
Maximum of Logged Data	4.7	SD of logged Data	1.594
Assuming Lognormal Distribution			
95% H-UCL	2.793	90% Chebyshev (MVUE) UCL	2.509
95% Chebyshev (MVUE) UCL	3.037	97.5% Chebyshev (MVUE) UCL	3.77
99% Chebyshev (MVUE) UCL	5.21		
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution (0.05)			
Nonparametric Distribution Free UCLs			
95% CLT UCL	6.37	95% Jackknife UCL	6.425
95% Standard Bootstrap UCL	6.397	95% Bootstrap-t UCL	25.17
95% Hall's Bootstrap UCL	21.53	95% Percentile Bootstrap UCL	6.939
95% BCA Bootstrap UCL	9.63		
90% Chebyshev(Mean, Sd) UCL	9.032	95% Chebyshev(Mean, Sd) UCL	11.7
97.5% Chebyshev(Mean, Sd) UCL	15.41	99% Chebyshev(Mean, Sd) UCL	22.68
Suggested UCL to Use			
95% Chebyshev (Mean, Sd) UCL	11.7		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
BenzoAPyrene			
General Statistics			
Total Number of Observations	57	Number of Distinct Observations	46
		Number of Missing Observations	11
Number of Detects	55	Number of Non-Detects	2

Number of Distinct Detects	44	Number of Distinct Non-Detects	2
Minimum Detect	0.044	Minimum Non-Detect	0.011
Maximum Detect	100	Maximum Non-Detect	0.012
Variance Detects	190	Percent Non-Detects	3.509%
Mean Detects	2.85	SD Detects	13.78
Median Detects	0.26	CV Detects	4.836
Skewness Detects	6.802	Kurtosis Detects	48.03
Mean of Logged Detects	-1.077	SD of Logged Detects	1.484
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.214	**Normal GOF Test on Detected Observations Only**	
5% Shapiro Wilk P Value	0	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.438	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.119	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	2.751	KM Standard Error of Mean	1.795
KM SD	13.43	95% KM (BCA) UCL	6.45
95% KM (t) UCL	5.753	95% KM (Percentile Bootstrap) UCL	6.231
95% KM (z) UCL	5.703	95% KM Bootstrap t UCL	33.28
90% KM Chebyshev UCL	8.135	95% KM Chebyshev UCL	10.57
97.5% KM Chebyshev UCL	13.96	99% KM Chebyshev UCL	20.61
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	8.944	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.858	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.318	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.13	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.321	k star (bias corrected MLE)	0.316
Theta hat (MLE)	8.88	Theta star (bias corrected MLE)	9.031
nu hat (MLE)	35.31	nu star (bias corrected)	34.72
Mean (detects)	2.85		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	2.751
Maximum	100	Median	0.25
SD	13.55	CV	4.925
k hat (MLE)	0.31	k star (bias corrected MLE)	0.305
Theta hat (MLE)	8.874	Theta star (bias corrected MLE)	9.008
nu hat (MLE)	35.34	nu star (bias corrected)	34.81
Adjusted Level of Significance (β)	0.0458		
Approximate Chi Square Value (34.81, α)	22.31	Adjusted Chi Square Value (34.81, β)	22.05

95% Gamma Approximate UCL (use when n>=50)	4.291	95% Gamma Adjusted UCL (use when n<50)	4.342
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	2.751	SD (KM)	13.43
Variance (KM)	180.3	SE of Mean (KM)	1.795
k hat (KM)	0.042	k star (KM)	0.0515
nu hat (KM)	4.785	nu star (KM)	5.866
theta hat (KM)	65.54	theta star (KM)	53.46
80% gamma percentile (KM)	0.412	90% gamma percentile (KM)	4.356
95% gamma percentile (KM)	14.78	99% gamma percentile (KM)	59.15
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (5.87, α)	1.572	Adjusted Chi Square Value (5.87, β)	1.515
95% Gamma Approximate KM-UCL (use when n>=50)	10.27	95% Gamma Adjusted KM-UCL (use when n<50)	10.65
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Approximate Test Statistic	0.885	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	1.7803E-5	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.141	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.119	Detected Data Not Lognormal at 5% Significance Level	
Detected Data Not Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	2.751	Mean in Log Scale	-1.198
SD in Original Scale	13.55	SD in Log Scale	1.592
95% t UCL (assumes normality of ROS data)	5.752	95% Percentile Bootstrap UCL	6.178
95% BCA Bootstrap UCL	10	95% Bootstrap t UCL	35.38
95% H-UCL (Log ROS)	2.121		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-1.198	KM Geo Mean	0.302
KM SD (logged)	1.576	95% Critical H Value (KM-Log)	3.188
KM Standard Error of Mean (logged)	0.211	95% H-UCL (KM -Log)	2.047
KM SD (logged)	1.576	95% Critical H Value (KM-Log)	3.188
KM Standard Error of Mean (logged)	0.211		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	2.751	Mean in Log Scale	-1.22
SD in Original Scale	13.55	SD in Log Scale	1.642
95% t UCL (Assumes normality)	5.751	95% H-Stat UCL	2.334
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution at 5% Significance Level			
Suggested UCL to Use			
95% KM (Chebyshev) UCL	10.57		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

DibenzAHAnthracene

General Statistics

Total Number of Observations	57	Number of Distinct Observations	47
		Number of Missing Observations	11
Number of Detects	52	Number of Non-Detects	5
Number of Distinct Detects	44	Number of Distinct Non-Detects	4
Minimum Detect	0.012	Minimum Non-Detect	0.0016
Maximum Detect	21	Maximum Non-Detect	0.021
Variance Detects	8.847	Percent Non-Detects	8.772%
Mean Detects	0.683	SD Detects	2.974
Median Detects	0.0785	CV Detects	4.358
Skewness Detects	6.565	Kurtosis Detects	44.96
Mean of Logged Detects	-2.331	SD of Logged Detects	1.507

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.238	**Normal GOF Test on Detected Observations Only**
5% Shapiro Wilk P Value	0	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.411	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.122	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	0.623	KM Standard Error of Mean	0.377
KM SD	2.82	95% KM (BCA) UCL	1.343
95% KM (t) UCL	1.254	95% KM (Percentile Bootstrap) UCL	1.268
95% KM (z) UCL	1.244	95% KM Bootstrap t UCL	5.435
90% KM Chebyshev UCL	1.755	95% KM Chebyshev UCL	2.267
97.5% KM Chebyshev UCL	2.979	99% KM Chebyshev UCL	4.376

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	7.272	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.852	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.299	**Kolmogorov-Smirnov GOF**
5% K-S Critical Value	0.133	Detected Data Not Gamma Distributed at 5% Significance Level

Detected Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	0.346	k star (bias corrected MLE)	0.339
Theta hat (MLE)	1.975	Theta star (bias corrected MLE)	2.016
nu hat (MLE)	35.95	nu star (bias corrected)	35.21
Mean (detects)	0.683		

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)

For such situations, GROS method may yield incorrect values of UCLs and BTVs

This is especially true when the sample size is small.

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	0.624
Maximum	21	Median	0.065
SD	2.845	CV	4.563
k hat (MLE)	0.33	k star (bias corrected MLE)	0.324
Theta hat (MLE)	1.89	Theta star (bias corrected MLE)	1.923
nu hat (MLE)	37.6	nu star (bias corrected)	36.96
Adjusted Level of Significance (β)	0.0458		
Approximate Chi Square Value (36.96, α)	24.04	Adjusted Chi Square Value (36.96, β)	23.77
95% Gamma Approximate UCL (use when n>=50)	0.959	95% Gamma Adjusted UCL (use when n<50)	0.969
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.623	SD (KM)	2.82
Variance (KM)	7.952	SE of Mean (KM)	0.377
k hat (KM)	0.0488	k star (KM)	0.058
nu hat (KM)	5.568	nu star (KM)	6.608
theta hat (KM)	12.76	theta star (KM)	10.75
80% gamma percentile (KM)	0.136	90% gamma percentile (KM)	1.132
95% gamma percentile (KM)	3.465	99% gamma percentile (KM)	12.76
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (6.61, α)	1.958	Adjusted Chi Square Value (6.61, β)	1.894
95% Gamma Approximate KM-UCL (use when n>=50)	2.103	95% Gamma Adjusted KM-UCL (use when n<50)	2.175
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Approximate Test Statistic	0.899	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	1.5543E-4	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.137	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.122	Detected Data Not Lognormal at 5% Significance Level	
Detected Data Not Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.623	Mean in Log Scale	-2.602
SD in Original Scale	2.845	SD in Log Scale	1.692
95% t UCL (assumes normality of ROS data)	1.253	95% Percentile Bootstrap UCL	1.324
95% BCA Bootstrap UCL	1.864	95% Bootstrap t UCL	5.491
95% H-UCL (Log ROS)	0.661		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-2.615	KM Geo Mean	0.0732
KM SD (logged)	1.723	95% Critical H Value (KM-Log)	3.386
KM Standard Error of Mean (logged)	0.234	95% H-UCL (KM -Log)	0.704
KM SD (logged)	1.723	95% Critical H Value (KM-Log)	3.386
KM Standard Error of Mean (logged)	0.234		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.623	Mean in Log Scale	-2.62
SD in Original Scale	2.845	SD in Log Scale	1.756
95% t UCL (Assumes normality)	1.253	95% H-Stat UCL	0.761
DL/2 is not a recommended method, provided for comparisons and historical reasons			

Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution at 5% Significance Level			
Suggested UCL to Use			
95% KM (Chebyshev) UCL	2.267		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
BenzoAAnthracene			
General Statistics			
Total Number of Observations	57	Number of Distinct Observations	43
		Number of Missing Observations	11
Number of Detects	55	Number of Non-Detects	2
Number of Distinct Detects	41	Number of Distinct Non-Detects	2
Minimum Detect	0.031	Minimum Non-Detect	0.03
Maximum Detect	100	Maximum Non-Detect	0.034
Variance Detects	186	Percent Non-Detects	3.509%
Mean Detects	2.669	SD Detects	13.64
Median Detects	0.2	CV Detects	5.109
Skewness Detects	7.016	Kurtosis Detects	50.58
Mean of Logged Detects	-1.286	SD of Logged Detects	1.526
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.202	**Normal GOF Test on Detected Observations Only**	
5% Shapiro Wilk P Value	0	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.442	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.119	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	2.577	KM Standard Error of Mean	1.775
KM SD	13.28	95% KM (BCA) UCL	5.982
95% KM (t) UCL	5.546	95% KM (Percentile Bootstrap) UCL	5.884
95% KM (z) UCL	5.497	95% KM Bootstrap t UCL	32.27
90% KM Chebyshev UCL	7.903	95% KM Chebyshev UCL	10.32
97.5% KM Chebyshev UCL	13.66	99% KM Chebyshev UCL	20.24
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	9.145	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.862	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.329	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.13	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.303	k star (bias corrected MLE)	0.299

Theta hat (MLE)	8.796	Theta star (bias corrected MLE)	8.926
nu hat (MLE)	33.38	nu star (bias corrected)	32.89
Mean (detects)	2.669		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	2.576
Maximum	100	Median	0.19
SD	13.4	CV	5.202
k hat (MLE)	0.294	k star (bias corrected MLE)	0.291
Theta hat (MLE)	8.748	Theta star (bias corrected MLE)	8.862
nu hat (MLE)	33.57	nu star (bias corrected)	33.14
Adjusted Level of Significance (β)	0.0458		
Approximate Chi Square Value (33.14, α)	20.97	Adjusted Chi Square Value (33.14, β)	20.72
95% Gamma Approximate UCL (use when n>=50)	4.069	95% Gamma Adjusted UCL (use when n<50)	4.119
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	2.577	SD (KM)	13.28
Variance (KM)	176.4	SE of Mean (KM)	1.775
k hat (KM)	0.0376	k star (KM)	0.0473
nu hat (KM)	4.29	nu star (KM)	5.398
theta hat (KM)	68.47	theta star (KM)	54.42
80% gamma percentile (KM)	0.286	90% gamma percentile (KM)	3.652
95% gamma percentile (KM)	13.42	99% gamma percentile (KM)	57.25
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (5.40, α)	1.34	Adjusted Chi Square Value (5.40, β)	1.289
95% Gamma Approximate KM-UCL (use when n>=50)	10.38	95% Gamma Adjusted KM-UCL (use when n<50)	10.79
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Approximate Test Statistic	0.886	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	1.8144E-5	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.137	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.119	Detected Data Not Lognormal at 5% Significance Level	
Detected Data Not Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	2.576	Mean in Log Scale	-1.408
SD in Original Scale	13.4	SD in Log Scale	1.633
95% t UCL (assumes normality of ROS data)	5.544	95% Percentile Bootstrap UCL	6.072
95% BCA Bootstrap UCL	7.947	95% Bootstrap t UCL	37.41
95% H-UCL (Log ROS)	1.889		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-1.364	KM Geo Mean	0.256
KM SD (logged)	1.54	95% Critical H Value (KM-Log)	3.14
KM Standard Error of Mean (logged)	0.206	95% H-UCL (KM -Log)	1.597

KM SD (logged)	1.54	95% Critical H Value (KM-Log)	3.14
KM Standard Error of Mean (logged)	0.206		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	2.576	Mean in Log Scale	-1.386
SD in Original Scale	13.4	SD in Log Scale	1.589
95% t UCL (Assumes normality)	5.545	95% H-Stat UCL	1.746

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution at 5% Significance Level

Suggested UCL to Use

95% KM (Chebyshev) UCL	10.32		

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Cyanide

General Statistics

Total Number of Observations	57	Number of Distinct Observations	46
		Number of Missing Observations	11
Number of Detects	43	Number of Non-Detects	14
Number of Distinct Detects	37	Number of Distinct Non-Detects	11
Minimum Detect	0.016	Minimum Non-Detect	0.016
Maximum Detect	9.9	Maximum Non-Detect	0.084
Variance Detects	2.302	Percent Non-Detects	24.56%
Mean Detects	0.494	SD Detects	1.517
Median Detects	0.12	CV Detects	3.072
Skewness Detects	5.968	Kurtosis Detects	37.39
Mean of Logged Detects	-1.81	SD of Logged Detects	1.235

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.299	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.943	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.385	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.134	Detected Data Not Normal at 5% Significance Level	

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	0.38	KM Standard Error of Mean	0.177
KM SD	1.318	95% KM (BCA) UCL	0.721
95% KM (t) UCL	0.676	95% KM (Percentile Bootstrap) UCL	0.71
95% KM (z) UCL	0.671	95% KM Bootstrap t UCL	1.592
90% KM Chebyshev UCL	0.91	95% KM Chebyshev UCL	1.15
97.5% KM Chebyshev UCL	1.483	99% KM Chebyshev UCL	2.137

Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	3.679	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.807	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.226	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.142	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.564	k star (bias corrected MLE)	0.541
Theta hat (MLE)	0.875	Theta star (bias corrected MLE)	0.914
nu hat (MLE)	48.54	nu star (bias corrected)	46.49
Mean (detects)	0.494		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	0.375
Maximum	9.9	Median	0.095
SD	1.331	CV	3.548
k hat (MLE)	0.429	k star (bias corrected MLE)	0.418
Theta hat (MLE)	0.874	Theta star (bias corrected MLE)	0.897
nu hat (MLE)	48.93	nu star (bias corrected)	47.69
Adjusted Level of Significance (β)	0.0458		
Approximate Chi Square Value (47.69, α)	32.84	Adjusted Chi Square Value (47.69, β)	32.52
95% Gamma Approximate UCL (use when n>=50)	0.545	95% Gamma Adjusted UCL (use when n<50)	0.55
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.38	SD (KM)	1.318
Variance (KM)	1.736	SE of Mean (KM)	0.177
k hat (KM)	0.0833	k star (KM)	0.0906
nu hat (KM)	9.493	nu star (KM)	10.33
theta hat (KM)	4.566	theta star (KM)	4.197
80% gamma percentile (KM)	0.226	90% gamma percentile (KM)	0.967
95% gamma percentile (KM)	2.215	99% gamma percentile (KM)	6.342
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (10.33, α)	4.147	Adjusted Chi Square Value (10.33, β)	4.045
95% Gamma Approximate KM-UCL (use when n>=50)	0.947	95% Gamma Adjusted KM-UCL (use when n<50)	0.971
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.956	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.943	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.111	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.134	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.378	Mean in Log Scale	-2.326

SD in Original Scale	1.33	SD in Log Scale	1.43
95% t UCL (assumes normality of ROS data)	0.673	95% Percentile Bootstrap UCL	0.711
95% BCA Bootstrap UCL	0.918	95% Bootstrap t UCL	1.667
95% H-UCL (Log ROS)	0.482		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-2.255	KM Geo Mean	0.105
KM SD (logged)	1.341	95% Critical H Value (KM-Log)	2.893
KM Standard Error of Mean (logged)	0.186	95% H-UCL (KM -Log)	0.433
KM SD (logged)	1.341	95% Critical H Value (KM-Log)	2.893
KM Standard Error of Mean (logged)	0.186		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.38	Mean in Log Scale	-2.253
SD in Original Scale	1.329	SD in Log Scale	1.347
95% t UCL (Assumes normality)	0.674	95% H-Stat UCL	0.439
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Lognormal Distributed at 5% Significance Level			
Suggested UCL to Use			
KM H-UCL	0.433		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Aluminum			
General Statistics			
Total Number of Observations	57	Number of Distinct Observations	51
		Number of Missing Observations	11
Minimum	4710	Mean	14658
Maximum	30800	Median	14100
SD	5191	Std. Error of Mean	687.5
Coefficient of Variation	0.354	Skewness	0.648
Normal GOF Test			
Shapiro Wilk Test Statistic	0.967	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	0.234	Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.0927	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.117	Data appear Normal at 5% Significance Level	
Data appear Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	15808	95% Adjusted-CLT UCL (Chen-1995)	15852

		95% Modified-t UCL (Johnson-1978)	15818
Gamma GOF Test			
A-D Test Statistic	0.218	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.752	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.0689	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.118	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	8.115	k star (bias corrected MLE)	7.7
Theta hat (MLE)	1806	Theta star (bias corrected MLE)	1904
nu hat (MLE)	925.1	nu star (bias corrected)	877.8
MLE Mean (bias corrected)	14658	MLE Sd (bias corrected)	5282
		Approximate Chi Square Value (0.05)	810
Adjusted Level of Significance	0.0458	Adjusted Chi Square Value	808.3
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	15884	95% Adjusted Gamma UCL (use when n<50)	15917
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.987	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk P Value	0.914	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.0612	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.117	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	8.457	Mean of logged Data	9.53
Maximum of Logged Data	10.34	SD of logged Data	0.364
Assuming Lognormal Distribution			
95% H-UCL	16025	90% Chebyshev (MVUE) UCL	16879
95% Chebyshev (MVUE) UCL	17870	97.5% Chebyshev (MVUE) UCL	19245
99% Chebyshev (MVUE) UCL	21947		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	15789	95% Jackknife UCL	15808
95% Standard Bootstrap UCL	15793	95% Bootstrap-t UCL	15950
95% Hall's Bootstrap UCL	15932	95% Percentile Bootstrap UCL	15799
95% BCA Bootstrap UCL	15816		
90% Chebyshev(Mean, Sd) UCL	16721	95% Chebyshev(Mean, Sd) UCL	17655
97.5% Chebyshev(Mean, Sd) UCL	18952	99% Chebyshev(Mean, Sd) UCL	21499
Suggested UCL to Use			
95% Student's-t UCL	15808		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Iron

General Statistics

Total Number of Observations	57	Number of Distinct Observations	47
		Number of Missing Observations	11
Minimum	2940	Mean	15478
Maximum	37100	Median	14500
SD	4411	Std. Error of Mean	584.3
Coefficient of Variation	0.285	Skewness	1.855

Normal GOF Test

Shapiro Wilk Test Statistic	0.85	**Shapiro Wilk GOF Test**
5% Shapiro Wilk P Value	1.4599E-7	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.128	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.117	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	16455	95% Adjusted-CLT UCL (Chen-1995)	16592
		95% Modified-t UCL (Johnson-1978)	16479

Gamma GOF Test

A-D Test Statistic	1.692	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.75	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.135	**Kolmogorov-Smirnov Gamma GOF Test**
5% K-S Critical Value	0.118	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	12.37	k star (bias corrected MLE)	11.73
Theta hat (MLE)	1252	Theta star (bias corrected MLE)	1320
nu hat (MLE)	1410	nu star (bias corrected)	1337
MLE Mean (bias corrected)	15478	MLE Sd (bias corrected)	4520
		Approximate Chi Square Value (0.05)	1253
Adjusted Level of Significance	0.0458	Adjusted Chi Square Value	1251

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	16514	95% Adjusted Gamma UCL (use when n<50)	16542

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.812	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk P Value	1.6342E-9	Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.157	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.117	Data Not Lognormal at 5% Significance Level

Data Not Lognormal at 5% Significance Level

Lognormal Statistics			
Minimum of Logged Data	7.986	Mean of logged Data	9.606
Maximum of Logged Data	10.52	SD of logged Data	0.31
Assuming Lognormal Distribution			
95% H-UCL	16721	90% Chebyshev (MVUE) UCL	17526
95% Chebyshev (MVUE) UCL	18411	97.5% Chebyshev (MVUE) UCL	19640
99% Chebyshev (MVUE) UCL	22053		
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution (0.05)			
Nonparametric Distribution Free UCLs			
95% CLT UCL	16439	95% Jackknife UCL	16455
95% Standard Bootstrap UCL	16418	95% Bootstrap-t UCL	16554
95% Hall's Bootstrap UCL	17067	95% Percentile Bootstrap UCL	16418
95% BCA Bootstrap UCL	16636		
90% Chebyshev(Mean, Sd) UCL	17231	95% Chebyshev(Mean, Sd) UCL	18025
97.5% Chebyshev(Mean, Sd) UCL	19127	99% Chebyshev(Mean, Sd) UCL	21292
Suggested UCL to Use			
95% Student's-t UCL	16455	or 95% Modified-t UCL	16479

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Manganese

General Statistics			
Total Number of Observations	57	Number of Distinct Observations	51
		Number of Missing Observations	11
Minimum	156	Mean	494.2
Maximum	1570	Median	444
SD	231.5	Std. Error of Mean	30.67
Coefficient of Variation	0.468	Skewness	2.565
Normal GOF Test			
Shapiro Wilk Test Statistic	0.759	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	4.783E-12	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.215	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.117	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	545.5	95% Adjusted-CLT UCL (Chen-1995)	555.8
		95% Modified-t UCL (Johnson-1978)	547.2

Gamma GOF Test			
A-D Test Statistic	2.031	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.753	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.152	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.118	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	6.613	k star (bias corrected MLE)	6.277
Theta hat (MLE)	74.73	Theta star (bias corrected MLE)	78.74
nu hat (MLE)	753.9	nu star (bias corrected)	715.5
MLE Mean (bias corrected)	494.2	MLE Sd (bias corrected)	197.3
		Approximate Chi Square Value (0.05)	654.5
Adjusted Level of Significance	0.0458	Adjusted Chi Square Value	653
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	540.3	95% Adjusted Gamma UCL (use when n<50)	541.6
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.938	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk P Value	0.00857	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.122	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.117	Data Not Lognormal at 5% Significance Level	
Data Not Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	5.05	Mean of logged Data	6.125
Maximum of Logged Data	7.359	SD of logged Data	0.376
Assuming Lognormal Distribution			
95% H-UCL	536.8	90% Chebyshev (MVUE) UCL	565.8
95% Chebyshev (MVUE) UCL	599.9	97.5% Chebyshev (MVUE) UCL	647.4
99% Chebyshev (MVUE) UCL	740.6		
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution (0.05)			
Nonparametric Distribution Free UCLs			
95% CLT UCL	544.7	95% Jackknife UCL	545.5
95% Standard Bootstrap UCL	544.7	95% Bootstrap-t UCL	563.7
95% Hall's Bootstrap UCL	577.4	95% Percentile Bootstrap UCL	548.4
95% BCA Bootstrap UCL	554.2		
90% Chebyshev(Mean, Sd) UCL	586.2	95% Chebyshev(Mean, Sd) UCL	627.9
97.5% Chebyshev(Mean, Sd) UCL	685.7	99% Chebyshev(Mean, Sd) UCL	799.3
Suggested UCL to Use			
95% Student's-t UCL	545.5	or 95% Modified-t UCL	547.2
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Mercury

General Statistics

Total Number of Observations	57	Number of Distinct Observations	23
		Number of Missing Observations	11
Number of Detects	47	Number of Non-Detects	10
Number of Distinct Detects	21	Number of Distinct Non-Detects	6
Minimum Detect	0.011	Minimum Non-Detect	0.01
Maximum Detect	0.045	Maximum Non-Detect	0.015
Variance Detects	4.3586E-5	Percent Non-Detects	17.54%
Mean Detects	0.022	SD Detects	0.0066
Median Detects	0.021	CV Detects	0.3
Skewness Detects	1.101	Kurtosis Detects	2.223
Mean of Logged Detects	-3.859	SD of Logged Detects	0.29

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.935	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.946	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.132	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.128	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	0.02	KM Standard Error of Mean	9.8994E-4
KM SD	0.00738	95% KM (BCA) UCL	0.0215
95% KM (t) UCL	0.0216	95% KM (Percentile Bootstrap) UCL	0.0216
95% KM (z) UCL	0.0216	95% KM Bootstrap t UCL	0.0218
90% KM Chebyshev UCL	0.0229	95% KM Chebyshev UCL	0.0243
97.5% KM Chebyshev UCL	0.0261	99% KM Chebyshev UCL	0.0298

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.367	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.749	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.0981	**Kolmogorov-Smirnov GOF**
5% K-S Critical Value	0.129	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	12.22	k star (bias corrected MLE)	11.45
Theta hat (MLE)	0.0018	Theta star (bias corrected MLE)	0.00192
nu hat (MLE)	1149	nu star (bias corrected)	1077
Mean (detects)	0.022		

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)

For such situations, GROS method may yield incorrect values of UCLs and BTVs

This is especially true when the sample size is small.

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	0.02
Maximum	0.045	Median	0.02
SD	0.00743	CV	0.372
k hat (MLE)	7.507	k star (bias corrected MLE)	7.123
Theta hat (MLE)	0.00266	Theta star (bias corrected MLE)	0.0028
nu hat (MLE)	855.8	nu star (bias corrected)	812.1
Adjusted Level of Significance (β)	0.0458		
Approximate Chi Square Value (812.08, α)	746.9	Adjusted Chi Square Value (812.08, β)	745.3
95% Gamma Approximate UCL (use when n>=50)	0.0217	95% Gamma Adjusted UCL (use when n<50)	0.0218
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.02	SD (KM)	0.00738
Variance (KM)	5.4495E-5	SE of Mean (KM)	9.8994E-4
k hat (KM)	7.311	k star (KM)	6.938
nu hat (KM)	833.5	nu star (KM)	790.9
theta hat (KM)	0.00273	theta star (KM)	0.00288
80% gamma percentile (KM)	0.0259	90% gamma percentile (KM)	0.0301
95% gamma percentile (KM)	0.0338	99% gamma percentile (KM)	0.0417
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (790.95, α)	726.7	Adjusted Chi Square Value (790.95, β)	725.1
95% Gamma Approximate KM-UCL (use when n>=50)	0.0217	95% Gamma Adjusted KM-UCL (use when n<50)	0.0218
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.983	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.946	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.0871	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.128	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.0201	Mean in Log Scale	-3.967
SD in Original Scale	0.00724	SD in Log Scale	0.356
95% t UCL (assumes normality of ROS data)	0.0217	95% Percentile Bootstrap UCL	0.0218
95% BCA Bootstrap UCL	0.0217	95% Bootstrap t UCL	0.0219
95% H-UCL (Log ROS)	0.0219		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-3.983	KM Geo Mean	0.0186
KM SD (logged)	0.375	95% Critical H Value (KM-Log)	1.774
KM Standard Error of Mean (logged)	0.0505	95% H-UCL (KM -Log)	0.0219
KM SD (logged)	0.375	95% Critical H Value (KM-Log)	1.774
KM Standard Error of Mean (logged)	0.0505		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.0192	Mean in Log Scale	-4.076
SD in Original Scale	0.00852	SD in Log Scale	0.545
95% t UCL (Assumes normality)	0.0211	95% H-Stat UCL	0.0227
DL/2 is not a recommended method, provided for comparisons and historical reasons			

Nonparametric Distribution Free UCL Statistics

Detected Data appear Gamma Distributed at 5% Significance Level

Suggested UCL to Use

95% KM Approximate Gamma UCL	0.0217	95% GROS Approximate Gamma UCL	0.0217

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Nickel

General Statistics

Total Number of Observations	57	Number of Distinct Observations	51
		Number of Missing Observations	11
Minimum	8.6	Mean	20.57
Maximum	89	Median	15.9
SD	14.76	Std. Error of Mean	1.955
Coefficient of Variation	0.717	Skewness	3.206

Normal GOF Test

Shapiro Wilk Test Statistic	0.64	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	0	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.241	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.117	Data Not Normal at 5% Significance Level	

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	23.84	95% Adjusted-CLT UCL (Chen-1995)	24.67
		95% Modified-t UCL (Johnson-1978)	23.98

Gamma GOF Test

A-D Test Statistic	2.732	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.755	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.173	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.118	Data Not Gamma Distributed at 5% Significance Level	

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	3.624	k star (bias corrected MLE)	3.445
Theta hat (MLE)	5.676	Theta star (bias corrected MLE)	5.971
nu hat (MLE)	413.1	nu star (bias corrected)	392.7
MLE Mean (bias corrected)	20.57	MLE Sd (bias corrected)	11.08
		Approximate Chi Square Value (0.05)	347.8
Adjusted Level of Significance	0.0458	Adjusted Chi Square Value	346.7

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	23.23	95% Adjusted Gamma UCL (use when n<50)	23.3
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.903	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk P Value	9.8851E-5	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.128	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.117	Data Not Lognormal at 5% Significance Level	
Data Not Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	2.152	Mean of logged Data	2.879
Maximum of Logged Data	4.489	SD of logged Data	0.486
Assuming Lognormal Distribution			
95% H-UCL	22.64	90% Chebyshev (MVUE) UCL	24.05
95% Chebyshev (MVUE) UCL	25.88	97.5% Chebyshev (MVUE) UCL	28.43
99% Chebyshev (MVUE) UCL	33.43		
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution (0.05)			
Nonparametric Distribution Free UCLs			
95% CLT UCL	23.78	95% Jackknife UCL	23.84
95% Standard Bootstrap UCL	23.71	95% Bootstrap-t UCL	25.58
95% Hall's Bootstrap UCL	28.65	95% Percentile Bootstrap UCL	23.91
95% BCA Bootstrap UCL	24.58		
90% Chebyshev(Mean, Sd) UCL	26.43	95% Chebyshev(Mean, Sd) UCL	29.09
97.5% Chebyshev(Mean, Sd) UCL	32.77	99% Chebyshev(Mean, Sd) UCL	40.02
Suggested UCL to Use			
95% Student's-t UCL	23.84	or 95% Modified-t UCL	23.98
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Thallium			
General Statistics			
Total Number of Observations	57	Number of Distinct Observations	11
		Number of Missing Observations	11
Number of Detects	7	Number of Non-Detects	50
Number of Distinct Detects	3	Number of Distinct Non-Detects	11
Minimum Detect	0.11	Minimum Non-Detect	0.1
Maximum Detect	0.14	Maximum Non-Detect	0.21
Variance Detects	1.2857E-4	Percent Non-Detects	87.72%
Mean Detects	0.134	SD Detects	0.0113
Median Detects	0.14	CV Detects	0.0844
Skewness Detects	-2.156	Kurtosis Detects	4.58
Mean of Logged Detects	-2.011	SD of Logged Detects	0.0908

Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.612	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.803	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.407	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.304	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.107	KM Standard Error of Mean	0.00258
KM SD	0.0138	95% KM (BCA) UCL	N/A
95% KM (t) UCL	0.111	95% KM (Percentile Bootstrap) UCL	N/A
95% KM (z) UCL	0.111	95% KM Bootstrap t UCL	N/A
90% KM Chebyshev UCL	0.115	95% KM Chebyshev UCL	0.118
97.5% KM Chebyshev UCL	0.123	99% KM Chebyshev UCL	0.133
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	1.42	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.708	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.419	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.311	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	148.7	k star (bias corrected MLE)	85.08
Theta hat (MLE)	9.0297E-4	Theta star (bias corrected MLE)	0.00158
nu hat (MLE)	2082	nu star (bias corrected)	1191
Mean (detects)	0.134		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.0784	Mean	0.107
Maximum	0.14	Median	0.106
SD	0.0157	CV	0.147
k hat (MLE)	48.15	k star (bias corrected MLE)	45.63
Theta hat (MLE)	0.00222	Theta star (bias corrected MLE)	0.00234
nu hat (MLE)	5489	nu star (bias corrected)	5202
Adjusted Level of Significance (β)	0.0458		
Approximate Chi Square Value (N/A, α)	5035	Adjusted Chi Square Value (N/A, β)	5031
95% Gamma Approximate UCL (use when n>=50)	0.11	95% Gamma Adjusted UCL (use when n<50)	0.11
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.107	SD (KM)	0.0138
Variance (KM)	1.8918E-4	SE of Mean (KM)	0.00258
k hat (KM)	60.55	k star (KM)	57.37
nu hat (KM)	6903	nu star (KM)	6541
theta hat (KM)	0.00177	theta star (KM)	0.00187

80% gamma percentile (KM)	0.119	90% gamma percentile (KM)	0.125
95% gamma percentile (KM)	0.131	99% gamma percentile (KM)	0.143
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (N/A, α)	6354	Adjusted Chi Square Value (N/A, β)	6349
95% Gamma Approximate KM-UCL (use when n>=50)	0.11	95% Gamma Adjusted KM-UCL (use when n<50)	0.11
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.604	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.803	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.404	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.304	Detected Data Not Lognormal at 5% Significance Level	
Detected Data Not Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.107	Mean in Log Scale	-2.243
SD in Original Scale	0.0148	SD in Log Scale	0.134
95% t UCL (assumes normality of ROS data)	0.11	95% Percentile Bootstrap UCL	0.11
95% BCA Bootstrap UCL	0.11	95% Bootstrap t UCL	0.111
95% H-UCL (Log ROS)	0.11		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-2.242	KM Geo Mean	0.106
KM SD (logged)	0.117	95% Critical H Value (KM-Log)	1.697
KM Standard Error of Mean (logged)	0.0223	95% H-UCL (KM -Log)	0.11
KM SD (logged)	0.117	95% Critical H Value (KM-Log)	1.697
KM Standard Error of Mean (logged)	0.0223		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.0778	Mean in Log Scale	-2.592
SD in Original Scale	0.0242	SD in Log Scale	0.267
95% t UCL (Assumes normality)	0.0832	95% H-Stat UCL	0.0825
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution at 5% Significance Level			
Suggested UCL to Use			
95% KM (t) UCL	0.111	KM H-UCL	0.11
95% KM (BCA) UCL	N/A		
Warning: One or more Recommended UCL(s) not available!			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Antimony			
General Statistics			

Total Number of Observations	57	Number of Distinct Observations	27
		Number of Missing Observations	11
Number of Detects	2	Number of Non-Detects	55
Number of Distinct Detects	2	Number of Distinct Non-Detects	26
Minimum Detect	0.37	Minimum Non-Detect	0.24
Maximum Detect	0.57	Maximum Non-Detect	0.5
Variance Detects	0.02	Percent Non-Detects	96.49%
Mean Detects	0.47	SD Detects	0.141
Median Detects	0.47	CV Detects	0.301
Skewness Detects	N/A	Kurtosis Detects	N/A
Mean of Logged Detects	-0.778	SD of Logged Detects	0.306

Warning: Data set has only 2 Detected Values.

This is not enough to compute meaningful or reliable statistics and estimates.

Normal GOF Test on Detects Only

Not Enough Data to Perform GOF Test

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	0.249	KM Standard Error of Mean	0.00924
KM SD	0.0475	95% KM (BCA) UCL	N/A
95% KM (t) UCL	0.265	95% KM (Percentile Bootstrap) UCL	N/A
95% KM (z) UCL	0.264	95% KM Bootstrap t UCL	N/A
90% KM Chebyshev UCL	0.277	95% KM Chebyshev UCL	0.289
97.5% KM Chebyshev UCL	0.307	99% KM Chebyshev UCL	0.341

Gamma GOF Tests on Detected Observations Only

Not Enough Data to Perform GOF Test

Gamma Statistics on Detected Data Only

k hat (MLE)	21.75	k star (bias corrected MLE)	N/A
Theta hat (MLE)	0.0216	Theta star (bias corrected MLE)	N/A
nu hat (MLE)	87.01	nu star (bias corrected)	N/A
Mean (detects)	0.47		

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	0.249	SD (KM)	0.0475
Variance (KM)	0.00225	SE of Mean (KM)	0.00924
k hat (KM)	27.52	k star (KM)	26.08
nu hat (KM)	3137	nu star (KM)	2974
theta hat (KM)	0.00905	theta star (KM)	0.00955
80% gamma percentile (KM)	0.289	90% gamma percentile (KM)	0.313
95% gamma percentile (KM)	0.334	99% gamma percentile (KM)	0.376

Gamma Kaplan-Meier (KM) Statistics

		Adjusted Level of Significance (β)	0.0458
Approximate Chi Square Value (N/A, α)	2848	Adjusted Chi Square Value (N/A, β)	2845
95% Gamma Approximate KM-UCL (use when n>=50)	0.26	95% Gamma Adjusted KM-UCL (use when n<50)	0.26

Lognormal GOF Test on Detected Observations Only

Not Enough Data to Perform GOF Test			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.0889	Mean in Log Scale	-2.607
SD in Original Scale	0.0816	SD in Log Scale	0.542
95% t UCL (assumes normality of ROS data)	0.107	95% Percentile Bootstrap UCL	0.108
95% BCA Bootstrap UCL	0.116	95% Bootstrap t UCL	0.13
95% H-UCL (Log ROS)	0.0982		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-1.401	KM Geo Mean	0.246
KM SD (logged)	0.131	95% Critical H Value (KM-Log)	1.705
KM Standard Error of Mean (logged)	0.0259	95% H-UCL (KM -Log)	0.256
KM SD (logged)	0.131	95% Critical H Value (KM-Log)	1.705
KM Standard Error of Mean (logged)	0.0259		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.183	Mean in Log Scale	-1.739
SD in Original Scale	0.067	SD in Log Scale	0.267
95% t UCL (Assumes normality)	0.198	95% H-Stat UCL	0.194
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution at 5% Significance Level			
Suggested UCL to Use			
95% KM (t) UCL	0.265	KM H-UCL	0.256
95% KM (BCA) UCL	N/A		
Warning: One or more Recommended UCL(s) not available!			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Arsenic			
General Statistics			
Total Number of Observations	57	Number of Distinct Observations	38
		Number of Missing Observations	11
Minimum	3.6	Mean	6.167
Maximum	11.8	Median	5.7
SD	1.902	Std. Error of Mean	0.252
Coefficient of Variation	0.309	Skewness	1.241
Normal GOF Test			
Shapiro Wilk Test Statistic	0.89	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	2.0489E-5	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.142	**Lilliefors GOF Test**	

5% Lilliefors Critical Value	0.117	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	6.588	95% Adjusted-CLT UCL (Chen-1995)	6.625
		95% Modified-t UCL (Johnson-1978)	6.595
Gamma GOF Test			
A-D Test Statistic	0.752	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.75	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.104	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.118	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data follow Appr. Gamma Distribution at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	12.19	k star (bias corrected MLE)	11.56
Theta hat (MLE)	0.506	Theta star (bias corrected MLE)	0.534
nu hat (MLE)	1389	nu star (bias corrected)	1318
MLE Mean (bias corrected)	6.167	MLE Sd (bias corrected)	1.814
		Approximate Chi Square Value (0.05)	1234
Adjusted Level of Significance	0.0458	Adjusted Chi Square Value	1232
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50)	6.583	95% Adjusted Gamma UCL (use when n<50)	6.594
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.959	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk P Value	0.112	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.0836	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.117	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	1.281	Mean of logged Data	1.778
Maximum of Logged Data	2.468	SD of logged Data	0.285
Assuming Lognormal Distribution			
95% H-UCL	6.573	90% Chebyshev (MVUE) UCL	6.864
95% Chebyshev (MVUE) UCL	7.185	97.5% Chebyshev (MVUE) UCL	7.63
99% Chebyshev (MVUE) UCL	8.505		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	6.581	95% Jackknife UCL	6.588
95% Standard Bootstrap UCL	6.578	95% Bootstrap-t UCL	6.648
95% Hall's Bootstrap UCL	6.638	95% Percentile Bootstrap UCL	6.588
95% BCA Bootstrap UCL	6.598		
90% Chebyshev(Mean, Sd) UCL	6.923	95% Chebyshev(Mean, Sd) UCL	7.265

97.5% Chebyshev(Mean, Sd) UCL	7.74	99% Chebyshev(Mean, Sd) UCL	8.674
Suggested UCL to Use			
95% Approximate Gamma UCL	6.583		
When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test			
When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Barium			
General Statistics			
Total Number of Observations	57	Number of Distinct Observations	55
		Number of Missing Observations	11
Minimum	55.3	Mean	149.3
Maximum	420	Median	111
SD	92.5	Std. Error of Mean	12.25
Coefficient of Variation	0.619	Skewness	1.373
Normal GOF Test			
Shapiro Wilk Test Statistic	0.823	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	6.2763E-9	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.197	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.117	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	169.8	95% Adjusted-CLT UCL (Chen-1995)	171.9
		95% Modified-t UCL (Johnson-1978)	170.2
Gamma GOF Test			
A-D Test Statistic	1.745	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.756	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.137	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.119	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	3.314	k star (bias corrected MLE)	3.151
Theta hat (MLE)	45.06	Theta star (bias corrected MLE)	47.39
nu hat (MLE)	377.8	nu star (bias corrected)	359.2
MLE Mean (bias corrected)	149.3	MLE Sd (bias corrected)	84.12
		Approximate Chi Square Value (0.05)	316.3
Adjusted Level of Significance	0.0458	Adjusted Chi Square Value	315.3

Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	169.6	95% Adjusted Gamma UCL (use when n<50)	170.2
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.927	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk P Value	0.0021	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.112	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.117	Data appear Lognormal at 5% Significance Level	
Data appear Approximate Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	4.013	Mean of logged Data	4.848
Maximum of Logged Data	6.04	SD of logged Data	0.549
Assuming Lognormal Distribution			
95% H-UCL	170.5	90% Chebyshev (MVUE) UCL	181.9
95% Chebyshev (MVUE) UCL	197.4	97.5% Chebyshev (MVUE) UCL	218.9
99% Chebyshev (MVUE) UCL	261.1		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	169.5	95% Jackknife UCL	169.8
95% Standard Bootstrap UCL	169.1	95% Bootstrap-t UCL	174.3
95% Hall's Bootstrap UCL	171.6	95% Percentile Bootstrap UCL	169.4
95% BCA Bootstrap UCL	171.3		
90% Chebyshev(Mean, Sd) UCL	186.1	95% Chebyshev(Mean, Sd) UCL	202.7
97.5% Chebyshev(Mean, Sd) UCL	225.8	99% Chebyshev(Mean, Sd) UCL	271.2
Suggested UCL to Use			
95% H-UCL	170.5		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
ProUCL computes and outputs H-statistic based UCLs for historical reasons only.			
H-statistic often results in unstable (both high and low) values of UCL95 as shown in examples in the Technical Guide.			
It is therefore recommended to avoid the use of H-statistic based 95% UCLs.			
Use of nonparametric methods are preferred to compute UCL95 for skewed data sets which do not follow a gamma distribution.			
ChromiumVI_EST			
General Statistics			
Total Number of Observations	57	Number of Distinct Observations	41
		Number of Missing Observations	11
Minimum	0.0642	Mean	0.319
Maximum	2.27	Median	0.276

SD	0.272	Std. Error of Mean	0.036
Coefficient of Variation	0.851	Skewness	6.817
Normal GOF Test			
Shapiro Wilk Test Statistic	0.34	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	0	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.327	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.117	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	0.379	95% Adjusted-CLT UCL (Chen-1995)	0.413
		95% Modified-t UCL (Johnson-1978)	0.385
Gamma GOF Test			
A-D Test Statistic	5.535	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.753	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.22	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.118	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	4.59	k star (bias corrected MLE)	4.36
Theta hat (MLE)	0.0696	Theta star (bias corrected MLE)	0.0732
nu hat (MLE)	523.3	nu star (bias corrected)	497.1
MLE Mean (bias corrected)	0.319	MLE Sd (bias corrected)	0.153
		Approximate Chi Square Value (0.05)	446.4
Adjusted Level of Significance	0.0458	Adjusted Chi Square Value	445.2
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	0.356	95% Adjusted Gamma UCL (use when n<50)	0.357
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.757	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk P Value	3.906E-12	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.19	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.117	Data Not Lognormal at 5% Significance Level	
Data Not Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	-2.745	Mean of logged Data	-1.255
Maximum of Logged Data	0.82	SD of logged Data	0.398
Assuming Lognormal Distribution			
95% H-UCL	0.34	90% Chebyshev (MVUE) UCL	0.359
95% Chebyshev (MVUE) UCL	0.382	97.5% Chebyshev (MVUE) UCL	0.413
99% Chebyshev (MVUE) UCL	0.475		
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution (0.05)			

Nonparametric Distribution Free UCLs			
95% CLT UCL	0.378	95% Jackknife UCL	0.379
95% Standard Bootstrap UCL	0.378	95% Bootstrap-t UCL	0.506
95% Hall's Bootstrap UCL	0.623	95% Percentile Bootstrap UCL	0.39
95% BCA Bootstrap UCL	0.428		
90% Chebyshev(Mean, Sd) UCL	0.427	95% Chebyshev(Mean, Sd) UCL	0.476
97.5% Chebyshev(Mean, Sd) UCL	0.544	99% Chebyshev(Mean, Sd) UCL	0.677
Suggested UCL to Use			
95% Student's-t UCL	0.379	or 95% Modified-t UCL	0.385
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			

Cobalt

General Statistics			
Total Number of Observations	57	Number of Distinct Observations	27
		Number of Missing Observations	11
Minimum	1.5	Mean	5.596
Maximum	9.5	Median	5.5
SD	1.215	Std. Error of Mean	0.161
Coefficient of Variation	0.217	Skewness	0.293
Normal GOF Test			
Shapiro Wilk Test Statistic	0.945	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	0.0196	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.123	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.117	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	5.866	95% Adjusted-CLT UCL (Chen-1995)	5.868
		95% Modified-t UCL (Johnson-1978)	5.867
Gamma GOF Test			
A-D Test Statistic	1.253	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.749	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.133	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.118	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	18.76	k star (bias corrected MLE)	17.79
Theta hat (MLE)	0.298	Theta star (bias corrected MLE)	0.315
nu hat (MLE)	2139	nu star (bias corrected)	2028

MLE Mean (bias corrected)	5.596	MLE Sd (bias corrected)	1.327
		Approximate Chi Square Value (0.05)	1924
Adjusted Level of Significance	0.0458	Adjusted Chi Square Value	1921
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	5.898	95% Adjusted Gamma UCL (use when n<50)	5.906
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.842	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk P Value	5.6138E-8	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.155	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.117	Data Not Lognormal at 5% Significance Level	
Data Not Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	0.405	Mean of logged Data	1.695
Maximum of Logged Data	2.251	SD of logged Data	0.251
Assuming Lognormal Distribution			
95% H-UCL	5.955	90% Chebyshev (MVUE) UCL	6.187
95% Chebyshev (MVUE) UCL	6.444	97.5% Chebyshev (MVUE) UCL	6.801
99% Chebyshev (MVUE) UCL	7.503		
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution (0.05)			
Nonparametric Distribution Free UCLs			
95% CLT UCL	5.861	95% Jackknife UCL	5.866
95% Standard Bootstrap UCL	5.856	95% Bootstrap-t UCL	5.874
95% Hall's Bootstrap UCL	5.885	95% Percentile Bootstrap UCL	5.856
95% BCA Bootstrap UCL	5.87		
90% Chebyshev(Mean, Sd) UCL	6.079	95% Chebyshev(Mean, Sd) UCL	6.298
97.5% Chebyshev(Mean, Sd) UCL	6.602	99% Chebyshev(Mean, Sd) UCL	7.198
Suggested UCL to Use			
95% Student's-t UCL	5.866	or 95% Modified-t UCL	5.867
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Copper			
General Statistics			
Total Number of Observations	57	Number of Distinct Observations	44
		Number of Missing Observations	11
Minimum	6.7	Mean	142.5
Maximum	7260	Median	13.9
SD	959.6	Std. Error of Mean	127.1

Coefficient of Variation	6.735	Skewness	7.549
Normal GOF Test			
Shapiro Wilk Test Statistic	0.138	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	0	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.517	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.117	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	355.1	95% Adjusted-CLT UCL (Chen-1995)	487.3
		95% Modified-t UCL (Johnson-1978)	376.2
Gamma GOF Test			
A-D Test Statistic	19	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.86	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.512	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.128	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	0.312	k star (bias corrected MLE)	0.307
Theta hat (MLE)	456.6	Theta star (bias corrected MLE)	463.6
nu hat (MLE)	35.57	nu star (bias corrected)	35.03
MLE Mean (bias corrected)	142.5	MLE Sd (bias corrected)	257
		Approximate Chi Square Value (0.05)	22.49
Adjusted Level of Significance	0.0458	Adjusted Chi Square Value	22.23
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	221.9	95% Adjusted Gamma UCL (use when n<50)	224.5
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.485	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk P Value	0	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.252	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.117	Data Not Lognormal at 5% Significance Level	
Data Not Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	1.902	Mean of logged Data	2.764
Maximum of Logged Data	8.89	SD of logged Data	0.905
Assuming Lognormal Distribution			
95% H-UCL	31.27	90% Chebyshev (MVUE) UCL	33.45
95% Chebyshev (MVUE) UCL	37.89	97.5% Chebyshev (MVUE) UCL	44.06
99% Chebyshev (MVUE) UCL	56.17		
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution (0.05)			

Nonparametric Distribution Free UCLs			
95% CLT UCL	351.5	95% Jackknife UCL	355.1
95% Standard Bootstrap UCL	348.3	95% Bootstrap-t UCL	26950
95% Hall's Bootstrap UCL	10480	95% Percentile Bootstrap UCL	396.5
95% BCA Bootstrap UCL	650.6		
90% Chebyshev(Mean, Sd) UCL	523.8	95% Chebyshev(Mean, Sd) UCL	696.5
97.5% Chebyshev(Mean, Sd) UCL	936.2	99% Chebyshev(Mean, Sd) UCL	1407
Suggested UCL to Use			
95% Chebyshev (Mean, Sd) UCL	696.5		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Vanadium			
General Statistics			
Total Number of Observations	57	Number of Distinct Observations	50
		Number of Missing Observations	11
Minimum	4	Mean	13.51
Maximum	27.7	Median	12.2
SD	5.031	Std. Error of Mean	0.666
Coefficient of Variation	0.373	Skewness	0.854
Normal GOF Test			
Shapiro Wilk Test Statistic	0.934	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	0.00541	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.133	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.117	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	14.62	95% Adjusted-CLT UCL (Chen-1995)	14.68
		95% Modified-t UCL (Johnson-1978)	14.63
Gamma GOF Test			
A-D Test Statistic	0.542	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.752	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.088	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.118	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	7.638	k star (bias corrected MLE)	7.247
Theta hat (MLE)	1.768	Theta star (bias corrected MLE)	1.863
nu hat (MLE)	870.7	nu star (bias corrected)	826.2
MLE Mean (bias corrected)	13.51	MLE Sd (bias corrected)	5.017

		Approximate Chi Square Value (0.05)	760.5
Adjusted Level of Significance	0.0458	Adjusted Chi Square Value	758.9
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50)	14.67	95% Adjusted Gamma UCL (use when n<50)	14.7
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.979	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk P Value	0.635	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.0749	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.117	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	1.386	Mean of logged Data	2.536
Maximum of Logged Data	3.321	SD of logged Data	0.374
Assuming Lognormal Distribution			
95% H-UCL	14.8	90% Chebyshev (MVUE) UCL	15.59
95% Chebyshev (MVUE) UCL	16.53	97.5% Chebyshev (MVUE) UCL	17.83
99% Chebyshev (MVUE) UCL	20.38		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	14.6	95% Jackknife UCL	14.62
95% Standard Bootstrap UCL	14.59	95% Bootstrap-t UCL	14.76
95% Hall's Bootstrap UCL	14.78	95% Percentile Bootstrap UCL	14.54
95% BCA Bootstrap UCL	14.67		
90% Chebyshev(Mean, Sd) UCL	15.5	95% Chebyshev(Mean, Sd) UCL	16.41
97.5% Chebyshev(Mean, Sd) UCL	17.67	99% Chebyshev(Mean, Sd) UCL	20.14
Suggested UCL to Use			
95% Approximate Gamma UCL	14.67		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Zinc			
General Statistics			
Total Number of Observations	57	Number of Distinct Observations	50
		Number of Missing Observations	11
Minimum	28.9	Mean	53.65
Maximum	114	Median	50.7
SD	18.91	Std. Error of Mean	2.504
Coefficient of Variation	0.352	Skewness	1.668

Normal GOF Test			
Shapiro Wilk Test Statistic	0.84	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	4.3644E-8	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.164	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.117	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	57.83	95% Adjusted-CLT UCL (Chen-1995)	58.36
		95% Modified-t UCL (Johnson-1978)	57.93
Gamma GOF Test			
A-D Test Statistic	1.029	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.751	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.12	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.118	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	10.02	k star (bias corrected MLE)	9.506
Theta hat (MLE)	5.353	Theta star (bias corrected MLE)	5.643
nu hat (MLE)	1142	nu star (bias corrected)	1084
MLE Mean (bias corrected)	53.65	MLE Sd (bias corrected)	17.4
		Approximate Chi Square Value (0.05)	1008
Adjusted Level of Significance	0.0458	Adjusted Chi Square Value	1006
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	57.66	95% Adjusted Gamma UCL (use when n<50)	57.77
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.949	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk P Value	0.0331	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.103	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.117	Data appear Lognormal at 5% Significance Level	
Data appear Approximate Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	3.364	Mean of logged Data	3.932
Maximum of Logged Data	4.736	SD of logged Data	0.31
Assuming Lognormal Distribution			
95% H-UCL	57.42	90% Chebyshev (MVUE) UCL	60.19
95% Chebyshev (MVUE) UCL	63.24	97.5% Chebyshev (MVUE) UCL	67.47
99% Chebyshev (MVUE) UCL	75.77		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			

95% CLT UCL	57.76	95% Jackknife UCL	57.83
95% Standard Bootstrap UCL	57.84	95% Bootstrap-t UCL	58.4
95% Hall's Bootstrap UCL	58.58	95% Percentile Bootstrap UCL	57.86
95% BCA Bootstrap UCL	58.49		
90% Chebyshev(Mean, Sd) UCL	61.16	95% Chebyshev(Mean, Sd) UCL	64.56
97.5% Chebyshev(Mean, Sd) UCL	69.29	99% Chebyshev(Mean, Sd) UCL	78.56

Suggested UCL to Use

95% Student's-t UCL	57.83	or 95% Modified-t UCL	57.93
or 95% H-UCL	57.42		

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

ProUCL computes and outputs H-statistic based UCLs for historical reasons only.

H-statistic often results in unstable (both high and low) values of UCL95 as shown in examples in the Technical Guide.

It is therefore recommended to avoid the use of H-statistic based 95% UCLs.

Use of nonparametric methods are preferred to compute UCL95 for skewed data sets which do not follow a gamma distribution.

Selenium

General Statistics

Total Number of Observations	57	Number of Distinct Observations	26
		Number of Missing Observations	11
Number of Detects	12	Number of Non-Detects	45
Number of Distinct Detects	11	Number of Distinct Non-Detects	19
Minimum Detect	0.34	Minimum Non-Detect	0.24
Maximum Detect	1.2	Maximum Non-Detect	0.5
Variance Detects	0.119	Percent Non-Detects	78.95%
Mean Detects	0.679	SD Detects	0.344
Median Detects	0.51	CV Detects	0.507
Skewness Detects	0.677	Kurtosis Detects	-1.465
Mean of Logged Detects	-0.5	SD of Logged Detects	0.491

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.814	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.859	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.238	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.243	Detected Data appear Normal at 5% Significance Level

Detected Data appear Approximate Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	0.334	KM Standard Error of Mean	0.0325
KM SD	0.234	95% KM (BCA) UCL	0.393
95% KM (t) UCL	0.388	95% KM (Percentile Bootstrap) UCL	0.39
95% KM (z) UCL	0.388	95% KM Bootstrap t UCL	0.408
90% KM Chebyshev UCL	0.432	95% KM Chebyshev UCL	0.476
97.5% KM Chebyshev UCL	0.537	99% KM Chebyshev UCL	0.657

Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	0.823	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.734	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.233	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.246	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data follow Appr. Gamma Distribution at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	4.572	k star (bias corrected MLE)	3.485
Theta hat (MLE)	0.149	Theta star (bias corrected MLE)	0.195
nu hat (MLE)	109.7	nu star (bias corrected)	83.64
Mean (detects)	0.679		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	0.153
Maximum	1.2	Median	0.01
SD	0.314	CV	2.059
k hat (MLE)	0.371	k star (bias corrected MLE)	0.364
Theta hat (MLE)	0.411	Theta star (bias corrected MLE)	0.42
nu hat (MLE)	42.34	nu star (bias corrected)	41.45
Adjusted Level of Significance (β)	0.0458		
Approximate Chi Square Value (41.45, α)	27.69	Adjusted Chi Square Value (41.45, β)	27.4
95% Gamma Approximate UCL (use when n>=50)	0.228	95% Gamma Adjusted UCL (use when n<50)	0.231
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.334	SD (KM)	0.234
Variance (KM)	0.0548	SE of Mean (KM)	0.0325
k hat (KM)	2.036	k star (KM)	1.941
nu hat (KM)	232.1	nu star (KM)	221.2
theta hat (KM)	0.164	theta star (KM)	0.172
80% gamma percentile (KM)	0.502	90% gamma percentile (KM)	0.655
95% gamma percentile (KM)	0.8	99% gamma percentile (KM)	1.124
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (221.22, α)	187.8	Adjusted Chi Square Value (221.22, β)	187
95% Gamma Approximate KM-UCL (use when n>=50)	0.394	95% Gamma Adjusted KM-UCL (use when n<50)	0.395
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.861	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.859	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.213	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.243	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.229	Mean in Log Scale	-1.937

SD in Original Scale	0.283	SD in Log Scale	0.89
95% t UCL (assumes normality of ROS data)	0.292	95% Percentile Bootstrap UCL	0.296
95% BCA Bootstrap UCL	0.305	95% Bootstrap t UCL	0.312
95% H-UCL (Log ROS)	0.279		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-1.226	KM Geo Mean	0.293
KM SD (logged)	0.435	95% Critical H Value (KM-Log)	1.849
KM Standard Error of Mean (logged)	0.0606	95% H-UCL (KM -Log)	0.359
KM SD (logged)	0.435	95% Critical H Value (KM-Log)	1.849
KM Standard Error of Mean (logged)	0.0606		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.269	Mean in Log Scale	-1.563
SD in Original Scale	0.264	SD in Log Scale	0.613
95% t UCL (Assumes normality)	0.328	95% H-Stat UCL	0.297
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Approximate Normal Distributed at 5% Significance Level			
Suggested UCL to Use			
95% KM (t) UCL	0.388		
When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test			
When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Naphthalene			
General Statistics			
Total Number of Observations	57	Number of Distinct Observations	40
		Number of Missing Observations	11
Number of Detects	35	Number of Non-Detects	22
Number of Distinct Detects	32	Number of Distinct Non-Detects	13
Minimum Detect	0.0014	Minimum Non-Detect	0.0014
Maximum Detect	4.6	Maximum Non-Detect	0.012
Variance Detects	0.605	Percent Non-Detects	38.6%
Mean Detects	0.181	SD Detects	0.778
Median Detects	0.011	CV Detects	4.29
Skewness Detects	5.712	Kurtosis Detects	33.26
Mean of Logged Detects	-4.169	SD of Logged Detects	1.782
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.244	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.934	Detected Data Not Normal at 5% Significance Level	

Lilliefors Test Statistic	0.452	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.148	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.112	KM Standard Error of Mean	0.0816
KM SD	0.607	95% KM (BCA) UCL	0.281
95% KM (t) UCL	0.249	95% KM (Percentile Bootstrap) UCL	0.271
95% KM (z) UCL	0.246	95% KM Bootstrap t UCL	1.079
90% KM Chebyshev UCL	0.357	95% KM Chebyshev UCL	0.468
97.5% KM Chebyshev UCL	0.622	99% KM Chebyshev UCL	0.924
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	5.049	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.865	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.349	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.162	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.283	k star (bias corrected MLE)	0.278
Theta hat (MLE)	0.641	Theta star (bias corrected MLE)	0.653
nu hat (MLE)	19.8	nu star (bias corrected)	19.44
Mean (detects)	0.181		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.0014	Mean	0.115
Maximum	4.6	Median	0.01
SD	0.612	CV	5.312
k hat (MLE)	0.314	k star (bias corrected MLE)	0.31
Theta hat (MLE)	0.366	Theta star (bias corrected MLE)	0.372
nu hat (MLE)	35.85	nu star (bias corrected)	35.29
Adjusted Level of Significance (β)	0.0458		
Approximate Chi Square Value (35.29, α)	22.7	Adjusted Chi Square Value (35.29, β)	22.44
95% Gamma Approximate UCL (use when n>=50)	0.179	95% Gamma Adjusted UCL (use when n<50)	0.181
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.112	SD (KM)	0.607
Variance (KM)	0.368	SE of Mean (KM)	0.0816
k hat (KM)	0.0342	k star (KM)	0.0441
nu hat (KM)	3.9	nu star (KM)	5.028
theta hat (KM)	3.282	theta star (KM)	2.546
80% gamma percentile (KM)	0.00943	90% gamma percentile (KM)	0.143
95% gamma percentile (KM)	0.567	99% gamma percentile (KM)	2.562
Gamma Kaplan-Meier (KM) Statistics			

Approximate Chi Square Value (5.03, α)	1.165	Adjusted Chi Square Value (5.03, β)	1.118
95% Gamma Approximate KM-UCL (use when n>=50)	0.485	95% Gamma Adjusted KM-UCL (use when n<50)	0.505
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.899	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.934	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.134	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.148	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Approximate Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.112	Mean in Log Scale	-5.334
SD in Original Scale	0.613	SD in Log Scale	2.127
95% t UCL (assumes normality of ROS data)	0.247	95% Percentile Bootstrap UCL	0.271
95% BCA Bootstrap UCL	0.441	95% Bootstrap t UCL	1.077
95% H-UCL (Log ROS)	0.143		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-4.952	KM Geo Mean	0.00707
KM SD (logged)	1.727	95% Critical H Value (KM-Log)	3.391
KM Standard Error of Mean (logged)	0.237	95% H-UCL (KM -Log)	0.0686
KM SD (logged)	1.727	95% Critical H Value (KM-Log)	3.391
KM Standard Error of Mean (logged)	0.237		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.113	Mean in Log Scale	-4.895
SD in Original Scale	0.612	SD in Log Scale	1.744
95% t UCL (Assumes normality)	0.248	95% H-Stat UCL	0.076
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Approximate Lognormal Distributed at 5% Significance Level			
Suggested UCL to Use			
KM H-UCL	0.0686		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			

ProUCL Output
Central Landfill Area Soil (0-2 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

UCL Statistics for Data Sets with Non-Detects

User Selected Options	
Date/Time of Computation	ProUCL 5.11/28/2019 10:59:07 AM
From File	20190128_CenLF_ProUCL_input_a.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

PCB1254Aroclor1254

General Statistics

Total Number of Observations	55	Number of Distinct Observations	7
		Number of Missing Observations	81
Number of Detects	0	Number of Non-Detects	55
Number of Distinct Detects	0	Number of Distinct Non-Detects	7

Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!
Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!
The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable PCB1254Aroclor1254 was not processed!

Bis2EthylhexylPhthalate

General Statistics

Total Number of Observations	94	Number of Distinct Observations	41
		Number of Missing Observations	42
Number of Detects	15	Number of Non-Detects	79
Number of Distinct Detects	14	Number of Distinct Non-Detects	29
Minimum Detect	0.025	Minimum Non-Detect	0.014
Maximum Detect	0.23	Maximum Non-Detect	0.87
Variance Detects	0.00314	Percent Non-Detects	84.04%
Mean Detects	0.0882	SD Detects	0.056
Median Detects	0.069	CV Detects	0.635
Skewness Detects	1.572	Kurtosis Detects	1.964
Mean of Logged Detects	-2.585	SD of Logged Detects	0.567

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.817	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.881	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.242	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.22	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	0.0276	KM Standard Error of Mean	0.004
KM SD	0.0358	95% KM (BCA) UCL	0.035
95% KM (t) UCL	0.0342	95% KM (Percentile Bootstrap) UCL	0.0344
95% KM (z) UCL	0.0341	95% KM Bootstrap t UCL	0.0363

90% KM Chebyshev UCL	0.0396	95% KM Chebyshev UCL	0.045
97.5% KM Chebyshev UCL	0.0525	99% KM Chebyshev UCL	0.0674
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	0.604	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.743	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.196	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.223	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	3.335	k star (bias corrected MLE)	2.713
Theta hat (MLE)	0.0264	Theta star (bias corrected MLE)	0.0325
nu hat (MLE)	100.1	nu star (bias corrected)	81.38
Mean (detects)	0.0882		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	0.0225
Maximum	0.23	Median	0.01
SD	0.0361	CV	1.605
k hat (MLE)	1.164	k star (bias corrected MLE)	1.134
Theta hat (MLE)	0.0193	Theta star (bias corrected MLE)	0.0198
nu hat (MLE)	218.8	nu star (bias corrected)	213.1
Adjusted Level of Significance (β)	0.0474		
Approximate Chi Square Value (213.11, α)	180.3	Adjusted Chi Square Value (213.11, β)	179.9
95% Gamma Approximate UCL (use when n>=50)	0.0266	95% Gamma Adjusted UCL (use when n<50)	0.0266
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.0276	SD (KM)	0.0358
Variance (KM)	0.00128	SE of Mean (KM)	0.004
k hat (KM)	0.592	k star (KM)	0.58
nu hat (KM)	111.3	nu star (KM)	109.1
theta hat (KM)	0.0466	theta star (KM)	0.0475
80% gamma percentile (KM)	0.0454	90% gamma percentile (KM)	0.0722
95% gamma percentile (KM)	0.1	99% gamma percentile (KM)	0.169
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (109.07, α)	85.96	Adjusted Chi Square Value (109.07, β)	85.64
95% Gamma Approximate KM-UCL (use when n>=50)	0.035	95% Gamma Adjusted KM-UCL (use when n<50)	0.0351
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.955	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.881	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.162	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.22	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			

Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.0246	Mean in Log Scale	-4.236
SD in Original Scale	0.0359	SD in Log Scale	0.945
95% t UCL (assumes normality of ROS data)	0.0307	95% Percentile Bootstrap UCL	0.031
95% BCA Bootstrap UCL	0.032	95% Bootstrap t UCL	0.0333
95% H-UCL (Log ROS)	0.028		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-3.95	KM Geo Mean	0.0193
KM SD (logged)	0.688	95% Critical H Value (KM-Log)	2.006
KM Standard Error of Mean (logged)	0.0794	95% H-UCL (KM -Log)	0.0281
KM SD (logged)	0.688	95% Critical H Value (KM-Log)	2.006
KM Standard Error of Mean (logged)	0.0794		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.0433	Mean in Log Scale	-3.847
SD in Original Scale	0.0731	SD in Log Scale	1.083
95% t UCL (Assumes normality)	0.0558	95% H-Stat UCL	0.0499
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Gamma Distributed at 5% Significance Level			
Suggested UCL to Use			
95% KM Approximate Gamma UCL	0.035	95% GROS Approximate Gamma UCL	0.0266
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Dibenzofuran			
General Statistics			
Total Number of Observations	94	Number of Distinct Observations	47
		Number of Missing Observations	42
Number of Detects	46	Number of Non-Detects	48
Number of Distinct Detects	40	Number of Distinct Non-Detects	13
Minimum Detect	0.0016	Minimum Non-Detect	0.0015
Maximum Detect	15	Maximum Non-Detect	0.054
Variance Detects	6.882	Percent Non-Detects	51.06%
Mean Detects	0.589	SD Detects	2.623
Median Detects	0.0103	CV Detects	4.453
Skewness Detects	4.914	Kurtosis Detects	24.12
Mean of Logged Detects	-4.082	SD of Logged Detects	2.005
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.246	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.945	Detected Data Not Normal at 5% Significance Level	

Lilliefors Test Statistic	0.462	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.129	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.29	KM Standard Error of Mean	0.192
KM SD	1.839	95% KM (BCA) UCL	0.708
95% KM (t) UCL	0.608	95% KM (Percentile Bootstrap) UCL	0.66
95% KM (z) UCL	0.605	95% KM Bootstrap t UCL	6.787
90% KM Chebyshev UCL	0.865	95% KM Chebyshev UCL	1.126
97.5% KM Chebyshev UCL	1.487	99% KM Chebyshev UCL	2.198
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	9.109	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.908	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.36	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.145	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.206	k star (bias corrected MLE)	0.207
Theta hat (MLE)	2.858	Theta star (bias corrected MLE)	2.843
nu hat (MLE)	18.97	nu star (bias corrected)	19.06
Mean (detects)	0.589		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.0016	Mean	0.293
Maximum	15	Median	0.01
SD	1.848	CV	6.298
k hat (MLE)	0.23	k star (bias corrected MLE)	0.23
Theta hat (MLE)	1.273	Theta star (bias corrected MLE)	1.275
nu hat (MLE)	43.32	nu star (bias corrected)	43.28
Adjusted Level of Significance (β)	0.0474		
Approximate Chi Square Value (43.28, α)	29.19	Adjusted Chi Square Value (43.28, β)	29.01
95% Gamma Approximate UCL (use when n>=50)	0.435	95% Gamma Adjusted UCL (use when n<50)	0.438
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.29	SD (KM)	1.839
Variance (KM)	3.38	SE of Mean (KM)	0.192
k hat (KM)	0.0249	k star (KM)	0.0312
nu hat (KM)	4.673	nu star (KM)	5.858
theta hat (KM)	11.66	theta star (KM)	9.304
80% gamma percentile (KM)	0.00416	90% gamma percentile (KM)	0.186
95% gamma percentile (KM)	1.162	99% gamma percentile (KM)	7.408
Gamma Kaplan-Meier (KM) Statistics			

Approximate Chi Square Value (5.86, α)	1.567	Adjusted Chi Square Value (5.86, β)	1.534
95% Gamma Approximate KM-UCL (use when n>=50)	1.083	95% Gamma Adjusted KM-UCL (use when n<50)	1.107
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.828	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.945	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.152	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.129	Detected Data Not Lognormal at 5% Significance Level	
Detected Data Not Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.29	Mean in Log Scale	-5.596
SD in Original Scale	1.849	SD in Log Scale	2.312
95% t UCL (assumes normality of ROS data)	0.606	95% Percentile Bootstrap UCL	0.617
95% BCA Bootstrap UCL	0.827	95% Bootstrap t UCL	7.042
95% H-UCL (Log ROS)	0.134		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-5.051	KM Geo Mean	0.00641
KM SD (logged)	1.733	95% Critical H Value (KM-Log)	3.067
KM Standard Error of Mean (logged)	0.189	95% H-UCL (KM -Log)	0.0499
KM SD (logged)	1.733	95% Critical H Value (KM-Log)	3.067
KM Standard Error of Mean (logged)	0.189		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.291	Mean in Log Scale	-4.861
SD in Original Scale	1.848	SD in Log Scale	1.7
95% t UCL (Assumes normality)	0.608	95% H-Stat UCL	0.0559
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution at 5% Significance Level			
Suggested UCL to Use			
95% KM (Chebyshev) UCL	1.126		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Fluoride			
General Statistics			
Total Number of Observations	94	Number of Distinct Observations	89
		Number of Missing Observations	42
Minimum	3.24	Mean	45.89
Maximum	250	Median	25.2
SD	51.95	Std. Error of Mean	5.358

Coefficient of Variation	1.132	Skewness	2.097
Normal GOF Test			
Shapiro Wilk Test Statistic	0.743	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	0	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.206	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.0916	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	54.79	95% Adjusted-CLT UCL (Chen-1995)	55.94
		95% Modified-t UCL (Johnson-1978)	54.98
Gamma GOF Test			
A-D Test Statistic	1.192	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.782	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.0992	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.095	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	1.036	k star (bias corrected MLE)	1.01
Theta hat (MLE)	44.27	Theta star (bias corrected MLE)	45.41
nu hat (MLE)	194.9	nu star (bias corrected)	190
MLE Mean (bias corrected)	45.89	MLE Sd (bias corrected)	45.65
		Approximate Chi Square Value (0.05)	159.1
Adjusted Level of Significance	0.0474	Adjusted Chi Square Value	158.6
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	54.79	95% Adjusted Gamma UCL (use when n<50)	54.95
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.964	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk P Value	0.0623	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.0515	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.0916	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	1.176	Mean of logged Data	3.272
Maximum of Logged Data	5.521	SD of logged Data	1.091
Assuming Lognormal Distribution			
95% H-UCL	62.24	90% Chebyshev (MVUE) UCL	66.93
95% Chebyshev (MVUE) UCL	75.82	97.5% Chebyshev (MVUE) UCL	88.16
99% Chebyshev (MVUE) UCL	112.4		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			

Nonparametric Distribution Free UCLs			
95% CLT UCL	54.7	95% Jackknife UCL	54.79
95% Standard Bootstrap UCL	54.55	95% Bootstrap-t UCL	56.88
95% Hall's Bootstrap UCL	56.28	95% Percentile Bootstrap UCL	54.38
95% BCA Bootstrap UCL	55.84		
90% Chebyshev(Mean, Sd) UCL	61.96	95% Chebyshev(Mean, Sd) UCL	69.24
97.5% Chebyshev(Mean, Sd) UCL	79.35	99% Chebyshev(Mean, Sd) UCL	99.2
Suggested UCL to Use			
95% H-UCL	62.24		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
ProUCL computes and outputs H-statistic based UCLs for historical reasons only.			
H-statistic often results in unstable (both high and low) values of UCL95 as shown in examples in the Technical Guide.			
It is therefore recommended to avoid the use of H-statistic based 95% UCLs.			
Use of nonparametric methods are preferred to compute UCL95 for skewed data sets which do not follow a gamma distribution.			
Indeno123CDPyrene			
General Statistics			
Total Number of Observations	94	Number of Distinct Observations	69
		Number of Missing Observations	42
Number of Detects	85	Number of Non-Detects	9
Number of Distinct Detects	66	Number of Distinct Non-Detects	4
Minimum Detect	0.0055	Minimum Non-Detect	0.023
Maximum Detect	76	Maximum Non-Detect	0.027
Variance Detects	111.8	Percent Non-Detects	9.574%
Mean Detects	2.563	SD Detects	10.57
Median Detects	0.2	CV Detects	4.125
Skewness Detects	5.854	Kurtosis Detects	35.85
Mean of Logged Detects	-1.403	SD of Logged Detects	1.803
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.265	**Normal GOF Test on Detected Observations Only**	
5% Shapiro Wilk P Value	0	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.414	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.0962	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	2.319	KM Standard Error of Mean	1.04
KM SD	10.02	95% KM (BCA) UCL	4.526
95% KM (t) UCL	4.047	95% KM (Percentile Bootstrap) UCL	4.155
95% KM (z) UCL	4.03	95% KM Bootstrap t UCL	8.223
90% KM Chebyshev UCL	5.439	95% KM Chebyshev UCL	6.852
97.5% KM Chebyshev UCL	8.813	99% KM Chebyshev UCL	12.67

Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	11.01	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.869	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.304	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.105	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.295	k star (bias corrected MLE)	0.292
Theta hat (MLE)	8.691	Theta star (bias corrected MLE)	8.767
nu hat (MLE)	50.14	nu star (bias corrected)	49.71
Mean (detects)	2.563		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.0055	Mean	2.319
Maximum	76	Median	0.175
SD	10.08	CV	4.345
k hat (MLE)	0.274	k star (bias corrected MLE)	0.273
Theta hat (MLE)	8.454	Theta star (bias corrected MLE)	8.505
nu hat (MLE)	51.57	nu star (bias corrected)	51.26
Adjusted Level of Significance (β)	0.0474		
Approximate Chi Square Value (51.26, α)	35.82	Adjusted Chi Square Value (51.26, β)	35.62
95% Gamma Approximate UCL (use when n>=50)	3.319	95% Gamma Adjusted UCL (use when n<50)	3.337
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	2.319	SD (KM)	10.02
Variance (KM)	100.5	SE of Mean (KM)	1.04
k hat (KM)	0.0535	k star (KM)	0.0589
nu hat (KM)	10.07	nu star (KM)	11.08
theta hat (KM)	43.32	theta star (KM)	39.36
80% gamma percentile (KM)	0.532	90% gamma percentile (KM)	4.284
95% gamma percentile (KM)	12.95	99% gamma percentile (KM)	47.15
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (11.08, α)	4.626	Adjusted Chi Square Value (11.08, β)	4.561
95% Gamma Approximate KM-UCL (use when n>=50)	5.554	95% Gamma Adjusted KM-UCL (use when n<50)	5.633
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Approximate Test Statistic	0.942	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	0.00139	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.126	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.0962	Detected Data Not Lognormal at 5% Significance Level	
Detected Data Not Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	2.319	Mean in Log Scale	-1.712

SD in Original Scale	10.08	SD in Log Scale	1.966
95% t UCL (assumes normality of ROS data)	4.046	95% Percentile Bootstrap UCL	4.256
95% BCA Bootstrap UCL	5.231	95% Bootstrap t UCL	8.316
95% H-UCL (Log ROS)	2.475		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-1.699	KM Geo Mean	0.183
KM SD (logged)	1.938	95% Critical H Value (KM-Log)	3.321
KM Standard Error of Mean (logged)	0.202	95% H-UCL (KM -Log)	2.329
KM SD (logged)	1.938	95% Critical H Value (KM-Log)	3.321
KM Standard Error of Mean (logged)	0.202		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	2.319	Mean in Log Scale	-1.69
SD in Original Scale	10.08	SD in Log Scale	1.929
95% t UCL (Assumes normality)	4.046	95% H-Stat UCL	2.301
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution at 5% Significance Level			
Suggested UCL to Use			
95% KM (Chebyshev) UCL	6.852		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
BenzoBFluoranthene			
General Statistics			
Total Number of Observations	94	Number of Distinct Observations	68
		Number of Missing Observations	42
Number of Detects	90	Number of Non-Detects	4
Number of Distinct Detects	66	Number of Distinct Non-Detects	3
Minimum Detect	0.011	Minimum Non-Detect	0.0018
Maximum Detect	120	Maximum Non-Detect	0.016
Variance Detects	291.2	Percent Non-Detects	4.255%
Mean Detects	4.019	SD Detects	17.07
Median Detects	0.33	CV Detects	4.246
Skewness Detects	5.817	Kurtosis Detects	34.95
Mean of Logged Detects	-1.022	SD of Logged Detects	1.836
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.254	**Normal GOF Test on Detected Observations Only**	
5% Shapiro Wilk P Value	0	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.436	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.0936	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	3.848	KM Standard Error of Mean	1.724
KM SD	16.63	95% KM (BCA) UCL	7.013
95% KM (t) UCL	6.713	95% KM (Percentile Bootstrap) UCL	6.759
95% KM (z) UCL	6.684	95% KM Bootstrap t UCL	13.01
90% KM Chebyshev UCL	9.021	95% KM Chebyshev UCL	11.36
97.5% KM Chebyshev UCL	14.62	99% KM Chebyshev UCL	21.01
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	11.49	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.874	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.273	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.103	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.288	k star (bias corrected MLE)	0.286
Theta hat (MLE)	13.97	Theta star (bias corrected MLE)	14.07
nu hat (MLE)	51.8	nu star (bias corrected)	51.4
Mean (detects)	4.019		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	3.848
Maximum	120	Median	0.32
SD	16.71	CV	4.343
k hat (MLE)	0.277	k star (bias corrected MLE)	0.275
Theta hat (MLE)	13.89	Theta star (bias corrected MLE)	13.98
nu hat (MLE)	52.08	nu star (bias corrected)	51.75
Adjusted Level of Significance (β)	0.0474		
Approximate Chi Square Value (51.75, α)	36.23	Adjusted Chi Square Value (51.75, β)	36.03
95% Gamma Approximate UCL (use when n>=50)	5.497	95% Gamma Adjusted UCL (use when n<50)	5.528
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	3.848	SD (KM)	16.63
Variance (KM)	276.4	SE of Mean (KM)	1.724
k hat (KM)	0.0536	k star (KM)	0.059
nu hat (KM)	10.07	nu star (KM)	11.08
theta hat (KM)	71.83	theta star (KM)	65.27
80% gamma percentile (KM)	0.884	90% gamma percentile (KM)	7.112
95% gamma percentile (KM)	21.48	99% gamma percentile (KM)	78.22
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (11.08, α)	4.63	Adjusted Chi Square Value (11.08, β)	4.565
95% Gamma Approximate KM-UCL (use when n>=50)	9.212	95% Gamma Adjusted KM-UCL (use when n<50)	9.343

Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Approximate Test Statistic	0.943	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	0.00112	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.112	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.0936	Detected Data Not Lognormal at 5% Significance Level	
Detected Data Not Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	3.848	Mean in Log Scale	-1.197
SD in Original Scale	16.71	SD in Log Scale	1.983
95% t UCL (assumes normality of ROS data)	6.712	95% Percentile Bootstrap UCL	6.881
95% BCA Bootstrap UCL	8.261	95% Bootstrap t UCL	13.73
95% H-UCL (Log ROS)	4.324		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-1.206	KM Geo Mean	0.299
KM SD (logged)	1.999	95% Critical H Value (KM-Log)	3.399
KM Standard Error of Mean (logged)	0.208	95% H-UCL (KM -Log)	4.46
KM SD (logged)	1.999	95% Critical H Value (KM-Log)	3.399
KM Standard Error of Mean (logged)	0.208		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	3.848	Mean in Log Scale	-1.208
SD in Original Scale	16.71	SD in Log Scale	2.014
95% t UCL (Assumes normality)	6.712	95% H-Stat UCL	4.629
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution at 5% Significance Level			
Suggested UCL to Use			
95% KM (Chebyshev) UCL	11.36		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
BenzoKFluoranthene			
General Statistics			
Total Number of Observations	94	Number of Distinct Observations	62
		Number of Missing Observations	42
Number of Detects	83	Number of Non-Detects	11
Number of Distinct Detects	61	Number of Distinct Non-Detects	3
Minimum Detect	0.0034	Minimum Non-Detect	0.016
Maximum Detect	50	Maximum Non-Detect	0.018
Variance Detects	49.67	Percent Non-Detects	11.7%
Mean Detects	1.636	SD Detects	7.048
Median Detects	0.12	CV Detects	4.307

Skewness Detects	5.843	Kurtosis Detects	35.45
Mean of Logged Detects	-1.985	SD of Logged Detects	1.788
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.254	**Normal GOF Test on Detected Observations Only**	
5% Shapiro Wilk P Value	0	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.435	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.0974	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	1.446	KM Standard Error of Mean	0.685
KM SD	6.603	95% KM (BCA) UCL	2.706
95% KM (t) UCL	2.584	95% KM (Percentile Bootstrap) UCL	2.755
95% KM (z) UCL	2.573	95% KM Bootstrap t UCL	5.935
90% KM Chebyshev UCL	3.501	95% KM Chebyshev UCL	4.433
97.5% KM Chebyshev UCL	5.725	99% KM Chebyshev UCL	8.264
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	12.2	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.875	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.321	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.107	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.281	k star (bias corrected MLE)	0.279
Theta hat (MLE)	5.818	Theta star (bias corrected MLE)	5.862
nu hat (MLE)	46.69	nu star (bias corrected)	46.34
Mean (detects)	1.636		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.0034	Mean	1.446
Maximum	50	Median	0.087
SD	6.639	CV	4.591
k hat (MLE)	0.265	k star (bias corrected MLE)	0.263
Theta hat (MLE)	5.466	Theta star (bias corrected MLE)	5.494
nu hat (MLE)	49.74	nu star (bias corrected)	49.48
Adjusted Level of Significance (β)	0.0474		
Approximate Chi Square Value (49.48, α)	34.33	Adjusted Chi Square Value (49.48, β)	34.14
95% Gamma Approximate UCL (use when n>=50)	2.084	95% Gamma Adjusted UCL (use when n<50)	2.096
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	1.446	SD (KM)	6.603
Variance (KM)	43.6	SE of Mean (KM)	0.685
k hat (KM)	0.0479	k star (KM)	0.0535

nu hat (KM)	9.013	nu star (KM)	10.06
theta hat (KM)	30.16	theta star (KM)	27.02
80% gamma percentile (KM)	0.247	90% gamma percentile (KM)	2.401
95% gamma percentile (KM)	7.865	99% gamma percentile (KM)	30.6
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (10.06, α)	3.979	Adjusted Chi Square Value (10.06, β)	3.919
95% Gamma Approximate KM-UCL (use when n>=50)	3.655	95% Gamma Adjusted KM-UCL (use when n<50)	3.711
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Approximate Test Statistic	0.924	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	4.6504E-5	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.155	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.0974	Detected Data Not Lognormal at 5% Significance Level	
Detected Data Not Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	1.446	Mean in Log Scale	-2.358
SD in Original Scale	6.639	SD in Log Scale	1.98
95% t UCL (assumes normality of ROS data)	2.583	95% Percentile Bootstrap UCL	2.673
95% BCA Bootstrap UCL	3.191	95% Bootstrap t UCL	5.82
95% H-UCL (Log ROS)	1.344		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-2.331	KM Geo Mean	0.0972
KM SD (logged)	1.931	95% Critical H Value (KM-Log)	3.313
KM Standard Error of Mean (logged)	0.203	95% H-UCL (KM -Log)	1.217
KM SD (logged)	1.931	95% Critical H Value (KM-Log)	3.313
KM Standard Error of Mean (logged)	0.203		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	1.446	Mean in Log Scale	-2.315
SD in Original Scale	6.639	SD in Log Scale	1.91
95% t UCL (Assumes normality)	2.583	95% H-Stat UCL	1.173
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution at 5% Significance Level			
Suggested UCL to Use			
95% KM (Chebyshev) UCL	4.433		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Chrysene			
General Statistics			

Total Number of Observations	94	Number of Distinct Observations	64
		Number of Missing Observations	42
Number of Detects	93	Number of Non-Detects	1
Number of Distinct Detects	63	Number of Distinct Non-Detects	1
Minimum Detect	0.0078	Minimum Non-Detect	0.01
Maximum Detect	110	Maximum Non-Detect	0.01
Variance Detects	299.5	Percent Non-Detects	1.064%
Mean Detects	3.905	SD Detects	17.31
Median Detects	0.22	CV Detects	4.431
Skewness Detects	5.572	Kurtosis Detects	31.28
Mean of Logged Detects	-1.375	SD of Logged Detects	1.918
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.24	**Normal GOF Test on Detected Observations Only**	
5% Shapiro Wilk P Value	0	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.443	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.0921	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	3.864	KM Standard Error of Mean	1.776
KM SD	17.12	95% KM (BCA) UCL	7.258
95% KM (t) UCL	6.814	95% KM (Percentile Bootstrap) UCL	7.075
95% KM (z) UCL	6.785	95% KM Bootstrap t UCL	11.05
90% KM Chebyshev UCL	9.192	95% KM Chebyshev UCL	11.6
97.5% KM Chebyshev UCL	14.95	99% KM Chebyshev UCL	21.53
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	13.19	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.888	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.295	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.102	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.258	k star (bias corrected MLE)	0.257
Theta hat (MLE)	15.13	Theta star (bias corrected MLE)	15.2
nu hat (MLE)	48.01	nu star (bias corrected)	47.79
Mean (detects)	3.905		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.0078	Mean	3.864
Maximum	110	Median	0.22
SD	17.22	CV	4.456
k hat (MLE)	0.256	k star (bias corrected MLE)	0.255
Theta hat (MLE)	15.08	Theta star (bias corrected MLE)	15.15

nu hat (MLE)	48.17	nu star (bias corrected)	47.96
Adjusted Level of Significance (β)	0.0474		
Approximate Chi Square Value (47.96, α)	33.07	Adjusted Chi Square Value (47.96, β)	32.87
95% Gamma Approximate UCL (use when n>=50)	5.605	95% Gamma Adjusted UCL (use when n<50)	5.637
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	3.864	SD (KM)	17.12
Variance (KM)	293.3	SE of Mean (KM)	1.776
k hat (KM)	0.0509	k star (KM)	0.0564
nu hat (KM)	9.571	nu star (KM)	10.6
theta hat (KM)	75.9	theta star (KM)	68.54
80% gamma percentile (KM)	0.777	90% gamma percentile (KM)	6.81
95% gamma percentile (KM)	21.33	99% gamma percentile (KM)	80.04
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (10.60, α)	4.32	Adjusted Chi Square Value (10.60, β)	4.257
95% Gamma Approximate KM-UCL (use when n>=50)	9.481	95% Gamma Adjusted KM-UCL (use when n<50)	9.62
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Approximate Test Statistic	0.934	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	1.2238E-4	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.115	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.0921	Detected Data Not Lognormal at 5% Significance Level	
Detected Data Not Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	3.864	Mean in Log Scale	-1.421
SD in Original Scale	17.22	SD in Log Scale	1.957
95% t UCL (assumes normality of ROS data)	6.814	95% Percentile Bootstrap UCL	7.17
95% BCA Bootstrap UCL	8.366	95% Bootstrap t UCL	14.23
95% H-UCL (Log ROS)	3.237		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-1.412	KM Geo Mean	0.244
KM SD (logged)	1.931	95% Critical H Value (KM-Log)	3.313
KM Standard Error of Mean (logged)	0.2	95% H-UCL (KM -Log)	3.049
KM SD (logged)	1.931	95% Critical H Value (KM-Log)	3.313
KM Standard Error of Mean (logged)	0.2		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	3.864	Mean in Log Scale	-1.417
SD in Original Scale	17.22	SD in Log Scale	1.95
95% t UCL (Assumes normality)	6.814	95% H-Stat UCL	3.189
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution at 5% Significance Level			
Suggested UCL to Use			
95% KM (Chebyshev) UCL	11.6		

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

BenzoAPyrene

General Statistics

Total Number of Observations	94	Number of Distinct Observations	66
		Number of Missing Observations	42
Number of Detects	89	Number of Non-Detects	5
Number of Distinct Detects	64	Number of Distinct Non-Detects	2
Minimum Detect	0.0066	Minimum Non-Detect	0.011
Maximum Detect	100	Maximum Non-Detect	0.012
Variance Detects	179.8	Percent Non-Detects	5.319%
Mean Detects	2.829	SD Detects	13.41
Median Detects	0.2	CV Detects	4.74
Skewness Detects	6.289	Kurtosis Detects	40.75
Mean of Logged Detects	-1.552	SD of Logged Detects	1.789

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.228	**Normal GOF Test on Detected Observations Only**
5% Shapiro Wilk P Value	0	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.45	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.0941	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	2.679	KM Standard Error of Mean	1.347
KM SD	12.99	95% KM (BCA) UCL	5.491
95% KM (t) UCL	4.917	95% KM (Percentile Bootstrap) UCL	5.137
95% KM (z) UCL	4.895	95% KM Bootstrap t UCL	12.51
90% KM Chebyshev UCL	6.721	95% KM Chebyshev UCL	8.552
97.5% KM Chebyshev UCL	11.09	99% KM Chebyshev UCL	16.08

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	13.27	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.882	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.32	**Kolmogorov-Smirnov GOF**
5% K-S Critical Value	0.103	Detected Data Not Gamma Distributed at 5% Significance Level

Detected Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	0.271	k star (bias corrected MLE)	0.269
Theta hat (MLE)	10.46	Theta star (bias corrected MLE)	10.52
nu hat (MLE)	48.15	nu star (bias corrected)	47.86
Mean (detects)	2.829		

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.0066	Mean	2.679
Maximum	100	Median	0.18
SD	13.06	CV	4.875
k hat (MLE)	0.261	k star (bias corrected MLE)	0.26
Theta hat (MLE)	10.26	Theta star (bias corrected MLE)	10.31
nu hat (MLE)	49.1	nu star (bias corrected)	48.87
Adjusted Level of Significance (β)	0.0474		
Approximate Chi Square Value (48.87, α)	33.82	Adjusted Chi Square Value (48.87, β)	33.63
95% Gamma Approximate UCL (use when n>=50)	3.871	95% Gamma Adjusted UCL (use when n<50)	3.893
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	2.679	SD (KM)	12.99
Variance (KM)	168.7	SE of Mean (KM)	1.347
k hat (KM)	0.0425	k star (KM)	0.0483
nu hat (KM)	7.995	nu star (KM)	9.073
theta hat (KM)	62.99	theta star (KM)	55.5
80% gamma percentile (KM)	0.32	90% gamma percentile (KM)	3.899
95% gamma percentile (KM)	14.06	99% gamma percentile (KM)	59.08
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (9.07, α)	3.371	Adjusted Chi Square Value (9.07, β)	3.317
95% Gamma Approximate KM-UCL (use when n>=50)	7.209	95% Gamma Adjusted KM-UCL (use when n<50)	7.327
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Approximate Test Statistic	0.932	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	1.2572E-4	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.128	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.0941	Detected Data Not Lognormal at 5% Significance Level	
Detected Data Not Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	2.679	Mean in Log Scale	-1.752
SD in Original Scale	13.06	SD in Log Scale	1.938
95% t UCL (assumes normality of ROS data)	4.916	95% Percentile Bootstrap UCL	5.104
95% BCA Bootstrap UCL	6.119	95% Bootstrap t UCL	12.66
95% H-UCL (Log ROS)	2.213		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-1.732	KM Geo Mean	0.177
KM SD (logged)	1.891	95% Critical H Value (KM-Log)	3.262
KM Standard Error of Mean (logged)	0.196	95% H-UCL (KM -Log)	2.003
KM SD (logged)	1.891	95% Critical H Value (KM-Log)	3.262
KM Standard Error of Mean (logged)	0.196		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	2.679	Mean in Log Scale	-1.746

SD in Original Scale	13.06	SD in Log Scale	1.924
95% t UCL (Assumes normality)	4.916	95% H-Stat UCL	2.148
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution at 5% Significance Level			
Suggested UCL to Use			
95% KM (Chebyshev) UCL	8.552		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
DibenzAHAnthracene			
General Statistics			
Total Number of Observations	94	Number of Distinct Observations	67
		Number of Missing Observations	42
Number of Detects	76	Number of Non-Detects	18
Number of Distinct Detects	63	Number of Distinct Non-Detects	7
Minimum Detect	0.0017	Minimum Non-Detect	0.0016
Maximum Detect	21	Maximum Non-Detect	0.022
Variance Detects	10.98	Percent Non-Detects	19.15%
Mean Detects	0.833	SD Detects	3.314
Median Detects	0.061	CV Detects	3.976
Skewness Detects	5.422	Kurtosis Detects	29.88
Mean of Logged Detects	-2.552	SD of Logged Detects	1.828
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.271	**Normal GOF Test on Detected Observations Only**	
5% Shapiro Wilk P Value	0	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.417	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.102	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.675	KM Standard Error of Mean	0.309
KM SD	2.978	95% KM (BCA) UCL	1.227
95% KM (t) UCL	1.189	95% KM (Percentile Bootstrap) UCL	1.255
95% KM (z) UCL	1.184	95% KM Bootstrap t UCL	2.542
90% KM Chebyshev UCL	1.603	95% KM Chebyshev UCL	2.023
97.5% KM Chebyshev UCL	2.606	99% KM Chebyshev UCL	3.751
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	9.802	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.869	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.303	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.111	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			

Gamma Statistics on Detected Data Only			
k hat (MLE)	0.292	k star (bias corrected MLE)	0.289
Theta hat (MLE)	2.852	Theta star (bias corrected MLE)	2.879
nu hat (MLE)	44.42	nu star (bias corrected)	44
Mean (detects)	0.833		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.0017	Mean	0.676
Maximum	21	Median	0.0415
SD	2.994	CV	4.43
k hat (MLE)	0.274	k star (bias corrected MLE)	0.272
Theta hat (MLE)	2.466	Theta star (bias corrected MLE)	2.481
nu hat (MLE)	51.53	nu star (bias corrected)	51.22
Adjusted Level of Significance (β)	0.0474		
Approximate Chi Square Value (51.22, α)	35.78	Adjusted Chi Square Value (51.22, β)	35.58
95% Gamma Approximate UCL (use when n>=50)	0.967	95% Gamma Adjusted UCL (use when n<50)	0.973
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.675	SD (KM)	2.978
Variance (KM)	8.867	SE of Mean (KM)	0.309
k hat (KM)	0.0514	k star (KM)	0.0569
nu hat (KM)	9.666	nu star (KM)	10.69
theta hat (KM)	13.13	theta star (KM)	11.87
80% gamma percentile (KM)	0.139	90% gamma percentile (KM)	1.201
95% gamma percentile (KM)	3.736	99% gamma percentile (KM)	13.94
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (10.69, α)	4.378	Adjusted Chi Square Value (10.69, β)	4.315
95% Gamma Approximate KM-UCL (use when n>=50)	1.649	95% Gamma Adjusted KM-UCL (use when n<50)	1.673
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Approximate Test Statistic	0.939	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	0.00187	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.14	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.102	Detected Data Not Lognormal at 5% Significance Level	
Detected Data Not Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.675	Mean in Log Scale	-3.158
SD in Original Scale	2.994	SD in Log Scale	2.109
95% t UCL (assumes normality of ROS data)	1.188	95% Percentile Bootstrap UCL	1.247
95% BCA Bootstrap UCL	1.479	95% Bootstrap t UCL	2.56
95% H-UCL (Log ROS)	0.851		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			

KM Mean (logged)	-3.09	KM Geo Mean	0.0455
KM SD (logged)	2.015	95% Critical H Value (KM-Log)	3.42
KM Standard Error of Mean (logged)	0.215	95% H-UCL (KM -Log)	0.708
KM SD (logged)	2.015	95% Critical H Value (KM-Log)	3.42
KM Standard Error of Mean (logged)	0.215		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.675	Mean in Log Scale	-3.028
SD in Original Scale	2.994	SD in Log Scale	1.957
95% t UCL (Assumes normality)	1.188	95% H-Stat UCL	0.647

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution at 5% Significance Level

Suggested UCL to Use

95% KM (Chebyshev) UCL	2.023		

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

BenzoAAnthracene

General Statistics

Total Number of Observations	94	Number of Distinct Observations	66
		Number of Missing Observations	42
Number of Detects	86	Number of Non-Detects	8
Number of Distinct Detects	63	Number of Distinct Non-Detects	4
Minimum Detect	0.005	Minimum Non-Detect	0.03
Maximum Detect	100	Maximum Non-Detect	0.034
Variance Detects	211.4	Percent Non-Detects	8.511%
Mean Detects	3.031	SD Detects	14.54
Median Detects	0.16	CV Detects	4.797
Skewness Detects	6.091	Kurtosis Detects	37.34
Mean of Logged Detects	-1.67	SD of Logged Detects	1.82

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.222	**Normal GOF Test on Detected Observations Only**	
5% Shapiro Wilk P Value	0	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.451	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.0957	Detected Data Not Normal at 5% Significance Level	

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	2.775	KM Standard Error of Mean	1.437
KM SD	13.85	95% KM (BCA) UCL	5.374
95% KM (t) UCL	5.162	95% KM (Percentile Bootstrap) UCL	5.5
95% KM (z) UCL	5.138	95% KM Bootstrap t UCL	15.16

90% KM Chebyshev UCL	7.086	95% KM Chebyshev UCL	9.039
97.5% KM Chebyshev UCL	11.75	99% KM Chebyshev UCL	17.07
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	14.05	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.889	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.328	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.106	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.255	k star (bias corrected MLE)	0.254
Theta hat (MLE)	11.89	Theta star (bias corrected MLE)	11.95
nu hat (MLE)	43.83	nu star (bias corrected)	43.64
Mean (detects)	3.031		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.005	Mean	2.774
Maximum	100	Median	0.15
SD	13.93	CV	5.02
k hat (MLE)	0.243	k star (bias corrected MLE)	0.242
Theta hat (MLE)	11.43	Theta star (bias corrected MLE)	11.46
nu hat (MLE)	45.64	nu star (bias corrected)	45.51
Adjusted Level of Significance (β)	0.0474		
Approximate Chi Square Value (45.51, α)	31.04	Adjusted Chi Square Value (45.51, β)	30.85
95% Gamma Approximate UCL (use when n>=50)	4.068	95% Gamma Adjusted UCL (use when n<50)	4.093
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	2.775	SD (KM)	13.85
Variance (KM)	191.9	SE of Mean (KM)	1.437
k hat (KM)	0.0401	k star (KM)	0.0459
nu hat (KM)	7.543	nu star (KM)	8.636
theta hat (KM)	69.15	theta star (KM)	60.4
80% gamma percentile (KM)	0.275	90% gamma percentile (KM)	3.765
95% gamma percentile (KM)	14.27	99% gamma percentile (KM)	62.37
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (8.64, α)	3.108	Adjusted Chi Square Value (8.64, β)	3.057
95% Gamma Approximate KM-UCL (use when n>=50)	7.708	95% Gamma Adjusted KM-UCL (use when n<50)	7.838
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Approximate Test Statistic	0.918	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	9.9692E-6	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.129	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.0957	Detected Data Not Lognormal at 5% Significance Level	
Detected Data Not Lognormal at 5% Significance Level			

Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	2.774	Mean in Log Scale	-1.916
SD in Original Scale	13.93	SD in Log Scale	1.924
95% t UCL (assumes normality of ROS data)	5.161	95% Percentile Bootstrap UCL	5.274
95% BCA Bootstrap UCL	6.587	95% Bootstrap t UCL	13.23
95% H-UCL (Log ROS)	1.812		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-1.894	KM Geo Mean	0.15
KM SD (logged)	1.889	95% Critical H Value (KM-Log)	3.26
KM Standard Error of Mean (logged)	0.198	95% H-UCL (KM -Log)	1.697
KM SD (logged)	1.889	95% Critical H Value (KM-Log)	3.26
KM Standard Error of Mean (logged)	0.198		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	2.775	Mean in Log Scale	-1.882
SD in Original Scale	13.93	SD in Log Scale	1.875
95% t UCL (Assumes normality)	5.161	95% H-Stat UCL	1.66
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution at 5% Significance Level			
Suggested UCL to Use			
95% KM (Chebyshev) UCL	9.039		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Cyanide			
General Statistics			
Total Number of Observations	94	Number of Distinct Observations	63
		Number of Missing Observations	42
Number of Detects	64	Number of Non-Detects	30
Number of Distinct Detects	49	Number of Distinct Non-Detects	20
Minimum Detect	0.016	Minimum Non-Detect	0.015
Maximum Detect	1.4	Maximum Non-Detect	0.089
Variance Detects	0.0545	Percent Non-Detects	31.91%
Mean Detects	0.181	SD Detects	0.233
Median Detects	0.096	CV Detects	1.289
Skewness Detects	3	Kurtosis Detects	11.73
Mean of Logged Detects	-2.28	SD of Logged Detects	1.061
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.673	**Normal GOF Test on Detected Observations Only**	
5% Shapiro Wilk P Value	0	Detected Data Not Normal at 5% Significance Level	

Lilliefors Test Statistic	0.26	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.111	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.132	KM Standard Error of Mean	0.0213
KM SD	0.204	95% KM (BCA) UCL	0.171
95% KM (t) UCL	0.167	95% KM (Percentile Bootstrap) UCL	0.169
95% KM (z) UCL	0.167	95% KM Bootstrap t UCL	0.179
90% KM Chebyshev UCL	0.196	95% KM Chebyshev UCL	0.225
97.5% KM Chebyshev UCL	0.265	99% KM Chebyshev UCL	0.344
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	1.567	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.779	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.173	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.115	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	1.008	k star (bias corrected MLE)	0.971
Theta hat (MLE)	0.18	Theta star (bias corrected MLE)	0.186
nu hat (MLE)	129.1	nu star (bias corrected)	124.3
Mean (detects)	0.181		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	0.127
Maximum	1.4	Median	0.0505
SD	0.208	CV	1.646
k hat (MLE)	0.641	k star (bias corrected MLE)	0.627
Theta hat (MLE)	0.197	Theta star (bias corrected MLE)	0.202
nu hat (MLE)	120.5	nu star (bias corrected)	118
Adjusted Level of Significance (β)	0.0474		
Approximate Chi Square Value (117.96, α)	93.88	Adjusted Chi Square Value (117.96, β)	93.55
95% Gamma Approximate UCL (use when n>=50)	0.159	95% Gamma Adjusted UCL (use when n<50)	0.16
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.132	SD (KM)	0.204
Variance (KM)	0.0418	SE of Mean (KM)	0.0213
k hat (KM)	0.417	k star (KM)	0.41
nu hat (KM)	78.34	nu star (KM)	77.17
theta hat (KM)	0.317	theta star (KM)	0.321
80% gamma percentile (KM)	0.214	90% gamma percentile (KM)	0.371
95% gamma percentile (KM)	0.543	99% gamma percentile (KM)	0.975
Gamma Kaplan-Meier (KM) Statistics			

Approximate Chi Square Value (77.17, α)	57.93	Adjusted Chi Square Value (77.17, β)	57.67
95% Gamma Approximate KM-UCL (use when n>=50)	0.176	95% Gamma Adjusted KM-UCL (use when n<50)	0.177
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Approximate Test Statistic	0.964	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	0.146	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.0975	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.111	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.13	Mean in Log Scale	-2.821
SD in Original Scale	0.206	SD in Log Scale	1.227
95% t UCL (assumes normality of ROS data)	0.166	95% Percentile Bootstrap UCL	0.165
95% BCA Bootstrap UCL	0.174	95% Bootstrap t UCL	0.177
95% H-UCL (Log ROS)	0.173		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-2.749	KM Geo Mean	0.064
KM SD (logged)	1.14	95% Critical H Value (KM-Log)	2.39
KM Standard Error of Mean (logged)	0.123	95% H-UCL (KM -Log)	0.163
KM SD (logged)	1.14	95% Critical H Value (KM-Log)	2.39
KM Standard Error of Mean (logged)	0.123		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.132	Mean in Log Scale	-2.739
SD in Original Scale	0.205	SD in Log Scale	1.153
95% t UCL (Assumes normality)	0.167	95% H-Stat UCL	0.167
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Lognormal Distributed at 5% Significance Level			
Suggested UCL to Use			
KM H-UCL	0.163		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Aluminum			
General Statistics			
Total Number of Observations	94	Number of Distinct Observations	79
		Number of Missing Observations	42
Minimum	4500	Mean	13802
Maximum	36800	Median	12700
SD	5164	Std. Error of Mean	532.6

Coefficient of Variation	0.374	Skewness	1.277
Normal GOF Test			
Shapiro Wilk Test Statistic	0.929	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	3.3583E-5	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.123	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.0916	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	14687	95% Adjusted-CLT UCL (Chen-1995)	14753
		95% Modified-t UCL (Johnson-1978)	14698
Gamma GOF Test			
A-D Test Statistic	0.503	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.753	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.0805	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.0923	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	7.912	k star (bias corrected MLE)	7.667
Theta hat (MLE)	1744	Theta star (bias corrected MLE)	1800
nu hat (MLE)	1487	nu star (bias corrected)	1441
MLE Mean (bias corrected)	13802	MLE Sd (bias corrected)	4985
		Approximate Chi Square Value (0.05)	1354
Adjusted Level of Significance	0.0474	Adjusted Chi Square Value	1353
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50)	14690	95% Adjusted Gamma UCL (use when n<50)	14704
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.988	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk P Value	0.892	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.0566	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.0916	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	8.412	Mean of logged Data	9.468
Maximum of Logged Data	10.51	SD of logged Data	0.362
Assuming Lognormal Distribution			
95% H-UCL	14766	90% Chebyshev (MVUE) UCL	15396
95% Chebyshev (MVUE) UCL	16117	97.5% Chebyshev (MVUE) UCL	17117
99% Chebyshev (MVUE) UCL	19082		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			

Nonparametric Distribution Free UCLs			
95% CLT UCL	14678	95% Jackknife UCL	14687
95% Standard Bootstrap UCL	14677	95% Bootstrap-t UCL	14726
95% Hall's Bootstrap UCL	14822	95% Percentile Bootstrap UCL	14706
95% BCA Bootstrap UCL	14730		
90% Chebyshev(Mean, Sd) UCL	15400	95% Chebyshev(Mean, Sd) UCL	16124
97.5% Chebyshev(Mean, Sd) UCL	17128	99% Chebyshev(Mean, Sd) UCL	19101

Suggested UCL to Use			
95% Approximate Gamma UCL	14690		

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Iron

General Statistics			
Total Number of Observations	94	Number of Distinct Observations	67
		Number of Missing Observations	42
Minimum	2940	Mean	14887
Maximum	37100	Median	14100
SD	4233	Std. Error of Mean	436.6
Coefficient of Variation	0.284	Skewness	1.333

Normal GOF Test		
Shapiro Wilk Test Statistic	0.91	**Shapiro Wilk GOF Test**
5% Shapiro Wilk P Value	3.5620E-7	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.0977	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.0916	Data Not Normal at 5% Significance Level
Data Not Normal at 5% Significance Level		

Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	15613	95% Adjusted-CLT UCL (Chen-1995)	15670
		95% Modified-t UCL (Johnson-1978)	15623

Gamma GOF Test		
A-D Test Statistic	2.139	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.752	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.124	**Kolmogorov-Smirnov Gamma GOF Test**
5% K-S Critical Value	0.0922	Data Not Gamma Distributed at 5% Significance Level
Data Not Gamma Distributed at 5% Significance Level		

Gamma Statistics			
k hat (MLE)	11.65	k star (bias corrected MLE)	11.28
Theta hat (MLE)	1278	Theta star (bias corrected MLE)	1320
nu hat (MLE)	2189	nu star (bias corrected)	2121
MLE Mean (bias corrected)	14887	MLE Sd (bias corrected)	4433

		Approximate Chi Square Value (0.05)	2015
Adjusted Level of Significance	0.0474	Adjusted Chi Square Value	2013
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	15671	95% Adjusted Gamma UCL (use when n<50)	15683
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.852	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk P Value	1.580E-13	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.149	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.0916	Data Not Lognormal at 5% Significance Level	
Data Not Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	7.986	Mean of logged Data	9.565
Maximum of Logged Data	10.52	SD of logged Data	0.319
Assuming Lognormal Distribution			
95% H-UCL	15892	90% Chebyshev (MVUE) UCL	16502
95% Chebyshev (MVUE) UCL	17188	97.5% Chebyshev (MVUE) UCL	18139
99% Chebyshev (MVUE) UCL	20008		
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution (0.05)			
Nonparametric Distribution Free UCLs			
95% CLT UCL	15606	95% Jackknife UCL	15613
95% Standard Bootstrap UCL	15593	95% Bootstrap-t UCL	15706
95% Hall's Bootstrap UCL	15786	95% Percentile Bootstrap UCL	15608
95% BCA Bootstrap UCL	15687		
90% Chebyshev(Mean, Sd) UCL	16197	95% Chebyshev(Mean, Sd) UCL	16790
97.5% Chebyshev(Mean, Sd) UCL	17614	99% Chebyshev(Mean, Sd) UCL	19231
Suggested UCL to Use			
95% Student's-t UCL	15613	or 95% Modified-t UCL	15623
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Manganese			
General Statistics			
Total Number of Observations	94	Number of Distinct Observations	84
		Number of Missing Observations	42
Minimum	129	Mean	448.2
Maximum	1140	Median	420
SD	178.3	Std. Error of Mean	18.39
Coefficient of Variation	0.398	Skewness	1.769

Normal GOF Test			
Shapiro Wilk Test Statistic	0.838	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	4.996E-15	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.169	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.0916	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	478.8	95% Adjusted-CLT UCL (Chen-1995)	482
		95% Modified-t UCL (Johnson-1978)	479.3
Gamma GOF Test			
A-D Test Statistic	2.387	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.753	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.118	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.0924	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	7.654	k star (bias corrected MLE)	7.416
Theta hat (MLE)	58.56	Theta star (bias corrected MLE)	60.44
nu hat (MLE)	1439	nu star (bias corrected)	1394
MLE Mean (bias corrected)	448.2	MLE Sd (bias corrected)	164.6
		Approximate Chi Square Value (0.05)	1309
Adjusted Level of Significance	0.0474	Adjusted Chi Square Value	1307
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	477.6	95% Adjusted Gamma UCL (use when n<50)	478
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.946	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk P Value	0.0017	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.115	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.0916	Data Not Lognormal at 5% Significance Level	
Data Not Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	4.86	Mean of logged Data	6.039
Maximum of Logged Data	7.039	SD of logged Data	0.364
Assuming Lognormal Distribution			
95% H-UCL	478.9	90% Chebyshev (MVUE) UCL	499.4
95% Chebyshev (MVUE) UCL	522.9	97.5% Chebyshev (MVUE) UCL	555.5
99% Chebyshev (MVUE) UCL	619.5		
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution (0.05)			
Nonparametric Distribution Free UCLs			

95% CLT UCL	478.5	95% Jackknife UCL	478.8
95% Standard Bootstrap UCL	478.1	95% Bootstrap-t UCL	482.8
95% Hall's Bootstrap UCL	482.8	95% Percentile Bootstrap UCL	477.9
95% BCA Bootstrap UCL	480.7		
90% Chebyshev(Mean, Sd) UCL	503.4	95% Chebyshev(Mean, Sd) UCL	528.4
97.5% Chebyshev(Mean, Sd) UCL	563	99% Chebyshev(Mean, Sd) UCL	631.2
Suggested UCL to Use			
95% Student's-t UCL	478.8	or 95% Modified-t UCL	479.3
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Mercury			
General Statistics			
Total Number of Observations	94	Number of Distinct Observations	31
		Number of Missing Observations	42
Number of Detects	77	Number of Non-Detects	17
Number of Distinct Detects	29	Number of Distinct Non-Detects	7
Minimum Detect	0.011	Minimum Non-Detect	0.0096
Maximum Detect	0.076	Maximum Non-Detect	0.015
Variance Detects	1.1122E-4	Percent Non-Detects	18.09%
Mean Detects	0.0237	SD Detects	0.0105
Median Detects	0.022	CV Detects	0.444
Skewness Detects	2.7	Kurtosis Detects	10.22
Mean of Logged Detects	-3.811	SD of Logged Detects	0.357
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.771	**Normal GOF Test on Detected Observations Only**	
5% Shapiro Wilk P Value	1.110E-16	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.207	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.101	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.0213	KM Standard Error of Mean	0.00113
KM SD	0.0109	95% KM (BCA) UCL	0.0235
95% KM (t) UCL	0.0231	95% KM (Percentile Bootstrap) UCL	0.0233
95% KM (z) UCL	0.0231	95% KM Bootstrap t UCL	0.0234
90% KM Chebyshev UCL	0.0247	95% KM Chebyshev UCL	0.0262
97.5% KM Chebyshev UCL	0.0283	99% KM Chebyshev UCL	0.0325
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	1.423	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.753	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.147	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.102	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			

Gamma Statistics on Detected Data Only			
k hat (MLE)	7.285	k star (bias corrected MLE)	7.01
Theta hat (MLE)	0.00326	Theta star (bias corrected MLE)	0.00339
nu hat (MLE)	1122	nu star (bias corrected)	1079
Mean (detects)	0.0237		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	0.0213
Maximum	0.076	Median	0.02
SD	0.0109	CV	0.514
k hat (MLE)	5.001	k star (bias corrected MLE)	4.848
Theta hat (MLE)	0.00425	Theta star (bias corrected MLE)	0.00438
nu hat (MLE)	940.1	nu star (bias corrected)	911.5
Adjusted Level of Significance (β)	0.0474		
Approximate Chi Square Value (911.47, α)	842.4	Adjusted Chi Square Value (911.47, β)	841.4
95% Gamma Approximate UCL (use when n>=50)	0.023	95% Gamma Adjusted UCL (use when n<50)	0.023
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.0213	SD (KM)	0.0109
Variance (KM)	1.1773E-4	SE of Mean (KM)	0.00113
k hat (KM)	3.843	k star (KM)	3.727
nu hat (KM)	722.5	nu star (KM)	700.7
theta hat (KM)	0.00554	theta star (KM)	0.00571
80% gamma percentile (KM)	0.0296	90% gamma percentile (KM)	0.036
95% gamma percentile (KM)	0.042	99% gamma percentile (KM)	0.0548
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (700.73, α)	640.3	Adjusted Chi Square Value (700.73, β)	639.4
95% Gamma Approximate KM-UCL (use when n>=50)	0.0233	95% Gamma Adjusted KM-UCL (use when n<50)	0.0233
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Approximate Test Statistic	0.955	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	0.0248	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.118	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.101	Detected Data Not Lognormal at 5% Significance Level	
Detected Data Not Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.0213	Mean in Log Scale	-3.95
SD in Original Scale	0.0109	SD in Log Scale	0.442
95% t UCL (assumes normality of ROS data)	0.0232	95% Percentile Bootstrap UCL	0.0234
95% BCA Bootstrap UCL	0.0235	95% Bootstrap t UCL	0.0235
95% H-UCL (Log ROS)	0.0231		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			

KM Mean (logged)	-3.954	KM Geo Mean	0.0192
KM SD (logged)	0.444	95% Critical H Value (KM-Log)	1.817
KM Standard Error of Mean (logged)	0.0463	95% H-UCL (KM -Log)	0.023
KM SD (logged)	0.444	95% Critical H Value (KM-Log)	1.817
KM Standard Error of Mean (logged)	0.0463		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.0206	Mean in Log Scale	-4.043
SD in Original Scale	0.0117	SD in Log Scale	0.595
95% t UCL (Assumes normality)	0.0226	95% H-Stat UCL	0.0236

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution at 5% Significance Level

Suggested UCL to Use

95% KM (t) UCL	0.0231	KM H-UCL	0.023
95% KM (BCA) UCL	0.0235		

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Nickel

General Statistics

Total Number of Observations	94	Number of Distinct Observations	79
		Number of Missing Observations	42
Minimum	4.9	Mean	25.56
Maximum	534	Median	14
SD	60.6	Std. Error of Mean	6.251
Coefficient of Variation	2.371	Skewness	7.277

Normal GOF Test

Shapiro Wilk Test Statistic	0.261	**Shapiro Wilk GOF Test**
5% Shapiro Wilk P Value	0	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.384	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.0916	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	35.94	95% Adjusted-CLT UCL (Chen-1995)	40.85
		95% Modified-t UCL (Johnson-1978)	36.73

Gamma GOF Test

A-D Test Statistic	13.46	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.777	Data Not Gamma Distributed at 5% Significance Level

K-S Test Statistic	0.287	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.0946	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	1.238	k star (bias corrected MLE)	1.206
Theta hat (MLE)	20.65	Theta star (bias corrected MLE)	21.2
nu hat (MLE)	232.7	nu star (bias corrected)	226.6
MLE Mean (bias corrected)	25.56	MLE Sd (bias corrected)	23.28
		Approximate Chi Square Value (0.05)	192.8
Adjusted Level of Significance	0.0474	Adjusted Chi Square Value	192.3
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	30.05	95% Adjusted Gamma UCL (use when n<50)	30.12
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.769	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk P Value	0	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.169	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.0916	Data Not Lognormal at 5% Significance Level	
Data Not Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	1.589	Mean of logged Data	2.786
Maximum of Logged Data	6.28	SD of logged Data	0.659
Assuming Lognormal Distribution			
95% H-UCL	23.06	90% Chebyshev (MVUE) UCL	24.57
95% Chebyshev (MVUE) UCL	26.6	97.5% Chebyshev (MVUE) UCL	29.42
99% Chebyshev (MVUE) UCL	34.95		
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution (0.05)			
Nonparametric Distribution Free UCLs			
95% CLT UCL	35.84	95% Jackknife UCL	35.94
95% Standard Bootstrap UCL	35.64	95% Bootstrap-t UCL	72.16
95% Hall's Bootstrap UCL	75.64	95% Percentile Bootstrap UCL	36.94
95% BCA Bootstrap UCL	44.2		
90% Chebyshev(Mean, Sd) UCL	44.31	95% Chebyshev(Mean, Sd) UCL	52.8
97.5% Chebyshev(Mean, Sd) UCL	64.59	99% Chebyshev(Mean, Sd) UCL	87.75
Suggested UCL to Use			
95% Chebyshev (Mean, Sd) UCL	52.8		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Thallium			

General Statistics			
Total Number of Observations	94	Number of Distinct Observations	12
		Number of Missing Observations	42
Number of Detects	12	Number of Non-Detects	82
Number of Distinct Detects	5	Number of Distinct Non-Detects	10
Minimum Detect	0.13	Minimum Non-Detect	0.099
Maximum Detect	1.1	Maximum Non-Detect	0.18
Variance Detects	0.119	Percent Non-Detects	87.23%
Mean Detects	0.285	SD Detects	0.345
Median Detects	0.14	CV Detects	1.211
Skewness Detects	2.099	Kurtosis Detects	2.969
Mean of Logged Detects	-1.648	SD of Logged Detects	0.78
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.495	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.859	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.486	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.243	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.125	KM Standard Error of Mean	0.0144
KM SD	0.133	95% KM (BCA) UCL	0.161
95% KM (t) UCL	0.149	95% KM (Percentile Bootstrap) UCL	0.152
95% KM (z) UCL	0.149	95% KM Bootstrap t UCL	0.275
90% KM Chebyshev UCL	0.168	95% KM Chebyshev UCL	0.188
97.5% KM Chebyshev UCL	0.215	99% KM Chebyshev UCL	0.268
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	3.145	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.747	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.487	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.25	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	1.415	k star (bias corrected MLE)	1.117
Theta hat (MLE)	0.201	Theta star (bias corrected MLE)	0.255
nu hat (MLE)	33.97	nu star (bias corrected)	26.81
Mean (detects)	0.285		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	0.0461
Maximum	1.1	Median	0.01
SD	0.15	CV	3.26

k hat (MLE)	0.555	k star (bias corrected MLE)	0.544
Theta hat (MLE)	0.0831	Theta star (bias corrected MLE)	0.0847
nu hat (MLE)	104.3	nu star (bias corrected)	102.3
Adjusted Level of Significance (β)	0.0474		
Approximate Chi Square Value (102.35, α)	80	Adjusted Chi Square Value (102.35, β)	79.7
95% Gamma Approximate UCL (use when n>=50)	0.059	95% Gamma Adjusted UCL (use when n<50)	0.0592
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.125	SD (KM)	0.133
Variance (KM)	0.0178	SE of Mean (KM)	0.0144
k hat (KM)	0.88	k star (KM)	0.859
nu hat (KM)	165.4	nu star (KM)	161.4
theta hat (KM)	0.142	theta star (KM)	0.146
80% gamma percentile (KM)	0.203	90% gamma percentile (KM)	0.299
95% gamma percentile (KM)	0.395	99% gamma percentile (KM)	0.622
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (161.44, α)	133.1	Adjusted Chi Square Value (161.44, β)	132.7
95% Gamma Approximate KM-UCL (use when n>=50)	0.152	95% Gamma Adjusted KM-UCL (use when n<50)	0.152
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.518	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.859	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.458	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.243	Detected Data Not Lognormal at 5% Significance Level	
Detected Data Not Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.0603	Mean in Log Scale	-3.696
SD in Original Scale	0.149	SD in Log Scale	1.214
95% t UCL (assumes normality of ROS data)	0.0858	95% Percentile Bootstrap UCL	0.0872
95% BCA Bootstrap UCL	0.101	95% Bootstrap t UCL	0.144
95% H-UCL (Log ROS)	0.0707		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-2.209	KM Geo Mean	0.11
KM SD (logged)	0.35	95% Critical H Value (KM-Log)	1.768
KM Standard Error of Mean (logged)	0.0391	95% H-UCL (KM -Log)	0.125
KM SD (logged)	0.35	95% Critical H Value (KM-Log)	1.768
KM Standard Error of Mean (logged)	0.0391		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.0966	Mean in Log Scale	-2.55
SD in Original Scale	0.139	SD in Log Scale	0.456
95% t UCL (Assumes normality)	0.12	95% H-Stat UCL	0.0944
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution at 5% Significance Level			

Suggested UCL to Use			
95% KM (Chebyshev) UCL	0.188		

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Antimony

General Statistics			
Total Number of Observations	94	Number of Distinct Observations	28
		Number of Missing Observations	42
Number of Detects	4	Number of Non-Detects	90
Number of Distinct Detects	4	Number of Distinct Non-Detects	25
Minimum Detect	0.37	Minimum Non-Detect	0.23
Maximum Detect	1.5	Maximum Non-Detect	0.49
Variance Detects	0.28	Percent Non-Detects	95.74%
Mean Detects	0.91	SD Detects	0.529
Median Detects	0.885	CV Detects	0.581
Skewness Detects	0.149	Kurtosis Detects	-3.85
Mean of Logged Detects	-0.242	SD of Logged Detects	0.65

Normal GOF Test on Detects Only		
Shapiro Wilk Test Statistic	0.927	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.748	Detected Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.24	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.375	Detected Data appear Normal at 5% Significance Level

Detected Data appear Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.26	KM Standard Error of Mean	0.0199
KM SD	0.167	95% KM (BCA) UCL	N/A
95% KM (t) UCL	0.293	95% KM (Percentile Bootstrap) UCL	N/A
95% KM (z) UCL	0.292	95% KM Bootstrap t UCL	N/A
90% KM Chebyshev UCL	0.319	95% KM Chebyshev UCL	0.346
97.5% KM Chebyshev UCL	0.384	99% KM Chebyshev UCL	0.458

Gamma GOF Tests on Detected Observations Only		
A-D Test Statistic	0.317	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.659	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.264	**Kolmogorov-Smirnov GOF**
5% K-S Critical Value	0.396	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only			
k hat (MLE)	3.54	k star (bias corrected MLE)	1.052
Theta hat (MLE)	0.257	Theta star (bias corrected MLE)	0.865
nu hat (MLE)	28.32	nu star (bias corrected)	8.414
Mean (detects)	0.91		

Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	0.0483
Maximum	1.5	Median	0.01
SD	0.206	CV	4.262
k hat (MLE)	0.463	k star (bias corrected MLE)	0.455
Theta hat (MLE)	0.104	Theta star (bias corrected MLE)	0.106
nu hat (MLE)	87.01	nu star (bias corrected)	85.56
Adjusted Level of Significance (β)	0.0474		
Approximate Chi Square Value (85.56, α)	65.24	Adjusted Chi Square Value (85.56, β)	64.97
95% Gamma Approximate UCL (use when n>=50)	0.0633	95% Gamma Adjusted UCL (use when n<50)	N/A
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.26	SD (KM)	0.167
Variance (KM)	0.0278	SE of Mean (KM)	0.0199
k hat (KM)	2.422	k star (KM)	2.352
nu hat (KM)	455.3	nu star (KM)	442.1
theta hat (KM)	0.107	theta star (KM)	0.11
80% gamma percentile (KM)	0.381	90% gamma percentile (KM)	0.486
95% gamma percentile (KM)	0.585	99% gamma percentile (KM)	0.804
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (442.09, α)	394.3	Adjusted Chi Square Value (442.09, β)	393.6
95% Gamma Approximate KM-UCL (use when n>=50)	0.291	95% Gamma Adjusted KM-UCL (use when n<50)	0.292
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.932	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.748	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.243	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.375	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.0517	Mean in Log Scale	-4.891
SD in Original Scale	0.206	SD in Log Scale	1.667
95% t UCL (assumes normality of ROS data)	0.087	95% Percentile Bootstrap UCL	0.0883
95% BCA Bootstrap UCL	0.111	95% Bootstrap t UCL	0.152
95% H-UCL (Log ROS)	0.0505		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-1.415	KM Geo Mean	0.243
KM SD (logged)	0.275	95% Critical H Value (KM-Log)	1.734
KM Standard Error of Mean (logged)	0.0331	95% H-UCL (KM -Log)	0.265
KM SD (logged)	0.275	95% Critical H Value (KM-Log)	1.734
KM Standard Error of Mean (logged)	0.0331		
DL/2 Statistics			

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	0.206	Mean in Log Scale	-1.694
SD in Original Scale	0.179	SD in Log Scale	0.367
95% t UCL (Assumes normality)	0.237	95% H-Stat UCL	0.21
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Normal Distributed at 5% Significance Level			
Suggested UCL to Use			
95% KM (t) UCL	0.293		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Arsenic			
General Statistics			
Total Number of Observations	94	Number of Distinct Observations	57
		Number of Missing Observations	42
Minimum	2.8	Mean	6.367
Maximum	17.9	Median	5.7
SD	2.691	Std. Error of Mean	0.278
Coefficient of Variation	0.423	Skewness	1.859
Normal GOF Test			
Shapiro Wilk Test Statistic	0.845	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	2.742E-14	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.163	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.0916	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	6.828	95% Adjusted-CLT UCL (Chen-1995)	6.88
		95% Modified-t UCL (Johnson-1978)	6.837
Gamma GOF Test			
A-D Test Statistic	1.382	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.754	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.117	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.0924	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	7.166	k star (bias corrected MLE)	6.944
Theta hat (MLE)	0.889	Theta star (bias corrected MLE)	0.917
nu hat (MLE)	1347	nu star (bias corrected)	1305

MLE Mean (bias corrected)	6.367	MLE Sd (bias corrected)	2.416
		Approximate Chi Square Value (0.05)	1223
Adjusted Level of Significance	0.0474	Adjusted Chi Square Value	1221
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	6.799	95% Adjusted Gamma UCL (use when n<50)	6.806
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.967	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk P Value	0.0954	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.0896	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.0916	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	1.03	Mean of logged Data	1.78
Maximum of Logged Data	2.885	SD of logged Data	0.366
Assuming Lognormal Distribution			
95% H-UCL	6.782	90% Chebyshev (MVUE) UCL	7.075
95% Chebyshev (MVUE) UCL	7.41	97.5% Chebyshev (MVUE) UCL	7.875
99% Chebyshev (MVUE) UCL	8.789		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	6.824	95% Jackknife UCL	6.828
95% Standard Bootstrap UCL	6.817	95% Bootstrap-t UCL	6.85
95% Hall's Bootstrap UCL	6.888	95% Percentile Bootstrap UCL	6.849
95% BCA Bootstrap UCL	6.886		
90% Chebyshev(Mean, Sd) UCL	7.2	95% Chebyshev(Mean, Sd) UCL	7.577
97.5% Chebyshev(Mean, Sd) UCL	8.1	99% Chebyshev(Mean, Sd) UCL	9.128
Suggested UCL to Use			
95% Student's-t UCL	6.828	or 95% Modified-t UCL	6.837
or 95% H-UCL	6.782		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
ProUCL computes and outputs H-statistic based UCLs for historical reasons only.			
H-statistic often results in unstable (both high and low) values of UCL95 as shown in examples in the Technical Guide.			
It is therefore recommended to avoid the use of H-statistic based 95% UCLs.			
Use of nonparametric methods are preferred to compute UCL95 for skewed data sets which do not follow a gamma distribution.			
Barium			

General Statistics			
Total Number of Observations	94	Number of Distinct Observations	85
		Number of Missing Observations	42
Minimum	40.7	Mean	137.2
Maximum	436	Median	104
SD	90.5	Std. Error of Mean	9.334
Coefficient of Variation	0.66	Skewness	1.691
Normal GOF Test			
Shapiro Wilk Test Statistic	0.785	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	0	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.206	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.0916	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	152.7	95% Adjusted-CLT UCL (Chen-1995)	154.3
		95% Modified-t UCL (Johnson-1978)	153
Gamma GOF Test			
A-D Test Statistic	3.025	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.758	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.158	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.0929	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	3.165	k star (bias corrected MLE)	3.071
Theta hat (MLE)	43.34	Theta star (bias corrected MLE)	44.67
nu hat (MLE)	595.1	nu star (bias corrected)	577.4
MLE Mean (bias corrected)	137.2	MLE Sd (bias corrected)	78.29
		Approximate Chi Square Value (0.05)	522.7
Adjusted Level of Significance	0.0474	Adjusted Chi Square Value	521.9
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	151.6	95% Adjusted Gamma UCL (use when n<50)	151.8
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.937	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk P Value	2.1320E-4	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.122	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.0916	Data Not Lognormal at 5% Significance Level	
Data Not Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	3.706	Mean of logged Data	4.755
Maximum of Logged Data	6.078	SD of logged Data	0.551
Assuming Lognormal Distribution			
95% H-UCL	150.6	90% Chebyshev (MVUE) UCL	159.6

95% Chebyshev (MVUE) UCL	170.7	97.5% Chebyshev (MVUE) UCL	186.2
99% Chebyshev (MVUE) UCL	216.5		

Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution (0.05)

Nonparametric Distribution Free UCLs

95% CLT UCL	152.5	95% Jackknife UCL	152.7
95% Standard Bootstrap UCL	152	95% Bootstrap-t UCL	155.1
95% Hall's Bootstrap UCL	153.8	95% Percentile Bootstrap UCL	151.9
95% BCA Bootstrap UCL	154.8		
90% Chebyshev(Mean, Sd) UCL	165.2	95% Chebyshev(Mean, Sd) UCL	177.9
97.5% Chebyshev(Mean, Sd) UCL	195.5	99% Chebyshev(Mean, Sd) UCL	230.1

Suggested UCL to Use

95% Chebyshev (Mean, Sd) UCL	177.9		

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

ChromiumVI_EST

General Statistics

Total Number of Observations	94	Number of Distinct Observations	53
		Number of Missing Observations	42
Minimum	0.0642	Mean	0.297
Maximum	2.27	Median	0.268
SD	0.218	Std. Error of Mean	0.0225
Coefficient of Variation	0.732	Skewness	8.13

Normal GOF Test

Shapiro Wilk Test Statistic	0.369	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	0	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.292	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.0916	Data Not Normal at 5% Significance Level	

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	0.335	95% Adjusted-CLT UCL (Chen-1995)	0.355
		95% Modified-t UCL (Johnson-1978)	0.338

Gamma GOF Test

A-D Test Statistic	6.392	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.754	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.181	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.0925	Data Not Gamma Distributed at 5% Significance Level	

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics			
k hat (MLE)	5.705	k star (bias corrected MLE)	5.53
Theta hat (MLE)	0.0521	Theta star (bias corrected MLE)	0.0538
nu hat (MLE)	1073	nu star (bias corrected)	1040
MLE Mean (bias corrected)	0.297	MLE Sd (bias corrected)	0.126
		Approximate Chi Square Value (0.05)	965.8
Adjusted Level of Significance	0.0474	Adjusted Chi Square Value	964.7
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	0.32	95% Adjusted Gamma UCL (use when n<50)	0.321
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.82	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk P Value	0	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.154	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.0916	Data Not Lognormal at 5% Significance Level	
Data Not Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	-2.745	Mean of logged Data	-1.303
Maximum of Logged Data	0.82	SD of logged Data	0.372
Assuming Lognormal Distribution			
95% H-UCL	0.312	90% Chebyshev (MVUE) UCL	0.326
95% Chebyshev (MVUE) UCL	0.341	97.5% Chebyshev (MVUE) UCL	0.363
99% Chebyshev (MVUE) UCL	0.406		
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution (0.05)			
Nonparametric Distribution Free UCLs			
95% CLT UCL	0.334	95% Jackknife UCL	0.335
95% Standard Bootstrap UCL	0.336	95% Bootstrap-t UCL	0.389
95% Hall's Bootstrap UCL	0.489	95% Percentile Bootstrap UCL	0.337
95% BCA Bootstrap UCL	0.373		
90% Chebyshev(Mean, Sd) UCL	0.365	95% Chebyshev(Mean, Sd) UCL	0.395
97.5% Chebyshev(Mean, Sd) UCL	0.438	99% Chebyshev(Mean, Sd) UCL	0.521
Suggested UCL to Use			
95% Student's-t UCL	0.335	or 95% Modified-t UCL	0.338
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Cobalt			
General Statistics			

Total Number of Observations	94	Number of Distinct Observations	37
		Number of Missing Observations	42
Minimum	1.5	Mean	5.59
Maximum	13	Median	5.5
SD	1.576	Std. Error of Mean	0.163
Coefficient of Variation	0.282	Skewness	1.685
Normal GOF Test			
Shapiro Wilk Test Statistic	0.869	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	1.072E-11	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.155	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.0916	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	5.861	95% Adjusted-CLT UCL (Chen-1995)	5.888
		95% Modified-t UCL (Johnson-1978)	5.865
Gamma GOF Test			
A-D Test Statistic	2.18	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.751	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.127	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.0922	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	13.34	k star (bias corrected MLE)	12.93
Theta hat (MLE)	0.419	Theta star (bias corrected MLE)	0.433
nu hat (MLE)	2509	nu star (bias corrected)	2430
MLE Mean (bias corrected)	5.59	MLE Sd (bias corrected)	1.555
		Approximate Chi Square Value (0.05)	2316
Adjusted Level of Significance	0.0474	Adjusted Chi Square Value	2315
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	5.864	95% Adjusted Gamma UCL (use when n<50)	5.869
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.896	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk P Value	1.0290E-8	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.123	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.0916	Data Not Lognormal at 5% Significance Level	
Data Not Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	0.405	Mean of logged Data	1.683
Maximum of Logged Data	2.565	SD of logged Data	0.285
Assuming Lognormal Distribution			
95% H-UCL	5.902	90% Chebyshev (MVUE) UCL	6.107
95% Chebyshev (MVUE) UCL	6.335	97.5% Chebyshev (MVUE) UCL	6.652

99% Chebyshev (MVUE) UCL	7.273		
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution (0.05)			
Nonparametric Distribution Free UCLs			
95% CLT UCL	5.858	95% Jackknife UCL	5.861
95% Standard Bootstrap UCL	5.847	95% Bootstrap-t UCL	5.894
95% Hall's Bootstrap UCL	5.932	95% Percentile Bootstrap UCL	5.849
95% BCA Bootstrap UCL	5.881		
90% Chebyshev(Mean, Sd) UCL	6.078	95% Chebyshev(Mean, Sd) UCL	6.299
97.5% Chebyshev(Mean, Sd) UCL	6.606	99% Chebyshev(Mean, Sd) UCL	7.208
Suggested UCL to Use			
95% Student's-t UCL	5.861	or 95% Modified-t UCL	5.865
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Copper			
General Statistics			
Total Number of Observations	94	Number of Distinct Observations	66
		Number of Missing Observations	42
Minimum	5.9	Mean	92.64
Maximum	7260	Median	13.9
SD	747.2	Std. Error of Mean	77.07
Coefficient of Variation	8.066	Skewness	9.694
Normal GOF Test			
Shapiro Wilk Test Statistic	0.109	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	0	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.507	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.0916	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	220.7	95% Adjusted-CLT UCL (Chen-1995)	301.8
		95% Modified-t UCL (Johnson-1978)	233.5
Gamma GOF Test			
A-D Test Statistic	29.34	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.851	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.458	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.0993	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			

Gamma Statistics			
k hat (MLE)	0.369	k star (bias corrected MLE)	0.365
Theta hat (MLE)	250.8	Theta star (bias corrected MLE)	254
nu hat (MLE)	69.44	nu star (bias corrected)	68.56
MLE Mean (bias corrected)	92.64	MLE Sd (bias corrected)	153.4
		Approximate Chi Square Value (0.05)	50.5
Adjusted Level of Significance	0.0474	Adjusted Chi Square Value	50.26
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	125.8	95% Adjusted Gamma UCL (use when n<50)	126.4
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.57	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk P Value	0	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.213	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.0916	Data Not Lognormal at 5% Significance Level	
Data Not Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	1.775	Mean of logged Data	2.724
Maximum of Logged Data	8.89	SD of logged Data	0.755
Assuming Lognormal Distribution			
95% H-UCL	23.8	90% Chebyshev (MVUE) UCL	25.47
95% Chebyshev (MVUE) UCL	27.86	97.5% Chebyshev (MVUE) UCL	31.18
99% Chebyshev (MVUE) UCL	37.7		
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution (0.05)			
Nonparametric Distribution Free UCLs			
95% CLT UCL	219.4	95% Jackknife UCL	220.7
95% Standard Bootstrap UCL	215.7	95% Bootstrap-t UCL	9950
95% Hall's Bootstrap UCL	3687	95% Percentile Bootstrap UCL	246.7
95% BCA Bootstrap UCL	325		
90% Chebyshev(Mean, Sd) UCL	323.9	95% Chebyshev(Mean, Sd) UCL	428.6
97.5% Chebyshev(Mean, Sd) UCL	574	99% Chebyshev(Mean, Sd) UCL	859.5
Suggested UCL to Use			
95% Chebyshev (Mean, Sd) UCL	428.6		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Vanadium			
General Statistics			
Total Number of Observations	94	Number of Distinct Observations	73

		Number of Missing Observations	42
Minimum	3	Mean	14.76
Maximum	151	Median	11.4
SD	18.19	Std. Error of Mean	1.876
Coefficient of Variation	1.233	Skewness	6.332
Normal GOF Test			
Shapiro Wilk Test Statistic	0.356	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	0	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.304	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.0916	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	17.88	95% Adjusted-CLT UCL (Chen-1995)	19.15
		95% Modified-t UCL (Johnson-1978)	18.08
Gamma GOF Test			
A-D Test Statistic	6.945	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.762	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.202	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.0932	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	2.556	k star (bias corrected MLE)	2.481
Theta hat (MLE)	5.775	Theta star (bias corrected MLE)	5.948
nu hat (MLE)	480.5	nu star (bias corrected)	466.5
MLE Mean (bias corrected)	14.76	MLE Sd (bias corrected)	9.369
		Approximate Chi Square Value (0.05)	417.4
Adjusted Level of Significance	0.0474	Adjusted Chi Square Value	416.7
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	16.49	95% Adjusted Gamma UCL (use when n<50)	16.52
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.867	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk P Value	8.073E-12	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.125	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.0916	Data Not Lognormal at 5% Significance Level	
Data Not Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	1.099	Mean of logged Data	2.484
Maximum of Logged Data	5.017	SD of logged Data	0.521
Assuming Lognormal Distribution			
95% H-UCL	15.18	90% Chebyshev (MVUE) UCL	16.04
95% Chebyshev (MVUE) UCL	17.1	97.5% Chebyshev (MVUE) UCL	18.57
99% Chebyshev (MVUE) UCL	21.46		

Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution (0.05)			
Nonparametric Distribution Free UCLs			
95% CLT UCL	17.84	95% Jackknife UCL	17.88
95% Standard Bootstrap UCL	17.82	95% Bootstrap-t UCL	25.84
95% Hall's Bootstrap UCL	34.41	95% Percentile Bootstrap UCL	18.11
95% BCA Bootstrap UCL	19.42		
90% Chebyshev(Mean, Sd) UCL	20.39	95% Chebyshev(Mean, Sd) UCL	22.94
97.5% Chebyshev(Mean, Sd) UCL	26.48	99% Chebyshev(Mean, Sd) UCL	33.43
Suggested UCL to Use			
95% Chebyshev (Mean, Sd) UCL	22.94		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Zinc			
General Statistics			
Total Number of Observations	94	Number of Distinct Observations	77
		Number of Missing Observations	42
Minimum	28.7	Mean	50.59
Maximum	114	Median	45.35
SD	18.36	Std. Error of Mean	1.894
Coefficient of Variation	0.363	Skewness	1.849
Normal GOF Test			
Shapiro Wilk Test Statistic	0.813	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	0	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.158	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.0916	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	53.74	95% Adjusted-CLT UCL (Chen-1995)	54.09
		95% Modified-t UCL (Johnson-1978)	53.8
Gamma GOF Test			
A-D Test Statistic	2.079	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.752	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.13	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.0922	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			

k hat (MLE)	9.76	k star (bias corrected MLE)	9.455
Theta hat (MLE)	5.184	Theta star (bias corrected MLE)	5.351
nu hat (MLE)	1835	nu star (bias corrected)	1778
MLE Mean (bias corrected)	50.59	MLE Sd (bias corrected)	16.45
		Approximate Chi Square Value (0.05)	1681
Adjusted Level of Significance	0.0474	Adjusted Chi Square Value	1679
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	53.51	95% Adjusted Gamma UCL (use when n<50)	53.56
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.932	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk P Value	6.6125E-5	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.11	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.0916	Data Not Lognormal at 5% Significance Level	
Data Not Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	3.357	Mean of logged Data	3.872
Maximum of Logged Data	4.736	SD of logged Data	0.31
Assuming Lognormal Distribution			
95% H-UCL	53.31	90% Chebyshev (MVUE) UCL	55.31
95% Chebyshev (MVUE) UCL	57.55	97.5% Chebyshev (MVUE) UCL	60.65
99% Chebyshev (MVUE) UCL	66.76		
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution (0.05)			
Nonparametric Distribution Free UCLs			
95% CLT UCL	53.71	95% Jackknife UCL	53.74
95% Standard Bootstrap UCL	53.71	95% Bootstrap-t UCL	54.64
95% Hall's Bootstrap UCL	54.28	95% Percentile Bootstrap UCL	53.7
95% BCA Bootstrap UCL	54.26		
90% Chebyshev(Mean, Sd) UCL	56.27	95% Chebyshev(Mean, Sd) UCL	58.85
97.5% Chebyshev(Mean, Sd) UCL	62.42	99% Chebyshev(Mean, Sd) UCL	69.43
Suggested UCL to Use			
95% Student's-t UCL	53.74	or 95% Modified-t UCL	53.8
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Selenium			
General Statistics			
Total Number of Observations	94	Number of Distinct Observations	29
		Number of Missing Observations	42
Number of Detects	17	Number of Non-Detects	77

Number of Distinct Detects	16	Number of Distinct Non-Detects	21
Minimum Detect	0.34	Minimum Non-Detect	0.23
Maximum Detect	3	Maximum Non-Detect	0.46
Variance Detects	0.527	Percent Non-Detects	81.91%
Mean Detects	0.854	SD Detects	0.726
Median Detects	0.49	CV Detects	0.85
Skewness Detects	2.047	Kurtosis Detects	4.247
Mean of Logged Detects	-0.403	SD of Logged Detects	0.671
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.723	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.892	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.247	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.207	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.345	KM Standard Error of Mean	0.0408
KM SD	0.384	95% KM (BCA) UCL	0.447
95% KM (t) UCL	0.412	95% KM (Percentile Bootstrap) UCL	0.422
95% KM (z) UCL	0.412	95% KM Bootstrap t UCL	0.457
90% KM Chebyshev UCL	0.467	95% KM Chebyshev UCL	0.522
97.5% KM Chebyshev UCL	0.599	99% KM Chebyshev UCL	0.751
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	1.09	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.749	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.227	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.211	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	2.199	k star (bias corrected MLE)	1.85
Theta hat (MLE)	0.388	Theta star (bias corrected MLE)	0.461
nu hat (MLE)	74.77	nu star (bias corrected)	62.91
Mean (detects)	0.854		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	0.163
Maximum	3	Median	0.01
SD	0.444	CV	2.732
k hat (MLE)	0.334	k star (bias corrected MLE)	0.33
Theta hat (MLE)	0.487	Theta star (bias corrected MLE)	0.492
nu hat (MLE)	62.8	nu star (bias corrected)	62.13
Adjusted Level of Significance (β)	0.0474		
Approximate Chi Square Value (62.13, α)	45	Adjusted Chi Square Value (62.13, β)	44.77

95% Gamma Approximate UCL (use when n>=50)	0.224	95% Gamma Adjusted UCL (use when n<50)	0.226
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.345	SD (KM)	0.384
Variance (KM)	0.147	SE of Mean (KM)	0.0408
k hat (KM)	0.807	k star (KM)	0.788
nu hat (KM)	151.7	nu star (KM)	148.2
theta hat (KM)	0.427	theta star (KM)	0.437
80% gamma percentile (KM)	0.563	90% gamma percentile (KM)	0.841
95% gamma percentile (KM)	1.124	99% gamma percentile (KM)	1.792
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (148.23, α)	121.1	Adjusted Chi Square Value (148.23, β)	120.7
95% Gamma Approximate KM-UCL (use when n>=50)	0.422	95% Gamma Adjusted KM-UCL (use when n<50)	0.423
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.871	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.892	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.208	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.207	Detected Data Not Lognormal at 5% Significance Level	
Detected Data Not Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.205	Mean in Log Scale	-2.613
SD in Original Scale	0.432	SD in Log Scale	1.329
95% t UCL (assumes normality of ROS data)	0.279	95% Percentile Bootstrap UCL	0.288
95% BCA Bootstrap UCL	0.32	95% Bootstrap t UCL	0.33
95% H-UCL (Log ROS)	0.253		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-1.271	KM Geo Mean	0.281
KM SD (logged)	0.496	95% Critical H Value (KM-Log)	1.847
KM Standard Error of Mean (logged)	0.053	95% H-UCL (KM -Log)	0.349
KM SD (logged)	0.496	95% Critical H Value (KM-Log)	1.847
KM Standard Error of Mean (logged)	0.053		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.288	Mean in Log Scale	-1.564
SD in Original Scale	0.403	SD in Log Scale	0.629
95% t UCL (Assumes normality)	0.357	95% H-Stat UCL	0.289
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution at 5% Significance Level			
Suggested UCL to Use			
95% KM (Chebyshev) UCL	0.522		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Naphthalene

General Statistics

Total Number of Observations	94	Number of Distinct Observations	54
		Number of Missing Observations	42
Number of Detects	45	Number of Non-Detects	49
Number of Distinct Detects	39	Number of Distinct Non-Detects	24
Minimum Detect	0.0014	Minimum Non-Detect	0.0014
Maximum Detect	10	Maximum Non-Detect	0.088
Variance Detects	2.632	Percent Non-Detects	52.13%
Mean Detects	0.363	SD Detects	1.622
Median Detects	0.0063	CV Detects	4.471
Skewness Detects	5.4	Kurtosis Detects	30.44
Mean of Logged Detects	-4.414	SD of Logged Detects	1.983

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.249	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.945	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.465	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.131	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	0.175	KM Standard Error of Mean	0.117
KM SD	1.124	95% KM (BCA) UCL	0.384
95% KM (t) UCL	0.37	95% KM (Percentile Bootstrap) UCL	0.384
95% KM (z) UCL	0.368	95% KM Bootstrap t UCL	2.857
90% KM Chebyshev UCL	0.527	95% KM Chebyshev UCL	0.686
97.5% KM Chebyshev UCL	0.907	99% KM Chebyshev UCL	1.342

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	8.752	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.904	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.373	**Kolmogorov-Smirnov GOF**
5% K-S Critical Value	0.146	Detected Data Not Gamma Distributed at 5% Significance Level

Detected Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	0.214	k star (bias corrected MLE)	0.215
Theta hat (MLE)	1.694	Theta star (bias corrected MLE)	1.69
nu hat (MLE)	19.27	nu star (bias corrected)	19.32
Mean (detects)	0.363		

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)

For such situations, GROS method may yield incorrect values of UCLs and BTVs

This is especially true when the sample size is small.

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.0014	Mean	0.179
Maximum	10	Median	0.01
SD	1.13	CV	6.316
k hat (MLE)	0.254	k star (bias corrected MLE)	0.253
Theta hat (MLE)	0.705	Theta star (bias corrected MLE)	0.708
nu hat (MLE)	47.7	nu star (bias corrected)	47.51
Adjusted Level of Significance (β)	0.0474		
Approximate Chi Square Value (47.51, α)	32.69	Adjusted Chi Square Value (47.51, β)	32.5
95% Gamma Approximate UCL (use when n>=50)	0.26	95% Gamma Adjusted UCL (use when n<50)	0.262
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.175	SD (KM)	1.124
Variance (KM)	1.264	SE of Mean (KM)	0.117
k hat (KM)	0.0242	k star (KM)	0.0306
nu hat (KM)	4.557	nu star (KM)	5.745
theta hat (KM)	7.222	theta star (KM)	5.729
80% gamma percentile (KM)	0.00222	90% gamma percentile (KM)	0.107
95% gamma percentile (KM)	0.689	99% gamma percentile (KM)	4.497
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (5.74, α)	1.511	Adjusted Chi Square Value (5.74, β)	1.478
95% Gamma Approximate KM-UCL (use when n>=50)	0.666	95% Gamma Adjusted KM-UCL (use when n<50)	0.681
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.813	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.945	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.186	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.131	Detected Data Not Lognormal at 5% Significance Level	
Detected Data Not Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.174	Mean in Log Scale	-5.82
SD in Original Scale	1.131	SD in Log Scale	2.111
95% t UCL (assumes normality of ROS data)	0.368	95% Percentile Bootstrap UCL	0.389
95% BCA Bootstrap UCL	0.551	95% Bootstrap t UCL	2.724
95% H-UCL (Log ROS)	0.0598		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-5.305	KM Geo Mean	0.00497
KM SD (logged)	1.649	95% Critical H Value (KM-Log)	2.964
KM Standard Error of Mean (logged)	0.179	95% H-UCL (KM -Log)	0.0321
KM SD (logged)	1.649	95% Critical H Value (KM-Log)	2.964
KM Standard Error of Mean (logged)	0.179		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.176	Mean in Log Scale	-5.079
SD in Original Scale	1.13	SD in Log Scale	1.644
95% t UCL (Assumes normality)	0.37	95% H-Stat UCL	0.0398
DL/2 is not a recommended method, provided for comparisons and historical reasons			

Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution at 5% Significance Level			
Suggested UCL to Use			
95% KM (Chebyshev) UCL	0.686		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			

ProUCL Output
Central Landfill Area Soil (0-12 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

UCL Statistics for Data Sets with Non-Detects	
User Selected Options	
Date/Time of Computation	ProUCL 5.11/28/2019 10:47:46 AM
From File	20190128_CenLF_ProUCL_input_b.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

PCB1254Aroclor1254

General Statistics			
Total Number of Observations	97	Number of Distinct Observations	15
		Number of Missing Observations	81
Number of Detects	6	Number of Non-Detects	91
Number of Distinct Detects	6	Number of Distinct Non-Detects	9
Minimum Detect	0.062	Minimum Non-Detect	0.0094
Maximum Detect	1.2	Maximum Non-Detect	0.013
Variance Detects	0.227	Percent Non-Detects	93.81%
Mean Detects	0.472	SD Detects	0.476
Median Detects	0.29	CV Detects	1.009
Skewness Detects	0.876	Kurtosis Detects	-1.122
Mean of Logged Detects	-1.308	SD of Logged Detects	1.238

Normal GOF Test on Detects Only		
Shapiro Wilk Test Statistic	0.854	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.788	Detected Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.23	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.325	Detected Data appear Normal at 5% Significance Level
Detected Data appear Normal at 5% Significance Level		

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.038	KM Standard Error of Mean	0.0173
KM SD	0.155	95% KM (BCA) UCL	0.0676
95% KM (t) UCL	0.0667	95% KM (Percentile Bootstrap) UCL	0.0667
95% KM (z) UCL	0.0664	95% KM Bootstrap t UCL	0.102
90% KM Chebyshev UCL	0.0898	95% KM Chebyshev UCL	0.113
97.5% KM Chebyshev UCL	0.146	99% KM Chebyshev UCL	0.21

Gamma GOF Tests on Detected Observations Only		
A-D Test Statistic	0.323	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.715	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.189	**Kolmogorov-Smirnov GOF**
5% K-S Critical Value	0.341	Detected data appear Gamma Distributed at 5% Significance Level
Detected data appear Gamma Distributed at 5% Significance Level		

Gamma Statistics on Detected Data Only			
k hat (MLE)	1.032	k star (bias corrected MLE)	0.627
Theta hat (MLE)	0.458	Theta star (bias corrected MLE)	0.753
nu hat (MLE)	12.38	nu star (bias corrected)	7.523
Mean (detects)	0.472		

Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	0.0386
Maximum	1.2	Median	0.01
SD	0.156	CV	4.043
k hat (MLE)	0.547	k star (bias corrected MLE)	0.537
Theta hat (MLE)	0.0706	Theta star (bias corrected MLE)	0.0719
nu hat (MLE)	106.1	nu star (bias corrected)	104.1
Adjusted Level of Significance (β)	0.0475		
Approximate Chi Square Value (104.10, α)	81.56	Adjusted Chi Square Value (104.10, β)	81.26
95% Gamma Approximate UCL (use when n>=50)	0.0492	95% Gamma Adjusted UCL (use when n<50)	0.0494
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.038	SD (KM)	0.155
Variance (KM)	0.0241	SE of Mean (KM)	0.0173
k hat (KM)	0.0599	k star (KM)	0.065
nu hat (KM)	11.63	nu star (KM)	12.6
theta hat (KM)	0.634	theta star (KM)	0.585
80% gamma percentile (KM)	0.0114	90% gamma percentile (KM)	0.0771
95% gamma percentile (KM)	0.216	99% gamma percentile (KM)	0.741
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (12.60, α)	5.626	Adjusted Chi Square Value (12.60, β)	5.556
95% Gamma Approximate KM-UCL (use when n>=50)	0.0851	95% Gamma Adjusted KM-UCL (use when n<50)	0.0862
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.921	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.788	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.171	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.325	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.0303	Mean in Log Scale	-9.413
SD in Original Scale	0.158	SD in Log Scale	3.757
95% t UCL (assumes normality of ROS data)	0.0569	95% Percentile Bootstrap UCL	0.0584
95% BCA Bootstrap UCL	0.0692	95% Bootstrap t UCL	0.132
95% H-UCL (Log ROS)	0.88		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-4.459	KM Geo Mean	0.0116
KM SD (logged)	0.857	95% Critical H Value (KM-Log)	2.117
KM Standard Error of Mean (logged)	0.0953	95% H-UCL (KM -Log)	0.0201
KM SD (logged)	0.857	95% Critical H Value (KM-Log)	2.117
KM Standard Error of Mean (logged)	0.0953		

DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.034	Mean in Log Scale	-5.029
SD in Original Scale	0.157	SD in Log Scale	1.003
95% t UCL (Assumes normality)	0.0605	95% H-Stat UCL	0.0136
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Normal Distributed at 5% Significance Level			
Suggested UCL to Use			
95% KM (t) UCL	0.0667		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Bis2EthylhexylPhthalate			
General Statistics			
Total Number of Observations	153	Number of Distinct Observations	51
		Number of Missing Observations	25
Number of Detects	22	Number of Non-Detects	131
Number of Distinct Detects	19	Number of Distinct Non-Detects	37
Minimum Detect	0.025	Minimum Non-Detect	0.013
Maximum Detect	2.5	Maximum Non-Detect	1
Variance Detects	0.267	Percent Non-Detects	85.62%
Mean Detects	0.196	SD Detects	0.517
Median Detects	0.068	CV Detects	2.642
Skewness Detects	4.618	Kurtosis Detects	21.52
Mean of Logged Detects	-2.439	SD of Logged Detects	0.915
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.295	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.911	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.428	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.184	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.0406	KM Standard Error of Mean	0.0167
KM SD	0.202	95% KM (BCA) UCL	0.0747
95% KM (t) UCL	0.0683	95% KM (Percentile Bootstrap) UCL	0.0716
95% KM (z) UCL	0.0682	95% KM Bootstrap t UCL	0.184
90% KM Chebyshev UCL	0.0909	95% KM Chebyshev UCL	0.114
97.5% KM Chebyshev UCL	0.145	99% KM Chebyshev UCL	0.207
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	3.673	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.784	Detected Data Not Gamma Distributed at 5% Significance Level	

K-S Test Statistic	0.293	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.193	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.742	k star (bias corrected MLE)	0.671
Theta hat (MLE)	0.264	Theta star (bias corrected MLE)	0.292
nu hat (MLE)	32.65	nu star (bias corrected)	29.53
Mean (detects)	0.196		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	0.0367
Maximum	2.5	Median	0.01
SD	0.203	CV	5.531
k hat (MLE)	0.622	k star (bias corrected MLE)	0.614
Theta hat (MLE)	0.0591	Theta star (bias corrected MLE)	0.0598
nu hat (MLE)	190.2	nu star (bias corrected)	187.8
Adjusted Level of Significance (β)	0.0484		
Approximate Chi Square Value (187.81, α)	157.1	Adjusted Chi Square Value (187.81, β)	156.8
95% Gamma Approximate UCL (use when n>=50)	0.0439	95% Gamma Adjusted UCL (use when n<50)	0.044
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.0406	SD (KM)	0.202
Variance (KM)	0.0408	SE of Mean (KM)	0.0167
k hat (KM)	0.0404	k star (KM)	0.044
nu hat (KM)	12.38	nu star (KM)	13.47
theta hat (KM)	1.005	theta star (KM)	0.924
80% gamma percentile (KM)	0.00338	90% gamma percentile (KM)	0.0517
95% gamma percentile (KM)	0.205	99% gamma percentile (KM)	0.928
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (13.47, α)	6.208	Adjusted Chi Square Value (13.47, β)	6.161
95% Gamma Approximate KM-UCL (use when n>=50)	0.0882	95% Gamma Adjusted KM-UCL (use when n<50)	0.0888
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.765	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.911	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.192	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.184	Detected Data Not Lognormal at 5% Significance Level	
Detected Data Not Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.033	Mean in Log Scale	-5.2
SD in Original Scale	0.204	SD in Log Scale	1.561
95% t UCL (assumes normality of ROS data)	0.0602	95% Percentile Bootstrap UCL	0.0647
95% BCA Bootstrap UCL	0.0835	95% Bootstrap t UCL	0.171

95% H-UCL (Log ROS)	0.0266		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-4.028	KM Geo Mean	0.0178
KM SD (logged)	0.775	95% Critical H Value (KM-Log)	2.016
KM Standard Error of Mean (logged)	0.0677	95% H-UCL (KM -Log)	0.0273
KM SD (logged)	0.775	95% Critical H Value (KM-Log)	2.016
KM Standard Error of Mean (logged)	0.0677		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.0565	Mean in Log Scale	-3.871
SD in Original Scale	0.211	SD in Log Scale	1.12
95% t UCL (Assumes normality)	0.0847	95% H-Stat UCL	0.0482
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution at 5% Significance Level			
Suggested UCL to Use			
95% KM (Chebyshev) UCL	0.114		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Dibenzofuran			
General Statistics			
Total Number of Observations	152	Number of Distinct Observations	55
		Number of Missing Observations	26
Number of Detects	62	Number of Non-Detects	90
Number of Distinct Detects	49	Number of Distinct Non-Detects	14
Minimum Detect	0.0016	Minimum Non-Detect	0.0015
Maximum Detect	15	Maximum Non-Detect	0.054
Variance Detects	5.141	Percent Non-Detects	59.21%
Mean Detects	0.441	SD Detects	2.267
Median Detects	0.0103	CV Detects	5.139
Skewness Detects	5.747	Kurtosis Detects	33.31
Mean of Logged Detects	-4.252	SD of Logged Detects	1.832
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.209	**Normal GOF Test on Detected Observations Only**	
5% Shapiro Wilk P Value	0	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.465	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.112	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.181	KM Standard Error of Mean	0.119

KM SD	1.452	95% KM (BCA) UCL	0.41
95% KM (t) UCL	0.378	95% KM (Percentile Bootstrap) UCL	0.408
95% KM (z) UCL	0.377	95% KM Bootstrap t UCL	4.399
90% KM Chebyshev UCL	0.538	95% KM Chebyshev UCL	0.699
97.5% KM Chebyshev UCL	0.923	99% KM Chebyshev UCL	1.363
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	12.92	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.908	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.376	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.125	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.212	k star (bias corrected MLE)	0.213
Theta hat (MLE)	2.078	Theta star (bias corrected MLE)	2.073
nu hat (MLE)	26.33	nu star (bias corrected)	26.39
Mean (detects)	0.441		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.0016	Mean	0.186
Maximum	15	Median	0.01
SD	1.457	CV	7.836
k hat (MLE)	0.255	k star (bias corrected MLE)	0.254
Theta hat (MLE)	0.729	Theta star (bias corrected MLE)	0.731
nu hat (MLE)	77.47	nu star (bias corrected)	77.28
Adjusted Level of Significance (β)	0.0484		
Approximate Chi Square Value (77.28, α)	58.03	Adjusted Chi Square Value (77.28, β)	57.87
95% Gamma Approximate UCL (use when n>=50)	0.248	95% Gamma Adjusted UCL (use when n<50)	0.248
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.181	SD (KM)	1.452
Variance (KM)	2.11	SE of Mean (KM)	0.119
k hat (KM)	0.0156	k star (KM)	0.0197
nu hat (KM)	4.745	nu star (KM)	5.985
theta hat (KM)	11.63	theta star (KM)	9.218
80% gamma percentile (KM)	6.2857E-5	90% gamma percentile (KM)	0.025
95% gamma percentile (KM)	0.405	99% gamma percentile (KM)	5.08
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (5.98, α)	1.632	Adjusted Chi Square Value (5.98, β)	1.611
95% Gamma Approximate KM-UCL (use when n>=50)	0.665	95% Gamma Adjusted KM-UCL (use when n<50)	0.674
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Approximate Test Statistic	0.834	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	2.9828E-9	Detected Data Not Lognormal at 5% Significance Level	

Lilliefors Test Statistic	0.142	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.112	Detected Data Not Lognormal at 5% Significance Level	
Detected Data Not Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.181	Mean in Log Scale	-6.249
SD in Original Scale	1.457	SD in Log Scale	2.379
95% t UCL (assumes normality of ROS data)	0.376	95% Percentile Bootstrap UCL	0.412
95% BCA Bootstrap UCL	0.505	95% Bootstrap t UCL	4.589
95% H-UCL (Log ROS)	0.0678		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-5.387	KM Geo Mean	0.00458
KM SD (logged)	1.551	95% Critical H Value (KM-Log)	2.772
KM Standard Error of Mean (logged)	0.134	95% H-UCL (KM -Log)	0.0216
KM SD (logged)	1.551	95% Critical H Value (KM-Log)	2.772
KM Standard Error of Mean (logged)	0.134		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.182	Mean in Log Scale	-5.178
SD in Original Scale	1.457	SD in Log Scale	1.567
95% t UCL (Assumes normality)	0.378	95% H-Stat UCL	0.0275
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution at 5% Significance Level			
Suggested UCL to Use			
95% KM (Chebyshev) UCL	0.699		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Fluoride			
General Statistics			
Total Number of Observations	152	Number of Distinct Observations	141
		Number of Missing Observations	26
Minimum	0.35	Mean	49.98
Maximum	796	Median	17.55
SD	100.6	Std. Error of Mean	8.157
Coefficient of Variation	2.012	Skewness	4.799
Normal GOF Test			
Shapiro Wilk Test Statistic	0.476	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	0	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.311	**Lilliefors GOF Test**	

5% Lilliefors Critical Value	0.0723	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	63.48	95% Adjusted-CLT UCL (Chen-1995)	66.79
		95% Modified-t UCL (Johnson-1978)	64.01
Gamma GOF Test			
A-D Test Statistic	5.31	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.804	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.138	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.0795	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	0.667	k star (bias corrected MLE)	0.659
Theta hat (MLE)	74.9	Theta star (bias corrected MLE)	75.9
nu hat (MLE)	202.9	nu star (bias corrected)	200.2
MLE Mean (bias corrected)	49.98	MLE Sd (bias corrected)	61.59
		Approximate Chi Square Value (0.05)	168.5
Adjusted Level of Significance	0.0484	Adjusted Chi Square Value	168.2
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	59.4	95% Adjusted Gamma UCL (use when n<50)	59.5
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.987	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk P Value	0.851	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.0483	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.0723	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	-1.05	Mean of logged Data	3
Maximum of Logged Data	6.68	SD of logged Data	1.305
Assuming Lognormal Distribution			
95% H-UCL	61.42	90% Chebyshev (MVUE) UCL	66.23
95% Chebyshev (MVUE) UCL	75.13	97.5% Chebyshev (MVUE) UCL	87.48
99% Chebyshev (MVUE) UCL	111.7		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	63.4	95% Jackknife UCL	63.48
95% Standard Bootstrap UCL	63.68	95% Bootstrap-t UCL	69.13
95% Hall's Bootstrap UCL	70.46	95% Percentile Bootstrap UCL	63.53
95% BCA Bootstrap UCL	68.75		
90% Chebyshev(Mean, Sd) UCL	74.46	95% Chebyshev(Mean, Sd) UCL	85.54

97.5% Chebyshev(Mean, Sd) UCL	100.9	99% Chebyshev(Mean, Sd) UCL	131.1
Suggested UCL to Use			
95% H-UCL	61.42		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
ProUCL computes and outputs H-statistic based UCLs for historical reasons only.			
H-statistic often results in unstable (both high and low) values of UCL95 as shown in examples in the Technical Guide.			
It is therefore recommended to avoid the use of H-statistic based 95% UCLs.			
Use of nonparametric methods are preferred to compute UCL95 for skewed data sets which do not follow a gamma distribution.			
Indeno123CDPyrene			
General Statistics			
Total Number of Observations	152	Number of Distinct Observations	93
		Number of Missing Observations	26
Number of Detects	125	Number of Non-Detects	27
Number of Distinct Detects	89	Number of Distinct Non-Detects	6
Minimum Detect	0.0022	Minimum Non-Detect	0.023
Maximum Detect	76	Maximum Non-Detect	0.031
Variance Detects	77.29	Percent Non-Detects	17.76%
Mean Detects	1.846	SD Detects	8.792
Median Detects	0.14	CV Detects	4.762
Skewness Detects	7.089	Kurtosis Detects	53.22
Mean of Logged Detects	-1.9	SD of Logged Detects	1.931
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.227	**Normal GOF Test on Detected Observations Only**	
5% Shapiro Wilk P Value	0	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.43	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.0796	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	1.52	KM Standard Error of Mean	0.649
KM SD	7.972	95% KM (BCA) UCL	2.7
95% KM (t) UCL	2.594	95% KM (Percentile Bootstrap) UCL	2.673
95% KM (z) UCL	2.588	95% KM Bootstrap t UCL	5.07
90% KM Chebyshev UCL	3.468	95% KM Chebyshev UCL	4.35
97.5% KM Chebyshev UCL	5.574	99% KM Chebyshev UCL	7.979
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	14.63	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.879	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.282	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.0906	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			

Gamma Statistics on Detected Data Only			
k hat (MLE)	0.278	k star (bias corrected MLE)	0.277
Theta hat (MLE)	6.645	Theta star (bias corrected MLE)	6.677
nu hat (MLE)	69.46	nu star (bias corrected)	69.13
Mean (detects)	1.846		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.0022	Mean	1.52
Maximum	76	Median	0.093
SD	7.998	CV	5.262
k hat (MLE)	0.253	k star (bias corrected MLE)	0.253
Theta hat (MLE)	6.003	Theta star (bias corrected MLE)	6.017
nu hat (MLE)	76.98	nu star (bias corrected)	76.8
Adjusted Level of Significance (β)	0.0484		
Approximate Chi Square Value (76.80, α)	57.61	Adjusted Chi Square Value (76.80, β)	57.45
95% Gamma Approximate UCL (use when n>=50)	2.026	95% Gamma Adjusted UCL (use when n<50)	2.032
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	1.52	SD (KM)	7.972
Variance (KM)	63.55	SE of Mean (KM)	0.649
k hat (KM)	0.0364	k star (KM)	0.04
nu hat (KM)	11.05	nu star (KM)	12.17
theta hat (KM)	41.81	theta star (KM)	37.98
80% gamma percentile (KM)	0.0836	90% gamma percentile (KM)	1.65
95% gamma percentile (KM)	7.294	99% gamma percentile (KM)	35.91
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (12.17, α)	5.337	Adjusted Chi Square Value (12.17, β)	5.294
95% Gamma Approximate KM-UCL (use when n>=50)	3.465	95% Gamma Adjusted KM-UCL (use when n<50)	3.493
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Approximate Test Statistic	0.961	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	0.0103	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.0909	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.0796	Detected Data Not Lognormal at 5% Significance Level	
Detected Data Not Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	1.52	Mean in Log Scale	-2.424
SD in Original Scale	7.998	SD in Log Scale	2.109
95% t UCL (assumes normality of ROS data)	2.594	95% Percentile Bootstrap UCL	2.73
95% BCA Bootstrap UCL	3.217	95% Bootstrap t UCL	4.938
95% H-UCL (Log ROS)	1.478		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			

KM Mean (logged)	-2.425	KM Geo Mean	0.0885
KM SD (logged)	2.095	95% Critical H Value (KM-Log)	3.414
KM Standard Error of Mean (logged)	0.174	95% H-UCL (KM -Log)	1.422
KM SD (logged)	2.095	95% Critical H Value (KM-Log)	3.414
KM Standard Error of Mean (logged)	0.174		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	1.52	Mean in Log Scale	-2.346
SD in Original Scale	7.998	SD in Log Scale	1.998
95% t UCL (Assumes normality)	2.594	95% H-Stat UCL	1.203

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution at 5% Significance Level

Suggested UCL to Use

95% KM (Chebyshev) UCL	4.35		

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

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General Statistics

Total Number of Observations	152	Number of Distinct Observations	89
		Number of Missing Observations	26
Number of Detects	132	Number of Non-Detects	20
Number of Distinct Detects	88	Number of Distinct Non-Detects	6
Minimum Detect	0.0033	Minimum Non-Detect	0.0018
Maximum Detect	120	Maximum Non-Detect	0.018
Variance Detects	201.4	Percent Non-Detects	13.16%
Mean Detects	2.881	SD Detects	14.19
Median Detects	0.23	CV Detects	4.925
Skewness Detects	7.064	Kurtosis Detects	52.16
Mean of Logged Detects	-1.481	SD of Logged Detects	1.916

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.215	**Normal GOF Test on Detected Observations Only**	
5% Shapiro Wilk P Value	0	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.434	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.0775	Detected Data Not Normal at 5% Significance Level	

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	2.503	KM Standard Error of Mean	1.075
KM SD	13.21	95% KM (BCA) UCL	4.42
95% KM (t) UCL	4.283	95% KM (Percentile Bootstrap) UCL	4.426
95% KM (z) UCL	4.272	95% KM Bootstrap t UCL	8.218

90% KM Chebyshev UCL	5.729	95% KM Chebyshev UCL	7.191
97.5% KM Chebyshev UCL	9.219	99% KM Chebyshev UCL	13.2
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	15.51	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.88	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.27	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.0886	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.275	k star (bias corrected MLE)	0.274
Theta hat (MLE)	10.46	Theta star (bias corrected MLE)	10.51
nu hat (MLE)	72.7	nu star (bias corrected)	72.38
Mean (detects)	2.881		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.0033	Mean	2.503
Maximum	120	Median	0.175
SD	13.25	CV	5.294
k hat (MLE)	0.252	k star (bias corrected MLE)	0.252
Theta hat (MLE)	9.917	Theta star (bias corrected MLE)	9.941
nu hat (MLE)	76.73	nu star (bias corrected)	76.55
Adjusted Level of Significance (β)	0.0484		
Approximate Chi Square Value (76.55, α)	57.4	Adjusted Chi Square Value (76.55, β)	57.24
95% Gamma Approximate UCL (use when n>=50)	3.339	95% Gamma Adjusted UCL (use when n<50)	3.348
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	2.503	SD (KM)	13.21
Variance (KM)	174.5	SE of Mean (KM)	1.075
k hat (KM)	0.0359	k star (KM)	0.0396
nu hat (KM)	10.91	nu star (KM)	12.03
theta hat (KM)	69.71	theta star (KM)	63.23
80% gamma percentile (KM)	0.131	90% gamma percentile (KM)	2.664
95% gamma percentile (KM)	11.93	99% gamma percentile (KM)	59.36
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (12.03, α)	5.249	Adjusted Chi Square Value (12.03, β)	5.206
95% Gamma Approximate KM-UCL (use when n>=50)	5.738	95% Gamma Adjusted KM-UCL (use when n<50)	5.785
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Approximate Test Statistic	0.96	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	0.00652	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.0946	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.0775	Detected Data Not Lognormal at 5% Significance Level	
Detected Data Not Lognormal at 5% Significance Level			

Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	2.503	Mean in Log Scale	-1.983
SD in Original Scale	13.25	SD in Log Scale	2.223
95% t UCL (assumes normality of ROS data)	4.282	95% Percentile Bootstrap UCL	4.56
95% BCA Bootstrap UCL	5.3	95% Bootstrap t UCL	7.327
95% H-UCL (Log ROS)	3.11		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-1.955	KM Geo Mean	0.142
KM SD (logged)	2.171	95% Critical H Value (KM-Log)	3.508
KM Standard Error of Mean (logged)	0.18	95% H-UCL (KM -Log)	2.779
KM SD (logged)	2.171	95% Critical H Value (KM-Log)	3.508
KM Standard Error of Mean (logged)	0.18		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	2.503	Mean in Log Scale	-1.95
SD in Original Scale	13.25	SD in Log Scale	2.162
95% t UCL (Assumes normality)	4.282	95% H-Stat UCL	2.722
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution at 5% Significance Level			
Suggested UCL to Use			
95% KM (Chebyshev) UCL	7.191		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
BenzoKFluoranthene			
General Statistics			
Total Number of Observations	152	Number of Distinct Observations	86
		Number of Missing Observations	26
Number of Detects	119	Number of Non-Detects	33
Number of Distinct Detects	82	Number of Distinct Non-Detects	6
Minimum Detect	0.0027	Minimum Non-Detect	0.0021
Maximum Detect	50	Maximum Non-Detect	0.02
Variance Detects	35.07	Percent Non-Detects	21.71%
Mean Detects	1.207	SD Detects	5.922
Median Detects	0.084	CV Detects	4.908
Skewness Detects	7.01	Kurtosis Detects	51.56
Mean of Logged Detects	-2.329	SD of Logged Detects	1.83
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.219	**Normal GOF Test on Detected Observations Only**	
5% Shapiro Wilk P Value	0	Detected Data Not Normal at 5% Significance Level	

Lilliefors Test Statistic	0.426	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.0816	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.946	KM Standard Error of Mean	0.427
KM SD	5.241	95% KM (BCA) UCL	1.84
95% KM (t) UCL	1.653	95% KM (Percentile Bootstrap) UCL	1.792
95% KM (z) UCL	1.648	95% KM Bootstrap t UCL	3.565
90% KM Chebyshev UCL	2.227	95% KM Chebyshev UCL	2.807
97.5% KM Chebyshev UCL	3.612	99% KM Chebyshev UCL	5.194
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	15.77	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.879	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.302	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.0922	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.277	k star (bias corrected MLE)	0.276
Theta hat (MLE)	4.349	Theta star (bias corrected MLE)	4.37
nu hat (MLE)	66.04	nu star (bias corrected)	65.71
Mean (detects)	1.207		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.0027	Mean	0.947
Maximum	50	Median	0.055
SD	5.259	CV	5.553
k hat (MLE)	0.256	k star (bias corrected MLE)	0.255
Theta hat (MLE)	3.704	Theta star (bias corrected MLE)	3.714
nu hat (MLE)	77.72	nu star (bias corrected)	77.52
Adjusted Level of Significance (β)	0.0484		
Approximate Chi Square Value (77.52, α)	58.23	Adjusted Chi Square Value (77.52, β)	58.07
95% Gamma Approximate UCL (use when n>=50)	1.26	95% Gamma Adjusted UCL (use when n<50)	1.264
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.946	SD (KM)	5.241
Variance (KM)	27.47	SE of Mean (KM)	0.427
k hat (KM)	0.0326	k star (KM)	0.0363
nu hat (KM)	9.905	nu star (KM)	11.04
theta hat (KM)	29.04	theta star (KM)	26.05
80% gamma percentile (KM)	0.0324	90% gamma percentile (KM)	0.855
95% gamma percentile (KM)	4.273	99% gamma percentile (KM)	23.09
Gamma Kaplan-Meier (KM) Statistics			

Approximate Chi Square Value (11.04, α)	4.604	Adjusted Chi Square Value (11.04, β)	4.564
95% Gamma Approximate KM-UCL (use when n>=50)	2.269	95% Gamma Adjusted KM-UCL (use when n<50)	2.289
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Approximate Test Statistic	0.947	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	2.6484E-4	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.12	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.0816	Detected Data Not Lognormal at 5% Significance Level	
Detected Data Not Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.946	Mean in Log Scale	-3.023
SD in Original Scale	5.259	SD in Log Scale	2.143
95% t UCL (assumes normality of ROS data)	1.652	95% Percentile Bootstrap UCL	1.709
95% BCA Bootstrap UCL	2.046	95% Bootstrap t UCL	3.386
95% H-UCL (Log ROS)	0.886		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-2.963	KM Geo Mean	0.0517
KM SD (logged)	2.034	95% Critical H Value (KM-Log)	3.339
KM Standard Error of Mean (logged)	0.17	95% H-UCL (KM -Log)	0.71
KM SD (logged)	2.034	95% Critical H Value (KM-Log)	3.339
KM Standard Error of Mean (logged)	0.17		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.946	Mean in Log Scale	-2.899
SD in Original Scale	5.259	SD in Log Scale	1.962
95% t UCL (Assumes normality)	1.652	95% H-Stat UCL	0.634
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution at 5% Significance Level			
Suggested UCL to Use			
95% KM (Chebyshev) UCL	2.807		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Chrysene			
General Statistics			
Total Number of Observations	152	Number of Distinct Observations	89
		Number of Missing Observations	26
Number of Detects	136	Number of Non-Detects	16
Number of Distinct Detects	84	Number of Distinct Non-Detects	8
Minimum Detect	0.0028	Minimum Non-Detect	0.0094
Maximum Detect	110	Maximum Non-Detect	0.013

Variance Detects	207.3	Percent Non-Detects	10.53%
Mean Detects	2.785	SD Detects	14.4
Median Detects	0.17	CV Detects	5.17
Skewness Detects	6.779	Kurtosis Detects	46.96
Mean of Logged Detects	-1.798	SD of Logged Detects	1.951
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.201	**Normal GOF Test on Detected Observations Only**	
5% Shapiro Wilk P Value	0	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.435	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.0763	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	2.492	KM Standard Error of Mean	1.107
KM SD	13.6	95% KM (BCA) UCL	4.438
95% KM (t) UCL	4.324	95% KM (Percentile Bootstrap) UCL	4.606
95% KM (z) UCL	4.313	95% KM Bootstrap t UCL	7.243
90% KM Chebyshev UCL	5.813	95% KM Chebyshev UCL	7.317
97.5% KM Chebyshev UCL	9.405	99% KM Chebyshev UCL	13.51
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	18.26	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.893	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.29	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.088	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.251	k star (bias corrected MLE)	0.251
Theta hat (MLE)	11.08	Theta star (bias corrected MLE)	11.1
nu hat (MLE)	68.39	nu star (bias corrected)	68.21
Mean (detects)	2.785		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.0028	Mean	2.493
Maximum	110	Median	0.13
SD	13.64	CV	5.472
k hat (MLE)	0.238	k star (bias corrected MLE)	0.238
Theta hat (MLE)	10.47	Theta star (bias corrected MLE)	10.48
nu hat (MLE)	72.37	nu star (bias corrected)	72.28
Adjusted Level of Significance (β)	0.0484		
Approximate Chi Square Value (72.28, α)	53.7	Adjusted Chi Square Value (72.28, β)	53.55
95% Gamma Approximate UCL (use when n>=50)	3.355	95% Gamma Adjusted UCL (use when n<50)	3.365
Estimates of Gamma Parameters using KM Estimates			

Mean (KM)	2.492	SD (KM)	13.6
Variance (KM)	184.9	SE of Mean (KM)	1.107
k hat (KM)	0.0336	k star (KM)	0.0373
nu hat (KM)	10.22	nu star (KM)	11.35
theta hat (KM)	74.17	theta star (KM)	66.77
80% gamma percentile (KM)	0.0981	90% gamma percentile (KM)	2.377
95% gamma percentile (KM)	11.46	99% gamma percentile (KM)	60.29
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (11.35, α)	4.801	Adjusted Chi Square Value (11.35, β)	4.76
95% Gamma Approximate KM-UCL (use when n>=50)	5.892	95% Gamma Adjusted KM-UCL (use when n<50)	5.942
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Approximate Test Statistic	0.951	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	2.8811E-4	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.0936	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.0763	Detected Data Not Lognormal at 5% Significance Level	
Detected Data Not Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	2.492	Mean in Log Scale	-2.191
SD in Original Scale	13.64	SD in Log Scale	2.179
95% t UCL (assumes normality of ROS data)	4.323	95% Percentile Bootstrap UCL	4.47
95% BCA Bootstrap UCL	5.137	95% Bootstrap t UCL	9.237
95% H-UCL (Log ROS)	2.242		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-2.15	KM Geo Mean	0.116
KM SD (logged)	2.11	95% Critical H Value (KM-Log)	3.432
KM Standard Error of Mean (logged)	0.173	95% H-UCL (KM -Log)	1.944
KM SD (logged)	2.11	95% Critical H Value (KM-Log)	3.432
KM Standard Error of Mean (logged)	0.173		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	2.492	Mean in Log Scale	-2.168
SD in Original Scale	13.64	SD in Log Scale	2.139
95% t UCL (Assumes normality)	4.323	95% H-Stat UCL	2.063
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution at 5% Significance Level			
Suggested UCL to Use			
95% KM (Chebyshev) UCL	7.317		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			

BenzoAPyrene

General Statistics			
Total Number of Observations	152	Number of Distinct Observations	93
		Number of Missing Observations	26
Number of Detects	131	Number of Non-Detects	21
Number of Distinct Detects	92	Number of Distinct Non-Detects	4
Minimum Detect	0.0019	Minimum Non-Detect	0.01
Maximum Detect	100	Maximum Non-Detect	0.014
Variance Detects	123.4	Percent Non-Detects	13.82%
Mean Detects	2.009	SD Detects	11.11
Median Detects	0.12	CV Detects	5.53
Skewness Detects	7.654	Kurtosis Detects	60.89
Mean of Logged Detects	-2.009	SD of Logged Detects	1.888

Normal GOF Test on Detects Only		
Shapiro Wilk Test Statistic	0.191	**Normal GOF Test on Detected Observations Only**
5% Shapiro Wilk P Value	0	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.449	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.0778	Detected Data Not Normal at 5% Significance Level
Detected Data Not Normal at 5% Significance Level		

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	1.732	KM Standard Error of Mean	0.838
KM SD	10.3	95% KM (BCA) UCL	3.347
95% KM (t) UCL	3.12	95% KM (Percentile Bootstrap) UCL	3.244
95% KM (z) UCL	3.111	95% KM Bootstrap t UCL	7.56
90% KM Chebyshev UCL	4.247	95% KM Chebyshev UCL	5.386
97.5% KM Chebyshev UCL	6.968	99% KM Chebyshev UCL	10.07

Gamma GOF Tests on Detected Observations Only		
A-D Test Statistic	17.53	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.888	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.299	**Kolmogorov-Smirnov GOF**
5% K-S Critical Value	0.0892	Detected Data Not Gamma Distributed at 5% Significance Level
Detected Data Not Gamma Distributed at 5% Significance Level		

Gamma Statistics on Detected Data Only			
k hat (MLE)	0.261	k star (bias corrected MLE)	0.26
Theta hat (MLE)	7.707	Theta star (bias corrected MLE)	7.734
nu hat (MLE)	68.29	nu star (bias corrected)	68.06
Mean (detects)	2.009		

Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.0019	Mean	1.733
Maximum	100	Median	0.1

SD	10.33	CV	5.962
k hat (MLE)	0.244	k star (bias corrected MLE)	0.244
Theta hat (MLE)	7.091	Theta star (bias corrected MLE)	7.104
nu hat (MLE)	74.28	nu star (bias corrected)	74.15
Adjusted Level of Significance (β)	0.0484		
Approximate Chi Square Value (74.15, α)	55.32	Adjusted Chi Square Value (74.15, β)	55.16
95% Gamma Approximate UCL (use when n>=50)	2.323	95% Gamma Adjusted UCL (use when n<50)	2.329
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	1.732	SD (KM)	10.3
Variance (KM)	106	SE of Mean (KM)	0.838
k hat (KM)	0.0283	k star (KM)	0.0321
nu hat (KM)	8.604	nu star (KM)	9.768
theta hat (KM)	61.2	theta star (KM)	53.91
80% gamma percentile (KM)	0.03	90% gamma percentile (KM)	1.195
95% gamma percentile (KM)	7.127	99% gamma percentile (KM)	43.88
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (9.77, α)	3.797	Adjusted Chi Square Value (9.77, β)	3.762
95% Gamma Approximate KM-UCL (use when n>=50)	4.456	95% Gamma Adjusted KM-UCL (use when n<50)	4.498
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Approximate Test Statistic	0.96	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	0.0056	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.082	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.0778	Detected Data Not Lognormal at 5% Significance Level	
Detected Data Not Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	1.732	Mean in Log Scale	-2.468
SD in Original Scale	10.33	SD in Log Scale	2.114
95% t UCL (assumes normality of ROS data)	3.119	95% Percentile Bootstrap UCL	3.228
95% BCA Bootstrap UCL	3.831	95% Bootstrap t UCL	7.84
95% H-UCL (Log ROS)	1.429		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-2.442	KM Geo Mean	0.087
KM SD (logged)	2.059	95% Critical H Value (KM-Log)	3.37
KM Standard Error of Mean (logged)	0.169	95% H-UCL (KM -Log)	1.276
KM SD (logged)	2.059	95% Critical H Value (KM-Log)	3.37
KM Standard Error of Mean (logged)	0.169		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	1.732	Mean in Log Scale	-2.45
SD in Original Scale	10.33	SD in Log Scale	2.071
95% t UCL (Assumes normality)	3.119	95% H-Stat UCL	1.304
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution at 5% Significance Level			

Suggested UCL to Use			
95% KM (Chebyshev) UCL	5.386		

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

DibenzAHAnthracene

General Statistics			
Total Number of Observations	152	Number of Distinct Observations	84
		Number of Missing Observations	26
Number of Detects	110	Number of Non-Detects	42
Number of Distinct Detects	82	Number of Distinct Non-Detects	9
Minimum Detect	0.0015	Minimum Non-Detect	0.0015
Maximum Detect	21	Maximum Non-Detect	0.024
Variance Detects	7.704	Percent Non-Detects	27.63%
Mean Detects	0.607	SD Detects	2.776
Median Detects	0.0425	CV Detects	4.575
Skewness Detects	6.54	Kurtosis Detects	44.1
Mean of Logged Detects	-2.936	SD of Logged Detects	1.839

Normal GOF Test on Detects Only		
Shapiro Wilk Test Statistic	0.231	**Normal GOF Test on Detected Observations Only**
5% Shapiro Wilk P Value	0	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.416	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.0848	Detected Data Not Normal at 5% Significance Level
Detected Data Not Normal at 5% Significance Level		

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.44	KM Standard Error of Mean	0.193
KM SD	2.366	95% KM (BCA) UCL	0.81
95% KM (t) UCL	0.76	95% KM (Percentile Bootstrap) UCL	0.774
95% KM (z) UCL	0.758	95% KM Bootstrap t UCL	1.402
90% KM Chebyshev UCL	1.019	95% KM Chebyshev UCL	1.281
97.5% KM Chebyshev UCL	1.644	99% KM Chebyshev UCL	2.358

Gamma GOF Tests on Detected Observations Only		
A-D Test Statistic	13.77	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.875	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.288	**Kolmogorov-Smirnov GOF**
5% K-S Critical Value	0.0946	Detected Data Not Gamma Distributed at 5% Significance Level
Detected Data Not Gamma Distributed at 5% Significance Level		

Gamma Statistics on Detected Data Only			
k hat (MLE)	0.285	k star (bias corrected MLE)	0.284
Theta hat (MLE)	2.126	Theta star (bias corrected MLE)	2.139
nu hat (MLE)	62.78	nu star (bias corrected)	62.4
Mean (detects)	0.607		

Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.0015	Mean	0.442
Maximum	21	Median	0.0235
SD	2.373	CV	5.372
k hat (MLE)	0.272	k star (bias corrected MLE)	0.271
Theta hat (MLE)	1.627	Theta star (bias corrected MLE)	1.632
nu hat (MLE)	82.57	nu star (bias corrected)	82.27
Adjusted Level of Significance (β)	0.0484		
Approximate Chi Square Value (82.27, α)	62.37	Adjusted Chi Square Value (82.27, β)	62.2
95% Gamma Approximate UCL (use when n>=50)	0.583	95% Gamma Adjusted UCL (use when n<50)	0.584
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.44	SD (KM)	2.366
Variance (KM)	5.597	SE of Mean (KM)	0.193
k hat (KM)	0.0347	k star (KM)	0.0384
nu hat (KM)	10.54	nu star (KM)	11.66
theta hat (KM)	12.71	theta star (KM)	11.48
80% gamma percentile (KM)	0.0198	90% gamma percentile (KM)	0.443
95% gamma percentile (KM)	2.061	99% gamma percentile (KM)	10.56
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (11.66, α)	5.007	Adjusted Chi Square Value (11.66, β)	4.965
95% Gamma Approximate KM-UCL (use when n>=50)	1.026	95% Gamma Adjusted KM-UCL (use when n<50)	1.035
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Approximate Test Statistic	0.948	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	7.4919E-4	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.113	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.0848	Detected Data Not Lognormal at 5% Significance Level	
Detected Data Not Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.44	Mean in Log Scale	-3.828
SD in Original Scale	2.374	SD in Log Scale	2.221
95% t UCL (assumes normality of ROS data)	0.759	95% Percentile Bootstrap UCL	0.801
95% BCA Bootstrap UCL	0.932	95% Bootstrap t UCL	1.6
95% H-UCL (Log ROS)	0.489		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-3.696	KM Geo Mean	0.0248
KM SD (logged)	2.043	95% Critical H Value (KM-Log)	3.35
KM Standard Error of Mean (logged)	0.173	95% H-UCL (KM -Log)	0.349
KM SD (logged)	2.043	95% Critical H Value (KM-Log)	3.35
KM Standard Error of Mean (logged)	0.173		

DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.441	Mean in Log Scale	-3.556
SD in Original Scale	2.373	SD in Log Scale	1.935
95% t UCL (Assumes normality)	0.76	95% H-Stat UCL	0.308
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution at 5% Significance Level			
Suggested UCL to Use			
95% KM (Chebyshev) UCL	1.281		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
BenzoAAnthracene			
General Statistics			
Total Number of Observations	152	Number of Distinct Observations	92
		Number of Missing Observations	26
Number of Detects	124	Number of Non-Detects	28
Number of Distinct Detects	86	Number of Distinct Non-Detects	7
Minimum Detect	0.0021	Minimum Non-Detect	0.029
Maximum Detect	100	Maximum Non-Detect	0.039
Variance Detects	147.9	Percent Non-Detects	18.42%
Mean Detects	2.182	SD Detects	12.16
Median Detects	0.11	CV Detects	5.576
Skewness Detects	7.347	Kurtosis Detects	54.87
Mean of Logged Detects	-2.066	SD of Logged Detects	1.888
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.186	**Normal GOF Test on Detected Observations Only**	
5% Shapiro Wilk P Value	0	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.458	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.0799	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	1.782	KM Standard Error of Mean	0.894
KM SD	10.97	95% KM (BCA) UCL	3.475
95% KM (t) UCL	3.261	95% KM (Percentile Bootstrap) UCL	3.397
95% KM (z) UCL	3.252	95% KM Bootstrap t UCL	8.714
90% KM Chebyshev UCL	4.463	95% KM Chebyshev UCL	5.677
97.5% KM Chebyshev UCL	7.363	99% KM Chebyshev UCL	10.67
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	18.43	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.893	Detected Data Not Gamma Distributed at 5% Significance Level	

K-S Test Statistic	0.307	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.0914	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.25	k star (bias corrected MLE)	0.249
Theta hat (MLE)	8.738	Theta star (bias corrected MLE)	8.761
nu hat (MLE)	61.92	nu star (bias corrected)	61.75
Mean (detects)	2.182		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.0021	Mean	1.781
Maximum	100	Median	0.084
SD	11.01	CV	6.18
k hat (MLE)	0.231	k star (bias corrected MLE)	0.231
Theta hat (MLE)	7.705	Theta star (bias corrected MLE)	7.711
nu hat (MLE)	70.29	nu star (bias corrected)	70.23
Adjusted Level of Significance (β)	0.0484		
Approximate Chi Square Value (70.23, α)	51.94	Adjusted Chi Square Value (70.23, β)	51.79
95% Gamma Approximate UCL (use when n>=50)	2.409	95% Gamma Adjusted UCL (use when n<50)	2.416
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	1.782	SD (KM)	10.97
Variance (KM)	120.4	SE of Mean (KM)	0.894
k hat (KM)	0.0264	k star (KM)	0.0302
nu hat (KM)	8.015	nu star (KM)	9.19
theta hat (KM)	67.58	theta star (KM)	58.94
80% gamma percentile (KM)	0.0211	90% gamma percentile (KM)	1.057
95% gamma percentile (KM)	6.947	99% gamma percentile (KM)	45.91
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (9.19, α)	3.442	Adjusted Chi Square Value (9.19, β)	3.408
95% Gamma Approximate KM-UCL (use when n>=50)	4.757	95% Gamma Adjusted KM-UCL (use when n<50)	4.804
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Approximate Test Statistic	0.948	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	2.4025E-4	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.092	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.0799	Detected Data Not Lognormal at 5% Significance Level	
Detected Data Not Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	1.782	Mean in Log Scale	-2.555
SD in Original Scale	11.01	SD in Log Scale	2.019
95% t UCL (assumes normality of ROS data)	3.26	95% Percentile Bootstrap UCL	3.479
95% BCA Bootstrap UCL	4.154	95% Bootstrap t UCL	8.29

95% H-UCL (Log ROS)	1.03		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-2.543	KM Geo Mean	0.0786
KM SD (logged)	1.995	95% Critical H Value (KM-Log)	3.292
KM Standard Error of Mean (logged)	0.166	95% H-UCL (KM -Log)	0.982
KM SD (logged)	1.995	95% Critical H Value (KM-Log)	3.292
KM Standard Error of Mean (logged)	0.166		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	1.782	Mean in Log Scale	-2.456
SD in Original Scale	11.01	SD in Log Scale	1.893
95% t UCL (Assumes normality)	3.26	95% H-Stat UCL	0.838
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution at 5% Significance Level			
Suggested UCL to Use			
95% KM (Chebyshev) UCL	5.677		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Cyanide			
General Statistics			
Total Number of Observations	152	Number of Distinct Observations	85
		Number of Missing Observations	26
Number of Detects	97	Number of Non-Detects	55
Number of Distinct Detects	71	Number of Distinct Non-Detects	21
Minimum Detect	0.016	Minimum Non-Detect	0.015
Maximum Detect	13	Maximum Non-Detect	0.089
Variance Detects	2.869	Percent Non-Detects	36.18%
Mean Detects	0.498	SD Detects	1.694
Median Detects	0.11	CV Detects	3.403
Skewness Detects	6.216	Kurtosis Detects	40.65
Mean of Logged Detects	-2.026	SD of Logged Detects	1.344
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.286	**Normal GOF Test on Detected Observations Only**	
5% Shapiro Wilk P Value	0	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.391	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.0902	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.326	KM Standard Error of Mean	0.111

KM SD	1.365	95% KM (BCA) UCL	0.552
95% KM (t) UCL	0.51	95% KM (Percentile Bootstrap) UCL	0.547
95% KM (z) UCL	0.509	95% KM Bootstrap t UCL	0.935
90% KM Chebyshev UCL	0.66	95% KM Chebyshev UCL	0.811
97.5% KM Chebyshev UCL	1.021	99% KM Chebyshev UCL	1.434
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	8.367	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.823	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.206	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.0963	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.481	k star (bias corrected MLE)	0.473
Theta hat (MLE)	1.034	Theta star (bias corrected MLE)	1.052
nu hat (MLE)	93.36	nu star (bias corrected)	91.81
Mean (detects)	0.498		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	0.321
Maximum	13	Median	0.0455
SD	1.371	CV	4.268
k hat (MLE)	0.366	k star (bias corrected MLE)	0.363
Theta hat (MLE)	0.877	Theta star (bias corrected MLE)	0.884
nu hat (MLE)	111.3	nu star (bias corrected)	110.4
Adjusted Level of Significance (β)	0.0484		
Approximate Chi Square Value (110.43, α)	87.18	Adjusted Chi Square Value (110.43, β)	86.98
95% Gamma Approximate UCL (use when n>=50)	0.407	95% Gamma Adjusted UCL (use when n<50)	0.408
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.326	SD (KM)	1.365
Variance (KM)	1.864	SE of Mean (KM)	0.111
k hat (KM)	0.057	k star (KM)	0.0603
nu hat (KM)	17.34	nu star (KM)	18.33
theta hat (KM)	5.717	theta star (KM)	5.408
80% gamma percentile (KM)	0.0798	90% gamma percentile (KM)	0.616
95% gamma percentile (KM)	1.829	99% gamma percentile (KM)	6.564
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (18.33, α)	9.629	Adjusted Chi Square Value (18.33, β)	9.568
95% Gamma Approximate KM-UCL (use when n>=50)	0.621	95% Gamma Adjusted KM-UCL (use when n<50)	0.625
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Approximate Test Statistic	0.935	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	9.6746E-5	Detected Data Not Lognormal at 5% Significance Level	

Lilliefors Test Statistic	0.116	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.0902	Detected Data Not Lognormal at 5% Significance Level	
Detected Data Not Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.323	Mean in Log Scale	-2.934
SD in Original Scale	1.37	SD in Log Scale	1.693
95% t UCL (assumes normality of ROS data)	0.507	95% Percentile Bootstrap UCL	0.524
95% BCA Bootstrap UCL	0.605	95% Bootstrap t UCL	0.943
95% H-UCL (Log ROS)	0.334		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-2.699	KM Geo Mean	0.0673
KM SD (logged)	1.42	95% Critical H Value (KM-Log)	2.627
KM Standard Error of Mean (logged)	0.118	95% H-UCL (KM -Log)	0.25
KM SD (logged)	1.42	95% Critical H Value (KM-Log)	2.627
KM Standard Error of Mean (logged)	0.118		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.326	Mean in Log Scale	-2.709
SD in Original Scale	1.37	SD in Log Scale	1.463
95% t UCL (Assumes normality)	0.51	95% H-Stat UCL	0.267
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution at 5% Significance Level			
Suggested UCL to Use			
95% KM (Chebyshev) UCL	0.811		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Aluminum			
General Statistics			
Total Number of Observations	152	Number of Distinct Observations	118
		Number of Missing Observations	26
Minimum	4500	Mean	12601
Maximum	36800	Median	11000
SD	5251	Std. Error of Mean	425.9
Coefficient of Variation	0.417	Skewness	1.395
Normal GOF Test			
Shapiro Wilk Test Statistic	0.898	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	7.772E-16	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.14	**Lilliefors GOF Test**	

5% Lilliefors Critical Value	0.0723	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	13306	95% Adjusted-CLT UCL (Chen-1995)	13353
		95% Modified-t UCL (Johnson-1978)	13314
Gamma GOF Test			
A-D Test Statistic	1.548	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.754	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.105	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.0761	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	6.742	k star (bias corrected MLE)	6.614
Theta hat (MLE)	1869	Theta star (bias corrected MLE)	1905
nu hat (MLE)	2050	nu star (bias corrected)	2011
MLE Mean (bias corrected)	12601	MLE Sd (bias corrected)	4900
		Approximate Chi Square Value (0.05)	1907
Adjusted Level of Significance	0.0484	Adjusted Chi Square Value	1906
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	13283	95% Adjusted Gamma UCL (use when n<50)	13289
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.978	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk P Value	0.319	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.0816	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.0723	Data Not Lognormal at 5% Significance Level	
Data appear Approximate Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	8.412	Mean of logged Data	9.366
Maximum of Logged Data	10.51	SD of logged Data	0.385
Assuming Lognormal Distribution			
95% H-UCL	13292	90% Chebyshev (MVUE) UCL	13786
95% Chebyshev (MVUE) UCL	14337	97.5% Chebyshev (MVUE) UCL	15102
99% Chebyshev (MVUE) UCL	16605		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	13302	95% Jackknife UCL	13306
95% Standard Bootstrap UCL	13306	95% Bootstrap-t UCL	13377
95% Hall's Bootstrap UCL	13345	95% Percentile Bootstrap UCL	13295
95% BCA Bootstrap UCL	13351		
90% Chebyshev(Mean, Sd) UCL	13879	95% Chebyshev(Mean, Sd) UCL	14458

97.5% Chebyshev(Mean, Sd) UCL	15261	99% Chebyshev(Mean, Sd) UCL	16839

Suggested UCL to Use

95% Student's-t UCL	13306	or 95% Modified-t UCL	13314
or 95% H-UCL	13292		

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

ProUCL computes and outputs H-statistic based UCLs for historical reasons only.

H-statistic often results in unstable (both high and low) values of UCL95 as shown in examples in the Technical Guide.

It is therefore recommended to avoid the use of H-statistic based 95% UCLs.

Use of nonparametric methods are preferred to compute UCL95 for skewed data sets which do not follow a gamma distribution.

Iron

General Statistics

Total Number of Observations	152	Number of Distinct Observations	87
		Number of Missing Observations	26
Minimum	2940	Mean	14469
Maximum	37100	Median	13800
SD	3824	Std. Error of Mean	310.1
Coefficient of Variation	0.264	Skewness	1.361

Normal GOF Test

Shapiro Wilk Test Statistic	0.928	**Shapiro Wilk GOF Test**
5% Shapiro Wilk P Value	3.8287E-9	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.114	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.0723	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	14983	95% Adjusted-CLT UCL (Chen-1995)	15016
		95% Modified-t UCL (Johnson-1978)	14988

Gamma GOF Test

A-D Test Statistic	1.925	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.751	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.0781	**Kolmogorov-Smirnov Gamma GOF Test**
5% K-S Critical Value	0.0759	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	14.11	k star (bias corrected MLE)	13.84
Theta hat (MLE)	1025	Theta star (bias corrected MLE)	1046
nu hat (MLE)	4290	nu star (bias corrected)	4207
MLE Mean (bias corrected)	14469	MLE Sd (bias corrected)	3890

		Approximate Chi Square Value (0.05)	4057
Adjusted Level of Significance	0.0484	Adjusted Chi Square Value	4056
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	15003	95% Adjusted Gamma UCL (use when n<50)	15009
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.899	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk P Value	1.554E-15	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.0978	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.0723	Data Not Lognormal at 5% Significance Level	
Data Not Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	7.986	Mean of logged Data	9.544
Maximum of Logged Data	10.52	SD of logged Data	0.282
Assuming Lognormal Distribution			
95% H-UCL	15115	90% Chebyshev (MVUE) UCL	15540
95% Chebyshev (MVUE) UCL	16000	97.5% Chebyshev (MVUE) UCL	16639
99% Chebyshev (MVUE) UCL	17894		
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution (0.05)			
Nonparametric Distribution Free UCLs			
95% CLT UCL	14980	95% Jackknife UCL	14983
95% Standard Bootstrap UCL	14980	95% Bootstrap-t UCL	15013
95% Hall's Bootstrap UCL	15055	95% Percentile Bootstrap UCL	14981
95% BCA Bootstrap UCL	15020		
90% Chebyshev(Mean, Sd) UCL	15400	95% Chebyshev(Mean, Sd) UCL	15821
97.5% Chebyshev(Mean, Sd) UCL	16406	99% Chebyshev(Mean, Sd) UCL	17555
Suggested UCL to Use			
95% Student's-t UCL	14983	or 95% Modified-t UCL	14988
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Manganese			
General Statistics			
Total Number of Observations	152	Number of Distinct Observations	125
		Number of Missing Observations	26
Minimum	129	Mean	440.7
Maximum	1570	Median	391.5
SD	190.1	Std. Error of Mean	15.42
Coefficient of Variation	0.431	Skewness	2.592

Normal GOF Test			
Shapiro Wilk Test Statistic	0.786	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	0	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.171	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.0723	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	466.2	95% Adjusted-CLT UCL (Chen-1995)	469.5
		95% Modified-t UCL (Johnson-1978)	466.8
Gamma GOF Test			
A-D Test Statistic	4.197	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.753	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.12	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.0761	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	7.436	k star (bias corrected MLE)	7.294
Theta hat (MLE)	59.26	Theta star (bias corrected MLE)	60.42
nu hat (MLE)	2261	nu star (bias corrected)	2217
MLE Mean (bias corrected)	440.7	MLE Sd (bias corrected)	163.2
		Approximate Chi Square Value (0.05)	2109
Adjusted Level of Significance	0.0484	Adjusted Chi Square Value	2108
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	463.3	95% Adjusted Gamma UCL (use when n<50)	463.6
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.952	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk P Value	1.4019E-4	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.0991	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.0723	Data Not Lognormal at 5% Significance Level	
Data Not Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	4.86	Mean of logged Data	6.02
Maximum of Logged Data	7.359	SD of logged Data	0.356
Assuming Lognormal Distribution			
95% H-UCL	461.3	90% Chebyshev (MVUE) UCL	477.4
95% Chebyshev (MVUE) UCL	495.1	97.5% Chebyshev (MVUE) UCL	519.7
99% Chebyshev (MVUE) UCL	568		
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution (0.05)			
Nonparametric Distribution Free UCLs			

95% CLT UCL	466.1	95% Jackknife UCL	466.2
95% Standard Bootstrap UCL	465.9	95% Bootstrap-t UCL	470.6
95% Hall's Bootstrap UCL	471.1	95% Percentile Bootstrap UCL	466.8
95% BCA Bootstrap UCL	468.2		
90% Chebyshev(Mean, Sd) UCL	486.9	95% Chebyshev(Mean, Sd) UCL	507.9
97.5% Chebyshev(Mean, Sd) UCL	537	99% Chebyshev(Mean, Sd) UCL	594.1

Suggested UCL to Use

95% Student's-t UCL	466.2	or 95% Modified-t UCL	466.8

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Mercury

General Statistics

Total Number of Observations	152	Number of Distinct Observations	35
		Number of Missing Observations	26
Number of Detects	126	Number of Non-Detects	26
Number of Distinct Detects	33	Number of Distinct Non-Detects	7
Minimum Detect	0.011	Minimum Non-Detect	0.0096
Maximum Detect	0.083	Maximum Non-Detect	0.015
Variance Detects	1.2351E-4	Percent Non-Detects	17.11%
Mean Detects	0.0232	SD Detects	0.0111
Median Detects	0.021	CV Detects	0.48
Skewness Detects	2.825	Kurtosis Detects	11.23
Mean of Logged Detects	-3.845	SD of Logged Detects	0.381

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.756	**Normal GOF Test on Detected Observations Only**	
5% Shapiro Wilk P Value	0	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.193	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.0793	Detected Data Not Normal at 5% Significance Level	

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	0.0209	KM Standard Error of Mean	9.1520E-4
KM SD	0.0112	95% KM (BCA) UCL	0.0227
95% KM (t) UCL	0.0224	95% KM (Percentile Bootstrap) UCL	0.0225
95% KM (z) UCL	0.0224	95% KM Bootstrap t UCL	0.0228
90% KM Chebyshev UCL	0.0237	95% KM Chebyshev UCL	0.0249
97.5% KM Chebyshev UCL	0.0266	99% KM Chebyshev UCL	0.03

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	2	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.754	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.128	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.0828	Detected Data Not Gamma Distributed at 5% Significance Level	

Detected Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only			
k hat (MLE)	6.375	k star (bias corrected MLE)	6.228
Theta hat (MLE)	0.00364	Theta star (bias corrected MLE)	0.00372
nu hat (MLE)	1606	nu star (bias corrected)	1569
Mean (detects)	0.0232		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	0.0209
Maximum	0.083	Median	0.019
SD	0.0113	CV	0.539
k hat (MLE)	4.783	k star (bias corrected MLE)	4.693
Theta hat (MLE)	0.00437	Theta star (bias corrected MLE)	0.00446
nu hat (MLE)	1454	nu star (bias corrected)	1427
Adjusted Level of Significance (β)	0.0484		
Approximate Chi Square Value (N/A, α)	1340	Adjusted Chi Square Value (N/A, β)	1339
95% Gamma Approximate UCL (use when n>=50)	0.0223	95% Gamma Adjusted UCL (use when n<50)	0.0223
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.0209	SD (KM)	0.0112
Variance (KM)	1.2615E-4	SE of Mean (KM)	9.1520E-4
k hat (KM)	3.472	k star (KM)	3.408
nu hat (KM)	1056	nu star (KM)	1036
theta hat (KM)	0.00603	theta star (KM)	0.00614
80% gamma percentile (KM)	0.0294	90% gamma percentile (KM)	0.0361
95% gamma percentile (KM)	0.0424	99% gamma percentile (KM)	0.0558
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (N/A, α)	962.4	Adjusted Chi Square Value (N/A, β)	961.7
95% Gamma Approximate KM-UCL (use when n>=50)	0.0225	95% Gamma Adjusted KM-UCL (use when n<50)	0.0225
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Approximate Test Statistic	0.947	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	1.8601E-4	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.0975	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.0793	Detected Data Not Lognormal at 5% Significance Level	
Detected Data Not Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.0208	Mean in Log Scale	-3.985
SD in Original Scale	0.0114	SD in Log Scale	0.468
95% t UCL (assumes normality of ROS data)	0.0224	95% Percentile Bootstrap UCL	0.0224
95% BCA Bootstrap UCL	0.0225	95% Bootstrap t UCL	0.0225
95% H-UCL (Log ROS)	0.0222		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			

KM Mean (logged)	-3.975	KM Geo Mean	0.0188
KM SD (logged)	0.45	95% Critical H Value (KM-Log)	1.803
KM Standard Error of Mean (logged)	0.0367	95% H-UCL (KM -Log)	0.0222
KM SD (logged)	0.45	95% Critical H Value (KM-Log)	1.803
KM Standard Error of Mean (logged)	0.0367		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.0202	Mean in Log Scale	-4.065
SD in Original Scale	0.012	SD in Log Scale	0.598
95% t UCL (Assumes normality)	0.0218	95% H-Stat UCL	0.0225

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution at 5% Significance Level

Suggested UCL to Use

95% KM (t) UCL	0.0224	KM H-UCL	0.0222
95% KM (BCA) UCL	0.0227		

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Nickel

General Statistics

Total Number of Observations	152	Number of Distinct Observations	104
		Number of Missing Observations	26
Minimum	4.9	Mean	20.51
Maximum	534	Median	12.8
SD	48.13	Std. Error of Mean	3.904
Coefficient of Variation	2.346	Skewness	9.184

Normal GOF Test

Shapiro Wilk Test Statistic	0.229	**Shapiro Wilk GOF Test**
5% Shapiro Wilk P Value	0	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.384	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.0723	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	26.97	95% Adjusted-CLT UCL (Chen-1995)	30.04
		95% Modified-t UCL (Johnson-1978)	27.46

Gamma GOF Test

A-D Test Statistic	19.39	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.771	Data Not Gamma Distributed at 5% Significance Level

K-S Test Statistic	0.254	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.0774	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	1.508	k star (bias corrected MLE)	1.483
Theta hat (MLE)	13.6	Theta star (bias corrected MLE)	13.83
nu hat (MLE)	458.5	nu star (bias corrected)	450.8
MLE Mean (bias corrected)	20.51	MLE Sd (bias corrected)	16.85
		Approximate Chi Square Value (0.05)	402.5
Adjusted Level of Significance	0.0484	Adjusted Chi Square Value	402.1
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	22.97	95% Adjusted Gamma UCL (use when n<50)	23
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.783	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk P Value	0	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.165	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.0723	Data Not Lognormal at 5% Significance Level	
Data Not Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	1.589	Mean of logged Data	2.654
Maximum of Logged Data	6.28	SD of logged Data	0.585
Assuming Lognormal Distribution			
95% H-UCL	18.44	90% Chebyshev (MVUE) UCL	19.42
95% Chebyshev (MVUE) UCL	20.59	97.5% Chebyshev (MVUE) UCL	22.21
99% Chebyshev (MVUE) UCL	25.4		
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution (0.05)			
Nonparametric Distribution Free UCLs			
95% CLT UCL	26.93	95% Jackknife UCL	26.97
95% Standard Bootstrap UCL	26.68	95% Bootstrap-t UCL	46.96
95% Hall's Bootstrap UCL	52.86	95% Percentile Bootstrap UCL	27.54
95% BCA Bootstrap UCL	31.53		
90% Chebyshev(Mean, Sd) UCL	32.22	95% Chebyshev(Mean, Sd) UCL	37.53
97.5% Chebyshev(Mean, Sd) UCL	44.89	99% Chebyshev(Mean, Sd) UCL	59.35
Suggested UCL to Use			
95% Chebyshev (Mean, Sd) UCL	37.53		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Thallium			

General Statistics			
Total Number of Observations	152	Number of Distinct Observations	15
		Number of Missing Observations	26
Number of Detects	16	Number of Non-Detects	136
Number of Distinct Detects	6	Number of Distinct Non-Detects	13
Minimum Detect	0.11	Minimum Non-Detect	0.098
Maximum Detect	1.1	Maximum Non-Detect	0.21
Variance Detects	0.0923	Percent Non-Detects	89.47%
Mean Detects	0.246	SD Detects	0.304
Median Detects	0.14	CV Detects	1.237
Skewness Detects	2.551	Kurtosis Detects	5.266
Mean of Logged Detects	-1.752	SD of Logged Detects	0.694
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.435	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.887	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.499	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.213	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.115	KM Standard Error of Mean	0.00889
KM SD	0.106	95% KM (BCA) UCL	0.134
95% KM (t) UCL	0.13	95% KM (Percentile Bootstrap) UCL	0.131
95% KM (z) UCL	0.13	95% KM Bootstrap t UCL	0.198
90% KM Chebyshev UCL	0.142	95% KM Chebyshev UCL	0.154
97.5% KM Chebyshev UCL	0.171	99% KM Chebyshev UCL	0.204
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	4.376	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.754	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.492	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.219	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	1.582	k star (bias corrected MLE)	1.327
Theta hat (MLE)	0.155	Theta star (bias corrected MLE)	0.185
nu hat (MLE)	50.62	nu star (bias corrected)	42.46
Mean (detects)	0.246		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	0.0356
Maximum	1.1	Median	0.01
SD	0.12	CV	3.379

k hat (MLE)	0.646	k star (bias corrected MLE)	0.638
Theta hat (MLE)	0.0551	Theta star (bias corrected MLE)	0.0558
nu hat (MLE)	196.5	nu star (bias corrected)	193.9
Adjusted Level of Significance (β)	0.0484		
Approximate Chi Square Value (193.93, α)	162.7	Adjusted Chi Square Value (193.93, β)	162.4
95% Gamma Approximate UCL (use when n>=50)	0.0424	95% Gamma Adjusted UCL (use when n<50)	0.0425
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.115	SD (KM)	0.106
Variance (KM)	0.0112	SE of Mean (KM)	0.00889
k hat (KM)	1.194	k star (KM)	1.175
nu hat (KM)	362.9	nu star (KM)	357.1
theta hat (KM)	0.0967	theta star (KM)	0.0983
80% gamma percentile (KM)	0.183	90% gamma percentile (KM)	0.255
95% gamma percentile (KM)	0.327	99% gamma percentile (KM)	0.491
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (357.10, α)	314.3	Adjusted Chi Square Value (357.10, β)	313.9
95% Gamma Approximate KM-UCL (use when n>=50)	0.131	95% Gamma Adjusted KM-UCL (use when n<50)	0.131
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.491	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.887	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.458	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.213	Detected Data Not Lognormal at 5% Significance Level	
Detected Data Not Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.0511	Mean in Log Scale	-3.7
SD in Original Scale	0.119	SD in Log Scale	1.103
95% t UCL (assumes normality of ROS data)	0.0671	95% Percentile Bootstrap UCL	0.0689
95% BCA Bootstrap UCL	0.0757	95% Bootstrap t UCL	0.0957
95% H-UCL (Log ROS)	0.0558		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-2.246	KM Geo Mean	0.106
KM SD (logged)	0.284	95% Critical H Value (KM-Log)	1.726
KM Standard Error of Mean (logged)	0.025	95% H-UCL (KM -Log)	0.115
KM SD (logged)	0.284	95% Critical H Value (KM-Log)	1.726
KM Standard Error of Mean (logged)	0.025		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.0865	Mean in Log Scale	-2.602
SD in Original Scale	0.111	SD in Log Scale	0.392
95% t UCL (Assumes normality)	0.101	95% H-Stat UCL	0.0847
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution at 5% Significance Level			

Suggested UCL to Use			
95% KM (Chebyshev) UCL	0.154		

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Antimony

General Statistics			
Total Number of Observations	152	Number of Distinct Observations	31
		Number of Missing Observations	26
Number of Detects	5	Number of Non-Detects	147
Number of Distinct Detects	5	Number of Distinct Non-Detects	28
Minimum Detect	0.37	Minimum Non-Detect	0.23
Maximum Detect	1.5	Maximum Non-Detect	0.5
Variance Detects	0.247	Percent Non-Detects	96.71%
Mean Detects	0.824	SD Detects	0.497
Median Detects	0.57	CV Detects	0.603
Skewness Detects	0.718	Kurtosis Detects	-2.061
Mean of Logged Detects	-0.341	SD of Logged Detects	0.604

Normal GOF Test on Detects Only		
Shapiro Wilk Test Statistic	0.866	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.762	Detected Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.295	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.343	Detected Data appear Normal at 5% Significance Level
Detected Data appear Normal at 5% Significance Level		

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.25	KM Standard Error of Mean	0.0121
KM SD	0.133	95% KM (BCA) UCL	0.275
95% KM (t) UCL	0.27	95% KM (Percentile Bootstrap) UCL	0.271
95% KM (z) UCL	0.27	95% KM Bootstrap t UCL	0.277
90% KM Chebyshev UCL	0.286	95% KM Chebyshev UCL	0.303
97.5% KM Chebyshev UCL	0.325	99% KM Chebyshev UCL	0.37

Gamma GOF Tests on Detected Observations Only		
A-D Test Statistic	0.405	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.682	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.282	**Kolmogorov-Smirnov GOF**
5% K-S Critical Value	0.359	Detected data appear Gamma Distributed at 5% Significance Level
Detected data appear Gamma Distributed at 5% Significance Level		

Gamma Statistics on Detected Data Only			
k hat (MLE)	3.561	k star (bias corrected MLE)	1.558
Theta hat (MLE)	0.231	Theta star (bias corrected MLE)	0.529
nu hat (MLE)	35.61	nu star (bias corrected)	15.58
Mean (detects)	0.824		

Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	0.0368
Maximum	1.5	Median	0.01
SD	0.167	CV	4.53
k hat (MLE)	0.54	k star (bias corrected MLE)	0.534
Theta hat (MLE)	0.0681	Theta star (bias corrected MLE)	0.0689
nu hat (MLE)	164.2	nu star (bias corrected)	162.3
Adjusted Level of Significance (β)	0.0484		
Approximate Chi Square Value (162.31, α)	133.9	Adjusted Chi Square Value (162.31, β)	133.6
95% Gamma Approximate UCL (use when n>=50)	0.0446	95% Gamma Adjusted UCL (use when n<50)	0.0447
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.25	SD (KM)	0.133
Variance (KM)	0.0178	SE of Mean (KM)	0.0121
k hat (KM)	3.516	k star (KM)	3.451
nu hat (KM)	1069	nu star (KM)	1049
theta hat (KM)	0.0711	theta star (KM)	0.0724
80% gamma percentile (KM)	0.351	90% gamma percentile (KM)	0.43
95% gamma percentile (KM)	0.504	99% gamma percentile (KM)	0.663
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (N/A, α)	974.9	Adjusted Chi Square Value (N/A, β)	974.3
95% Gamma Approximate KM-UCL (use when n>=50)	0.269	95% Gamma Adjusted KM-UCL (use when n<50)	0.269
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.907	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.762	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.243	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.343	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.0422	Mean in Log Scale	-4.866
SD in Original Scale	0.167	SD in Log Scale	1.63
95% t UCL (assumes normality of ROS data)	0.0646	95% Percentile Bootstrap UCL	0.0669
95% BCA Bootstrap UCL	0.0765	95% Bootstrap t UCL	0.088
95% H-UCL (Log ROS)	0.0425		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-1.431	KM Geo Mean	0.239
KM SD (logged)	0.225	95% Critical H Value (KM-Log)	1.705
KM Standard Error of Mean (logged)	0.0206	95% H-UCL (KM -Log)	0.253
KM SD (logged)	0.225	95% Critical H Value (KM-Log)	1.705
KM Standard Error of Mean (logged)	0.0206		
DL/2 Statistics			

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	0.191	Mean in Log Scale	-1.742
SD in Original Scale	0.146	SD in Log Scale	0.332
95% t UCL (Assumes normality)	0.211	95% H-Stat UCL	0.194
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Normal Distributed at 5% Significance Level			
Suggested UCL to Use			
95% KM (t) UCL	0.27		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Arsenic			
General Statistics			
Total Number of Observations	152	Number of Distinct Observations	65
		Number of Missing Observations	26
Minimum	2.8	Mean	5.844
Maximum	17.9	Median	5.3
SD	2.407	Std. Error of Mean	0.195
Coefficient of Variation	0.412	Skewness	2.022
Normal GOF Test			
Shapiro Wilk Test Statistic	0.836	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	0	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.139	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.0723	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	6.167	95% Adjusted-CLT UCL (Chen-1995)	6.199
		95% Modified-t UCL (Johnson-1978)	6.173
Gamma GOF Test			
A-D Test Statistic	2.202	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.753	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.0905	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.0761	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	7.651	k star (bias corrected MLE)	7.504
Theta hat (MLE)	0.764	Theta star (bias corrected MLE)	0.779
nu hat (MLE)	2326	nu star (bias corrected)	2281

MLE Mean (bias corrected)	5.844	MLE Sd (bias corrected)	2.133
		Approximate Chi Square Value (0.05)	2171
Adjusted Level of Significance	0.0484	Adjusted Chi Square Value	2170
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	6.14	95% Adjusted Gamma UCL (use when n<50)	6.143
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.958	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk P Value	0.00122	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.0718	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.0723	Data appear Lognormal at 5% Significance Level	
Data appear Approximate Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	1.03	Mean of logged Data	1.699
Maximum of Logged Data	2.885	SD of logged Data	0.352
Assuming Lognormal Distribution			
95% H-UCL	6.115	90% Chebyshev (MVUE) UCL	6.325
95% Chebyshev (MVUE) UCL	6.557	97.5% Chebyshev (MVUE) UCL	6.879
99% Chebyshev (MVUE) UCL	7.511		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	6.165	95% Jackknife UCL	6.167
95% Standard Bootstrap UCL	6.166	95% Bootstrap-t UCL	6.209
95% Hall's Bootstrap UCL	6.214	95% Percentile Bootstrap UCL	6.164
95% BCA Bootstrap UCL	6.188		
90% Chebyshev(Mean, Sd) UCL	6.43	95% Chebyshev(Mean, Sd) UCL	6.695
97.5% Chebyshev(Mean, Sd) UCL	7.063	99% Chebyshev(Mean, Sd) UCL	7.787
Suggested UCL to Use			
95% Student's-t UCL	6.167	or 95% Modified-t UCL	6.173
or 95% H-UCL	6.115		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
ProUCL computes and outputs H-statistic based UCLs for historical reasons only.			
H-statistic often results in unstable (both high and low) values of UCL95 as shown in examples in the Technical Guide.			
It is therefore recommended to avoid the use of H-statistic based 95% UCLs.			
Use of nonparametric methods are preferred to compute UCL95 for skewed data sets which do not follow a gamma distribution.			
Barium			

ProUCL Output
Central Landfill Area Soil (0-12 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

General Statistics			
Total Number of Observations	152	Number of Distinct Observations	131
		Number of Missing Observations	26
Minimum	29.5	Mean	119.2
Maximum	436	Median	93.05
SD	81.37	Std. Error of Mean	6.6
Coefficient of Variation	0.683	Skewness	1.92
Normal GOF Test			
Shapiro Wilk Test Statistic	0.781	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	0	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.191	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.0723	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	130.1	95% Adjusted-CLT UCL (Chen-1995)	131.1
		95% Modified-t UCL (Johnson-1978)	130.3
Gamma GOF Test			
A-D Test Statistic	3.521	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.759	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.112	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.0765	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	3.012	k star (bias corrected MLE)	2.957
Theta hat (MLE)	39.57	Theta star (bias corrected MLE)	40.3
nu hat (MLE)	915.5	nu star (bias corrected)	898.8
MLE Mean (bias corrected)	119.2	MLE Sd (bias corrected)	69.3
		Approximate Chi Square Value (0.05)	830.2
Adjusted Level of Significance	0.0484	Adjusted Chi Square Value	829.6
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	129	95% Adjusted Gamma UCL (use when n<50)	129.1
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.957	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk P Value	8.7235E-4	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.0769	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.0723	Data Not Lognormal at 5% Significance Level	
Data Not Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	3.384	Mean of logged Data	4.605
Maximum of Logged Data	6.078	SD of logged Data	0.568
Assuming Lognormal Distribution			
95% H-UCL	128.1	90% Chebyshev (MVUE) UCL	134.7

95% Chebyshev (MVUE) UCL	142.6	97.5% Chebyshev (MVUE) UCL	153.6
99% Chebyshev (MVUE) UCL	175		

Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution (0.05)

Nonparametric Distribution Free UCLs

95% CLT UCL	130	95% Jackknife UCL	130.1
95% Standard Bootstrap UCL	130.1	95% Bootstrap-t UCL	131.2
95% Hall's Bootstrap UCL	131.5	95% Percentile Bootstrap UCL	130.2
95% BCA Bootstrap UCL	131.9		
90% Chebyshev(Mean, Sd) UCL	139	95% Chebyshev(Mean, Sd) UCL	147.9
97.5% Chebyshev(Mean, Sd) UCL	160.4	99% Chebyshev(Mean, Sd) UCL	184.8

Suggested UCL to Use

95% Chebyshev (Mean, Sd) UCL	147.9		

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

ChromiumVI_EST

General Statistics

Total Number of Observations	152	Number of Distinct Observations	67
		Number of Missing Observations	26
Minimum	0.0642	Mean	0.287
Maximum	2.27	Median	0.268
SD	0.175	Std. Error of Mean	0.0142
Coefficient of Variation	0.61	Skewness	9.749

Normal GOF Test

Shapiro Wilk Test Statistic	0.384	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	0	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.247	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.0723	Data Not Normal at 5% Significance Level	

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	0.31	95% Adjusted-CLT UCL (Chen-1995)	0.322
		95% Modified-t UCL (Johnson-1978)	0.312

Gamma GOF Test

A-D Test Statistic	6.579E+28	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.753	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.133	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.0761	Data Not Gamma Distributed at 5% Significance Level	

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics			
k hat (MLE)	7.825	k star (bias corrected MLE)	7.675
Theta hat (MLE)	0.0367	Theta star (bias corrected MLE)	0.0374
nu hat (MLE)	2379	nu star (bias corrected)	2333
MLE Mean (bias corrected)	0.287	MLE Sd (bias corrected)	0.104
		Approximate Chi Square Value (0.05)	2222
Adjusted Level of Significance	0.0484	Adjusted Chi Square Value	2221
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	0.301	95% Adjusted Gamma UCL (use when n<50)	0.301
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.856	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk P Value	0	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.116	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.0723	Data Not Lognormal at 5% Significance Level	
Data Not Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	-2.745	Mean of logged Data	-1.314
Maximum of Logged Data	0.82	SD of logged Data	0.32
Assuming Lognormal Distribution			
95% H-UCL	0.296	90% Chebyshev (MVUE) UCL	0.306
95% Chebyshev (MVUE) UCL	0.316	97.5% Chebyshev (MVUE) UCL	0.33
99% Chebyshev (MVUE) UCL	0.358		
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution (0.05)			
Nonparametric Distribution Free UCLs			
95% CLT UCL	0.31	95% Jackknife UCL	0.31
95% Standard Bootstrap UCL	0.31	95% Bootstrap-t UCL	0.34
95% Hall's Bootstrap UCL	0.408	95% Percentile Bootstrap UCL	0.311
95% BCA Bootstrap UCL	0.328		
90% Chebyshev(Mean, Sd) UCL	0.33	95% Chebyshev(Mean, Sd) UCL	0.349
97.5% Chebyshev(Mean, Sd) UCL	0.376	99% Chebyshev(Mean, Sd) UCL	0.428
Suggested UCL to Use			
95% Student's-t UCL	0.31	or 95% Modified-t UCL	0.312
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Cobalt			
General Statistics			

Total Number of Observations	152	Number of Distinct Observations	48
		Number of Missing Observations	26
Minimum	1.5	Mean	5.508
Maximum	13	Median	5.3
SD	1.537	Std. Error of Mean	0.125
Coefficient of Variation	0.279	Skewness	1.577
Normal GOF Test			
Shapiro Wilk Test Statistic	0.898	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	7.772E-16	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.119	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.0723	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	5.714	95% Adjusted-CLT UCL (Chen-1995)	5.73
		95% Modified-t UCL (Johnson-1978)	5.717
Gamma GOF Test			
A-D Test Statistic	1.951	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.751	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.0891	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.0759	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	14.01	k star (bias corrected MLE)	13.74
Theta hat (MLE)	0.393	Theta star (bias corrected MLE)	0.401
nu hat (MLE)	4260	nu star (bias corrected)	4178
MLE Mean (bias corrected)	5.508	MLE Sd (bias corrected)	1.486
		Approximate Chi Square Value (0.05)	4028
Adjusted Level of Significance	0.0484	Adjusted Chi Square Value	4027
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	5.712	95% Adjusted Gamma UCL (use when n<50)	5.714
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.946	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk P Value	1.3861E-5	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.0828	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.0723	Data Not Lognormal at 5% Significance Level	
Data Not Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	0.405	Mean of logged Data	1.67
Maximum of Logged Data	2.565	SD of logged Data	0.273
Assuming Lognormal Distribution			
95% H-UCL	5.728	90% Chebyshev (MVUE) UCL	5.884
95% Chebyshev (MVUE) UCL	6.053	97.5% Chebyshev (MVUE) UCL	6.287

99% Chebyshev (MVUE) UCL	6.746		
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution (0.05)			
Nonparametric Distribution Free UCLs			
95% CLT UCL	5.713	95% Jackknife UCL	5.714
95% Standard Bootstrap UCL	5.718	95% Bootstrap-t UCL	5.735
95% Hall's Bootstrap UCL	5.738	95% Percentile Bootstrap UCL	5.713
95% BCA Bootstrap UCL	5.743		
90% Chebyshev(Mean, Sd) UCL	5.882	95% Chebyshev(Mean, Sd) UCL	6.051
97.5% Chebyshev(Mean, Sd) UCL	6.286	99% Chebyshev(Mean, Sd) UCL	6.748
Suggested UCL to Use			
95% Student's-t UCL	5.714	or 95% Modified-t UCL	5.717
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Copper			
General Statistics			
Total Number of Observations	152	Number of Distinct Observations	96
		Number of Missing Observations	26
Minimum	5.9	Mean	63.71
Maximum	7260	Median	13.4
SD	587.9	Std. Error of Mean	47.68
Coefficient of Variation	9.227	Skewness	12.31
Normal GOF Test			
Shapiro Wilk Test Statistic	0.0899	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	0	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.494	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.0723	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	142.6	95% Adjusted-CLT UCL (Chen-1995)	193
		95% Modified-t UCL (Johnson-1978)	150.6
Gamma GOF Test			
A-D Test Statistic	6.579E+28	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.835	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.443	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.0811	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			

Gamma Statistics			
k hat (MLE)	0.436	k star (bias corrected MLE)	0.431
Theta hat (MLE)	146.3	Theta star (bias corrected MLE)	147.7
nu hat (MLE)	132.4	nu star (bias corrected)	131.1
MLE Mean (bias corrected)	63.71	MLE Sd (bias corrected)	97
		Approximate Chi Square Value (0.05)	105.7
Adjusted Level of Significance	0.0484	Adjusted Chi Square Value	105.5
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	79.06	95% Adjusted Gamma UCL (use when n<50)	79.22
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.606	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk P Value	0	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.198	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.0723	Data Not Lognormal at 5% Significance Level	
Data Not Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	1.775	Mean of logged Data	2.664
Maximum of Logged Data	8.89	SD of logged Data	0.668
Assuming Lognormal Distribution			
95% H-UCL	19.93	90% Chebyshev (MVUE) UCL	21.11
95% Chebyshev (MVUE) UCL	22.56	97.5% Chebyshev (MVUE) UCL	24.57
99% Chebyshev (MVUE) UCL	28.51		
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution (0.05)			
Nonparametric Distribution Free UCLs			
95% CLT UCL	142.1	95% Jackknife UCL	142.6
95% Standard Bootstrap UCL	140.7	95% Bootstrap-t UCL	4629
95% Hall's Bootstrap UCL	1665	95% Percentile Bootstrap UCL	158.7
95% BCA Bootstrap UCL	255		
90% Chebyshev(Mean, Sd) UCL	206.8	95% Chebyshev(Mean, Sd) UCL	271.6
97.5% Chebyshev(Mean, Sd) UCL	361.5	99% Chebyshev(Mean, Sd) UCL	538.2
Suggested UCL to Use			
95% Chebyshev (Mean, Sd) UCL	271.6		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Vanadium			
General Statistics			
Total Number of Observations	152	Number of Distinct Observations	99

		Number of Missing Observations	26
Minimum	3	Mean	12.61
Maximum	151	Median	10.2
SD	14.82	Std. Error of Mean	1.202
Coefficient of Variation	1.175	Skewness	7.551
Normal GOF Test			
Shapiro Wilk Test Statistic	0.373	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	0	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.273	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.0723	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	14.6	95% Adjusted-CLT UCL (Chen-1995)	15.37
		95% Modified-t UCL (Johnson-1978)	14.72
Gamma GOF Test			
A-D Test Statistic	5.988	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.761	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.139	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.0767	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	2.739	k star (bias corrected MLE)	2.689
Theta hat (MLE)	4.603	Theta star (bias corrected MLE)	4.689
nu hat (MLE)	832.6	nu star (bias corrected)	817.5
MLE Mean (bias corrected)	12.61	MLE Sd (bias corrected)	7.689
		Approximate Chi Square Value (0.05)	752.2
Adjusted Level of Significance	0.0484	Adjusted Chi Square Value	751.6
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	13.7	95% Adjusted Gamma UCL (use when n<50)	13.71
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.925	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk P Value	1.0210E-9	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.0715	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.0723	Data appear Lognormal at 5% Significance Level	
Data appear Approximate Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	1.099	Mean of logged Data	2.341
Maximum of Logged Data	5.017	SD of logged Data	0.521
Assuming Lognormal Distribution			
95% H-UCL	12.86	90% Chebyshev (MVUE) UCL	13.48
95% Chebyshev (MVUE) UCL	14.21	97.5% Chebyshev (MVUE) UCL	15.21
99% Chebyshev (MVUE) UCL	17.19		

Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	14.59	95% Jackknife UCL	14.6
95% Standard Bootstrap UCL	14.65	95% Bootstrap-t UCL	17.93
95% Hall's Bootstrap UCL	25.12	95% Percentile Bootstrap UCL	14.78
95% BCA Bootstrap UCL	15.51		
90% Chebyshev(Mean, Sd) UCL	16.21	95% Chebyshev(Mean, Sd) UCL	17.85
97.5% Chebyshev(Mean, Sd) UCL	20.12	99% Chebyshev(Mean, Sd) UCL	24.57
Suggested UCL to Use			
95% H-UCL	12.86		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
ProUCL computes and outputs H-statistic based UCLs for historical reasons only.			
H-statistic often results in unstable (both high and low) values of UCL95 as shown in examples in the Technical Guide.			
It is therefore recommended to avoid the use of H-statistic based 95% UCLs.			
Use of nonparametric methods are preferred to compute UCL95 for skewed data sets which do not follow a gamma distribution.			
Zinc			
General Statistics			
Total Number of Observations	152	Number of Distinct Observations	117
		Number of Missing Observations	26
Minimum	25.2	Mean	46.69
Maximum	114	Median	42
SD	17.14	Std. Error of Mean	1.39
Coefficient of Variation	0.367	Skewness	2.077
Normal GOF Test			
Shapiro Wilk Test Statistic	0.795	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	0	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.158	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.0723	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	48.99	95% Adjusted-CLT UCL (Chen-1995)	49.23
		95% Modified-t UCL (Johnson-1978)	49.03
Gamma GOF Test			
A-D Test Statistic	3.613	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.752	Data Not Gamma Distributed at 5% Significance Level	

K-S Test Statistic	0.115	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.076	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	9.798	k star (bias corrected MLE)	9.609
Theta hat (MLE)	4.766	Theta star (bias corrected MLE)	4.859
nu hat (MLE)	2979	nu star (bias corrected)	2921
MLE Mean (bias corrected)	46.69	MLE Sd (bias corrected)	15.06
		Approximate Chi Square Value (0.05)	2797
Adjusted Level of Significance	0.0484	Adjusted Chi Square Value	2795
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	48.77	95% Adjusted Gamma UCL (use when n<50)	48.79
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.928	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk P Value	4.1304E-9	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.0907	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.0723	Data Not Lognormal at 5% Significance Level	
Data Not Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	3.227	Mean of logged Data	3.792
Maximum of Logged Data	4.736	SD of logged Data	0.307
Assuming Lognormal Distribution			
95% H-UCL	48.54	90% Chebyshev (MVUE) UCL	50.01
95% Chebyshev (MVUE) UCL	51.62	97.5% Chebyshev (MVUE) UCL	53.85
99% Chebyshev (MVUE) UCL	58.24		
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution (0.05)			
Nonparametric Distribution Free UCLs			
95% CLT UCL	48.98	95% Jackknife UCL	48.99
95% Standard Bootstrap UCL	49.02	95% Bootstrap-t UCL	49.37
95% Hall's Bootstrap UCL	49.21	95% Percentile Bootstrap UCL	49.07
95% BCA Bootstrap UCL	49.35		
90% Chebyshev(Mean, Sd) UCL	50.86	95% Chebyshev(Mean, Sd) UCL	52.75
97.5% Chebyshev(Mean, Sd) UCL	55.38	99% Chebyshev(Mean, Sd) UCL	60.53
Suggested UCL to Use			
95% Student's-t UCL	48.99	or 95% Modified-t UCL	49.03
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Selenium			

General Statistics			
Total Number of Observations	152	Number of Distinct Observations	33
		Number of Missing Observations	26
Number of Detects	18	Number of Non-Detects	134
Number of Distinct Detects	17	Number of Distinct Non-Detects	24
Minimum Detect	0.34	Minimum Non-Detect	0.23
Maximum Detect	3	Maximum Non-Detect	0.5
Variance Detects	0.501	Percent Non-Detects	88.16%
Mean Detects	0.837	SD Detects	0.707
Median Detects	0.525	CV Detects	0.845
Skewness Detects	2.138	Kurtosis Detects	4.691
Mean of Logged Detects	-0.412	SD of Logged Detects	0.652
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.713	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.897	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.26	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.202	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.303	KM Standard Error of Mean	0.0257
KM SD	0.307	95% KM (BCA) UCL	0.345
95% KM (t) UCL	0.345	95% KM (Percentile Bootstrap) UCL	0.347
95% KM (z) UCL	0.345	95% KM Bootstrap t UCL	0.377
90% KM Chebyshev UCL	0.38	95% KM Chebyshev UCL	0.415
97.5% KM Chebyshev UCL	0.463	99% KM Chebyshev UCL	0.558
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	1.14	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.751	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.206	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.206	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data follow Appr. Gamma Distribution at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	2.282	k star (bias corrected MLE)	1.939
Theta hat (MLE)	0.367	Theta star (bias corrected MLE)	0.432
nu hat (MLE)	82.15	nu star (bias corrected)	69.79
Mean (detects)	0.837		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	0.108
Maximum	3	Median	0.01
SD	0.358	CV	3.317

k hat (MLE)	0.356	k star (bias corrected MLE)	0.354
Theta hat (MLE)	0.303	Theta star (bias corrected MLE)	0.305
nu hat (MLE)	108.3	nu star (bias corrected)	107.5
Adjusted Level of Significance (β)	0.0484		
Approximate Chi Square Value (107.47, α)	84.54	Adjusted Chi Square Value (107.47, β)	84.35
95% Gamma Approximate UCL (use when n>=50)	0.137	95% Gamma Adjusted UCL (use when n<50)	0.138
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.303	SD (KM)	0.307
Variance (KM)	0.0945	SE of Mean (KM)	0.0257
k hat (KM)	0.971	k star (KM)	0.957
nu hat (KM)	295.3	nu star (KM)	290.8
theta hat (KM)	0.312	theta star (KM)	0.317
80% gamma percentile (KM)	0.489	90% gamma percentile (KM)	0.705
95% gamma percentile (KM)	0.922	99% gamma percentile (KM)	1.427
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (290.83, α)	252.3	Adjusted Chi Square Value (290.83, β)	252
95% Gamma Approximate KM-UCL (use when n>=50)	0.349	95% Gamma Adjusted KM-UCL (use when n<50)	0.35
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.875	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.897	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.178	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.202	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Approximate Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.142	Mean in Log Scale	-3.133
SD in Original Scale	0.351	SD in Log Scale	1.43
95% t UCL (assumes normality of ROS data)	0.19	95% Percentile Bootstrap UCL	0.195
95% BCA Bootstrap UCL	0.2	95% Bootstrap t UCL	0.211
95% H-UCL (Log ROS)	0.165		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-1.341	KM Geo Mean	0.262
KM SD (logged)	0.406	95% Critical H Value (KM-Log)	1.78
KM Standard Error of Mean (logged)	0.0341	95% H-UCL (KM -Log)	0.301
KM SD (logged)	0.406	95% Critical H Value (KM-Log)	1.78
KM Standard Error of Mean (logged)	0.0341		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.24	Mean in Log Scale	-1.676
SD in Original Scale	0.324	SD in Log Scale	0.536
95% t UCL (Assumes normality)	0.284	95% H-Stat UCL	0.234
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Approximate Gamma Distributed at 5% Significance Level			

Suggested UCL to Use			
95% KM Approximate Gamma UCL	0.349	95% GROS Approximate Gamma UCL	0.137

When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test

When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Naphthalene

General Statistics			
Total Number of Observations	152	Number of Distinct Observations	62
		Number of Missing Observations	26
Number of Detects	54	Number of Non-Detects	98
Number of Distinct Detects	46	Number of Distinct Non-Detects	28
Minimum Detect	0.0014	Minimum Non-Detect	0.0013
Maximum Detect	10	Maximum Non-Detect	0.088
Variance Detects	2.2	Percent Non-Detects	64.47%
Mean Detects	0.308	SD Detects	1.483
Median Detects	0.00955	CV Detects	4.811
Skewness Detects	5.932	Kurtosis Detects	36.81
Mean of Logged Detects	-4.359	SD of Logged Detects	1.883

Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.229	**Normal GOF Test on Detected Observations Only**	
5% Shapiro Wilk P Value	0	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.455	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.12	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.111	KM Standard Error of Mean	0.0727
KM SD	0.888	95% KM (BCA) UCL	0.244
95% KM (t) UCL	0.231	95% KM (Percentile Bootstrap) UCL	0.236
95% KM (z) UCL	0.23	95% KM Bootstrap t UCL	1.813
90% KM Chebyshev UCL	0.329	95% KM Chebyshev UCL	0.428
97.5% KM Chebyshev UCL	0.565	99% KM Chebyshev UCL	0.834

Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	10.06	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.9	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.353	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.134	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			

Gamma Statistics on Detected Data Only			
k hat (MLE)	0.227	k star (bias corrected MLE)	0.226
Theta hat (MLE)	1.36	Theta star (bias corrected MLE)	1.362

nu hat (MLE)	24.48	nu star (bias corrected)	24.46
Mean (detects)	0.308		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.0014	Mean	0.116
Maximum	10	Median	0.01
SD	0.89	CV	7.676
k hat (MLE)	0.293	k star (bias corrected MLE)	0.291
Theta hat (MLE)	0.396	Theta star (bias corrected MLE)	0.398
nu hat (MLE)	89.04	nu star (bias corrected)	88.61
Adjusted Level of Significance (β)	0.0484		
Approximate Chi Square Value (88.61, α)	67.91	Adjusted Chi Square Value (88.61, β)	67.74
95% Gamma Approximate UCL (use when n>=50)	0.151	95% Gamma Adjusted UCL (use when n<50)	0.152
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.111	SD (KM)	0.888
Variance (KM)	0.789	SE of Mean (KM)	0.0727
k hat (KM)	0.0156	k star (KM)	0.0197
nu hat (KM)	4.735	nu star (KM)	5.975
theta hat (KM)	7.116	theta star (KM)	5.639
80% gamma percentile (KM)	3.7765E-5	90% gamma percentile (KM)	0.0152
95% gamma percentile (KM)	0.247	99% gamma percentile (KM)	3.103
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (5.98, α)	1.627	Adjusted Chi Square Value (5.98, β)	1.606
95% Gamma Approximate KM-UCL (use when n>=50)	0.407	95% Gamma Adjusted KM-UCL (use when n<50)	0.412
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Approximate Test Statistic	0.841	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	1.3837E-7	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.18	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.12	Detected Data Not Lognormal at 5% Significance Level	
Detected Data Not Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.11	Mean in Log Scale	-6.822
SD in Original Scale	0.891	SD in Log Scale	2.467
95% t UCL (assumes normality of ROS data)	0.23	95% Percentile Bootstrap UCL	0.243
95% BCA Bootstrap UCL	0.335	95% Bootstrap t UCL	1.702
95% H-UCL (Log ROS)	0.0498		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-5.662	KM Geo Mean	0.00348
KM SD (logged)	1.525	95% Critical H Value (KM-Log)	2.743
KM Standard Error of Mean (logged)	0.131	95% H-UCL (KM -Log)	0.0156
KM SD (logged)	1.525	95% Critical H Value (KM-Log)	2.743

KM Standard Error of Mean (logged)	0.131		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.112	Mean in Log Scale	-5.403
SD in Original Scale	0.891	SD in Log Scale	1.56
95% t UCL (Assumes normality)	0.232	95% H-Stat UCL	0.0217
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution at 5% Significance Level			
Suggested UCL to Use			
95% KM (Chebyshev) UCL	0.428		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			

ProUCL Output
Central Landfill Area (Surface Water)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

UCL Statistics for Data Sets with Non-Detects			
User Selected Options			
Date/Time of Computation	ProUCL 5.11/28/2019 10:38:43 AM		
From File	20190128_CenLF_ProUCL_input_c.xls		
Full Precision	OFF		
Confidence Coefficient	95%		
Number of Bootstrap Operations	2000		
Fluoride			
General Statistics			
Total Number of Observations	13	Number of Distinct Observations	11
		Number of Missing Observations	0
Minimum	38.7	Mean	287.4
Maximum	2600	Median	94.3
SD	696	Std. Error of Mean	193
Coefficient of Variation	2.422	Skewness	3.584
Normal GOF Test			
Shapiro Wilk Test Statistic	0.362	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.866	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.484	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.234	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	631.4	95% Adjusted-CLT UCL (Chen-1995)	810
		95% Modified-t UCL (Johnson-1978)	663.4
Gamma GOF Test			
A-D Test Statistic	2.575	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.779	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.394	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.248	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	0.642	k star (bias corrected MLE)	0.545
Theta hat (MLE)	448	Theta star (bias corrected MLE)	527.5
nu hat (MLE)	16.68	nu star (bias corrected)	14.16
MLE Mean (bias corrected)	287.4	MLE Sd (bias corrected)	389.4
		Approximate Chi Square Value (0.05)	6.684
Adjusted Level of Significance	0.0301	Adjusted Chi Square Value	5.966
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	609	95% Adjusted Gamma UCL (use when n<50)	682.3
Lognormal GOF Test			

Shapiro Wilk Test Statistic	0.718	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.866	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.284	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.234	Data Not Lognormal at 5% Significance Level	
Data Not Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	3.656	Mean of logged Data	4.707
Maximum of Logged Data	7.863	SD of logged Data	1.066
Assuming Lognormal Distribution			
95% H-UCL	486.3	90% Chebyshev (MVUE) UCL	360.4
95% Chebyshev (MVUE) UCL	440.4	97.5% Chebyshev (MVUE) UCL	551.4
99% Chebyshev (MVUE) UCL	769.6		
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution (0.05)			
Nonparametric Distribution Free UCLs			
95% CLT UCL	604.9	95% Jackknife UCL	631.4
95% Standard Bootstrap UCL	586.5	95% Bootstrap-t UCL	4813
95% Hall's Bootstrap UCL	3159	95% Percentile Bootstrap UCL	671.9
95% BCA Bootstrap UCL	869.4		
90% Chebyshev(Mean, Sd) UCL	866.5	95% Chebyshev(Mean, Sd) UCL	1129
97.5% Chebyshev(Mean, Sd) UCL	1493	99% Chebyshev(Mean, Sd) UCL	2208
Suggested UCL to Use			
95% Chebyshev (Mean, Sd) UCL	1129		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Antimony			
General Statistics			
Total Number of Observations	13	Number of Distinct Observations	3
Number of Detects	1	Number of Non-Detects	12
Number of Distinct Detects	1	Number of Distinct Non-Detects	2
Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set!			
It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).			
The data set for variable Antimony was not processed!			
Arsenic			
General Statistics			
Total Number of Observations	13	Number of Distinct Observations	4

ProUCL Output
Central Landfill Area (Surface Water)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Number of Detects	1	Number of Non-Detects	12
Number of Distinct Detects	1	Number of Distinct Non-Detects	3

Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set!

It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable Arsenic was not processed!

ProUCL Output
Industrial Landfill Area Soil (0-0.5 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

UCL Statistics for Data Sets with Non-Detects

User Selected Options	
Date/Time of Computation	ProUCL 5.11/28/2019 11:43:00 AM
From File	20190128_IndLF_ProUCL_input.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Bis2EthylhexylPhthalate

General Statistics

Total Number of Observations	15	Number of Distinct Observations	14
Number of Detects	3	Number of Non-Detects	12
Number of Distinct Detects	3	Number of Distinct Non-Detects	11
Minimum Detect	0.06	Minimum Non-Detect	0.038
Maximum Detect	0.093	Maximum Non-Detect	3.8
Variance Detects	3.2433E-4	Percent Non-Detects	80%
Mean Detects	0.0723	SD Detects	0.018
Median Detects	0.064	CV Detects	0.249
Skewness Detects	1.636	Kurtosis Detects	N/A
Mean of Logged Detects	-2.646	SD of Logged Detects	0.237

Warning: Data set has only 3 Detected Values.
This is not enough to compute meaningful or reliable statistics and estimates.

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.839	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.767	Detected Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.345	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.425	Detected Data appear Normal at 5% Significance Level

Detected Data appear Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	0.0507	KM Standard Error of Mean	0.00748
KM SD	0.0178	95% KM (BCA) UCL	N/A
95% KM (t) UCL	0.0639	95% KM (Percentile Bootstrap) UCL	N/A
95% KM (z) UCL	0.063	95% KM Bootstrap t UCL	N/A
90% KM Chebyshev UCL	0.0732	95% KM Chebyshev UCL	0.0833
97.5% KM Chebyshev UCL	0.0974	99% KM Chebyshev UCL	0.125

Gamma GOF Tests on Detected Observations Only
Not Enough Data to Perform GOF Test

Gamma Statistics on Detected Data Only

k hat (MLE)	26.02	k star (bias corrected MLE)	N/A
Theta hat (MLE)	0.00278	Theta star (bias corrected MLE)	N/A
nu hat (MLE)	156.1	nu star (bias corrected)	N/A
Mean (detects)	0.0723		

Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.0219	Mean	0.0447
Maximum	0.093	Median	0.0432
SD	0.017	CV	0.381
k hat (MLE)	8.902	k star (bias corrected MLE)	7.166
Theta hat (MLE)	0.00502	Theta star (bias corrected MLE)	0.00624
nu hat (MLE)	267	nu star (bias corrected)	215
Adjusted Level of Significance (β)	0.0324		
Approximate Chi Square Value (214.97, α)	182	Adjusted Chi Square Value (214.97, β)	178.3
95% Gamma Approximate UCL (use when n>=50)	0.0528	95% Gamma Adjusted UCL (use when n<50)	N/A
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.0507	SD (KM)	0.0178
Variance (KM)	3.1521E-4	SE of Mean (KM)	0.00748
k hat (KM)	8.155	k star (KM)	6.568
nu hat (KM)	244.6	nu star (KM)	197
theta hat (KM)	0.00622	theta star (KM)	0.00772
80% gamma percentile (KM)	0.0662	90% gamma percentile (KM)	0.0771
95% gamma percentile (KM)	0.087	99% gamma percentile (KM)	0.108
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (197.05, α)	165.6	Adjusted Chi Square Value (197.05, β)	162
95% Gamma Approximate KM-UCL (use when n>=50)	0.0603	95% Gamma Adjusted KM-UCL (use when n<50)	0.0617
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.858	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.767	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.335	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.425	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.0494	Mean in Log Scale	-3.04
SD in Original Scale	0.0143	SD in Log Scale	0.244
95% t UCL (assumes normality of ROS data)	0.0559	95% Percentile Bootstrap UCL	0.0557
95% BCA Bootstrap UCL	0.0576	95% Bootstrap t UCL	0.0606
95% H-UCL (Log ROS)	0.0556		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-3.034	KM Geo Mean	0.0481
KM SD (logged)	0.31	95% Critical H Value (KM-Log)	1.89
KM Standard Error of Mean (logged)	0.134	95% H-UCL (KM -Log)	0.0591
KM SD (logged)	0.31	95% Critical H Value (KM-Log)	1.89
KM Standard Error of Mean (logged)	0.134		
DL/2 Statistics			

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	0.235	Mean in Log Scale	-2.681
SD in Original Scale	0.516	SD in Log Scale	1.352
95% t UCL (Assumes normality)	0.47	95% H-Stat UCL	0.572
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Normal Distributed at 5% Significance Level			
Suggested UCL to Use			
95% KM (t) UCL	0.0639		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Fluoride			
General Statistics			
Total Number of Observations	15	Number of Distinct Observations	15
		Number of Missing Observations	0
Minimum	2.24	Mean	64.06
Maximum	579	Median	6.48
SD	158.5	Std. Error of Mean	40.93
Coefficient of Variation	2.475	Skewness	2.976
Normal GOF Test			
Shapiro Wilk Test Statistic	0.448	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.881	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.462	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.22	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	136.1	95% Adjusted-CLT UCL (Chen-1995)	165
		95% Modified-t UCL (Johnson-1978)	141.4
Gamma GOF Test			
A-D Test Statistic	2.497	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.82	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.36	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.238	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	0.375	k star (bias corrected MLE)	0.345
Theta hat (MLE)	170.7	Theta star (bias corrected MLE)	185.8
nu hat (MLE)	11.26	nu star (bias corrected)	10.34

MLE Mean (bias corrected)	64.06	MLE Sd (bias corrected)	109.1
		Approximate Chi Square Value (0.05)	4.156
Adjusted Level of Significance	0.0324	Adjusted Chi Square Value	3.685
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	159.4	95% Adjusted Gamma UCL (use when n<50)	179.8
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.79	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.881	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.223	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.22	Data Not Lognormal at 5% Significance Level	
Data Not Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	0.806	Mean of logged Data	2.388
Maximum of Logged Data	6.361	SD of logged Data	1.613
Assuming Lognormal Distribution			
95% H-UCL	207.5	90% Chebyshev (MVUE) UCL	82.45
95% Chebyshev (MVUE) UCL	104.4	97.5% Chebyshev (MVUE) UCL	135
99% Chebyshev (MVUE) UCL	194.9		
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution (0.05)			
Nonparametric Distribution Free UCLs			
95% CLT UCL	131.4	95% Jackknife UCL	136.1
95% Standard Bootstrap UCL	128.6	95% Bootstrap-t UCL	1496
95% Hall's Bootstrap UCL	948.9	95% Percentile Bootstrap UCL	139.6
95% BCA Bootstrap UCL	160.6		
90% Chebyshev(Mean, Sd) UCL	186.8	95% Chebyshev(Mean, Sd) UCL	242.5
97.5% Chebyshev(Mean, Sd) UCL	319.7	99% Chebyshev(Mean, Sd) UCL	471.3
Suggested UCL to Use			
99% Chebyshev (Mean, Sd) UCL	471.3		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Indeno123CDPyrene			
General Statistics			
Total Number of Observations	15	Number of Distinct Observations	14
Number of Detects	14	Number of Non-Detects	1
Number of Distinct Detects	13	Number of Distinct Non-Detects	1
Minimum Detect	0.007	Minimum Non-Detect	0.027
Maximum Detect	40	Maximum Non-Detect	0.027
Variance Detects	188	Percent Non-Detects	6.667%

Mean Detects	5.695	SD Detects	13.71
Median Detects	0.29	CV Detects	2.408
Skewness Detects	2.308	Kurtosis Detects	3.907
Mean of Logged Detects	-1.23	SD of Logged Detects	2.529
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.457	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.874	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.488	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.226	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	5.316	KM Standard Error of Mean	3.442
KM SD	12.84	95% KM (BCA) UCL	12.62
95% KM (t) UCL	11.38	95% KM (Percentile Bootstrap) UCL	10.58
95% KM (z) UCL	10.98	95% KM Bootstrap t UCL	210.9
90% KM Chebyshev UCL	15.64	95% KM Chebyshev UCL	20.32
97.5% KM Chebyshev UCL	26.81	99% KM Chebyshev UCL	39.56
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	1.67	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.86	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.336	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.251	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.241	k star (bias corrected MLE)	0.237
Theta hat (MLE)	23.66	Theta star (bias corrected MLE)	24.06
nu hat (MLE)	6.739	nu star (bias corrected)	6.628
Mean (detects)	5.695		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.007	Mean	5.316
Maximum	40	Median	0.18
SD	13.3	CV	2.501
k hat (MLE)	0.23	k star (bias corrected MLE)	0.229
Theta hat (MLE)	23.08	Theta star (bias corrected MLE)	23.25
nu hat (MLE)	6.908	nu star (bias corrected)	6.86
Adjusted Level of Significance (β)	0.0324		
Approximate Chi Square Value (6.86, α)	2.094	Adjusted Chi Square Value (6.86, β)	1.786
95% Gamma Approximate UCL (use when n>=50)	17.41	95% Gamma Adjusted UCL (use when n<50)	20.42
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	5.316	SD (KM)	12.84

Variance (KM)	165	SE of Mean (KM)	3.442
k hat (KM)	0.171	k star (KM)	0.181
nu hat (KM)	5.139	nu star (KM)	5.445
theta hat (KM)	31.03	theta star (KM)	29.29
80% gamma percentile (KM)	6.629	90% gamma percentile (KM)	16.04
95% gamma percentile (KM)	28.07	99% gamma percentile (KM)	61.73
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (5.44, α)	1.363	Adjusted Chi Square Value (5.44, β)	1.13
95% Gamma Approximate KM-UCL (use when n>=50)	21.24	95% Gamma Adjusted KM-UCL (use when n<50)	25.62
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.921	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.874	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.157	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.226	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	5.316	Mean in Log Scale	-1.486
SD in Original Scale	13.3	SD in Log Scale	2.632
95% t UCL (assumes normality of ROS data)	11.36	95% Percentile Bootstrap UCL	10.64
95% BCA Bootstrap UCL	14.97	95% Bootstrap t UCL	210
95% H-UCL (Log ROS)	434.1		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-1.439	KM Geo Mean	0.237
KM SD (logged)	2.486	95% Critical H Value (KM-Log)	5.528
KM Standard Error of Mean (logged)	0.668	95% H-UCL (KM -Log)	205.2
KM SD (logged)	2.486	95% Critical H Value (KM-Log)	5.528
KM Standard Error of Mean (logged)	0.668		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	5.316	Mean in Log Scale	-1.435
SD in Original Scale	13.3	SD in Log Scale	2.563
95% t UCL (Assumes normality)	11.36	95% H-Stat UCL	312.3
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Lognormal Distributed at 5% Significance Level			
Suggested UCL to Use			
99% KM (Chebyshev) UCL	39.56		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			

BenzoBFluoranthene			
General Statistics			
Total Number of Observations	15	Number of Distinct Observations	15
		Number of Missing Observations	0
Minimum	0.014	Mean	7.962
Maximum	60	Median	0.36
SD	19.76	Std. Error of Mean	5.101
Coefficient of Variation	2.482	Skewness	2.423
Normal GOF Test			
Shapiro Wilk Test Statistic	0.444	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.881	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.491	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.22	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	16.95	95% Adjusted-CLT UCL (Chen-1995)	19.76
		95% Modified-t UCL (Johnson-1978)	17.48
Gamma GOF Test			
A-D Test Statistic	1.83	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.861	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.339	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.243	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	0.246	k star (bias corrected MLE)	0.242
Theta hat (MLE)	32.31	Theta star (bias corrected MLE)	32.95
nu hat (MLE)	7.394	nu star (bias corrected)	7.248
MLE Mean (bias corrected)	7.962	MLE Sd (bias corrected)	16.2
		Approximate Chi Square Value (0.05)	2.308
Adjusted Level of Significance	0.0324	Adjusted Chi Square Value	1.98
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	25.01	95% Adjusted Gamma UCL (use when n<50)	29.15
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.912	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.881	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.157	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.22	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	-4.269	Mean of logged Data	-0.814
Maximum of Logged Data	4.094	SD of logged Data	2.434

Assuming Lognormal Distribution			
95% H-UCL	291.2	90% Chebyshev (MVUE) UCL	15.49
95% Chebyshev (MVUE) UCL	20.25	97.5% Chebyshev (MVUE) UCL	26.87
99% Chebyshev (MVUE) UCL	39.87		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	16.35	95% Jackknife UCL	16.95
95% Standard Bootstrap UCL	16.02	95% Bootstrap-t UCL	297.8
95% Hall's Bootstrap UCL	156.4	95% Percentile Bootstrap UCL	15.78
95% BCA Bootstrap UCL	19.36		
90% Chebyshev(Mean, Sd) UCL	23.27	95% Chebyshev(Mean, Sd) UCL	30.2
97.5% Chebyshev(Mean, Sd) UCL	39.82	99% Chebyshev(Mean, Sd) UCL	58.72
Suggested UCL to Use			
99% Chebyshev (Mean, Sd) UCL	58.72		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
BenzoKFluoranthene			
General Statistics			
Total Number of Observations	15	Number of Distinct Observations	14
Number of Detects	14	Number of Non-Detects	1
Number of Distinct Detects	14	Number of Distinct Non-Detects	1
Minimum Detect	0.005	Minimum Non-Detect	0.018
Maximum Detect	24	Maximum Non-Detect	0.018
Variance Detects	65.95	Percent Non-Detects	6.667%
Mean Detects	3.388	SD Detects	8.121
Median Detects	0.155	CV Detects	2.397
Skewness Detects	2.317	Kurtosis Detects	3.979
Mean of Logged Detects	-1.682	SD of Logged Detects	2.5
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.461	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.874	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.484	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.226	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	3.163	KM Standard Error of Mean	2.038
KM SD	7.607	95% KM (BCA) UCL	6.661
95% KM (t) UCL	6.753	95% KM (Percentile Bootstrap) UCL	6.358
95% KM (z) UCL	6.516	95% KM Bootstrap t UCL	112.5
90% KM Chebyshev UCL	9.278	95% KM Chebyshev UCL	12.05

97.5% KM Chebyshev UCL	15.89	99% KM Chebyshev UCL	23.44
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	1.631	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.858	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.322	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.25	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.245	k star (bias corrected MLE)	0.24
Theta hat (MLE)	13.81	Theta star (bias corrected MLE)	14.09
nu hat (MLE)	6.872	nu star (bias corrected)	6.733
Mean (detects)	3.388		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.005	Mean	3.163
Maximum	24	Median	0.09
SD	7.874	CV	2.489
k hat (MLE)	0.237	k star (bias corrected MLE)	0.234
Theta hat (MLE)	13.37	Theta star (bias corrected MLE)	13.53
nu hat (MLE)	7.098	nu star (bias corrected)	7.012
Adjusted Level of Significance (β)	0.0324		
Approximate Chi Square Value (7.01, α)	2.177	Adjusted Chi Square Value (7.01, β)	1.861
95% Gamma Approximate UCL (use when n>=50)	10.19	95% Gamma Adjusted UCL (use when n<50)	11.92
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	3.163	SD (KM)	7.607
Variance (KM)	57.87	SE of Mean (KM)	2.038
k hat (KM)	0.173	k star (KM)	0.183
nu hat (KM)	5.187	nu star (KM)	5.483
theta hat (KM)	18.29	theta star (KM)	17.31
80% gamma percentile (KM)	3.961	90% gamma percentile (KM)	9.546
95% gamma percentile (KM)	16.67	99% gamma percentile (KM)	36.59
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (5.48, α)	1.382	Adjusted Chi Square Value (5.48, β)	1.146
95% Gamma Approximate KM-UCL (use when n>=50)	12.55	95% Gamma Adjusted KM-UCL (use when n<50)	15.13
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.92	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.874	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.144	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.226	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			

Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	3.163	Mean in Log Scale	-1.936
SD in Original Scale	7.874	SD in Log Scale	2.601
95% t UCL (assumes normality of ROS data)	6.744	95% Percentile Bootstrap UCL	6.437
95% BCA Bootstrap UCL	7.903	95% Bootstrap t UCL	114.8
95% H-UCL (Log ROS)	233.1		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-1.883	KM Geo Mean	0.152
KM SD (logged)	2.45	95% Critical H Value (KM-Log)	5.456
KM Standard Error of Mean (logged)	0.659	95% H-UCL (KM -Log)	109
KM SD (logged)	2.45	95% Critical H Value (KM-Log)	5.456
KM Standard Error of Mean (logged)	0.659		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	3.163	Mean in Log Scale	-1.884
SD in Original Scale	7.874	SD in Log Scale	2.533
95% t UCL (Assumes normality)	6.744	95% H-Stat UCL	168.8
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Lognormal Distributed at 5% Significance Level			
Suggested UCL to Use			
99% KM (Chebyshev) UCL	23.44		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Chrysene			
General Statistics			
Total Number of Observations	15	Number of Distinct Observations	14
		Number of Missing Observations	0
Minimum	0.009	Mean	6.952
Maximum	51	Median	0.29
SD	17.29	Std. Error of Mean	4.464
Coefficient of Variation	2.487	Skewness	2.407
Normal GOF Test			
Shapiro Wilk Test Statistic	0.439	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.881	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.49	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.22	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			

95% Normal UCL		95% UCLs (Adjusted for Skewness)	
95% Student's-t UCL	14.81	95% Adjusted-CLT UCL (Chen-1995)	17.26
		95% Modified-t UCL (Johnson-1978)	15.28
Gamma GOF Test			
A-D Test Statistic	1.845	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.865	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.33	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.243	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	0.239	k star (bias corrected MLE)	0.235
Theta hat (MLE)	29.14	Theta star (bias corrected MLE)	29.55
nu hat (MLE)	7.156	nu star (bias corrected)	7.058
MLE Mean (bias corrected)	6.952	MLE Sd (bias corrected)	14.33
		Approximate Chi Square Value (0.05)	2.203
Adjusted Level of Significance	0.0324	Adjusted Chi Square Value	1.884
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	22.28	95% Adjusted Gamma UCL (use when n<50)	26.04
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.913	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.881	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.145	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.22	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	-4.711	Mean of logged Data	-1.061
Maximum of Logged Data	3.932	SD of logged Data	2.495
Assuming Lognormal Distribution			
95% H-UCL	314.3	90% Chebyshev (MVUE) UCL	13.69
95% Chebyshev (MVUE) UCL	17.93	97.5% Chebyshev (MVUE) UCL	23.81
99% Chebyshev (MVUE) UCL	35.37		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	14.29	95% Jackknife UCL	14.81
95% Standard Bootstrap UCL	14	95% Bootstrap-t UCL	259.6
95% Hall's Bootstrap UCL	161.8	95% Percentile Bootstrap UCL	13.79
95% BCA Bootstrap UCL	16.85		
90% Chebyshev(Mean, Sd) UCL	20.34	95% Chebyshev(Mean, Sd) UCL	26.41
97.5% Chebyshev(Mean, Sd) UCL	34.83	99% Chebyshev(Mean, Sd) UCL	51.37
Suggested UCL to Use			
99% Chebyshev (Mean, Sd) UCL	51.37		

Recommended UCL exceeds the maximum observation

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

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General Statistics

Total Number of Observations	15	Number of Distinct Observations	14
		Number of Missing Observations	0
Minimum	0.0065	Mean	7.073
Maximum	53	Median	0.24
SD	17.66	Std. Error of Mean	4.56
Coefficient of Variation	2.497	Skewness	2.415

Normal GOF Test

Shapiro Wilk Test Statistic	0.441	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.881	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.488	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.22	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	15.11	95% Adjusted-CLT UCL (Chen-1995)	17.61
		95% Modified-t UCL (Johnson-1978)	15.58

Gamma GOF Test

A-D Test Statistic	1.803	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.868	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.317	**Kolmogorov-Smirnov Gamma GOF Test**
5% K-S Critical Value	0.243	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	0.232	k star (bias corrected MLE)	0.23
Theta hat (MLE)	30.53	Theta star (bias corrected MLE)	30.78
nu hat (MLE)	6.95	nu star (bias corrected)	6.893
MLE Mean (bias corrected)	7.073	MLE Sd (bias corrected)	14.76
		Approximate Chi Square Value (0.05)	2.112
Adjusted Level of Significance	0.0324	Adjusted Chi Square Value	1.802

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	23.08	95% Adjusted Gamma UCL (use when n<50)	27.06

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.921	**Shapiro Wilk Lognormal GOF Test**

5% Shapiro Wilk Critical Value	0.881	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.131	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.22	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	-5.036	Mean of logged Data	-1.148
Maximum of Logged Data	3.97	SD of logged Data	2.568
Assuming Lognormal Distribution			
95% H-UCL	426.4	90% Chebyshev (MVUE) UCL	14.54
95% Chebyshev (MVUE) UCL	19.08	97.5% Chebyshev (MVUE) UCL	25.38
99% Chebyshev (MVUE) UCL	37.74		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	14.57	95% Jackknife UCL	15.11
95% Standard Bootstrap UCL	14.41	95% Bootstrap-t UCL	263.1
95% Hall's Bootstrap UCL	202.9	95% Percentile Bootstrap UCL	14.14
95% BCA Bootstrap UCL	17.31		
90% Chebyshev(Mean, Sd) UCL	20.75	95% Chebyshev(Mean, Sd) UCL	26.95
97.5% Chebyshev(Mean, Sd) UCL	35.55	99% Chebyshev(Mean, Sd) UCL	52.45
Suggested UCL to Use			
99% Chebyshev (Mean, Sd) UCL	52.45		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
DibenzAHAnthracene			
General Statistics			
Total Number of Observations	15	Number of Distinct Observations	13
Number of Detects	13	Number of Non-Detects	2
Number of Distinct Detects	11	Number of Distinct Non-Detects	2
Minimum Detect	0.0078	Minimum Non-Detect	0.0017
Maximum Detect	11	Maximum Non-Detect	0.021
Variance Detects	15.29	Percent Non-Detects	13.33%
Mean Detects	1.705	SD Detects	3.91
Median Detects	0.12	CV Detects	2.294
Skewness Detects	2.188	Kurtosis Detects	3.312
Mean of Logged Detects	-2.134	SD of Logged Detects	2.346
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.477	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.866	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.486	**Lilliefors GOF Test**	

5% Lilliefors Critical Value	0.234	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	1.478	KM Standard Error of Mean	0.953
KM SD	3.545	95% KM (BCA) UCL	2.952
95% KM (t) UCL	3.156	95% KM (Percentile Bootstrap) UCL	2.927
95% KM (z) UCL	3.045	95% KM Bootstrap t UCL	51.16
90% KM Chebyshev UCL	4.336	95% KM Chebyshev UCL	5.631
97.5% KM Chebyshev UCL	7.427	99% KM Chebyshev UCL	10.96
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	1.643	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.845	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.355	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.258	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.264	k star (bias corrected MLE)	0.254
Theta hat (MLE)	6.458	Theta star (bias corrected MLE)	6.703
nu hat (MLE)	6.864	nu star (bias corrected)	6.613
Mean (detects)	1.705		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.0078	Mean	1.479
Maximum	11	Median	0.052
SD	3.669	CV	2.481
k hat (MLE)	0.249	k star (bias corrected MLE)	0.244
Theta hat (MLE)	5.939	Theta star (bias corrected MLE)	6.07
nu hat (MLE)	7.47	nu star (bias corrected)	7.309
Adjusted Level of Significance (β)	0.0324		
Approximate Chi Square Value (7.31, α)	2.342	Adjusted Chi Square Value (7.31, β)	2.011
95% Gamma Approximate UCL (use when n>=50)	4.616	95% Gamma Adjusted UCL (use when n<50)	5.376
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	1.478	SD (KM)	3.545
Variance (KM)	12.56	SE of Mean (KM)	0.953
k hat (KM)	0.174	k star (KM)	0.184
nu hat (KM)	5.218	nu star (KM)	5.508
theta hat (KM)	8.499	theta star (KM)	8.052
80% gamma percentile (KM)	1.856	90% gamma percentile (KM)	4.462
95% gamma percentile (KM)	7.783	99% gamma percentile (KM)	17.06
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (5.51, α)	1.394	Adjusted Chi Square Value (5.51, β)	1.157

95% Gamma Approximate KM-UCL (use when n>=50)	5.842	95% Gamma Adjusted KM-UCL (use when n<50)	7.037
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.879	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.866	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.187	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.234	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	1.478	Mean in Log Scale	-2.693
SD in Original Scale	3.669	SD in Log Scale	2.67
95% t UCL (assumes normality of ROS data)	3.147	95% Percentile Bootstrap UCL	2.921
95% BCA Bootstrap UCL	3.646	95% Bootstrap t UCL	51.63
95% H-UCL (Log ROS)	161.1		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-2.595	KM Geo Mean	0.0746
KM SD (logged)	2.432	95% Critical H Value (KM-Log)	5.42
KM Standard Error of Mean (logged)	0.657	95% H-UCL (KM -Log)	48.63
KM SD (logged)	2.432	95% Critical H Value (KM-Log)	5.42
KM Standard Error of Mean (logged)	0.657		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	1.478	Mean in Log Scale	-2.624
SD in Original Scale	3.669	SD in Log Scale	2.573
95% t UCL (Assumes normality)	3.147	95% H-Stat UCL	100
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Lognormal Distributed at 5% Significance Level			
Suggested UCL to Use			
99% KM (Chebyshev) UCL	10.96		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
BenzoAAnthracene			
General Statistics			
Total Number of Observations	15	Number of Distinct Observations	15
Number of Detects	14	Number of Non-Detects	1
Number of Distinct Detects	14	Number of Distinct Non-Detects	1
Minimum Detect	0.0069	Minimum Non-Detect	0.034
Maximum Detect	43	Maximum Non-Detect	0.034
Variance Detects	234.6	Percent Non-Detects	6.667%
Mean Detects	6.357	SD Detects	15.32

Median Detects	0.285	CV Detects	2.41
Skewness Detects	2.293	Kurtosis Detects	3.789
Mean of Logged Detects	-1.216	SD of Logged Detects	2.584
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.45	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.874	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.487	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.226	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	5.935	KM Standard Error of Mean	3.844
KM SD	14.35	95% KM (BCA) UCL	11.83
95% KM (t) UCL	12.71	95% KM (Percentile Bootstrap) UCL	11.69
95% KM (z) UCL	12.26	95% KM Bootstrap t UCL	228.8
90% KM Chebyshev UCL	17.47	95% KM Chebyshev UCL	22.69
97.5% KM Chebyshev UCL	29.94	99% KM Chebyshev UCL	44.19
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	1.672	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.863	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.322	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.251	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.234	k star (bias corrected MLE)	0.232
Theta hat (MLE)	27.15	Theta star (bias corrected MLE)	27.45
nu hat (MLE)	6.556	nu star (bias corrected)	6.484
Mean (detects)	6.357		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.0069	Mean	5.934
Maximum	43	Median	0.17
SD	14.85	CV	2.503
k hat (MLE)	0.224	k star (bias corrected MLE)	0.224
Theta hat (MLE)	26.46	Theta star (bias corrected MLE)	26.51
nu hat (MLE)	6.728	nu star (bias corrected)	6.716
Adjusted Level of Significance (β)	0.0324		
Approximate Chi Square Value (6.72, α)	2.016	Adjusted Chi Square Value (6.72, β)	1.715
95% Gamma Approximate UCL (use when n>=50)	19.77	95% Gamma Adjusted UCL (use when n<50)	23.24
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	5.935	SD (KM)	14.35
Variance (KM)	205.9	SE of Mean (KM)	3.844

k hat (KM)	0.171	k star (KM)	0.181
nu hat (KM)	5.132	nu star (KM)	5.439
theta hat (KM)	34.69	theta star (KM)	32.73
80% gamma percentile (KM)	7.396	90% gamma percentile (KM)	17.9
95% gamma percentile (KM)	31.34	99% gamma percentile (KM)	68.95
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (5.44, α)	1.36	Adjusted Chi Square Value (5.44, β)	1.128
95% Gamma Approximate KM-UCL (use when n>=50)	23.73	95% Gamma Adjusted KM-UCL (use when n<50)	28.63
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.919	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.874	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.141	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.226	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	5.934	Mean in Log Scale	-1.478
SD in Original Scale	14.85	SD in Log Scale	2.689
95% t UCL (assumes normality of ROS data)	12.69	95% Percentile Bootstrap UCL	11.65
95% BCA Bootstrap UCL	14.47	95% Bootstrap t UCL	244.2
95% H-UCL (Log ROS)	603.5		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-1.425	KM Geo Mean	0.24
KM SD (logged)	2.535	95% Critical H Value (KM-Log)	5.627
KM Standard Error of Mean (logged)	0.681	95% H-UCL (KM -Log)	270.1
KM SD (logged)	2.535	95% Critical H Value (KM-Log)	5.627
KM Standard Error of Mean (logged)	0.681		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	5.935	Mean in Log Scale	-1.407
SD in Original Scale	14.85	SD in Log Scale	2.597
95% t UCL (Assumes normality)	12.69	95% H-Stat UCL	386.9
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Lognormal Distributed at 5% Significance Level			
Suggested UCL to Use			
99% KM (Chebyshev) UCL	44.19		
Warning: Recommended UCL exceeds the maximum observation			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Cyanide			

General Statistics			
Total Number of Observations	15	Number of Distinct Observations	11
Number of Detects	6	Number of Non-Detects	9
Number of Distinct Detects	5	Number of Distinct Non-Detects	7
Minimum Detect	0.066	Minimum Non-Detect	0.063
Maximum Detect	0.42	Maximum Non-Detect	0.075
Variance Detects	0.0173	Percent Non-Detects	60%
Mean Detects	0.179	SD Detects	0.131
Median Detects	0.142	CV Detects	0.734
Skewness Detects	1.5	Kurtosis Detects	2.291
Mean of Logged Detects	-1.923	SD of Logged Detects	0.684
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.835	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.788	Detected Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.241	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.325	Detected Data appear Normal at 5% Significance Level	
Detected Data appear Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.11	KM Standard Error of Mean	0.0268
KM SD	0.0946	95% KM (BCA) UCL	0.157
95% KM (t) UCL	0.157	95% KM (Percentile Bootstrap) UCL	0.154
95% KM (z) UCL	0.154	95% KM Bootstrap t UCL	0.195
90% KM Chebyshev UCL	0.19	95% KM Chebyshev UCL	0.226
97.5% KM Chebyshev UCL	0.277	99% KM Chebyshev UCL	0.376
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	0.37	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.702	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.266	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.335	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	2.627	k star (bias corrected MLE)	1.424
Theta hat (MLE)	0.0682	Theta star (bias corrected MLE)	0.126
nu hat (MLE)	31.52	nu star (bias corrected)	17.09
Mean (detects)	0.179		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	0.0776
Maximum	0.42	Median	0.01
SD	0.116	CV	1.498
k hat (MLE)	0.629	k star (bias corrected MLE)	0.547

Theta hat (MLE)	0.123	Theta star (bias corrected MLE)	0.142
nu hat (MLE)	18.86	nu star (bias corrected)	16.42
Adjusted Level of Significance (β)	0.0324		
Approximate Chi Square Value (16.42, α)	8.262	Adjusted Chi Square Value (16.42, β)	7.558
95% Gamma Approximate UCL (use when n>=50)	0.154	95% Gamma Adjusted UCL (use when n<50)	0.169
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.11	SD (KM)	0.0946
Variance (KM)	0.00895	SE of Mean (KM)	0.0268
k hat (KM)	1.349	k star (KM)	1.124
nu hat (KM)	40.48	nu star (KM)	33.72
theta hat (KM)	0.0814	theta star (KM)	0.0978
80% gamma percentile (KM)	0.175	90% gamma percentile (KM)	0.246
95% gamma percentile (KM)	0.316	99% gamma percentile (KM)	0.477
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (33.72, α)	21.44	Adjusted Chi Square Value (33.72, β)	20.24
95% Gamma Approximate KM-UCL (use when n>=50)	0.173	95% Gamma Adjusted KM-UCL (use when n<50)	0.183
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.934	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.788	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.241	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.325	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.0867	Mean in Log Scale	-3.015
SD in Original Scale	0.111	SD in Log Scale	1.047
95% t UCL (assumes normality of ROS data)	0.137	95% Percentile Bootstrap UCL	0.138
95% BCA Bootstrap UCL	0.159	95% Bootstrap t UCL	0.182
95% H-UCL (Log ROS)	0.187		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-2.421	KM Geo Mean	0.0889
KM SD (logged)	0.567	95% Critical H Value (KM-Log)	2.142
KM Standard Error of Mean (logged)	0.161	95% H-UCL (KM -Log)	0.144
KM SD (logged)	0.567	95% Critical H Value (KM-Log)	2.142
KM Standard Error of Mean (logged)	0.161		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.0926	Mean in Log Scale	-2.782
SD in Original Scale	0.107	SD in Log Scale	0.834
95% t UCL (Assumes normality)	0.141	95% H-Stat UCL	0.153
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Normal Distributed at 5% Significance Level			
Suggested UCL to Use			

95% KM (t) UCL	0.157		

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Aluminum

General Statistics

Total Number of Observations	15	Number of Distinct Observations	15
		Number of Missing Observations	0
Minimum	6230	Mean	16762
Maximum	38900	Median	15100
SD	8372	Std. Error of Mean	2162
Coefficient of Variation	0.499	Skewness	1.686

Normal GOF Test

Shapiro Wilk Test Statistic	0.827	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.881	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.236	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.22	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	20569	95% Adjusted-CLT UCL (Chen-1995)	21323
		95% Modified-t UCL (Johnson-1978)	20726

Gamma GOF Test

A-D Test Statistic	0.52	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.738	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.179	**Kolmogorov-Smirnov Gamma GOF Test**
5% K-S Critical Value	0.222	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	5.31	k star (bias corrected MLE)	4.293
Theta hat (MLE)	3156	Theta star (bias corrected MLE)	3905
nu hat (MLE)	159.3	nu star (bias corrected)	128.8
MLE Mean (bias corrected)	16762	MLE Sd (bias corrected)	8090
		Approximate Chi Square Value (0.05)	103.6
Adjusted Level of Significance	0.0324	Adjusted Chi Square Value	100.8

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50)	20843	95% Adjusted Gamma UCL (use when n<50)	21418

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.955	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.881	Data appear Lognormal at 5% Significance Level

Lilliefors Test Statistic	0.15	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.22	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	8.737	Mean of logged Data	9.63
Maximum of Logged Data	10.57	SD of logged Data	0.445
Assuming Lognormal Distribution			
95% H-UCL	21334	90% Chebyshev (MVUE) UCL	22563
95% Chebyshev (MVUE) UCL	25230	97.5% Chebyshev (MVUE) UCL	28932
99% Chebyshev (MVUE) UCL	36203		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	20317	95% Jackknife UCL	20569
95% Standard Bootstrap UCL	20152	95% Bootstrap-t UCL	23837
95% Hall's Bootstrap UCL	42530	95% Percentile Bootstrap UCL	20507
95% BCA Bootstrap UCL	21149		
90% Chebyshev(Mean, Sd) UCL	23247	95% Chebyshev(Mean, Sd) UCL	26184
97.5% Chebyshev(Mean, Sd) UCL	30261	99% Chebyshev(Mean, Sd) UCL	38269
Suggested UCL to Use			
95% Adjusted Gamma UCL	21418		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Iron			
General Statistics			
Total Number of Observations	15	Number of Distinct Observations	12
		Number of Missing Observations	0
Minimum	9890	Mean	15606
Maximum	20600	Median	15600
SD	2648	Std. Error of Mean	683.7
Coefficient of Variation	0.17	Skewness	-0.429
Normal GOF Test			
Shapiro Wilk Test Statistic	0.969	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.881	Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.138	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.22	Data appear Normal at 5% Significance Level	
Data appear Normal at 5% Significance Level			
Assuming Normal Distribution			

95% Normal UCL		95% UCLs (Adjusted for Skewness)	
95% Student's-t UCL	16810	95% Adjusted-CLT UCL (Chen-1995)	16650
		95% Modified-t UCL (Johnson-1978)	16798
Gamma GOF Test			
A-D Test Statistic	0.391	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.735	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.158	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.221	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	34.27	k star (bias corrected MLE)	27.46
Theta hat (MLE)	455.4	Theta star (bias corrected MLE)	568.4
nu hat (MLE)	1028	nu star (bias corrected)	823.7
MLE Mean (bias corrected)	15606	MLE Sd (bias corrected)	2978
		Approximate Chi Square Value (0.05)	758.1
Adjusted Level of Significance	0.0324	Adjusted Chi Square Value	750.4
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	16957	95% Adjusted Gamma UCL (use when n<50)	17132
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.934	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.881	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.173	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.22	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	9.199	Mean of logged Data	9.641
Maximum of Logged Data	9.933	SD of logged Data	0.182
Assuming Lognormal Distribution			
95% H-UCL	17062	90% Chebyshev (MVUE) UCL	17827
95% Chebyshev (MVUE) UCL	18827	97.5% Chebyshev (MVUE) UCL	20216
99% Chebyshev (MVUE) UCL	22944		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	16731	95% Jackknife UCL	16810
95% Standard Bootstrap UCL	16691	95% Bootstrap-t UCL	16715
95% Hall's Bootstrap UCL	16717	95% Percentile Bootstrap UCL	16707
95% BCA Bootstrap UCL	16647		
90% Chebyshev(Mean, Sd) UCL	17657	95% Chebyshev(Mean, Sd) UCL	18586
97.5% Chebyshev(Mean, Sd) UCL	19876	99% Chebyshev(Mean, Sd) UCL	22409
Suggested UCL to Use			
95% Student's-t UCL	16810		

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Note: For highly negatively-skewed data, confidence limits (e.g., Chen, Johnson, Lognormal, and Gamma) may not be reliable. Chen's and Johnson's methods provide adjustments for positvely skewed data sets.

Manganese

General Statistics

Total Number of Observations	15	Number of Distinct Observations	14
		Number of Missing Observations	0
Minimum	284	Mean	614.5
Maximum	2620	Median	400
SD	591.5	Std. Error of Mean	152.7
Coefficient of Variation	0.963	Skewness	3.176

Normal GOF Test

Shapiro Wilk Test Statistic	0.545	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.881	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.323	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.22	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	883.5	95% Adjusted-CLT UCL (Chen-1995)	999.6
		95% Modified-t UCL (Johnson-1978)	904.4

Gamma GOF Test

A-D Test Statistic	1.727	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.746	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.293	**Kolmogorov-Smirnov Gamma GOF Test**
5% K-S Critical Value	0.224	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	2.441	k star (bias corrected MLE)	1.998
Theta hat (MLE)	251.7	Theta star (bias corrected MLE)	307.6
nu hat (MLE)	73.24	nu star (bias corrected)	59.93
MLE Mean (bias corrected)	614.5	MLE Sd (bias corrected)	434.8
		Approximate Chi Square Value (0.05)	43.13
Adjusted Level of Significance	0.0324	Adjusted Chi Square Value	41.38

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	853.9	95% Adjusted Gamma UCL (use when n<50)	890.1

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.777	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.881	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.251	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.22	Data Not Lognormal at 5% Significance Level	
Data Not Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	5.649	Mean of logged Data	6.202
Maximum of Logged Data	7.871	SD of logged Data	0.584
Assuming Lognormal Distribution			
95% H-UCL	820.3	90% Chebyshev (MVUE) UCL	849.6
95% Chebyshev (MVUE) UCL	972.7	97.5% Chebyshev (MVUE) UCL	1143
99% Chebyshev (MVUE) UCL	1479		
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution (0.05)			
Nonparametric Distribution Free UCLs			
95% CLT UCL	865.7	95% Jackknife UCL	883.5
95% Standard Bootstrap UCL	860.6	95% Bootstrap-t UCL	1504
95% Hall's Bootstrap UCL	1767	95% Percentile Bootstrap UCL	891.9
95% BCA Bootstrap UCL	1010		
90% Chebyshev(Mean, Sd) UCL	1073	95% Chebyshev(Mean, Sd) UCL	1280
97.5% Chebyshev(Mean, Sd) UCL	1568	99% Chebyshev(Mean, Sd) UCL	2134
Suggested UCL to Use			
95% Chebyshev (Mean, Sd) UCL	1280		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Mercury			
General Statistics			
Total Number of Observations	15	Number of Distinct Observations	12
Number of Detects	14	Number of Non-Detects	1
Number of Distinct Detects	11	Number of Distinct Non-Detects	1
Minimum Detect	0.01	Minimum Non-Detect	0.011
Maximum Detect	0.055	Maximum Non-Detect	0.011
Variance Detects	1.5222E-4	Percent Non-Detects	6.667%
Mean Detects	0.0223	SD Detects	0.0123
Median Detects	0.0195	CV Detects	0.554
Skewness Detects	1.823	Kurtosis Detects	3.256
Mean of Logged Detects	-3.915	SD of Logged Detects	0.465
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.799	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.874	Detected Data Not Normal at 5% Significance Level	

Lilliefors Test Statistic	0.23	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.226	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.0215	KM Standard Error of Mean	0.00319
KM SD	0.0119	95% KM (BCA) UCL	0.0269
95% KM (t) UCL	0.0271	95% KM (Percentile Bootstrap) UCL	0.0269
95% KM (z) UCL	0.0267	95% KM Bootstrap t UCL	0.0323
90% KM Chebyshev UCL	0.031	95% KM Chebyshev UCL	0.0354
97.5% KM Chebyshev UCL	0.0414	99% KM Chebyshev UCL	0.0532
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	0.545	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.739	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.172	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.229	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	4.664	k star (bias corrected MLE)	3.712
Theta hat (MLE)	0.00478	Theta star (bias corrected MLE)	0.006
nu hat (MLE)	130.6	nu star (bias corrected)	103.9
Mean (detects)	0.0223		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	0.0215
Maximum	0.055	Median	0.019
SD	0.0123	CV	0.573
k hat (MLE)	4.341	k star (bias corrected MLE)	3.517
Theta hat (MLE)	0.00495	Theta star (bias corrected MLE)	0.0061
nu hat (MLE)	130.2	nu star (bias corrected)	105.5
Adjusted Level of Significance (β)	0.0324		
Approximate Chi Square Value (105.51, α)	82.8	Adjusted Chi Square Value (105.51, β)	80.33
95% Gamma Approximate UCL (use when n>=50)	0.0274	95% Gamma Adjusted UCL (use when n<50)	0.0282
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.0215	SD (KM)	0.0119
Variance (KM)	1.4132E-4	SE of Mean (KM)	0.00319
k hat (KM)	3.261	k star (KM)	2.653
nu hat (KM)	97.83	nu star (KM)	79.6
theta hat (KM)	0.00658	theta star (KM)	0.00809
80% gamma percentile (KM)	0.0311	90% gamma percentile (KM)	0.0391
95% gamma percentile (KM)	0.0467	99% gamma percentile (KM)	0.0632
Gamma Kaplan-Meier (KM) Statistics			

Approximate Chi Square Value (79.60, α)	60.04	Adjusted Chi Square Value (79.60, β)	57.95
95% Gamma Approximate KM-UCL (use when n>=50)	0.0285	95% Gamma Adjusted KM-UCL (use when n<50)	0.0295
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.946	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.874	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.14	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.226	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.0214	Mean in Log Scale	-3.972
SD in Original Scale	0.0124	SD in Log Scale	0.501
95% t UCL (assumes normality of ROS data)	0.027	95% Percentile Bootstrap UCL	0.0264
95% BCA Bootstrap UCL	0.0279	95% Bootstrap t UCL	0.032
95% H-UCL (Log ROS)	0.0282		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-3.961	KM Geo Mean	0.019
KM SD (logged)	0.466	95% Critical H Value (KM-Log)	2.033
KM Standard Error of Mean (logged)	0.125	95% H-UCL (KM -Log)	0.0274
KM SD (logged)	0.466	95% Critical H Value (KM-Log)	2.033
KM Standard Error of Mean (logged)	0.125		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.0212	Mean in Log Scale	-4.001
SD in Original Scale	0.0127	SD in Log Scale	0.558
95% t UCL (Assumes normality)	0.0269	95% H-Stat UCL	0.0294
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Gamma Distributed at 5% Significance Level			
Suggested UCL to Use			
95% KM Adjusted Gamma UCL	0.0295	95% GROS Adjusted Gamma UCL	0.0282
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Nickel			
General Statistics			
Total Number of Observations	15	Number of Distinct Observations	14
		Number of Missing Observations	0
Minimum	7.8	Mean	47.56
Maximum	463	Median	14.2
SD	115.6	Std. Error of Mean	29.84

Coefficient of Variation	2.43	Skewness	3.801
Normal GOF Test			
Shapiro Wilk Test Statistic	0.35	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.881	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.444	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.22	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	100.1	95% Adjusted-CLT UCL (Chen-1995)	127.9
		95% Modified-t UCL (Johnson-1978)	105
Gamma GOF Test			
A-D Test Statistic	3.241	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.78	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.398	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.231	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	0.685	k star (bias corrected MLE)	0.592
Theta hat (MLE)	69.45	Theta star (bias corrected MLE)	80.3
nu hat (MLE)	20.54	nu star (bias corrected)	17.77
MLE Mean (bias corrected)	47.56	MLE Sd (bias corrected)	61.8
		Approximate Chi Square Value (0.05)	9.224
Adjusted Level of Significance	0.0324	Adjusted Chi Square Value	8.474
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	91.62	95% Adjusted Gamma UCL (use when n<50)	99.72
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.654	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.881	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.324	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.22	Data Not Lognormal at 5% Significance Level	
Data Not Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	2.054	Mean of logged Data	2.977
Maximum of Logged Data	6.138	SD of logged Data	0.986
Assuming Lognormal Distribution			
95% H-UCL	65.31	90% Chebyshev (MVUE) UCL	55.91
95% Chebyshev (MVUE) UCL	67.42	97.5% Chebyshev (MVUE) UCL	83.39
99% Chebyshev (MVUE) UCL	114.8		
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution (0.05)			

Nonparametric Distribution Free UCLs			
95% CLT UCL	96.65	95% Jackknife UCL	100.1
95% Standard Bootstrap UCL	94.5	95% Bootstrap-t UCL	1069
95% Hall's Bootstrap UCL	396.9	95% Percentile Bootstrap UCL	105.1
95% BCA Bootstrap UCL	136.8		
90% Chebyshev(Mean, Sd) UCL	137.1	95% Chebyshev(Mean, Sd) UCL	177.6
97.5% Chebyshev(Mean, Sd) UCL	233.9	99% Chebyshev(Mean, Sd) UCL	344.5

Suggested UCL to Use			
95% Chebyshev (Mean, Sd) UCL	177.6		

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Thallium

General Statistics			
Total Number of Observations	15	Number of Distinct Observations	7
Number of Detects	2	Number of Non-Detects	13
Number of Distinct Detects	1	Number of Distinct Non-Detects	6

Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set!
It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable Thallium was not processed!

Antimony

General Statistics			
Total Number of Observations	15	Number of Distinct Observations	9
Number of Detects	3	Number of Non-Detects	12
Number of Distinct Detects	3	Number of Distinct Non-Detects	7
Minimum Detect	0.32	Minimum Non-Detect	0.26
Maximum Detect	2.8	Maximum Non-Detect	0.5
Variance Detects	2.034	Percent Non-Detects	80%
Mean Detects	1.153	SD Detects	1.426
Median Detects	0.34	CV Detects	1.236
Skewness Detects	1.732	Kurtosis Detects	N/A
Mean of Logged Detects	-0.396	SD of Logged Detects	1.235

Warning: Data set has only 3 Detected Values.
This is not enough to compute meaningful or reliable statistics and estimates.

Normal GOF Test on Detects Only		
Shapiro Wilk Test Statistic	0.756	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.767	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.382	**Lilliefors GOF Test**

5% Lilliefors Critical Value	0.425	Detected Data appear Normal at 5% Significance Level	
Detected Data appear Approximate Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.442	KM Standard Error of Mean	0.2
KM SD	0.631	95% KM (BCA) UCL	N/A
95% KM (t) UCL	0.794	95% KM (Percentile Bootstrap) UCL	N/A
95% KM (z) UCL	0.771	95% KM Bootstrap t UCL	N/A
90% KM Chebyshev UCL	1.041	95% KM Chebyshev UCL	1.312
97.5% KM Chebyshev UCL	1.688	99% KM Chebyshev UCL	2.428
Gamma GOF Tests on Detected Observations Only			
Not Enough Data to Perform GOF Test			
Gamma Statistics on Detected Data Only			
k hat (MLE)	1.064	k star (bias corrected MLE)	N/A
Theta hat (MLE)	1.084	Theta star (bias corrected MLE)	N/A
nu hat (MLE)	6.382	nu star (bias corrected)	N/A
Mean (detects)	1.153		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	0.239
Maximum	2.8	Median	0.01
SD	0.717	CV	3.006
k hat (MLE)	0.296	k star (bias corrected MLE)	0.282
Theta hat (MLE)	0.805	Theta star (bias corrected MLE)	0.848
nu hat (MLE)	8.893	nu star (bias corrected)	8.448
Adjusted Level of Significance (β)	0.0324		
Approximate Chi Square Value (8.45, α)	2.997	Adjusted Chi Square Value (8.45, β)	2.611
95% Gamma Approximate UCL (use when n>=50)	0.673	95% Gamma Adjusted UCL (use when n<50)	N/A
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.442	SD (KM)	0.631
Variance (KM)	0.398	SE of Mean (KM)	0.2
k hat (KM)	0.492	k star (KM)	0.438
nu hat (KM)	14.77	nu star (KM)	13.15
theta hat (KM)	0.899	theta star (KM)	1.01
80% gamma percentile (KM)	0.721	90% gamma percentile (KM)	1.229
95% gamma percentile (KM)	1.781	99% gamma percentile (KM)	3.156
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (13.15, α)	5.992	Adjusted Chi Square Value (13.15, β)	5.408
95% Gamma Approximate KM-UCL (use when n>=50)	0.971	95% Gamma Adjusted KM-UCL (use when n<50)	1.076
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.771	**Shapiro Wilk GOF Test**	

5% Shapiro Wilk Critical Value	0.767	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.376	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.425	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.252	Mean in Log Scale	-3.202
SD in Original Scale	0.713	SD in Log Scale	1.696
95% t UCL (assumes normality of ROS data)	0.577	95% Percentile Bootstrap UCL	0.612
95% BCA Bootstrap UCL	0.805	95% Bootstrap t UCL	2.135
95% H-UCL (Log ROS)	1.038		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-1.144	KM Geo Mean	0.319
KM SD (logged)	0.588	95% Critical H Value (KM-Log)	2.167
KM Standard Error of Mean (logged)	0.187	95% H-UCL (KM -Log)	0.532
KM SD (logged)	0.588	95% Critical H Value (KM-Log)	2.167
KM Standard Error of Mean (logged)	0.187		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.362	Mean in Log Scale	-1.538
SD in Original Scale	0.678	SD in Log Scale	0.767
95% t UCL (Assumes normality)	0.67	95% H-Stat UCL	0.472
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Approximate Normal Distributed at 5% Significance Level			
Suggested UCL to Use			
95% KM (t) UCL	0.794		
When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test			
When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Arsenic			
General Statistics			
Total Number of Observations	15	Number of Distinct Observations	13
		Number of Missing Observations	0
Minimum	4.1	Mean	6.98
Maximum	23.5	Median	6.1
SD	4.702	Std. Error of Mean	1.214
Coefficient of Variation	0.674	Skewness	3.513

Normal GOF Test			
Shapiro Wilk Test Statistic	0.505	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.881	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.348	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.22	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	9.118	95% Adjusted-CLT UCL (Chen-1995)	10.15
		95% Modified-t UCL (Johnson-1978)	9.302
Gamma GOF Test			
A-D Test Statistic	1.804	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.739	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.279	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.222	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	4.749	k star (bias corrected MLE)	3.844
Theta hat (MLE)	1.47	Theta star (bias corrected MLE)	1.816
nu hat (MLE)	142.5	nu star (bias corrected)	115.3
MLE Mean (bias corrected)	6.98	MLE Sd (bias corrected)	3.56
		Approximate Chi Square Value (0.05)	91.53
Adjusted Level of Significance	0.0324	Adjusted Chi Square Value	88.92
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	8.794	95% Adjusted Gamma UCL (use when n<50)	9.052
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.733	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.881	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.234	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.22	Data Not Lognormal at 5% Significance Level	
Data Not Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	1.411	Mean of logged Data	1.834
Maximum of Logged Data	3.157	SD of logged Data	0.413
Assuming Lognormal Distribution			
95% H-UCL	8.484	90% Chebyshev (MVUE) UCL	8.99
95% Chebyshev (MVUE) UCL	9.993	97.5% Chebyshev (MVUE) UCL	11.38
99% Chebyshev (MVUE) UCL	14.12		
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution (0.05)			
Nonparametric Distribution Free UCLs			
95% CLT UCL	8.977	95% Jackknife UCL	9.118

95% Standard Bootstrap UCL	8.936	95% Bootstrap-t UCL	13.98
95% Hall's Bootstrap UCL	17.29	95% Percentile Bootstrap UCL	9.24
95% BCA Bootstrap UCL	10.55		
90% Chebyshev(Mean, Sd) UCL	10.62	95% Chebyshev(Mean, Sd) UCL	12.27
97.5% Chebyshev(Mean, Sd) UCL	14.56	99% Chebyshev(Mean, Sd) UCL	19.06
Suggested UCL to Use			
95% Student's-t UCL	9.118	or 95% Modified-t UCL	9.302
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Barium			
General Statistics			
Total Number of Observations	15	Number of Distinct Observations	15
		Number of Missing Observations	0
Minimum	64.2	Mean	166.6
Maximum	436	Median	148
SD	104.2	Std. Error of Mean	26.91
Coefficient of Variation	0.626	Skewness	1.225
Normal GOF Test			
Shapiro Wilk Test Statistic	0.856	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.881	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.223	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.22	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	214	95% Adjusted-CLT UCL (Chen-1995)	219.9
		95% Modified-t UCL (Johnson-1978)	215.4
Gamma GOF Test			
A-D Test Statistic	0.619	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.744	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.228	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.223	Data Not Gamma Distributed at 5% Significance Level	
Detected data follow Appr. Gamma Distribution at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	3.05	k star (bias corrected MLE)	2.484
Theta hat (MLE)	54.61	Theta star (bias corrected MLE)	67.04
nu hat (MLE)	91.49	nu star (bias corrected)	74.53
MLE Mean (bias corrected)	166.6	MLE Sd (bias corrected)	105.7
		Approximate Chi Square Value (0.05)	55.65
Adjusted Level of Significance	0.0324	Adjusted Chi Square Value	53.64

Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50)	223.1	95% Adjusted Gamma UCL (use when n<50)	231.4
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.913	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.881	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.211	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.22	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	4.162	Mean of logged Data	4.943
Maximum of Logged Data	6.078	SD of logged Data	0.607
Assuming Lognormal Distribution			
95% H-UCL	240.2	90% Chebyshev (MVUE) UCL	247.5
95% Chebyshev (MVUE) UCL	284.3	97.5% Chebyshev (MVUE) UCL	335.5
99% Chebyshev (MVUE) UCL	436		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	210.8	95% Jackknife UCL	214
95% Standard Bootstrap UCL	207.8	95% Bootstrap-t UCL	228.8
95% Hall's Bootstrap UCL	230.7	95% Percentile Bootstrap UCL	209.8
95% BCA Bootstrap UCL	219.5		
90% Chebyshev(Mean, Sd) UCL	247.3	95% Chebyshev(Mean, Sd) UCL	283.9
97.5% Chebyshev(Mean, Sd) UCL	334.6	99% Chebyshev(Mean, Sd) UCL	434.4
Suggested UCL to Use			
95% Adjusted Gamma UCL	231.4		
When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test			
When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
ChromiumVI_EST			
General Statistics			
Total Number of Observations	15	Number of Distinct Observations	15
		Number of Missing Observations	0
Minimum	0.174	Mean	0.33
Maximum	1.049	Median	0.278
SD	0.206	Std. Error of Mean	0.0531

Coefficient of Variation	0.623	Skewness	3.454
Normal GOF Test			
Shapiro Wilk Test Statistic	0.527	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.881	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.337	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.22	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	0.424	95% Adjusted-CLT UCL (Chen-1995)	0.468
		95% Modified-t UCL (Johnson-1978)	0.431
Gamma GOF Test			
A-D Test Statistic	1.728	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.738	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.268	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.222	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	5.282	k star (bias corrected MLE)	4.27
Theta hat (MLE)	0.0625	Theta star (bias corrected MLE)	0.0773
nu hat (MLE)	158.5	nu star (bias corrected)	128.1
MLE Mean (bias corrected)	0.33	MLE Sd (bias corrected)	0.16
		Approximate Chi Square Value (0.05)	103
Adjusted Level of Significance	0.0324	Adjusted Chi Square Value	100.2
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	0.411	95% Adjusted Gamma UCL (use when n<50)	0.422
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.761	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.881	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.23	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.22	Data Not Lognormal at 5% Significance Level	
Data Not Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	-1.749	Mean of logged Data	-1.206
Maximum of Logged Data	0.048	SD of logged Data	0.397
Assuming Lognormal Distribution			
95% H-UCL	0.399	90% Chebyshev (MVUE) UCL	0.423
95% Chebyshev (MVUE) UCL	0.469	97.5% Chebyshev (MVUE) UCL	0.532
99% Chebyshev (MVUE) UCL	0.657		
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution (0.05)			

Nonparametric Distribution Free UCLs			
95% CLT UCL	0.417	95% Jackknife UCL	0.424
95% Standard Bootstrap UCL	0.414	95% Bootstrap-t UCL	0.639
95% Hall's Bootstrap UCL	0.806	95% Percentile Bootstrap UCL	0.432
95% BCA Bootstrap UCL	0.483		
90% Chebyshev(Mean, Sd) UCL	0.489	95% Chebyshev(Mean, Sd) UCL	0.561
97.5% Chebyshev(Mean, Sd) UCL	0.662	99% Chebyshev(Mean, Sd) UCL	0.858
Suggested UCL to Use			
95% Student's-t UCL	0.424	or 95% Modified-t UCL	0.431
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Cobalt			
General Statistics			
Total Number of Observations	15	Number of Distinct Observations	9
		Number of Missing Observations	0
Minimum	3.6	Mean	6.033
Maximum	16	Median	5.5
SD	2.892	Std. Error of Mean	0.747
Coefficient of Variation	0.479	Skewness	3.281
Normal GOF Test			
Shapiro Wilk Test Statistic	0.551	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.881	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.371	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.22	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	7.349	95% Adjusted-CLT UCL (Chen-1995)	7.938
		95% Modified-t UCL (Johnson-1978)	7.454
Gamma GOF Test			
A-D Test Statistic	1.95	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.738	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.325	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.222	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	7.821	k star (bias corrected MLE)	6.301
Theta hat (MLE)	0.771	Theta star (bias corrected MLE)	0.957
nu hat (MLE)	234.6	nu star (bias corrected)	189
MLE Mean (bias corrected)	6.033	MLE Sd (bias corrected)	2.403

		Approximate Chi Square Value (0.05)	158.2
Adjusted Level of Significance	0.0324	Adjusted Chi Square Value	154.8
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	7.208	95% Adjusted Gamma UCL (use when n<50)	7.369
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.733	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.881	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.296	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.22	Data Not Lognormal at 5% Significance Level	
Data Not Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	1.281	Mean of logged Data	1.732
Maximum of Logged Data	2.773	SD of logged Data	0.335
Assuming Lognormal Distribution			
95% H-UCL	7.091	90% Chebyshev (MVUE) UCL	7.519
95% Chebyshev (MVUE) UCL	8.227	97.5% Chebyshev (MVUE) UCL	9.211
99% Chebyshev (MVUE) UCL	11.14		
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution (0.05)			
Nonparametric Distribution Free UCLs			
95% CLT UCL	7.262	95% Jackknife UCL	7.349
95% Standard Bootstrap UCL	7.197	95% Bootstrap-t UCL	9.915
95% Hall's Bootstrap UCL	13.72	95% Percentile Bootstrap UCL	7.46
95% BCA Bootstrap UCL	8.173		
90% Chebyshev(Mean, Sd) UCL	8.273	95% Chebyshev(Mean, Sd) UCL	9.288
97.5% Chebyshev(Mean, Sd) UCL	10.7	99% Chebyshev(Mean, Sd) UCL	13.46
Suggested UCL to Use			
95% Student's-t UCL	7.349	or 95% Modified-t UCL	7.454
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Copper			
General Statistics			
Total Number of Observations	15	Number of Distinct Observations	15
		Number of Missing Observations	0
Minimum	7.5	Mean	16.23
Maximum	54.6	Median	12.3
SD	11.48	Std. Error of Mean	2.965
Coefficient of Variation	0.707	Skewness	2.997

Normal GOF Test			
Shapiro Wilk Test Statistic	0.621	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.881	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.276	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.22	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	21.46	95% Adjusted-CLT UCL (Chen-1995)	23.56
		95% Modified-t UCL (Johnson-1978)	21.84
Gamma GOF Test			
A-D Test Statistic	1.132	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.741	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.247	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.223	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	3.818	k star (bias corrected MLE)	3.098
Theta hat (MLE)	4.252	Theta star (bias corrected MLE)	5.239
nu hat (MLE)	114.5	nu star (bias corrected)	92.95
MLE Mean (bias corrected)	16.23	MLE Sd (bias corrected)	9.222
		Approximate Chi Square Value (0.05)	71.72
Adjusted Level of Significance	0.0324	Adjusted Chi Square Value	69.43
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	21.04	95% Adjusted Gamma UCL (use when n<50)	21.73
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.862	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.881	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.218	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.22	Data appear Lognormal at 5% Significance Level	
Data appear Approximate Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	2.015	Mean of logged Data	2.65
Maximum of Logged Data	4	SD of logged Data	0.482
Assuming Lognormal Distribution			
95% H-UCL	20.71	90% Chebyshev (MVUE) UCL	21.82
95% Chebyshev (MVUE) UCL	24.56	97.5% Chebyshev (MVUE) UCL	28.37
99% Chebyshev (MVUE) UCL	35.84		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			

95% CLT UCL	21.11	95% Jackknife UCL	21.46
95% Standard Bootstrap UCL	20.96	95% Bootstrap-t UCL	29.77
95% Hall's Bootstrap UCL	38.88	95% Percentile Bootstrap UCL	21.69
95% BCA Bootstrap UCL	24.44		
90% Chebyshev(Mean, Sd) UCL	25.13	95% Chebyshev(Mean, Sd) UCL	29.16
97.5% Chebyshev(Mean, Sd) UCL	34.75	99% Chebyshev(Mean, Sd) UCL	45.73
Suggested UCL to Use			
95% Student's-t UCL	21.46	or 95% Modified-t UCL	21.84
or 95% H-UCL	20.71		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
ProUCL computes and outputs H-statistic based UCLs for historical reasons only.			
H-statistic often results in unstable (both high and low) values of UCL95 as shown in examples in the Technical Guide.			
It is therefore recommended to avoid the use of H-statistic based 95% UCLs.			
Use of nonparametric methods are preferred to compute UCL95 for skewed data sets which do not follow a gamma distribution.			
Vanadium			
General Statistics			
Total Number of Observations	15	Number of Distinct Observations	14
		Number of Missing Observations	0
Minimum	4.6	Mean	23.22
Maximum	169	Median	12.9
SD	40.67	Std. Error of Mean	10.5
Coefficient of Variation	1.752	Skewness	3.764
Normal GOF Test			
Shapiro Wilk Test Statistic	0.395	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.881	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.403	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.22	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	41.72	95% Adjusted-CLT UCL (Chen-1995)	51.4
		95% Modified-t UCL (Johnson-1978)	43.42
Gamma GOF Test			
A-D Test Statistic	2.309	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.76	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.334	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.227	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			

Gamma Statistics			
k hat (MLE)	1.14	k star (bias corrected MLE)	0.957
Theta hat (MLE)	20.37	Theta star (bias corrected MLE)	24.28
nu hat (MLE)	34.2	nu star (bias corrected)	28.7
MLE Mean (bias corrected)	23.22	MLE Sd (bias corrected)	23.74
		Approximate Chi Square Value (0.05)	17.47
Adjusted Level of Significance	0.0324	Adjusted Chi Square Value	16.4
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	38.14	95% Adjusted Gamma UCL (use when n<50)	40.63
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.778	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.881	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.256	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.22	Data Not Lognormal at 5% Significance Level	
Data Not Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	1.526	Mean of logged Data	2.646
Maximum of Logged Data	5.13	SD of logged Data	0.8
Assuming Lognormal Distribution			
95% H-UCL	32.74	90% Chebyshev (MVUE) UCL	31.41
95% Chebyshev (MVUE) UCL	37.07	97.5% Chebyshev (MVUE) UCL	44.93
99% Chebyshev (MVUE) UCL	60.36		
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution (0.05)			
Nonparametric Distribution Free UCLs			
95% CLT UCL	40.49	95% Jackknife UCL	41.72
95% Standard Bootstrap UCL	39.87	95% Bootstrap-t UCL	161.9
95% Hall's Bootstrap UCL	129.8	95% Percentile Bootstrap UCL	43.54
95% BCA Bootstrap UCL	55.59		
90% Chebyshev(Mean, Sd) UCL	54.72	95% Chebyshev(Mean, Sd) UCL	68.99
97.5% Chebyshev(Mean, Sd) UCL	88.8	99% Chebyshev(Mean, Sd) UCL	127.7
Suggested UCL to Use			
95% Chebyshev (Mean, Sd) UCL	68.99		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Zinc			
General Statistics			
Total Number of Observations	15	Number of Distinct Observations	15

		Number of Missing Observations	0
Minimum	36.9	Mean	56.75
Maximum	89.1	Median	55.7
SD	14.19	Std. Error of Mean	3.665
Coefficient of Variation	0.25	Skewness	0.609
Normal GOF Test			
Shapiro Wilk Test Statistic	0.955	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.881	Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.109	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.22	Data appear Normal at 5% Significance Level	
Data appear Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	63.21	95% Adjusted-CLT UCL (Chen-1995)	63.4
		95% Modified-t UCL (Johnson-1978)	63.3
Gamma GOF Test			
A-D Test Statistic	0.216	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.735	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.114	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.221	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	17.62	k star (bias corrected MLE)	14.14
Theta hat (MLE)	3.22	Theta star (bias corrected MLE)	4.012
nu hat (MLE)	528.7	nu star (bias corrected)	424.3
MLE Mean (bias corrected)	56.75	MLE Sd (bias corrected)	15.09
		Approximate Chi Square Value (0.05)	377.6
Adjusted Level of Significance	0.0324	Adjusted Chi Square Value	372.1
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	63.78	95% Adjusted Gamma UCL (use when n<50)	64.71
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.973	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.881	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.122	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.22	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	3.608	Mean of logged Data	4.01
Maximum of Logged Data	4.49	SD of logged Data	0.247
Assuming Lognormal Distribution			
95% H-UCL	64.23	90% Chebyshev (MVUE) UCL	67.71
95% Chebyshev (MVUE) UCL	72.67	97.5% Chebyshev (MVUE) UCL	79.57
99% Chebyshev (MVUE) UCL	93.1		

Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	62.78	95% Jackknife UCL	63.21
95% Standard Bootstrap UCL	62.59	95% Bootstrap-t UCL	64.08
95% Hall's Bootstrap UCL	64.7	95% Percentile Bootstrap UCL	62.56
95% BCA Bootstrap UCL	62.55		
90% Chebyshev(Mean, Sd) UCL	67.75	95% Chebyshev(Mean, Sd) UCL	72.73
97.5% Chebyshev(Mean, Sd) UCL	79.64	99% Chebyshev(Mean, Sd) UCL	93.22
Suggested UCL to Use			
95% Student's-t UCL	63.21		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Selenium			
General Statistics			
Total Number of Observations	15	Number of Distinct Observations	10
Number of Detects	3	Number of Non-Detects	12
Number of Distinct Detects	3	Number of Distinct Non-Detects	7
Minimum Detect	0.37	Minimum Non-Detect	0.26
Maximum Detect	0.75	Maximum Non-Detect	0.47
Variance Detects	0.0469	Percent Non-Detects	80%
Mean Detects	0.5	SD Detects	0.217
Median Detects	0.38	CV Detects	0.433
Skewness Detects	1.728	Kurtosis Detects	N/A
Mean of Logged Detects	-0.75	SD of Logged Detects	0.4
Warning: Data set has only 3 Detected Values.			
This is not enough to compute meaningful or reliable statistics and estimates.			
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.77	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.767	Detected Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.377	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.425	Detected Data appear Normal at 5% Significance Level	
Detected Data appear Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.309	KM Standard Error of Mean	0.0395
KM SD	0.124	95% KM (BCA) UCL	N/A
95% KM (t) UCL	0.379	95% KM (Percentile Bootstrap) UCL	N/A
95% KM (z) UCL	0.374	95% KM Bootstrap t UCL	N/A
90% KM Chebyshev UCL	0.428	95% KM Chebyshev UCL	0.481

97.5% KM Chebyshev UCL	0.556	99% KM Chebyshev UCL	0.702
Gamma GOF Tests on Detected Observations Only			
Not Enough Data to Perform GOF Test			
Gamma Statistics on Detected Data Only			
k hat (MLE)	8.983	k star (bias corrected MLE)	N/A
Theta hat (MLE)	0.0557	Theta star (bias corrected MLE)	N/A
nu hat (MLE)	53.9	nu star (bias corrected)	N/A
Mean (detects)	0.5		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	0.112
Maximum	0.75	Median	0.01
SD	0.217	CV	1.948
k hat (MLE)	0.429	k star (bias corrected MLE)	0.388
Theta hat (MLE)	0.26	Theta star (bias corrected MLE)	0.288
nu hat (MLE)	12.87	nu star (bias corrected)	11.63
Adjusted Level of Significance (β)	0.0324		
Approximate Chi Square Value (11.63, α)	4.982	Adjusted Chi Square Value (11.63, β)	4.458
95% Gamma Approximate UCL (use when n>=50)	0.261	95% Gamma Adjusted UCL (use when n<50)	N/A
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.309	SD (KM)	0.124
Variance (KM)	0.0155	SE of Mean (KM)	0.0395
k hat (KM)	6.171	k star (KM)	4.981
nu hat (KM)	185.1	nu star (KM)	149.4
theta hat (KM)	0.0501	theta star (KM)	0.0621
80% gamma percentile (KM)	0.416	90% gamma percentile (KM)	0.495
95% gamma percentile (KM)	0.567	99% gamma percentile (KM)	0.719
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (149.44, α)	122.2	Adjusted Chi Square Value (149.44, β)	119.1
95% Gamma Approximate KM-UCL (use when n>=50)	0.378	95% Gamma Adjusted KM-UCL (use when n<50)	0.388
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.778	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.767	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.373	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.425	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.195	Mean in Log Scale	-1.892
SD in Original Scale	0.181	SD in Log Scale	0.676
95% t UCL (assumes normality of ROS data)	0.277	95% Percentile Bootstrap UCL	0.276

95% BCA Bootstrap UCL	0.302	95% Bootstrap t UCL	0.359
95% H-UCL (Log ROS)	0.286		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-1.224	KM Geo Mean	0.294
KM SD (logged)	0.281	95% Critical H Value (KM-Log)	1.867
KM Standard Error of Mean (logged)	0.0895	95% H-UCL (KM -Log)	0.352
KM SD (logged)	0.281	95% Critical H Value (KM-Log)	1.867
KM Standard Error of Mean (logged)	0.0895		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.229	Mean in Log Scale	-1.619
SD in Original Scale	0.164	SD in Log Scale	0.493
95% t UCL (Assumes normality)	0.304	95% H-Stat UCL	0.294
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Normal Distributed at 5% Significance Level			
Suggested UCL to Use			
95% KM (t) UCL	0.379		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Naphthalene			
General Statistics			
Total Number of Observations	15	Number of Distinct Observations	12
Number of Detects	11	Number of Non-Detects	4
Number of Distinct Detects	11	Number of Distinct Non-Detects	2
Minimum Detect	0.0015	Minimum Non-Detect	0.0015
Maximum Detect	1.8	Maximum Non-Detect	0.01
Variance Detects	0.288	Percent Non-Detects	26.67%
Mean Detects	0.197	SD Detects	0.537
Median Detects	0.012	CV Detects	2.728
Skewness Detects	3.207	Kurtosis Detects	10.42
Mean of Logged Detects	-4.088	SD of Logged Detects	2.123
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.422	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.85	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.439	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.251	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.145	KM Standard Error of Mean	0.121

KM SD	0.447	95% KM (BCA) UCL	0.381
95% KM (t) UCL	0.358	95% KM (Percentile Bootstrap) UCL	0.369
95% KM (z) UCL	0.344	95% KM Bootstrap t UCL	6.813
90% KM Chebyshev UCL	0.508	95% KM Chebyshev UCL	0.672
97.5% KM Chebyshev UCL	0.901	99% KM Chebyshev UCL	1.349
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	1.407	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.827	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.362	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.277	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.283	k star (bias corrected MLE)	0.266
Theta hat (MLE)	0.696	Theta star (bias corrected MLE)	0.739
nu hat (MLE)	6.22	nu star (bias corrected)	5.857
Mean (detects)	0.197		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.0015	Mean	0.147
Maximum	1.8	Median	0.01
SD	0.462	CV	3.141
k hat (MLE)	0.299	k star (bias corrected MLE)	0.284
Theta hat (MLE)	0.492	Theta star (bias corrected MLE)	0.519
nu hat (MLE)	8.966	nu star (bias corrected)	8.506
Adjusted Level of Significance (β)	0.0324		
Approximate Chi Square Value (8.51, α)	3.032	Adjusted Chi Square Value (8.51, β)	2.643
95% Gamma Approximate UCL (use when n>=50)	0.413	95% Gamma Adjusted UCL (use when n<50)	0.473
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.145	SD (KM)	0.447
Variance (KM)	0.2	SE of Mean (KM)	0.121
k hat (KM)	0.105	k star (KM)	0.129
nu hat (KM)	3.153	nu star (KM)	3.856
theta hat (KM)	1.378	theta star (KM)	1.127
80% gamma percentile (KM)	0.137	90% gamma percentile (KM)	0.418
95% gamma percentile (KM)	0.819	99% gamma percentile (KM)	2.023
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (3.86, α)	0.665	Adjusted Chi Square Value (3.86, β)	0.525
95% Gamma Approximate KM-UCL (use when n>=50)	0.839	95% Gamma Adjusted KM-UCL (use when n<50)	1.064
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.902	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.85	Detected Data appear Lognormal at 5% Significance Level	

Lilliefors Test Statistic	0.204	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.251	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.144	Mean in Log Scale	-5.244
SD in Original Scale	0.463	SD in Log Scale	2.745
95% t UCL (assumes normality of ROS data)	0.355	95% Percentile Bootstrap UCL	0.368
95% BCA Bootstrap UCL	0.509	95% Bootstrap t UCL	6.766
95% H-UCL (Log ROS)	19.36		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-4.699	KM Geo Mean	0.00911
KM SD (logged)	2.017	95% Critical H Value (KM-Log)	4.597
KM Standard Error of Mean (logged)	0.548	95% H-UCL (KM -Log)	0.829
KM SD (logged)	2.017	95% Critical H Value (KM-Log)	4.597
KM Standard Error of Mean (logged)	0.548		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.145	Mean in Log Scale	-4.79
SD in Original Scale	0.463	SD in Log Scale	2.206
95% t UCL (Assumes normality)	0.355	95% H-Stat UCL	1.769
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Lognormal Distributed at 5% Significance Level			
Suggested UCL to Use			
99% KM (Chebyshev) UCL	1.349		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			

ProUCL Output
Industrial Landfill Area Soil (0-2 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

UCL Statistics for Data Sets with Non-Detects			
User Selected Options			
Date/Time of Computation	ProUCL 5.11/28/2019 11:39:58 AM		
From File	20190128_IndLF_ProUCL_input_a.xls		
Full Precision	OFF		
Confidence Coefficient	95%		
Number of Bootstrap Operations	2000		
Bis2EthylhexylPhthalate			
General Statistics			
Total Number of Observations	30	Number of Distinct Observations	23
Number of Detects	6	Number of Non-Detects	24
Number of Distinct Detects	6	Number of Distinct Non-Detects	18
Minimum Detect	0.043	Minimum Non-Detect	0.037
Maximum Detect	0.093	Maximum Non-Detect	3.8
Variance Detects	2.6670E-4	Percent Non-Detects	80%
Mean Detects	0.0635	SD Detects	0.0163
Median Detects	0.0615	CV Detects	0.257
Skewness Detects	1.16	Kurtosis Detects	2.952
Mean of Logged Detects	-2.783	SD of Logged Detects	0.247
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.872	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.788	Detected Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.321	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.325	Detected Data appear Normal at 5% Significance Level	
Detected Data appear Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.0454	KM Standard Error of Mean	0.00363
KM SD	0.0146	95% KM (BCA) UCL	0.052
95% KM (t) UCL	0.0516	95% KM (Percentile Bootstrap) UCL	0.0516
95% KM (z) UCL	0.0514	95% KM Bootstrap t UCL	0.051
90% KM Chebyshev UCL	0.0563	95% KM Chebyshev UCL	0.0613
97.5% KM Chebyshev UCL	0.0681	99% KM Chebyshev UCL	0.0816
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	0.456	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.697	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.289	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.332	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	19.44	k star (bias corrected MLE)	9.832
Theta hat (MLE)	0.00327	Theta star (bias corrected MLE)	0.00646
nu hat (MLE)	233.3	nu star (bias corrected)	118
Mean (detects)	0.0635		

Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	0.0343
Maximum	0.093	Median	0.0326
SD	0.0177	CV	0.515
k hat (MLE)	4.435	k star (bias corrected MLE)	4.014
Theta hat (MLE)	0.00774	Theta star (bias corrected MLE)	0.00856
nu hat (MLE)	266.1	nu star (bias corrected)	240.8
Adjusted Level of Significance (β)	0.041		
Approximate Chi Square Value (240.81, α)	205.9	Adjusted Chi Square Value (240.81, β)	204
95% Gamma Approximate UCL (use when n>=50)	0.0402	95% Gamma Adjusted UCL (use when n<50)	0.0405
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.0454	SD (KM)	0.0146
Variance (KM)	2.1322E-4	SE of Mean (KM)	0.00363
k hat (KM)	9.683	k star (KM)	8.737
nu hat (KM)	581	nu star (KM)	524.2
theta hat (KM)	0.00469	theta star (KM)	0.0052
80% gamma percentile (KM)	0.0576	90% gamma percentile (KM)	0.0659
95% gamma percentile (KM)	0.0733	99% gamma percentile (KM)	0.0886
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (524.19, α)	472.1	Adjusted Chi Square Value (524.19, β)	469.3
95% Gamma Approximate KM-UCL (use when n>=50)	0.0505	95% Gamma Adjusted KM-UCL (use when n<50)	0.0508
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.914	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.788	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.279	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.325	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.04	Mean in Log Scale	-3.269
SD in Original Scale	0.0144	SD in Log Scale	0.301
95% t UCL (assumes normality of ROS data)	0.0444	95% Percentile Bootstrap UCL	0.0446
95% BCA Bootstrap UCL	0.0457	95% Bootstrap t UCL	0.0461
95% H-UCL (Log ROS)	0.0441		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-3.132	KM Geo Mean	0.0436
KM SD (logged)	0.268	95% Critical H Value (KM-Log)	1.789
KM Standard Error of Mean (logged)	0.0672	95% H-UCL (KM -Log)	0.0494
KM SD (logged)	0.268	95% Critical H Value (KM-Log)	1.789
KM Standard Error of Mean (logged)	0.0672		

DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.182	Mean in Log Scale	-2.812
SD in Original Scale	0.385	SD in Log Scale	1.313
95% t UCL (Assumes normality)	0.301	95% H-Stat UCL	0.288
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Normal Distributed at 5% Significance Level			
Suggested UCL to Use			
95% KM (t) UCL	0.0516		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Fluoride			
General Statistics			
Total Number of Observations	30	Number of Distinct Observations	30
		Number of Missing Observations	0
Minimum	1.37	Mean	79.33
Maximum	810	Median	7.995
SD	193	Std. Error of Mean	35.24
Coefficient of Variation	2.433	Skewness	2.885
Normal GOF Test			
Shapiro Wilk Test Statistic	0.456	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.927	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.442	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.159	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	139.2	95% Adjusted-CLT UCL (Chen-1995)	157.1
		95% Modified-t UCL (Johnson-1978)	142.3
Gamma GOF Test			
A-D Test Statistic	4.396	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.839	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.334	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.172	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			

k hat (MLE)	0.366	k star (bias corrected MLE)	0.351
Theta hat (MLE)	216.8	Theta star (bias corrected MLE)	225.7
nu hat (MLE)	21.95	nu star (bias corrected)	21.09
MLE Mean (bias corrected)	79.33	MLE Sd (bias corrected)	133.8
		Approximate Chi Square Value (0.05)	11.66
Adjusted Level of Significance	0.041	Adjusted Chi Square Value	11.25
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	143.5	95% Adjusted Gamma UCL (use when n<50)	148.7
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.837	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.927	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.203	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.159	Data Not Lognormal at 5% Significance Level	
Data Not Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	0.315	Mean of logged Data	2.549
Maximum of Logged Data	6.697	SD of logged Data	1.656
Assuming Lognormal Distribution			
95% H-UCL	143.5	90% Chebyshev (MVUE) UCL	99.42
95% Chebyshev (MVUE) UCL	123.7	97.5% Chebyshev (MVUE) UCL	157.5
99% Chebyshev (MVUE) UCL	223.7		
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution (0.05)			
Nonparametric Distribution Free UCLs			
95% CLT UCL	137.3	95% Jackknife UCL	139.2
95% Standard Bootstrap UCL	136.9	95% Bootstrap-t UCL	209.4
95% Hall's Bootstrap UCL	146.1	95% Percentile Bootstrap UCL	139.4
95% BCA Bootstrap UCL	164.1		
90% Chebyshev(Mean, Sd) UCL	185	95% Chebyshev(Mean, Sd) UCL	232.9
97.5% Chebyshev(Mean, Sd) UCL	299.4	99% Chebyshev(Mean, Sd) UCL	429.9
Suggested UCL to Use			
95% Chebyshev (Mean, Sd) UCL	232.9		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Indeno123CDPyrene			
General Statistics			
Total Number of Observations	30	Number of Distinct Observations	27
Number of Detects	25	Number of Non-Detects	5

Number of Distinct Detects	23	Number of Distinct Non-Detects	4
Minimum Detect	0.0038	Minimum Non-Detect	0.0015
Maximum Detect	40	Maximum Non-Detect	0.027
Variance Detects	112.2	Percent Non-Detects	16.67%
Mean Detects	4.313	SD Detects	10.59
Median Detects	0.17	CV Detects	2.456
Skewness Detects	2.915	Kurtosis Detects	7.811
Mean of Logged Detects	-1.458	SD of Logged Detects	2.654
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.463	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.918	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.394	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.173	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	3.595	KM Standard Error of Mean	1.791
KM SD	9.609	95% KM (BCA) UCL	6.567
95% KM (t) UCL	6.637	95% KM (Percentile Bootstrap) UCL	6.795
95% KM (z) UCL	6.54	95% KM Bootstrap t UCL	13.46
90% KM Chebyshev UCL	8.966	95% KM Chebyshev UCL	11.4
97.5% KM Chebyshev UCL	14.78	99% KM Chebyshev UCL	21.41
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	1.876	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.879	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.241	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.192	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.244	k star (bias corrected MLE)	0.242
Theta hat (MLE)	17.66	Theta star (bias corrected MLE)	17.85
nu hat (MLE)	12.21	nu star (bias corrected)	12.08
Mean (detects)	4.313		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.0038	Mean	3.596
Maximum	40	Median	0.058
SD	9.773	CV	2.718
k hat (MLE)	0.222	k star (bias corrected MLE)	0.222
Theta hat (MLE)	16.2	Theta star (bias corrected MLE)	16.2
nu hat (MLE)	13.32	nu star (bias corrected)	13.32
Adjusted Level of Significance (β)	0.041		

Approximate Chi Square Value (13.32, α)	6.107	Adjusted Chi Square Value (13.32, β)	5.826
95% Gamma Approximate UCL (use when n>=50)	7.841	95% Gamma Adjusted UCL (use when n<50)	8.219
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	3.595	SD (KM)	9.609
Variance (KM)	92.33	SE of Mean (KM)	1.791
k hat (KM)	0.14	k star (KM)	0.148
nu hat (KM)	8.396	nu star (KM)	8.89
theta hat (KM)	25.69	theta star (KM)	24.26
80% gamma percentile (KM)	3.873	90% gamma percentile (KM)	10.64
95% gamma percentile (KM)	19.83	99% gamma percentile (KM)	46.57
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (8.89, α)	3.261	Adjusted Chi Square Value (8.89, β)	3.066
95% Gamma Approximate KM-UCL (use when n>=50)	9.8	95% Gamma Adjusted KM-UCL (use when n<50)	10.42
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.946	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.918	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.123	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.173	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	3.594	Mean in Log Scale	-2.367
SD in Original Scale	9.773	SD in Log Scale	3.209
95% t UCL (assumes normality of ROS data)	6.626	95% Percentile Bootstrap UCL	6.615
95% BCA Bootstrap UCL	7.932	95% Bootstrap t UCL	13.44
95% H-UCL (Log ROS)	553.5		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-2.218	KM Geo Mean	0.109
KM SD (logged)	2.943	95% Critical H Value (KM-Log)	5.484
KM Standard Error of Mean (logged)	0.551	95% H-UCL (KM -Log)	165.3
KM SD (logged)	2.943	95% Critical H Value (KM-Log)	5.484
KM Standard Error of Mean (logged)	0.551		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	3.595	Mean in Log Scale	-2.222
SD in Original Scale	9.773	SD in Log Scale	3.03
95% t UCL (Assumes normality)	6.627	95% H-Stat UCL	253.5
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Lognormal Distributed at 5% Significance Level			
Suggested UCL to Use			
97.5% KM (Chebyshev) UCL	14.78		

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

BenzoBFluoranthene

General Statistics

Total Number of Observations	30	Number of Distinct Observations	29
Number of Detects	28	Number of Non-Detects	2
Number of Distinct Detects	27	Number of Distinct Non-Detects	2
Minimum Detect	0.0018	Minimum Non-Detect	0.0019
Maximum Detect	60	Maximum Non-Detect	0.002
Variance Detects	222.2	Percent Non-Detects	6.667%
Mean Detects	5.615	SD Detects	14.91
Median Detects	0.175	CV Detects	2.655
Skewness Detects	3.195	Kurtosis Detects	9.589
Mean of Logged Detects	-1.338	SD of Logged Detects	2.715

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.428	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.924	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.402	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.164	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	5.241	KM Standard Error of Mean	2.642
KM SD	14.21	95% KM (BCA) UCL	10.01
95% KM (t) UCL	9.73	95% KM (Percentile Bootstrap) UCL	9.59
95% KM (z) UCL	9.586	95% KM Bootstrap t UCL	22.92
90% KM Chebyshev UCL	13.17	95% KM Chebyshev UCL	16.76
97.5% KM Chebyshev UCL	21.74	99% KM Chebyshev UCL	31.53

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	2.133	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.886	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.236	**Kolmogorov-Smirnov GOF**
5% K-S Critical Value	0.182	Detected Data Not Gamma Distributed at 5% Significance Level

Detected Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	0.234	k star (bias corrected MLE)	0.233
Theta hat (MLE)	23.97	Theta star (bias corrected MLE)	24.1
nu hat (MLE)	13.12	nu star (bias corrected)	13.05
Mean (detects)	5.615		

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)

For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.0018	Mean	5.241
Maximum	60	Median	0.104
SD	14.45	CV	2.758
k hat (MLE)	0.225	k star (bias corrected MLE)	0.225
Theta hat (MLE)	23.31	Theta star (bias corrected MLE)	23.33
nu hat (MLE)	13.49	nu star (bias corrected)	13.48
Adjusted Level of Significance (β)	0.041		
Approximate Chi Square Value (13.48, α)	6.215	Adjusted Chi Square Value (13.48, β)	5.931
95% Gamma Approximate UCL (use when n>=50)	11.37	95% Gamma Adjusted UCL (use when n<50)	11.91
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	5.241	SD (KM)	14.21
Variance (KM)	201.9	SE of Mean (KM)	2.642
k hat (KM)	0.136	k star (KM)	0.145
nu hat (KM)	8.161	nu star (KM)	8.678
theta hat (KM)	38.53	theta star (KM)	36.23
80% gamma percentile (KM)	5.532	90% gamma percentile (KM)	15.46
95% gamma percentile (KM)	29.04	99% gamma percentile (KM)	68.77
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (8.68, α)	3.134	Adjusted Chi Square Value (8.68, β)	2.944
95% Gamma Approximate KM-UCL (use when n>=50)	14.51	95% Gamma Adjusted KM-UCL (use when n<50)	15.45
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.962	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.924	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.138	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.164	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	5.241	Mean in Log Scale	-1.711
SD in Original Scale	14.45	SD in Log Scale	2.978
95% t UCL (assumes normality of ROS data)	9.724	95% Percentile Bootstrap UCL	9.95
95% BCA Bootstrap UCL	11.23	95% Bootstrap t UCL	21.04
95% H-UCL (Log ROS)	327.4		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-1.67	KM Geo Mean	0.188
KM SD (logged)	2.86	95% Critical H Value (KM-Log)	5.344
KM Standard Error of Mean (logged)	0.532	95% H-UCL (KM -Log)	191.8
KM SD (logged)	2.86	95% Critical H Value (KM-Log)	5.344
KM Standard Error of Mean (logged)	0.532		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	5.241	Mean in Log Scale	-1.711

SD in Original Scale	14.45	SD in Log Scale	2.979
95% t UCL (Assumes normality)	9.724	95% H-Stat UCL	328.9
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Lognormal Distributed at 5% Significance Level			
Suggested UCL to Use			
97.5% KM (Chebyshev) UCL	21.74		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
BenzoKFluoranthene			
General Statistics			
Total Number of Observations	30	Number of Distinct Observations	29
Number of Detects	25	Number of Non-Detects	5
Number of Distinct Detects	25	Number of Distinct Non-Detects	5
Minimum Detect	0.0037	Minimum Non-Detect	0.0022
Maximum Detect	24	Maximum Non-Detect	0.018
Variance Detects	39.58	Percent Non-Detects	16.67%
Mean Detects	2.611	SD Detects	6.291
Median Detects	0.09	CV Detects	2.409
Skewness Detects	2.881	Kurtosis Detects	7.688
Mean of Logged Detects	-1.904	SD of Logged Detects	2.618
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.474	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.918	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.402	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.173	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	2.177	KM Standard Error of Mean	1.064
KM SD	5.71	95% KM (BCA) UCL	4.161
95% KM (t) UCL	3.985	95% KM (Percentile Bootstrap) UCL	4.096
95% KM (z) UCL	3.927	95% KM Bootstrap t UCL	7.441
90% KM Chebyshev UCL	5.369	95% KM Chebyshev UCL	6.815
97.5% KM Chebyshev UCL	8.821	99% KM Chebyshev UCL	12.76
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	1.905	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.877	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.242	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.192	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			

Gamma Statistics on Detected Data Only			
k hat (MLE)	0.248	k star (bias corrected MLE)	0.245
Theta hat (MLE)	10.52	Theta star (bias corrected MLE)	10.65
nu hat (MLE)	12.41	nu star (bias corrected)	12.26
Mean (detects)	2.611		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.0037	Mean	2.178
Maximum	24	Median	0.0355
SD	5.807	CV	2.667
k hat (MLE)	0.23	k star (bias corrected MLE)	0.229
Theta hat (MLE)	9.476	Theta star (bias corrected MLE)	9.507
nu hat (MLE)	13.79	nu star (bias corrected)	13.74
Adjusted Level of Significance (β)	0.041		
Approximate Chi Square Value (13.74, α)	6.396	Adjusted Chi Square Value (13.74, β)	6.108
95% Gamma Approximate UCL (use when n>=50)	4.679	95% Gamma Adjusted UCL (use when n<50)	4.9
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	2.177	SD (KM)	5.71
Variance (KM)	32.61	SE of Mean (KM)	1.064
k hat (KM)	0.145	k star (KM)	0.153
nu hat (KM)	8.718	nu star (KM)	9.179
theta hat (KM)	14.98	theta star (KM)	14.23
80% gamma percentile (KM)	2.408	90% gamma percentile (KM)	6.471
95% gamma percentile (KM)	11.93	99% gamma percentile (KM)	27.72
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (9.18, α)	3.436	Adjusted Chi Square Value (9.18, β)	3.235
95% Gamma Approximate KM-UCL (use when n>=50)	5.815	95% Gamma Adjusted KM-UCL (use when n<50)	6.176
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.933	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.918	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.146	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.173	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	2.176	Mean in Log Scale	-2.783
SD in Original Scale	5.808	SD in Log Scale	3.137
95% t UCL (assumes normality of ROS data)	3.978	95% Percentile Bootstrap UCL	4.028
95% BCA Bootstrap UCL	4.639	95% Bootstrap t UCL	7.787
95% H-UCL (Log ROS)	250		

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-2.553	KM Geo Mean	0.0779
KM SD (logged)	2.765	95% Critical H Value (KM-Log)	5.186
KM Standard Error of Mean (logged)	0.517	95% H-UCL (KM -Log)	51.09
KM SD (logged)	2.765	95% Critical H Value (KM-Log)	5.186
KM Standard Error of Mean (logged)	0.517		

DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	2.177	Mean in Log Scale	-2.582
SD in Original Scale	5.808	SD in Log Scale	2.866
95% t UCL (Assumes normality)	3.978	95% H-Stat UCL	79.32

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Lognormal Distributed at 5% Significance Level

Suggested UCL to Use

97.5% KM (Chebyshev) UCL	8.821		

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

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General Statistics

Total Number of Observations	30	Number of Distinct Observations	28
Number of Detects	27	Number of Non-Detects	3
Number of Distinct Detects	25	Number of Distinct Non-Detects	3
Minimum Detect	0.0017	Minimum Non-Detect	0.0015
Maximum Detect	51	Maximum Non-Detect	0.01
Variance Detects	173.9	Percent Non-Detects	10%
Mean Detects	4.959	SD Detects	13.19
Median Detects	0.14	CV Detects	2.66
Skewness Detects	3.178	Kurtosis Detects	9.337
Mean of Logged Detects	-1.462	SD of Logged Detects	2.722

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.421	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.923	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.395	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.167	Detected Data Not Normal at 5% Significance Level	

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	4.463	KM Standard Error of Mean	2.301
KM SD	12.37	95% KM (BCA) UCL	8.104
95% KM (t) UCL	8.373	95% KM (Percentile Bootstrap) UCL	8.592

95% KM (z) UCL	8.248	95% KM Bootstrap t UCL	20.05
90% KM Chebyshev UCL	11.37	95% KM Chebyshev UCL	14.49
97.5% KM Chebyshev UCL	18.83	99% KM Chebyshev UCL	27.36
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	2.035	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.885	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.224	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.185	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.234	k star (bias corrected MLE)	0.233
Theta hat (MLE)	21.17	Theta star (bias corrected MLE)	21.29
nu hat (MLE)	12.65	nu star (bias corrected)	12.58
Mean (detects)	4.959		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.0017	Mean	4.464
Maximum	51	Median	0.0775
SD	12.58	CV	2.818
k hat (MLE)	0.221	k star (bias corrected MLE)	0.221
Theta hat (MLE)	20.17	Theta star (bias corrected MLE)	20.16
nu hat (MLE)	13.28	nu star (bias corrected)	13.28
Adjusted Level of Significance (β)	0.041		
Approximate Chi Square Value (13.28, α)	6.084	Adjusted Chi Square Value (13.28, β)	5.804
95% Gamma Approximate UCL (use when n>=50)	9.747	95% Gamma Adjusted UCL (use when n<50)	10.22
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	4.463	SD (KM)	12.37
Variance (KM)	153	SE of Mean (KM)	2.301
k hat (KM)	0.13	k star (KM)	0.139
nu hat (KM)	7.814	nu star (KM)	8.366
theta hat (KM)	34.27	theta star (KM)	32.01
80% gamma percentile (KM)	4.561	90% gamma percentile (KM)	13.08
95% gamma percentile (KM)	24.9	99% gamma percentile (KM)	59.72
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (8.37, α)	2.949	Adjusted Chi Square Value (8.37, β)	2.766
95% Gamma Approximate KM-UCL (use when n>=50)	12.66	95% Gamma Adjusted KM-UCL (use when n<50)	13.5
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.962	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.923	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.12	**Lilliefors GOF Test**	

5% Lilliefors Critical Value	0.167	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	4.463	Mean in Log Scale	-2.055
SD in Original Scale	12.58	SD in Log Scale	3.157
95% t UCL (assumes normality of ROS data)	8.365	95% Percentile Bootstrap UCL	8.39
95% BCA Bootstrap UCL	10.06	95% Bootstrap t UCL	20.18
95% H-UCL (Log ROS)	575.4		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-1.946	KM Geo Mean	0.143
KM SD (logged)	2.924	95% Critical H Value (KM-Log)	5.453
KM Standard Error of Mean (logged)	0.545	95% H-UCL (KM -Log)	198.2
KM SD (logged)	2.924	95% Critical H Value (KM-Log)	5.453
KM Standard Error of Mean (logged)	0.545		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	4.463	Mean in Log Scale	-1.97
SD in Original Scale	12.58	SD in Log Scale	3.021
95% t UCL (Assumes normality)	8.365	95% H-Stat UCL	311.6
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Lognormal Distributed at 5% Significance Level			
Suggested UCL to Use			
97.5% KM (Chebyshev) UCL	18.83		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
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General Statistics			
Total Number of Observations	30	Number of Distinct Observations	27
Number of Detects	26	Number of Non-Detects	4
Number of Distinct Detects	24	Number of Distinct Non-Detects	3
Minimum Detect	0.0056	Minimum Non-Detect	0.0016
Maximum Detect	53	Maximum Non-Detect	0.011
Variance Detects	189	Percent Non-Detects	13.33%
Mean Detects	5.361	SD Detects	13.75
Median Detects	0.175	CV Detects	2.565
Skewness Detects	3.062	Kurtosis Detects	8.668
Mean of Logged Detects	-1.314	SD of Logged Detects	2.647
Normal GOF Test on Detects Only			

Shapiro Wilk Test Statistic	0.442	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.92	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.396	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.17	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	4.646	KM Standard Error of Mean	2.361
KM SD	12.68	95% KM (BCA) UCL	8.653
95% KM (t) UCL	8.659	95% KM (Percentile Bootstrap) UCL	8.78
95% KM (z) UCL	8.53	95% KM Bootstrap t UCL	18.26
90% KM Chebyshev UCL	11.73	95% KM Chebyshev UCL	14.94
97.5% KM Chebyshev UCL	19.39	99% KM Chebyshev UCL	28.14
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	2.084	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.882	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.228	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.189	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.239	k star (bias corrected MLE)	0.237
Theta hat (MLE)	22.43	Theta star (bias corrected MLE)	22.61
nu hat (MLE)	12.43	nu star (bias corrected)	12.33
Mean (detects)	5.361		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.0056	Mean	4.647
Maximum	53	Median	0.076
SD	12.9	CV	2.776
k hat (MLE)	0.22	k star (bias corrected MLE)	0.221
Theta hat (MLE)	21.09	Theta star (bias corrected MLE)	21.07
nu hat (MLE)	13.22	nu star (bias corrected)	13.23
Adjusted Level of Significance (β)	0.041		
Approximate Chi Square Value (13.23, α)	6.049	Adjusted Chi Square Value (13.23, β)	5.77
95% Gamma Approximate UCL (use when n>=50)	10.17	95% Gamma Adjusted UCL (use when n<50)	10.66
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	4.646	SD (KM)	12.68
Variance (KM)	160.9	SE of Mean (KM)	2.361
k hat (KM)	0.134	k star (KM)	0.143
nu hat (KM)	8.052	nu star (KM)	8.581
theta hat (KM)	34.62	theta star (KM)	32.49
80% gamma percentile (KM)	4.857	90% gamma percentile (KM)	13.68

95% gamma percentile (KM)	25.8	99% gamma percentile (KM)	61.34
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (8.58, α)	3.076	Adjusted Chi Square Value (8.58, β)	2.888
95% Gamma Approximate KM-UCL (use when n>=50)	12.96	95% Gamma Adjusted KM-UCL (use when n<50)	13.8
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.938	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.92	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.132	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.17	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	4.646	Mean in Log Scale	-2.101
SD in Original Scale	12.9	SD in Log Scale	3.202
95% t UCL (assumes normality of ROS data)	8.648	95% Percentile Bootstrap UCL	8.814
95% BCA Bootstrap UCL	10.21	95% Bootstrap t UCL	19.59
95% H-UCL (Log ROS)	696.7		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-1.98	KM Geo Mean	0.138
KM SD (logged)	2.956	95% Critical H Value (KM-Log)	5.507
KM Standard Error of Mean (logged)	0.551	95% H-UCL (KM -Log)	224.4
KM SD (logged)	2.956	95% Critical H Value (KM-Log)	5.507
KM Standard Error of Mean (logged)	0.551		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	4.646	Mean in Log Scale	-2.024
SD in Original Scale	12.9	SD in Log Scale	3.085
95% t UCL (Assumes normality)	8.648	95% H-Stat UCL	409.8
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Lognormal Distributed at 5% Significance Level			
Suggested UCL to Use			
97.5% KM (Chebyshev) UCL	19.39		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
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General Statistics			
Total Number of Observations	30	Number of Distinct Observations	26
Number of Detects	23	Number of Non-Detects	7

Number of Distinct Detects	21	Number of Distinct Non-Detects	5
Minimum Detect	0.003	Minimum Non-Detect	0.0016
Maximum Detect	11	Maximum Non-Detect	0.021
Variance Detects	9.153	Percent Non-Detects	23.33%
Mean Detects	1.29	SD Detects	3.025
Median Detects	0.052	CV Detects	2.345
Skewness Detects	2.792	Kurtosis Detects	7.025
Mean of Logged Detects	-2.37	SD of Logged Detects	2.487
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.481	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.914	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.386	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.18	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.99	KM Standard Error of Mean	0.494
KM SD	2.647	95% KM (BCA) UCL	1.749
95% KM (t) UCL	1.83	95% KM (Percentile Bootstrap) UCL	1.834
95% KM (z) UCL	1.803	95% KM Bootstrap t UCL	3.958
90% KM Chebyshev UCL	2.472	95% KM Chebyshev UCL	3.144
97.5% KM Chebyshev UCL	4.076	99% KM Chebyshev UCL	5.907
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	1.698	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.865	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.217	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.198	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.268	k star (bias corrected MLE)	0.262
Theta hat (MLE)	4.821	Theta star (bias corrected MLE)	4.93
nu hat (MLE)	12.31	nu star (bias corrected)	12.04
Mean (detects)	1.29		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.003	Mean	0.992
Maximum	11	Median	0.0155
SD	2.692	CV	2.715
k hat (MLE)	0.247	k star (bias corrected MLE)	0.244
Theta hat (MLE)	4.017	Theta star (bias corrected MLE)	4.057
nu hat (MLE)	14.81	nu star (bias corrected)	14.66
Adjusted Level of Significance (β)	0.041		

Approximate Chi Square Value (14.66, α)	7.028	Adjusted Chi Square Value (14.66, β)	6.724
95% Gamma Approximate UCL (use when n>=50)	2.069	95% Gamma Adjusted UCL (use when n<50)	2.162
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.99	SD (KM)	2.647
Variance (KM)	7.008	SE of Mean (KM)	0.494
k hat (KM)	0.14	k star (KM)	0.148
nu hat (KM)	8.389	nu star (KM)	8.884
theta hat (KM)	7.08	theta star (KM)	6.686
80% gamma percentile (KM)	1.066	90% gamma percentile (KM)	2.93
95% gamma percentile (KM)	5.462	99% gamma percentile (KM)	12.83
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (8.88, α)	3.257	Adjusted Chi Square Value (8.88, β)	3.063
95% Gamma Approximate KM-UCL (use when n>=50)	2.7	95% Gamma Adjusted KM-UCL (use when n<50)	2.871
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.929	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.914	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.137	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.18	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.989	Mean in Log Scale	-3.544
SD in Original Scale	2.693	SD in Log Scale	3.117
95% t UCL (assumes normality of ROS data)	1.825	95% Percentile Bootstrap UCL	1.826
95% BCA Bootstrap UCL	2.361	95% Bootstrap t UCL	3.664
95% H-UCL (Log ROS)	105.5		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-3.247	KM Geo Mean	0.0389
KM SD (logged)	2.678	95% Critical H Value (KM-Log)	5.041
KM Standard Error of Mean (logged)	0.502	95% H-UCL (KM -Log)	17.22
KM SD (logged)	2.678	95% Critical H Value (KM-Log)	5.041
KM Standard Error of Mean (logged)	0.502		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.99	Mean in Log Scale	-3.305
SD in Original Scale	2.693	SD in Log Scale	2.822
95% t UCL (Assumes normality)	1.825	95% H-Stat UCL	31.3
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Lognormal Distributed at 5% Significance Level			
Suggested UCL to Use			
97.5% KM (Chebyshev) UCL	4.076		

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

BenzoAAnthracene

General Statistics

Total Number of Observations	30	Number of Distinct Observations	29
Number of Detects	26	Number of Non-Detects	4
Number of Distinct Detects	26	Number of Distinct Non-Detects	4
Minimum Detect	0.0016	Minimum Non-Detect	0.0014
Maximum Detect	43	Maximum Non-Detect	0.034
Variance Detects	133	Percent Non-Detects	13.33%
Mean Detects	4.429	SD Detects	11.53
Median Detects	0.135	CV Detects	2.604
Skewness Detects	3.085	Kurtosis Detects	8.726
Mean of Logged Detects	-1.653	SD of Logged Detects	2.792

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.429	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.92	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.391	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.17	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	3.839	KM Standard Error of Mean	1.98
KM SD	10.63	95% KM (BCA) UCL	7.515
95% KM (t) UCL	7.203	95% KM (Percentile Bootstrap) UCL	7.63
95% KM (z) UCL	7.096	95% KM Bootstrap t UCL	17.08
90% KM Chebyshev UCL	9.779	95% KM Chebyshev UCL	12.47
97.5% KM Chebyshev UCL	16.2	99% KM Chebyshev UCL	23.54

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	1.905	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.887	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.224	**Kolmogorov-Smirnov GOF**
5% K-S Critical Value	0.189	Detected Data Not Gamma Distributed at 5% Significance Level

Detected Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	0.229	k star (bias corrected MLE)	0.228
Theta hat (MLE)	19.31	Theta star (bias corrected MLE)	19.38
nu hat (MLE)	11.92	nu star (bias corrected)	11.88
Mean (detects)	4.429		

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)

For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.0016	Mean	3.84
Maximum	43	Median	0.0575
SD	10.82	CV	2.817
k hat (MLE)	0.215	k star (bias corrected MLE)	0.215
Theta hat (MLE)	17.89	Theta star (bias corrected MLE)	17.83
nu hat (MLE)	12.88	nu star (bias corrected)	12.92
Adjusted Level of Significance (β)	0.041		
Approximate Chi Square Value (12.92, α)	5.84	Adjusted Chi Square Value (12.92, β)	5.566
95% Gamma Approximate UCL (use when n>=50)	8.496	95% Gamma Adjusted UCL (use when n<50)	8.914
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	3.839	SD (KM)	10.63
Variance (KM)	113.1	SE of Mean (KM)	1.98
k hat (KM)	0.13	k star (KM)	0.14
nu hat (KM)	7.821	nu star (KM)	8.373
theta hat (KM)	29.45	theta star (KM)	27.51
80% gamma percentile (KM)	3.926	90% gamma percentile (KM)	11.25
95% gamma percentile (KM)	21.41	99% gamma percentile (KM)	51.35
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (8.37, α)	2.953	Adjusted Chi Square Value (8.37, β)	2.77
95% Gamma Approximate KM-UCL (use when n>=50)	10.89	95% Gamma Adjusted KM-UCL (use when n<50)	11.61
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.959	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.92	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.121	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.17	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	3.839	Mean in Log Scale	-2.34
SD in Original Scale	10.82	SD in Log Scale	3.194
95% t UCL (assumes normality of ROS data)	7.194	95% Percentile Bootstrap UCL	7.564
95% BCA Bootstrap UCL	8.447	95% Bootstrap t UCL	16.84
95% H-UCL (Log ROS)	527.5		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-2.207	KM Geo Mean	0.11
KM SD (logged)	2.942	95% Critical H Value (KM-Log)	5.483
KM Standard Error of Mean (logged)	0.551	95% H-UCL (KM -Log)	166.6
KM SD (logged)	2.942	95% Critical H Value (KM-Log)	5.483
KM Standard Error of Mean (logged)	0.551		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	3.84	Mean in Log Scale	-2.189

SD in Original Scale	10.82	SD in Log Scale	2.998
95% t UCL (Assumes normality)	7.195	95% H-Stat UCL	223.7
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Lognormal Distributed at 5% Significance Level			
Suggested UCL to Use			
97.5% KM (Chebyshev) UCL	16.2		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Cyanide			
General Statistics			
Total Number of Observations	30	Number of Distinct Observations	22
Number of Detects	12	Number of Non-Detects	18
Number of Distinct Detects	11	Number of Distinct Non-Detects	12
Minimum Detect	0.053	Minimum Non-Detect	0.059
Maximum Detect	0.42	Maximum Non-Detect	0.075
Variance Detects	0.0111	Percent Non-Detects	60%
Mean Detects	0.143	SD Detects	0.105
Median Detects	0.094	CV Detects	0.735
Skewness Detects	1.857	Kurtosis Detects	3.859
Mean of Logged Detects	-2.14	SD of Logged Detects	0.622
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.781	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.859	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.263	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.243	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.0897	KM Standard Error of Mean	0.0147
KM SD	0.0772	95% KM (BCA) UCL	0.123
95% KM (t) UCL	0.115	95% KM (Percentile Bootstrap) UCL	0.117
95% KM (z) UCL	0.114	95% KM Bootstrap t UCL	0.133
90% KM Chebyshev UCL	0.134	95% KM Chebyshev UCL	0.154
97.5% KM Chebyshev UCL	0.182	99% KM Chebyshev UCL	0.236
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	0.591	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.74	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.252	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.248	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected data follow Appr. Gamma Distribution at 5% Significance Level			

Gamma Statistics on Detected Data Only			
k hat (MLE)	2.72	k star (bias corrected MLE)	2.096
Theta hat (MLE)	0.0526	Theta star (bias corrected MLE)	0.0682
nu hat (MLE)	65.29	nu star (bias corrected)	50.3
Mean (detects)	0.143		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	0.0638
Maximum	0.42	Median	0.0105
SD	0.0923	CV	1.447
k hat (MLE)	0.73	k star (bias corrected MLE)	0.679
Theta hat (MLE)	0.0874	Theta star (bias corrected MLE)	0.0939
nu hat (MLE)	43.82	nu star (bias corrected)	40.77
Adjusted Level of Significance (β)	0.041		
Approximate Chi Square Value (40.77, α)	27.14	Adjusted Chi Square Value (40.77, β)	26.49
95% Gamma Approximate UCL (use when n>=50)	0.0959	95% Gamma Adjusted UCL (use when n<50)	0.0982
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.0897	SD (KM)	0.0772
Variance (KM)	0.00596	SE of Mean (KM)	0.0147
k hat (KM)	1.349	k star (KM)	1.236
nu hat (KM)	80.93	nu star (KM)	74.17
theta hat (KM)	0.0665	theta star (KM)	0.0725
80% gamma percentile (KM)	0.142	90% gamma percentile (KM)	0.196
95% gamma percentile (KM)	0.249	99% gamma percentile (KM)	0.372
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (74.17, α)	55.33	Adjusted Chi Square Value (74.17, β)	54.4
95% Gamma Approximate KM-UCL (use when n>=50)	0.12	95% Gamma Adjusted KM-UCL (use when n<50)	0.122
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.925	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.859	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.224	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.243	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.0788	Mean in Log Scale	-2.869
SD in Original Scale	0.0842	SD in Log Scale	0.743
95% t UCL (assumes normality of ROS data)	0.105	95% Percentile Bootstrap UCL	0.105
95% BCA Bootstrap UCL	0.111	95% Bootstrap t UCL	0.123
95% H-UCL (Log ROS)	0.101		

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-2.607	KM Geo Mean	0.0737
KM SD (logged)	0.539	95% Critical H Value (KM-Log)	1.984
KM Standard Error of Mean (logged)	0.103	95% H-UCL (KM -Log)	0.104
KM SD (logged)	0.539	95% Critical H Value (KM-Log)	1.984
KM Standard Error of Mean (logged)	0.103		

DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.0774	Mean in Log Scale	-2.891
SD in Original Scale	0.0846	SD in Log Scale	0.734
95% t UCL (Assumes normality)	0.104	95% H-Stat UCL	0.0977

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Approximate Gamma Distributed at 5% Significance Level

Suggested UCL to Use

95% KM Adjusted Gamma UCL	0.122	95% GROS Adjusted Gamma UCL	0.0982

When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test

When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Aluminum

General Statistics

Total Number of Observations	30	Number of Distinct Observations	29
		Number of Missing Observations	0
Minimum	6230	Mean	20004
Maximum	117000	Median	15200
SD	20165	Std. Error of Mean	3682
Coefficient of Variation	1.008	Skewness	4.189

Normal GOF Test

Shapiro Wilk Test Statistic	0.49	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.927	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.371	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.159	Data Not Normal at 5% Significance Level	

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	26259	95% Adjusted-CLT UCL (Chen-1995)	29068
		95% Modified-t UCL (Johnson-1978)	26729

Gamma GOF Test			
A-D Test Statistic	2.695	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.755	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.29	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.162	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	2.57	k star (bias corrected MLE)	2.335
Theta hat (MLE)	7784	Theta star (bias corrected MLE)	8567
nu hat (MLE)	154.2	nu star (bias corrected)	140.1
MLE Mean (bias corrected)	20004	MLE Sd (bias corrected)	13091
		Approximate Chi Square Value (0.05)	113.7
Adjusted Level of Significance	0.041	Adjusted Chi Square Value	112.4
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	24638	95% Adjusted Gamma UCL (use when n<50)	24938
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.847	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.927	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.227	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.159	Data Not Lognormal at 5% Significance Level	
Data Not Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	8.737	Mean of logged Data	9.697
Maximum of Logged Data	11.67	SD of logged Data	0.551
Assuming Lognormal Distribution			
95% H-UCL	23203	90% Chebyshev (MVUE) UCL	24788
95% Chebyshev (MVUE) UCL	27494	97.5% Chebyshev (MVUE) UCL	31248
99% Chebyshev (MVUE) UCL	38624		
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution (0.05)			
Nonparametric Distribution Free UCLs			
95% CLT UCL	26060	95% Jackknife UCL	26259
95% Standard Bootstrap UCL	25971	95% Bootstrap-t UCL	36535
95% Hall's Bootstrap UCL	48606	95% Percentile Bootstrap UCL	26729
95% BCA Bootstrap UCL	30033		
90% Chebyshev(Mean, Sd) UCL	31049	95% Chebyshev(Mean, Sd) UCL	36052
97.5% Chebyshev(Mean, Sd) UCL	42995	99% Chebyshev(Mean, Sd) UCL	56635
Suggested UCL to Use			
95% Chebyshev (Mean, Sd) UCL	36052		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Iron

General Statistics

Total Number of Observations	30	Number of Distinct Observations	25
		Number of Missing Observations	0
Minimum	6400	Mean	15447
Maximum	20500	Median	15800
SD	3228	Std. Error of Mean	589.3
Coefficient of Variation	0.209	Skewness	-0.949

Normal GOF Test

Shapiro Wilk Test Statistic	0.941	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.927	Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.136	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.159	Data appear Normal at 5% Significance Level

Data appear Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	16449	95% Adjusted-CLT UCL (Chen-1995)	16307
		95% Modified-t UCL (Johnson-1978)	16432

Gamma GOF Test

A-D Test Statistic	1.023	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.744	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.169	**Kolmogorov-Smirnov Gamma GOF Test**
5% K-S Critical Value	0.16	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	19.11	k star (bias corrected MLE)	17.22
Theta hat (MLE)	808.4	Theta star (bias corrected MLE)	897
nu hat (MLE)	1147	nu star (bias corrected)	1033
MLE Mean (bias corrected)	15447	MLE Sd (bias corrected)	3722
		Approximate Chi Square Value (0.05)	959.6
Adjusted Level of Significance	0.041	Adjusted Chi Square Value	955.6

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	16632	95% Adjusted Gamma UCL (use when n<50)	16703

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.852	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.927	Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.183	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.159	Data Not Lognormal at 5% Significance Level

Data Not Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	8.764	Mean of logged Data	9.619
Maximum of Logged Data	9.928	SD of logged Data	0.249
Assuming Lognormal Distribution			
95% H-UCL	16852	90% Chebyshev (MVUE) UCL	17644
95% Chebyshev (MVUE) UCL	18614	97.5% Chebyshev (MVUE) UCL	19960
99% Chebyshev (MVUE) UCL	22604		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	16417	95% Jackknife UCL	16449
95% Standard Bootstrap UCL	16432	95% Bootstrap-t UCL	16370
95% Hall's Bootstrap UCL	16367	95% Percentile Bootstrap UCL	16364
95% BCA Bootstrap UCL	16301		
90% Chebyshev(Mean, Sd) UCL	17215	95% Chebyshev(Mean, Sd) UCL	18016
97.5% Chebyshev(Mean, Sd) UCL	19127	99% Chebyshev(Mean, Sd) UCL	21311
Suggested UCL to Use			
95% Student's-t UCL	16449		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Note: For highly negatively-skewed data, confidence limits (e.g., Chen, Johnson, Lognormal, and Gamma) may not be			
reliable. Chen's and Johnson's methods provide adjustments for positvely skewed data sets.			
Manganese			
General Statistics			
Total Number of Observations	30	Number of Distinct Observations	29
		Number of Missing Observations	0
Minimum	137	Mean	488.4
Maximum	2620	Median	384.5
SD	441.4	Std. Error of Mean	80.59
Coefficient of Variation	0.904	Skewness	4.179
Normal GOF Test			
Shapiro Wilk Test Statistic	0.527	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.927	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.285	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.159	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			

Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	625.3	95% Adjusted-CLT UCL (Chen-1995)	686.6
		95% Modified-t UCL (Johnson-1978)	635.5
Gamma GOF Test			
A-D Test Statistic	1.907	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.753	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.202	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.161	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	2.864	k star (bias corrected MLE)	2.6
Theta hat (MLE)	170.5	Theta star (bias corrected MLE)	187.8
nu hat (MLE)	171.8	nu star (bias corrected)	156
MLE Mean (bias corrected)	488.4	MLE Sd (bias corrected)	302.9
		Approximate Chi Square Value (0.05)	128.1
Adjusted Level of Significance	0.041	Adjusted Chi Square Value	126.7
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	594.6	95% Adjusted Gamma UCL (use when n<50)	601.4
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.898	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.927	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.171	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.159	Data Not Lognormal at 5% Significance Level	
Data Not Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	4.92	Mean of logged Data	6.006
Maximum of Logged Data	7.871	SD of logged Data	0.545
Assuming Lognormal Distribution			
95% H-UCL	576.1	90% Chebyshev (MVUE) UCL	615.5
95% Chebyshev (MVUE) UCL	682.1	97.5% Chebyshev (MVUE) UCL	774.5
99% Chebyshev (MVUE) UCL	956.1		
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution (0.05)			
Nonparametric Distribution Free UCLs			
95% CLT UCL	620.9	95% Jackknife UCL	625.3
95% Standard Bootstrap UCL	620.6	95% Bootstrap-t UCL	826.7
95% Hall's Bootstrap UCL	1180	95% Percentile Bootstrap UCL	635.6
95% BCA Bootstrap UCL	712		
90% Chebyshev(Mean, Sd) UCL	730.1	95% Chebyshev(Mean, Sd) UCL	839.6
97.5% Chebyshev(Mean, Sd) UCL	991.6	99% Chebyshev(Mean, Sd) UCL	1290

Suggested UCL to Use			
95% Chebyshev (Mean, Sd) UCL	839.6		

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Mercury

General Statistics			
Total Number of Observations	30	Number of Distinct Observations	18
Number of Detects	22	Number of Non-Detects	8
Number of Distinct Detects	17	Number of Distinct Non-Detects	3
Minimum Detect	0.01	Minimum Non-Detect	0.01
Maximum Detect	0.055	Maximum Non-Detect	0.012
Variance Detects	1.0421E-4	Percent Non-Detects	26.67%
Mean Detects	0.0233	SD Detects	0.0102
Median Detects	0.021	CV Detects	0.439
Skewness Detects	1.674	Kurtosis Detects	3.637
Mean of Logged Detects	-3.838	SD of Logged Detects	0.395

Normal GOF Test on Detects Only		
Shapiro Wilk Test Statistic	0.862	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.911	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.199	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.184	Detected Data Not Normal at 5% Significance Level
Detected Data Not Normal at 5% Significance Level		

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.0197	KM Standard Error of Mean	0.00194
KM SD	0.0104	95% KM (BCA) UCL	0.0232
95% KM (t) UCL	0.023	95% KM (Percentile Bootstrap) UCL	0.0229
95% KM (z) UCL	0.0229	95% KM Bootstrap t UCL	0.0239
90% KM Chebyshev UCL	0.0255	95% KM Chebyshev UCL	0.0282
97.5% KM Chebyshev UCL	0.0318	99% KM Chebyshev UCL	0.039

Gamma GOF Tests on Detected Observations Only		
A-D Test Statistic	0.38	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.746	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.144	**Kolmogorov-Smirnov GOF**
5% K-S Critical Value	0.186	Detected data appear Gamma Distributed at 5% Significance Level
Detected data appear Gamma Distributed at 5% Significance Level		

Gamma Statistics on Detected Data Only			
k hat (MLE)	6.59	k star (bias corrected MLE)	5.722
Theta hat (MLE)	0.00353	Theta star (bias corrected MLE)	0.00407
nu hat (MLE)	290	nu star (bias corrected)	251.8
Mean (detects)	0.0233		

Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	0.0197
Maximum	0.055	Median	0.0185
SD	0.0105	CV	0.534
k hat (MLE)	4.422	k star (bias corrected MLE)	4.002
Theta hat (MLE)	0.00446	Theta star (bias corrected MLE)	0.00493
nu hat (MLE)	265.3	nu star (bias corrected)	240.1
Adjusted Level of Significance (β)	0.041		
Approximate Chi Square Value (240.11, α)	205.2	Adjusted Chi Square Value (240.11, β)	203.4
95% Gamma Approximate UCL (use when n>=50)	0.0231	95% Gamma Adjusted UCL (use when n<50)	0.0233
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.0197	SD (KM)	0.0104
Variance (KM)	1.0740E-4	SE of Mean (KM)	0.00194
k hat (KM)	3.626	k star (KM)	3.286
nu hat (KM)	217.6	nu star (KM)	197.1
theta hat (KM)	0.00544	theta star (KM)	0.00601
80% gamma percentile (KM)	0.0278	90% gamma percentile (KM)	0.0343
95% gamma percentile (KM)	0.0404	99% gamma percentile (KM)	0.0534
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (197.13, α)	165.6	Adjusted Chi Square Value (197.13, β)	164
95% Gamma Approximate KM-UCL (use when n>=50)	0.0235	95% Gamma Adjusted KM-UCL (use when n<50)	0.0237
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.979	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.911	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.119	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.184	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.0194	Mean in Log Scale	-4.079
SD in Original Scale	0.0109	SD in Log Scale	0.535
95% t UCL (assumes normality of ROS data)	0.0228	95% Percentile Bootstrap UCL	0.0227
95% BCA Bootstrap UCL	0.0231	95% Bootstrap t UCL	0.0236
95% H-UCL (Log ROS)	0.0238		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-4.043	KM Geo Mean	0.0175
KM SD (logged)	0.473	95% Critical H Value (KM-Log)	1.93
KM Standard Error of Mean (logged)	0.0885	95% H-UCL (KM -Log)	0.0233
KM SD (logged)	0.473	95% Critical H Value (KM-Log)	1.93
KM Standard Error of Mean (logged)	0.0885		

DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.0185	Mean in Log Scale	-4.206
SD in Original Scale	0.0118	SD in Log Scale	0.705
95% t UCL (Assumes normality)	0.0222	95% H-Stat UCL	0.0253
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Gamma Distributed at 5% Significance Level			
Suggested UCL to Use			
95% KM Adjusted Gamma UCL	0.0237	95% GROS Adjusted Gamma UCL	0.0233
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Nickel			
General Statistics			
Total Number of Observations	30	Number of Distinct Observations	28
		Number of Missing Observations	0
Minimum	7.8	Mean	41.53
Maximum	513	Median	13.1
SD	97.39	Std. Error of Mean	17.78
Coefficient of Variation	2.345	Skewness	4.388
Normal GOF Test			
Shapiro Wilk Test Statistic	0.358	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.927	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.424	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.159	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	71.74	95% Adjusted-CLT UCL (Chen-1995)	86
		95% Modified-t UCL (Johnson-1978)	74.11
Gamma GOF Test			
A-D Test Statistic	5.83	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.787	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.353	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.166	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			

k hat (MLE)	0.76	k star (bias corrected MLE)	0.706
Theta hat (MLE)	54.67	Theta star (bias corrected MLE)	58.83
nu hat (MLE)	45.58	nu star (bias corrected)	42.35
MLE Mean (bias corrected)	41.53	MLE Sd (bias corrected)	49.43
		Approximate Chi Square Value (0.05)	28.43
Adjusted Level of Significance	0.041	Adjusted Chi Square Value	27.77
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	61.86	95% Adjusted Gamma UCL (use when n<50)	63.32
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.669	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.927	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.276	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.159	Data Not Lognormal at 5% Significance Level	
Data Not Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	2.054	Mean of logged Data	2.94
Maximum of Logged Data	6.24	SD of logged Data	0.932
Assuming Lognormal Distribution			
95% H-UCL	44.16	90% Chebyshev (MVUE) UCL	45.15
95% Chebyshev (MVUE) UCL	52.65	97.5% Chebyshev (MVUE) UCL	63.05
99% Chebyshev (MVUE) UCL	83.48		
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution (0.05)			
Nonparametric Distribution Free UCLs			
95% CLT UCL	70.77	95% Jackknife UCL	71.74
95% Standard Bootstrap UCL	70.83	95% Bootstrap-t UCL	214.6
95% Hall's Bootstrap UCL	183.3	95% Percentile Bootstrap UCL	73.14
95% BCA Bootstrap UCL	96.08		
90% Chebyshev(Mean, Sd) UCL	94.87	95% Chebyshev(Mean, Sd) UCL	119
97.5% Chebyshev(Mean, Sd) UCL	152.6	99% Chebyshev(Mean, Sd) UCL	218.4
Suggested UCL to Use			
95% Chebyshev (Mean, Sd) UCL	119		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Thallium			
General Statistics			
Total Number of Observations	30	Number of Distinct Observations	7
Number of Detects	5	Number of Non-Detects	25

Number of Distinct Detects	4	Number of Distinct Non-Detects	6
Minimum Detect	0.11	Minimum Non-Detect	0.11
Maximum Detect	0.19	Maximum Non-Detect	0.19
Variance Detects	0.00108	Percent Non-Detects	83.33%
Mean Detects	0.154	SD Detects	0.0329
Median Detects	0.17	CV Detects	0.213
Skewness Detects	-0.518	Kurtosis Detects	-1.687
Mean of Logged Detects	-1.89	SD of Logged Detects	0.226
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.914	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.762	Detected Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.287	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.343	Detected Data appear Normal at 5% Significance Level	
Detected Data appear Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.118	KM Standard Error of Mean	0.00427
KM SD	0.0205	95% KM (BCA) UCL	N/A
95% KM (t) UCL	0.125	95% KM (Percentile Bootstrap) UCL	N/A
95% KM (z) UCL	0.125	95% KM Bootstrap t UCL	N/A
90% KM Chebyshev UCL	0.131	95% KM Chebyshev UCL	0.136
97.5% KM Chebyshev UCL	0.144	99% KM Chebyshev UCL	0.16
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	0.401	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.679	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.317	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.357	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	25.64	k star (bias corrected MLE)	10.39
Theta hat (MLE)	0.00601	Theta star (bias corrected MLE)	0.0148
nu hat (MLE)	256.4	nu star (bias corrected)	103.9
Mean (detects)	0.154		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.0251	Mean	0.0892
Maximum	0.19	Median	0.0817
SD	0.0398	CV	0.446
k hat (MLE)	5.269	k star (bias corrected MLE)	4.764
Theta hat (MLE)	0.0169	Theta star (bias corrected MLE)	0.0187
nu hat (MLE)	316.1	nu star (bias corrected)	285.8
Adjusted Level of Significance (β)	0.041		

Approximate Chi Square Value (285.84, α)	247.7	Adjusted Chi Square Value (285.84, β)	245.6
95% Gamma Approximate UCL (use when n>=50)	0.103	95% Gamma Adjusted UCL (use when n<50)	0.104
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.118	SD (KM)	0.0205
Variance (KM)	4.2090E-4	SE of Mean (KM)	0.00427
k hat (KM)	32.97	k star (KM)	29.7
nu hat (KM)	1978	nu star (KM)	1782
theta hat (KM)	0.00357	theta star (KM)	0.00397
80% gamma percentile (KM)	0.136	90% gamma percentile (KM)	0.146
95% gamma percentile (KM)	0.155	99% gamma percentile (KM)	0.174
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (N/A, α)	1685	Adjusted Chi Square Value (N/A, β)	1679
95% Gamma Approximate KM-UCL (use when n>=50)	0.125	95% Gamma Adjusted KM-UCL (use when n<50)	0.125
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.899	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.762	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.3	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.343	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.0973	Mean in Log Scale	-2.379
SD in Original Scale	0.0331	SD in Log Scale	0.31
95% t UCL (assumes normality of ROS data)	0.108	95% Percentile Bootstrap UCL	0.108
95% BCA Bootstrap UCL	0.109	95% Bootstrap t UCL	0.11
95% H-UCL (Log ROS)	0.108		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-2.151	KM Geo Mean	0.116
KM SD (logged)	0.146	95% Critical H Value (KM-Log)	1.728
KM Standard Error of Mean (logged)	0.0305	95% H-UCL (KM -Log)	0.123
KM SD (logged)	0.146	95% Critical H Value (KM-Log)	1.728
KM Standard Error of Mean (logged)	0.0305		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.0815	Mean in Log Scale	-2.573
SD in Original Scale	0.0359	SD in Log Scale	0.337
95% t UCL (Assumes normality)	0.0926	95% H-Stat UCL	0.0906
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Normal Distributed at 5% Significance Level			
Suggested UCL to Use			
95% KM (t) UCL	0.125		

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Antimony

General Statistics

Total Number of Observations	30	Number of Distinct Observations	14
Number of Detects	5	Number of Non-Detects	25
Number of Distinct Detects	5	Number of Distinct Non-Detects	11
Minimum Detect	0.32	Minimum Non-Detect	0.26
Maximum Detect	2.9	Maximum Non-Detect	0.5
Variance Detects	1.179	Percent Non-Detects	83.33%
Mean Detects	1.122	SD Detects	1.086
Median Detects	0.65	CV Detects	0.968
Skewness Detects	1.479	Kurtosis Detects	1.745
Mean of Logged Detects	-0.25	SD of Logged Detects	0.946

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.823	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.762	Detected Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.268	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.343	Detected Data appear Normal at 5% Significance Level

Detected Data appear Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	0.405	KM Standard Error of Mean	0.104
KM SD	0.51	95% KM (BCA) UCL	0.571
95% KM (t) UCL	0.582	95% KM (Percentile Bootstrap) UCL	0.592
95% KM (z) UCL	0.576	95% KM Bootstrap t UCL	0.952
90% KM Chebyshev UCL	0.717	95% KM Chebyshev UCL	0.859
97.5% KM Chebyshev UCL	1.055	99% KM Chebyshev UCL	1.441

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.366	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.686	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.23	**Kolmogorov-Smirnov GOF**
5% K-S Critical Value	0.362	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	1.516	k star (bias corrected MLE)	0.74
Theta hat (MLE)	0.74	Theta star (bias corrected MLE)	1.517
nu hat (MLE)	15.16	nu star (bias corrected)	7.398
Mean (detects)	1.122		

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)

For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	0.195
Maximum	2.9	Median	0.01
SD	0.583	CV	2.986
k hat (MLE)	0.306	k star (bias corrected MLE)	0.298
Theta hat (MLE)	0.638	Theta star (bias corrected MLE)	0.656
nu hat (MLE)	18.36	nu star (bias corrected)	17.86
Adjusted Level of Significance (β)	0.041		
Approximate Chi Square Value (17.86, α)	9.288	Adjusted Chi Square Value (17.86, β)	8.932
95% Gamma Approximate UCL (use when n>=50)	0.376	95% Gamma Adjusted UCL (use when n<50)	0.391
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.405	SD (KM)	0.51
Variance (KM)	0.26	SE of Mean (KM)	0.104
k hat (KM)	0.631	k star (KM)	0.59
nu hat (KM)	37.85	nu star (KM)	35.4
theta hat (KM)	0.642	theta star (KM)	0.687
80% gamma percentile (KM)	0.668	90% gamma percentile (KM)	1.057
95% gamma percentile (KM)	1.466	99% gamma percentile (KM)	2.457
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (35.40, α)	22.78	Adjusted Chi Square Value (35.40, β)	22.2
95% Gamma Approximate KM-UCL (use when n>=50)	0.629	95% Gamma Adjusted KM-UCL (use when n<50)	0.646
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.911	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.762	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.21	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.343	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.205	Mean in Log Scale	-3.625
SD in Original Scale	0.58	SD in Log Scale	1.854
95% t UCL (assumes normality of ROS data)	0.385	95% Percentile Bootstrap UCL	0.399
95% BCA Bootstrap UCL	0.496	95% Bootstrap t UCL	0.914
95% H-UCL (Log ROS)	0.533		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-1.159	KM Geo Mean	0.314
KM SD (logged)	0.535	95% Critical H Value (KM-Log)	1.98
KM Standard Error of Mean (logged)	0.109	95% H-UCL (KM -Log)	0.441
KM SD (logged)	0.535	95% Critical H Value (KM-Log)	1.98
KM Standard Error of Mean (logged)	0.109		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.319	Mean in Log Scale	-1.587

SD in Original Scale	0.545	SD in Log Scale	0.713
95% t UCL (Assumes normality)	0.488	95% H-Stat UCL	0.35
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Normal Distributed at 5% Significance Level			
Suggested UCL to Use			
95% KM (t) UCL	0.582		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Arsenic			
General Statistics			
Total Number of Observations	30	Number of Distinct Observations	23
		Number of Missing Observations	0
Minimum	3.2	Mean	6.577
Maximum	23.2	Median	6.1
SD	3.75	Std. Error of Mean	0.685
Coefficient of Variation	0.57	Skewness	3.441
Normal GOF Test			
Shapiro Wilk Test Statistic	0.61	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.927	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.301	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.159	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	7.74	95% Adjusted-CLT UCL (Chen-1995)	8.163
		95% Modified-t UCL (Johnson-1978)	7.812
Gamma GOF Test			
A-D Test Statistic	1.916	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.746	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.227	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.16	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	5.648	k star (bias corrected MLE)	5.105
Theta hat (MLE)	1.164	Theta star (bias corrected MLE)	1.288
nu hat (MLE)	338.9	nu star (bias corrected)	306.3
MLE Mean (bias corrected)	6.577	MLE Sd (bias corrected)	2.911

		Approximate Chi Square Value (0.05)	266.8
Adjusted Level of Significance	0.041	Adjusted Chi Square Value	264.6
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	7.552	95% Adjusted Gamma UCL (use when n<50)	7.612
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.859	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.927	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.187	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.159	Data Not Lognormal at 5% Significance Level	
Data Not Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	1.163	Mean of logged Data	1.792
Maximum of Logged Data	3.144	SD of logged Data	0.389
Assuming Lognormal Distribution			
95% H-UCL	7.411	90% Chebyshev (MVUE) UCL	7.872
95% Chebyshev (MVUE) UCL	8.513	97.5% Chebyshev (MVUE) UCL	9.402
99% Chebyshev (MVUE) UCL	11.15		
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution (0.05)			
Nonparametric Distribution Free UCLs			
95% CLT UCL	7.703	95% Jackknife UCL	7.74
95% Standard Bootstrap UCL	7.701	95% Bootstrap-t UCL	9.228
95% Hall's Bootstrap UCL	13.29	95% Percentile Bootstrap UCL	7.82
95% BCA Bootstrap UCL	8.22		
90% Chebyshev(Mean, Sd) UCL	8.631	95% Chebyshev(Mean, Sd) UCL	9.561
97.5% Chebyshev(Mean, Sd) UCL	10.85	99% Chebyshev(Mean, Sd) UCL	13.39
Suggested UCL to Use			
95% Student's-t UCL	7.74	or 95% Modified-t UCL	7.812
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Barium			
General Statistics			
Total Number of Observations	30	Number of Distinct Observations	29
		Number of Missing Observations	0
Minimum	43.9	Mean	139.2
Maximum	436	Median	98.8
SD	86.25	Std. Error of Mean	15.75

Coefficient of Variation	0.62	Skewness	1.586
Normal GOF Test			
Shapiro Wilk Test Statistic	0.845	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.927	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.206	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.159	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	165.9	95% Adjusted-CLT UCL (Chen-1995)	169.9
		95% Modified-t UCL (Johnson-1978)	166.7
Gamma GOF Test			
A-D Test Statistic	0.751	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.752	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.179	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.161	Data Not Gamma Distributed at 5% Significance Level	
Detected data follow Appr. Gamma Distribution at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	3.269	k star (bias corrected MLE)	2.965
Theta hat (MLE)	42.57	Theta star (bias corrected MLE)	46.94
nu hat (MLE)	196.2	nu star (bias corrected)	177.9
MLE Mean (bias corrected)	139.2	MLE Sd (bias corrected)	80.82
		Approximate Chi Square Value (0.05)	148
Adjusted Level of Significance	0.041	Adjusted Chi Square Value	146.5
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50)	167.2	95% Adjusted Gamma UCL (use when n<50)	169
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.96	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.927	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.154	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.159	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	3.782	Mean of logged Data	4.775
Maximum of Logged Data	6.078	SD of logged Data	0.567
Assuming Lognormal Distribution			
95% H-UCL	172	90% Chebyshev (MVUE) UCL	183.7
95% Chebyshev (MVUE) UCL	204.3	97.5% Chebyshev (MVUE) UCL	232.8
99% Chebyshev (MVUE) UCL	288.9		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			

Nonparametric Distribution Free UCLs			
95% CLT UCL	165.1	95% Jackknife UCL	165.9
95% Standard Bootstrap UCL	164.8	95% Bootstrap-t UCL	172
95% Hall's Bootstrap UCL	176.2	95% Percentile Bootstrap UCL	166.5
95% BCA Bootstrap UCL	169.6		
90% Chebyshev(Mean, Sd) UCL	186.4	95% Chebyshev(Mean, Sd) UCL	207.8
97.5% Chebyshev(Mean, Sd) UCL	237.5	99% Chebyshev(Mean, Sd) UCL	295.8
Suggested UCL to Use			
95% Adjusted Gamma UCL	169		

When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test
When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

ChromiumVI_EST

General Statistics			
Total Number of Observations	30	Number of Distinct Observations	25
		Number of Missing Observations	0
Minimum	0.174	Mean	0.299
Maximum	0.575	Median	0.288
SD	0.0878	Std. Error of Mean	0.016
Coefficient of Variation	0.294	Skewness	1.901
Normal GOF Test			
Shapiro Wilk Test Statistic	0.808	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.927	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.205	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.159	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	0.326	95% Adjusted-CLT UCL (Chen-1995)	0.331
		95% Modified-t UCL (Johnson-1978)	0.327
Gamma GOF Test			
A-D Test Statistic	1.038	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.745	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.167	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.16	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			

Gamma Statistics			
k hat (MLE)	14.59	k star (bias corrected MLE)	13.15
Theta hat (MLE)	0.0205	Theta star (bias corrected MLE)	0.0227
nu hat (MLE)	875.2	nu star (bias corrected)	789
MLE Mean (bias corrected)	0.299	MLE Sd (bias corrected)	0.0824
		Approximate Chi Square Value (0.05)	724.9
Adjusted Level of Significance	0.041	Adjusted Chi Square Value	721.3
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	0.325	95% Adjusted Gamma UCL (use when n<50)	0.327
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.922	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.927	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.149	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.159	Data appear Lognormal at 5% Significance Level	
Data appear Approximate Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	-1.749	Mean of logged Data	-1.242
Maximum of Logged Data	-0.553	SD of logged Data	0.259
Assuming Lognormal Distribution			
95% H-UCL	0.325	90% Chebyshev (MVUE) UCL	0.341
95% Chebyshev (MVUE) UCL	0.36	97.5% Chebyshev (MVUE) UCL	0.387
99% Chebyshev (MVUE) UCL	0.44		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	0.325	95% Jackknife UCL	0.326
95% Standard Bootstrap UCL	0.325	95% Bootstrap-t UCL	0.339
95% Hall's Bootstrap UCL	0.367	95% Percentile Bootstrap UCL	0.326
95% BCA Bootstrap UCL	0.33		
90% Chebyshev(Mean, Sd) UCL	0.347	95% Chebyshev(Mean, Sd) UCL	0.369
97.5% Chebyshev(Mean, Sd) UCL	0.399	99% Chebyshev(Mean, Sd) UCL	0.458
Suggested UCL to Use			
95% Student's-t UCL	0.326	or 95% Modified-t UCL	0.327
or 95% H-UCL	0.325		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
ProUCL computes and outputs H-statistic based UCLs for historical reasons only.			
H-statistic often results in unstable (both high and low) values of UCL95 as shown in examples in the Technical Guide.			
It is therefore recommended to avoid the use of H-statistic based 95% UCLs.			

Use of nonparametric methods are preferred to compute UCL95 for skewed data sets which do not follow a gamma distribution.			
Cobalt			
General Statistics			
Total Number of Observations	30	Number of Distinct Observations	19
		Number of Missing Observations	0
Minimum	3.4	Mean	5.813
Maximum	15.6	Median	5.25
SD	2.355	Std. Error of Mean	0.43
Coefficient of Variation	0.405	Skewness	2.953
Normal GOF Test			
Shapiro Wilk Test Statistic	0.672	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.927	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.253	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.159	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	6.544	95% Adjusted-CLT UCL (Chen-1995)	6.768
		95% Modified-t UCL (Johnson-1978)	6.583
Gamma GOF Test			
A-D Test Statistic	2.002	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.746	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.223	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.16	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	9.39	k star (bias corrected MLE)	8.473
Theta hat (MLE)	0.619	Theta star (bias corrected MLE)	0.686
nu hat (MLE)	563.4	nu star (bias corrected)	508.4
MLE Mean (bias corrected)	5.813	MLE Sd (bias corrected)	1.997
		Approximate Chi Square Value (0.05)	457.1
Adjusted Level of Significance	0.041	Adjusted Chi Square Value	454.3
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	6.466	95% Adjusted Gamma UCL (use when n<50)	6.505
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.852	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.927	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.202	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.159	Data Not Lognormal at 5% Significance Level	
Data Not Lognormal at 5% Significance Level			

Lognormal Statistics			
Minimum of Logged Data	1.224	Mean of logged Data	1.706
Maximum of Logged Data	2.747	SD of logged Data	0.31
Assuming Lognormal Distribution			
95% H-UCL	6.416	90% Chebyshev (MVUE) UCL	6.767
95% Chebyshev (MVUE) UCL	7.219	97.5% Chebyshev (MVUE) UCL	7.846
99% Chebyshev (MVUE) UCL	9.079		
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution (0.05)			
Nonparametric Distribution Free UCLs			
95% CLT UCL	6.521	95% Jackknife UCL	6.544
95% Standard Bootstrap UCL	6.497	95% Bootstrap-t UCL	7.151
95% Hall's Bootstrap UCL	10.47	95% Percentile Bootstrap UCL	6.6
95% BCA Bootstrap UCL	6.82		
90% Chebyshev(Mean, Sd) UCL	7.103	95% Chebyshev(Mean, Sd) UCL	7.687
97.5% Chebyshev(Mean, Sd) UCL	8.498	99% Chebyshev(Mean, Sd) UCL	10.09
Suggested UCL to Use			
95% Student's-t UCL	6.544	or 95% Modified-t UCL	6.583
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Copper			
General Statistics			
Total Number of Observations	30	Number of Distinct Observations	28
		Number of Missing Observations	0
Minimum	7.5	Mean	39.7
Maximum	776	Median	13.7
SD	139.1	Std. Error of Mean	25.4
Coefficient of Variation	3.505	Skewness	5.467
Normal GOF Test			
Shapiro Wilk Test Statistic	0.213	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.927	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.502	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.159	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	82.87	95% Adjusted-CLT UCL (Chen-1995)	108.6
		95% Modified-t UCL (Johnson-1978)	87.09

Gamma GOF Test			
A-D Test Statistic	7.576	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.796	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.424	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.167	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	0.651	k star (bias corrected MLE)	0.608
Theta hat (MLE)	60.99	Theta star (bias corrected MLE)	65.29
nu hat (MLE)	39.06	nu star (bias corrected)	36.48
MLE Mean (bias corrected)	39.7	MLE Sd (bias corrected)	50.92
		Approximate Chi Square Value (0.05)	23.66
Adjusted Level of Significance	0.041	Adjusted Chi Square Value	23.06
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	61.23	95% Adjusted Gamma UCL (use when n<50)	62.81
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.567	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.927	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.254	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.159	Data Not Lognormal at 5% Significance Level	
Data Not Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	2.015	Mean of logged Data	2.743
Maximum of Logged Data	6.654	SD of logged Data	0.806
Assuming Lognormal Distribution			
95% H-UCL	30.11	90% Chebyshev (MVUE) UCL	31.55
95% Chebyshev (MVUE) UCL	36.24	97.5% Chebyshev (MVUE) UCL	42.74
99% Chebyshev (MVUE) UCL	55.51		
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution (0.05)			
Nonparametric Distribution Free UCLs			
95% CLT UCL	81.49	95% Jackknife UCL	82.87
95% Standard Bootstrap UCL	80.81	95% Bootstrap-t UCL	944.7
95% Hall's Bootstrap UCL	316.8	95% Percentile Bootstrap UCL	90.15
95% BCA Bootstrap UCL	116.3		
90% Chebyshev(Mean, Sd) UCL	115.9	95% Chebyshev(Mean, Sd) UCL	150.4
97.5% Chebyshev(Mean, Sd) UCL	198.4	99% Chebyshev(Mean, Sd) UCL	292.5
Suggested UCL to Use			
95% Chebyshev (Mean, Sd) UCL	150.4		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Vanadium

General Statistics

Total Number of Observations	30	Number of Distinct Observations	27
		Number of Missing Observations	0
Minimum	4.6	Mean	20.8
Maximum	163	Median	12.1
SD	30.87	Std. Error of Mean	5.635
Coefficient of Variation	1.484	Skewness	3.924

Normal GOF Test

Shapiro Wilk Test Statistic	0.457	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.927	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.356	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.159	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	30.37	95% Adjusted-CLT UCL (Chen-1995)	34.38
		95% Modified-t UCL (Johnson-1978)	31.04

Gamma GOF Test

A-D Test Statistic	3.415	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.766	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.284	**Kolmogorov-Smirnov Gamma GOF Test**
5% K-S Critical Value	0.163	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	1.383	k star (bias corrected MLE)	1.266
Theta hat (MLE)	15.04	Theta star (bias corrected MLE)	16.42
nu hat (MLE)	82.95	nu star (bias corrected)	75.99
MLE Mean (bias corrected)	20.8	MLE Sd (bias corrected)	18.48
		Approximate Chi Square Value (0.05)	56.91
Adjusted Level of Significance	0.041	Adjusted Chi Square Value	55.96

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	27.77	95% Adjusted Gamma UCL (use when n<50)	28.24

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.828	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.927	Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.211	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.159	Data Not Lognormal at 5% Significance Level

Data Not Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	1.526	Mean of logged Data	2.631
Maximum of Logged Data	5.094	SD of logged Data	0.738
Assuming Lognormal Distribution			
95% H-UCL	24.59	90% Chebyshev (MVUE) UCL	25.99
95% Chebyshev (MVUE) UCL	29.59	97.5% Chebyshev (MVUE) UCL	34.59
99% Chebyshev (MVUE) UCL	44.41		
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution (0.05)			
Nonparametric Distribution Free UCLs			
95% CLT UCL	30.07	95% Jackknife UCL	30.37
95% Standard Bootstrap UCL	29.93	95% Bootstrap-t UCL	53.29
95% Hall's Bootstrap UCL	64.88	95% Percentile Bootstrap UCL	30.69
95% BCA Bootstrap UCL	35.74		
90% Chebyshev(Mean, Sd) UCL	37.7	95% Chebyshev(Mean, Sd) UCL	45.36
97.5% Chebyshev(Mean, Sd) UCL	55.99	99% Chebyshev(Mean, Sd) UCL	76.87
Suggested UCL to Use			
95% Chebyshev (Mean, Sd) UCL	45.36		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Zinc			
General Statistics			
Total Number of Observations	30	Number of Distinct Observations	30
		Number of Missing Observations	0
Minimum	27.7	Mean	51.56
Maximum	89.1	Median	51.25
SD	12.47	Std. Error of Mean	2.276
Coefficient of Variation	0.242	Skewness	0.898
Normal GOF Test			
Shapiro Wilk Test Statistic	0.949	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.927	Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.105	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.159	Data appear Normal at 5% Significance Level	
Data appear Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	

95% Student's-t UCL	55.42	95% Adjusted-CLT UCL (Chen-1995)	55.7
		95% Modified-t UCL (Johnson-1978)	55.49
Gamma GOF Test			
A-D Test Statistic	0.319	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.744	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.0906	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.16	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	18.64	k star (bias corrected MLE)	16.79
Theta hat (MLE)	2.767	Theta star (bias corrected MLE)	3.07
nu hat (MLE)	1118	nu star (bias corrected)	1008
MLE Mean (bias corrected)	51.56	MLE Sd (bias corrected)	12.58
		Approximate Chi Square Value (0.05)	934.9
Adjusted Level of Significance	0.041	Adjusted Chi Square Value	930.9
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	55.56	95% Adjusted Gamma UCL (use when n<50)	55.8
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.981	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.927	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.0886	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.159	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	3.321	Mean of logged Data	3.916
Maximum of Logged Data	4.49	SD of logged Data	0.236
Assuming Lognormal Distribution			
95% H-UCL	55.76	90% Chebyshev (MVUE) UCL	58.28
95% Chebyshev (MVUE) UCL	61.33	97.5% Chebyshev (MVUE) UCL	65.56
99% Chebyshev (MVUE) UCL	73.88		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	55.3	95% Jackknife UCL	55.42
95% Standard Bootstrap UCL	55.19	95% Bootstrap-t UCL	55.95
95% Hall's Bootstrap UCL	56.06	95% Percentile Bootstrap UCL	55.24
95% BCA Bootstrap UCL	55.48		
90% Chebyshev(Mean, Sd) UCL	58.38	95% Chebyshev(Mean, Sd) UCL	61.48
97.5% Chebyshev(Mean, Sd) UCL	65.77	99% Chebyshev(Mean, Sd) UCL	74.2
Suggested UCL to Use			
95% Student's-t UCL	55.42		

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Selenium

General Statistics

Total Number of Observations	30	Number of Distinct Observations	14
Number of Detects	4	Number of Non-Detects	26
Number of Distinct Detects	4	Number of Distinct Non-Detects	11
Minimum Detect	0.33	Minimum Non-Detect	0.26
Maximum Detect	0.39	Maximum Non-Detect	0.47
Variance Detects	6.9167E-4	Percent Non-Detects	86.67%
Mean Detects	0.368	SD Detects	0.0263
Median Detects	0.375	CV Detects	0.0716
Skewness Detects	-1.443	Kurtosis Detects	2.235
Mean of Logged Detects	-1.003	SD of Logged Detects	0.0736

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.887	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.748	Detected Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.288	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.375	Detected Data appear Normal at 5% Significance Level

Detected Data appear Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	0.276	KM Standard Error of Mean	0.00841
KM SD	0.0384	95% KM (BCA) UCL	N/A
95% KM (t) UCL	0.29	95% KM (Percentile Bootstrap) UCL	N/A
95% KM (z) UCL	0.289	95% KM Bootstrap t UCL	N/A
90% KM Chebyshev UCL	0.301	95% KM Chebyshev UCL	0.312
97.5% KM Chebyshev UCL	0.328	99% KM Chebyshev UCL	0.359

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.413	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.657	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.301	**Kolmogorov-Smirnov GOF**
5% K-S Critical Value	0.394	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	250.8	k star (bias corrected MLE)	62.87
Theta hat (MLE)	0.00147	Theta star (bias corrected MLE)	0.00585
nu hat (MLE)	2006	nu star (bias corrected)	502.9
Mean (detects)	0.368		

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.189	Mean	0.264
Maximum	0.39	Median	0.251
SD	0.0518	CV	0.196
k hat (MLE)	28.86	k star (bias corrected MLE)	26
Theta hat (MLE)	0.00913	Theta star (bias corrected MLE)	0.0101
nu hat (MLE)	1732	nu star (bias corrected)	1560
Adjusted Level of Significance (β)	0.041		
Approximate Chi Square Value (N/A, α)	1469	Adjusted Chi Square Value (N/A, β)	1464
95% Gamma Approximate UCL (use when n>=50)	0.28	95% Gamma Adjusted UCL (use when n<50)	N/A
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.276	SD (KM)	0.0384
Variance (KM)	0.00147	SE of Mean (KM)	0.00841
k hat (KM)	51.5	k star (KM)	46.37
nu hat (KM)	3090	nu star (KM)	2782
theta hat (KM)	0.00535	theta star (KM)	0.00594
80% gamma percentile (KM)	0.309	90% gamma percentile (KM)	0.329
95% gamma percentile (KM)	0.345	99% gamma percentile (KM)	0.378
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (N/A, α)	2661	Adjusted Chi Square Value (N/A, β)	2654
95% Gamma Approximate KM-UCL (use when n>=50)	0.288	95% Gamma Adjusted KM-UCL (use when n<50)	0.289
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.875	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.748	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.297	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.375	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.275	Mean in Log Scale	-1.303
SD in Original Scale	0.0444	SD in Log Scale	0.151
95% t UCL (assumes normality of ROS data)	0.289	95% Percentile Bootstrap UCL	0.289
95% BCA Bootstrap UCL	0.29	95% Bootstrap t UCL	0.291
95% H-UCL (Log ROS)	0.288		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-1.297	KM Geo Mean	0.273
KM SD (logged)	0.122	95% Critical H Value (KM-Log)	1.718
KM Standard Error of Mean (logged)	0.0269	95% H-UCL (KM -Log)	0.286
KM SD (logged)	0.122	95% Critical H Value (KM-Log)	1.718
KM Standard Error of Mean (logged)	0.0269		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	

Mean in Original Scale	0.185	Mean in Log Scale	-1.745
SD in Original Scale	0.0758	SD in Log Scale	0.318
95% t UCL (Assumes normality)	0.209	95% H-Stat UCL	0.204
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Normal Distributed at 5% Significance Level			
Suggested UCL to Use			
95% KM (t) UCL	0.29		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Naphthalene			
General Statistics			
Total Number of Observations	30	Number of Distinct Observations	21
Number of Detects	16	Number of Non-Detects	14
Number of Distinct Detects	16	Number of Distinct Non-Detects	6
Minimum Detect	0.0015	Minimum Non-Detect	0.0013
Maximum Detect	1.8	Maximum Non-Detect	0.01
Variance Detects	0.197	Percent Non-Detects	46.67%
Mean Detects	0.158	SD Detects	0.443
Median Detects	0.0215	CV Detects	2.812
Skewness Detects	3.845	Kurtosis Detects	15.07
Mean of Logged Detects	-3.826	SD of Logged Detects	1.995
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.382	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.887	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.391	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.213	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.0847	KM Standard Error of Mean	0.0609
KM SD	0.323	95% KM (BCA) UCL	0.204
95% KM (t) UCL	0.188	95% KM (Percentile Bootstrap) UCL	0.199
95% KM (z) UCL	0.185	95% KM Bootstrap t UCL	0.865
90% KM Chebyshev UCL	0.267	95% KM Chebyshev UCL	0.35
97.5% KM Chebyshev UCL	0.465	99% KM Chebyshev UCL	0.691
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	1.132	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.829	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.201	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.232	Detected data appear Gamma Distributed at 5% Significance Level	

Detected data follow Appr. Gamma Distribution at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.341	k star (bias corrected MLE)	0.319
Theta hat (MLE)	0.462	Theta star (bias corrected MLE)	0.494
nu hat (MLE)	10.92	nu star (bias corrected)	10.21
Mean (detects)	0.158		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.0015	Mean	0.0887
Maximum	1.8	Median	0.01
SD	0.328	CV	3.691
k hat (MLE)	0.376	k star (bias corrected MLE)	0.361
Theta hat (MLE)	0.236	Theta star (bias corrected MLE)	0.246
nu hat (MLE)	22.56	nu star (bias corrected)	21.64
Adjusted Level of Significance (β)	0.041		
Approximate Chi Square Value (21.64, α)	12.07	Adjusted Chi Square Value (21.64, β)	11.65
95% Gamma Approximate UCL (use when n>=50)	0.159	95% Gamma Adjusted UCL (use when n<50)	0.165
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.0847	SD (KM)	0.323
Variance (KM)	0.104	SE of Mean (KM)	0.0609
k hat (KM)	0.0688	k star (KM)	0.0842
nu hat (KM)	4.129	nu star (KM)	5.049
theta hat (KM)	1.231	theta star (KM)	1.007
80% gamma percentile (KM)	0.0444	90% gamma percentile (KM)	0.207
95% gamma percentile (KM)	0.494	99% gamma percentile (KM)	1.465
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (5.05, α)	1.175	Adjusted Chi Square Value (5.05, β)	1.073
95% Gamma Approximate KM-UCL (use when n>=50)	0.364	95% Gamma Adjusted KM-UCL (use when n<50)	0.399
95% Gamma Adjusted KM-UCL (use when k<=1 and 15 < n < 50)			
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.96	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.887	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.0953	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.213	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.0842	Mean in Log Scale	-6.192
SD in Original Scale	0.329	SD in Log Scale	3.069
95% t UCL (assumes normality of ROS data)	0.186	95% Percentile Bootstrap UCL	0.2
95% BCA Bootstrap UCL	0.271	95% Bootstrap t UCL	0.84

95% H-UCL (Log ROS)	5.838		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-5.123	KM Geo Mean	0.00596
KM SD (logged)	1.984	95% Critical H Value (KM-Log)	3.909
KM Standard Error of Mean (logged)	0.375	95% H-UCL (KM -Log)	0.18
KM SD (logged)	1.984	95% Critical H Value (KM-Log)	3.909
KM Standard Error of Mean (logged)	0.375		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.0847	Mean in Log Scale	-5.286
SD in Original Scale	0.329	SD in Log Scale	2.189
95% t UCL (Assumes normality)	0.187	95% H-Stat UCL	0.311
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Approximate Gamma Distributed at 5% Significance Level			
Suggested UCL to Use			
Adjusted KM-UCL (use when k<=1 and 15 < n < 50 but k<=1)	0.399		
When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test			
When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			

ProUCL Output
Eastern Undeveloped Area Soil (0-0.5 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

UCL Statistics for Data Sets with Non-Detects	
User Selected Options	
Date/Time of Computation	ProUCL 5.11/28/2019 12:31:59 PM
From File	20190128_EastUndev_ProUCL_input.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Bis2EthylhexylPhthalate

General Statistics

Total Number of Observations	16	Number of Distinct Observations	14
Number of Detects	2	Number of Non-Detects	14
Number of Distinct Detects	2	Number of Distinct Non-Detects	13
Minimum Detect	0.12	Minimum Non-Detect	0.037
Maximum Detect	0.15	Maximum Non-Detect	1.9
Variance Detects	4.5000E-4	Percent Non-Detects	87.5%
Mean Detects	0.135	SD Detects	0.0212
Median Detects	0.135	CV Detects	0.157
Skewness Detects	N/A	Kurtosis Detects	N/A
Mean of Logged Detects	-2.009	SD of Logged Detects	0.158

Warning: Data set has only 2 Detected Values.
This is not enough to compute meaningful or reliable statistics and estimates.

Normal GOF Test on Detects Only
Not Enough Data to Perform GOF Test

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	0.0588	KM Standard Error of Mean	0.0195
KM SD	0.0414	95% KM (BCA) UCL	N/A
95% KM (t) UCL	0.093	95% KM (Percentile Bootstrap) UCL	N/A
95% KM (z) UCL	0.0908	95% KM Bootstrap t UCL	N/A
90% KM Chebyshev UCL	0.117	95% KM Chebyshev UCL	0.144
97.5% KM Chebyshev UCL	0.181	99% KM Chebyshev UCL	0.253

Gamma GOF Tests on Detected Observations Only
Not Enough Data to Perform GOF Test

Gamma Statistics on Detected Data Only

k hat (MLE)	80.67	k star (bias corrected MLE)	N/A
Theta hat (MLE)	0.00167	Theta star (bias corrected MLE)	N/A
nu hat (MLE)	322.7	nu star (bias corrected)	N/A
Mean (detects)	0.135		

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	0.0588	SD (KM)	0.0414
Variance (KM)	0.00171	SE of Mean (KM)	0.0195

k hat (KM)	2.02	k star (KM)	1.683
nu hat (KM)	64.65	nu star (KM)	53.86
theta hat (KM)	0.0291	theta star (KM)	0.0349
80% gamma percentile (KM)	0.0898	90% gamma percentile (KM)	0.119
95% gamma percentile (KM)	0.147	99% gamma percentile (KM)	0.211
Gamma Kaplan-Meier (KM) Statistics			
		Adjusted Level of Significance (β)	0.0335
Approximate Chi Square Value (53.86, α)	38	Adjusted Chi Square Value (53.86, β)	36.49
95% Gamma Approximate KM-UCL (use when n>=50)	0.0833	95% Gamma Adjusted KM-UCL (use when n<50)	0.0868
Lognormal GOF Test on Detected Observations Only			
Not Enough Data to Perform GOF Test			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.0715	Mean in Log Scale	-2.684
SD in Original Scale	0.0261	SD in Log Scale	0.286
95% t UCL (assumes normality of ROS data)	0.0829	95% Percentile Bootstrap UCL	0.083
95% BCA Bootstrap UCL	0.0877	95% Bootstrap t UCL	0.11
95% H-UCL (Log ROS)	0.0817		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-3.011	KM Geo Mean	0.0493
KM SD (logged)	0.538	95% Critical H Value (KM-Log)	2.09
KM Standard Error of Mean (logged)	0.254	95% H-UCL (KM -Log)	0.0761
KM SD (logged)	0.538	95% Critical H Value (KM-Log)	2.09
KM Standard Error of Mean (logged)	0.254		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.187	Mean in Log Scale	-2.434
SD in Original Scale	0.284	SD in Log Scale	1.216
95% t UCL (Assumes normality)	0.311	95% H-Stat UCL	0.479
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution at 5% Significance Level			
Suggested UCL to Use			
95% KM (t) UCL	0.093	KM H-UCL	0.0761
95% KM (BCA) UCL	N/A		
Warning: One or more Recommended UCL(s) not available!			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Fluoride			

ProUCL Output
Eastern Undeveloped Area Soil (0-0.5 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

General Statistics			
Total Number of Observations	16	Number of Distinct Observations	16
		Number of Missing Observations	0
Minimum	0.75	Mean	11.11
Maximum	32.9	Median	9.03
SD	10.91	Std. Error of Mean	2.728
Coefficient of Variation	0.982	Skewness	0.707
Normal GOF Test			
Shapiro Wilk Test Statistic	0.854	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.887	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.23	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.213	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	15.89	95% Adjusted-CLT UCL (Chen-1995)	16.11
		95% Modified-t UCL (Johnson-1978)	15.97
Gamma GOF Test			
A-D Test Statistic	0.826	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.772	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.209	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.223	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data follow Appr. Gamma Distribution at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	0.813	k star (bias corrected MLE)	0.702
Theta hat (MLE)	13.67	Theta star (bias corrected MLE)	15.82
nu hat (MLE)	26.01	nu star (bias corrected)	22.47
MLE Mean (bias corrected)	11.11	MLE Sd (bias corrected)	13.26
		Approximate Chi Square Value (0.05)	12.69
Adjusted Level of Significance	0.0335	Adjusted Chi Square Value	11.86
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50)	19.67	95% Adjusted Gamma UCL (use when n<50)	21.05
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.869	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.887	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.233	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.213	Data Not Lognormal at 5% Significance Level	
Data Not Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	-0.288	Mean of logged Data	1.679
Maximum of Logged Data	3.493	SD of logged Data	1.411

Assuming Lognormal Distribution			
95% H-UCL	49.78	90% Chebyshev (MVUE) UCL	28.82
95% Chebyshev (MVUE) UCL	35.98	97.5% Chebyshev (MVUE) UCL	45.91
99% Chebyshev (MVUE) UCL	65.42		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	15.59	95% Jackknife UCL	15.89
95% Standard Bootstrap UCL	15.42	95% Bootstrap-t UCL	16.48
95% Hall's Bootstrap UCL	15.9	95% Percentile Bootstrap UCL	15.45
95% BCA Bootstrap UCL	15.89		
90% Chebyshev(Mean, Sd) UCL	19.29	95% Chebyshev(Mean, Sd) UCL	23
97.5% Chebyshev(Mean, Sd) UCL	28.14	99% Chebyshev(Mean, Sd) UCL	38.25
Suggested UCL to Use			
95% Adjusted Gamma UCL	21.05		
When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test			
When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Indeno123CDPyrene			
General Statistics			
Total Number of Observations	16	Number of Distinct Observations	15
		Number of Missing Observations	0
Minimum	0.0077	Mean	0.539
Maximum	2.5	Median	0.28
SD	0.666	Std. Error of Mean	0.167
Coefficient of Variation	1.237	Skewness	2.05
Normal GOF Test			
Shapiro Wilk Test Statistic	0.748	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.887	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.279	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.213	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	0.831	95% Adjusted-CLT UCL (Chen-1995)	0.904
		95% Modified-t UCL (Johnson-1978)	0.845

ProUCL Output
Eastern Undeveloped Area Soil (0-0.5 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Gamma GOF Test			
A-D Test Statistic	0.203	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.774	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.129	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.223	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	0.757	k star (bias corrected MLE)	0.657
Theta hat (MLE)	0.711	Theta star (bias corrected MLE)	0.82
nu hat (MLE)	24.23	nu star (bias corrected)	21.02
MLE Mean (bias corrected)	0.539	MLE Sd (bias corrected)	0.664
		Approximate Chi Square Value (0.05)	11.61
Adjusted Level of Significance	0.0335	Adjusted Chi Square Value	10.82
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50)	0.975	95% Adjusted Gamma UCL (use when n<50)	1.047
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.952	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.887	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.141	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.213	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	-4.867	Mean of logged Data	-1.408
Maximum of Logged Data	0.916	SD of logged Data	1.522
Assuming Lognormal Distribution			
95% H-UCL	3.184	90% Chebyshev (MVUE) UCL	1.581
95% Chebyshev (MVUE) UCL	1.989	97.5% Chebyshev (MVUE) UCL	2.554
99% Chebyshev (MVUE) UCL	3.665		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	0.813	95% Jackknife UCL	0.831
95% Standard Bootstrap UCL	0.804	95% Bootstrap-t UCL	1.082
95% Hall's Bootstrap UCL	1.799	95% Percentile Bootstrap UCL	0.834
95% BCA Bootstrap UCL	0.886		
90% Chebyshev(Mean, Sd) UCL	1.038	95% Chebyshev(Mean, Sd) UCL	1.265
97.5% Chebyshev(Mean, Sd) UCL	1.579	99% Chebyshev(Mean, Sd) UCL	2.196
Suggested UCL to Use			
95% Adjusted Gamma UCL	1.047		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

BenzoBFluoranthene

General Statistics

Total Number of Observations	16	Number of Distinct Observations	16
		Number of Missing Observations	0
Minimum	0.015	Mean	1.026
Maximum	4.5	Median	0.62
SD	1.286	Std. Error of Mean	0.321
Coefficient of Variation	1.253	Skewness	1.896

Normal GOF Test

Shapiro Wilk Test Statistic	0.747	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.887	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.289	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.213	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	1.589	95% Adjusted-CLT UCL (Chen-1995)	1.717
		95% Modified-t UCL (Johnson-1978)	1.615

Gamma GOF Test

A-D Test Statistic	0.185	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.779	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.133	**Kolmogorov-Smirnov Gamma GOF Test**
5% K-S Critical Value	0.224	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	0.704	k star (bias corrected MLE)	0.613
Theta hat (MLE)	1.458	Theta star (bias corrected MLE)	1.672
nu hat (MLE)	22.52	nu star (bias corrected)	19.63
MLE Mean (bias corrected)	1.026	MLE Sd (bias corrected)	1.31
		Approximate Chi Square Value (0.05)	10.58
Adjusted Level of Significance	0.0335	Adjusted Chi Square Value	9.83

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50)	1.903	95% Adjusted Gamma UCL (use when n<50)	2.049

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.953	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.887	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.13	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.213	Data appear Lognormal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Lognormal Statistics			
Minimum of Logged Data	-4.2	Mean of logged Data	-0.833
Maximum of Logged Data	1.504	SD of logged Data	1.595
Assuming Lognormal Distribution			
95% H-UCL	7.154	90% Chebyshev (MVUE) UCL	3.181
95% Chebyshev (MVUE) UCL	4.019	97.5% Chebyshev (MVUE) UCL	5.181
99% Chebyshev (MVUE) UCL	7.464		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	1.554	95% Jackknife UCL	1.589
95% Standard Bootstrap UCL	1.515	95% Bootstrap-t UCL	2.161
95% Hall's Bootstrap UCL	4.004	95% Percentile Bootstrap UCL	1.573
95% BCA Bootstrap UCL	1.722		
90% Chebyshev(Mean, Sd) UCL	1.99	95% Chebyshev(Mean, Sd) UCL	2.427
97.5% Chebyshev(Mean, Sd) UCL	3.033	99% Chebyshev(Mean, Sd) UCL	4.224
Suggested UCL to Use			
95% Adjusted Gamma UCL	2.049		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
BenzoAPyrene			
General Statistics			
Total Number of Observations	16	Number of Distinct Observations	15
		Number of Missing Observations	0
Minimum	0.0097	Mean	0.471
Maximum	1.9	Median	0.29
SD	0.524	Std. Error of Mean	0.131
Coefficient of Variation	1.113	Skewness	1.678
Normal GOF Test			
Shapiro Wilk Test Statistic	0.808	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.887	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.238	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.213	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	0.7	95% Adjusted-CLT UCL (Chen-1995)	0.745

		95% Modified-t UCL (Johnson-1978)	0.709
Gamma GOF Test			
A-D Test Statistic	0.15	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.772	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.103	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.223	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	0.814	k star (bias corrected MLE)	0.703
Theta hat (MLE)	0.578	Theta star (bias corrected MLE)	0.669
nu hat (MLE)	26.06	nu star (bias corrected)	22.5
MLE Mean (bias corrected)	0.471	MLE Sd (bias corrected)	0.561
		Approximate Chi Square Value (0.05)	12.72
Adjusted Level of Significance	0.0335	Adjusted Chi Square Value	11.88
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50)	0.833	95% Adjusted Gamma UCL (use when n<50)	0.891
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.946	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.887	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.128	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.213	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	-4.636	Mean of logged Data	-1.481
Maximum of Logged Data	0.642	SD of logged Data	1.472
Assuming Lognormal Distribution			
95% H-UCL	2.535	90% Chebyshev (MVUE) UCL	1.352
95% Chebyshev (MVUE) UCL	1.695	97.5% Chebyshev (MVUE) UCL	2.171
99% Chebyshev (MVUE) UCL	3.106		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	0.686	95% Jackknife UCL	0.7
95% Standard Bootstrap UCL	0.686	95% Bootstrap-t UCL	0.852
95% Hall's Bootstrap UCL	0.906	95% Percentile Bootstrap UCL	0.698
95% BCA Bootstrap UCL	0.735		
90% Chebyshev(Mean, Sd) UCL	0.864	95% Chebyshev(Mean, Sd) UCL	1.042
97.5% Chebyshev(Mean, Sd) UCL	1.289	99% Chebyshev(Mean, Sd) UCL	1.774
Suggested UCL to Use			
95% Adjusted Gamma UCL	0.891		

ProUCL Output
Eastern Undeveloped Area Soil (0-0.5 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

DibenzAHAnthracene

General Statistics

Total Number of Observations	16	Number of Distinct Observations	15
Number of Detects	14	Number of Non-Detects	2
Number of Distinct Detects	14	Number of Distinct Non-Detects	1
Minimum Detect	0.017	Minimum Non-Detect	0.0016
Maximum Detect	0.62	Maximum Non-Detect	0.0016
Variance Detects	0.0281	Percent Non-Detects	12.5%
Mean Detects	0.153	SD Detects	0.168
Median Detects	0.0785	CV Detects	1.093
Skewness Detects	1.977	Kurtosis Detects	4.061
Mean of Logged Detects	-2.348	SD of Logged Detects	1.005

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.759	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.874	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.246	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.226	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	0.134	KM Standard Error of Mean	0.0413
KM SD	0.159	95% KM (BCA) UCL	0.209
95% KM (t) UCL	0.207	95% KM (Percentile Bootstrap) UCL	0.203
95% KM (z) UCL	0.202	95% KM Bootstrap t UCL	0.262
90% KM Chebyshev UCL	0.258	95% KM Chebyshev UCL	0.314
97.5% KM Chebyshev UCL	0.392	99% KM Chebyshev UCL	0.545

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.417	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.756	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.173	**Kolmogorov-Smirnov GOF**
5% K-S Critical Value	0.234	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	1.199	k star (bias corrected MLE)	0.99
Theta hat (MLE)	0.128	Theta star (bias corrected MLE)	0.155
nu hat (MLE)	33.58	nu star (bias corrected)	27.72
Mean (detects)	0.153		

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)

For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	0.135
Maximum	0.62	Median	0.0675
SD	0.163	CV	1.208
k hat (MLE)	0.925	k star (bias corrected MLE)	0.793
Theta hat (MLE)	0.146	Theta star (bias corrected MLE)	0.171
nu hat (MLE)	29.61	nu star (bias corrected)	25.39
Adjusted Level of Significance (β)	0.0335		
Approximate Chi Square Value (25.39, α)	14.91	Adjusted Chi Square Value (25.39, β)	14
95% Gamma Approximate UCL (use when n>=50)	0.23	95% Gamma Adjusted UCL (use when n<50)	0.245
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.134	SD (KM)	0.159
Variance (KM)	0.0253	SE of Mean (KM)	0.0413
k hat (KM)	0.712	k star (KM)	0.62
nu hat (KM)	22.79	nu star (KM)	19.85
theta hat (KM)	0.189	theta star (KM)	0.216
80% gamma percentile (KM)	0.221	90% gamma percentile (KM)	0.347
95% gamma percentile (KM)	0.477	99% gamma percentile (KM)	0.793
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (19.85, α)	10.74	Adjusted Chi Square Value (19.85, β)	9.983
95% Gamma Approximate KM-UCL (use when n>=50)	0.248	95% Gamma Adjusted KM-UCL (use when n<50)	0.267
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.978	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.874	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.127	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.226	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.135	Mean in Log Scale	-2.648
SD in Original Scale	0.164	SD in Log Scale	1.248
95% t UCL (assumes normality of ROS data)	0.207	95% Percentile Bootstrap UCL	0.202
95% BCA Bootstrap UCL	0.224	95% Bootstrap t UCL	0.273
95% H-UCL (Log ROS)	0.42		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-2.859	KM Geo Mean	0.0573
KM SD (logged)	1.628	95% Critical H Value (KM-Log)	3.775
KM Standard Error of Mean (logged)	0.422	95% H-UCL (KM -Log)	1.055
KM SD (logged)	1.628	95% Critical H Value (KM-Log)	3.775
KM Standard Error of Mean (logged)	0.422		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.134	Mean in Log Scale	-2.946

SD in Original Scale	0.164	SD in Log Scale	1.883
95% t UCL (Assumes normality)	0.206	95% H-Stat UCL	2.44
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Gamma Distributed at 5% Significance Level			
Suggested UCL to Use			
Adjusted KM-UCL (use when k<=1 and 15 < n < 50 but k<=1)	0.267		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
BenzoAAnthracene			
General Statistics			
Total Number of Observations	16	Number of Distinct Observations	16
		Number of Missing Observations	0
Minimum	0.0068	Mean	0.33
Maximum	1.5	Median	0.195
SD	0.382	Std. Error of Mean	0.0955
Coefficient of Variation	1.157	Skewness	2.178
Normal GOF Test			
Shapiro Wilk Test Statistic	0.76	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.887	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.25	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.213	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	0.498	95% Adjusted-CLT UCL (Chen-1995)	0.543
		95% Modified-t UCL (Johnson-1978)	0.506
Gamma GOF Test			
A-D Test Statistic	0.193	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.77	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.111	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.222	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	0.842	k star (bias corrected MLE)	0.726
Theta hat (MLE)	0.392	Theta star (bias corrected MLE)	0.455
nu hat (MLE)	26.95	nu star (bias corrected)	23.23
MLE Mean (bias corrected)	0.33	MLE Sd (bias corrected)	0.388

		Approximate Chi Square Value (0.05)	13.27
Adjusted Level of Significance	0.0335	Adjusted Chi Square Value	12.41
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50)	0.578	95% Adjusted Gamma UCL (use when n<50)	0.618
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.933	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.887	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.163	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.213	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	-4.991	Mean of logged Data	-1.808
Maximum of Logged Data	0.405	SD of logged Data	1.45
Assuming Lognormal Distribution			
95% H-UCL	1.711	90% Chebyshev (MVUE) UCL	0.94
95% Chebyshev (MVUE) UCL	1.177	97.5% Chebyshev (MVUE) UCL	1.505
99% Chebyshev (MVUE) UCL	2.151		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	0.487	95% Jackknife UCL	0.498
95% Standard Bootstrap UCL	0.481	95% Bootstrap-t UCL	0.641
95% Hall's Bootstrap UCL	1.211	95% Percentile Bootstrap UCL	0.498
95% BCA Bootstrap UCL	0.55		
90% Chebyshev(Mean, Sd) UCL	0.617	95% Chebyshev(Mean, Sd) UCL	0.747
97.5% Chebyshev(Mean, Sd) UCL	0.927	99% Chebyshev(Mean, Sd) UCL	1.28
Suggested UCL to Use			
95% Adjusted Gamma UCL	0.618		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Cyanide			
General Statistics			
Total Number of Observations	16	Number of Distinct Observations	13
Number of Detects	11	Number of Non-Detects	5
Number of Distinct Detects	9	Number of Distinct Non-Detects	5
Minimum Detect	0.067	Minimum Non-Detect	0.062
Maximum Detect	0.64	Maximum Non-Detect	0.11
Variance Detects	0.0388	Percent Non-Detects	31.25%

Mean Detects	0.289	SD Detects	0.197
Median Detects	0.18	CV Detects	0.682
Skewness Detects	0.73	Kurtosis Detects	-0.968
Mean of Logged Detects	-1.469	SD of Logged Detects	0.726
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.881	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.85	Detected Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.255	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.251	Detected Data Not Normal at 5% Significance Level	
Detected Data appear Approximate Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.218	KM Standard Error of Mean	0.0492
KM SD	0.188	95% KM (BCA) UCL	0.3
95% KM (t) UCL	0.304	95% KM (Percentile Bootstrap) UCL	0.303
95% KM (z) UCL	0.299	95% KM Bootstrap t UCL	0.327
90% KM Chebyshev UCL	0.366	95% KM Chebyshev UCL	0.433
97.5% KM Chebyshev UCL	0.526	99% KM Chebyshev UCL	0.708
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	0.402	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.737	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.218	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.258	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	2.352	k star (bias corrected MLE)	1.772
Theta hat (MLE)	0.123	Theta star (bias corrected MLE)	0.163
nu hat (MLE)	51.75	nu star (bias corrected)	38.97
Mean (detects)	0.289		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	0.202
Maximum	0.64	Median	0.145
SD	0.209	CV	1.036
k hat (MLE)	0.711	k star (bias corrected MLE)	0.619
Theta hat (MLE)	0.284	Theta star (bias corrected MLE)	0.326
nu hat (MLE)	22.75	nu star (bias corrected)	19.82
Adjusted Level of Significance (β)	0.0335		
Approximate Chi Square Value (19.82, α)	10.72	Adjusted Chi Square Value (19.82, β)	9.961
95% Gamma Approximate UCL (use when n>=50)	0.373	95% Gamma Adjusted UCL (use when n<50)	0.401
Estimates of Gamma Parameters using KM Estimates			

Mean (KM)	0.218	SD (KM)	0.188
Variance (KM)	0.0353	SE of Mean (KM)	0.0492
k hat (KM)	1.349	k star (KM)	1.137
nu hat (KM)	43.16	nu star (KM)	36.4
theta hat (KM)	0.162	theta star (KM)	0.192
80% gamma percentile (KM)	0.347	90% gamma percentile (KM)	0.486
95% gamma percentile (KM)	0.624	99% gamma percentile (KM)	0.942
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (36.40, α)	23.59	Adjusted Chi Square Value (36.40, β)	22.42
95% Gamma Approximate KM-UCL (use when n>=50)	0.337	95% Gamma Adjusted KM-UCL (use when n<50)	0.354
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.945	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.85	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.178	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.251	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.212	Mean in Log Scale	-2.001
SD in Original Scale	0.2	SD in Log Scale	1.009
95% t UCL (assumes normality of ROS data)	0.299	95% Percentile Bootstrap UCL	0.299
95% BCA Bootstrap UCL	0.311	95% Bootstrap t UCL	0.328
95% H-UCL (Log ROS)	0.457		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-1.877	KM Geo Mean	0.153
KM SD (logged)	0.834	95% Critical H Value (KM-Log)	2.459
KM Standard Error of Mean (logged)	0.219	95% H-UCL (KM -Log)	0.368
KM SD (logged)	0.834	95% Critical H Value (KM-Log)	2.459
KM Standard Error of Mean (logged)	0.219		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.21	Mean in Log Scale	-2.042
SD in Original Scale	0.201	SD in Log Scale	1.066
95% t UCL (Assumes normality)	0.298	95% H-Stat UCL	0.496
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Approximate Normal Distributed at 5% Significance Level			
Suggested UCL to Use			
95% KM (t) UCL	0.304		
When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test			
When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Aluminum

General Statistics

Total Number of Observations	16	Number of Distinct Observations	15
		Number of Missing Observations	0
Minimum	5350	Mean	16317
Maximum	30300	Median	15200
SD	7442	Std. Error of Mean	1861
Coefficient of Variation	0.456	Skewness	0.0951

Normal GOF Test

Shapiro Wilk Test Statistic	0.949	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.887	Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.144	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.213	Data appear Normal at 5% Significance Level

Data appear Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	19578	95% Adjusted-CLT UCL (Chen-1995)	19424
		95% Modified-t UCL (Johnson-1978)	19586

Gamma GOF Test

A-D Test Statistic	0.459	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.742	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.161	**Kolmogorov-Smirnov Gamma GOF Test**
5% K-S Critical Value	0.216	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	4.384	k star (bias corrected MLE)	3.604
Theta hat (MLE)	3722	Theta star (bias corrected MLE)	4527
nu hat (MLE)	140.3	nu star (bias corrected)	115.3
MLE Mean (bias corrected)	16317	MLE Sd (bias corrected)	8595
		Approximate Chi Square Value (0.05)	91.54
Adjusted Level of Significance	0.0335	Adjusted Chi Square Value	89.12

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	20558	95% Adjusted Gamma UCL (use when n<50)	21114

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.917	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.887	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.153	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.213	Data appear Lognormal at 5% Significance Level

Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	8.585	Mean of logged Data	9.582
Maximum of Logged Data	10.32	SD of logged Data	0.532
Assuming Lognormal Distribution			
95% H-UCL	22234	90% Chebyshev (MVUE) UCL	23367
95% Chebyshev (MVUE) UCL	26462	97.5% Chebyshev (MVUE) UCL	30757
99% Chebyshev (MVUE) UCL	39194		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	19377	95% Jackknife UCL	19578
95% Standard Bootstrap UCL	19250	95% Bootstrap-t UCL	19657
95% Hall's Bootstrap UCL	19395	95% Percentile Bootstrap UCL	19363
95% BCA Bootstrap UCL	19183		
90% Chebyshev(Mean, Sd) UCL	21898	95% Chebyshev(Mean, Sd) UCL	24427
97.5% Chebyshev(Mean, Sd) UCL	27936	99% Chebyshev(Mean, Sd) UCL	34829
Suggested UCL to Use			
95% Student's-t UCL	19578		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Iron			
General Statistics			
Total Number of Observations	16	Number of Distinct Observations	15
		Number of Missing Observations	0
Minimum	8490	Mean	11706
Maximum	16600	Median	11050
SD	2641	Std. Error of Mean	660.2
Coefficient of Variation	0.226	Skewness	0.596
Normal GOF Test			
Shapiro Wilk Test Statistic	0.918	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.887	Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.148	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.213	Data appear Normal at 5% Significance Level	
Data appear Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	

95% Student's-t UCL	12863	95% Adjusted-CLT UCL (Chen-1995)	12897
		95% Modified-t UCL (Johnson-1978)	12879
Gamma GOF Test			
A-D Test Statistic	0.393	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.736	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.134	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.215	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	21.88	k star (bias corrected MLE)	17.82
Theta hat (MLE)	534.9	Theta star (bias corrected MLE)	656.8
nu hat (MLE)	700.3	nu star (bias corrected)	570.3
MLE Mean (bias corrected)	11706	MLE Sd (bias corrected)	2773
		Approximate Chi Square Value (0.05)	515.9
Adjusted Level of Significance	0.0335	Adjusted Chi Square Value	510
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	12940	95% Adjusted Gamma UCL (use when n<50)	13089
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.938	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.887	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.119	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.213	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	9.047	Mean of logged Data	9.345
Maximum of Logged Data	9.717	SD of logged Data	0.22
Assuming Lognormal Distribution			
95% H-UCL	12990	90% Chebyshev (MVUE) UCL	13643
95% Chebyshev (MVUE) UCL	14523	97.5% Chebyshev (MVUE) UCL	15744
99% Chebyshev (MVUE) UCL	18142		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	12792	95% Jackknife UCL	12863
95% Standard Bootstrap UCL	12766	95% Bootstrap-t UCL	13015
95% Hall's Bootstrap UCL	12934	95% Percentile Bootstrap UCL	12773
95% BCA Bootstrap UCL	12894		
90% Chebyshev(Mean, Sd) UCL	13686	95% Chebyshev(Mean, Sd) UCL	14583
97.5% Chebyshev(Mean, Sd) UCL	15829	99% Chebyshev(Mean, Sd) UCL	18275
Suggested UCL to Use			
95% Student's-t UCL	12863		

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Manganese

General Statistics

Total Number of Observations	16	Number of Distinct Observations	16
		Number of Missing Observations	0
Minimum	210	Mean	1242
Maximum	3950	Median	1082
SD	1049	Std. Error of Mean	262.2
Coefficient of Variation	0.844	Skewness	1.253

Normal GOF Test

Shapiro Wilk Test Statistic	0.867	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.887	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.201	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.213	Data appear Normal at 5% Significance Level

Data appear Approximate Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	1701	95% Adjusted-CLT UCL (Chen-1995)	1761
		95% Modified-t UCL (Johnson-1978)	1715

Gamma GOF Test

A-D Test Statistic	0.435	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.755	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.198	**Kolmogorov-Smirnov Gamma GOF Test**
5% K-S Critical Value	0.219	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	1.521	k star (bias corrected MLE)	1.277
Theta hat (MLE)	816.6	Theta star (bias corrected MLE)	972.3
nu hat (MLE)	48.67	nu star (bias corrected)	40.87
MLE Mean (bias corrected)	1242	MLE Sd (bias corrected)	1099
		Approximate Chi Square Value (0.05)	27.22
Adjusted Level of Significance	0.0335	Adjusted Chi Square Value	25.96

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	1865	95% Adjusted Gamma UCL (use when n<50)	1956

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.938	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.887	Data appear Lognormal at 5% Significance Level

Lilliefors Test Statistic	0.169	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.213	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	5.347	Mean of logged Data	6.761
Maximum of Logged Data	8.281	SD of logged Data	0.92
Assuming Lognormal Distribution			
95% H-UCL	2436	90% Chebyshev (MVUE) UCL	2229
95% Chebyshev (MVUE) UCL	2662	97.5% Chebyshev (MVUE) UCL	3262
99% Chebyshev (MVUE) UCL	4443		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	1673	95% Jackknife UCL	1701
95% Standard Bootstrap UCL	1660	95% Bootstrap-t UCL	1850
95% Hall's Bootstrap UCL	1917	95% Percentile Bootstrap UCL	1685
95% BCA Bootstrap UCL	1773		
90% Chebyshev(Mean, Sd) UCL	2028	95% Chebyshev(Mean, Sd) UCL	2385
97.5% Chebyshev(Mean, Sd) UCL	2879	99% Chebyshev(Mean, Sd) UCL	3851
Suggested UCL to Use			
95% Student's-t UCL	1701		
When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test			
When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Mercury			
General Statistics			
Total Number of Observations	16	Number of Distinct Observations	14
		Number of Missing Observations	0
Minimum	0.011	Mean	0.0372
Maximum	0.12	Median	0.034
SD	0.0248	Std. Error of Mean	0.00619
Coefficient of Variation	0.666	Skewness	2.649
Normal GOF Test			
Shapiro Wilk Test Statistic	0.714	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.887	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.269	**Lilliefors GOF Test**	

5% Lilliefors Critical Value	0.213	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	0.048	95% Adjusted-CLT UCL (Chen-1995)	0.0517
		95% Modified-t UCL (Johnson-1978)	0.0487
Gamma GOF Test			
A-D Test Statistic	0.562	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.743	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.188	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.216	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	3.456	k star (bias corrected MLE)	2.85
Theta hat (MLE)	0.0108	Theta star (bias corrected MLE)	0.013
nu hat (MLE)	110.6	nu star (bias corrected)	91.19
MLE Mean (bias corrected)	0.0372	MLE Sd (bias corrected)	0.022
		Approximate Chi Square Value (0.05)	70.17
Adjusted Level of Significance	0.0335	Adjusted Chi Square Value	68.07
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50)	0.0483	95% Adjusted Gamma UCL (use when n<50)	0.0498
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.943	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.887	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.168	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.213	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	-4.51	Mean of logged Data	-3.443
Maximum of Logged Data	-2.12	SD of logged Data	0.553
Assuming Lognormal Distribution			
95% H-UCL	0.0503	90% Chebyshev (MVUE) UCL	0.0527
95% Chebyshev (MVUE) UCL	0.0598	97.5% Chebyshev (MVUE) UCL	0.0698
99% Chebyshev (MVUE) UCL	0.0894		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	0.0474	95% Jackknife UCL	0.048
95% Standard Bootstrap UCL	0.0472	95% Bootstrap-t UCL	0.0557
95% Hall's Bootstrap UCL	0.0941	95% Percentile Bootstrap UCL	0.0487
95% BCA Bootstrap UCL	0.0518		

90% Chebyshev(Mean, Sd) UCL	0.0558	95% Chebyshev(Mean, Sd) UCL	0.0642
97.5% Chebyshev(Mean, Sd) UCL	0.0758	99% Chebyshev(Mean, Sd) UCL	0.0988
Suggested UCL to Use			
95% Adjusted Gamma UCL	0.0498		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Nickel			
General Statistics			
Total Number of Observations	16	Number of Distinct Observations	16
		Number of Missing Observations	0
Minimum	7.9	Mean	27.83
Maximum	68.9	Median	20.1
SD	20.03	Std. Error of Mean	5.008
Coefficient of Variation	0.72	Skewness	0.929
Normal GOF Test			
Shapiro Wilk Test Statistic	0.841	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.887	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.255	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.213	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	36.6	95% Adjusted-CLT UCL (Chen-1995)	37.31
		95% Modified-t UCL (Johnson-1978)	36.8
Gamma GOF Test			
A-D Test Statistic	0.62	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.749	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.174	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.218	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	2.236	k star (bias corrected MLE)	1.858
Theta hat (MLE)	12.45	Theta star (bias corrected MLE)	14.97
nu hat (MLE)	71.54	nu star (bias corrected)	59.46
MLE Mean (bias corrected)	27.83	MLE Sd (bias corrected)	20.41
		Approximate Chi Square Value (0.05)	42.73
Adjusted Level of Significance	0.0335	Adjusted Chi Square Value	41.12
Assuming Gamma Distribution			

95% Approximate Gamma UCL (use when n>=50)	38.72	95% Adjusted Gamma UCL (use when n<50)	40.24
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.927	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.887	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.146	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.213	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	2.067	Mean of logged Data	3.086
Maximum of Logged Data	4.233	SD of logged Data	0.717
Assuming Lognormal Distribution			
95% H-UCL	43.35	90% Chebyshev (MVUE) UCL	43.58
95% Chebyshev (MVUE) UCL	50.75	97.5% Chebyshev (MVUE) UCL	60.69
99% Chebyshev (MVUE) UCL	80.23		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	36.06	95% Jackknife UCL	36.6
95% Standard Bootstrap UCL	35.66	95% Bootstrap-t UCL	38.86
95% Hall's Bootstrap UCL	36.18	95% Percentile Bootstrap UCL	35.84
95% BCA Bootstrap UCL	37.44		
90% Chebyshev(Mean, Sd) UCL	42.85	95% Chebyshev(Mean, Sd) UCL	49.65
97.5% Chebyshev(Mean, Sd) UCL	59.1	99% Chebyshev(Mean, Sd) UCL	77.66
Suggested UCL to Use			
95% Adjusted Gamma UCL	40.24		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Thallium			
General Statistics			
Total Number of Observations	16	Number of Distinct Observations	9
Number of Detects	4	Number of Non-Detects	12
Number of Distinct Detects	4	Number of Distinct Non-Detects	8
Minimum Detect	0.11	Minimum Non-Detect	0.1
Maximum Detect	0.15	Maximum Non-Detect	0.24
Variance Detects	2.9167E-4	Percent Non-Detects	75%
Mean Detects	0.133	SD Detects	0.0171
Median Detects	0.135	CV Detects	0.129
Skewness Detects	-0.753	Kurtosis Detects	0.343
Mean of Logged Detects	-2.028	SD of Logged Detects	0.133

Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.972	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.748	Detected Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.192	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.375	Detected Data appear Normal at 5% Significance Level	
Detected Data appear Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.112	KM Standard Error of Mean	0.00619
KM SD	0.0177	95% KM (BCA) UCL	N/A
95% KM (t) UCL	0.123	95% KM (Percentile Bootstrap) UCL	N/A
95% KM (z) UCL	0.122	95% KM Bootstrap t UCL	N/A
90% KM Chebyshev UCL	0.131	95% KM Chebyshev UCL	0.139
97.5% KM Chebyshev UCL	0.151	99% KM Chebyshev UCL	0.174
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	0.257	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.656	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.2	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.394	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	76.98	k star (bias corrected MLE)	19.41
Theta hat (MLE)	0.00172	Theta star (bias corrected MLE)	0.00683
nu hat (MLE)	615.8	nu star (bias corrected)	155.3
Mean (detects)	0.133		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.0782	Mean	0.106
Maximum	0.15	Median	0.102
SD	0.0196	CV	0.185
k hat (MLE)	33.64	k star (bias corrected MLE)	27.38
Theta hat (MLE)	0.00315	Theta star (bias corrected MLE)	0.00387
nu hat (MLE)	1077	nu star (bias corrected)	876.1
Adjusted Level of Significance (β)	0.0335		
Approximate Chi Square Value (876.10, α)	808.4	Adjusted Chi Square Value (876.10, β)	801
95% Gamma Approximate UCL (use when n>=50)	0.115	95% Gamma Adjusted UCL (use when n<50)	N/A
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.112	SD (KM)	0.0177
Variance (KM)	3.1270E-4	SE of Mean (KM)	0.00619
k hat (KM)	40.21	k star (KM)	32.71
nu hat (KM)	1287	nu star (KM)	1047

theta hat (KM)	0.00279	theta star (KM)	0.00343
80% gamma percentile (KM)	0.128	90% gamma percentile (KM)	0.138
95% gamma percentile (KM)	0.146	99% gamma percentile (KM)	0.163
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (N/A, α)	972.6	Adjusted Chi Square Value (N/A, β)	964.5
95% Gamma Approximate KM-UCL (use when n>=50)	0.121	95% Gamma Adjusted KM-UCL (use when n<50)	0.122
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.956	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.748	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.213	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.375	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.107	Mean in Log Scale	-2.243
SD in Original Scale	0.0183	SD in Log Scale	0.16
95% t UCL (assumes normality of ROS data)	0.115	95% Percentile Bootstrap UCL	0.115
95% BCA Bootstrap UCL	0.116	95% Bootstrap t UCL	0.119
95% H-UCL (Log ROS)	0.116		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-2.199	KM Geo Mean	0.111
KM SD (logged)	0.147	95% Critical H Value (KM-Log)	1.768
KM Standard Error of Mean (logged)	0.0517	95% H-UCL (KM -Log)	0.12
KM SD (logged)	0.147	95% Critical H Value (KM-Log)	1.768
KM Standard Error of Mean (logged)	0.0517		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.0881	Mean in Log Scale	-2.5
SD in Original Scale	0.0342	SD in Log Scale	0.39
95% t UCL (Assumes normality)	0.103	95% H-Stat UCL	0.108
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Normal Distributed at 5% Significance Level			
Suggested UCL to Use			
95% KM (t) UCL	0.123		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Arsenic			

ProUCL Output
Eastern Undeveloped Area Soil (0-0.5 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

General Statistics			
Total Number of Observations	16	Number of Distinct Observations	14
		Number of Missing Observations	0
Minimum	2.8	Mean	6.075
Maximum	12.4	Median	5.35
SD	2.52	Std. Error of Mean	0.63
Coefficient of Variation	0.415	Skewness	1.376
Normal GOF Test			
Shapiro Wilk Test Statistic	0.867	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.887	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.167	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.213	Data appear Normal at 5% Significance Level	
Data appear Approximate Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	7.18	95% Adjusted-CLT UCL (Chen-1995)	7.343
		95% Modified-t UCL (Johnson-1978)	7.216
Gamma GOF Test			
A-D Test Statistic	0.504	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.74	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.16	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.215	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	7.279	k star (bias corrected MLE)	5.956
Theta hat (MLE)	0.835	Theta star (bias corrected MLE)	1.02
nu hat (MLE)	232.9	nu star (bias corrected)	190.6
MLE Mean (bias corrected)	6.075	MLE Sd (bias corrected)	2.489
		Approximate Chi Square Value (0.05)	159.7
Adjusted Level of Significance	0.0335	Adjusted Chi Square Value	156.4
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	7.252	95% Adjusted Gamma UCL (use when n<50)	7.402
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.954	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.887	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.152	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.213	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	1.03	Mean of logged Data	1.734
Maximum of Logged Data	2.518	SD of logged Data	0.378
Assuming Lognormal Distribution			

95% H-UCL	7.346	90% Chebyshev (MVUE) UCL	7.802
95% Chebyshev (MVUE) UCL	8.594	97.5% Chebyshev (MVUE) UCL	9.693
99% Chebyshev (MVUE) UCL	11.85		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	7.111	95% Jackknife UCL	7.18
95% Standard Bootstrap UCL	7.08	95% Bootstrap-t UCL	7.752
95% Hall's Bootstrap UCL	8.354	95% Percentile Bootstrap UCL	7.1
95% BCA Bootstrap UCL	7.3		
90% Chebyshev(Mean, Sd) UCL	7.965	95% Chebyshev(Mean, Sd) UCL	8.822
97.5% Chebyshev(Mean, Sd) UCL	10.01	99% Chebyshev(Mean, Sd) UCL	12.34
Suggested UCL to Use			
95% Student's-t UCL	7.18		
When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test			
When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Barium			
General Statistics			
Total Number of Observations	16	Number of Distinct Observations	16
		Number of Missing Observations	0
Minimum	45.3	Mean	484.7
Maximum	1060	Median	429.5
SD	352.1	Std. Error of Mean	88.03
Coefficient of Variation	0.726	Skewness	0.202
Normal GOF Test			
Shapiro Wilk Test Statistic	0.895	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.887	Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.213	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.213	Data appear Normal at 5% Significance Level	
Data appear Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	639	95% Adjusted-CLT UCL (Chen-1995)	634.2
		95% Modified-t UCL (Johnson-1978)	639.8
Gamma GOF Test			

A-D Test Statistic	0.658	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.755	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.19	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.219	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	1.454	k star (bias corrected MLE)	1.223
Theta hat (MLE)	333.4	Theta star (bias corrected MLE)	396.3
nu hat (MLE)	46.53	nu star (bias corrected)	39.14
MLE Mean (bias corrected)	484.7	MLE Sd (bias corrected)	438.3
		Approximate Chi Square Value (0.05)	25.81
Adjusted Level of Significance	0.0335	Adjusted Chi Square Value	24.58
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	735.1	95% Adjusted Gamma UCL (use when n<50)	771.8
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.891	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.887	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.204	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.213	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	3.813	Mean of logged Data	5.802
Maximum of Logged Data	6.966	SD of logged Data	1.022
Assuming Lognormal Distribution			
95% H-UCL	1150	90% Chebyshev (MVUE) UCL	983.4
95% Chebyshev (MVUE) UCL	1187	97.5% Chebyshev (MVUE) UCL	1471
99% Chebyshev (MVUE) UCL	2027		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	629.5	95% Jackknife UCL	639
95% Standard Bootstrap UCL	625.4	95% Bootstrap-t UCL	638.2
95% Hall's Bootstrap UCL	626.8	95% Percentile Bootstrap UCL	625.9
95% BCA Bootstrap UCL	620.3		
90% Chebyshev(Mean, Sd) UCL	748.8	95% Chebyshev(Mean, Sd) UCL	868.4
97.5% Chebyshev(Mean, Sd) UCL	1034	99% Chebyshev(Mean, Sd) UCL	1361
Suggested UCL to Use			
95% Student's-t UCL	639		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

ChromiumVI_EST

General Statistics

Total Number of Observations	16	Number of Distinct Observations	14
		Number of Missing Observations	0
Minimum	0.171	Mean	0.217
Maximum	0.31	Median	0.206
SD	0.0408	Std. Error of Mean	0.0102
Coefficient of Variation	0.188	Skewness	1.272

Normal GOF Test

Shapiro Wilk Test Statistic	0.857	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.887	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.246	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.213	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	0.235	95% Adjusted-CLT UCL (Chen-1995)	0.238
		95% Modified-t UCL (Johnson-1978)	0.236

Gamma GOF Test

A-D Test Statistic	0.724	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.736	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.229	**Kolmogorov-Smirnov Gamma GOF Test**
5% K-S Critical Value	0.215	Data Not Gamma Distributed at 5% Significance Level

Detected data follow Appr. Gamma Distribution at 5% Significance Level

Gamma Statistics

k hat (MLE)	33.56	k star (bias corrected MLE)	27.31
Theta hat (MLE)	0.00648	Theta star (bias corrected MLE)	0.00796
nu hat (MLE)	1074	nu star (bias corrected)	873.9
MLE Mean (bias corrected)	0.217	MLE Sd (bias corrected)	0.0416
		Approximate Chi Square Value (0.05)	806.3
Adjusted Level of Significance	0.0335	Adjusted Chi Square Value	798.9

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50)	0.236	95% Adjusted Gamma UCL (use when n<50)	0.238

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.901	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.887	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.217	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.213	Data Not Lognormal at 5% Significance Level

Data appear Approximate Lognormal at 5% Significance Level

Lognormal Statistics			
Minimum of Logged Data	-1.764	Mean of logged Data	-1.541
Maximum of Logged Data	-1.17	SD of logged Data	0.175
Assuming Lognormal Distribution			
95% H-UCL	0.236	90% Chebyshev (MVUE) UCL	0.246
95% Chebyshev (MVUE) UCL	0.259	97.5% Chebyshev (MVUE) UCL	0.277
99% Chebyshev (MVUE) UCL	0.312		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	0.234	95% Jackknife UCL	0.235
95% Standard Bootstrap UCL	0.233	95% Bootstrap-t UCL	0.242
95% Hall's Bootstrap UCL	0.246	95% Percentile Bootstrap UCL	0.234
95% BCA Bootstrap UCL	0.238		
90% Chebyshev(Mean, Sd) UCL	0.248	95% Chebyshev(Mean, Sd) UCL	0.262
97.5% Chebyshev(Mean, Sd) UCL	0.281	99% Chebyshev(Mean, Sd) UCL	0.319
Suggested UCL to Use			
95% Adjusted Gamma UCL	0.238		
When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test			
When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Cobalt			
General Statistics			
Total Number of Observations	16	Number of Distinct Observations	13
		Number of Missing Observations	0
Minimum	3.9	Mean	5.125
Maximum	7.3	Median	4.75
SD	1.071	Std. Error of Mean	0.268
Coefficient of Variation	0.209	Skewness	1.001
Normal GOF Test			
Shapiro Wilk Test Statistic	0.867	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.887	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.208	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.213	Data appear Normal at 5% Significance Level	
Data appear Approximate Normal at 5% Significance Level			
Assuming Normal Distribution			

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	5.594	95% Adjusted-CLT UCL (Chen-1995)	5.637
		95% Modified-t UCL (Johnson-1978)	5.606
Gamma GOF Test			
A-D Test Statistic	0.706	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.736	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.191	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.215	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	26.66	k star (bias corrected MLE)	21.7
Theta hat (MLE)	0.192	Theta star (bias corrected MLE)	0.236
nu hat (MLE)	853.2	nu star (bias corrected)	694.5
MLE Mean (bias corrected)	5.125	MLE Sd (bias corrected)	1.1
		Approximate Chi Square Value (0.05)	634.4
Adjusted Level of Significance	0.0335	Adjusted Chi Square Value	627.8
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	5.611	95% Adjusted Gamma UCL (use when n<50)	5.669
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.906	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.887	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.178	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.213	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	1.361	Mean of logged Data	1.615
Maximum of Logged Data	1.988	SD of logged Data	0.197
Assuming Lognormal Distribution			
95% H-UCL	5.618	90% Chebyshev (MVUE) UCL	5.881
95% Chebyshev (MVUE) UCL	6.225	97.5% Chebyshev (MVUE) UCL	6.703
99% Chebyshev (MVUE) UCL	7.641		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	5.565	95% Jackknife UCL	5.594
95% Standard Bootstrap UCL	5.555	95% Bootstrap-t UCL	5.738
95% Hall's Bootstrap UCL	5.61	95% Percentile Bootstrap UCL	5.569
95% BCA Bootstrap UCL	5.644		
90% Chebyshev(Mean, Sd) UCL	5.928	95% Chebyshev(Mean, Sd) UCL	6.292
97.5% Chebyshev(Mean, Sd) UCL	6.797	99% Chebyshev(Mean, Sd) UCL	7.789
Suggested UCL to Use			

95% Student's-t UCL	5.594		
When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test			
When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Copper			
General Statistics			
Total Number of Observations	16	Number of Distinct Observations	15
		Number of Missing Observations	0
Minimum	5.9	Mean	12.85
Maximum	18.6	Median	13.05
SD	3.31	Std. Error of Mean	0.828
Coefficient of Variation	0.258	Skewness	-0.145
Normal GOF Test			
Shapiro Wilk Test Statistic	0.976	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.887	Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.115	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.213	Data appear Normal at 5% Significance Level	
Data appear Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	14.3	95% Adjusted-CLT UCL (Chen-1995)	14.18
		95% Modified-t UCL (Johnson-1978)	14.3
Gamma GOF Test			
A-D Test Statistic	0.262	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.738	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.109	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.215	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	14.39	k star (bias corrected MLE)	11.73
Theta hat (MLE)	0.893	Theta star (bias corrected MLE)	1.095
nu hat (MLE)	460.4	nu star (bias corrected)	375.4
MLE Mean (bias corrected)	12.85	MLE Sd (bias corrected)	3.752
		Approximate Chi Square Value (0.05)	331.5
Adjusted Level of Significance	0.0335	Adjusted Chi Square Value	326.8
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	14.55	95% Adjusted Gamma UCL (use when n<50)	14.76

Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.932	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.887	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.117	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.213	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	1.775	Mean of logged Data	2.518
Maximum of Logged Data	2.923	SD of logged Data	0.285
Assuming Lognormal Distribution			
95% H-UCL	14.82	90% Chebyshev (MVUE) UCL	15.67
95% Chebyshev (MVUE) UCL	16.93	97.5% Chebyshev (MVUE) UCL	18.68
99% Chebyshev (MVUE) UCL	22.12		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	14.21	95% Jackknife UCL	14.3
95% Standard Bootstrap UCL	14.14	95% Bootstrap-t UCL	14.3
95% Hall's Bootstrap UCL	14.22	95% Percentile Bootstrap UCL	14.16
95% BCA Bootstrap UCL	14.11		
90% Chebyshev(Mean, Sd) UCL	15.33	95% Chebyshev(Mean, Sd) UCL	16.46
97.5% Chebyshev(Mean, Sd) UCL	18.02	99% Chebyshev(Mean, Sd) UCL	21.08
Suggested UCL to Use			
95% Student's-t UCL	14.3		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Note: For highly negatively-skewed data, confidence limits (e.g., Chen, Johnson, Lognormal, and Gamma) may not be			
reliable. Chen's and Johnson's methods provide adjustments for positvely skewed data sets.			
Vanadium			
General Statistics			
Total Number of Observations	16	Number of Distinct Observations	16
		Number of Missing Observations	0
Minimum	4.9	Mean	14.38
Maximum	25.7	Median	13.25
SD	7.096	Std. Error of Mean	1.774
Coefficient of Variation	0.494	Skewness	0.366

Normal GOF Test			
Shapiro Wilk Test Statistic	0.918	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.887	Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.135	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.213	Data appear Normal at 5% Significance Level	
Data appear Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	17.48	95% Adjusted-CLT UCL (Chen-1995)	17.47
		95% Modified-t UCL (Johnson-1978)	17.51
Gamma GOF Test			
A-D Test Statistic	0.319	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.742	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.135	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.216	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	4.101	k star (bias corrected MLE)	3.374
Theta hat (MLE)	3.505	Theta star (bias corrected MLE)	4.261
nu hat (MLE)	131.2	nu star (bias corrected)	108
MLE Mean (bias corrected)	14.38	MLE Sd (bias corrected)	7.826
		Approximate Chi Square Value (0.05)	84.98
Adjusted Level of Significance	0.0335	Adjusted Chi Square Value	82.66
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	18.26	95% Adjusted Gamma UCL (use when n<50)	18.77
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.942	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.887	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.127	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.213	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	1.589	Mean of logged Data	2.539
Maximum of Logged Data	3.246	SD of logged Data	0.538
Assuming Lognormal Distribution			
95% H-UCL	19.57	90% Chebyshev (MVUE) UCL	20.54
95% Chebyshev (MVUE) UCL	23.29	97.5% Chebyshev (MVUE) UCL	27.1
99% Chebyshev (MVUE) UCL	34.58		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			

95% CLT UCL	17.29	95% Jackknife UCL	17.48
95% Standard Bootstrap UCL	17.19	95% Bootstrap-t UCL	17.63
95% Hall's Bootstrap UCL	17.27	95% Percentile Bootstrap UCL	17.39
95% BCA Bootstrap UCL	17.35		
90% Chebyshev(Mean, Sd) UCL	19.7	95% Chebyshev(Mean, Sd) UCL	22.11
97.5% Chebyshev(Mean, Sd) UCL	25.45	99% Chebyshev(Mean, Sd) UCL	32.03
Suggested UCL to Use			
95% Student's-t UCL	17.48		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Zinc			
General Statistics			
Total Number of Observations	16	Number of Distinct Observations	16
		Number of Missing Observations	0
Minimum	25.3	Mean	72.19
Maximum	150	Median	70.6
SD	37.02	Std. Error of Mean	9.254
Coefficient of Variation	0.513	Skewness	0.778
Normal GOF Test			
Shapiro Wilk Test Statistic	0.921	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.887	Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.153	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.213	Data appear Normal at 5% Significance Level	
Data appear Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	88.41	95% Adjusted-CLT UCL (Chen-1995)	89.33
		95% Modified-t UCL (Johnson-1978)	88.71
Gamma GOF Test			
A-D Test Statistic	0.289	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.742	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.123	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.216	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	4.095	k star (bias corrected MLE)	3.369
Theta hat (MLE)	17.63	Theta star (bias corrected MLE)	21.43
nu hat (MLE)	131	nu star (bias corrected)	107.8
MLE Mean (bias corrected)	72.19	MLE Sd (bias corrected)	39.33

		Approximate Chi Square Value (0.05)	84.84
Adjusted Level of Significance	0.0335	Adjusted Chi Square Value	82.53
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	91.73	95% Adjusted Gamma UCL (use when n<50)	94.3
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.958	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.887	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.14	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.213	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	3.231	Mean of logged Data	4.152
Maximum of Logged Data	5.011	SD of logged Data	0.531
Assuming Lognormal Distribution			
95% H-UCL	97.4	90% Chebyshev (MVUE) UCL	102.4
95% Chebyshev (MVUE) UCL	115.9	97.5% Chebyshev (MVUE) UCL	134.7
99% Chebyshev (MVUE) UCL	171.6		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	87.41	95% Jackknife UCL	88.41
95% Standard Bootstrap UCL	87.05	95% Bootstrap-t UCL	91.01
95% Hall's Bootstrap UCL	92.93	95% Percentile Bootstrap UCL	86.78
95% BCA Bootstrap UCL	89.53		
90% Chebyshev(Mean, Sd) UCL	99.95	95% Chebyshev(Mean, Sd) UCL	112.5
97.5% Chebyshev(Mean, Sd) UCL	130	99% Chebyshev(Mean, Sd) UCL	164.3
Suggested UCL to Use			
95% Student's-t UCL	88.41		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Selenium			
General Statistics			
Total Number of Observations	16	Number of Distinct Observations	13
Number of Detects	2	Number of Non-Detects	14
Number of Distinct Detects	2	Number of Distinct Non-Detects	11
Minimum Detect	0.57	Minimum Non-Detect	0.23
Maximum Detect	0.64	Maximum Non-Detect	0.46
Variance Detects	0.00245	Percent Non-Detects	87.5%

Mean Detects	0.605	SD Detects	0.0495
Median Detects	0.605	CV Detects	0.0818
Skewness Detects	N/A	Kurtosis Detects	N/A
Mean of Logged Detects	-0.504	SD of Logged Detects	0.0819

Warning: Data set has only 2 Detected Values.

This is not enough to compute meaningful or reliable statistics and estimates.

Normal GOF Test on Detects Only

Not Enough Data to Perform GOF Test

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	0.277	KM Standard Error of Mean	0.0441
KM SD	0.125	95% KM (BCA) UCL	N/A
95% KM (t) UCL	0.354	95% KM (Percentile Bootstrap) UCL	N/A
95% KM (z) UCL	0.349	95% KM Bootstrap t UCL	N/A
90% KM Chebyshev UCL	0.409	95% KM Chebyshev UCL	0.469
97.5% KM Chebyshev UCL	0.552	99% KM Chebyshev UCL	0.715

Gamma GOF Tests on Detected Observations Only

Not Enough Data to Perform GOF Test

Gamma Statistics on Detected Data Only

k hat (MLE)	298.5	k star (bias corrected MLE)	N/A
Theta hat (MLE)	0.00203	Theta star (bias corrected MLE)	N/A
nu hat (MLE)	1194	nu star (bias corrected)	N/A
Mean (detects)	0.605		

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	0.277	SD (KM)	0.125
Variance (KM)	0.0155	SE of Mean (KM)	0.0441
k hat (KM)	4.935	k star (KM)	4.051
nu hat (KM)	157.9	nu star (KM)	129.6
theta hat (KM)	0.0561	theta star (KM)	0.0683
80% gamma percentile (KM)	0.381	90% gamma percentile (KM)	0.461
95% gamma percentile (KM)	0.535	99% gamma percentile (KM)	0.692

Gamma Kaplan-Meier (KM) Statistics

		Adjusted Level of Significance (β)	0.0335
Approximate Chi Square Value (129.64, α)	104.3	Adjusted Chi Square Value (129.64, β)	101.8
95% Gamma Approximate KM-UCL (use when n>=50)	0.344	95% Gamma Adjusted KM-UCL (use when n<50)	0.353

Lognormal GOF Test on Detected Observations Only

Not Enough Data to Perform GOF Test

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	0.375	Mean in Log Scale	-1.004
SD in Original Scale	0.0951	SD in Log Scale	0.214
95% t UCL (assumes normality of ROS data)	0.417	95% Percentile Bootstrap UCL	0.418

95% BCA Bootstrap UCL	0.426	95% Bootstrap t UCL	0.496
95% H-UCL (Log ROS)	0.414		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-1.349	KM Geo Mean	0.26
KM SD (logged)	0.32	95% Critical H Value (KM-Log)	1.887
KM Standard Error of Mean (logged)	0.113	95% H-UCL (KM -Log)	0.319
KM SD (logged)	0.32	95% Critical H Value (KM-Log)	1.887
KM Standard Error of Mean (logged)	0.113		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.206	Mean in Log Scale	-1.747
SD in Original Scale	0.16	SD in Log Scale	0.525
95% t UCL (Assumes normality)	0.276	95% H-Stat UCL	0.265
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution at 5% Significance Level			
Suggested UCL to Use			
95% KM (t) UCL	0.354	KM H-UCL	0.319
95% KM (BCA) UCL	N/A		
Warning: One or more Recommended UCL(s) not available!			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Naphthalene			
General Statistics			
Total Number of Observations	16	Number of Distinct Observations	15
Number of Detects	7	Number of Non-Detects	9
Number of Distinct Detects	7	Number of Distinct Non-Detects	8
Minimum Detect	0.0019	Minimum Non-Detect	0.0014
Maximum Detect	0.021	Maximum Non-Detect	0.069
Variance Detects	3.5180E-5	Percent Non-Detects	56.25%
Mean Detects	0.0087	SD Detects	0.00593
Median Detects	0.0075	CV Detects	0.682
Skewness Detects	1.699	Kurtosis Detects	4.061
Mean of Logged Detects	-4.941	SD of Logged Detects	0.713
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.82	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.803	Detected Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.297	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.304	Detected Data appear Normal at 5% Significance Level	
Detected Data appear Normal at 5% Significance Level			

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.00561	KM Standard Error of Mean	0.00157
KM SD	0.00521	95% KM (BCA) UCL	0.00817
95% KM (t) UCL	0.00835	95% KM (Percentile Bootstrap) UCL	0.0081
95% KM (z) UCL	0.00818	95% KM Bootstrap t UCL	0.00886
90% KM Chebyshev UCL	0.0103	95% KM Chebyshev UCL	0.0124
97.5% KM Chebyshev UCL	0.0154	99% KM Chebyshev UCL	0.0212
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	0.444	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.713	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.242	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.314	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	2.693	k star (bias corrected MLE)	1.634
Theta hat (MLE)	0.00323	Theta star (bias corrected MLE)	0.00532
nu hat (MLE)	37.7	nu star (bias corrected)	22.87
Mean (detects)	0.0087		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.0019	Mean	0.00943
Maximum	0.021	Median	0.01
SD	0.00381	CV	0.404
k hat (MLE)	5.807	k star (bias corrected MLE)	4.76
Theta hat (MLE)	0.00162	Theta star (bias corrected MLE)	0.00198
nu hat (MLE)	185.8	nu star (bias corrected)	152.3
Adjusted Level of Significance (β)	0.0335		
Approximate Chi Square Value (152.31, α)	124.8	Adjusted Chi Square Value (152.31, β)	121.9
95% Gamma Approximate UCL (use when n>=50)	0.0115	95% Gamma Adjusted UCL (use when n<50)	0.0118
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.00561	SD (KM)	0.00521
Variance (KM)	2.7180E-5	SE of Mean (KM)	0.00157
k hat (KM)	1.156	k star (KM)	0.981
nu hat (KM)	36.99	nu star (KM)	31.39
theta hat (KM)	0.00485	theta star (KM)	0.00571
80% gamma percentile (KM)	0.00904	90% gamma percentile (KM)	0.013
95% gamma percentile (KM)	0.0169	99% gamma percentile (KM)	0.0261
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (31.39, α)	19.59	Adjusted Chi Square Value (31.39, β)	18.53
95% Gamma Approximate KM-UCL (use when n>=50)	0.00898	95% Gamma Adjusted KM-UCL (use when n<50)	0.00949

Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.902	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.803	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.287	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.304	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.00532	Mean in Log Scale	-5.531
SD in Original Scale	0.00491	SD in Log Scale	0.762
95% t UCL (assumes normality of ROS data)	0.00747	95% Percentile Bootstrap UCL	0.00744
95% BCA Bootstrap UCL	0.00829	95% Bootstrap t UCL	0.00913
95% H-UCL (Log ROS)	0.00842		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-5.592	KM Geo Mean	0.00373
KM SD (logged)	0.914	95% Critical H Value (KM-Log)	2.575
KM Standard Error of Mean (logged)	0.289	95% H-UCL (KM -Log)	0.0104
KM SD (logged)	0.914	95% Critical H Value (KM-Log)	2.575
KM Standard Error of Mean (logged)	0.289		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.0092	Mean in Log Scale	-5.314
SD in Original Scale	0.0105	SD in Log Scale	1.242
95% t UCL (Assumes normality)	0.0138	95% H-Stat UCL	0.0287
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Normal Distributed at 5% Significance Level			
Suggested UCL to Use			
95% KM (t) UCL	0.00835		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			

ProUCL Output
Eastern Undeveloped Area Soil (0-12 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

UCL Statistics for Data Sets with Non-Detects	
User Selected Options	
Date/Time of Computation	ProUCL 5.11/28/2019 12:16:59 PM
From File	20190128_EastUndev_ProUCL_input_a.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Bis2EthylhexylPhthalate

General Statistics			
Total Number of Observations	34	Number of Distinct Observations	23
Number of Detects	7	Number of Non-Detects	27
Number of Distinct Detects	6	Number of Distinct Non-Detects	18
Minimum Detect	0.047	Minimum Non-Detect	0.036
Maximum Detect	0.15	Maximum Non-Detect	1.9
Variance Detects	0.00166	Percent Non-Detects	79.41%
Mean Detects	0.101	SD Detects	0.0408
Median Detects	0.12	CV Detects	0.402
Skewness Detects	-0.227	Kurtosis Detects	-2.015
Mean of Logged Detects	-2.37	SD of Logged Detects	0.453

Normal GOF Test on Detects Only		
Shapiro Wilk Test Statistic	0.899	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.803	Detected Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.247	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.304	Detected Data appear Normal at 5% Significance Level
Detected Data appear Normal at 5% Significance Level		

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.0535	KM Standard Error of Mean	0.00721
KM SD	0.0345	95% KM (BCA) UCL	0.0659
95% KM (t) UCL	0.0657	95% KM (Percentile Bootstrap) UCL	0.0655
95% KM (z) UCL	0.0654	95% KM Bootstrap t UCL	0.0661
90% KM Chebyshev UCL	0.0752	95% KM Chebyshev UCL	0.085
97.5% KM Chebyshev UCL	0.0986	99% KM Chebyshev UCL	0.125

Gamma GOF Tests on Detected Observations Only		
A-D Test Statistic	0.467	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.709	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.286	**Kolmogorov-Smirnov GOF**
5% K-S Critical Value	0.313	Detected data appear Gamma Distributed at 5% Significance Level
Detected data appear Gamma Distributed at 5% Significance Level		

Gamma Statistics on Detected Data Only			
k hat (MLE)	6.321	k star (bias corrected MLE)	3.707
Theta hat (MLE)	0.016	Theta star (bias corrected MLE)	0.0274
nu hat (MLE)	88.5	nu star (bias corrected)	51.9

Mean (detects)	0.101		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	0.0298
Maximum	0.15	Median	0.01
SD	0.041	CV	1.379
k hat (MLE)	1.014	k star (bias corrected MLE)	0.944
Theta hat (MLE)	0.0294	Theta star (bias corrected MLE)	0.0315
nu hat (MLE)	68.95	nu star (bias corrected)	64.2
Adjusted Level of Significance (β)	0.0422		
Approximate Chi Square Value (64.20, α)	46.77	Adjusted Chi Square Value (64.20, β)	46.03
95% Gamma Approximate UCL (use when n>=50)	0.0409	95% Gamma Adjusted UCL (use when n<50)	0.0415
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.0535	SD (KM)	0.0345
Variance (KM)	0.00119	SE of Mean (KM)	0.00721
k hat (KM)	2.411	k star (KM)	2.218
nu hat (KM)	164	nu star (KM)	150.8
theta hat (KM)	0.0222	theta star (KM)	0.0241
80% gamma percentile (KM)	0.0792	90% gamma percentile (KM)	0.102
95% gamma percentile (KM)	0.123	99% gamma percentile (KM)	0.17
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (150.83, α)	123.4	Adjusted Chi Square Value (150.83, β)	122.2
95% Gamma Approximate KM-UCL (use when n>=50)	0.0654	95% Gamma Adjusted KM-UCL (use when n<50)	0.0661
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.887	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.803	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.281	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.304	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.0401	Mean in Log Scale	-3.483
SD in Original Scale	0.0367	SD in Log Scale	0.678
95% t UCL (assumes normality of ROS data)	0.0508	95% Percentile Bootstrap UCL	0.0509
95% BCA Bootstrap UCL	0.0534	95% Bootstrap t UCL	0.0552
95% H-UCL (Log ROS)	0.0495		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-3.065	KM Geo Mean	0.0466
KM SD (logged)	0.47	95% Critical H Value (KM-Log)	1.916
KM Standard Error of Mean (logged)	0.0992	95% H-UCL (KM -Log)	0.0609

KM SD (logged)	0.47	95% Critical H Value (KM-Log)	1.916
KM Standard Error of Mean (logged)	0.0992		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.109	Mean in Log Scale	-2.998
SD in Original Scale	0.207	SD in Log Scale	1.099
95% t UCL (Assumes normality)	0.169	95% H-Stat UCL	0.149

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Normal Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (t) UCL	0.0657		

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Fluoride

General Statistics

Total Number of Observations	34	Number of Distinct Observations	33
		Number of Missing Observations	0
Minimum	0.69	Mean	11.86
Maximum	41.3	Median	9.03
SD	11.46	Std. Error of Mean	1.965
Coefficient of Variation	0.966	Skewness	0.709

Normal GOF Test

Shapiro Wilk Test Statistic	0.855	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.933	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.221	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.15	Data Not Normal at 5% Significance Level	

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	15.18	95% Adjusted-CLT UCL (Chen-1995)	15.34
		95% Modified-t UCL (Johnson-1978)	15.22

Gamma GOF Test

A-D Test Statistic	1.719	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.785	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.19	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.157	Data Not Gamma Distributed at 5% Significance Level	

Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	0.797	k star (bias corrected MLE)	0.746
Theta hat (MLE)	14.87	Theta star (bias corrected MLE)	15.88
nu hat (MLE)	54.21	nu star (bias corrected)	50.76
MLE Mean (bias corrected)	11.86	MLE Sd (bias corrected)	13.72
		Approximate Chi Square Value (0.05)	35.4
Adjusted Level of Significance	0.0422	Adjusted Chi Square Value	34.76
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	17	95% Adjusted Gamma UCL (use when n<50)	17.31
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.858	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.933	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.222	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.15	Data Not Lognormal at 5% Significance Level	
Data Not Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	-0.371	Mean of logged Data	1.728
Maximum of Logged Data	3.721	SD of logged Data	1.411
Assuming Lognormal Distribution			
95% H-UCL	31.79	90% Chebyshev (MVUE) UCL	27.63
95% Chebyshev (MVUE) UCL	33.61	97.5% Chebyshev (MVUE) UCL	41.91
99% Chebyshev (MVUE) UCL	58.21		
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution (0.05)			
Nonparametric Distribution Free UCLs			
95% CLT UCL	15.09	95% Jackknife UCL	15.18
95% Standard Bootstrap UCL	14.98	95% Bootstrap-t UCL	15.55
95% Hall's Bootstrap UCL	15.24	95% Percentile Bootstrap UCL	14.99
95% BCA Bootstrap UCL	15.13		
90% Chebyshev(Mean, Sd) UCL	17.75	95% Chebyshev(Mean, Sd) UCL	20.42
97.5% Chebyshev(Mean, Sd) UCL	24.12	99% Chebyshev(Mean, Sd) UCL	31.4
Suggested UCL to Use			
95% Chebyshev (Mean, Sd) UCL	20.42		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Indeno123CDPyrene			

ProUCL Output
Eastern Undeveloped Area Soil (0-12 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

General Statistics			
Total Number of Observations	34	Number of Distinct Observations	28
Number of Detects	32	Number of Non-Detects	2
Number of Distinct Detects	27	Number of Distinct Non-Detects	1
Minimum Detect	0.0026	Minimum Non-Detect	0.0014
Maximum Detect	2.5	Maximum Non-Detect	0.0014
Variance Detects	0.277	Percent Non-Detects	5.882%
Mean Detects	0.297	SD Detects	0.526
Median Detects	0.0805	CV Detects	1.771
Skewness Detects	3.011	Kurtosis Detects	10.05
Mean of Logged Detects	-2.414	SD of Logged Detects	1.684
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.59	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.93	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.294	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.154	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.28	KM Standard Error of Mean	0.0884
KM SD	0.507	95% KM (BCA) UCL	0.433
95% KM (t) UCL	0.429	95% KM (Percentile Bootstrap) UCL	0.439
95% KM (z) UCL	0.425	95% KM Bootstrap t UCL	0.541
90% KM Chebyshev UCL	0.545	95% KM Chebyshev UCL	0.665
97.5% KM Chebyshev UCL	0.832	99% KM Chebyshev UCL	1.159
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	0.827	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.808	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.144	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.164	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data follow Appr. Gamma Distribution at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.525	k star (bias corrected MLE)	0.497
Theta hat (MLE)	0.566	Theta star (bias corrected MLE)	0.598
nu hat (MLE)	33.62	nu star (bias corrected)	31.8
Mean (detects)	0.297		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.0026	Mean	0.28
Maximum	2.5	Median	0.07

SD	0.515	CV	1.837
k hat (MLE)	0.5	k star (bias corrected MLE)	0.475
Theta hat (MLE)	0.56	Theta star (bias corrected MLE)	0.589
nu hat (MLE)	34	nu star (bias corrected)	32.33
Adjusted Level of Significance (β)	0.0422		
Approximate Chi Square Value (32.33, α)	20.33	Adjusted Chi Square Value (32.33, β)	19.86
95% Gamma Approximate UCL (use when n>=50)	0.446	95% Gamma Adjusted UCL (use when n<50)	0.456
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.28	SD (KM)	0.507
Variance (KM)	0.257	SE of Mean (KM)	0.0884
k hat (KM)	0.304	k star (KM)	0.297
nu hat (KM)	20.67	nu star (KM)	20.18
theta hat (KM)	0.92	theta star (KM)	0.942
80% gamma percentile (KM)	0.428	90% gamma percentile (KM)	0.826
95% gamma percentile (KM)	1.284	99% gamma percentile (KM)	2.476
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (20.18, α)	10.99	Adjusted Chi Square Value (20.18, β)	10.65
95% Gamma Approximate KM-UCL (use when n>=50)	0.514	95% Gamma Adjusted KM-UCL (use when n<50)	0.53
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.985	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.93	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.0805	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.154	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.28	Mean in Log Scale	-2.652
SD in Original Scale	0.515	SD in Log Scale	1.899
95% t UCL (assumes normality of ROS data)	0.429	95% Percentile Bootstrap UCL	0.435
95% BCA Bootstrap UCL	0.5	95% Bootstrap t UCL	0.575
95% H-UCL (Log ROS)	1.458		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-2.658	KM Geo Mean	0.0701
KM SD (logged)	1.882	95% Critical H Value (KM-Log)	3.687
KM Standard Error of Mean (logged)	0.328	95% H-UCL (KM -Log)	1.378
KM SD (logged)	1.882	95% Critical H Value (KM-Log)	3.687
KM Standard Error of Mean (logged)	0.328		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.28	Mean in Log Scale	-2.699
SD in Original Scale	0.515	SD in Log Scale	2.001
95% t UCL (Assumes normality)	0.429	95% H-Stat UCL	1.921
DL/2 is not a recommended method, provided for comparisons and historical reasons			

Nonparametric Distribution Free UCL Statistics			
Detected Data appear Approximate Gamma Distributed at 5% Significance Level			
Suggested UCL to Use			
Adjusted KM-UCL (use when k<=1 and 15 < n < 50 but k<=1)	0.53		
When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test			
When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
BenzoBFluoranthene			
General Statistics			
Total Number of Observations	34	Number of Distinct Observations	34
Number of Detects	33	Number of Non-Detects	1
Number of Distinct Detects	33	Number of Distinct Non-Detects	1
Minimum Detect	0.002	Minimum Non-Detect	0.0017
Maximum Detect	4.5	Maximum Non-Detect	0.0017
Variance Detects	1.006	Percent Non-Detects	2.941%
Mean Detects	0.545	SD Detects	1.003
Median Detects	0.12	CV Detects	1.841
Skewness Detects	2.924	Kurtosis Detects	8.845
Mean of Logged Detects	-1.988	SD of Logged Detects	1.872
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.576	Shapiro Wilk GOF Test	
5% Shapiro Wilk Critical Value	0.931	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.294	Lilliefors GOF Test	
5% Lilliefors Critical Value	0.152	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.529	KM Standard Error of Mean	0.17
KM SD	0.977	95% KM (BCA) UCL	0.85
95% KM (t) UCL	0.817	95% KM (Percentile Bootstrap) UCL	0.823
95% KM (z) UCL	0.809	95% KM Bootstrap t UCL	1.091
90% KM Chebyshev UCL	1.039	95% KM Chebyshev UCL	1.271
97.5% KM Chebyshev UCL	1.592	99% KM Chebyshev UCL	2.222
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	0.822	Anderson-Darling GOF Test	
5% A-D Critical Value	0.819	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.16	Kolmogorov-Smirnov GOF	
5% K-S Critical Value	0.163	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data follow Appr. Gamma Distribution at 5% Significance Level			

Gamma Statistics on Detected Data Only			
k hat (MLE)	0.465	k star (bias corrected MLE)	0.443
Theta hat (MLE)	1.171	Theta star (bias corrected MLE)	1.229
nu hat (MLE)	30.7	nu star (bias corrected)	29.25
Mean (detects)	0.545		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.002	Mean	0.529
Maximum	4.5	Median	0.115
SD	0.992	CV	1.875
k hat (MLE)	0.452	k star (bias corrected MLE)	0.432
Theta hat (MLE)	1.171	Theta star (bias corrected MLE)	1.226
nu hat (MLE)	30.72	nu star (bias corrected)	29.34
Adjusted Level of Significance (β)	0.0422		
Approximate Chi Square Value (29.34, α)	17.98	Adjusted Chi Square Value (29.34, β)	17.54
95% Gamma Approximate UCL (use when n>=50)	0.863	95% Gamma Adjusted UCL (use when n<50)	0.885
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.529	SD (KM)	0.977
Variance (KM)	0.955	SE of Mean (KM)	0.17
k hat (KM)	0.293	k star (KM)	0.287
nu hat (KM)	19.91	nu star (KM)	19.49
theta hat (KM)	1.806	theta star (KM)	1.845
80% gamma percentile (KM)	0.801	90% gamma percentile (KM)	1.568
95% gamma percentile (KM)	2.454	99% gamma percentile (KM)	4.772
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (19.49, α)	10.47	Adjusted Chi Square Value (19.49, β)	10.15
95% Gamma Approximate KM-UCL (use when n>=50)	0.984	95% Gamma Adjusted KM-UCL (use when n<50)	1.016
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.982	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.931	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.0788	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.152	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.529	Mean in Log Scale	-2.128
SD in Original Scale	0.992	SD in Log Scale	2.016
95% t UCL (assumes normality of ROS data)	0.817	95% Percentile Bootstrap UCL	0.829
95% BCA Bootstrap UCL	0.912	95% Bootstrap t UCL	1.093
95% H-UCL (Log ROS)	3.559		

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-2.117	KM Geo Mean	0.12
KM SD (logged)	1.962	95% Critical H Value (KM-Log)	3.81
KM Standard Error of Mean (logged)	0.342	95% H-UCL (KM -Log)	3.028
KM SD (logged)	1.962	95% Critical H Value (KM-Log)	3.81
KM Standard Error of Mean (logged)	0.342		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.529	Mean in Log Scale	-2.138
SD in Original Scale	0.992	SD in Log Scale	2.039
95% t UCL (Assumes normality)	0.817	95% H-Stat UCL	3.806
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Approximate Gamma Distributed at 5% Significance Level			
Suggested UCL to Use			
Adjusted KM-UCL (use when k<=1 and 15 < n < 50 but k<=1)	1.016		
When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test			
When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
BenzoAPyrene			
General Statistics			
Total Number of Observations	34	Number of Distinct Observations	28
Number of Detects	32	Number of Non-Detects	2
Number of Distinct Detects	27	Number of Distinct Non-Detects	1
Minimum Detect	0.0026	Minimum Non-Detect	0.0015
Maximum Detect	1.9	Maximum Non-Detect	0.0015
Variance Detects	0.18	Percent Non-Detects	5.882%
Mean Detects	0.259	SD Detects	0.425
Median Detects	0.059	CV Detects	1.643
Skewness Detects	2.592	Kurtosis Detects	7.18
Mean of Logged Detects	-2.519	SD of Logged Detects	1.664
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.636	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.93	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.273	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.154	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.243	KM Standard Error of Mean	0.0714
KM SD	0.41	95% KM (BCA) UCL	0.382
95% KM (t) UCL	0.364	95% KM (Percentile Bootstrap) UCL	0.365
95% KM (z) UCL	0.361	95% KM Bootstrap t UCL	0.439
90% KM Chebyshev UCL	0.458	95% KM Chebyshev UCL	0.555
97.5% KM Chebyshev UCL	0.69	99% KM Chebyshev UCL	0.954
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	0.831	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.807	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.171	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.164	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.538	k star (bias corrected MLE)	0.509
Theta hat (MLE)	0.48	Theta star (bias corrected MLE)	0.508
nu hat (MLE)	34.46	nu star (bias corrected)	32.57
Mean (detects)	0.259		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.0026	Mean	0.244
Maximum	1.9	Median	0.0545
SD	0.416	CV	1.705
k hat (MLE)	0.514	k star (bias corrected MLE)	0.488
Theta hat (MLE)	0.475	Theta star (bias corrected MLE)	0.5
nu hat (MLE)	34.95	nu star (bias corrected)	33.2
Adjusted Level of Significance (β)	0.0422		
Approximate Chi Square Value (33.20, α)	21.02	Adjusted Chi Square Value (33.20, β)	20.54
95% Gamma Approximate UCL (use when n>=50)	0.385	95% Gamma Adjusted UCL (use when n<50)	0.394
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.243	SD (KM)	0.41
Variance (KM)	0.168	SE of Mean (KM)	0.0714
k hat (KM)	0.353	k star (KM)	0.341
nu hat (KM)	23.97	nu star (KM)	23.19
theta hat (KM)	0.691	theta star (KM)	0.714
80% gamma percentile (KM)	0.384	90% gamma percentile (KM)	0.706
95% gamma percentile (KM)	1.068	99% gamma percentile (KM)	1.994
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (23.19, α)	13.23	Adjusted Chi Square Value (23.19, β)	12.86

95% Gamma Approximate KM-UCL (use when n>=50)	0.427	95% Gamma Adjusted KM-UCL (use when n<50)	0.439
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.981	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.93	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.0907	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.154	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.243	Mean in Log Scale	-2.755
SD in Original Scale	0.416	SD in Log Scale	1.877
95% t UCL (assumes normality of ROS data)	0.364	95% Percentile Bootstrap UCL	0.363
95% BCA Bootstrap UCL	0.41	95% Bootstrap t UCL	0.437
95% H-UCL (Log ROS)	1.232		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-2.753	KM Geo Mean	0.0637
KM SD (logged)	1.845	95% Critical H Value (KM-Log)	3.63
KM Standard Error of Mean (logged)	0.321	95% H-UCL (KM -Log)	1.121
KM SD (logged)	1.845	95% Critical H Value (KM-Log)	3.63
KM Standard Error of Mean (logged)	0.321		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.243	Mean in Log Scale	-2.794
SD in Original Scale	0.416	SD in Log Scale	1.962
95% t UCL (Assumes normality)	0.364	95% H-Stat UCL	1.54
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Lognormal Distributed at 5% Significance Level			
Suggested UCL to Use			
95% KM (Chebyshev) UCL	0.555		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
DibenzAHAnthracene			
General Statistics			
Total Number of Observations	34	Number of Distinct Observations	29
Number of Detects	26	Number of Non-Detects	8
Number of Distinct Detects	26	Number of Distinct Non-Detects	3
Minimum Detect	0.0049	Minimum Non-Detect	0.0015
Maximum Detect	0.62	Maximum Non-Detect	0.0019

Variance Detects	0.0194	Percent Non-Detects	23.53%
Mean Detects	0.091	SD Detects	0.139
Median Detects	0.037	CV Detects	1.53
Skewness Detects	2.723	Kurtosis Detects	8.18
Mean of Logged Detects	-3.227	SD of Logged Detects	1.3
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.634	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.92	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.294	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.17	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.07	KM Standard Error of Mean	0.0219
KM SD	0.125	95% KM (BCA) UCL	0.114
95% KM (t) UCL	0.107	95% KM (Percentile Bootstrap) UCL	0.108
95% KM (z) UCL	0.106	95% KM Bootstrap t UCL	0.141
90% KM Chebyshev UCL	0.136	95% KM Chebyshev UCL	0.166
97.5% KM Chebyshev UCL	0.207	99% KM Chebyshev UCL	0.288
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	0.926	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.787	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.161	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.178	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data follow Appr. Gamma Distribution at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.725	k star (bias corrected MLE)	0.667
Theta hat (MLE)	0.126	Theta star (bias corrected MLE)	0.137
nu hat (MLE)	37.68	nu star (bias corrected)	34.66
Mean (detects)	0.091		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.0049	Mean	0.072
Maximum	0.62	Median	0.0175
SD	0.126	CV	1.753
k hat (MLE)	0.662	k star (bias corrected MLE)	0.624
Theta hat (MLE)	0.109	Theta star (bias corrected MLE)	0.115
nu hat (MLE)	45.05	nu star (bias corrected)	42.4
Adjusted Level of Significance (β)	0.0422		
Approximate Chi Square Value (42.40, α)	28.48	Adjusted Chi Square Value (42.40, β)	27.91
95% Gamma Approximate UCL (use when n>=50)	0.107	95% Gamma Adjusted UCL (use when n<50)	0.109

Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.07	SD (KM)	0.125
Variance (KM)	0.0157	SE of Mean (KM)	0.0219
k hat (KM)	0.312	k star (KM)	0.304
nu hat (KM)	21.19	nu star (KM)	20.65
theta hat (KM)	0.225	theta star (KM)	0.23
80% gamma percentile (KM)	0.108	90% gamma percentile (KM)	0.206
95% gamma percentile (KM)	0.319	99% gamma percentile (KM)	0.611
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (20.65, α)	11.33	Adjusted Chi Square Value (20.65, β)	10.99
95% Gamma Approximate KM-UCL (use when n>=50)	0.127	95% Gamma Adjusted KM-UCL (use when n<50)	0.131
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.967	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.92	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.138	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.17	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.0701	Mean in Log Scale	-3.942
SD in Original Scale	0.127	SD in Log Scale	1.749
95% t UCL (assumes normality of ROS data)	0.107	95% Percentile Bootstrap UCL	0.108
95% BCA Bootstrap UCL	0.115	95% Bootstrap t UCL	0.141
95% H-UCL (Log ROS)	0.259		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-3.997	KM Geo Mean	0.0184
KM SD (logged)	1.781	95% Critical H Value (KM-Log)	3.534
KM Standard Error of Mean (logged)	0.312	95% H-UCL (KM -Log)	0.269
KM SD (logged)	1.781	95% Critical H Value (KM-Log)	3.534
KM Standard Error of Mean (logged)	0.312		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.0698	Mean in Log Scale	-4.144
SD in Original Scale	0.127	SD in Log Scale	2.025
95% t UCL (Assumes normality)	0.107	95% H-Stat UCL	0.489
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Approximate Gamma Distributed at 5% Significance Level			
Suggested UCL to Use			
Adjusted KM-UCL (use when k<=1 and 15 < n < 50 but k<=1)	0.131		
When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test			

When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

BenzoAAnthracene

General Statistics

Total Number of Observations	34	Number of Distinct Observations	28
Number of Detects	32	Number of Non-Detects	2
Number of Distinct Detects	27	Number of Distinct Non-Detects	1
Minimum Detect	0.0023	Minimum Non-Detect	0.0013
Maximum Detect	1.5	Maximum Non-Detect	0.0013
Variance Detects	0.0938	Percent Non-Detects	5.882%
Mean Detects	0.182	SD Detects	0.306
Median Detects	0.043	CV Detects	1.682
Skewness Detects	3.064	Kurtosis Detects	10.98
Mean of Logged Detects	-2.824	SD of Logged Detects	1.623

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.612	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.93	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.279	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.154	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	0.171	KM Standard Error of Mean	0.0515
KM SD	0.296	95% KM (BCA) UCL	0.266
95% KM (t) UCL	0.259	95% KM (Percentile Bootstrap) UCL	0.265
95% KM (z) UCL	0.256	95% KM Bootstrap t UCL	0.329
90% KM Chebyshev UCL	0.326	95% KM Chebyshev UCL	0.396
97.5% KM Chebyshev UCL	0.493	99% KM Chebyshev UCL	0.684

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.794	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.805	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.17	**Kolmogorov-Smirnov GOF**
5% K-S Critical Value	0.164	Detected Data Not Gamma Distributed at 5% Significance Level

Detected data follow Appr. Gamma Distribution at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	0.557	k star (bias corrected MLE)	0.526
Theta hat (MLE)	0.327	Theta star (bias corrected MLE)	0.346
nu hat (MLE)	35.68	nu star (bias corrected)	33.66
Mean (detects)	0.182		

Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.0023	Mean	0.172
Maximum	1.5	Median	0.039
SD	0.3	CV	1.743
k hat (MLE)	0.538	k star (bias corrected MLE)	0.51
Theta hat (MLE)	0.32	Theta star (bias corrected MLE)	0.337
nu hat (MLE)	36.56	nu star (bias corrected)	34.67
Adjusted Level of Significance (β)	0.0422		
Approximate Chi Square Value (34.67, α)	22.2	Adjusted Chi Square Value (34.67, β)	21.7
95% Gamma Approximate UCL (use when n>=50)	0.269	95% Gamma Adjusted UCL (use when n<50)	0.275
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.171	SD (KM)	0.296
Variance (KM)	0.0874	SE of Mean (KM)	0.0515
k hat (KM)	0.337	k star (KM)	0.326
nu hat (KM)	22.89	nu star (KM)	22.2
theta hat (KM)	0.509	theta star (KM)	0.525
80% gamma percentile (KM)	0.268	90% gamma percentile (KM)	0.5
95% gamma percentile (KM)	0.763	99% gamma percentile (KM)	1.439
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (22.20, α)	12.49	Adjusted Chi Square Value (22.20, β)	12.13
95% Gamma Approximate KM-UCL (use when n>=50)	0.305	95% Gamma Adjusted KM-UCL (use when n<50)	0.314
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.978	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.93	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.102	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.154	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.171	Mean in Log Scale	-3.053
SD in Original Scale	0.3	SD in Log Scale	1.83
95% t UCL (assumes normality of ROS data)	0.259	95% Percentile Bootstrap UCL	0.265
95% BCA Bootstrap UCL	0.291	95% Bootstrap t UCL	0.332
95% H-UCL (Log ROS)	0.794		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-3.049	KM Geo Mean	0.0474
KM SD (logged)	1.792	95% Critical H Value (KM-Log)	3.549
KM Standard Error of Mean (logged)	0.312	95% H-UCL (KM -Log)	0.714
KM SD (logged)	1.792	95% Critical H Value (KM-Log)	3.549
KM Standard Error of Mean (logged)	0.312		

DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.171	Mean in Log Scale	-3.089
SD in Original Scale	0.3	SD in Log Scale	1.907
95% t UCL (Assumes normality)	0.259	95% H-Stat UCL	0.966
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Approximate Gamma Distributed at 5% Significance Level			
Suggested UCL to Use			
Adjusted KM-UCL (use when k<=1 and 15 < n < 50 but k<=1)	0.314		
When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test			
When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Cyanide			
General Statistics			
Total Number of Observations	34	Number of Distinct Observations	26
Number of Detects	20	Number of Non-Detects	14
Number of Distinct Detects	17	Number of Distinct Non-Detects	11
Minimum Detect	0.067	Minimum Non-Detect	0.056
Maximum Detect	1.2	Maximum Non-Detect	0.11
Variance Detects	0.0759	Percent Non-Detects	41.18%
Mean Detects	0.268	SD Detects	0.276
Median Detects	0.16	CV Detects	1.027
Skewness Detects	2.37	Kurtosis Detects	6.348
Mean of Logged Detects	-1.656	SD of Logged Detects	0.787
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.698	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.905	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.276	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.192	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.181	KM Standard Error of Mean	0.0406
KM SD	0.231	95% KM (BCA) UCL	0.253
95% KM (t) UCL	0.25	95% KM (Percentile Bootstrap) UCL	0.251
95% KM (z) UCL	0.248	95% KM Bootstrap t UCL	0.301
90% KM Chebyshev UCL	0.303	95% KM Chebyshev UCL	0.358

97.5% KM Chebyshev UCL	0.435	99% KM Chebyshev UCL	0.585
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	1.06	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.757	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.231	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.197	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	1.613	k star (bias corrected MLE)	1.404
Theta hat (MLE)	0.166	Theta star (bias corrected MLE)	0.191
nu hat (MLE)	64.5	nu star (bias corrected)	56.16
Mean (detects)	0.268		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	0.162
Maximum	1.2	Median	0.086
SD	0.246	CV	1.517
k hat (MLE)	0.59	k star (bias corrected MLE)	0.557
Theta hat (MLE)	0.275	Theta star (bias corrected MLE)	0.291
nu hat (MLE)	40.1	nu star (bias corrected)	37.9
Adjusted Level of Significance (β)	0.0422		
Approximate Chi Square Value (37.90, α)	24.8	Adjusted Chi Square Value (37.90, β)	24.28
95% Gamma Approximate UCL (use when n>=50)	0.248	95% Gamma Adjusted UCL (use when n<50)	0.253
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.181	SD (KM)	0.231
Variance (KM)	0.0533	SE of Mean (KM)	0.0406
k hat (KM)	0.617	k star (KM)	0.582
nu hat (KM)	41.95	nu star (KM)	39.58
theta hat (KM)	0.294	theta star (KM)	0.311
80% gamma percentile (KM)	0.299	90% gamma percentile (KM)	0.475
95% gamma percentile (KM)	0.66	99% gamma percentile (KM)	1.108
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (39.58, α)	26.17	Adjusted Chi Square Value (39.58, β)	25.63
95% Gamma Approximate KM-UCL (use when n>=50)	0.274	95% Gamma Adjusted KM-UCL (use when n<50)	0.28
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.925	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.905	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.18	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.192	Detected Data appear Lognormal at 5% Significance Level	

Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.17	Mean in Log Scale	-2.448
SD in Original Scale	0.241	SD in Log Scale	1.141
95% t UCL (assumes normality of ROS data)	0.24	95% Percentile Bootstrap UCL	0.242
95% BCA Bootstrap UCL	0.259	95% Bootstrap t UCL	0.297
95% H-UCL (Log ROS)	0.279		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-2.156	KM Geo Mean	0.116
KM SD (logged)	0.839	95% Critical H Value (KM-Log)	2.263
KM Standard Error of Mean (logged)	0.148	95% H-UCL (KM -Log)	0.229
KM SD (logged)	0.839	95% Critical H Value (KM-Log)	2.263
KM Standard Error of Mean (logged)	0.148		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.172	Mean in Log Scale	-2.361
SD in Original Scale	0.239	SD in Log Scale	1.048
95% t UCL (Assumes normality)	0.242	95% H-Stat UCL	0.258
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Lognormal Distributed at 5% Significance Level			
Suggested UCL to Use			
KM H-UCL	0.229		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Aluminum			
General Statistics			
Total Number of Observations	34	Number of Distinct Observations	32
		Number of Missing Observations	0
Minimum	5350	Mean	15282
Maximum	30300	Median	14800
SD	7748	Std. Error of Mean	1329
Coefficient of Variation	0.507	Skewness	0.279
Normal GOF Test			
Shapiro Wilk Test Statistic	0.909	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.933	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.152	**Lilliefors GOF Test**	

5% Lilliefors Critical Value	0.15	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	17531	95% Adjusted-CLT UCL (Chen-1995)	17536
		95% Modified-t UCL (Johnson-1978)	17542
Gamma GOF Test			
A-D Test Statistic	1.063	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.752	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.168	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.152	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	3.662	k star (bias corrected MLE)	3.358
Theta hat (MLE)	4174	Theta star (bias corrected MLE)	4551
nu hat (MLE)	249	nu star (bias corrected)	228.4
MLE Mean (bias corrected)	15282	MLE Sd (bias corrected)	8339
		Approximate Chi Square Value (0.05)	194.4
Adjusted Level of Significance	0.0422	Adjusted Chi Square Value	192.8
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	17954	95% Adjusted Gamma UCL (use when n<50)	18098
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.894	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.933	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.167	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.15	Data Not Lognormal at 5% Significance Level	
Data Not Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	8.585	Mean of logged Data	9.492
Maximum of Logged Data	10.32	SD of logged Data	0.563
Assuming Lognormal Distribution			
95% H-UCL	18864	90% Chebyshev (MVUE) UCL	20166
95% Chebyshev (MVUE) UCL	22306	97.5% Chebyshev (MVUE) UCL	25277
99% Chebyshev (MVUE) UCL	31113		
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution (0.05)			
Nonparametric Distribution Free UCLs			
95% CLT UCL	17468	95% Jackknife UCL	17531
95% Standard Bootstrap UCL	17468	95% Bootstrap-t UCL	17546
95% Hall's Bootstrap UCL	17475	95% Percentile Bootstrap UCL	17445

95% BCA Bootstrap UCL	17477		
90% Chebyshev(Mean, Sd) UCL	19269	95% Chebyshev(Mean, Sd) UCL	21075
97.5% Chebyshev(Mean, Sd) UCL	23581	99% Chebyshev(Mean, Sd) UCL	28504
Suggested UCL to Use			
95% Chebyshev (Mean, Sd) UCL	21075		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Iron			
General Statistics			
Total Number of Observations	34	Number of Distinct Observations	31
		Number of Missing Observations	0
Minimum	8490	Mean	11656
Maximum	16600	Median	10850
SD	2441	Std. Error of Mean	418.6
Coefficient of Variation	0.209	Skewness	0.615
Normal GOF Test			
Shapiro Wilk Test Statistic	0.904	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.933	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.151	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.15	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	12365	95% Adjusted-CLT UCL (Chen-1995)	12392
		95% Modified-t UCL (Johnson-1978)	12372
Gamma GOF Test			
A-D Test Statistic	0.86	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.746	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.133	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.151	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data follow Appr. Gamma Distribution at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	24.71	k star (bias corrected MLE)	22.55
Theta hat (MLE)	471.8	Theta star (bias corrected MLE)	517
nu hat (MLE)	1680	nu star (bias corrected)	1533
MLE Mean (bias corrected)	11656	MLE Sd (bias corrected)	2455
		Approximate Chi Square Value (0.05)	1443
Adjusted Level of Significance	0.0422	Adjusted Chi Square Value	1439

Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50)	12383	95% Adjusted Gamma UCL (use when n<50)	12420
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.925	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.933	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.121	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.15	Data appear Lognormal at 5% Significance Level	
Data appear Approximate Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	9.047	Mean of logged Data	9.343
Maximum of Logged Data	9.717	SD of logged Data	0.203
Assuming Lognormal Distribution			
95% H-UCL	12401	90% Chebyshev (MVUE) UCL	12877
95% Chebyshev (MVUE) UCL	13432	97.5% Chebyshev (MVUE) UCL	14203
99% Chebyshev (MVUE) UCL	15716		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	12345	95% Jackknife UCL	12365
95% Standard Bootstrap UCL	12334	95% Bootstrap-t UCL	12438
95% Hall's Bootstrap UCL	12410	95% Percentile Bootstrap UCL	12325
95% BCA Bootstrap UCL	12409		
90% Chebyshev(Mean, Sd) UCL	12912	95% Chebyshev(Mean, Sd) UCL	13481
97.5% Chebyshev(Mean, Sd) UCL	14271	99% Chebyshev(Mean, Sd) UCL	15822
Suggested UCL to Use			
95% Adjusted Gamma UCL	12420		
When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test			
When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Manganese			
General Statistics			
Total Number of Observations	34	Number of Distinct Observations	33
		Number of Missing Observations	0
Minimum	169	Mean	835.5

Maximum	3950	Median	505.5
SD	830.7	Std. Error of Mean	142.5
Coefficient of Variation	0.994	Skewness	2.161
Normal GOF Test			
Shapiro Wilk Test Statistic	0.734	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.933	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.263	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.15	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	1077	95% Adjusted-CLT UCL (Chen-1995)	1126
		95% Modified-t UCL (Johnson-1978)	1085
Gamma GOF Test			
A-D Test Statistic	1.53	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.765	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.201	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.154	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	1.565	k star (bias corrected MLE)	1.447
Theta hat (MLE)	533.8	Theta star (bias corrected MLE)	577.6
nu hat (MLE)	106.4	nu star (bias corrected)	98.37
MLE Mean (bias corrected)	835.5	MLE Sd (bias corrected)	694.7
		Approximate Chi Square Value (0.05)	76.49
Adjusted Level of Significance	0.0422	Adjusted Chi Square Value	75.54
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	1075	95% Adjusted Gamma UCL (use when n<50)	1088
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.928	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.933	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.149	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.15	Data appear Lognormal at 5% Significance Level	
Data appear Approximate Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	5.13	Mean of logged Data	6.376
Maximum of Logged Data	8.281	SD of logged Data	0.807
Assuming Lognormal Distribution			
95% H-UCL	1113	90% Chebyshev (MVUE) UCL	1174
95% Chebyshev (MVUE) UCL	1342	97.5% Chebyshev (MVUE) UCL	1575
99% Chebyshev (MVUE) UCL	2032		

Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	1070	95% Jackknife UCL	1077
95% Standard Bootstrap UCL	1075	95% Bootstrap-t UCL	1152
95% Hall's Bootstrap UCL	1209	95% Percentile Bootstrap UCL	1086
95% BCA Bootstrap UCL	1122		
90% Chebyshev(Mean, Sd) UCL	1263	95% Chebyshev(Mean, Sd) UCL	1456
97.5% Chebyshev(Mean, Sd) UCL	1725	99% Chebyshev(Mean, Sd) UCL	2253
Suggested UCL to Use			
95% H-UCL	1113		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
ProUCL computes and outputs H-statistic based UCLs for historical reasons only.			
H-statistic often results in unstable (both high and low) values of UCL95 as shown in examples in the Technical Guide.			
It is therefore recommended to avoid the use of H-statistic based 95% UCLs.			
Use of nonparametric methods are preferred to compute UCL95 for skewed data sets which do not follow a gamma distribution.			
Mercury			
General Statistics			
Total Number of Observations	34	Number of Distinct Observations	21
Number of Detects	33	Number of Non-Detects	1
Number of Distinct Detects	21	Number of Distinct Non-Detects	1
Minimum Detect	0.011	Minimum Non-Detect	0.012
Maximum Detect	0.12	Maximum Non-Detect	0.012
Variance Detects	4.0088E-4	Percent Non-Detects	2.941%
Mean Detects	0.0268	SD Detects	0.02
Median Detects	0.021	CV Detects	0.746
Skewness Detects	3.341	Kurtosis Detects	14.58
Mean of Logged Detects	-3.781	SD of Logged Detects	0.537
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.666	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.931	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.214	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.152	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.0264	KM Standard Error of Mean	0.00341
KM SD	0.0196	95% KM (BCA) UCL	0.0328

95% KM (t) UCL	0.0322	95% KM (Percentile Bootstrap) UCL	0.0322
95% KM (z) UCL	0.032	95% KM Bootstrap t UCL	0.0358
90% KM Chebyshev UCL	0.0366	95% KM Chebyshev UCL	0.0413
97.5% KM Chebyshev UCL	0.0477	99% KM Chebyshev UCL	0.0604
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	0.941	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.753	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.124	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.154	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data follow Appr. Gamma Distribution at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	3.208	k star (bias corrected MLE)	2.937
Theta hat (MLE)	0.00837	Theta star (bias corrected MLE)	0.00914
nu hat (MLE)	211.8	nu star (bias corrected)	193.8
Mean (detects)	0.0268		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	0.0264
Maximum	0.12	Median	0.0205
SD	0.0199	CV	0.756
k hat (MLE)	3.107	k star (bias corrected MLE)	2.853
Theta hat (MLE)	0.00848	Theta star (bias corrected MLE)	0.00924
nu hat (MLE)	211.3	nu star (bias corrected)	194
Adjusted Level of Significance (β)	0.0422		
Approximate Chi Square Value (193.98, α)	162.8	Adjusted Chi Square Value (193.98, β)	161.3
95% Gamma Approximate UCL (use when n>=50)	0.0314	95% Gamma Adjusted UCL (use when n<50)	0.0317
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.0264	SD (KM)	0.0196
Variance (KM)	3.8447E-4	SE of Mean (KM)	0.00341
k hat (KM)	1.81	k star (KM)	1.67
nu hat (KM)	123.1	nu star (KM)	113.6
theta hat (KM)	0.0146	theta star (KM)	0.0158
80% gamma percentile (KM)	0.0403	90% gamma percentile (KM)	0.0536
95% gamma percentile (KM)	0.0663	99% gamma percentile (KM)	0.0949
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (113.58, α)	89.97	Adjusted Chi Square Value (113.58, β)	88.93
95% Gamma Approximate KM-UCL (use when n>=50)	0.0333	95% Gamma Adjusted KM-UCL (use when n<50)	0.0337
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.933	**Shapiro Wilk GOF Test**	

5% Shapiro Wilk Critical Value	0.931	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.101	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.152	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.0263	Mean in Log Scale	-3.808
SD in Original Scale	0.0199	SD in Log Scale	0.551
95% t UCL (assumes normality of ROS data)	0.0321	95% Percentile Bootstrap UCL	0.0325
95% BCA Bootstrap UCL	0.0341	95% Bootstrap t UCL	0.0357
95% H-UCL (Log ROS)	0.0312		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-3.803	KM Geo Mean	0.0223
KM SD (logged)	0.535	95% Critical H Value (KM-Log)	1.967
KM Standard Error of Mean (logged)	0.0932	95% H-UCL (KM -Log)	0.0309
KM SD (logged)	0.535	95% Critical H Value (KM-Log)	1.967
KM Standard Error of Mean (logged)	0.0932		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.0262	Mean in Log Scale	-3.821
SD in Original Scale	0.02	SD in Log Scale	0.576
95% t UCL (Assumes normality)	0.0321	95% H-Stat UCL	0.0316
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Approximate Gamma Distributed at 5% Significance Level			
Suggested UCL to Use			
95% KM Adjusted Gamma UCL	0.0337	95% GROS Adjusted Gamma UCL	0.0317
When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test			
When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Nickel			
General Statistics			
Total Number of Observations	34	Number of Distinct Observations	30
		Number of Missing Observations	0
Minimum	7.4	Mean	18.41
Maximum	68.9	Median	11.35
SD	16.29	Std. Error of Mean	2.794

Coefficient of Variation	0.885	Skewness	2.006
Normal GOF Test			
Shapiro Wilk Test Statistic	0.658	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.933	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.288	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.15	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	23.14	95% Adjusted-CLT UCL (Chen-1995)	24.04
		95% Modified-t UCL (Johnson-1978)	23.3
Gamma GOF Test			
A-D Test Statistic	3.105	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.758	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.252	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.153	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	2.168	k star (bias corrected MLE)	1.996
Theta hat (MLE)	8.495	Theta star (bias corrected MLE)	9.225
nu hat (MLE)	147.4	nu star (bias corrected)	135.7
MLE Mean (bias corrected)	18.41	MLE Sd (bias corrected)	13.03
		Approximate Chi Square Value (0.05)	109.8
Adjusted Level of Significance	0.0422	Adjusted Chi Square Value	108.7
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	22.76	95% Adjusted Gamma UCL (use when n<50)	23
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.82	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.933	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.223	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.15	Data Not Lognormal at 5% Significance Level	
Data Not Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	2.001	Mean of logged Data	2.665
Maximum of Logged Data	4.233	SD of logged Data	0.643
Assuming Lognormal Distribution			
95% H-UCL	22.27	90% Chebyshev (MVUE) UCL	23.78
95% Chebyshev (MVUE) UCL	26.6	97.5% Chebyshev (MVUE) UCL	30.52
99% Chebyshev (MVUE) UCL	38.22		
Nonparametric Distribution Free UCL Statistics			

Data do not follow a Discernible Distribution (0.05)			
Nonparametric Distribution Free UCLs			
95% CLT UCL	23.01	95% Jackknife UCL	23.14
95% Standard Bootstrap UCL	22.86	95% Bootstrap-t UCL	25.34
95% Hall's Bootstrap UCL	23.43	95% Percentile Bootstrap UCL	23.33
95% BCA Bootstrap UCL	24.39		
90% Chebyshev(Mean, Sd) UCL	26.8	95% Chebyshev(Mean, Sd) UCL	30.59
97.5% Chebyshev(Mean, Sd) UCL	35.86	99% Chebyshev(Mean, Sd) UCL	46.21
Suggested UCL to Use			
95% Chebyshev (Mean, Sd) UCL	30.59		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Thallium			
General Statistics			
Total Number of Observations	34	Number of Distinct Observations	11
Number of Detects	7	Number of Non-Detects	27
Number of Distinct Detects	5	Number of Distinct Non-Detects	11
Minimum Detect	0.11	Minimum Non-Detect	0.098
Maximum Detect	0.15	Maximum Non-Detect	0.24
Variance Detects	2.2381E-4	Percent Non-Detects	79.41%
Mean Detects	0.127	SD Detects	0.015
Median Detects	0.13	CV Detects	0.118
Skewness Detects	0.256	Kurtosis Detects	-0.968
Mean of Logged Detects	-2.068	SD of Logged Detects	0.117
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.935	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.803	Detected Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.16	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.304	Detected Data appear Normal at 5% Significance Level	
Detected Data appear Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.106	KM Standard Error of Mean	0.00297
KM SD	0.0144	95% KM (BCA) UCL	0.112
95% KM (t) UCL	0.111	95% KM (Percentile Bootstrap) UCL	0.111
95% KM (z) UCL	0.111	95% KM Bootstrap t UCL	0.11
90% KM Chebyshev UCL	0.115	95% KM Chebyshev UCL	0.119
97.5% KM Chebyshev UCL	0.124	99% KM Chebyshev UCL	0.135
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	0.29	**Anderson-Darling GOF Test**	

5% A-D Critical Value	0.708	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.183	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.311	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	84.75	k star (bias corrected MLE)	48.52
Theta hat (MLE)	0.0015	Theta star (bias corrected MLE)	0.00262
nu hat (MLE)	1186	nu star (bias corrected)	679.3
Mean (detects)	0.127		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.0572	Mean	0.094
Maximum	0.15	Median	0.0917
SD	0.0214	CV	0.228
k hat (MLE)	20.76	k star (bias corrected MLE)	18.95
Theta hat (MLE)	0.00453	Theta star (bias corrected MLE)	0.00496
nu hat (MLE)	1412	nu star (bias corrected)	1289
Adjusted Level of Significance (β)	0.0422		
Approximate Chi Square Value (N/A, α)	1206	Adjusted Chi Square Value (N/A, β)	1202
95% Gamma Approximate UCL (use when n>=50)	0.1	95% Gamma Adjusted UCL (use when n<50)	0.101
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.106	SD (KM)	0.0144
Variance (KM)	2.0611E-4	SE of Mean (KM)	0.00297
k hat (KM)	54.19	k star (KM)	49.43
nu hat (KM)	3685	nu star (KM)	3361
theta hat (KM)	0.00195	theta star (KM)	0.00214
80% gamma percentile (KM)	0.118	90% gamma percentile (KM)	0.125
95% gamma percentile (KM)	0.132	99% gamma percentile (KM)	0.144
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (N/A, α)	3227	Adjusted Chi Square Value (N/A, β)	3221
95% Gamma Approximate KM-UCL (use when n>=50)	0.11	95% Gamma Adjusted KM-UCL (use when n<50)	0.11
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.933	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.803	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.167	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.304	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.0976	Mean in Log Scale	-2.343

SD in Original Scale	0.0187	SD in Log Scale	0.181
95% t UCL (assumes normality of ROS data)	0.103	95% Percentile Bootstrap UCL	0.103
95% BCA Bootstrap UCL	0.103	95% Bootstrap t UCL	0.104
95% H-UCL (Log ROS)	0.103		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-2.255	KM Geo Mean	0.105
KM SD (logged)	0.123	95% Critical H Value (KM-Log)	1.713
KM Standard Error of Mean (logged)	0.0255	95% H-UCL (KM -Log)	0.11
KM SD (logged)	0.123	95% Critical H Value (KM-Log)	1.713
KM Standard Error of Mean (logged)	0.0255		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.0772	Mean in Log Scale	-2.632
SD in Original Scale	0.0313	SD in Log Scale	0.37
95% t UCL (Assumes normality)	0.0863	95% H-Stat UCL	0.0867
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Normal Distributed at 5% Significance Level			
Suggested UCL to Use			
95% KM (t) UCL	0.111		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Arsenic			
General Statistics			
Total Number of Observations	34	Number of Distinct Observations	27
		Number of Missing Observations	0
Minimum	2	Mean	5.579
Maximum	12.4	Median	5.15
SD	2.155	Std. Error of Mean	0.37
Coefficient of Variation	0.386	Skewness	1.073
Normal GOF Test			
Shapiro Wilk Test Statistic	0.927	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.933	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.114	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.15	Data appear Normal at 5% Significance Level	
Data appear Approximate Normal at 5% Significance Level			
Assuming Normal Distribution			

95% Normal UCL		95% UCLs (Adjusted for Skewness)	
95% Student's-t UCL	6.205	95% Adjusted-CLT UCL (Chen-1995)	6.26
		95% Modified-t UCL (Johnson-1978)	6.216
Gamma GOF Test			
A-D Test Statistic	0.42	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.748	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.129	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.151	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	7.125	k star (bias corrected MLE)	6.516
Theta hat (MLE)	0.783	Theta star (bias corrected MLE)	0.856
nu hat (MLE)	484.5	nu star (bias corrected)	443.1
MLE Mean (bias corrected)	5.579	MLE Sd (bias corrected)	2.186
		Approximate Chi Square Value (0.05)	395.3
Adjusted Level of Significance	0.0422	Adjusted Chi Square Value	393
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	6.254	95% Adjusted Gamma UCL (use when n<50)	6.29
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.963	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.933	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.148	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.15	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	0.693	Mean of logged Data	1.647
Maximum of Logged Data	2.518	SD of logged Data	0.393
Assuming Lognormal Distribution			
95% H-UCL	6.37	90% Chebyshev (MVUE) UCL	6.76
95% Chebyshev (MVUE) UCL	7.287	97.5% Chebyshev (MVUE) UCL	8.019
99% Chebyshev (MVUE) UCL	9.456		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	6.187	95% Jackknife UCL	6.205
95% Standard Bootstrap UCL	6.176	95% Bootstrap-t UCL	6.363
95% Hall's Bootstrap UCL	6.366	95% Percentile Bootstrap UCL	6.176
95% BCA Bootstrap UCL	6.288		
90% Chebyshev(Mean, Sd) UCL	6.688	95% Chebyshev(Mean, Sd) UCL	7.19
97.5% Chebyshev(Mean, Sd) UCL	7.887	99% Chebyshev(Mean, Sd) UCL	9.257

Suggested UCL to Use			
95% Student's-t UCL	6.205		
When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test			
When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Barium			
General Statistics			
Total Number of Observations	34	Number of Distinct Observations	33
		Number of Missing Observations	0
Minimum	45.3	Mean	385.2
Maximum	1060	Median	274.5
SD	286.6	Std. Error of Mean	49.15
Coefficient of Variation	0.744	Skewness	0.803
Normal GOF Test			
Shapiro Wilk Test Statistic	0.897	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.933	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.166	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.15	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	468.4	95% Adjusted-CLT UCL (Chen-1995)	473.3
		95% Modified-t UCL (Johnson-1978)	469.5
Gamma GOF Test			
A-D Test Statistic	0.409	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.763	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.104	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.153	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	1.734	k star (bias corrected MLE)	1.601
Theta hat (MLE)	222.1	Theta star (bias corrected MLE)	240.7
nu hat (MLE)	117.9	nu star (bias corrected)	108.8
MLE Mean (bias corrected)	385.2	MLE Sd (bias corrected)	304.5
		Approximate Chi Square Value (0.05)	85.76
Adjusted Level of Significance	0.0422	Adjusted Chi Square Value	84.74

Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50)	488.8	95% Adjusted Gamma UCL (use when n<50)	494.7
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.953	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.933	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.098	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.15	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	3.813	Mean of logged Data	5.638
Maximum of Logged Data	6.966	SD of logged Data	0.861
Assuming Lognormal Distribution			
95% H-UCL	573.6	90% Chebyshev (MVUE) UCL	600.7
95% Chebyshev (MVUE) UCL	691.1	97.5% Chebyshev (MVUE) UCL	816.5
99% Chebyshev (MVUE) UCL	1063		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	466	95% Jackknife UCL	468.4
95% Standard Bootstrap UCL	465.3	95% Bootstrap-t UCL	473.3
95% Hall's Bootstrap UCL	472.1	95% Percentile Bootstrap UCL	466.3
95% BCA Bootstrap UCL	479.5		
90% Chebyshev(Mean, Sd) UCL	532.6	95% Chebyshev(Mean, Sd) UCL	599.4
97.5% Chebyshev(Mean, Sd) UCL	692.1	99% Chebyshev(Mean, Sd) UCL	874.2
Suggested UCL to Use			
95% Adjusted Gamma UCL	494.7		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
ChromiumVI_EST			
General Statistics			
Total Number of Observations	34	Number of Distinct Observations	28
		Number of Missing Observations	0
Minimum	0.15	Mean	0.212
Maximum	0.31	Median	0.206
SD	0.0398	Std. Error of Mean	0.00682
Coefficient of Variation	0.188	Skewness	0.968

Normal GOF Test			
Shapiro Wilk Test Statistic	0.921	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.933	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.128	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.15	Data appear Normal at 5% Significance Level	
Data appear Approximate Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	0.224	95% Adjusted-CLT UCL (Chen-1995)	0.224
		95% Modified-t UCL (Johnson-1978)	0.224
Gamma GOF Test			
A-D Test Statistic	0.494	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.746	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.103	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.151	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	31.46	k star (bias corrected MLE)	28.7
Theta hat (MLE)	0.00674	Theta star (bias corrected MLE)	0.00739
nu hat (MLE)	2139	nu star (bias corrected)	1952
MLE Mean (bias corrected)	0.212	MLE Sd (bias corrected)	0.0396
		Approximate Chi Square Value (0.05)	1850
Adjusted Level of Significance	0.0422	Adjusted Chi Square Value	1845
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	0.224	95% Adjusted Gamma UCL (use when n<50)	0.224
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.962	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.933	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.0915	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.15	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	-1.898	Mean of logged Data	-1.567
Maximum of Logged Data	-1.17	SD of logged Data	0.179
Assuming Lognormal Distribution			
95% H-UCL	0.224	90% Chebyshev (MVUE) UCL	0.232
95% Chebyshev (MVUE) UCL	0.24	97.5% Chebyshev (MVUE) UCL	0.253
99% Chebyshev (MVUE) UCL	0.277		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			

Nonparametric Distribution Free UCLs			
95% CLT UCL	0.223	95% Jackknife UCL	0.224
95% Standard Bootstrap UCL	0.223	95% Bootstrap-t UCL	0.225
95% Hall's Bootstrap UCL	0.225	95% Percentile Bootstrap UCL	0.223
95% BCA Bootstrap UCL	0.225		
90% Chebyshev(Mean, Sd) UCL	0.232	95% Chebyshev(Mean, Sd) UCL	0.242
97.5% Chebyshev(Mean, Sd) UCL	0.255	99% Chebyshev(Mean, Sd) UCL	0.28
Suggested UCL to Use			
95% Student's-t UCL	0.224		
When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test			
When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Cobalt			
General Statistics			
Total Number of Observations	34	Number of Distinct Observations	18
		Number of Missing Observations	0
Minimum	3	Mean	4.759
Maximum	7.3	Median	4.5
SD	0.95	Std. Error of Mean	0.163
Coefficient of Variation	0.2	Skewness	0.979
Normal GOF Test			
Shapiro Wilk Test Statistic	0.917	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.933	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.142	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.15	Data appear Normal at 5% Significance Level	
Data appear Approximate Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	5.034	95% Adjusted-CLT UCL (Chen-1995)	5.056
		95% Modified-t UCL (Johnson-1978)	5.039
Gamma GOF Test			
A-D Test Statistic	0.719	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.746	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.12	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.151	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			

Gamma Statistics			
k hat (MLE)	27.69	k star (bias corrected MLE)	25.27
Theta hat (MLE)	0.172	Theta star (bias corrected MLE)	0.188
nu hat (MLE)	1883	nu star (bias corrected)	1718
MLE Mean (bias corrected)	4.759	MLE Sd (bias corrected)	0.947
		Approximate Chi Square Value (0.05)	1623
Adjusted Level of Significance	0.0422	Adjusted Chi Square Value	1618
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	5.038	95% Adjusted Gamma UCL (use when n<50)	5.052
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.959	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.933	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.112	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.15	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	1.099	Mean of logged Data	1.542
Maximum of Logged Data	1.988	SD of logged Data	0.191
Assuming Lognormal Distribution			
95% H-UCL	5.044	90% Chebyshev (MVUE) UCL	5.229
95% Chebyshev (MVUE) UCL	5.443	97.5% Chebyshev (MVUE) UCL	5.739
99% Chebyshev (MVUE) UCL	6.322		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	5.027	95% Jackknife UCL	5.034
95% Standard Bootstrap UCL	5.021	95% Bootstrap-t UCL	5.074
95% Hall's Bootstrap UCL	5.071	95% Percentile Bootstrap UCL	5.029
95% BCA Bootstrap UCL	5.059		
90% Chebyshev(Mean, Sd) UCL	5.247	95% Chebyshev(Mean, Sd) UCL	5.469
97.5% Chebyshev(Mean, Sd) UCL	5.776	99% Chebyshev(Mean, Sd) UCL	6.379
Suggested UCL to Use			
95% Student's-t UCL	5.034		
When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test			
When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			

Copper

General Statistics

Total Number of Observations	34	Number of Distinct Observations	31
		Number of Missing Observations	0
Minimum	4.7	Mean	11.6
Maximum	18.6	Median	11.25
SD	3.464	Std. Error of Mean	0.594
Coefficient of Variation	0.299	Skewness	0.0366

Normal GOF Test

Shapiro Wilk Test Statistic	0.98	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.933	Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.0764	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.15	Data appear Normal at 5% Significance Level

Data appear Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	12.6	95% Adjusted-CLT UCL (Chen-1995)	12.58
		95% Modified-t UCL (Johnson-1978)	12.6

Gamma GOF Test

A-D Test Statistic	0.285	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.748	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.0823	**Kolmogorov-Smirnov Gamma GOF Test**
5% K-S Critical Value	0.151	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	10.45	k star (bias corrected MLE)	9.543
Theta hat (MLE)	1.11	Theta star (bias corrected MLE)	1.215
nu hat (MLE)	710.3	nu star (bias corrected)	648.9
MLE Mean (bias corrected)	11.6	MLE Sd (bias corrected)	3.754
		Approximate Chi Square Value (0.05)	590.8
Adjusted Level of Significance	0.0422	Adjusted Chi Square Value	588.1

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	12.74	95% Adjusted Gamma UCL (use when n<50)	12.8

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.95	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.933	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.105	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.15	Data appear Lognormal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	1.548	Mean of logged Data	2.402
Maximum of Logged Data	2.923	SD of logged Data	0.329
Assuming Lognormal Distribution			
95% H-UCL	12.94	90% Chebyshev (MVUE) UCL	13.65
95% Chebyshev (MVUE) UCL	14.57	97.5% Chebyshev (MVUE) UCL	15.83
99% Chebyshev (MVUE) UCL	18.31		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	12.57	95% Jackknife UCL	12.6
95% Standard Bootstrap UCL	12.57	95% Bootstrap-t UCL	12.64
95% Hall's Bootstrap UCL	12.58	95% Percentile Bootstrap UCL	12.56
95% BCA Bootstrap UCL	12.53		
90% Chebyshev(Mean, Sd) UCL	13.38	95% Chebyshev(Mean, Sd) UCL	14.19
97.5% Chebyshev(Mean, Sd) UCL	15.31	99% Chebyshev(Mean, Sd) UCL	17.51
Suggested UCL to Use			
95% Student's-t UCL	12.6		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Vanadium			
General Statistics			
Total Number of Observations	34	Number of Distinct Observations	31
		Number of Missing Observations	0
Minimum	4.9	Mean	11.49
Maximum	25.7	Median	9.75
SD	5.988	Std. Error of Mean	1.027
Coefficient of Variation	0.521	Skewness	1.102
Normal GOF Test			
Shapiro Wilk Test Statistic	0.863	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.933	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.148	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.15	Data appear Normal at 5% Significance Level	
Data appear Approximate Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	13.23	95% Adjusted-CLT UCL (Chen-1995)	13.39
		95% Modified-t UCL (Johnson-1978)	13.26

Gamma GOF Test			
A-D Test Statistic	0.654	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.751	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.0937	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.152	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	4.36	k star (bias corrected MLE)	3.995
Theta hat (MLE)	2.636	Theta star (bias corrected MLE)	2.877
nu hat (MLE)	296.5	nu star (bias corrected)	271.7
MLE Mean (bias corrected)	11.49	MLE Sd (bias corrected)	5.751
		Approximate Chi Square Value (0.05)	234.5
Adjusted Level of Significance	0.0422	Adjusted Chi Square Value	232.8
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	13.32	95% Adjusted Gamma UCL (use when n<50)	13.41
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.942	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.933	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.0898	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.15	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	1.589	Mean of logged Data	2.323
Maximum of Logged Data	3.246	SD of logged Data	0.487
Assuming Lognormal Distribution			
95% H-UCL	13.53	90% Chebyshev (MVUE) UCL	14.44
95% Chebyshev (MVUE) UCL	15.8	97.5% Chebyshev (MVUE) UCL	17.68
99% Chebyshev (MVUE) UCL	21.38		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	13.18	95% Jackknife UCL	13.23
95% Standard Bootstrap UCL	13.13	95% Bootstrap-t UCL	13.45
95% Hall's Bootstrap UCL	13.27	95% Percentile Bootstrap UCL	13.27
95% BCA Bootstrap UCL	13.4		
90% Chebyshev(Mean, Sd) UCL	14.57	95% Chebyshev(Mean, Sd) UCL	15.97
97.5% Chebyshev(Mean, Sd) UCL	17.91	99% Chebyshev(Mean, Sd) UCL	21.71
Suggested UCL to Use			
95% Student's-t UCL	13.23		

When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test

When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Zinc

General Statistics

Total Number of Observations	34	Number of Distinct Observations	34
		Number of Missing Observations	0
Minimum	25.3	Mean	57.42
Maximum	150	Median	49.05
SD	31.48	Std. Error of Mean	5.399
Coefficient of Variation	0.548	Skewness	1.375

Normal GOF Test

Shapiro Wilk Test Statistic	0.854	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.933	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.154	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.15	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	66.56	95% Adjusted-CLT UCL (Chen-1995)	67.66
		95% Modified-t UCL (Johnson-1978)	66.77

Gamma GOF Test

A-D Test Statistic	0.733	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.752	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.13	**Kolmogorov-Smirnov Gamma GOF Test**
5% K-S Critical Value	0.152	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	4.118	k star (bias corrected MLE)	3.774
Theta hat (MLE)	13.94	Theta star (bias corrected MLE)	15.21
nu hat (MLE)	280	nu star (bias corrected)	256.6
MLE Mean (bias corrected)	57.42	MLE Sd (bias corrected)	29.56
		Approximate Chi Square Value (0.05)	220.5
Adjusted Level of Significance	0.0422	Adjusted Chi Square Value	218.9

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50)	66.82	95% Adjusted Gamma UCL (use when n<50)	67.32

Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.939	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.933	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.125	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.15	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	3.231	Mean of logged Data	3.924
Maximum of Logged Data	5.011	SD of logged Data	0.498
Assuming Lognormal Distribution			
95% H-UCL	67.76	90% Chebyshev (MVUE) UCL	72.34
95% Chebyshev (MVUE) UCL	79.26	97.5% Chebyshev (MVUE) UCL	88.87
99% Chebyshev (MVUE) UCL	107.7		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	66.3	95% Jackknife UCL	66.56
95% Standard Bootstrap UCL	65.95	95% Bootstrap-t UCL	68.7
95% Hall's Bootstrap UCL	68.47	95% Percentile Bootstrap UCL	66.13
95% BCA Bootstrap UCL	68.04		
90% Chebyshev(Mean, Sd) UCL	73.62	95% Chebyshev(Mean, Sd) UCL	80.95
97.5% Chebyshev(Mean, Sd) UCL	91.14	99% Chebyshev(Mean, Sd) UCL	111.1
Suggested UCL to Use			
95% Adjusted Gamma UCL	67.32		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Selenium			
General Statistics			
Total Number of Observations	34	Number of Distinct Observations	14
Number of Detects	3	Number of Non-Detects	31
Number of Distinct Detects	3	Number of Distinct Non-Detects	11
Minimum Detect	0.52	Minimum Non-Detect	0.23
Maximum Detect	0.64	Maximum Non-Detect	0.46
Variance Detects	0.00363	Percent Non-Detects	91.18%
Mean Detects	0.577	SD Detects	0.0603
Median Detects	0.57	CV Detects	0.105
Skewness Detects	0.492	Kurtosis Detects	N/A
Mean of Logged Detects	-0.554	SD of Logged Detects	0.104

Warning: Data set has only 3 Detected Values.			
This is not enough to compute meaningful or reliable statistics and estimates.			
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.991	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.767	Detected Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.211	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.425	Detected Data appear Normal at 5% Significance Level	
Detected Data appear Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.261	KM Standard Error of Mean	0.0209
KM SD	0.0994	95% KM (BCA) UCL	N/A
95% KM (t) UCL	0.296	95% KM (Percentile Bootstrap) UCL	N/A
95% KM (z) UCL	0.295	95% KM Bootstrap t UCL	N/A
90% KM Chebyshev UCL	0.323	95% KM Chebyshev UCL	0.352
97.5% KM Chebyshev UCL	0.391	99% KM Chebyshev UCL	0.468
Gamma GOF Tests on Detected Observations Only			
Not Enough Data to Perform GOF Test			
Gamma Statistics on Detected Data Only			
k hat (MLE)	138.3	k star (bias corrected MLE)	N/A
Theta hat (MLE)	0.00417	Theta star (bias corrected MLE)	N/A
nu hat (MLE)	829.7	nu star (bias corrected)	N/A
Mean (detects)	0.577		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	0.2
Maximum	0.64	Median	0.162
SD	0.157	CV	0.787
k hat (MLE)	1.216	k star (bias corrected MLE)	1.129
Theta hat (MLE)	0.164	Theta star (bias corrected MLE)	0.177
nu hat (MLE)	82.7	nu star (bias corrected)	76.74
Adjusted Level of Significance (β)	0.0422		
Approximate Chi Square Value (76.74, α)	57.56	Adjusted Chi Square Value (76.74, β)	56.74
95% Gamma Approximate UCL (use when n>=50)	0.267	95% Gamma Adjusted UCL (use when n<50)	N/A
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.261	SD (KM)	0.0994
Variance (KM)	0.00988	SE of Mean (KM)	0.0209
k hat (KM)	6.872	k star (KM)	6.285
nu hat (KM)	467.3	nu star (KM)	427.4

theta hat (KM)	0.0379	theta star (KM)	0.0415
80% gamma percentile (KM)	0.342	90% gamma percentile (KM)	0.399
95% gamma percentile (KM)	0.452	99% gamma percentile (KM)	0.561
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (427.38, α)	380.5	Adjusted Chi Square Value (427.38, β)	378.3
95% Gamma Approximate KM-UCL (use when n>=50)	0.293	95% Gamma Adjusted KM-UCL (use when n<50)	0.294
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.996	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.767	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.197	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.425	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.302	Mean in Log Scale	-1.246
SD in Original Scale	0.104	SD in Log Scale	0.3
95% t UCL (assumes normality of ROS data)	0.332	95% Percentile Bootstrap UCL	0.332
95% BCA Bootstrap UCL	0.34	95% Bootstrap t UCL	0.342
95% H-UCL (Log ROS)	0.331		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-1.389	KM Geo Mean	0.249
KM SD (logged)	0.261	95% Critical H Value (KM-Log)	1.777
KM Standard Error of Mean (logged)	0.0548	95% H-UCL (KM -Log)	0.28
KM SD (logged)	0.261	95% Critical H Value (KM-Log)	1.777
KM Standard Error of Mean (logged)	0.0548		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.177	Mean in Log Scale	-1.865
SD in Original Scale	0.13	SD in Log Scale	0.444
95% t UCL (Assumes normality)	0.215	95% H-Stat UCL	0.198
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Normal Distributed at 5% Significance Level			
Suggested UCL to Use			
95% KM (t) UCL	0.296		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Naphthalene			

ProUCL Output
Eastern Undeveloped Area Soil (0-12 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

General Statistics			
Total Number of Observations	34	Number of Distinct Observations	24
Number of Detects	16	Number of Non-Detects	18
Number of Distinct Detects	15	Number of Distinct Non-Detects	10
Minimum Detect	0.0016	Minimum Non-Detect	0.0013
Maximum Detect	0.021	Maximum Non-Detect	0.069
Variance Detects	2.2849E-5	Percent Non-Detects	52.94%
Mean Detects	0.00571	SD Detects	0.00478
Median Detects	0.0051	CV Detects	0.837
Skewness Detects	2.339	Kurtosis Detects	6.977
Mean of Logged Detects	-5.418	SD of Logged Detects	0.719
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.752	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.887	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.195	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.213	Detected Data appear Normal at 5% Significance Level	
Detected Data appear Approximate Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.00367	KM Standard Error of Mean	7.3236E-4
KM SD	0.00394	95% KM (BCA) UCL	0.00508
95% KM (t) UCL	0.00491	95% KM (Percentile Bootstrap) UCL	0.00494
95% KM (z) UCL	0.00488	95% KM Bootstrap t UCL	0.00545
90% KM Chebyshev UCL	0.00587	95% KM Chebyshev UCL	0.00687
97.5% KM Chebyshev UCL	0.00825	99% KM Chebyshev UCL	0.011
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	0.422	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.75	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.142	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.218	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	2.125	k star (bias corrected MLE)	1.768
Theta hat (MLE)	0.00269	Theta star (bias corrected MLE)	0.00323
nu hat (MLE)	68	nu star (bias corrected)	56.59
Mean (detects)	0.00571		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.0016	Mean	0.00798
Maximum	0.021	Median	0.01
SD	0.00389	CV	0.487

k hat (MLE)	3.335	k star (bias corrected MLE)	3.06
Theta hat (MLE)	0.00239	Theta star (bias corrected MLE)	0.00261
nu hat (MLE)	226.8	nu star (bias corrected)	208.1
Adjusted Level of Significance (β)	0.0422		
Approximate Chi Square Value (208.08, α)	175.7	Adjusted Chi Square Value (208.08, β)	174.2
95% Gamma Approximate UCL (use when n>=50)	0.00945	95% Gamma Adjusted UCL (use when n<50)	0.00953
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.00367	SD (KM)	0.00394
Variance (KM)	1.5552E-5	SE of Mean (KM)	7.3236E-4
k hat (KM)	0.868	k star (KM)	0.811
nu hat (KM)	58.99	nu star (KM)	55.12
theta hat (KM)	0.00423	theta star (KM)	0.00453
80% gamma percentile (KM)	0.006	90% gamma percentile (KM)	0.0089
95% gamma percentile (KM)	0.0119	99% gamma percentile (KM)	0.0188
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (55.12, α)	39.06	Adjusted Chi Square Value (55.12, β)	38.39
95% Gamma Approximate KM-UCL (use when n>=50)	0.00518	95% Gamma Adjusted KM-UCL (use when n<50)	0.00527
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.949	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.887	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.132	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.213	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.00332	Mean in Log Scale	-6.174
SD in Original Scale	0.00397	SD in Log Scale	0.941
95% t UCL (assumes normality of ROS data)	0.00447	95% Percentile Bootstrap UCL	0.00452
95% BCA Bootstrap UCL	0.00498	95% Bootstrap t UCL	0.00525
95% H-UCL (Log ROS)	0.00479		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-5.972	KM Geo Mean	0.00255
KM SD (logged)	0.786	95% Critical H Value (KM-Log)	2.206
KM Standard Error of Mean (logged)	0.149	95% H-UCL (KM -Log)	0.0047
KM SD (logged)	0.786	95% Critical H Value (KM-Log)	2.206
KM Standard Error of Mean (logged)	0.149		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.00542	Mean in Log Scale	-5.949
SD in Original Scale	0.00807	SD in Log Scale	1.189
95% t UCL (Assumes normality)	0.00776	95% H-Stat UCL	0.00922
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			

ProUCL Output
Eastern Undeveloped Area Soil (0-12 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Detected Data appear Approximate Normal Distributed at 5% Significance Level			
Suggested UCL to Use			
95% KM (t) UCL	0.00491		
When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test			
When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			

ProUCL Output
North-Central Undeveloped Area Soil (0-0.5 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

UCL Statistics for Data Sets with Non-Detects	
User Selected Options	
Date/Time of Computation	ProUCL 5.11/28/2019 1:51:03 PM
From File	20190128_NCenUndev_ProUCL_input.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Fluoride

General Statistics

Total Number of Observations	23	Number of Distinct Observations	23
		Number of Missing Observations	0
Minimum	2.22	Mean	9.136
Maximum	27.6	Median	7.27
SD	5.902	Std. Error of Mean	1.231
Coefficient of Variation	0.646	Skewness	1.455

Normal GOF Test

Shapiro Wilk Test Statistic	0.878	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.914	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.163	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.18	Data appear Normal at 5% Significance Level	

Data appear Approximate Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	11.25	95% Adjusted-CLT UCL (Chen-1995)	11.56
		95% Modified-t UCL (Johnson-1978)	11.31

Gamma GOF Test

A-D Test Statistic	0.243	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.751	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.0886	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.183	Detected data appear Gamma Distributed at 5% Significance Level	

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	2.786	k star (bias corrected MLE)	2.452
Theta hat (MLE)	3.279	Theta star (bias corrected MLE)	3.726
nu hat (MLE)	128.2	nu star (bias corrected)	112.8
MLE Mean (bias corrected)	9.136	MLE Sd (bias corrected)	5.834
		Approximate Chi Square Value (0.05)	89.27
Adjusted Level of Significance	0.0389	Adjusted Chi Square Value	87.75

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	11.54	95% Adjusted Gamma UCL (use when n<50)	11.74

Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.978	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.914	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.104	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.18	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	0.798	Mean of logged Data	2.022
Maximum of Logged Data	3.318	SD of logged Data	0.642
Assuming Lognormal Distribution			
95% H-UCL	12.39	90% Chebyshev (MVUE) UCL	13.11
95% Chebyshev (MVUE) UCL	14.89	97.5% Chebyshev (MVUE) UCL	17.35
99% Chebyshev (MVUE) UCL	22.2		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	11.16	95% Jackknife UCL	11.25
95% Standard Bootstrap UCL	11.18	95% Bootstrap-t UCL	12
95% Hall's Bootstrap UCL	12.34	95% Percentile Bootstrap UCL	11.09
95% BCA Bootstrap UCL	11.57		
90% Chebyshev(Mean, Sd) UCL	12.83	95% Chebyshev(Mean, Sd) UCL	14.5
97.5% Chebyshev(Mean, Sd) UCL	16.82	99% Chebyshev(Mean, Sd) UCL	21.38
Suggested UCL to Use			
95% Student's-t UCL	11.25		
When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test			
When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
BenzoBFluoranthene			
General Statistics			
Total Number of Observations	23	Number of Distinct Observations	21
Number of Detects	22	Number of Non-Detects	1
Number of Distinct Detects	20	Number of Distinct Non-Detects	1
Minimum Detect	0.0048	Minimum Non-Detect	0.021
Maximum Detect	0.51	Maximum Non-Detect	0.021
Variance Detects	0.0162	Percent Non-Detects	4.348%
Mean Detects	0.119	SD Detects	0.127
Median Detects	0.088	CV Detects	1.071
Skewness Detects	2.03	Kurtosis Detects	4.187

Mean of Logged Detects	-2.692	SD of Logged Detects	1.212
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.758	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.911	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.255	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.184	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.114	KM Standard Error of Mean	0.0264
KM SD	0.124	95% KM (BCA) UCL	0.161
95% KM (t) UCL	0.16	95% KM (Percentile Bootstrap) UCL	0.161
95% KM (z) UCL	0.158	95% KM Bootstrap t UCL	0.192
90% KM Chebyshev UCL	0.193	95% KM Chebyshev UCL	0.229
97.5% KM Chebyshev UCL	0.279	99% KM Chebyshev UCL	0.377
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	0.45	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.77	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.126	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.191	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	1.024	k star (bias corrected MLE)	0.914
Theta hat (MLE)	0.116	Theta star (bias corrected MLE)	0.13
nu hat (MLE)	45.05	nu star (bias corrected)	40.24
Mean (detects)	0.119		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.0048	Mean	0.114
Maximum	0.51	Median	0.086
SD	0.126	CV	1.107
k hat (MLE)	0.959	k star (bias corrected MLE)	0.863
Theta hat (MLE)	0.119	Theta star (bias corrected MLE)	0.132
nu hat (MLE)	44.12	nu star (bias corrected)	39.7
Adjusted Level of Significance (β)	0.0389		
Approximate Chi Square Value (39.70, α)	26.26	Adjusted Chi Square Value (39.70, β)	25.47
95% Gamma Approximate UCL (use when n>=50)	0.173	95% Gamma Adjusted UCL (use when n<50)	0.178
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.114	SD (KM)	0.124
Variance (KM)	0.0153	SE of Mean (KM)	0.0264
k hat (KM)	0.855	k star (KM)	0.772

nu hat (KM)	39.32	nu star (KM)	35.52
theta hat (KM)	0.134	theta star (KM)	0.148
80% gamma percentile (KM)	0.187	90% gamma percentile (KM)	0.28
95% gamma percentile (KM)	0.375	99% gamma percentile (KM)	0.601
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (35.52, α)	22.89	Adjusted Chi Square Value (35.52, β)	22.15
95% Gamma Approximate KM-UCL (use when n>=50)	0.177	95% Gamma Adjusted KM-UCL (use when n<50)	0.183
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.941	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.911	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.191	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.184	Detected Data Not Lognormal at 5% Significance Level	
Detected Data appear Approximate Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.114	Mean in Log Scale	-2.759
SD in Original Scale	0.126	SD in Log Scale	1.226
95% t UCL (assumes normality of ROS data)	0.16	95% Percentile Bootstrap UCL	0.159
95% BCA Bootstrap UCL	0.166	95% Bootstrap t UCL	0.192
95% H-UCL (Log ROS)	0.282		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-2.771	KM Geo Mean	0.0626
KM SD (logged)	1.219	95% Critical H Value (KM-Log)	2.828
KM Standard Error of Mean (logged)	0.261	95% H-UCL (KM -Log)	0.275
KM SD (logged)	1.219	95% Critical H Value (KM-Log)	2.828
KM Standard Error of Mean (logged)	0.261		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.114	Mean in Log Scale	-2.773
SD in Original Scale	0.126	SD in Log Scale	1.246
95% t UCL (Assumes normality)	0.159	95% H-Stat UCL	0.291
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Gamma Distributed at 5% Significance Level			
Suggested UCL to Use			
Adjusted KM-UCL (use when k<=1 and 15 < n < 50 but k<=1)	0.183		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
BenzoAPyrene			

ProUCL Output
North-Central Undeveloped Area Soil (0-0.5 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

General Statistics			
Total Number of Observations	23	Number of Distinct Observations	20
Number of Detects	22	Number of Non-Detects	1
Number of Distinct Detects	19	Number of Distinct Non-Detects	1
Minimum Detect	0.0042	Minimum Non-Detect	0.016
Maximum Detect	0.22	Maximum Non-Detect	0.016
Variance Detects	0.0032	Percent Non-Detects	4.348%
Mean Detects	0.0625	SD Detects	0.0565
Median Detects	0.0485	CV Detects	0.904
Skewness Detects	1.426	Kurtosis Detects	1.811
Mean of Logged Detects	-3.244	SD of Logged Detects	1.126
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.852	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.911	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.21	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.184	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.0601	KM Standard Error of Mean	0.0118
KM SD	0.0552	95% KM (BCA) UCL	0.0811
95% KM (t) UCL	0.0804	95% KM (Percentile Bootstrap) UCL	0.0802
95% KM (z) UCL	0.0795	95% KM Bootstrap t UCL	0.0881
90% KM Chebyshev UCL	0.0955	95% KM Chebyshev UCL	0.111
97.5% KM Chebyshev UCL	0.134	99% KM Chebyshev UCL	0.177
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	0.308	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.766	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.127	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.19	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	1.198	k star (bias corrected MLE)	1.065
Theta hat (MLE)	0.0522	Theta star (bias corrected MLE)	0.0587
nu hat (MLE)	52.7	nu star (bias corrected)	46.85
Mean (detects)	0.0625		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.0042	Mean	0.0602
Maximum	0.22	Median	0.047
SD	0.0563	CV	0.935
k hat (MLE)	1.15	k star (bias corrected MLE)	1.029

Theta hat (MLE)	0.0524	Theta star (bias corrected MLE)	0.0586
nu hat (MLE)	52.88	nu star (bias corrected)	47.32
Adjusted Level of Significance (β)	0.0389		
Approximate Chi Square Value (47.32, α)	32.53	Adjusted Chi Square Value (47.32, β)	31.64
95% Gamma Approximate UCL (use when n>=50)	0.0876	95% Gamma Adjusted UCL (use when n<50)	0.0901
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.0601	SD (KM)	0.0552
Variance (KM)	0.00304	SE of Mean (KM)	0.0118
k hat (KM)	1.188	k star (KM)	1.062
nu hat (KM)	54.66	nu star (KM)	48.86
theta hat (KM)	0.0506	theta star (KM)	0.0566
80% gamma percentile (KM)	0.0963	90% gamma percentile (KM)	0.136
95% gamma percentile (KM)	0.176	99% gamma percentile (KM)	0.269
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (48.86, α)	33.82	Adjusted Chi Square Value (48.86, β)	32.91
95% Gamma Approximate KM-UCL (use when n>=50)	0.0869	95% Gamma Adjusted KM-UCL (use when n<50)	0.0893
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.93	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.911	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.191	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.184	Detected Data Not Lognormal at 5% Significance Level	
Detected Data appear Approximate Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.0602	Mean in Log Scale	-3.306
SD in Original Scale	0.0563	SD in Log Scale	1.139
95% t UCL (assumes normality of ROS data)	0.0804	95% Percentile Bootstrap UCL	0.0801
95% BCA Bootstrap UCL	0.0846	95% Bootstrap t UCL	0.088
95% H-UCL (Log ROS)	0.136		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-3.319	KM Geo Mean	0.0362
KM SD (logged)	1.135	95% Critical H Value (KM-Log)	2.708
KM Standard Error of Mean (logged)	0.243	95% H-UCL (KM -Log)	0.133
KM SD (logged)	1.135	95% Critical H Value (KM-Log)	2.708
KM Standard Error of Mean (logged)	0.243		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.0602	Mean in Log Scale	-3.313
SD in Original Scale	0.0564	SD in Log Scale	1.148
95% t UCL (Assumes normality)	0.0804	95% H-Stat UCL	0.137
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Gamma Distributed at 5% Significance Level			

Suggested UCL to Use			
95% KM Adjusted Gamma UCL	0.0893	95% GROS Adjusted Gamma UCL	0.0901

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

BenzoAAnthracene

General Statistics			
Total Number of Observations	23	Number of Distinct Observations	21
Number of Detects	21	Number of Non-Detects	2
Number of Distinct Detects	20	Number of Distinct Non-Detects	2
Minimum Detect	0.0034	Minimum Non-Detect	0.034
Maximum Detect	0.14	Maximum Non-Detect	0.044
Variance Detects	0.00177	Percent Non-Detects	8.696%
Mean Detects	0.0491	SD Detects	0.042
Median Detects	0.038	CV Detects	0.856
Skewness Detects	1.021	Kurtosis Detects	0.0135
Mean of Logged Detects	-3.463	SD of Logged Detects	1.095

Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.865	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.908	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.216	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.188	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.0464	KM Standard Error of Mean	0.00867
KM SD	0.0404	95% KM (BCA) UCL	0.0614
95% KM (t) UCL	0.0612	95% KM (Percentile Bootstrap) UCL	0.0604
95% KM (z) UCL	0.0606	95% KM Bootstrap t UCL	0.0648
90% KM Chebyshev UCL	0.0724	95% KM Chebyshev UCL	0.0841
97.5% KM Chebyshev UCL	0.1	99% KM Chebyshev UCL	0.133

Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	0.387	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.764	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.123	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.194	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			

Gamma Statistics on Detected Data Only			
k hat (MLE)	1.254	k star (bias corrected MLE)	1.107
Theta hat (MLE)	0.0392	Theta star (bias corrected MLE)	0.0444
nu hat (MLE)	52.67	nu star (bias corrected)	46.48
Mean (detects)	0.0491		

Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.0034	Mean	0.0462
Maximum	0.14	Median	0.037
SD	0.0413	CV	0.894
k hat (MLE)	1.246	k star (bias corrected MLE)	1.113
Theta hat (MLE)	0.037	Theta star (bias corrected MLE)	0.0415
nu hat (MLE)	57.33	nu star (bias corrected)	51.19
Adjusted Level of Significance (β)	0.0389		
Approximate Chi Square Value (51.19, α)	35.76	Adjusted Chi Square Value (51.19, β)	34.82
95% Gamma Approximate UCL (use when n>=50)	0.0661	95% Gamma Adjusted UCL (use when n<50)	0.0679
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.0464	SD (KM)	0.0404
Variance (KM)	0.00163	SE of Mean (KM)	0.00867
k hat (KM)	1.318	k star (KM)	1.175
nu hat (KM)	60.62	nu star (KM)	54.04
theta hat (KM)	0.0352	theta star (KM)	0.0395
80% gamma percentile (KM)	0.0735	90% gamma percentile (KM)	0.103
95% gamma percentile (KM)	0.131	99% gamma percentile (KM)	0.197
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (54.04, α)	38.15	Adjusted Chi Square Value (54.04, β)	37.18
95% Gamma Approximate KM-UCL (use when n>=50)	0.0657	95% Gamma Adjusted KM-UCL (use when n<50)	0.0674
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.928	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.908	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.185	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.188	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.046	Mean in Log Scale	-3.536
SD in Original Scale	0.0414	SD in Log Scale	1.073
95% t UCL (assumes normality of ROS data)	0.0608	95% Percentile Bootstrap UCL	0.0602
95% BCA Bootstrap UCL	0.0633	95% Bootstrap t UCL	0.0634
95% H-UCL (Log ROS)	0.0943		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-3.542	KM Geo Mean	0.029
KM SD (logged)	1.082	95% Critical H Value (KM-Log)	2.635
KM Standard Error of Mean (logged)	0.238	95% H-UCL (KM -Log)	0.0954
KM SD (logged)	1.082	95% Critical H Value (KM-Log)	2.635
KM Standard Error of Mean (logged)	0.238		

DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.0465	Mean in Log Scale	-3.505
SD in Original Scale	0.041	SD in Log Scale	1.054
95% t UCL (Assumes normality)	0.0612	95% H-Stat UCL	0.0938
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Gamma Distributed at 5% Significance Level			
Suggested UCL to Use			
95% KM Adjusted Gamma UCL	0.0674	95% GROS Adjusted Gamma UCL	0.0679
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Cyanide			
General Statistics			
Total Number of Observations	23	Number of Distinct Observations	19
Number of Detects	12	Number of Non-Detects	11
Number of Distinct Detects	10	Number of Distinct Non-Detects	9
Minimum Detect	0.042	Minimum Non-Detect	0.026
Maximum Detect	0.3	Maximum Non-Detect	0.098
Variance Detects	0.00583	Percent Non-Detects	47.83%
Mean Detects	0.175	SD Detects	0.0764
Median Detects	0.155	CV Detects	0.436
Skewness Detects	0.192	Kurtosis Detects	-0.579
Mean of Logged Detects	-1.851	SD of Logged Detects	0.532
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.948	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.859	Detected Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.162	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.243	Detected Data appear Normal at 5% Significance Level	
Detected Data appear Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.107	KM Standard Error of Mean	0.0195
KM SD	0.0886	95% KM (BCA) UCL	0.144
95% KM (t) UCL	0.141	95% KM (Percentile Bootstrap) UCL	0.143
95% KM (z) UCL	0.139	95% KM Bootstrap t UCL	0.145
90% KM Chebyshev UCL	0.166	95% KM Chebyshev UCL	0.192
97.5% KM Chebyshev UCL	0.229	99% KM Chebyshev UCL	0.301
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	0.367	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.733	Detected data appear Gamma Distributed at 5% Significance Level	

K-S Test Statistic	0.185	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.246	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	4.74	k star (bias corrected MLE)	3.61
Theta hat (MLE)	0.037	Theta star (bias corrected MLE)	0.0485
nu hat (MLE)	113.8	nu star (bias corrected)	86.65
Mean (detects)	0.175		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	0.104
Maximum	0.3	Median	0.0603
SD	0.0933	CV	0.893
k hat (MLE)	1.182	k star (bias corrected MLE)	1.057
Theta hat (MLE)	0.0884	Theta star (bias corrected MLE)	0.0988
nu hat (MLE)	54.38	nu star (bias corrected)	48.62
Adjusted Level of Significance (β)	0.0389		
Approximate Chi Square Value (48.62, α)	33.61	Adjusted Chi Square Value (48.62, β)	32.71
95% Gamma Approximate UCL (use when n>=50)	0.151	95% Gamma Adjusted UCL (use when n<50)	0.155
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.107	SD (KM)	0.0886
Variance (KM)	0.00784	SE of Mean (KM)	0.0195
k hat (KM)	1.468	k star (KM)	1.305
nu hat (KM)	67.52	nu star (KM)	60.05
theta hat (KM)	0.0731	theta star (KM)	0.0822
80% gamma percentile (KM)	0.168	90% gamma percentile (KM)	0.231
95% gamma percentile (KM)	0.293	99% gamma percentile (KM)	0.433
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (60.05, α)	43.23	Adjusted Chi Square Value (60.05, β)	42.2
95% Gamma Approximate KM-UCL (use when n>=50)	0.149	95% Gamma Adjusted KM-UCL (use when n<50)	0.153
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.884	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.859	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.223	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.243	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.114	Mean in Log Scale	-2.436
SD in Original Scale	0.085	SD in Log Scale	0.742
95% t UCL (assumes normality of ROS data)	0.144	95% Percentile Bootstrap UCL	0.144

95% BCA Bootstrap UCL	0.145	95% Bootstrap t UCL	0.149
95% H-UCL (Log ROS)	0.164		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-2.607	KM Geo Mean	0.0737
KM SD (logged)	0.886	95% Critical H Value (KM-Log)	2.382
KM Standard Error of Mean (logged)	0.211	95% H-UCL (KM -Log)	0.171
KM SD (logged)	0.886	95% Critical H Value (KM-Log)	2.382
KM Standard Error of Mean (logged)	0.211		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.109	Mean in Log Scale	-2.567
SD in Original Scale	0.0892	SD in Log Scale	0.885
95% t UCL (Assumes normality)	0.141	95% H-Stat UCL	0.178
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Normal Distributed at 5% Significance Level			
Suggested UCL to Use			
95% KM (t) UCL	0.141		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Aluminum			
General Statistics			
Total Number of Observations	23	Number of Distinct Observations	22
		Number of Missing Observations	0
Minimum	7750	Mean	17334
Maximum	27400	Median	16300
SD	5391	Std. Error of Mean	1124
Coefficient of Variation	0.311	Skewness	0.196
Normal GOF Test			
Shapiro Wilk Test Statistic	0.959	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.914	Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.141	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.18	Data appear Normal at 5% Significance Level	
Data appear Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	19264	95% Adjusted-CLT UCL (Chen-1995)	19232
		95% Modified-t UCL (Johnson-1978)	19272

Gamma GOF Test			
A-D Test Statistic	0.398	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.744	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.14	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.182	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	10.08	k star (bias corrected MLE)	8.793
Theta hat (MLE)	1720	Theta star (bias corrected MLE)	1971
nu hat (MLE)	463.6	nu star (bias corrected)	404.5
MLE Mean (bias corrected)	17334	MLE Sd (bias corrected)	5846
		Approximate Chi Square Value (0.05)	358.9
Adjusted Level of Significance	0.0389	Adjusted Chi Square Value	355.7
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	19537	95% Adjusted Gamma UCL (use when n<50)	19708
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.944	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.914	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.162	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.18	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	8.955	Mean of logged Data	9.71
Maximum of Logged Data	10.22	SD of logged Data	0.335
Assuming Lognormal Distribution			
95% H-UCL	19887	90% Chebyshev (MVUE) UCL	21098
95% Chebyshev (MVUE) UCL	22778	97.5% Chebyshev (MVUE) UCL	25110
99% Chebyshev (MVUE) UCL	29692		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	19183	95% Jackknife UCL	19264
95% Standard Bootstrap UCL	19173	95% Bootstrap-t UCL	19267
95% Hall's Bootstrap UCL	19219	95% Percentile Bootstrap UCL	19139
95% BCA Bootstrap UCL	19103		
90% Chebyshev(Mean, Sd) UCL	20706	95% Chebyshev(Mean, Sd) UCL	22234
97.5% Chebyshev(Mean, Sd) UCL	24354	99% Chebyshev(Mean, Sd) UCL	28518
Suggested UCL to Use			
95% Student's-t UCL	19264		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Iron

General Statistics

Total Number of Observations	23	Number of Distinct Observations	22
		Number of Missing Observations	0
Minimum	6490	Mean	14240
Maximum	23400	Median	14900
SD	3905	Std. Error of Mean	814.2
Coefficient of Variation	0.274	Skewness	-0.161

Normal GOF Test

Shapiro Wilk Test Statistic	0.957	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.914	Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.145	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.18	Data appear Normal at 5% Significance Level

Data appear Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	15638	95% Adjusted-CLT UCL (Chen-1995)	15550
		95% Modified-t UCL (Johnson-1978)	15633

Gamma GOF Test

A-D Test Statistic	0.76	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.744	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.181	**Kolmogorov-Smirnov Gamma GOF Test**
5% K-S Critical Value	0.181	Detected data appear Gamma Distributed at 5% Significance Level

Detected data follow Appr. Gamma Distribution at 5% Significance Level

Gamma Statistics

k hat (MLE)	12.06	k star (bias corrected MLE)	10.51
Theta hat (MLE)	1181	Theta star (bias corrected MLE)	1355
nu hat (MLE)	554.6	nu star (bias corrected)	483.6
MLE Mean (bias corrected)	14240	MLE Sd (bias corrected)	4392
		Approximate Chi Square Value (0.05)	433.6
Adjusted Level of Significance	0.0389	Adjusted Chi Square Value	430.1

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	15881	95% Adjusted Gamma UCL (use when n<50)	16008

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.898	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.914	Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.194	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.18	Data Not Lognormal at 5% Significance Level

Data Not Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	8.778	Mean of logged Data	9.522
Maximum of Logged Data	10.06	SD of logged Data	0.312
Assuming Lognormal Distribution			
95% H-UCL	16184	90% Chebyshev (MVUE) UCL	17132
95% Chebyshev (MVUE) UCL	18414	97.5% Chebyshev (MVUE) UCL	20194
99% Chebyshev (MVUE) UCL	23690		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	15579	95% Jackknife UCL	15638
95% Standard Bootstrap UCL	15558	95% Bootstrap-t UCL	15642
95% Hall's Bootstrap UCL	15615	95% Percentile Bootstrap UCL	15534
95% BCA Bootstrap UCL	15530		
90% Chebyshev(Mean, Sd) UCL	16682	95% Chebyshev(Mean, Sd) UCL	17788
97.5% Chebyshev(Mean, Sd) UCL	19324	99% Chebyshev(Mean, Sd) UCL	22340
Suggested UCL to Use			
95% Student's-t UCL	15638		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Note: For highly negatively-skewed data, confidence limits (e.g., Chen, Johnson, Lognormal, and Gamma) may not be			
reliable. Chen's and Johnson's methods provide adjustments for positvely skewed data sets.			
Manganese			
General Statistics			
Total Number of Observations	23	Number of Distinct Observations	23
		Number of Missing Observations	0
Minimum	49.4	Mean	617.3
Maximum	1940	Median	553
SD	376.1	Std. Error of Mean	78.41
Coefficient of Variation	0.609	Skewness	1.938
Normal GOF Test			
Shapiro Wilk Test Statistic	0.827	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.914	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.18	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.18	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			

Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	752	95% Adjusted-CLT UCL (Chen-1995)	780.2
		95% Modified-t UCL (Johnson-1978)	757.3
Gamma GOF Test			
A-D Test Statistic	1.012	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.752	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.214	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.183	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	2.605	k star (bias corrected MLE)	2.294
Theta hat (MLE)	237	Theta star (bias corrected MLE)	269.1
nu hat (MLE)	119.8	nu star (bias corrected)	105.5
MLE Mean (bias corrected)	617.3	MLE Sd (bias corrected)	407.6
		Approximate Chi Square Value (0.05)	82.83
Adjusted Level of Significance	0.0389	Adjusted Chi Square Value	81.38
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	786.6	95% Adjusted Gamma UCL (use when n<50)	800.7
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.827	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.914	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.262	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.18	Data Not Lognormal at 5% Significance Level	
Data Not Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	3.9	Mean of logged Data	6.221
Maximum of Logged Data	7.57	SD of logged Data	0.756
Assuming Lognormal Distribution			
95% H-UCL	958.8	90% Chebyshev (MVUE) UCL	996.9
95% Chebyshev (MVUE) UCL	1150	97.5% Chebyshev (MVUE) UCL	1362
99% Chebyshev (MVUE) UCL	1779		
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution (0.05)			
Nonparametric Distribution Free UCLs			
95% CLT UCL	746.3	95% Jackknife UCL	752
95% Standard Bootstrap UCL	742.9	95% Bootstrap-t UCL	815.4
95% Hall's Bootstrap UCL	1469	95% Percentile Bootstrap UCL	755.4
95% BCA Bootstrap UCL	778.7		
90% Chebyshev(Mean, Sd) UCL	852.6	95% Chebyshev(Mean, Sd) UCL	959.1
97.5% Chebyshev(Mean, Sd) UCL	1107	99% Chebyshev(Mean, Sd) UCL	1398

Suggested UCL to Use			
95% Chebyshev (Mean, Sd) UCL	959.1		

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Mercury

General Statistics			
Total Number of Observations	23	Number of Distinct Observations	17
Number of Detects	20	Number of Non-Detects	3
Number of Distinct Detects	15	Number of Distinct Non-Detects	3
Minimum Detect	0.011	Minimum Non-Detect	0.011
Maximum Detect	0.053	Maximum Non-Detect	0.019
Variance Detects	1.1157E-4	Percent Non-Detects	13.04%
Mean Detects	0.0263	SD Detects	0.0106
Median Detects	0.025	CV Detects	0.402
Skewness Detects	0.668	Kurtosis Detects	0.536
Mean of Logged Detects	-3.719	SD of Logged Detects	0.416

Normal GOF Test on Detects Only		
Shapiro Wilk Test Statistic	0.948	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.905	Detected Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.124	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.192	Detected Data appear Normal at 5% Significance Level
Detected Data appear Normal at 5% Significance Level		

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.0244	KM Standard Error of Mean	0.0023
KM SD	0.0107	95% KM (BCA) UCL	0.0279
95% KM (t) UCL	0.0284	95% KM (Percentile Bootstrap) UCL	0.0282
95% KM (z) UCL	0.0282	95% KM Bootstrap t UCL	0.0288
90% KM Chebyshev UCL	0.0313	95% KM Chebyshev UCL	0.0344
97.5% KM Chebyshev UCL	0.0388	99% KM Chebyshev UCL	0.0473

Gamma GOF Tests on Detected Observations Only		
A-D Test Statistic	0.291	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.744	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.164	**Kolmogorov-Smirnov GOF**
5% K-S Critical Value	0.194	Detected data appear Gamma Distributed at 5% Significance Level
Detected data appear Gamma Distributed at 5% Significance Level		

Gamma Statistics on Detected Data Only			
k hat (MLE)	6.467	k star (bias corrected MLE)	5.53
Theta hat (MLE)	0.00406	Theta star (bias corrected MLE)	0.00475
nu hat (MLE)	258.7	nu star (bias corrected)	221.2
Mean (detects)	0.0263		

Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	0.0243
Maximum	0.053	Median	0.022
SD	0.0111	CV	0.456
k hat (MLE)	5.049	k star (bias corrected MLE)	4.42
Theta hat (MLE)	0.00481	Theta star (bias corrected MLE)	0.0055
nu hat (MLE)	232.3	nu star (bias corrected)	203.3
Adjusted Level of Significance (β)	0.0389		
Approximate Chi Square Value (203.31, α)	171.3	Adjusted Chi Square Value (203.31, β)	169.2
95% Gamma Approximate UCL (use when n>=50)	0.0288	95% Gamma Adjusted UCL (use when n<50)	0.0292
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.0244	SD (KM)	0.0107
Variance (KM)	1.1517E-4	SE of Mean (KM)	0.0023
k hat (KM)	5.173	k star (KM)	4.528
nu hat (KM)	238	nu star (KM)	208.3
theta hat (KM)	0.00472	theta star (KM)	0.00539
80% gamma percentile (KM)	0.0332	90% gamma percentile (KM)	0.0398
95% gamma percentile (KM)	0.0458	99% gamma percentile (KM)	0.0586
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (208.27, α)	175.9	Adjusted Chi Square Value (208.27, β)	173.7
95% Gamma Approximate KM-UCL (use when n>=50)	0.0289	95% Gamma Adjusted KM-UCL (use when n<50)	0.0293
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.967	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.905	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.172	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.192	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.0243	Mean in Log Scale	-3.82
SD in Original Scale	0.0111	SD in Log Scale	0.475
95% t UCL (assumes normality of ROS data)	0.0283	95% Percentile Bootstrap UCL	0.028
95% BCA Bootstrap UCL	0.0285	95% Bootstrap t UCL	0.0287
95% H-UCL (Log ROS)	0.0299		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-3.811	KM Geo Mean	0.0221
KM SD (logged)	0.449	95% Critical H Value (KM-Log)	1.93
KM Standard Error of Mean (logged)	0.0965	95% H-UCL (KM -Log)	0.0294
KM SD (logged)	0.449	95% Critical H Value (KM-Log)	1.93
KM Standard Error of Mean (logged)	0.0965		

DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.0238	Mean in Log Scale	-3.876
SD in Original Scale	0.0118	SD in Log Scale	0.572
95% t UCL (Assumes normality)	0.028	95% H-Stat UCL	0.0313
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Normal Distributed at 5% Significance Level			
Suggested UCL to Use			
95% KM (t) UCL	0.0284		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Nickel			
General Statistics			
Total Number of Observations	23	Number of Distinct Observations	19
		Number of Missing Observations	0
Minimum	4.2	Mean	12.31
Maximum	35.7	Median	12.2
SD	5.914	Std. Error of Mean	1.233
Coefficient of Variation	0.48	Skewness	2.824
Normal GOF Test			
Shapiro Wilk Test Statistic	0.7	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.914	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.246	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.18	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	14.43	95% Adjusted-CLT UCL (Chen-1995)	15.11
		95% Modified-t UCL (Johnson-1978)	14.55
Gamma GOF Test			
A-D Test Statistic	1.277	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.746	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.183	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.182	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			

k hat (MLE)	6.059	k star (bias corrected MLE)	5.298
Theta hat (MLE)	2.031	Theta star (bias corrected MLE)	2.323
nu hat (MLE)	278.7	nu star (bias corrected)	243.7
MLE Mean (bias corrected)	12.31	MLE Sd (bias corrected)	5.348
		Approximate Chi Square Value (0.05)	208.6
Adjusted Level of Significance	0.0389	Adjusted Chi Square Value	206.2
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	14.38	95% Adjusted Gamma UCL (use when n<50)	14.55
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.878	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.914	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.182	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.18	Data Not Lognormal at 5% Significance Level	
Data Not Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	1.435	Mean of logged Data	2.426
Maximum of Logged Data	3.575	SD of logged Data	0.415
Assuming Lognormal Distribution			
95% H-UCL	14.59	90% Chebyshev (MVUE) UCL	15.55
95% Chebyshev (MVUE) UCL	17.04	97.5% Chebyshev (MVUE) UCL	19.09
99% Chebyshev (MVUE) UCL	23.14		
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution (0.05)			
Nonparametric Distribution Free UCLs			
95% CLT UCL	14.34	95% Jackknife UCL	14.43
95% Standard Bootstrap UCL	14.28	95% Bootstrap-t UCL	15.63
95% Hall's Bootstrap UCL	24.68	95% Percentile Bootstrap UCL	14.37
95% BCA Bootstrap UCL	15.11		
90% Chebyshev(Mean, Sd) UCL	16.01	95% Chebyshev(Mean, Sd) UCL	17.68
97.5% Chebyshev(Mean, Sd) UCL	20.01	99% Chebyshev(Mean, Sd) UCL	24.58
Suggested UCL to Use			
95% Student's-t UCL	14.43	or 95% Modified-t UCL	14.55
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Thallium			
General Statistics			
Total Number of Observations	23	Number of Distinct Observations	8
Number of Detects	1	Number of Non-Detects	22

Number of Distinct Detects	1	Number of Distinct Non-Detects	8

Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set!

It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable Thallium was not processed!

Arsenic

General Statistics

Total Number of Observations	23	Number of Distinct Observations	21
		Number of Missing Observations	0
Minimum	2.8	Mean	6.204
Maximum	15.8	Median	5.3
SD	2.898	Std. Error of Mean	0.604
Coefficient of Variation	0.467	Skewness	1.786

Normal GOF Test

Shapiro Wilk Test Statistic	0.845	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.914	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.205	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.18	Data Not Normal at 5% Significance Level	

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	7.242	95% Adjusted-CLT UCL (Chen-1995)	7.439
		95% Modified-t UCL (Johnson-1978)	7.279

Gamma GOF Test

A-D Test Statistic	0.439	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.746	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.168	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.182	Detected data appear Gamma Distributed at 5% Significance Level	

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	5.938	k star (bias corrected MLE)	5.193
Theta hat (MLE)	1.045	Theta star (bias corrected MLE)	1.195
nu hat (MLE)	273.2	nu star (bias corrected)	238.9
MLE Mean (bias corrected)	6.204	MLE Sd (bias corrected)	2.723
		Approximate Chi Square Value (0.05)	204.1
Adjusted Level of Significance	0.0389	Adjusted Chi Square Value	201.8

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50)	7.262	95% Adjusted Gamma UCL (use when n<50)	7.345

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.97	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.914	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.141	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.18	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	1.03	Mean of logged Data	1.739
Maximum of Logged Data	2.76	SD of logged Data	0.414
Assuming Lognormal Distribution			
95% H-UCL	7.331	90% Chebyshev (MVUE) UCL	7.815
95% Chebyshev (MVUE) UCL	8.559	97.5% Chebyshev (MVUE) UCL	9.591
99% Chebyshev (MVUE) UCL	11.62		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	7.198	95% Jackknife UCL	7.242
95% Standard Bootstrap UCL	7.151	95% Bootstrap-t UCL	7.66
95% Hall's Bootstrap UCL	8.235	95% Percentile Bootstrap UCL	7.23
95% BCA Bootstrap UCL	7.496		
90% Chebyshev(Mean, Sd) UCL	8.017	95% Chebyshev(Mean, Sd) UCL	8.838
97.5% Chebyshev(Mean, Sd) UCL	9.978	99% Chebyshev(Mean, Sd) UCL	12.22
Suggested UCL to Use			
95% Adjusted Gamma UCL	7.345		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Barium			
General Statistics			
Total Number of Observations	23	Number of Distinct Observations	22
		Number of Missing Observations	0
Minimum	103	Mean	305.8
Maximum	486	Median	310
SD	105.9	Std. Error of Mean	22.09
Coefficient of Variation	0.346	Skewness	-0.143
Normal GOF Test			
Shapiro Wilk Test Statistic	0.971	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.914	Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.0978	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.18	Data appear Normal at 5% Significance Level	

Data appear Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	343.7	95% Adjusted-CLT UCL (Chen-1995)	341.4
		95% Modified-t UCL (Johnson-1978)	343.6
Gamma GOF Test			
A-D Test Statistic	0.472	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.745	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.138	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.182	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	7.316	k star (bias corrected MLE)	6.39
Theta hat (MLE)	41.8	Theta star (bias corrected MLE)	47.85
nu hat (MLE)	336.5	nu star (bias corrected)	294
MLE Mean (bias corrected)	305.8	MLE Sd (bias corrected)	121
		Approximate Chi Square Value (0.05)	255.2
Adjusted Level of Significance	0.0389	Adjusted Chi Square Value	252.6
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	352.2	95% Adjusted Gamma UCL (use when n<50)	355.8
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.92	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.914	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.167	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.18	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	4.635	Mean of logged Data	5.653
Maximum of Logged Data	6.186	SD of logged Data	0.406
Assuming Lognormal Distribution			
95% H-UCL	365	90% Chebyshev (MVUE) UCL	389
95% Chebyshev (MVUE) UCL	425.4	97.5% Chebyshev (MVUE) UCL	476
99% Chebyshev (MVUE) UCL	575.4		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	342.1	95% Jackknife UCL	343.7
95% Standard Bootstrap UCL	341.4	95% Bootstrap-t UCL	341.7
95% Hall's Bootstrap UCL	343	95% Percentile Bootstrap UCL	342.2
95% BCA Bootstrap UCL	340.4		
90% Chebyshev(Mean, Sd) UCL	372	95% Chebyshev(Mean, Sd) UCL	402.1

97.5% Chebyshev(Mean, Sd) UCL	443.7	99% Chebyshev(Mean, Sd) UCL	525.5
Suggested UCL to Use			
95% Student's-t UCL	343.7		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Note: For highly negatively-skewed data, confidence limits (e.g., Chen, Johnson, Lognormal, and Gamma) may not be			
reliable. Chen's and Johnson's methods provide adjustments for positvely skewed data sets.			
ChromiumVI_EST			
General Statistics			
Total Number of Observations	23	Number of Distinct Observations	22
		Number of Missing Observations	0
Minimum	0.118	Mean	0.235
Maximum	0.415	Median	0.244
SD	0.0722	Std. Error of Mean	0.0151
Coefficient of Variation	0.308	Skewness	0.462
Normal GOF Test			
Shapiro Wilk Test Statistic	0.965	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.914	Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.0969	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.18	Data appear Normal at 5% Significance Level	
Data appear Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	0.261	95% Adjusted-CLT UCL (Chen-1995)	0.261
		95% Modified-t UCL (Johnson-1978)	0.261
Gamma GOF Test			
A-D Test Statistic	0.311	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.744	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.125	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.182	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	10.79	k star (bias corrected MLE)	9.408
Theta hat (MLE)	0.0218	Theta star (bias corrected MLE)	0.0249
nu hat (MLE)	496.1	nu star (bias corrected)	432.7
MLE Mean (bias corrected)	0.235	MLE Sd (bias corrected)	0.0765
		Approximate Chi Square Value (0.05)	385.5
Adjusted Level of Significance	0.0389	Adjusted Chi Square Value	382.3

Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	0.263	95% Adjusted Gamma UCL (use when n<50)	0.266
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.967	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.914	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.143	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.18	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	-2.139	Mean of logged Data	-1.496
Maximum of Logged Data	-0.88	SD of logged Data	0.32
Assuming Lognormal Distribution			
95% H-UCL	0.267	90% Chebyshev (MVUE) UCL	0.283
95% Chebyshev (MVUE) UCL	0.305	97.5% Chebyshev (MVUE) UCL	0.335
99% Chebyshev (MVUE) UCL	0.394		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	0.259	95% Jackknife UCL	0.261
95% Standard Bootstrap UCL	0.259	95% Bootstrap-t UCL	0.263
95% Hall's Bootstrap UCL	0.262	95% Percentile Bootstrap UCL	0.258
95% BCA Bootstrap UCL	0.259		
90% Chebyshev(Mean, Sd) UCL	0.28	95% Chebyshev(Mean, Sd) UCL	0.3
97.5% Chebyshev(Mean, Sd) UCL	0.329	99% Chebyshev(Mean, Sd) UCL	0.385
Suggested UCL to Use			
95% Student's-t UCL	0.261		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Cobalt			
General Statistics			
Total Number of Observations	23	Number of Distinct Observations	20
		Number of Missing Observations	0
Minimum	2.2	Mean	5.252
Maximum	8.2	Median	5.4
SD	1.414	Std. Error of Mean	0.295
Coefficient of Variation	0.269	Skewness	-0.446

Normal GOF Test			
Shapiro Wilk Test Statistic	0.958	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.914	Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.157	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.18	Data appear Normal at 5% Significance Level	
Data appear Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	5.759	95% Adjusted-CLT UCL (Chen-1995)	5.708
		95% Modified-t UCL (Johnson-1978)	5.754
Gamma GOF Test			
A-D Test Statistic	0.823	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.744	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.2	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.181	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	11.98	k star (bias corrected MLE)	10.44
Theta hat (MLE)	0.439	Theta star (bias corrected MLE)	0.503
nu hat (MLE)	550.9	nu star (bias corrected)	480.4
MLE Mean (bias corrected)	5.252	MLE Sd (bias corrected)	1.625
		Approximate Chi Square Value (0.05)	430.6
Adjusted Level of Significance	0.0389	Adjusted Chi Square Value	427.2
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	5.86	95% Adjusted Gamma UCL (use when n<50)	5.907
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.885	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.914	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.223	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.18	Data Not Lognormal at 5% Significance Level	
Data Not Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	0.788	Mean of logged Data	1.616
Maximum of Logged Data	2.104	SD of logged Data	0.316
Assuming Lognormal Distribution			
95% H-UCL	5.986	90% Chebyshev (MVUE) UCL	6.339
95% Chebyshev (MVUE) UCL	6.819	97.5% Chebyshev (MVUE) UCL	7.484
99% Chebyshev (MVUE) UCL	8.793		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			

95% CLT UCL	5.737	95% Jackknife UCL	5.759
95% Standard Bootstrap UCL	5.735	95% Bootstrap-t UCL	5.762
95% Hall's Bootstrap UCL	5.741	95% Percentile Bootstrap UCL	5.726
95% BCA Bootstrap UCL	5.713		
90% Chebyshev(Mean, Sd) UCL	6.137	95% Chebyshev(Mean, Sd) UCL	6.538
97.5% Chebyshev(Mean, Sd) UCL	7.094	99% Chebyshev(Mean, Sd) UCL	8.187

Suggested UCL to Use

95% Student's-t UCL	5.759		

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Note: For highly negatively-skewed data, confidence limits (e.g., Chen, Johnson, Lognormal, and Gamma) may not be reliable. Chen's and Johnson's methods provide adjustments for positvely skewed data sets.

Copper

General Statistics

Total Number of Observations	23	Number of Distinct Observations	20
		Number of Missing Observations	0
Minimum	4	Mean	13.83
Maximum	26.2	Median	13.1
SD	5.351	Std. Error of Mean	1.116
Coefficient of Variation	0.387	Skewness	0.38

Normal GOF Test

Shapiro Wilk Test Statistic	0.979	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.914	Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.0973	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.18	Data appear Normal at 5% Significance Level	

Data appear Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	15.75	95% Adjusted-CLT UCL (Chen-1995)	15.76
		95% Modified-t UCL (Johnson-1978)	15.76

Gamma GOF Test

A-D Test Statistic	0.171	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.746	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.0679	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.182	Detected data appear Gamma Distributed at 5% Significance Level	

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	6.398	k star (bias corrected MLE)	5.592

Theta hat (MLE)	2.162	Theta star (bias corrected MLE)	2.473
nu hat (MLE)	294.3	nu star (bias corrected)	257.2
MLE Mean (bias corrected)	13.83	MLE Sd (bias corrected)	5.848
		Approximate Chi Square Value (0.05)	221.1
Adjusted Level of Significance	0.0389	Adjusted Chi Square Value	218.7
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	16.09	95% Adjusted Gamma UCL (use when n<50)	16.27
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.962	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.914	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.0893	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.18	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	1.386	Mean of logged Data	2.547
Maximum of Logged Data	3.266	SD of logged Data	0.429
Assuming Lognormal Distribution			
95% H-UCL	16.68	90% Chebyshev (MVUE) UCL	17.79
95% Chebyshev (MVUE) UCL	19.53	97.5% Chebyshev (MVUE) UCL	21.96
99% Chebyshev (MVUE) UCL	26.71		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	15.67	95% Jackknife UCL	15.75
95% Standard Bootstrap UCL	15.6	95% Bootstrap-t UCL	15.89
95% Hall's Bootstrap UCL	15.86	95% Percentile Bootstrap UCL	15.67
95% BCA Bootstrap UCL	15.68		
90% Chebyshev(Mean, Sd) UCL	17.18	95% Chebyshev(Mean, Sd) UCL	18.69
97.5% Chebyshev(Mean, Sd) UCL	20.8	99% Chebyshev(Mean, Sd) UCL	24.93
Suggested UCL to Use			
95% Student's-t UCL	15.75		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Vanadium			
General Statistics			
Total Number of Observations	23	Number of Distinct Observations	18
		Number of Missing Observations	0

Minimum	4.3	Mean	12.01
Maximum	20.4	Median	12.7
SD	3.683	Std. Error of Mean	0.768
Coefficient of Variation	0.307	Skewness	-0.0386
Normal GOF Test			
Shapiro Wilk Test Statistic	0.962	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.914	Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.146	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.18	Data appear Normal at 5% Significance Level	
Data appear Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	13.33	95% Adjusted-CLT UCL (Chen-1995)	13.27
		95% Modified-t UCL (Johnson-1978)	13.33
Gamma GOF Test			
A-D Test Statistic	0.727	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.744	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.147	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.182	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	9.305	k star (bias corrected MLE)	8.12
Theta hat (MLE)	1.291	Theta star (bias corrected MLE)	1.479
nu hat (MLE)	428	nu star (bias corrected)	373.5
MLE Mean (bias corrected)	12.01	MLE Sd (bias corrected)	4.214
		Approximate Chi Square Value (0.05)	329.7
Adjusted Level of Significance	0.0389	Adjusted Chi Square Value	326.8
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	13.6	95% Adjusted Gamma UCL (use when n<50)	13.73
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.881	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.914	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.175	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.18	Data appear Lognormal at 5% Significance Level	
Data appear Approximate Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	1.459	Mean of logged Data	2.431
Maximum of Logged Data	3.016	SD of logged Data	0.362
Assuming Lognormal Distribution			
95% H-UCL	14.02	90% Chebyshev (MVUE) UCL	14.9
95% Chebyshev (MVUE) UCL	16.17	97.5% Chebyshev (MVUE) UCL	17.93
99% Chebyshev (MVUE) UCL	21.38		

Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	13.27	95% Jackknife UCL	13.33
95% Standard Bootstrap UCL	13.23	95% Bootstrap-t UCL	13.3
95% Hall's Bootstrap UCL	13.42	95% Percentile Bootstrap UCL	13.27
95% BCA Bootstrap UCL	13.25		
90% Chebyshev(Mean, Sd) UCL	14.31	95% Chebyshev(Mean, Sd) UCL	15.36
97.5% Chebyshev(Mean, Sd) UCL	16.8	99% Chebyshev(Mean, Sd) UCL	19.65
Suggested UCL to Use			
95% Student's-t UCL	13.33		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Note: For highly negatively-skewed data, confidence limits (e.g., Chen, Johnson, Lognormal, and Gamma) may not be			
reliable. Chen's and Johnson's methods provide adjustments for positvely skewed data sets.			
Zinc			
General Statistics			
Total Number of Observations	23	Number of Distinct Observations	22
		Number of Missing Observations	0
Minimum	13.6	Mean	58.91
Maximum	112	Median	54.7
SD	20.32	Std. Error of Mean	4.237
Coefficient of Variation	0.345	Skewness	0.415
Normal GOF Test			
Shapiro Wilk Test Statistic	0.965	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.914	Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.121	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.18	Data appear Normal at 5% Significance Level	
Data appear Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	66.18	95% Adjusted-CLT UCL (Chen-1995)	66.27
		95% Modified-t UCL (Johnson-1978)	66.25
Gamma GOF Test			
A-D Test Statistic	0.43	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.745	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.135	**Kolmogorov-Smirnov Gamma GOF Test**	

5% K-S Critical Value	0.182	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	7.466	k star (bias corrected MLE)	6.522
Theta hat (MLE)	7.89	Theta star (bias corrected MLE)	9.033
nu hat (MLE)	343.5	nu star (bias corrected)	300
MLE Mean (bias corrected)	58.91	MLE Sd (bias corrected)	23.07
		Approximate Chi Square Value (0.05)	260.9
Adjusted Level of Significance	0.0389	Adjusted Chi Square Value	258.2
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	67.74	95% Adjusted Gamma UCL (use when n<50)	68.44
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.873	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.914	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.16	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.18	Data appear Lognormal at 5% Significance Level	
Data appear Approximate Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	2.61	Mean of logged Data	4.008
Maximum of Logged Data	4.718	SD of logged Data	0.412
Assuming Lognormal Distribution			
95% H-UCL	70.74	90% Chebyshev (MVUE) UCL	75.41
95% Chebyshev (MVUE) UCL	82.56	97.5% Chebyshev (MVUE) UCL	92.47
99% Chebyshev (MVUE) UCL	112		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	65.88	95% Jackknife UCL	66.18
95% Standard Bootstrap UCL	65.87	95% Bootstrap-t UCL	66.31
95% Hall's Bootstrap UCL	66.95	95% Percentile Bootstrap UCL	65.71
95% BCA Bootstrap UCL	66.1		
90% Chebyshev(Mean, Sd) UCL	71.62	95% Chebyshev(Mean, Sd) UCL	77.38
97.5% Chebyshev(Mean, Sd) UCL	85.37	99% Chebyshev(Mean, Sd) UCL	101.1
Suggested UCL to Use			
95% Student's-t UCL	66.18		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Selenium			

General Statistics			
Total Number of Observations	23	Number of Distinct Observations	14
Number of Detects	5	Number of Non-Detects	18
Number of Distinct Detects	5	Number of Distinct Non-Detects	13
Minimum Detect	0.34	Minimum Non-Detect	0.25
Maximum Detect	0.5	Maximum Non-Detect	0.46
Variance Detects	0.00402	Percent Non-Detects	78.26%
Mean Detects	0.418	SD Detects	0.0634
Median Detects	0.41	CV Detects	0.152
Skewness Detects	0.156	Kurtosis Detects	-1.237
Mean of Logged Detects	-0.882	SD of Logged Detects	0.152
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.982	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.762	Detected Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.15	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.343	Detected Data appear Normal at 5% Significance Level	
Detected Data appear Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.292	KM Standard Error of Mean	0.0189
KM SD	0.0754	95% KM (BCA) UCL	0.328
95% KM (t) UCL	0.325	95% KM (Percentile Bootstrap) UCL	0.325
95% KM (z) UCL	0.323	95% KM Bootstrap t UCL	0.306
90% KM Chebyshev UCL	0.349	95% KM Chebyshev UCL	0.375
97.5% KM Chebyshev UCL	0.41	99% KM Chebyshev UCL	0.48
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	0.187	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.678	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.177	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.357	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	54.16	k star (bias corrected MLE)	21.8
Theta hat (MLE)	0.00772	Theta star (bias corrected MLE)	0.0192
nu hat (MLE)	541.6	nu star (bias corrected)	218
Mean (detects)	0.418		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.17	Mean	0.263
Maximum	0.5	Median	0.223
SD	0.0929	CV	0.354

k hat (MLE)	10.08	k star (bias corrected MLE)	8.797
Theta hat (MLE)	0.026	Theta star (bias corrected MLE)	0.0299
nu hat (MLE)	463.8	nu star (bias corrected)	404.7
Adjusted Level of Significance (β)	0.0389		
Approximate Chi Square Value (404.65, α)	359	Adjusted Chi Square Value (404.65, β)	355.9
95% Gamma Approximate UCL (use when n>=50)	0.296	95% Gamma Adjusted UCL (use when n<50)	0.299
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.292	SD (KM)	0.0754
Variance (KM)	0.00569	SE of Mean (KM)	0.0189
k hat (KM)	15.03	k star (KM)	13.1
nu hat (KM)	691.3	nu star (KM)	602.4
theta hat (KM)	0.0195	theta star (KM)	0.0223
80% gamma percentile (KM)	0.357	90% gamma percentile (KM)	0.4
95% gamma percentile (KM)	0.437	99% gamma percentile (KM)	0.512
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (602.44, α)	546.5	Adjusted Chi Square Value (602.44, β)	542.7
95% Gamma Approximate KM-UCL (use when n>=50)	0.322	95% Gamma Adjusted KM-UCL (use when n<50)	0.325
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.984	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.762	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.155	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.343	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.286	Mean in Log Scale	-1.28
SD in Original Scale	0.0786	SD in Log Scale	0.239
95% t UCL (assumes normality of ROS data)	0.315	95% Percentile Bootstrap UCL	0.314
95% BCA Bootstrap UCL	0.319	95% Bootstrap t UCL	0.326
95% H-UCL (Log ROS)	0.313		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-1.257	KM Geo Mean	0.285
KM SD (logged)	0.223	95% Critical H Value (KM-Log)	1.776
KM Standard Error of Mean (logged)	0.0568	95% H-UCL (KM -Log)	0.317
KM SD (logged)	0.223	95% Critical H Value (KM-Log)	1.776
KM Standard Error of Mean (logged)	0.0568		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.226	Mean in Log Scale	-1.579
SD in Original Scale	0.111	SD in Log Scale	0.418
95% t UCL (Assumes normality)	0.266	95% H-Stat UCL	0.267
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Normal Distributed at 5% Significance Level			

Suggested UCL to Use			
95% KM (t) UCL	0.325		

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Naphthalene

General Statistics			
Total Number of Observations	23	Number of Distinct Observations	18
Number of Detects	10	Number of Non-Detects	13
Number of Distinct Detects	10	Number of Distinct Non-Detects	9
Minimum Detect	0.0019	Minimum Non-Detect	0.0014
Maximum Detect	0.049	Maximum Non-Detect	0.013
Variance Detects	2.0426E-4	Percent Non-Detects	56.52%
Mean Detects	0.00886	SD Detects	0.0143
Median Detects	0.00355	CV Detects	1.613
Skewness Detects	3.012	Kurtosis Detects	9.284
Mean of Logged Detects	-5.303	SD of Logged Detects	0.95
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.508	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.842	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.399	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.262	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.00493	KM Standard Error of Mean	0.00213
KM SD	0.00964	95% KM (BCA) UCL	0.00921
95% KM (t) UCL	0.00859	95% KM (Percentile Bootstrap) UCL	0.00865
95% KM (z) UCL	0.00844	95% KM Bootstrap t UCL	0.0181
90% KM Chebyshev UCL	0.0113	95% KM Chebyshev UCL	0.0142
97.5% KM Chebyshev UCL	0.0182	99% KM Chebyshev UCL	0.0261
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	1.189	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.748	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.266	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.274	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data follow Appr. Gamma Distribution at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	1	k star (bias corrected MLE)	0.767
Theta hat (MLE)	0.00886	Theta star (bias corrected MLE)	0.0116
nu hat (MLE)	20.01	nu star (bias corrected)	15.34
Mean (detects)	0.00886		

Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.0019	Mean	0.0095
Maximum	0.049	Median	0.01
SD	0.00916	CV	0.964
k hat (MLE)	2.131	k star (bias corrected MLE)	1.882
Theta hat (MLE)	0.00446	Theta star (bias corrected MLE)	0.00505
nu hat (MLE)	98	nu star (bias corrected)	86.55
Adjusted Level of Significance (β)	0.0389		
Approximate Chi Square Value (86.55, α)	66.11	Adjusted Chi Square Value (86.55, β)	64.81
95% Gamma Approximate UCL (use when n>=50)	0.0124	95% Gamma Adjusted UCL (use when n<50)	0.0127
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.00493	SD (KM)	0.00964
Variance (KM)	9.2946E-5	SE of Mean (KM)	0.00213
k hat (KM)	0.262	k star (KM)	0.256
nu hat (KM)	12.03	nu star (KM)	11.8
theta hat (KM)	0.0188	theta star (KM)	0.0192
80% gamma percentile (KM)	0.00722	90% gamma percentile (KM)	0.0148
95% gamma percentile (KM)	0.0237	99% gamma percentile (KM)	0.0473
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (11.80, α)	5.094	Adjusted Chi Square Value (11.80, β)	4.777
95% Gamma Approximate KM-UCL (use when n>=50)	0.0114	95% Gamma Adjusted KM-UCL (use when n<50)	0.0122
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.842	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.842	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.222	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.262	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Approximate Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.00438	Mean in Log Scale	-6.355
SD in Original Scale	0.01	SD in Log Scale	1.213
95% t UCL (assumes normality of ROS data)	0.00796	95% Percentile Bootstrap UCL	0.00845
95% BCA Bootstrap UCL	0.0107	95% Bootstrap t UCL	0.0192
95% H-UCL (Log ROS)	0.00752		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-5.919	KM Geo Mean	0.00269
KM SD (logged)	0.865	95% Critical H Value (KM-Log)	2.356
KM Standard Error of Mean (logged)	0.201	95% H-UCL (KM -Log)	0.00603
KM SD (logged)	0.865	95% Critical H Value (KM-Log)	2.356
KM Standard Error of Mean (logged)	0.201		

DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.00517	Mean in Log Scale	-5.959
SD in Original Scale	0.00986	SD in Log Scale	1.077
95% t UCL (Assumes normality)	0.0087	95% H-Stat UCL	0.00843
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Approximate Gamma Distributed at 5% Significance Level			
Suggested UCL to Use			
Adjusted KM-UCL (use when k<=1 and 15 < n < 50 but k<=1)	0.0122		
When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test			
When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			

ProUCL Output
North-Central Undeveloped Area Soil (0-12 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

UCL Statistics for Data Sets with Non-Detects	
User Selected Options	
Date/Time of Computation	ProUCL 5.11/28/2019 1:42:10 PM
From File	20190128_NCenUndev_ProUCL_input_a.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Fluoride

General Statistics			
Total Number of Observations	61	Number of Distinct Observations	58
Number of Detects	60	Number of Non-Detects	1
Number of Distinct Detects	57	Number of Distinct Non-Detects	1
Minimum Detect	0.54	Minimum Non-Detect	0.17
Maximum Detect	27.6	Maximum Non-Detect	0.17
Variance Detects	26.39	Percent Non-Detects	1.639%
Mean Detects	6.338	SD Detects	5.137
Median Detects	5.205	CV Detects	0.811
Skewness Detects	1.448	Kurtosis Detects	3.594
Mean of Logged Detects	1.452	SD of Logged Detects	1.001

Normal GOF Test on Detects Only		
Shapiro Wilk Test Statistic	0.885	**Normal GOF Test on Detected Observations Only**
5% Shapiro Wilk P Value	5.6314E-6	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.13	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.114	Detected Data Not Normal at 5% Significance Level
Detected Data Not Normal at 5% Significance Level		

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	6.237	KM Standard Error of Mean	0.66
KM SD	5.112	95% KM (BCA) UCL	7.351
95% KM (t) UCL	7.34	95% KM (Percentile Bootstrap) UCL	7.319
95% KM (z) UCL	7.323	95% KM Bootstrap t UCL	7.474
90% KM Chebyshev UCL	8.217	95% KM Chebyshev UCL	9.114
97.5% KM Chebyshev UCL	10.36	99% KM Chebyshev UCL	12.8

Gamma GOF Tests on Detected Observations Only		
A-D Test Statistic	0.592	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.771	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.0988	**Kolmogorov-Smirnov GOF**
5% K-S Critical Value	0.117	Detected data appear Gamma Distributed at 5% Significance Level
Detected data appear Gamma Distributed at 5% Significance Level		

Gamma Statistics on Detected Data Only			
k hat (MLE)	1.409	k star (bias corrected MLE)	1.35
Theta hat (MLE)	4.497	Theta star (bias corrected MLE)	4.694
nu hat (MLE)	169.1	nu star (bias corrected)	162

Mean (detects)	6.338		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	6.234
Maximum	27.6	Median	5.19
SD	5.158	CV	0.827
k hat (MLE)	1.186	k star (bias corrected MLE)	1.138
Theta hat (MLE)	5.259	Theta star (bias corrected MLE)	5.477
nu hat (MLE)	144.6	nu star (bias corrected)	138.9
Adjusted Level of Significance (β)	0.0461		
Approximate Chi Square Value (138.86, α)	112.6	Adjusted Chi Square Value (138.86, β)	112.1
95% Gamma Approximate UCL (use when n>=50)	7.686	95% Gamma Adjusted UCL (use when n<50)	7.725
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	6.237	SD (KM)	5.112
Variance (KM)	26.14	SE of Mean (KM)	0.66
k hat (KM)	1.488	k star (KM)	1.426
nu hat (KM)	181.6	nu star (KM)	174
theta hat (KM)	4.191	theta star (KM)	4.374
80% gamma percentile (KM)	9.703	90% gamma percentile (KM)	13.16
95% gamma percentile (KM)	16.53	99% gamma percentile (KM)	24.15
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (173.97, α)	144.5	Adjusted Chi Square Value (173.97, β)	143.8
95% Gamma Approximate KM-UCL (use when n>=50)	7.511	95% Gamma Adjusted KM-UCL (use when n<50)	7.544
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Approximate Test Statistic	0.927	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	0.00146	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.13	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.114	Detected Data Not Lognormal at 5% Significance Level	
Detected Data Not Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	6.239	Mean in Log Scale	1.409
SD in Original Scale	5.152	SD in Log Scale	1.046
95% t UCL (assumes normality of ROS data)	7.341	95% Percentile Bootstrap UCL	7.331
95% BCA Bootstrap UCL	7.518	95% Bootstrap t UCL	7.571
95% H-UCL (Log ROS)	9.615		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	1.399	KM Geo Mean	4.05
KM SD (logged)	1.066	95% Critical H Value (KM-Log)	2.281
KM Standard Error of Mean (logged)	0.138	95% H-UCL (KM -Log)	9.782

KM SD (logged)	1.066	95% Critical H Value (KM-Log)	2.281
KM Standard Error of Mean (logged)	0.138		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	6.235	Mean in Log Scale	1.387
SD in Original Scale	5.157	SD in Log Scale	1.112
95% t UCL (Assumes normality)	7.339	95% H-Stat UCL	10.32
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Gamma Distributed at 5% Significance Level			
Suggested UCL to Use			
95% KM Approximate Gamma UCL	7.511	95% GROS Approximate Gamma UCL	7.686
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
BenzoBFluoranthene			
General Statistics			
Total Number of Observations	61	Number of Distinct Observations	46
Number of Detects	42	Number of Non-Detects	19
Number of Distinct Detects	37	Number of Distinct Non-Detects	12
Minimum Detect	0.0025	Minimum Non-Detect	0.0017
Maximum Detect	0.51	Maximum Non-Detect	0.021
Variance Detects	0.0108	Percent Non-Detects	31.15%
Mean Detects	0.0802	SD Detects	0.104
Median Detects	0.0555	CV Detects	1.296
Skewness Detects	2.655	Kurtosis Detects	8.279
Mean of Logged Detects	-3.326	SD of Logged Detects	1.428
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.671	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.942	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.227	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.135	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.056	KM Standard Error of Mean	0.012
KM SD	0.0925	95% KM (BCA) UCL	0.0774
95% KM (t) UCL	0.076	95% KM (Percentile Bootstrap) UCL	0.0777
95% KM (z) UCL	0.0757	95% KM Bootstrap t UCL	0.0862
90% KM Chebyshev UCL	0.092	95% KM Chebyshev UCL	0.108
97.5% KM Chebyshev UCL	0.131	99% KM Chebyshev UCL	0.175

Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	0.719	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.79	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.124	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.142	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.747	k star (bias corrected MLE)	0.709
Theta hat (MLE)	0.107	Theta star (bias corrected MLE)	0.113
nu hat (MLE)	62.72	nu star (bias corrected)	59.57
Mean (detects)	0.0802		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.0025	Mean	0.0583
Maximum	0.51	Median	0.013
SD	0.092	CV	1.577
k hat (MLE)	0.687	k star (bias corrected MLE)	0.664
Theta hat (MLE)	0.0849	Theta star (bias corrected MLE)	0.0878
nu hat (MLE)	83.78	nu star (bias corrected)	80.99
Adjusted Level of Significance (β)	0.0461		
Approximate Chi Square Value (80.99, α)	61.25	Adjusted Chi Square Value (80.99, β)	60.84
95% Gamma Approximate UCL (use when n>=50)	0.0771	95% Gamma Adjusted UCL (use when n<50)	0.0776
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.056	SD (KM)	0.0925
Variance (KM)	0.00855	SE of Mean (KM)	0.012
k hat (KM)	0.367	k star (KM)	0.36
nu hat (KM)	44.76	nu star (KM)	43.9
theta hat (KM)	0.153	theta star (KM)	0.156
80% gamma percentile (KM)	0.0891	90% gamma percentile (KM)	0.161
95% gamma percentile (KM)	0.241	99% gamma percentile (KM)	0.446
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (43.90, α)	29.7	Adjusted Chi Square Value (43.90, β)	29.42
95% Gamma Approximate KM-UCL (use when n>=50)	0.0828	95% Gamma Adjusted KM-UCL (use when n<50)	0.0836
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.887	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.942	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.152	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.135	Detected Data Not Lognormal at 5% Significance Level	
Detected Data Not Lognormal at 5% Significance Level			

Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.0559	Mean in Log Scale	-4.235
SD in Original Scale	0.0933	SD in Log Scale	1.837
95% t UCL (assumes normality of ROS data)	0.0759	95% Percentile Bootstrap UCL	0.0768
95% BCA Bootstrap UCL	0.0823	95% Bootstrap t UCL	0.0835
95% H-UCL (Log ROS)	0.157		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-4.21	KM Geo Mean	0.0148
KM SD (logged)	1.786	95% Critical H Value (KM-Log)	2.871
KM Standard Error of Mean (logged)	0.234	95% H-UCL (KM -Log)	0.142
KM SD (logged)	1.786	95% Critical H Value (KM-Log)	2.871
KM Standard Error of Mean (logged)	0.234		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.0562	Mean in Log Scale	-4.243
SD in Original Scale	0.0932	SD in Log Scale	1.894
95% t UCL (Assumes normality)	0.0761	95% H-Stat UCL	0.18
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Gamma Distributed at 5% Significance Level			
Suggested UCL to Use			
95% KM Approximate Gamma UCL	0.0828		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
BenzoAPyrene			
General Statistics			
Total Number of Observations	61	Number of Distinct Observations	44
Number of Detects	41	Number of Non-Detects	20
Number of Distinct Detects	35	Number of Distinct Non-Detects	11
Minimum Detect	0.0021	Minimum Non-Detect	0.0015
Maximum Detect	0.22	Maximum Non-Detect	0.016
Variance Detects	0.00235	Percent Non-Detects	32.79%
Mean Detects	0.0437	SD Detects	0.0484
Median Detects	0.036	CV Detects	1.11
Skewness Detects	1.91	Kurtosis Detects	4.136
Mean of Logged Detects	-3.834	SD of Logged Detects	1.356
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.79	**Shapiro Wilk GOF Test**	

5% Shapiro Wilk Critical Value	0.941	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.195	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.137	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.03	KM Standard Error of Mean	0.00568
KM SD	0.0438	95% KM (BCA) UCL	0.041
95% KM (t) UCL	0.0395	95% KM (Percentile Bootstrap) UCL	0.0393
95% KM (z) UCL	0.0394	95% KM Bootstrap t UCL	0.0423
90% KM Chebyshev UCL	0.0471	95% KM Chebyshev UCL	0.0548
97.5% KM Chebyshev UCL	0.0655	99% KM Chebyshev UCL	0.0866
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	0.575	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.785	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.113	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.143	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.839	k star (bias corrected MLE)	0.794
Theta hat (MLE)	0.052	Theta star (bias corrected MLE)	0.055
nu hat (MLE)	68.81	nu star (bias corrected)	65.11
Mean (detects)	0.0437		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.0021	Mean	0.0326
Maximum	0.22	Median	0.01
SD	0.0426	CV	1.307
k hat (MLE)	0.882	k star (bias corrected MLE)	0.85
Theta hat (MLE)	0.037	Theta star (bias corrected MLE)	0.0384
nu hat (MLE)	107.6	nu star (bias corrected)	103.7
Adjusted Level of Significance (β)	0.0461		
Approximate Chi Square Value (103.68, α)	81.18	Adjusted Chi Square Value (103.68, β)	80.7
95% Gamma Approximate UCL (use when n>=50)	0.0417	95% Gamma Adjusted UCL (use when n<50)	0.0419
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.03	SD (KM)	0.0438
Variance (KM)	0.00192	SE of Mean (KM)	0.00568
k hat (KM)	0.469	k star (KM)	0.457
nu hat (KM)	57.27	nu star (KM)	55.78
theta hat (KM)	0.064	theta star (KM)	0.0657
80% gamma percentile (KM)	0.0491	90% gamma percentile (KM)	0.0827

95% gamma percentile (KM)	0.119	99% gamma percentile (KM)	0.209
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (55.78, α)	39.62	Adjusted Chi Square Value (55.78, β)	39.29
95% Gamma Approximate KM-UCL (use when n>=50)	0.0423	95% Gamma Adjusted KM-UCL (use when n<50)	0.0426
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.924	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.941	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.159	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.137	Detected Data Not Lognormal at 5% Significance Level	
Detected Data Not Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.0299	Mean in Log Scale	-4.736
SD in Original Scale	0.0443	SD in Log Scale	1.748
95% t UCL (assumes normality of ROS data)	0.0394	95% Percentile Bootstrap UCL	0.0398
95% BCA Bootstrap UCL	0.0415	95% Bootstrap t UCL	0.0421
95% H-UCL (Log ROS)	0.0766		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-4.649	KM Geo Mean	0.00957
KM SD (logged)	1.622	95% Critical H Value (KM-Log)	2.676
KM Standard Error of Mean (logged)	0.212	95% H-UCL (KM -Log)	0.0625
KM SD (logged)	1.622	95% Critical H Value (KM-Log)	2.676
KM Standard Error of Mean (logged)	0.212		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.0302	Mean in Log Scale	-4.666
SD in Original Scale	0.0441	SD in Log Scale	1.719
95% t UCL (Assumes normality)	0.0397	95% H-Stat UCL	0.0766
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Gamma Distributed at 5% Significance Level			
Suggested UCL to Use			
95% KM Approximate Gamma UCL	0.0423		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
BenzoAAnthracene			
General Statistics			
Total Number of Observations	61	Number of Distinct Observations	42

Number of Detects	39	Number of Non-Detects	22
Number of Distinct Detects	34	Number of Distinct Non-Detects	13
Minimum Detect	0.0015	Minimum Non-Detect	0.0013
Maximum Detect	0.14	Maximum Non-Detect	0.044
Variance Detects	0.00134	Percent Non-Detects	36.07%
Mean Detects	0.0341	SD Detects	0.0367
Median Detects	0.028	CV Detects	1.075
Skewness Detects	1.547	Kurtosis Detects	1.927
Mean of Logged Detects	-4.065	SD of Logged Detects	1.329
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.799	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.939	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.187	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.14	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.0231	KM Standard Error of Mean	0.00426
KM SD	0.0327	95% KM (BCA) UCL	0.0303
95% KM (t) UCL	0.0302	95% KM (Percentile Bootstrap) UCL	0.0303
95% KM (z) UCL	0.0301	95% KM Bootstrap t UCL	0.0322
90% KM Chebyshev UCL	0.0359	95% KM Chebyshev UCL	0.0417
97.5% KM Chebyshev UCL	0.0497	99% KM Chebyshev UCL	0.0655
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	0.685	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.784	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.11	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.146	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.857	k star (bias corrected MLE)	0.808
Theta hat (MLE)	0.0398	Theta star (bias corrected MLE)	0.0422
nu hat (MLE)	66.83	nu star (bias corrected)	63.03
Mean (detects)	0.0341		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.0015	Mean	0.0254
Maximum	0.14	Median	0.01
SD	0.0314	CV	1.237
k hat (MLE)	0.985	k star (bias corrected MLE)	0.947
Theta hat (MLE)	0.0258	Theta star (bias corrected MLE)	0.0268

nu hat (MLE)	120.2	nu star (bias corrected)	115.6
Adjusted Level of Significance (β)	0.0461		
Approximate Chi Square Value (115.58, α)	91.76	Adjusted Chi Square Value (115.58, β)	91.25
95% Gamma Approximate UCL (use when n>=50)	0.032	95% Gamma Adjusted UCL (use when n<50)	0.0322
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.0231	SD (KM)	0.0327
Variance (KM)	0.00107	SE of Mean (KM)	0.00426
k hat (KM)	0.5	k star (KM)	0.486
nu hat (KM)	61.01	nu star (KM)	59.35
theta hat (KM)	0.0462	theta star (KM)	0.0475
80% gamma percentile (KM)	0.0379	90% gamma percentile (KM)	0.0628
95% gamma percentile (KM)	0.0896	99% gamma percentile (KM)	0.156
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (59.35, α)	42.63	Adjusted Chi Square Value (59.35, β)	42.29
95% Gamma Approximate KM-UCL (use when n>=50)	0.0322	95% Gamma Adjusted KM-UCL (use when n<50)	0.0324
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.926	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.939	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.168	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.14	Detected Data Not Lognormal at 5% Significance Level	
Detected Data Not Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.0226	Mean in Log Scale	-4.926
SD in Original Scale	0.033	SD in Log Scale	1.641
95% t UCL (assumes normality of ROS data)	0.0296	95% Percentile Bootstrap UCL	0.0297
95% BCA Bootstrap UCL	0.0307	95% Bootstrap t UCL	0.0311
95% H-UCL (Log ROS)	0.0494		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-4.844	KM Geo Mean	0.00787
KM SD (logged)	1.561	95% Critical H Value (KM-Log)	2.607
KM Standard Error of Mean (logged)	0.211	95% H-UCL (KM -Log)	0.045
KM SD (logged)	1.561	95% Critical H Value (KM-Log)	2.607
KM Standard Error of Mean (logged)	0.211		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.0244	Mean in Log Scale	-4.735
SD in Original Scale	0.0323	SD in Log Scale	1.668
95% t UCL (Assumes normality)	0.0314	95% H-Stat UCL	0.0635
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Gamma Distributed at 5% Significance Level			

Suggested UCL to Use			
95% KM Approximate Gamma UCL	0.0322		

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Cyanide

General Statistics			
Total Number of Observations	61	Number of Distinct Observations	41
Number of Detects	23	Number of Non-Detects	38
Number of Distinct Detects	18	Number of Distinct Non-Detects	24
Minimum Detect	0.022	Minimum Non-Detect	0.017
Maximum Detect	0.3	Maximum Non-Detect	0.098
Variance Detects	0.00684	Percent Non-Detects	62.3%
Mean Detects	0.142	SD Detects	0.0827
Median Detects	0.13	CV Detects	0.581
Skewness Detects	0.409	Kurtosis Detects	-0.634
Mean of Logged Detects	-2.162	SD of Logged Detects	0.739

Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.944	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.914	Detected Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.116	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.18	Detected Data appear Normal at 5% Significance Level	
Detected Data appear Normal at 5% Significance Level			

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.0711	KM Standard Error of Mean	0.0102
KM SD	0.0752	95% KM (BCA) UCL	0.0895
95% KM (t) UCL	0.0882	95% KM (Percentile Bootstrap) UCL	0.0885
95% KM (z) UCL	0.0879	95% KM Bootstrap t UCL	0.0901
90% KM Chebyshev UCL	0.102	95% KM Chebyshev UCL	0.116
97.5% KM Chebyshev UCL	0.135	99% KM Chebyshev UCL	0.173

Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	0.425	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.753	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.133	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.183	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			

Gamma Statistics on Detected Data Only			
k hat (MLE)	2.495	k star (bias corrected MLE)	2.199
Theta hat (MLE)	0.0571	Theta star (bias corrected MLE)	0.0648
nu hat (MLE)	114.8	nu star (bias corrected)	101.1
Mean (detects)	0.142		

Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	0.0641
Maximum	0.3	Median	0.0204
SD	0.08	CV	1.249
k hat (MLE)	0.794	k star (bias corrected MLE)	0.766
Theta hat (MLE)	0.0806	Theta star (bias corrected MLE)	0.0836
nu hat (MLE)	96.92	nu star (bias corrected)	93.49
Adjusted Level of Significance (β)	0.0461		
Approximate Chi Square Value (93.49, α)	72.19	Adjusted Chi Square Value (93.49, β)	71.74
95% Gamma Approximate UCL (use when n>=50)	0.083	95% Gamma Adjusted UCL (use when n<50)	0.0835
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.0711	SD (KM)	0.0752
Variance (KM)	0.00566	SE of Mean (KM)	0.0102
k hat (KM)	0.892	k star (KM)	0.859
nu hat (KM)	108.9	nu star (KM)	104.8
theta hat (KM)	0.0797	theta star (KM)	0.0827
80% gamma percentile (KM)	0.116	90% gamma percentile (KM)	0.17
95% gamma percentile (KM)	0.225	99% gamma percentile (KM)	0.354
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (104.83, α)	82.21	Adjusted Chi Square Value (104.83, β)	81.72
95% Gamma Approximate KM-UCL (use when n>=50)	0.0906	95% Gamma Adjusted KM-UCL (use when n<50)	0.0912
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.916	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.914	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.175	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.18	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.0706	Mean in Log Scale	-3.111
SD in Original Scale	0.0759	SD in Log Scale	0.927
95% t UCL (assumes normality of ROS data)	0.0869	95% Percentile Bootstrap UCL	0.0871
95% BCA Bootstrap UCL	0.0891	95% Bootstrap t UCL	0.0893
95% H-UCL (Log ROS)	0.0891		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-3.107	KM Geo Mean	0.0447
KM SD (logged)	0.923	95% Critical H Value (KM-Log)	2.196
KM Standard Error of Mean (logged)	0.152	95% H-UCL (KM -Log)	0.089
KM SD (logged)	0.923	95% Critical H Value (KM-Log)	2.196

KM Standard Error of Mean (logged)	0.152		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.0743	Mean in Log Scale	-2.977
SD in Original Scale	0.0736	SD in Log Scale	0.842
95% t UCL (Assumes normality)	0.09	95% H-Stat UCL	0.0914
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Normal Distributed at 5% Significance Level			
Suggested UCL to Use			
95% KM (t) UCL	0.0882		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Aluminum			
General Statistics			
Total Number of Observations	61	Number of Distinct Observations	50
		Number of Missing Observations	0
Minimum	4740	Mean	13882
Maximum	29400	Median	13500
SD	5867	Std. Error of Mean	751.2
Coefficient of Variation	0.423	Skewness	0.791
Normal GOF Test			
Shapiro Wilk Test Statistic	0.93	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	0.00198	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.11	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.113	Data appear Normal at 5% Significance Level	
Data appear Approximate Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	15137	95% Adjusted-CLT UCL (Chen-1995)	15199
		95% Modified-t UCL (Johnson-1978)	15150
Gamma GOF Test			
A-D Test Statistic	0.387	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.753	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.0707	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.114	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			

Gamma Statistics			
k hat (MLE)	5.883	k star (bias corrected MLE)	5.605
Theta hat (MLE)	2360	Theta star (bias corrected MLE)	2477
nu hat (MLE)	717.7	nu star (bias corrected)	683.8
MLE Mean (bias corrected)	13882	MLE Sd (bias corrected)	5864
		Approximate Chi Square Value (0.05)	624.1
Adjusted Level of Significance	0.0461	Adjusted Chi Square Value	622.7
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	15210	95% Adjusted Gamma UCL (use when n<50)	15243
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.971	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk P Value	0.316	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.08	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.113	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	8.464	Mean of logged Data	9.451
Maximum of Logged Data	10.29	SD of logged Data	0.427
Assuming Lognormal Distribution			
95% H-UCL	15398	90% Chebyshev (MVUE) UCL	16276
95% Chebyshev (MVUE) UCL	17348	97.5% Chebyshev (MVUE) UCL	18836
99% Chebyshev (MVUE) UCL	21759		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	15118	95% Jackknife UCL	15137
95% Standard Bootstrap UCL	15132	95% Bootstrap-t UCL	15294
95% Hall's Bootstrap UCL	15205	95% Percentile Bootstrap UCL	15099
95% BCA Bootstrap UCL	15174		
90% Chebyshev(Mean, Sd) UCL	16136	95% Chebyshev(Mean, Sd) UCL	17157
97.5% Chebyshev(Mean, Sd) UCL	18574	99% Chebyshev(Mean, Sd) UCL	21357
Suggested UCL to Use			
95% Student's-t UCL	15137		
When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test			
When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			

Iron

General Statistics

Total Number of Observations	61	Number of Distinct Observations	51
		Number of Missing Observations	0
Minimum	5720	Mean	13877
Maximum	23400	Median	14500
SD	3598	Std. Error of Mean	460.7
Coefficient of Variation	0.259	Skewness	-0.101

Normal GOF Test

Shapiro Wilk Test Statistic	0.979	**Shapiro Wilk GOF Test**
5% Shapiro Wilk P Value	0.621	Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.0769	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.113	Data appear Normal at 5% Significance Level

Data appear Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	14647	95% Adjusted-CLT UCL (Chen-1995)	14628
		95% Modified-t UCL (Johnson-1978)	14646

Gamma GOF Test

A-D Test Statistic	0.882	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.75	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.108	**Kolmogorov-Smirnov Gamma GOF Test**
5% K-S Critical Value	0.114	Detected data appear Gamma Distributed at 5% Significance Level

Detected data follow Appr. Gamma Distribution at 5% Significance Level

Gamma Statistics

k hat (MLE)	13.47	k star (bias corrected MLE)	12.81
Theta hat (MLE)	1030	Theta star (bias corrected MLE)	1083
nu hat (MLE)	1643	nu star (bias corrected)	1563
MLE Mean (bias corrected)	13877	MLE Sd (bias corrected)	3876
		Approximate Chi Square Value (0.05)	1473
Adjusted Level of Significance	0.0461	Adjusted Chi Square Value	1470

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	14733	95% Adjusted Gamma UCL (use when n<50)	14754

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.937	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk P Value	0.00535	Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.12	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.113	Data Not Lognormal at 5% Significance Level

Data Not Lognormal at 5% Significance Level

Lognormal Statistics			
Minimum of Logged Data	8.652	Mean of logged Data	9.5
Maximum of Logged Data	10.06	SD of logged Data	0.288
Assuming Lognormal Distribution			
95% H-UCL	14867	90% Chebyshev (MVUE) UCL	15490
95% Chebyshev (MVUE) UCL	16200	97.5% Chebyshev (MVUE) UCL	17186
99% Chebyshev (MVUE) UCL	19123		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	14635	95% Jackknife UCL	14647
95% Standard Bootstrap UCL	14651	95% Bootstrap-t UCL	14646
95% Hall's Bootstrap UCL	14667	95% Percentile Bootstrap UCL	14619
95% BCA Bootstrap UCL	14636		
90% Chebyshev(Mean, Sd) UCL	15259	95% Chebyshev(Mean, Sd) UCL	15885
97.5% Chebyshev(Mean, Sd) UCL	16754	99% Chebyshev(Mean, Sd) UCL	18461
Suggested UCL to Use			
95% Student's-t UCL	14647		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Note: For highly negatively-skewed data, confidence limits (e.g., Chen, Johnson, Lognormal, and Gamma) may not be			
reliable. Chen's and Johnson's methods provide adjustments for positvely skewed data sets.			

Manganese

General Statistics			
Total Number of Observations	61	Number of Distinct Observations	59
		Number of Missing Observations	0
Minimum	36.1	Mean	504.6
Maximum	1940	Median	457
SD	291.2	Std. Error of Mean	37.29
Coefficient of Variation	0.577	Skewness	2.088
Normal GOF Test			
Shapiro Wilk Test Statistic	0.866	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	3.0526E-7	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.149	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.113	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			

ProUCL Output
North-Central Undeveloped Area Soil (0-12 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	566.9	95% Adjusted-CLT UCL (Chen-1995)	576.6
		95% Modified-t UCL (Johnson-1978)	568.6
Gamma GOF Test			
A-D Test Statistic	1.275	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.759	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.124	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.115	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	2.886	k star (bias corrected MLE)	2.755
Theta hat (MLE)	174.9	Theta star (bias corrected MLE)	183.2
nu hat (MLE)	352.1	nu star (bias corrected)	336.1
MLE Mean (bias corrected)	504.6	MLE Sd (bias corrected)	304
		Approximate Chi Square Value (0.05)	294.6
Adjusted Level of Significance	0.0461	Adjusted Chi Square Value	293.7
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	575.7	95% Adjusted Gamma UCL (use when n<50)	577.5
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.856	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk P Value	7.9765E-8	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.17	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.113	Data Not Lognormal at 5% Significance Level	
Data Not Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	3.586	Mean of logged Data	6.041
Maximum of Logged Data	7.57	SD of logged Data	0.701
Assuming Lognormal Distribution			
95% H-UCL	644.1	90% Chebyshev (MVUE) UCL	692.5
95% Chebyshev (MVUE) UCL	764.1	97.5% Chebyshev (MVUE) UCL	863.5
99% Chebyshev (MVUE) UCL	1059		
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution (0.05)			
Nonparametric Distribution Free UCLs			
95% CLT UCL	566	95% Jackknife UCL	566.9
95% Standard Bootstrap UCL	563.8	95% Bootstrap-t UCL	576.5
95% Hall's Bootstrap UCL	596.8	95% Percentile Bootstrap UCL	568.7
95% BCA Bootstrap UCL	571.8		
90% Chebyshev(Mean, Sd) UCL	616.5	95% Chebyshev(Mean, Sd) UCL	667.2
97.5% Chebyshev(Mean, Sd) UCL	737.5	99% Chebyshev(Mean, Sd) UCL	875.6

Suggested UCL to Use			
95% Chebyshev (Mean, Sd) UCL	667.2		

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Mercury

General Statistics			
Total Number of Observations	61	Number of Distinct Observations	29
Number of Detects	50	Number of Non-Detects	11
Number of Distinct Detects	27	Number of Distinct Non-Detects	7
Minimum Detect	0.0098	Minimum Non-Detect	0.01
Maximum Detect	0.053	Maximum Non-Detect	0.019
Variance Detects	9.0325E-5	Percent Non-Detects	18.03%
Mean Detects	0.0235	SD Detects	0.0095
Median Detects	0.021	CV Detects	0.404
Skewness Detects	0.995	Kurtosis Detects	0.869
Mean of Logged Detects	-3.826	SD of Logged Detects	0.39

Normal GOF Test on Detects Only		
Shapiro Wilk Test Statistic	0.925	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.947	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.144	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.125	Detected Data Not Normal at 5% Significance Level
Detected Data Not Normal at 5% Significance Level		

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.0212	KM Standard Error of Mean	0.00128
KM SD	0.00986	95% KM (BCA) UCL	0.023
95% KM (t) UCL	0.0233	95% KM (Percentile Bootstrap) UCL	0.0233
95% KM (z) UCL	0.0233	95% KM Bootstrap t UCL	0.0235
90% KM Chebyshev UCL	0.025	95% KM Chebyshev UCL	0.0268
97.5% KM Chebyshev UCL	0.0292	99% KM Chebyshev UCL	0.0339

Gamma GOF Tests on Detected Observations Only		
A-D Test Statistic	0.405	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.752	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.11	**Kolmogorov-Smirnov GOF**
5% K-S Critical Value	0.125	Detected data appear Gamma Distributed at 5% Significance Level
Detected data appear Gamma Distributed at 5% Significance Level		

Gamma Statistics on Detected Data Only			
k hat (MLE)	6.805	k star (bias corrected MLE)	6.41
Theta hat (MLE)	0.00345	Theta star (bias corrected MLE)	0.00367
nu hat (MLE)	680.5	nu star (bias corrected)	641

Mean (detects)	0.0235		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.0098	Mean	0.0211
Maximum	0.053	Median	0.018
SD	0.00998	CV	0.472
k hat (MLE)	5.005	k star (bias corrected MLE)	4.77
Theta hat (MLE)	0.00422	Theta star (bias corrected MLE)	0.00443
nu hat (MLE)	610.6	nu star (bias corrected)	581.9
Adjusted Level of Significance (β)	0.0461		
Approximate Chi Square Value (581.95, α)	527	Adjusted Chi Square Value (581.95, β)	525.7
95% Gamma Approximate UCL (use when n>=50)	0.0233	95% Gamma Adjusted UCL (use when n<50)	0.0234
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.0212	SD (KM)	0.00986
Variance (KM)	9.7262E-5	SE of Mean (KM)	0.00128
k hat (KM)	4.618	k star (KM)	4.402
nu hat (KM)	563.4	nu star (KM)	537
theta hat (KM)	0.00459	theta star (KM)	0.00481
80% gamma percentile (KM)	0.0289	90% gamma percentile (KM)	0.0347
95% gamma percentile (KM)	0.0401	99% gamma percentile (KM)	0.0514
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (537.04, α)	484.3	Adjusted Chi Square Value (537.04, β)	483.1
95% Gamma Approximate KM-UCL (use when n>=50)	0.0235	95% Gamma Adjusted KM-UCL (use when n<50)	0.0236
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.979	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.947	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.0881	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.125	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.0212	Mean in Log Scale	-3.96
SD in Original Scale	0.00998	SD in Log Scale	0.46
95% t UCL (assumes normality of ROS data)	0.0233	95% Percentile Bootstrap UCL	0.0234
95% BCA Bootstrap UCL	0.0234	95% Bootstrap t UCL	0.0236
95% H-UCL (Log ROS)	0.0236		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-3.956	KM Geo Mean	0.0191
KM SD (logged)	0.45	95% Critical H Value (KM-Log)	1.831
KM Standard Error of Mean (logged)	0.0587	95% H-UCL (KM -Log)	0.0236

KM SD (logged)	0.45	95% Critical H Value (KM-Log)	1.831
KM Standard Error of Mean (logged)	0.0587		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.0204	Mean in Log Scale	-4.046
SD in Original Scale	0.0108	SD in Log Scale	0.595
95% t UCL (Assumes normality)	0.0228	95% H-Stat UCL	0.0242

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Gamma Distributed at 5% Significance Level

Suggested UCL to Use

95% KM Approximate Gamma UCL	0.0235	95% GROS Approximate Gamma UCL	0.0233

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Nickel

General Statistics

Total Number of Observations	61	Number of Distinct Observations	44
		Number of Missing Observations	0
Minimum	4.2	Mean	10.9
Maximum	35.7	Median	10.4
SD	4.16	Std. Error of Mean	0.533
Coefficient of Variation	0.382	Skewness	3.474

Normal GOF Test

Shapiro Wilk Test Statistic	0.742	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	5.695E-14	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.168	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.113	Data Not Normal at 5% Significance Level	

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	11.78	95% Adjusted-CLT UCL (Chen-1995)	12.02
		95% Modified-t UCL (Johnson-1978)	11.82

Gamma GOF Test

A-D Test Statistic	1.398	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.751	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.121	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.114	Data Not Gamma Distributed at 5% Significance Level	

Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	9.377	k star (bias corrected MLE)	8.927
Theta hat (MLE)	1.162	Theta star (bias corrected MLE)	1.22
nu hat (MLE)	1144	nu star (bias corrected)	1089
MLE Mean (bias corrected)	10.9	MLE Sd (bias corrected)	3.647
		Approximate Chi Square Value (0.05)	1013
Adjusted Level of Significance	0.0461	Adjusted Chi Square Value	1012
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	11.71	95% Adjusted Gamma UCL (use when n<50)	11.73
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.934	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk P Value	0.00337	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.132	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.113	Data Not Lognormal at 5% Significance Level	
Data Not Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	1.435	Mean of logged Data	2.334
Maximum of Logged Data	3.575	SD of logged Data	0.325
Assuming Lognormal Distribution			
95% H-UCL	11.72	90% Chebyshev (MVUE) UCL	12.26
95% Chebyshev (MVUE) UCL	12.89	97.5% Chebyshev (MVUE) UCL	13.76
99% Chebyshev (MVUE) UCL	15.47		
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution (0.05)			
Nonparametric Distribution Free UCLs			
95% CLT UCL	11.77	95% Jackknife UCL	11.78
95% Standard Bootstrap UCL	11.76	95% Bootstrap-t UCL	12.16
95% Hall's Bootstrap UCL	15.86	95% Percentile Bootstrap UCL	11.83
95% BCA Bootstrap UCL	11.99		
90% Chebyshev(Mean, Sd) UCL	12.49	95% Chebyshev(Mean, Sd) UCL	13.22
97.5% Chebyshev(Mean, Sd) UCL	14.22	99% Chebyshev(Mean, Sd) UCL	16.2
Suggested UCL to Use			
95% Student's-t UCL	11.78	or 95% Modified-t UCL	11.82
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Thallium			

General Statistics			
Total Number of Observations	61	Number of Distinct Observations	11
Number of Detects	3	Number of Non-Detects	58
Number of Distinct Detects	3	Number of Distinct Non-Detects	10
Minimum Detect	0.13	Minimum Non-Detect	0.1
Maximum Detect	0.41	Maximum Non-Detect	0.19
Variance Detects	0.0217	Percent Non-Detects	95.08%
Mean Detects	0.243	SD Detects	0.147
Median Detects	0.19	CV Detects	0.606
Skewness Detects	1.415	Kurtosis Detects	N/A
Mean of Logged Detects	-1.531	SD of Logged Detects	0.585

Warning: Data set has only 3 Detected Values.

This is not enough to compute meaningful or reliable statistics and estimates.

Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.902	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.767	Detected Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.308	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.425	Detected Data appear Normal at 5% Significance Level	

Detected Data appear Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.108	KM Standard Error of Mean	0.0065
KM SD	0.041	95% KM (BCA) UCL	N/A
95% KM (t) UCL	0.118	95% KM (Percentile Bootstrap) UCL	N/A
95% KM (z) UCL	0.118	95% KM Bootstrap t UCL	N/A
90% KM Chebyshev UCL	0.127	95% KM Chebyshev UCL	0.136
97.5% KM Chebyshev UCL	0.148	99% KM Chebyshev UCL	0.172

Gamma GOF Tests on Detected Observations Only

Not Enough Data to Perform GOF Test

Gamma Statistics on Detected Data Only			
k hat (MLE)	4.414	k star (bias corrected MLE)	N/A
Theta hat (MLE)	0.0551	Theta star (bias corrected MLE)	N/A
nu hat (MLE)	26.49	nu star (bias corrected)	N/A
Mean (detects)	0.243		

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)

For such situations, GROS method may yield incorrect values of UCLs and BTVs

This is especially true when the sample size is small.

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	0.0215
Maximum	0.41	Median	0.01

SD	0.0576	CV	2.68
k hat (MLE)	0.947	k star (bias corrected MLE)	0.912
Theta hat (MLE)	0.0227	Theta star (bias corrected MLE)	0.0236
nu hat (MLE)	115.6	nu star (bias corrected)	111.2
Adjusted Level of Significance (β)	0.0461		
Approximate Chi Square Value (111.24, α)	87.9	Adjusted Chi Square Value (111.24, β)	87.4
95% Gamma Approximate UCL (use when n>=50)	0.0272	95% Gamma Adjusted UCL (use when n<50)	N/A
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.108	SD (KM)	0.041
Variance (KM)	0.00168	SE of Mean (KM)	0.0065
k hat (KM)	6.887	k star (KM)	6.559
nu hat (KM)	840.2	nu star (KM)	800.2
theta hat (KM)	0.0156	theta star (KM)	0.0164
80% gamma percentile (KM)	0.14	90% gamma percentile (KM)	0.164
95% gamma percentile (KM)	0.185	99% gamma percentile (KM)	0.229
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (800.19, α)	735.5	Adjusted Chi Square Value (800.19, β)	734.1
95% Gamma Approximate KM-UCL (use when n>=50)	0.117	95% Gamma Adjusted KM-UCL (use when n<50)	0.117
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.963	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.767	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.254	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.425	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.0231	Mean in Log Scale	-4.883
SD in Original Scale	0.0586	SD in Log Scale	1.387
95% t UCL (assumes normality of ROS data)	0.0356	95% Percentile Bootstrap UCL	0.0365
95% BCA Bootstrap UCL	0.0422	95% Bootstrap t UCL	0.0604
95% H-UCL (Log ROS)	0.0304		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-2.26	KM Geo Mean	0.104
KM SD (logged)	0.2	95% Critical H Value (KM-Log)	1.711
KM Standard Error of Mean (logged)	0.0324	95% H-UCL (KM -Log)	0.111
KM SD (logged)	0.2	95% Critical H Value (KM-Log)	1.711
KM Standard Error of Mean (logged)	0.0324		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.0787	Mean in Log Scale	-2.614
SD in Original Scale	0.0478	SD in Log Scale	0.315
95% t UCL (Assumes normality)	0.0889	95% H-Stat UCL	0.0826
DL/2 is not a recommended method, provided for comparisons and historical reasons			

Nonparametric Distribution Free UCL Statistics			
Detected Data appear Normal Distributed at 5% Significance Level			
Suggested UCL to Use			
95% KM (t) UCL	0.118		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Arsenic			
General Statistics			
Total Number of Observations	61	Number of Distinct Observations	46
		Number of Missing Observations	0
Minimum	2	Mean	6.398
Maximum	15.8	Median	5.4
SD	3.375	Std. Error of Mean	0.432
Coefficient of Variation	0.527	Skewness	1.348
Normal GOF Test			
Shapiro Wilk Test Statistic	0.86	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	1.5225E-7	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.151	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.113	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	7.12	95% Adjusted-CLT UCL (Chen-1995)	7.189
		95% Modified-t UCL (Johnson-1978)	7.133
Gamma GOF Test			
A-D Test Statistic	0.668	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.754	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.0882	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.114	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	4.266	k star (bias corrected MLE)	4.067
Theta hat (MLE)	1.5	Theta star (bias corrected MLE)	1.573
nu hat (MLE)	520.4	nu star (bias corrected)	496.2
MLE Mean (bias corrected)	6.398	MLE Sd (bias corrected)	3.173
		Approximate Chi Square Value (0.05)	445.5
Adjusted Level of Significance	0.0461	Adjusted Chi Square Value	444.3

Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50)	7.126	95% Adjusted Gamma UCL (use when n<50)	7.144
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.97	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk P Value	0.297	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.0581	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.113	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	0.693	Mean of logged Data	1.734
Maximum of Logged Data	2.76	SD of logged Data	0.494
Assuming Lognormal Distribution			
95% H-UCL	7.203	90% Chebyshev (MVUE) UCL	7.658
95% Chebyshev (MVUE) UCL	8.234	97.5% Chebyshev (MVUE) UCL	9.034
99% Chebyshev (MVUE) UCL	10.61		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	7.109	95% Jackknife UCL	7.12
95% Standard Bootstrap UCL	7.113	95% Bootstrap-t UCL	7.239
95% Hall's Bootstrap UCL	7.184	95% Percentile Bootstrap UCL	7.118
95% BCA Bootstrap UCL	7.182		
90% Chebyshev(Mean, Sd) UCL	7.695	95% Chebyshev(Mean, Sd) UCL	8.282
97.5% Chebyshev(Mean, Sd) UCL	9.097	99% Chebyshev(Mean, Sd) UCL	10.7
Suggested UCL to Use			
95% Approximate Gamma UCL	7.126		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Barium			
General Statistics			
Total Number of Observations	61	Number of Distinct Observations	56
		Number of Missing Observations	0
Minimum	43	Mean	206.8
Maximum	486	Median	179
SD	129.7	Std. Error of Mean	16.61
Coefficient of Variation	0.627	Skewness	0.651

Normal GOF Test			
Shapiro Wilk Test Statistic	0.899	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	2.8132E-5	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.132	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.113	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	234.6	95% Adjusted-CLT UCL (Chen-1995)	235.6
		95% Modified-t UCL (Johnson-1978)	234.8
Gamma GOF Test			
A-D Test Statistic	0.772	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.761	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.121	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.115	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	2.476	k star (bias corrected MLE)	2.366
Theta hat (MLE)	83.52	Theta star (bias corrected MLE)	87.43
nu hat (MLE)	302.1	nu star (bias corrected)	288.6
MLE Mean (bias corrected)	206.8	MLE Sd (bias corrected)	134.5
		Approximate Chi Square Value (0.05)	250.2
Adjusted Level of Significance	0.0461	Adjusted Chi Square Value	249.4
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	238.5	95% Adjusted Gamma UCL (use when n<50)	239.3
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.938	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk P Value	0.00581	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.102	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.113	Data appear Lognormal at 5% Significance Level	
Data appear Approximate Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	3.761	Mean of logged Data	5.117
Maximum of Logged Data	6.186	SD of logged Data	0.688
Assuming Lognormal Distribution			
95% H-UCL	252.4	90% Chebyshev (MVUE) UCL	271.2
95% Chebyshev (MVUE) UCL	298.8	97.5% Chebyshev (MVUE) UCL	337.1
99% Chebyshev (MVUE) UCL	412.3		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			

Nonparametric Distribution Free UCLs			
95% CLT UCL	234.2	95% Jackknife UCL	234.6
95% Standard Bootstrap UCL	233.7	95% Bootstrap-t UCL	236.3
95% Hall's Bootstrap UCL	234.4	95% Percentile Bootstrap UCL	234.7
95% BCA Bootstrap UCL	233.8		
90% Chebyshev(Mean, Sd) UCL	256.7	95% Chebyshev(Mean, Sd) UCL	279.2
97.5% Chebyshev(Mean, Sd) UCL	310.6	99% Chebyshev(Mean, Sd) UCL	372.1
Suggested UCL to Use			
95% H-UCL	252.4		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
ProUCL computes and outputs H-statistic based UCLs for historical reasons only.			
H-statistic often results in unstable (both high and low) values of UCL95 as shown in examples in the Technical Guide.			
It is therefore recommended to avoid the use of H-statistic based 95% UCLs.			
Use of nonparametric methods are preferred to compute UCL95 for skewed data sets which do not follow a gamma distribution.			
ChromiumVI_EST			
General Statistics			
Total Number of Observations	61	Number of Distinct Observations	45
		Number of Missing Observations	0
Minimum	0.107	Mean	0.242
Maximum	0.415	Median	0.249
SD	0.0682	Std. Error of Mean	0.00874
Coefficient of Variation	0.282	Skewness	0.0468
Normal GOF Test			
Shapiro Wilk Test Statistic	0.968	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	0.247	Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.117	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.113	Data Not Normal at 5% Significance Level	
Data appear Approximate Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	0.257	95% Adjusted-CLT UCL (Chen-1995)	0.256
		95% Modified-t UCL (Johnson-1978)	0.257
Gamma GOF Test			
A-D Test Statistic	1.082	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.751	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.157	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.114	Data Not Gamma Distributed at 5% Significance Level	

Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	11.63	k star (bias corrected MLE)	11.07
Theta hat (MLE)	0.0208	Theta star (bias corrected MLE)	0.0219
nu hat (MLE)	1419	nu star (bias corrected)	1350
MLE Mean (bias corrected)	0.242	MLE Sd (bias corrected)	0.0727
		Approximate Chi Square Value (0.05)	1266
Adjusted Level of Significance	0.0461	Adjusted Chi Square Value	1264
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	0.258	95% Adjusted Gamma UCL (use when n<50)	0.258
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.934	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk P Value	0.00332	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.175	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.113	Data Not Lognormal at 5% Significance Level	
Data Not Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	-2.234	Mean of logged Data	-1.463
Maximum of Logged Data	-0.88	SD of logged Data	0.309
Assuming Lognormal Distribution			
95% H-UCL	0.261	90% Chebyshev (MVUE) UCL	0.272
95% Chebyshev (MVUE) UCL	0.285	97.5% Chebyshev (MVUE) UCL	0.304
99% Chebyshev (MVUE) UCL	0.34		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	0.256	95% Jackknife UCL	0.257
95% Standard Bootstrap UCL	0.256	95% Bootstrap-t UCL	0.256
95% Hall's Bootstrap UCL	0.257	95% Percentile Bootstrap UCL	0.256
95% BCA Bootstrap UCL	0.257		
90% Chebyshev(Mean, Sd) UCL	0.268	95% Chebyshev(Mean, Sd) UCL	0.28
97.5% Chebyshev(Mean, Sd) UCL	0.297	99% Chebyshev(Mean, Sd) UCL	0.329
Suggested UCL to Use			
95% Student's-t UCL	0.257		
When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test			
When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Cobalt

General Statistics

Total Number of Observations	61	Number of Distinct Observations	40
		Number of Missing Observations	0
Minimum	2.2	Mean	5.275
Maximum	8.6	Median	5.3
SD	1.467	Std. Error of Mean	0.188
Coefficient of Variation	0.278	Skewness	0.0893

Normal GOF Test

Shapiro Wilk Test Statistic	0.977	**Shapiro Wilk GOF Test**
5% Shapiro Wilk P Value	0.53	Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.0622	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.113	Data appear Normal at 5% Significance Level

Data appear Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	5.589	95% Adjusted-CLT UCL (Chen-1995)	5.587
		95% Modified-t UCL (Johnson-1978)	5.59

Gamma GOF Test

A-D Test Statistic	0.482	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.751	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.0832	**Kolmogorov-Smirnov Gamma GOF Test**
5% K-S Critical Value	0.114	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	11.99	k star (bias corrected MLE)	11.41
Theta hat (MLE)	0.44	Theta star (bias corrected MLE)	0.462
nu hat (MLE)	1462	nu star (bias corrected)	1392
MLE Mean (bias corrected)	5.275	MLE Sd (bias corrected)	1.562
		Approximate Chi Square Value (0.05)	1306
Adjusted Level of Significance	0.0461	Adjusted Chi Square Value	1304

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	5.621	95% Adjusted Gamma UCL (use when n<50)	5.63

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.946	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk P Value	0.0171	Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.104	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.113	Data appear Lognormal at 5% Significance Level

Data appear Approximate Lognormal at 5% Significance Level

Lognormal Statistics			
Minimum of Logged Data	0.788	Mean of logged Data	1.621
Maximum of Logged Data	2.152	SD of logged Data	0.304
Assuming Lognormal Distribution			
95% H-UCL	5.675	90% Chebyshev (MVUE) UCL	5.924
95% Chebyshev (MVUE) UCL	6.21	97.5% Chebyshev (MVUE) UCL	6.606
99% Chebyshev (MVUE) UCL	7.386		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	5.584	95% Jackknife UCL	5.589
95% Standard Bootstrap UCL	5.587	95% Bootstrap-t UCL	5.584
95% Hall's Bootstrap UCL	5.592	95% Percentile Bootstrap UCL	5.585
95% BCA Bootstrap UCL	5.589		
90% Chebyshev(Mean, Sd) UCL	5.839	95% Chebyshev(Mean, Sd) UCL	6.094
97.5% Chebyshev(Mean, Sd) UCL	6.449	99% Chebyshev(Mean, Sd) UCL	7.144
Suggested UCL to Use			
95% Student's-t UCL	5.589		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Copper			
General Statistics			
Total Number of Observations	61	Number of Distinct Observations	53
		Number of Missing Observations	0
Minimum	3.5	Mean	13.2
Maximum	26.7	Median	12.5
SD	4.878	Std. Error of Mean	0.625
Coefficient of Variation	0.37	Skewness	0.588
Normal GOF Test			
Shapiro Wilk Test Statistic	0.967	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	0.221	Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.0817	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.113	Data appear Normal at 5% Significance Level	
Data appear Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	

95% Student's-t UCL	14.24	95% Adjusted-CLT UCL (Chen-1995)	14.28
		95% Modified-t UCL (Johnson-1978)	14.25
Gamma GOF Test			
A-D Test Statistic	0.212	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.752	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.0537	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.114	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	7.069	k star (bias corrected MLE)	6.733
Theta hat (MLE)	1.867	Theta star (bias corrected MLE)	1.96
nu hat (MLE)	862.4	nu star (bias corrected)	821.4
MLE Mean (bias corrected)	13.2	MLE Sd (bias corrected)	5.087
		Approximate Chi Square Value (0.05)	755.9
Adjusted Level of Significance	0.0461	Adjusted Chi Square Value	754.3
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	14.34	95% Adjusted Gamma UCL (use when n<50)	14.37
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.964	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk P Value	0.151	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.0756	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.113	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	1.253	Mean of logged Data	2.508
Maximum of Logged Data	3.285	SD of logged Data	0.4
Assuming Lognormal Distribution			
95% H-UCL	14.59	90% Chebyshev (MVUE) UCL	15.39
95% Chebyshev (MVUE) UCL	16.34	97.5% Chebyshev (MVUE) UCL	17.67
99% Chebyshev (MVUE) UCL	20.27		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	14.23	95% Jackknife UCL	14.24
95% Standard Bootstrap UCL	14.21	95% Bootstrap-t UCL	14.26
95% Hall's Bootstrap UCL	14.34	95% Percentile Bootstrap UCL	14.24
95% BCA Bootstrap UCL	14.3		
90% Chebyshev(Mean, Sd) UCL	15.07	95% Chebyshev(Mean, Sd) UCL	15.92
97.5% Chebyshev(Mean, Sd) UCL	17.1	99% Chebyshev(Mean, Sd) UCL	19.41
Suggested UCL to Use			

95% Student's-t UCL	14.24		

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Vanadium

General Statistics

Total Number of Observations	61	Number of Distinct Observations	47
		Number of Missing Observations	0
Minimum	4	Mean	10.16
Maximum	20.4	Median	9.8
SD	3.737	Std. Error of Mean	0.478
Coefficient of Variation	0.368	Skewness	0.589

Normal GOF Test

Shapiro Wilk Test Statistic	0.951	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	0.0345	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.112	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.113	Data appear Normal at 5% Significance Level	

Data appear Approximate Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	10.96	95% Adjusted-CLT UCL (Chen-1995)	10.98
		95% Modified-t UCL (Johnson-1978)	10.96

Gamma GOF Test

A-D Test Statistic	0.419	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.752	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.0889	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.114	Detected data appear Gamma Distributed at 5% Significance Level	

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	7.544	k star (bias corrected MLE)	7.184
Theta hat (MLE)	1.347	Theta star (bias corrected MLE)	1.414
nu hat (MLE)	920.4	nu star (bias corrected)	876.5
MLE Mean (bias corrected)	10.16	MLE Sd (bias corrected)	3.79
		Approximate Chi Square Value (0.05)	808.8
Adjusted Level of Significance	0.0461	Adjusted Chi Square Value	807.2

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	11.01	95% Adjusted Gamma UCL (use when n<50)	11.03

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.972	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk P Value	0.368	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.0955	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.113	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	1.386	Mean of logged Data	2.251
Maximum of Logged Data	3.016	SD of logged Data	0.376
Assuming Lognormal Distribution			
95% H-UCL	11.12	90% Chebyshev (MVUE) UCL	11.69
95% Chebyshev (MVUE) UCL	12.38	97.5% Chebyshev (MVUE) UCL	13.33
99% Chebyshev (MVUE) UCL	15.2		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	10.95	95% Jackknife UCL	10.96
95% Standard Bootstrap UCL	10.93	95% Bootstrap-t UCL	11.02
95% Hall's Bootstrap UCL	11.01	95% Percentile Bootstrap UCL	10.96
95% BCA Bootstrap UCL	11		
90% Chebyshev(Mean, Sd) UCL	11.59	95% Chebyshev(Mean, Sd) UCL	12.24
97.5% Chebyshev(Mean, Sd) UCL	13.15	99% Chebyshev(Mean, Sd) UCL	14.92
Suggested UCL to Use			
95% Student's-t UCL	10.96		
When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test			
When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Zinc			
General Statistics			
Total Number of Observations	61	Number of Distinct Observations	60
		Number of Missing Observations	0
Minimum	10.1	Mean	47.64
Maximum	116	Median	42.2
SD	20.46	Std. Error of Mean	2.619
Coefficient of Variation	0.429	Skewness	1.163
Normal GOF Test			

Shapiro Wilk Test Statistic	0.919	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	4.7622E-4	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.121	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.113	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	52.02	95% Adjusted-CLT UCL (Chen-1995)	52.37
		95% Modified-t UCL (Johnson-1978)	52.08
Gamma GOF Test			
A-D Test Statistic	0.674	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.753	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.0807	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.114	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	5.608	k star (bias corrected MLE)	5.343
Theta hat (MLE)	8.495	Theta star (bias corrected MLE)	8.917
nu hat (MLE)	684.2	nu star (bias corrected)	651.9
MLE Mean (bias corrected)	47.64	MLE Sd (bias corrected)	20.61
		Approximate Chi Square Value (0.05)	593.7
Adjusted Level of Significance	0.0461	Adjusted Chi Square Value	592.3
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50)	52.32	95% Adjusted Gamma UCL (use when n<50)	52.44
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.945	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk P Value	0.0159	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.0971	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.113	Data appear Lognormal at 5% Significance Level	
Data appear Approximate Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	2.313	Mean of logged Data	3.772
Maximum of Logged Data	4.754	SD of logged Data	0.451
Assuming Lognormal Distribution			
95% H-UCL	53.51	90% Chebyshev (MVUE) UCL	56.69
95% Chebyshev (MVUE) UCL	60.61	97.5% Chebyshev (MVUE) UCL	66.06
99% Chebyshev (MVUE) UCL	76.76		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			

95% CLT UCL	51.95	95% Jackknife UCL	52.02
95% Standard Bootstrap UCL	51.8	95% Bootstrap-t UCL	52.46
95% Hall's Bootstrap UCL	52.72	95% Percentile Bootstrap UCL	51.84
95% BCA Bootstrap UCL	52.25		
90% Chebyshev(Mean, Sd) UCL	55.5	95% Chebyshev(Mean, Sd) UCL	59.06
97.5% Chebyshev(Mean, Sd) UCL	64	99% Chebyshev(Mean, Sd) UCL	73.7
Suggested UCL to Use			
95% Approximate Gamma UCL	52.32		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Selenium			
General Statistics			
Total Number of Observations	61	Number of Distinct Observations	22
Number of Detects	10	Number of Non-Detects	51
Number of Distinct Detects	10	Number of Distinct Non-Detects	19
Minimum Detect	0.26	Minimum Non-Detect	0.24
Maximum Detect	0.5	Maximum Non-Detect	0.48
Variance Detects	0.00518	Percent Non-Detects	83.61%
Mean Detects	0.387	SD Detects	0.072
Median Detects	0.395	CV Detects	0.186
Skewness Detects	-0.249	Kurtosis Detects	-0.295
Mean of Logged Detects	-0.966	SD of Logged Detects	0.195
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.991	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.842	Detected Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.125	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.262	Detected Data appear Normal at 5% Significance Level	
Detected Data appear Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.269	KM Standard Error of Mean	0.00903
KM SD	0.0623	95% KM (BCA) UCL	0.285
95% KM (t) UCL	0.284	95% KM (Percentile Bootstrap) UCL	0.284
95% KM (z) UCL	0.284	95% KM Bootstrap t UCL	0.285
90% KM Chebyshev UCL	0.296	95% KM Chebyshev UCL	0.308
97.5% KM Chebyshev UCL	0.325	99% KM Chebyshev UCL	0.359
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	0.165	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.724	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.149	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.266	Detected data appear Gamma Distributed at 5% Significance Level	

Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	30.33	k star (bias corrected MLE)	21.3
Theta hat (MLE)	0.0128	Theta star (bias corrected MLE)	0.0182
nu hat (MLE)	606.7	nu star (bias corrected)	426
Mean (detects)	0.387		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.0533	Mean	0.209
Maximum	0.5	Median	0.195
SD	0.0982	CV	0.47
k hat (MLE)	4.994	k star (bias corrected MLE)	4.759
Theta hat (MLE)	0.0419	Theta star (bias corrected MLE)	0.0439
nu hat (MLE)	609.3	nu star (bias corrected)	580.6
Adjusted Level of Significance (β)	0.0461		
Approximate Chi Square Value (580.63, α)	525.7	Adjusted Chi Square Value (580.63, β)	524.5
95% Gamma Approximate UCL (use when n>=50)	0.231	95% Gamma Adjusted UCL (use when n<50)	0.231
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.269	SD (KM)	0.0623
Variance (KM)	0.00388	SE of Mean (KM)	0.00903
k hat (KM)	18.65	k star (KM)	17.75
nu hat (KM)	2276	nu star (KM)	2165
theta hat (KM)	0.0144	theta star (KM)	0.0152
80% gamma percentile (KM)	0.321	90% gamma percentile (KM)	0.353
95% gamma percentile (KM)	0.382	99% gamma percentile (KM)	0.439
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (N/A, α)	2058	Adjusted Chi Square Value (N/A, β)	2055
95% Gamma Approximate KM-UCL (use when n>=50)	0.283	95% Gamma Adjusted KM-UCL (use when n<50)	0.283
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.97	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.842	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.148	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.262	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.236	Mean in Log Scale	-1.493
SD in Original Scale	0.0805	SD in Log Scale	0.298
95% t UCL (assumes normality of ROS data)	0.253	95% Percentile Bootstrap UCL	0.253
95% BCA Bootstrap UCL	0.256	95% Bootstrap t UCL	0.256

95% H-UCL (Log ROS)	0.251		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-1.334	KM Geo Mean	0.263
KM SD (logged)	0.191	95% Critical H Value (KM-Log)	1.708
KM Standard Error of Mean (logged)	0.0284	95% H-UCL (KM -Log)	0.28
KM SD (logged)	0.191	95% Critical H Value (KM-Log)	1.708
KM Standard Error of Mean (logged)	0.0284		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.201	Mean in Log Scale	-1.681
SD in Original Scale	0.0915	SD in Log Scale	0.363
95% t UCL (Assumes normality)	0.22	95% H-Stat UCL	0.216
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Normal Distributed at 5% Significance Level			
Suggested UCL to Use			
95% KM (t) UCL	0.284		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Naphthalene			
General Statistics			
Total Number of Observations	61	Number of Distinct Observations	28
Number of Detects	15	Number of Non-Detects	46
Number of Distinct Detects	15	Number of Distinct Non-Detects	15
Minimum Detect	0.0016	Minimum Non-Detect	0.0014
Maximum Detect	0.049	Maximum Non-Detect	0.013
Variance Detects	1.5318E-4	Percent Non-Detects	75.41%
Mean Detects	0.00894	SD Detects	0.0124
Median Detects	0.0037	CV Detects	1.384
Skewness Detects	2.828	Kurtosis Detects	8.538
Mean of Logged Detects	-5.242	SD of Logged Detects	0.956
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.603	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.881	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.301	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.22	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			

KM Mean	0.0034	KM Standard Error of Mean	9.0374E-4
KM SD	0.00677	95% KM (BCA) UCL	0.00516
95% KM (t) UCL	0.00491	95% KM (Percentile Bootstrap) UCL	0.00508
95% KM (z) UCL	0.00489	95% KM Bootstrap t UCL	0.00727
90% KM Chebyshev UCL	0.00611	95% KM Chebyshev UCL	0.00734
97.5% KM Chebyshev UCL	0.00905	99% KM Chebyshev UCL	0.0124
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	0.967	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.761	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.212	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.227	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data follow Appr. Gamma Distribution at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	1.09	k star (bias corrected MLE)	0.916
Theta hat (MLE)	0.0082	Theta star (bias corrected MLE)	0.00976
nu hat (MLE)	32.7	nu star (bias corrected)	27.49
Mean (detects)	0.00894		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.0016	Mean	0.00974
Maximum	0.049	Median	0.01
SD	0.006	CV	0.616
k hat (MLE)	4.002	k star (bias corrected MLE)	3.817
Theta hat (MLE)	0.00243	Theta star (bias corrected MLE)	0.00255
nu hat (MLE)	488.3	nu star (bias corrected)	465.6
Adjusted Level of Significance (β)	0.0461		
Approximate Chi Square Value (465.62, α)	416.6	Adjusted Chi Square Value (465.62, β)	415.5
95% Gamma Approximate UCL (use when n>=50)	0.0109	95% Gamma Adjusted UCL (use when n<50)	0.0109
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.0034	SD (KM)	0.00677
Variance (KM)	4.5802E-5	SE of Mean (KM)	9.0374E-4
k hat (KM)	0.253	k star (KM)	0.251
nu hat (KM)	30.83	nu star (KM)	30.65
theta hat (KM)	0.0135	theta star (KM)	0.0135
80% gamma percentile (KM)	0.00495	90% gamma percentile (KM)	0.0102
95% gamma percentile (KM)	0.0164	99% gamma percentile (KM)	0.033
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (30.65, α)	19	Adjusted Chi Square Value (30.65, β)	18.78
95% Gamma Approximate KM-UCL (use when n>=50)	0.00549	95% Gamma Adjusted KM-UCL (use when n<50)	0.00555

Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.923	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.881	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.179	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.22	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.00256	Mean in Log Scale	-7.335
SD in Original Scale	0.00703	SD in Log Scale	1.534
95% t UCL (assumes normality of ROS data)	0.00406	95% Percentile Bootstrap UCL	0.00426
95% BCA Bootstrap UCL	0.0051	95% Bootstrap t UCL	0.00664
95% H-UCL (Log ROS)	0.00352		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-6.193	KM Geo Mean	0.00204
KM SD (logged)	0.751	95% Critical H Value (KM-Log)	2.046
KM Standard Error of Mean (logged)	0.105	95% H-UCL (KM -Log)	0.0033
KM SD (logged)	0.751	95% Critical H Value (KM-Log)	2.046
KM Standard Error of Mean (logged)	0.105		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.00364	Mean in Log Scale	-6.317
SD in Original Scale	0.00692	SD in Log Scale	1.063
95% t UCL (Assumes normality)	0.00512	95% H-Stat UCL	0.00435
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Approximate Gamma Distributed at 5% Significance Level			
Suggested UCL to Use			
95% KM Approximate Gamma UCL	0.00549		
When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test			
When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			

ProUCL Output
North-Central Undeveloped Area (Surface Water)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

UCL Statistics for Data Sets with Non-Detects	
User Selected Options	
Date/Time of Computation	ProUCL 5.11/28/2019 1:34:56 PM
From File	20190128_NCenUndev_ProUCL_input_b.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Fluoride

General Statistics

Total Number of Observations	23	Number of Distinct Observations	20
		Number of Missing Observations	1
Minimum	39.2	Mean	202.4
Maximum	473	Median	214
SD	87.88	Std. Error of Mean	18.32
Coefficient of Variation	0.434	Skewness	0.954

Normal GOF Test

Shapiro Wilk Test Statistic	0.885	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.914	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.199	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.18	Data Not Normal at 5% Significance Level	

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	233.9	95% Adjusted-CLT UCL (Chen-1995)	236.5
		95% Modified-t UCL (Johnson-1978)	234.5

Gamma GOF Test

A-D Test Statistic	1.217	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.747	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.198	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.182	Data Not Gamma Distributed at 5% Significance Level	

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	4.878	k star (bias corrected MLE)	4.27
Theta hat (MLE)	41.5	Theta star (bias corrected MLE)	47.4
nu hat (MLE)	224.4	nu star (bias corrected)	196.4
MLE Mean (bias corrected)	202.4	MLE Sd (bias corrected)	97.96
		Approximate Chi Square Value (0.05)	165
Adjusted Level of Significance	0.0389	Adjusted Chi Square Value	162.9

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	241	95% Adjusted Gamma UCL (use when n<50)	244.1

Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.858	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.914	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.225	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.18	Data Not Lognormal at 5% Significance Level	
Data Not Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	3.669	Mean of logged Data	5.204
Maximum of Logged Data	6.159	SD of logged Data	0.514
Assuming Lognormal Distribution			
95% H-UCL	258.2	90% Chebyshev (MVUE) UCL	275.5
95% Chebyshev (MVUE) UCL	306.8	97.5% Chebyshev (MVUE) UCL	350.2
99% Chebyshev (MVUE) UCL	435.5		
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution (0.05)			
Nonparametric Distribution Free UCLs			
95% CLT UCL	232.6	95% Jackknife UCL	233.9
95% Standard Bootstrap UCL	231.9	95% Bootstrap-t UCL	238.5
95% Hall's Bootstrap UCL	250.6	95% Percentile Bootstrap UCL	233.6
95% BCA Bootstrap UCL	237.7		
90% Chebyshev(Mean, Sd) UCL	257.4	95% Chebyshev(Mean, Sd) UCL	282.3
97.5% Chebyshev(Mean, Sd) UCL	316.9	99% Chebyshev(Mean, Sd) UCL	384.8
Suggested UCL to Use			
95% Chebyshev (Mean, Sd) UCL	282.3		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Cyanide			
General Statistics			
Total Number of Observations	23	Number of Distinct Observations	3
		Number of Missing Observations	1
Number of Detects	1	Number of Non-Detects	22
Number of Distinct Detects	1	Number of Distinct Non-Detects	2
Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set!			
It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).			
The data set for variable Cyanide was not processed!			
CyanideFREE			

General Statistics			
Total Number of Observations	13	Number of Distinct Observations	8
		Number of Missing Observations	10
Number of Detects	7	Number of Non-Detects	6
Number of Distinct Detects	7	Number of Distinct Non-Detects	1
Minimum Detect	1.6	Minimum Non-Detect	1.5
Maximum Detect	4.1	Maximum Non-Detect	1.5
Variance Detects	0.79	Percent Non-Detects	46.15%
Mean Detects	2.657	SD Detects	0.889
Median Detects	2.5	CV Detects	0.334
Skewness Detects	0.589	Kurtosis Detects	-0.435
Mean of Logged Detects	0.93	SD of Logged Detects	0.335

Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.945	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.803	Detected Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.195	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.304	Detected Data appear Normal at 5% Significance Level	
Detected Data appear Normal at 5% Significance Level			

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	2.123	KM Standard Error of Mean	0.25
KM SD	0.835	95% KM (BCA) UCL	2.523
95% KM (t) UCL	2.569	95% KM (Percentile Bootstrap) UCL	2.508
95% KM (z) UCL	2.535	95% KM Bootstrap t UCL	2.737
90% KM Chebyshev UCL	2.873	95% KM Chebyshev UCL	3.213
97.5% KM Chebyshev UCL	3.685	99% KM Chebyshev UCL	4.612

Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	0.227	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.708	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.153	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.312	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			

Gamma Statistics on Detected Data Only			
k hat (MLE)	10.64	k star (bias corrected MLE)	6.173
Theta hat (MLE)	0.25	Theta star (bias corrected MLE)	0.43
nu hat (MLE)	148.9	nu star (bias corrected)	86.42
Mean (detects)	2.657		

Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	1.665
Maximum	4.1	Median	1.6

SD	1.314	CV	0.79
k hat (MLE)	0.789	k star (bias corrected MLE)	0.658
Theta hat (MLE)	2.11	Theta star (bias corrected MLE)	2.53
nu hat (MLE)	20.51	nu star (bias corrected)	17.11
Adjusted Level of Significance (β)	0.0301		
Approximate Chi Square Value (17.11, α)	8.75	Adjusted Chi Square Value (17.11, β)	7.911
95% Gamma Approximate UCL (use when n>=50)	3.255	95% Gamma Adjusted UCL (use when n<50)	3.6
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	2.123	SD (KM)	0.835
Variance (KM)	0.697	SE of Mean (KM)	0.25
k hat (KM)	6.465	k star (KM)	5.025
nu hat (KM)	168.1	nu star (KM)	130.6
theta hat (KM)	0.328	theta star (KM)	0.423
80% gamma percentile (KM)	2.852	90% gamma percentile (KM)	3.391
95% gamma percentile (KM)	3.882	99% gamma percentile (KM)	4.919
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (130.64, α)	105.2	Adjusted Chi Square Value (130.64, β)	102
95% Gamma Approximate KM-UCL (use when n>=50)	2.636	95% Gamma Adjusted KM-UCL (use when n<50)	2.719
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.964	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.803	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.15	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.304	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	1.889	Mean in Log Scale	0.48
SD in Original Scale	1.083	SD in Log Scale	0.59
95% t UCL (assumes normality of ROS data)	2.424	95% Percentile Bootstrap UCL	2.386
95% BCA Bootstrap UCL	2.425	95% Bootstrap t UCL	2.604
95% H-UCL (Log ROS)	2.81		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	0.688	KM Geo Mean	1.989
KM SD (logged)	0.346	95% Critical H Value (KM-Log)	1.951
KM Standard Error of Mean (logged)	0.104	95% H-UCL (KM -Log)	2.567
KM SD (logged)	0.346	95% Critical H Value (KM-Log)	1.951
KM Standard Error of Mean (logged)	0.104		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	1.777	Mean in Log Scale	0.368
SD in Original Scale	1.172	SD in Log Scale	0.674
95% t UCL (Assumes normality)	2.356	95% H-Stat UCL	2.857
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			

Detected Data appear Normal Distributed at 5% Significance Level			
Suggested UCL to Use			
95% KM (t) UCL	2.569		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Aluminum			
General Statistics			
Total Number of Observations	23	Number of Distinct Observations	20
		Number of Missing Observations	1
Number of Detects	19	Number of Non-Detects	4
Number of Distinct Detects	19	Number of Distinct Non-Detects	1
Minimum Detect	16.1	Minimum Non-Detect	15
Maximum Detect	5750	Maximum Non-Detect	15
Variance Detects	1779000	Percent Non-Detects	17.39%
Mean Detects	498.6	SD Detects	1334
Median Detects	47.8	CV Detects	2.675
Skewness Detects	3.792	Kurtosis Detects	15.13
Mean of Logged Detects	4.477	SD of Logged Detects	1.632
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.409	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.901	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.395	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.197	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	414.5	KM Standard Error of Mean	255.8
KM SD	1194	95% KM (BCA) UCL	903.7
95% KM (t) UCL	853.7	95% KM (Percentile Bootstrap) UCL	888.1
95% KM (z) UCL	835.2	95% KM Bootstrap t UCL	2559
90% KM Chebyshev UCL	1182	95% KM Chebyshev UCL	1530
97.5% KM Chebyshev UCL	2012	99% KM Chebyshev UCL	2960
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	2.471	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.826	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.324	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.213	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.382	k star (bias corrected MLE)	0.357
Theta hat (MLE)	1305	Theta star (bias corrected MLE)	1397

nu hat (MLE)	14.52	nu star (bias corrected)	13.56
Mean (detects)	498.6		

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)

For such situations, GROS method may yield incorrect values of UCLs and BTVs

This is especially true when the sample size is small.

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	411.9
Maximum	5750	Median	38.6
SD	1222	CV	2.967
k hat (MLE)	0.23	k star (bias corrected MLE)	0.229
Theta hat (MLE)	1787	Theta star (bias corrected MLE)	1796
nu hat (MLE)	10.6	nu star (bias corrected)	10.55
Adjusted Level of Significance (β)	0.0389		
Approximate Chi Square Value (10.55, α)	4.289	Adjusted Chi Square Value (10.55, β)	4.002
95% Gamma Approximate UCL (use when n>=50)	1013	95% Gamma Adjusted UCL (use when n<50)	1086

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	414.5	SD (KM)	1194
Variance (KM)	1425856	SE of Mean (KM)	255.8
k hat (KM)	0.12	k star (KM)	0.134
nu hat (KM)	5.542	nu star (KM)	6.152
theta hat (KM)	3440	theta star (KM)	3099
80% gamma percentile (KM)	407.3	90% gamma percentile (KM)	1205
95% gamma percentile (KM)	2328	99% gamma percentile (KM)	5669

Gamma Kaplan-Meier (KM) Statistics

Approximate Chi Square Value (6.15, α)	1.718	Adjusted Chi Square Value (6.15, β)	1.555
95% Gamma Approximate KM-UCL (use when n>=50)	1484	95% Gamma Adjusted KM-UCL (use when n<50)	1640

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.85	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.901	Detected Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.2	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.197	Detected Data Not Lognormal at 5% Significance Level

Detected Data Not Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	412.3	Mean in Log Scale	3.833
SD in Original Scale	1222	SD in Log Scale	2.075
95% t UCL (assumes normality of ROS data)	849.7	95% Percentile Bootstrap UCL	886.3
95% BCA Bootstrap UCL	1171	95% Bootstrap t UCL	2568
95% H-UCL (Log ROS)	2527		

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution

KM Mean (logged)	4.169	KM Geo Mean	64.68
KM SD (logged)	1.592	95% Critical H Value (KM-Log)	3.391
KM Standard Error of Mean (logged)	0.341	95% H-UCL (KM -Log)	726.6

KM SD (logged)	1.592	95% Critical H Value (KM-Log)	3.391
KM Standard Error of Mean (logged)	0.341		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	413.2	Mean in Log Scale	4.049
SD in Original Scale	1221	SD in Log Scale	1.758
95% t UCL (Assumes normality)	850.5	95% H-Stat UCL	1059

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution at 5% Significance Level

Suggested UCL to Use

95% KM (Chebyshev) UCL	1530		

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Iron

General Statistics

Total Number of Observations	23	Number of Distinct Observations	12
		Number of Missing Observations	1
Number of Detects	9	Number of Non-Detects	14
Number of Distinct Detects	9	Number of Distinct Non-Detects	3
Minimum Detect	50.2	Minimum Non-Detect	42.4
Maximum Detect	4760	Maximum Non-Detect	49.1
Variance Detects	2897437	Percent Non-Detects	60.87%
Mean Detects	949	SD Detects	1702
Median Detects	99.2	CV Detects	1.794
Skewness Detects	1.918	Kurtosis Detects	2.74
Mean of Logged Detects	5.428	SD of Logged Detects	1.682

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.607	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.829	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.426	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.274	Detected Data Not Normal at 5% Significance Level	

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	397.2	KM Standard Error of Mean	242.6
KM SD	1097	95% KM (BCA) UCL	848.5
95% KM (t) UCL	813.8	95% KM (Percentile Bootstrap) UCL	808.4
95% KM (z) UCL	796.2	95% KM Bootstrap t UCL	6512
90% KM Chebyshev UCL	1125	95% KM Chebyshev UCL	1455
97.5% KM Chebyshev UCL	1912	99% KM Chebyshev UCL	2811

Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	1.221	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.779	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.328	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.296	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.452	k star (bias corrected MLE)	0.376
Theta hat (MLE)	2099	Theta star (bias corrected MLE)	2527
nu hat (MLE)	8.14	nu star (bias corrected)	6.76
Mean (detects)	949		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	371.3
Maximum	4760	Median	0.01
SD	1130	CV	3.044
k hat (MLE)	0.12	k star (bias corrected MLE)	0.134
Theta hat (MLE)	3089	Theta star (bias corrected MLE)	2782
nu hat (MLE)	5.529	nu star (bias corrected)	6.141
Adjusted Level of Significance (β)	0.0389		
Approximate Chi Square Value (6.14, α)	1.712	Adjusted Chi Square Value (6.14, β)	1.549
95% Gamma Approximate UCL (use when n>=50)	1332	95% Gamma Adjusted UCL (use when n<50)	1472
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	397.2	SD (KM)	1097
Variance (KM)	1203570	SE of Mean (KM)	242.6
k hat (KM)	0.131	k star (KM)	0.143
nu hat (KM)	6.028	nu star (KM)	6.575
theta hat (KM)	3030	theta star (KM)	2778
80% gamma percentile (KM)	415	90% gamma percentile (KM)	1169
95% gamma percentile (KM)	2206	99% gamma percentile (KM)	5245
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (6.58, α)	1.941	Adjusted Chi Square Value (6.58, β)	1.764
95% Gamma Approximate KM-UCL (use when n>=50)	1346	95% Gamma Adjusted KM-UCL (use when n<50)	1480
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.805	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.829	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.245	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.274	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Approximate Lognormal at 5% Significance Level			

Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	373.2	Mean in Log Scale	2.175
SD in Original Scale	1130	SD in Log Scale	3.167
95% t UCL (assumes normality of ROS data)	777.7	95% Percentile Bootstrap UCL	779.9
95% BCA Bootstrap UCL	952.8	95% Bootstrap t UCL	5795
95% H-UCL (Log ROS)	79221		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	4.405	KM Geo Mean	81.86
KM SD (logged)	1.288	95% Critical H Value (KM-Log)	2.928
KM Standard Error of Mean (logged)	0.285	95% H-UCL (KM -Log)	418.9
KM SD (logged)	1.288	95% Critical H Value (KM-Log)	2.928
KM Standard Error of Mean (logged)	0.285		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	385.2	Mean in Log Scale	4.025
SD in Original Scale	1126	SD in Log Scale	1.534
95% t UCL (Assumes normality)	788.2	95% H-Stat UCL	534.5
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Approximate Lognormal Distributed at 5% Significance Level			
Suggested UCL to Use			
95% KM (Chebyshev) UCL	1455		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Manganese			
General Statistics			
Total Number of Observations	23	Number of Distinct Observations	22
		Number of Missing Observations	1
Number of Detects	20	Number of Non-Detects	3
Number of Distinct Detects	20	Number of Distinct Non-Detects	2
Minimum Detect	3	Minimum Non-Detect	2.5
Maximum Detect	3750	Maximum Non-Detect	2.7
Variance Detects	696686	Percent Non-Detects	13.04%
Mean Detects	206.1	SD Detects	834.7
Median Detects	8.8	CV Detects	4.05
Skewness Detects	4.463	Kurtosis Detects	19.94
Mean of Logged Detects	2.638	SD of Logged Detects	1.648
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.257	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.905	Detected Data Not Normal at 5% Significance Level	

Lilliefors Test Statistic	0.488	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.192	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	179.5	KM Standard Error of Mean	163
KM SD	761.7	95% KM (BCA) UCL	505.9
95% KM (t) UCL	459.4	95% KM (Percentile Bootstrap) UCL	502.4
95% KM (z) UCL	447.6	95% KM Bootstrap t UCL	9637
90% KM Chebyshev UCL	668.4	95% KM Chebyshev UCL	889.8
97.5% KM Chebyshev UCL	1197	99% KM Chebyshev UCL	1801
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	4.355	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.863	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.364	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.212	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.262	k star (bias corrected MLE)	0.256
Theta hat (MLE)	786.6	Theta star (bias corrected MLE)	804.9
nu hat (MLE)	10.48	nu star (bias corrected)	10.24
Mean (detects)	206.1		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	179.2
Maximum	3750	Median	8.1
SD	778.9	CV	4.347
k hat (MLE)	0.209	k star (bias corrected MLE)	0.211
Theta hat (MLE)	857.1	Theta star (bias corrected MLE)	850.2
nu hat (MLE)	9.617	nu star (bias corrected)	9.696
Adjusted Level of Significance (β)	0.0389		
Approximate Chi Square Value (9.70, α)	3.753	Adjusted Chi Square Value (9.70, β)	3.488
95% Gamma Approximate UCL (use when n>=50)	463	95% Gamma Adjusted UCL (use when n<50)	498.1
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	179.5	SD (KM)	761.7
Variance (KM)	580224	SE of Mean (KM)	163
k hat (KM)	0.0555	k star (KM)	0.0773
nu hat (KM)	2.555	nu star (KM)	3.555
theta hat (KM)	3232	theta star (KM)	2323
80% gamma percentile (KM)	79.77	90% gamma percentile (KM)	416.3
95% gamma percentile (KM)	1042	99% gamma percentile (KM)	3232

Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (3.56, α)	0.554	Adjusted Chi Square Value (3.56, β)	0.48
95% Gamma Approximate KM-UCL (use when n>=50)	1151	95% Gamma Adjusted KM-UCL (use when n<50)	1331
95% Gamma Adjusted KM-UCL (use when k<=1 and 15 < n < 50)			
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.764	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.905	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.214	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.192	Detected Data Not Lognormal at 5% Significance Level	
Detected Data Not Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	179.3	Mean in Log Scale	2.19
SD in Original Scale	778.9	SD in Log Scale	1.938
95% t UCL (assumes normality of ROS data)	458.2	95% Percentile Bootstrap UCL	502.2
95% BCA Bootstrap UCL	826.1	95% Bootstrap t UCL	9867
95% H-UCL (Log ROS)	298.5		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	2.413	KM Geo Mean	11.17
KM SD (logged)	1.606	95% Critical H Value (KM-Log)	3.413
KM Standard Error of Mean (logged)	0.344	95% H-UCL (KM -Log)	130.6
KM SD (logged)	1.606	95% Critical H Value (KM-Log)	3.413
KM Standard Error of Mean (logged)	0.344		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	179.4	Mean in Log Scale	2.33
SD in Original Scale	778.9	SD in Log Scale	1.734
95% t UCL (Assumes normality)	458.3	95% H-Stat UCL	176.1
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution at 5% Significance Level			
Suggested UCL to Use			
95% KM (Chebyshev) UCL	889.8		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Antimony			
General Statistics			
Total Number of Observations	23	Number of Distinct Observations	5
		Number of Missing Observations	1
Number of Detects	3	Number of Non-Detects	20

Number of Distinct Detects	3	Number of Distinct Non-Detects	2
Minimum Detect	2.4	Minimum Non-Detect	0.62
Maximum Detect	2.9	Maximum Non-Detect	0.76
Variance Detects	0.0633	Percent Non-Detects	86.96%
Mean Detects	2.667	SD Detects	0.252
Median Detects	2.7	CV Detects	0.0944
Skewness Detects	-0.586	Kurtosis Detects	N/A
Mean of Logged Detects	0.978	SD of Logged Detects	0.0956

Warning: Data set has only 3 Detected Values.

This is not enough to compute meaningful or reliable statistics and estimates.

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.987	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.767	Detected Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.219	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.425	Detected Data appear Normal at 5% Significance Level	

Detected Data appear Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	0.887	KM Standard Error of Mean	0.177
KM SD	0.693	95% KM (BCA) UCL	N/A
95% KM (t) UCL	1.191	95% KM (Percentile Bootstrap) UCL	N/A
95% KM (z) UCL	1.178	95% KM Bootstrap t UCL	N/A
90% KM Chebyshev UCL	1.418	95% KM Chebyshev UCL	1.659
97.5% KM Chebyshev UCL	1.993	99% KM Chebyshev UCL	2.649

Gamma GOF Tests on Detected Observations Only

Not Enough Data to Perform GOF Test

Gamma Statistics on Detected Data Only

k hat (MLE)	165.8	k star (bias corrected MLE)	N/A
Theta hat (MLE)	0.0161	Theta star (bias corrected MLE)	N/A
nu hat (MLE)	994.8	nu star (bias corrected)	N/A
Mean (detects)	2.667		

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)

For such situations, GROS method may yield incorrect values of UCLs and BTVs

This is especially true when the sample size is small.

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.0511	Mean	1.379
Maximum	2.9	Median	1.315
SD	0.736	CV	0.534
k hat (MLE)	2.372	k star (bias corrected MLE)	2.092
Theta hat (MLE)	0.581	Theta star (bias corrected MLE)	0.659
nu hat (MLE)	109.1	nu star (bias corrected)	96.23
Adjusted Level of Significance (β)	0.0389		

Approximate Chi Square Value (96.23, α)	74.6	Adjusted Chi Square Value (96.23, β)	73.22
95% Gamma Approximate UCL (use when n>=50)	1.778	95% Gamma Adjusted UCL (use when n<50)	N/A
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.887	SD (KM)	0.693
Variance (KM)	0.481	SE of Mean (KM)	0.177
k hat (KM)	1.637	k star (KM)	1.452
nu hat (KM)	75.3	nu star (KM)	66.81
theta hat (KM)	0.542	theta star (KM)	0.611
80% gamma percentile (KM)	1.377	90% gamma percentile (KM)	1.863
95% gamma percentile (KM)	2.336	99% gamma percentile (KM)	3.405
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (66.81, α)	49	Adjusted Chi Square Value (66.81, β)	47.89
95% Gamma Approximate KM-UCL (use when n>=50)	1.209	95% Gamma Adjusted KM-UCL (use when n<50)	1.237
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.98	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.767	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.231	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.425	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	1.664	Mean in Log Scale	0.466
SD in Original Scale	0.515	SD in Log Scale	0.299
95% t UCL (assumes normality of ROS data)	1.849	95% Percentile Bootstrap UCL	1.85
95% BCA Bootstrap UCL	1.878	95% Bootstrap t UCL	1.876
95% H-UCL (Log ROS)	1.872		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-0.288	KM Geo Mean	0.75
KM SD (logged)	0.491	95% Critical H Value (KM-Log)	1.965
KM Standard Error of Mean (logged)	0.125	95% H-UCL (KM -Log)	1.039
KM SD (logged)	0.491	95% Critical H Value (KM-Log)	1.965
KM Standard Error of Mean (logged)	0.125		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.627	Mean in Log Scale	-0.864
SD in Original Scale	0.812	SD in Log Scale	0.733
95% t UCL (Assumes normality)	0.917	95% H-Stat UCL	0.778
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Normal Distributed at 5% Significance Level			
Suggested UCL to Use			
95% KM (t) UCL	1.191		

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Arsenic

General Statistics

Total Number of Observations	23	Number of Distinct Observations	14
		Number of Missing Observations	1
Number of Detects	12	Number of Non-Detects	11
Number of Distinct Detects	11	Number of Distinct Non-Detects	3
Minimum Detect	0.78	Minimum Non-Detect	0.64
Maximum Detect	3.7	Maximum Non-Detect	0.77
Variance Detects	0.735	Percent Non-Detects	47.83%
Mean Detects	1.378	SD Detects	0.857
Median Detects	0.95	CV Detects	0.622
Skewness Detects	2.118	Kurtosis Detects	4.739
Mean of Logged Detects	0.194	SD of Logged Detects	0.485

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.717	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.859	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.274	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.243	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	1.025	KM Standard Error of Mean	0.152
KM SD	0.698	95% KM (BCA) UCL	1.263
95% KM (t) UCL	1.286	95% KM (Percentile Bootstrap) UCL	1.291
95% KM (z) UCL	1.275	95% KM Bootstrap t UCL	1.544
90% KM Chebyshev UCL	1.481	95% KM Chebyshev UCL	1.687
97.5% KM Chebyshev UCL	1.974	99% KM Chebyshev UCL	2.537

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	1.001	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.735	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.289	**Kolmogorov-Smirnov GOF**
5% K-S Critical Value	0.246	Detected Data Not Gamma Distributed at 5% Significance Level

Detected Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	4.113	k star (bias corrected MLE)	3.14
Theta hat (MLE)	0.335	Theta star (bias corrected MLE)	0.439
nu hat (MLE)	98.71	nu star (bias corrected)	75.37
Mean (detects)	1.378		

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	0.729
Maximum	3.7	Median	0.78
SD	0.921	CV	1.262
k hat (MLE)	0.395	k star (bias corrected MLE)	0.372
Theta hat (MLE)	1.847	Theta star (bias corrected MLE)	1.958
nu hat (MLE)	18.17	nu star (bias corrected)	17.13
Adjusted Level of Significance (β)	0.0389		
Approximate Chi Square Value (17.13, α)	8.767	Adjusted Chi Square Value (17.13, β)	8.335
95% Gamma Approximate UCL (use when n>=50)	1.425	95% Gamma Adjusted UCL (use when n<50)	1.499
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	1.025	SD (KM)	0.698
Variance (KM)	0.487	SE of Mean (KM)	0.152
k hat (KM)	2.155	k star (KM)	1.903
nu hat (KM)	99.15	nu star (KM)	87.55
theta hat (KM)	0.475	theta star (KM)	0.538
80% gamma percentile (KM)	1.543	90% gamma percentile (KM)	2.017
95% gamma percentile (KM)	2.469	99% gamma percentile (KM)	3.477
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (87.55, α)	66.98	Adjusted Chi Square Value (87.55, β)	65.68
95% Gamma Approximate KM-UCL (use when n>=50)	1.34	95% Gamma Adjusted KM-UCL (use when n<50)	1.366
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.835	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.859	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.277	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.243	Detected Data Not Lognormal at 5% Significance Level	
Detected Data Not Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.881	Mean in Log Scale	-0.442
SD in Original Scale	0.809	SD in Log Scale	0.8
95% t UCL (assumes normality of ROS data)	1.171	95% Percentile Bootstrap UCL	1.172
95% BCA Bootstrap UCL	1.253	95% Bootstrap t UCL	1.342
95% H-UCL (Log ROS)	1.306		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-0.112	KM Geo Mean	0.894
KM SD (logged)	0.463	95% Critical H Value (KM-Log)	1.942
KM Standard Error of Mean (logged)	0.101	95% H-UCL (KM -Log)	1.206
KM SD (logged)	0.463	95% Critical H Value (KM-Log)	1.942
KM Standard Error of Mean (logged)	0.101		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	

Mean in Original Scale	0.893	Mean in Log Scale	-0.383
SD in Original Scale	0.797	SD in Log Scale	0.707
95% t UCL (Assumes normality)	1.178	95% H-Stat UCL	1.216

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution at 5% Significance Level

Suggested UCL to Use

95% KM (t) UCL	1.286	KM H-UCL	1.206
95% KM (BCA) UCL	1.263		

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Cobalt

General Statistics

Total Number of Observations	23	Number of Distinct Observations	4
		Number of Missing Observations	1
Number of Detects	2	Number of Non-Detects	21
Number of Distinct Detects	2	Number of Distinct Non-Detects	2
Minimum Detect	2	Minimum Non-Detect	1.3
Maximum Detect	2.4	Maximum Non-Detect	1.5
Variance Detects	0.08	Percent Non-Detects	91.3%
Mean Detects	2.2	SD Detects	0.283
Median Detects	2.2	CV Detects	0.129
Skewness Detects	N/A	Kurtosis Detects	N/A
Mean of Logged Detects	0.784	SD of Logged Detects	0.129

Warning: Data set has only 2 Detected Values.

This is not enough to compute meaningful or reliable statistics and estimates.

Normal GOF Test on Detects Only

Not Enough Data to Perform GOF Test

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	1.378	KM Standard Error of Mean	0.0768
KM SD	0.26	95% KM (BCA) UCL	N/A
95% KM (t) UCL	1.51	95% KM (Percentile Bootstrap) UCL	N/A
95% KM (z) UCL	1.505	95% KM Bootstrap t UCL	N/A
90% KM Chebyshev UCL	1.609	95% KM Chebyshev UCL	1.713
97.5% KM Chebyshev UCL	1.858	99% KM Chebyshev UCL	2.142

Gamma GOF Tests on Detected Observations Only

Not Enough Data to Perform GOF Test

Gamma Statistics on Detected Data Only			
k hat (MLE)	120.7	k star (bias corrected MLE)	N/A
Theta hat (MLE)	0.0182	Theta star (bias corrected MLE)	N/A
nu hat (MLE)	482.7	nu star (bias corrected)	N/A
Mean (detects)	2.2		
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	1.378	SD (KM)	0.26
Variance (KM)	0.0678	SE of Mean (KM)	0.0768
k hat (KM)	28.02	k star (KM)	24.4
nu hat (KM)	1289	nu star (KM)	1122
theta hat (KM)	0.0492	theta star (KM)	0.0565
80% gamma percentile (KM)	1.606	90% gamma percentile (KM)	1.746
95% gamma percentile (KM)	1.867	99% gamma percentile (KM)	2.109
Gamma Kaplan-Meier (KM) Statistics			
		Adjusted Level of Significance (β)	0.0389
Approximate Chi Square Value (N/A, α)	1045	Adjusted Chi Square Value (N/A, β)	1040
95% Gamma Approximate KM-UCL (use when n>=50)	1.479	95% Gamma Adjusted KM-UCL (use when n<50)	1.487
Lognormal GOF Test on Detected Observations Only			
Not Enough Data to Perform GOF Test			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.942	Mean in Log Scale	-0.183
SD in Original Scale	0.51	SD in Log Scale	0.503
95% t UCL (assumes normality of ROS data)	1.125	95% Percentile Bootstrap UCL	1.124
95% BCA Bootstrap UCL	1.149	95% Bootstrap t UCL	1.175
95% H-UCL (Log ROS)	1.168		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	0.308	KM Geo Mean	1.36
KM SD (logged)	0.15	95% Critical H Value (KM-Log)	1.738
KM Standard Error of Mean (logged)	0.0441	95% H-UCL (KM -Log)	1.454
KM SD (logged)	0.15	95% Critical H Value (KM-Log)	1.738
KM Standard Error of Mean (logged)	0.0441		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.798	Mean in Log Scale	-0.306
SD in Original Scale	0.448	SD in Log Scale	0.349
95% t UCL (Assumes normality)	0.958	95% H-Stat UCL	0.898
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution at 5% Significance Level			
Suggested UCL to Use			
95% KM (t) UCL	1.51	KM H-UCL	1.454
95% KM (BCA) UCL	N/A		

Warning: One or more Recommended UCL(s) not available!
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

ProUCL Output
North-Central Undeveloped Area (Sediment)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

UCL Statistics for Data Sets with Non-Detects	
User Selected Options	
Date/Time of Computation	ProUCL 5.11/28/2019 1:31:31 PM
From File	20190128_NCenUndev_ProUCL_input_c.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Aluminum

General Statistics

Total Number of Observations	13	Number of Distinct Observations	13
		Number of Missing Observations	0
Minimum	12100	Mean	20446
Maximum	35400	Median	18400
SD	7506	Std. Error of Mean	2082
Coefficient of Variation	0.367	Skewness	1.272

Normal GOF Test

Shapiro Wilk Test Statistic	0.818	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.866	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.256	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.234	Data Not Normal at 5% Significance Level	

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	24156	95% Adjusted-CLT UCL (Chen-1995)	24655
		95% Modified-t UCL (Johnson-1978)	24279

Gamma GOF Test

A-D Test Statistic	0.782	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.734	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.211	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.237	Detected data appear Gamma Distributed at 5% Significance Level	

Detected data follow Appr. Gamma Distribution at 5% Significance Level

Gamma Statistics

k hat (MLE)	9.475	k star (bias corrected MLE)	7.339
Theta hat (MLE)	2158	Theta star (bias corrected MLE)	2786
nu hat (MLE)	246.3	nu star (bias corrected)	190.8
MLE Mean (bias corrected)	20446	MLE Sd (bias corrected)	7547
		Approximate Chi Square Value (0.05)	159.9
Adjusted Level of Significance	0.0301	Adjusted Chi Square Value	155.8

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50)	24405	95% Adjusted Gamma UCL (use when n<50)	25037

ProUCL Output
North-Central Undeveloped Area (Sediment)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.895	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.866	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.19	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.234	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	9.401	Mean of logged Data	9.872
Maximum of Logged Data	10.47	SD of logged Data	0.33
Assuming Lognormal Distribution			
95% H-UCL	24593	90% Chebyshev (MVUE) UCL	26021
95% Chebyshev (MVUE) UCL	28581	97.5% Chebyshev (MVUE) UCL	32135
99% Chebyshev (MVUE) UCL	39115		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	23870	95% Jackknife UCL	24156
95% Standard Bootstrap UCL	23719	95% Bootstrap-t UCL	26438
95% Hall's Bootstrap UCL	25996	95% Percentile Bootstrap UCL	23915
95% BCA Bootstrap UCL	24454		
90% Chebyshev(Mean, Sd) UCL	26691	95% Chebyshev(Mean, Sd) UCL	29520
97.5% Chebyshev(Mean, Sd) UCL	33447	99% Chebyshev(Mean, Sd) UCL	41159
Suggested UCL to Use			
95% Adjusted Gamma UCL	25037		
When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test			
When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Iron			
General Statistics			
Total Number of Observations	13	Number of Distinct Observations	12
		Number of Missing Observations	0
Minimum	7770	Mean	14400
Maximum	25200	Median	14200
SD	4604	Std. Error of Mean	1277
Coefficient of Variation	0.32	Skewness	0.973
Normal GOF Test			

Shapiro Wilk Test Statistic	0.918	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.866	Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.201	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.234	Data appear Normal at 5% Significance Level	
Data appear Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	16676	95% Adjusted-CLT UCL (Chen-1995)	16869
		95% Modified-t UCL (Johnson-1978)	16733
Gamma GOF Test			
A-D Test Statistic	0.377	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.734	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.162	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.237	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	11.19	k star (bias corrected MLE)	8.661
Theta hat (MLE)	1287	Theta star (bias corrected MLE)	1663
nu hat (MLE)	291	nu star (bias corrected)	225.2
MLE Mean (bias corrected)	14400	MLE Sd (bias corrected)	4893
		Approximate Chi Square Value (0.05)	191.4
Adjusted Level of Significance	0.0301	Adjusted Chi Square Value	187
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	16937	95% Adjusted Gamma UCL (use when n<50)	17339
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.958	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.866	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.168	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.234	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	8.958	Mean of logged Data	9.53
Maximum of Logged Data	10.13	SD of logged Data	0.314
Assuming Lognormal Distribution			
95% H-UCL	17201	90% Chebyshev (MVUE) UCL	18196
95% Chebyshev (MVUE) UCL	19917	97.5% Chebyshev (MVUE) UCL	22304
99% Chebyshev (MVUE) UCL	26994		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	16500	95% Jackknife UCL	16676

95% Standard Bootstrap UCL	16416	95% Bootstrap-t UCL	17284
95% Hall's Bootstrap UCL	19245	95% Percentile Bootstrap UCL	16543
95% BCA Bootstrap UCL	16941		
90% Chebyshev(Mean, Sd) UCL	18231	95% Chebyshev(Mean, Sd) UCL	19966
97.5% Chebyshev(Mean, Sd) UCL	22375	99% Chebyshev(Mean, Sd) UCL	27106
Suggested UCL to Use			
95% Student's-t UCL	16676		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Manganese			
General Statistics			
Total Number of Observations	13	Number of Distinct Observations	13
		Number of Missing Observations	0
Minimum	34.1	Mean	424.6
Maximum	1210	Median	234
SD	437.6	Std. Error of Mean	121.4
Coefficient of Variation	1.031	Skewness	0.955
Normal GOF Test			
Shapiro Wilk Test Statistic	0.804	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.866	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.242	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.234	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	640.9	95% Adjusted-CLT UCL (Chen-1995)	658.6
		95% Modified-t UCL (Johnson-1978)	646.3
Gamma GOF Test			
A-D Test Statistic	0.527	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.759	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.194	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.243	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	0.965	k star (bias corrected MLE)	0.793
Theta hat (MLE)	440.1	Theta star (bias corrected MLE)	535.1
nu hat (MLE)	25.09	nu star (bias corrected)	20.63
MLE Mean (bias corrected)	424.6	MLE Sd (bias corrected)	476.7
		Approximate Chi Square Value (0.05)	11.32

Adjusted Level of Significance	0.0301	Adjusted Chi Square Value	10.35
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50)	774	95% Adjusted Gamma UCL (use when n<50)	846.7
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.928	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.866	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.18	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.234	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	3.529	Mean of logged Data	5.45
Maximum of Logged Data	7.098	SD of logged Data	1.212
Assuming Lognormal Distribution			
95% H-UCL	1503	90% Chebyshev (MVUE) UCL	938
95% Chebyshev (MVUE) UCL	1161	97.5% Chebyshev (MVUE) UCL	1471
99% Chebyshev (MVUE) UCL	2079		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	624.2	95% Jackknife UCL	640.9
95% Standard Bootstrap UCL	611.4	95% Bootstrap-t UCL	703.2
95% Hall's Bootstrap UCL	605.4	95% Percentile Bootstrap UCL	632.8
95% BCA Bootstrap UCL	656.4		
90% Chebyshev(Mean, Sd) UCL	788.7	95% Chebyshev(Mean, Sd) UCL	953.6
97.5% Chebyshev(Mean, Sd) UCL	1183	99% Chebyshev(Mean, Sd) UCL	1632
Suggested UCL to Use			
95% Adjusted Gamma UCL	846.7		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Arsenic			
General Statistics			
Total Number of Observations	13	Number of Distinct Observations	13
		Number of Missing Observations	0
Minimum	3.2	Mean	7.131
Maximum	14.5	Median	6.2
SD	3.716	Std. Error of Mean	1.031
Coefficient of Variation	0.521	Skewness	1.036

ProUCL Output
North-Central Undeveloped Area (Sediment)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Normal GOF Test			
Shapiro Wilk Test Statistic	0.875	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.866	Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.169	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.234	Data appear Normal at 5% Significance Level	
Data appear Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	8.968	95% Adjusted-CLT UCL (Chen-1995)	9.142
		95% Modified-t UCL (Johnson-1978)	9.017
Gamma GOF Test			
A-D Test Statistic	0.354	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.737	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.156	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.238	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	4.482	k star (bias corrected MLE)	3.499
Theta hat (MLE)	1.591	Theta star (bias corrected MLE)	2.038
nu hat (MLE)	116.5	nu star (bias corrected)	90.98
MLE Mean (bias corrected)	7.131	MLE Sd (bias corrected)	3.812
		Approximate Chi Square Value (0.05)	69.98
Adjusted Level of Significance	0.0301	Adjusted Chi Square Value	67.36
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	9.27	95% Adjusted Gamma UCL (use when n<50)	9.63
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.948	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.866	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.133	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.234	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	1.163	Mean of logged Data	1.849
Maximum of Logged Data	2.674	SD of logged Data	0.493
Assuming Lognormal Distribution			
95% H-UCL	9.682	90% Chebyshev (MVUE) UCL	10.09
95% Chebyshev (MVUE) UCL	11.44	97.5% Chebyshev (MVUE) UCL	13.32
99% Chebyshev (MVUE) UCL	17.02		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			

Nonparametric Distribution Free UCLs			
95% CLT UCL	8.826	95% Jackknife UCL	8.968
95% Standard Bootstrap UCL	8.763	95% Bootstrap-t UCL	9.478
95% Hall's Bootstrap UCL	9.615	95% Percentile Bootstrap UCL	8.838
95% BCA Bootstrap UCL	8.962		
90% Chebyshev(Mean, Sd) UCL	10.22	95% Chebyshev(Mean, Sd) UCL	11.62
97.5% Chebyshev(Mean, Sd) UCL	13.57	99% Chebyshev(Mean, Sd) UCL	17.38
Suggested UCL to Use			
95% Student's-t UCL	8.968		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Cobalt			
General Statistics			
Total Number of Observations	13	Number of Distinct Observations	11
		Number of Missing Observations	0
Minimum	1.9	Mean	5.2
Maximum	9.2	Median	5.4
SD	1.958	Std. Error of Mean	0.543
Coefficient of Variation	0.377	Skewness	0.28
Normal GOF Test			
Shapiro Wilk Test Statistic	0.969	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.866	Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.168	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.234	Data appear Normal at 5% Significance Level	
Data appear Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	6.168	95% Adjusted-CLT UCL (Chen-1995)	6.138
		95% Modified-t UCL (Johnson-1978)	6.175
Gamma GOF Test			
A-D Test Statistic	0.332	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.735	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.205	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.237	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	6.831	k star (bias corrected MLE)	5.306
Theta hat (MLE)	0.761	Theta star (bias corrected MLE)	0.98
nu hat (MLE)	177.6	nu star (bias corrected)	138

MLE Mean (bias corrected)	5.2	MLE Sd (bias corrected)	2.257
		Approximate Chi Square Value (0.05)	111.8
Adjusted Level of Significance	0.0301	Adjusted Chi Square Value	108.5
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	6.416	95% Adjusted Gamma UCL (use when n<50)	6.614
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.941	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.866	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.22	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.234	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	0.642	Mean of logged Data	1.574
Maximum of Logged Data	2.219	SD of logged Data	0.424
Assuming Lognormal Distribution			
95% H-UCL	6.761	90% Chebyshev (MVUE) UCL	7.12
95% Chebyshev (MVUE) UCL	7.972	97.5% Chebyshev (MVUE) UCL	9.154
99% Chebyshev (MVUE) UCL	11.48		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	6.093	95% Jackknife UCL	6.168
95% Standard Bootstrap UCL	6.053	95% Bootstrap-t UCL	6.219
95% Hall's Bootstrap UCL	6.334	95% Percentile Bootstrap UCL	6.077
95% BCA Bootstrap UCL	6.077		
90% Chebyshev(Mean, Sd) UCL	6.829	95% Chebyshev(Mean, Sd) UCL	7.567
97.5% Chebyshev(Mean, Sd) UCL	8.591	99% Chebyshev(Mean, Sd) UCL	10.6
Suggested UCL to Use			
95% Student's-t UCL	6.168		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			

ProUCL Output
Western Undeveloped Area Soil (0-0.5 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

UCL Statistics for Data Sets with Non-Detects	
User Selected Options	
Date/Time of Computation	ProUCL 5.11/28/2019 4:03:04 PM
From File	20190128_WCenUndev_ProUCL_input.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Fluoride

General Statistics			
Total Number of Observations	31	Number of Distinct Observations	31
		Number of Missing Observations	5
Minimum	1.15	Mean	5.458
Maximum	15.4	Median	3.93
SD	3.831	Std. Error of Mean	0.688
Coefficient of Variation	0.702	Skewness	1.069

Normal GOF Test		
Shapiro Wilk Test Statistic	0.88	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.929	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.202	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.156	Data Not Normal at 5% Significance Level
Data Not Normal at 5% Significance Level		

Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	6.626	95% Adjusted-CLT UCL (Chen-1995)	6.731
		95% Modified-t UCL (Johnson-1978)	6.648

Gamma GOF Test		
A-D Test Statistic	0.45	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.757	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.141	**Kolmogorov-Smirnov Gamma GOF Test**
5% K-S Critical Value	0.16	Detected data appear Gamma Distributed at 5% Significance Level
Detected data appear Gamma Distributed at 5% Significance Level		

Gamma Statistics			
k hat (MLE)	2.248	k star (bias corrected MLE)	2.052
Theta hat (MLE)	2.428	Theta star (bias corrected MLE)	2.66
nu hat (MLE)	139.4	nu star (bias corrected)	127.2
MLE Mean (bias corrected)	5.458	MLE Sd (bias corrected)	3.81
		Approximate Chi Square Value (0.05)	102.2
Adjusted Level of Significance	0.0413	Adjusted Chi Square Value	100.9

Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50)	6.796	95% Adjusted Gamma UCL (use when n<50)	6.88

Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.966	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.929	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.102	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.156	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	0.14	Mean of logged Data	1.459
Maximum of Logged Data	2.734	SD of logged Data	0.716
Assuming Lognormal Distribution			
95% H-UCL	7.329	90% Chebyshev (MVUE) UCL	7.805
95% Chebyshev (MVUE) UCL	8.849	97.5% Chebyshev (MVUE) UCL	10.3
99% Chebyshev (MVUE) UCL	13.14		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	6.59	95% Jackknife UCL	6.626
95% Standard Bootstrap UCL	6.575	95% Bootstrap-t UCL	6.749
95% Hall's Bootstrap UCL	6.761	95% Percentile Bootstrap UCL	6.581
95% BCA Bootstrap UCL	6.773		
90% Chebyshev(Mean, Sd) UCL	7.522	95% Chebyshev(Mean, Sd) UCL	8.457
97.5% Chebyshev(Mean, Sd) UCL	9.755	99% Chebyshev(Mean, Sd) UCL	12.3
Suggested UCL to Use			
95% Adjusted Gamma UCL	6.88		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
BenzoBFluoranthene			
General Statistics			
Total Number of Observations	31	Number of Distinct Observations	28
		Number of Missing Observations	5
Number of Detects	27	Number of Non-Detects	4
Number of Distinct Detects	26	Number of Distinct Non-Detects	3
Minimum Detect	0.0032	Minimum Non-Detect	0.014
Maximum Detect	0.35	Maximum Non-Detect	0.017
Variance Detects	0.0067	Percent Non-Detects	12.9%
Mean Detects	0.0799	SD Detects	0.0818
Median Detects	0.049	CV Detects	1.024
Skewness Detects	1.948	Kurtosis Detects	3.768

Mean of Logged Detects	-2.972	SD of Logged Detects	1.012
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.767	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.923	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.228	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.167	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.0706	KM Standard Error of Mean	0.0144
KM SD	0.0788	95% KM (BCA) UCL	0.0969
95% KM (t) UCL	0.0951	95% KM (Percentile Bootstrap) UCL	0.0952
95% KM (z) UCL	0.0943	95% KM Bootstrap t UCL	0.104
90% KM Chebyshev UCL	0.114	95% KM Chebyshev UCL	0.133
97.5% KM Chebyshev UCL	0.161	99% KM Chebyshev UCL	0.214
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	0.465	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.768	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.119	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.172	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	1.263	k star (bias corrected MLE)	1.147
Theta hat (MLE)	0.0633	Theta star (bias corrected MLE)	0.0697
nu hat (MLE)	68.2	nu star (bias corrected)	61.96
Mean (detects)	0.0799		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.0032	Mean	0.0709
Maximum	0.35	Median	0.044
SD	0.0798	CV	1.126
k hat (MLE)	1.068	k star (bias corrected MLE)	0.986
Theta hat (MLE)	0.0664	Theta star (bias corrected MLE)	0.0719
nu hat (MLE)	66.21	nu star (bias corrected)	61.14
Adjusted Level of Significance (β)	0.0413		
Approximate Chi Square Value (61.14, α)	44.15	Adjusted Chi Square Value (61.14, β)	43.35
95% Gamma Approximate UCL (use when n>=50)	0.0982	95% Gamma Adjusted UCL (use when n<50)	0.1
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.0706	SD (KM)	0.0788
Variance (KM)	0.00621	SE of Mean (KM)	0.0144

k hat (KM)	0.803	k star (KM)	0.747
nu hat (KM)	49.78	nu star (KM)	46.29
theta hat (KM)	0.0879	theta star (KM)	0.0946
80% gamma percentile (KM)	0.116	90% gamma percentile (KM)	0.175
95% gamma percentile (KM)	0.235	99% gamma percentile (KM)	0.378
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (46.29, α)	31.68	Adjusted Chi Square Value (46.29, β)	31.01
95% Gamma Approximate KM-UCL (use when n>=50)	0.103	95% Gamma Adjusted KM-UCL (use when n<50)	0.105
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.976	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.923	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.069	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.167	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.0707	Mean in Log Scale	-3.211
SD in Original Scale	0.08	SD in Log Scale	1.137
95% t UCL (assumes normality of ROS data)	0.0951	95% Percentile Bootstrap UCL	0.0944
95% BCA Bootstrap UCL	0.101	95% Bootstrap t UCL	0.104
95% H-UCL (Log ROS)	0.132		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-3.245	KM Geo Mean	0.039
KM SD (logged)	1.19	95% Critical H Value (KM-Log)	2.658
KM Standard Error of Mean (logged)	0.231	95% H-UCL (KM -Log)	0.141
KM SD (logged)	1.19	95% Critical H Value (KM-Log)	2.658
KM Standard Error of Mean (logged)	0.231		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.0706	Mean in Log Scale	-3.218
SD in Original Scale	0.0801	SD in Log Scale	1.145
95% t UCL (Assumes normality)	0.095	95% H-Stat UCL	0.133
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Gamma Distributed at 5% Significance Level			
Suggested UCL to Use			
95% KM Adjusted Gamma UCL	0.105	95% GROS Adjusted Gamma UCL	0.1
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			

BenzoAPyrene

General Statistics

Total Number of Observations	31	Number of Distinct Observations	21
		Number of Missing Observations	5
Number of Detects	26	Number of Non-Detects	5
Number of Distinct Detects	19	Number of Distinct Non-Detects	3
Minimum Detect	0.002	Minimum Non-Detect	0.011
Maximum Detect	0.27	Maximum Non-Detect	0.013
Variance Detects	0.0033	Percent Non-Detects	16.13%
Mean Detects	0.0491	SD Detects	0.0575
Median Detects	0.0265	CV Detects	1.169
Skewness Detects	2.636	Kurtosis Detects	8.269
Mean of Logged Detects	-3.507	SD of Logged Detects	1.039

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.691	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.92	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.288	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.17	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	0.0422	KM Standard Error of Mean	0.00989
KM SD	0.054	95% KM (BCA) UCL	0.0612
95% KM (t) UCL	0.059	95% KM (Percentile Bootstrap) UCL	0.0591
95% KM (z) UCL	0.0585	95% KM Bootstrap t UCL	0.0702
90% KM Chebyshev UCL	0.0719	95% KM Chebyshev UCL	0.0854
97.5% KM Chebyshev UCL	0.104	99% KM Chebyshev UCL	0.141

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.646	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.77	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.166	**Kolmogorov-Smirnov GOF**
5% K-S Critical Value	0.176	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	1.149	k star (bias corrected MLE)	1.042
Theta hat (MLE)	0.0428	Theta star (bias corrected MLE)	0.0472
nu hat (MLE)	59.75	nu star (bias corrected)	54.19
Mean (detects)	0.0491		

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)

For such situations, GROS method may yield incorrect values of UCLs and BTVs

This is especially true when the sample size is small.

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.002	Mean	0.0428
Maximum	0.27	Median	0.023
SD	0.0545	CV	1.271
k hat (MLE)	1.072	k star (bias corrected MLE)	0.99
Theta hat (MLE)	0.0399	Theta star (bias corrected MLE)	0.0433
nu hat (MLE)	66.48	nu star (bias corrected)	61.38
Adjusted Level of Significance (β)	0.0413		
Approximate Chi Square Value (61.38, α)	44.36	Adjusted Chi Square Value (61.38, β)	43.55
95% Gamma Approximate UCL (use when n>=50)	0.0593	95% Gamma Adjusted UCL (use when n<50)	0.0604
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.0422	SD (KM)	0.054
Variance (KM)	0.00291	SE of Mean (KM)	0.00989
k hat (KM)	0.612	k star (KM)	0.574
nu hat (KM)	37.96	nu star (KM)	35.62
theta hat (KM)	0.069	theta star (KM)	0.0735
80% gamma percentile (KM)	0.0696	90% gamma percentile (KM)	0.111
95% gamma percentile (KM)	0.154	99% gamma percentile (KM)	0.26
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (35.62, α)	22.96	Adjusted Chi Square Value (35.62, β)	22.39
95% Gamma Approximate KM-UCL (use when n>=50)	0.0655	95% Gamma Adjusted KM-UCL (use when n<50)	0.0672
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.976	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.92	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.106	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.17	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.0421	Mean in Log Scale	-3.788
SD in Original Scale	0.0549	SD in Log Scale	1.155
95% t UCL (assumes normality of ROS data)	0.0588	95% Percentile Bootstrap UCL	0.059
95% BCA Bootstrap UCL	0.0638	95% Bootstrap t UCL	0.0716
95% H-UCL (Log ROS)	0.0766		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-3.791	KM Geo Mean	0.0226
KM SD (logged)	1.168	95% Critical H Value (KM-Log)	2.629
KM Standard Error of Mean (logged)	0.229	95% H-UCL (KM -Log)	0.0782
KM SD (logged)	1.168	95% Critical H Value (KM-Log)	2.629
KM Standard Error of Mean (logged)	0.229		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.0422	Mean in Log Scale	-3.773
SD in Original Scale	0.0549	SD in Log Scale	1.131
95% t UCL (Assumes normality)	0.0589	95% H-Stat UCL	0.0743

DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Gamma Distributed at 5% Significance Level			
Suggested UCL to Use			
95% KM Adjusted Gamma UCL	0.0672	95% GROS Adjusted Gamma UCL	0.0604
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
BenzoAAnthracene			
General Statistics			
Total Number of Observations	31	Number of Distinct Observations	24
		Number of Missing Observations	5
Number of Detects	23	Number of Non-Detects	8
Number of Distinct Detects	20	Number of Distinct Non-Detects	6
Minimum Detect	0.0019	Minimum Non-Detect	0.03
Maximum Detect	0.19	Maximum Non-Detect	0.037
Variance Detects	0.00193	Percent Non-Detects	25.81%
Mean Detects	0.0426	SD Detects	0.0439
Median Detects	0.033	CV Detects	1.031
Skewness Detects	2.133	Kurtosis Detects	5.089
Mean of Logged Detects	-3.606	SD of Logged Detects	1.03
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.762	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.914	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.27	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.18	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.0356	KM Standard Error of Mean	0.00723
KM SD	0.039	95% KM (BCA) UCL	0.0483
95% KM (t) UCL	0.0479	95% KM (Percentile Bootstrap) UCL	0.0479
95% KM (z) UCL	0.0475	95% KM Bootstrap t UCL	0.0539
90% KM Chebyshev UCL	0.0573	95% KM Chebyshev UCL	0.0671
97.5% KM Chebyshev UCL	0.0807	99% KM Chebyshev UCL	0.108
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	0.366	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.765	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.15	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.186	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			

Gamma Statistics on Detected Data Only			
k hat (MLE)	1.252	k star (bias corrected MLE)	1.118
Theta hat (MLE)	0.034	Theta star (bias corrected MLE)	0.0381
nu hat (MLE)	57.61	nu star (bias corrected)	51.43
Mean (detects)	0.0426		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.0019	Mean	0.0347
Maximum	0.19	Median	0.021
SD	0.04	CV	1.151
k hat (MLE)	1.223	k star (bias corrected MLE)	1.126
Theta hat (MLE)	0.0284	Theta star (bias corrected MLE)	0.0308
nu hat (MLE)	75.84	nu star (bias corrected)	69.84
Adjusted Level of Significance (β)	0.0413		
Approximate Chi Square Value (69.84, α)	51.6	Adjusted Chi Square Value (69.84, β)	50.73
95% Gamma Approximate UCL (use when n>=50)	0.047	95% Gamma Adjusted UCL (use when n<50)	0.0478
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.0356	SD (KM)	0.039
Variance (KM)	0.00152	SE of Mean (KM)	0.00723
k hat (KM)	0.834	k star (KM)	0.774
nu hat (KM)	51.68	nu star (KM)	48.01
theta hat (KM)	0.0427	theta star (KM)	0.046
80% gamma percentile (KM)	0.0583	90% gamma percentile (KM)	0.0873
95% gamma percentile (KM)	0.117	99% gamma percentile (KM)	0.187
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (48.01, α)	33.11	Adjusted Chi Square Value (48.01, β)	32.42
95% Gamma Approximate KM-UCL (use when n>=50)	0.0517	95% Gamma Adjusted KM-UCL (use when n<50)	0.0528
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.974	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.914	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.141	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.18	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.0351	Mean in Log Scale	-3.793
SD in Original Scale	0.0398	SD in Log Scale	0.947
95% t UCL (assumes normality of ROS data)	0.0472	95% Percentile Bootstrap UCL	0.0473
95% BCA Bootstrap UCL	0.0513	95% Bootstrap t UCL	0.0552
95% H-UCL (Log ROS)	0.0531		

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-3.8	KM Geo Mean	0.0224
KM SD (logged)	0.999	95% Critical H Value (KM-Log)	2.421
KM Standard Error of Mean (logged)	0.203	95% H-UCL (KM -Log)	0.0573
KM SD (logged)	0.999	95% Critical H Value (KM-Log)	2.421
KM Standard Error of Mean (logged)	0.203		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.0359	Mean in Log Scale	-3.732
SD in Original Scale	0.0393	SD in Log Scale	0.909
95% t UCL (Assumes normality)	0.0479	95% H-Stat UCL	0.0532
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Gamma Distributed at 5% Significance Level			
Suggested UCL to Use			
95% KM Adjusted Gamma UCL	0.0528	95% GROS Adjusted Gamma UCL	0.0478
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Cyanide			
General Statistics			
Total Number of Observations	31	Number of Distinct Observations	24
		Number of Missing Observations	5
Number of Detects	26	Number of Non-Detects	5
Number of Distinct Detects	19	Number of Distinct Non-Detects	5
Minimum Detect	0.024	Minimum Non-Detect	0.056
Maximum Detect	2.2	Maximum Non-Detect	0.072
Variance Detects	0.174	Percent Non-Detects	16.13%
Mean Detects	0.262	SD Detects	0.418
Median Detects	0.155	CV Detects	1.592
Skewness Detects	4.33	Kurtosis Detects	20.25
Mean of Logged Detects	-1.816	SD of Logged Detects	0.878
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.453	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.92	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.321	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.17	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			

KM Mean	0.226	KM Standard Error of Mean	0.0704
KM SD	0.384	95% KM (BCA) UCL	0.366
95% KM (t) UCL	0.345	95% KM (Percentile Bootstrap) UCL	0.352
95% KM (z) UCL	0.342	95% KM Bootstrap t UCL	0.592
90% KM Chebyshev UCL	0.437	95% KM Chebyshev UCL	0.533
97.5% KM Chebyshev UCL	0.666	99% KM Chebyshev UCL	0.926
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	1.456	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.769	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.19	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.176	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	1.184	k star (bias corrected MLE)	1.073
Theta hat (MLE)	0.222	Theta star (bias corrected MLE)	0.244
nu hat (MLE)	61.57	nu star (bias corrected)	55.8
Mean (detects)	0.262		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	0.222
Maximum	2.2	Median	0.12
SD	0.393	CV	1.772
k hat (MLE)	0.783	k star (bias corrected MLE)	0.729
Theta hat (MLE)	0.283	Theta star (bias corrected MLE)	0.304
nu hat (MLE)	48.58	nu star (bias corrected)	45.21
Adjusted Level of Significance (β)	0.0413		
Approximate Chi Square Value (45.21, α)	30.78	Adjusted Chi Square Value (45.21, β)	30.12
95% Gamma Approximate UCL (use when n>=50)	0.325	95% Gamma Adjusted UCL (use when n<50)	0.333
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.226	SD (KM)	0.384
Variance (KM)	0.148	SE of Mean (KM)	0.0704
k hat (KM)	0.346	k star (KM)	0.334
nu hat (KM)	21.47	nu star (KM)	20.72
theta hat (KM)	0.653	theta star (KM)	0.676
80% gamma percentile (KM)	0.355	90% gamma percentile (KM)	0.657
95% gamma percentile (KM)	0.998	99% gamma percentile (KM)	1.873
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (20.72, α)	11.39	Adjusted Chi Square Value (20.72, β)	11
95% Gamma Approximate KM-UCL (use when n>=50)	0.411	95% Gamma Adjusted KM-UCL (use when n<50)	0.426

Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.95	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.92	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.115	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.17	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.226	Mean in Log Scale	-2.065
SD in Original Scale	0.391	SD in Log Scale	0.989
95% t UCL (assumes normality of ROS data)	0.345	95% Percentile Bootstrap UCL	0.353
95% BCA Bootstrap UCL	0.439	95% Bootstrap t UCL	0.584
95% H-UCL (Log ROS)	0.32		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-2.069	KM Geo Mean	0.126
KM SD (logged)	0.992	95% Critical H Value (KM-Log)	2.413
KM Standard Error of Mean (logged)	0.186	95% H-UCL (KM -Log)	0.32
KM SD (logged)	0.992	95% Critical H Value (KM-Log)	2.413
KM Standard Error of Mean (logged)	0.186		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.225	Mean in Log Scale	-2.079
SD in Original Scale	0.391	SD in Log Scale	1.007
95% t UCL (Assumes normality)	0.344	95% H-Stat UCL	0.325
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Lognormal Distributed at 5% Significance Level			
Suggested UCL to Use			
KM H-UCL	0.32		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Aluminum			
General Statistics			
Total Number of Observations	31	Number of Distinct Observations	27
		Number of Missing Observations	5
Minimum	8330	Mean	17662
Maximum	29200	Median	17900
SD	5020	Std. Error of Mean	901.6
Coefficient of Variation	0.284	Skewness	0.34

Normal GOF Test			
Shapiro Wilk Test Statistic	0.971	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.929	Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.105	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.156	Data appear Normal at 5% Significance Level	
Data appear Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	19193	95% Adjusted-CLT UCL (Chen-1995)	19204
		95% Modified-t UCL (Johnson-1978)	19202
Gamma GOF Test			
A-D Test Statistic	0.302	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.746	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.0925	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.158	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	12.41	k star (bias corrected MLE)	11.23
Theta hat (MLE)	1424	Theta star (bias corrected MLE)	1573
nu hat (MLE)	769.3	nu star (bias corrected)	696.2
MLE Mean (bias corrected)	17662	MLE Sd (bias corrected)	5271
		Approximate Chi Square Value (0.05)	635.9
Adjusted Level of Significance	0.0413	Adjusted Chi Square Value	632.8
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	19335	95% Adjusted Gamma UCL (use when n<50)	19432
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.972	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.929	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.101	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.156	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	9.028	Mean of logged Data	9.738
Maximum of Logged Data	10.28	SD of logged Data	0.296
Assuming Lognormal Distribution			
95% H-UCL	19514	90% Chebyshev (MVUE) UCL	20555
95% Chebyshev (MVUE) UCL	21853	97.5% Chebyshev (MVUE) UCL	23656
99% Chebyshev (MVUE) UCL	27196		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			

Nonparametric Distribution Free UCLs			
95% CLT UCL	19145	95% Jackknife UCL	19193
95% Standard Bootstrap UCL	19087	95% Bootstrap-t UCL	19283
95% Hall's Bootstrap UCL	19208	95% Percentile Bootstrap UCL	19106
95% BCA Bootstrap UCL	19282		
90% Chebyshev(Mean, Sd) UCL	20367	95% Chebyshev(Mean, Sd) UCL	21592
97.5% Chebyshev(Mean, Sd) UCL	23293	99% Chebyshev(Mean, Sd) UCL	26633
Suggested UCL to Use			
95% Student's-t UCL	19193		

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Iron

General Statistics			
Total Number of Observations	31	Number of Distinct Observations	25
		Number of Missing Observations	5
Minimum	11300	Mean	15177
Maximum	19900	Median	14300
SD	2283	Std. Error of Mean	410
Coefficient of Variation	0.15	Skewness	0.455
Normal GOF Test			
Shapiro Wilk Test Statistic	0.937	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.929	Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.182	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.156	Data Not Normal at 5% Significance Level	
Data appear Approximate Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	15873	95% Adjusted-CLT UCL (Chen-1995)	15888
		95% Modified-t UCL (Johnson-1978)	15879
Gamma GOF Test			
A-D Test Statistic	0.745	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.744	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.169	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.157	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	46.84	k star (bias corrected MLE)	42.33

Theta hat (MLE)	324	Theta star (bias corrected MLE)	358.6
nu hat (MLE)	2904	nu star (bias corrected)	2624
MLE Mean (bias corrected)	15177	MLE Sd (bias corrected)	2333
		Approximate Chi Square Value (0.05)	2506
Adjusted Level of Significance	0.0413	Adjusted Chi Square Value	2500
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	15892	95% Adjusted Gamma UCL (use when n<50)	15933
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.951	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.929	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.16	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.156	Data Not Lognormal at 5% Significance Level	
Data appear Approximate Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	9.333	Mean of logged Data	9.617
Maximum of Logged Data	9.898	SD of logged Data	0.148
Assuming Lognormal Distribution			
95% H-UCL	15904	90% Chebyshev (MVUE) UCL	16392
95% Chebyshev (MVUE) UCL	16943	97.5% Chebyshev (MVUE) UCL	17708
99% Chebyshev (MVUE) UCL	19210		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	15852	95% Jackknife UCL	15873
95% Standard Bootstrap UCL	15837	95% Bootstrap-t UCL	15945
95% Hall's Bootstrap UCL	15911	95% Percentile Bootstrap UCL	15826
95% BCA Bootstrap UCL	15890		
90% Chebyshev(Mean, Sd) UCL	16407	95% Chebyshev(Mean, Sd) UCL	16964
97.5% Chebyshev(Mean, Sd) UCL	17738	99% Chebyshev(Mean, Sd) UCL	19257
Suggested UCL to Use			
95% Student's-t UCL	15873		
When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test			
When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Manganese			

ProUCL Output
Western Undeveloped Area Soil (0-0.5 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

General Statistics			
Total Number of Observations	31	Number of Distinct Observations	31
		Number of Missing Observations	5
Minimum	62.7	Mean	513.3
Maximum	2210	Median	446
SD	393.9	Std. Error of Mean	70.74
Coefficient of Variation	0.767	Skewness	2.827
Normal GOF Test			
Shapiro Wilk Test Statistic	0.752	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.929	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.178	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.156	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	633.4	95% Adjusted-CLT UCL (Chen-1995)	668.1
		95% Modified-t UCL (Johnson-1978)	639.4
Gamma GOF Test			
A-D Test Statistic	0.365	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.757	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.0944	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.159	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	2.357	k star (bias corrected MLE)	2.151
Theta hat (MLE)	217.8	Theta star (bias corrected MLE)	238.7
nu hat (MLE)	146.2	nu star (bias corrected)	133.3
MLE Mean (bias corrected)	513.3	MLE Sd (bias corrected)	350
		Approximate Chi Square Value (0.05)	107.7
Adjusted Level of Significance	0.0413	Adjusted Chi Square Value	106.4
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50)	635.7	95% Adjusted Gamma UCL (use when n<50)	643.4
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.966	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.929	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.111	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.156	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	4.138	Mean of logged Data	6.014
Maximum of Logged Data	7.701	SD of logged Data	0.709

Assuming Lognormal Distribution			
95% H-UCL	690.9	90% Chebyshev (MVUE) UCL	736.2
95% Chebyshev (MVUE) UCL	833.9	97.5% Chebyshev (MVUE) UCL	969.4
99% Chebyshev (MVUE) UCL	1236		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	629.7	95% Jackknife UCL	633.4
95% Standard Bootstrap UCL	631.3	95% Bootstrap-t UCL	697.3
95% Hall's Bootstrap UCL	1214	95% Percentile Bootstrap UCL	631.9
95% BCA Bootstrap UCL	690.4		
90% Chebyshev(Mean, Sd) UCL	725.5	95% Chebyshev(Mean, Sd) UCL	821.7
97.5% Chebyshev(Mean, Sd) UCL	955.1	99% Chebyshev(Mean, Sd) UCL	1217
Suggested UCL to Use			
95% Adjusted Gamma UCL	643.4		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Mercury			
General Statistics			
Total Number of Observations	31	Number of Distinct Observations	19
		Number of Missing Observations	5
Number of Detects	25	Number of Non-Detects	6
Number of Distinct Detects	18	Number of Distinct Non-Detects	3
Minimum Detect	0.012	Minimum Non-Detect	0.011
Maximum Detect	0.063	Maximum Non-Detect	0.014
Variance Detects	1.4423E-4	Percent Non-Detects	19.35%
Mean Detects	0.0257	SD Detects	0.012
Median Detects	0.022	CV Detects	0.468
Skewness Detects	1.604	Kurtosis Detects	2.912
Mean of Logged Detects	-3.749	SD of Logged Detects	0.412
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.854	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.918	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.22	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.173	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.0228	KM Standard Error of Mean	0.00221

KM SD	0.012	95% KM (BCA) UCL	0.0266
95% KM (t) UCL	0.0266	95% KM (Percentile Bootstrap) UCL	0.0264
95% KM (z) UCL	0.0265	95% KM Bootstrap t UCL	0.0279
90% KM Chebyshev UCL	0.0295	95% KM Chebyshev UCL	0.0325
97.5% KM Chebyshev UCL	0.0366	99% KM Chebyshev UCL	0.0448
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	0.526	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.747	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.19	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.175	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected data follow Appr. Gamma Distribution at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	5.897	k star (bias corrected MLE)	5.216
Theta hat (MLE)	0.00436	Theta star (bias corrected MLE)	0.00492
nu hat (MLE)	294.8	nu star (bias corrected)	260.8
Mean (detects)	0.0257		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	0.0226
Maximum	0.063	Median	0.02
SD	0.0125	CV	0.55
k hat (MLE)	4.094	k star (bias corrected MLE)	3.719
Theta hat (MLE)	0.00553	Theta star (bias corrected MLE)	0.00609
nu hat (MLE)	253.8	nu star (bias corrected)	230.6
Adjusted Level of Significance (β)	0.0413		
Approximate Chi Square Value (230.58, α)	196.4	Adjusted Chi Square Value (230.58, β)	194.7
95% Gamma Approximate UCL (use when n>=50)	0.0266	95% Gamma Adjusted UCL (use when n<50)	0.0268
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.0228	SD (KM)	0.012
Variance (KM)	1.4517E-4	SE of Mean (KM)	0.00221
k hat (KM)	3.595	k star (KM)	3.268
nu hat (KM)	222.9	nu star (KM)	202.6
theta hat (KM)	0.00636	theta star (KM)	0.00699
80% gamma percentile (KM)	0.0323	90% gamma percentile (KM)	0.0398
95% gamma percentile (KM)	0.0468	99% gamma percentile (KM)	0.0619
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (202.63, α)	170.7	Adjusted Chi Square Value (202.63, β)	169.1
95% Gamma Approximate KM-UCL (use when n>=50)	0.0271	95% Gamma Adjusted KM-UCL (use when n<50)	0.0274
Lognormal GOF Test on Detected Observations Only			

Shapiro Wilk Test Statistic	0.965	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.918	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.165	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.173	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.0225	Mean in Log Scale	-3.932
SD in Original Scale	0.0126	SD in Log Scale	0.531
95% t UCL (assumes normality of ROS data)	0.0263	95% Percentile Bootstrap UCL	0.0261
95% BCA Bootstrap UCL	0.0266	95% Bootstrap t UCL	0.0273
95% H-UCL (Log ROS)	0.0273		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-3.896	KM Geo Mean	0.0203
KM SD (logged)	0.47	95% Critical H Value (KM-Log)	1.906
KM Standard Error of Mean (logged)	0.0862	95% H-UCL (KM -Log)	0.0267
KM SD (logged)	0.47	95% Critical H Value (KM-Log)	1.906
KM Standard Error of Mean (logged)	0.0862		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.0219	Mean in Log Scale	-4.017
SD in Original Scale	0.0134	SD in Log Scale	0.668
95% t UCL (Assumes normality)	0.0259	95% H-Stat UCL	0.029
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Approximate Gamma Distributed at 5% Significance Level			
Suggested UCL to Use			
95% KM Adjusted Gamma UCL	0.0274	95% GROS Adjusted Gamma UCL	0.0268
When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test			
When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Nickel			
General Statistics			
Total Number of Observations	31	Number of Distinct Observations	23
		Number of Missing Observations	5
Minimum	8.9	Mean	11.6
Maximum	14.3	Median	11.3

SD	1.562	Std. Error of Mean	0.28
Coefficient of Variation	0.135	Skewness	0.17
Normal GOF Test			
Shapiro Wilk Test Statistic	0.933	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.929	Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.138	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.156	Data appear Normal at 5% Significance Level	
Data appear Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	12.08	95% Adjusted-CLT UCL (Chen-1995)	12.07
		95% Modified-t UCL (Johnson-1978)	12.08
Gamma GOF Test			
A-D Test Statistic	0.713	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.744	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.144	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.157	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	57.03	k star (bias corrected MLE)	51.54
Theta hat (MLE)	0.203	Theta star (bias corrected MLE)	0.225
nu hat (MLE)	3536	nu star (bias corrected)	3195
MLE Mean (bias corrected)	11.6	MLE Sd (bias corrected)	1.616
		Approximate Chi Square Value (0.05)	3065
Adjusted Level of Significance	0.0413	Adjusted Chi Square Value	3058
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	12.09	95% Adjusted Gamma UCL (use when n<50)	12.12
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.94	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.929	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.141	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.156	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	2.186	Mean of logged Data	2.442
Maximum of Logged Data	2.66	SD of logged Data	0.135
Assuming Lognormal Distribution			
95% H-UCL	12.1	90% Chebyshev (MVUE) UCL	12.45
95% Chebyshev (MVUE) UCL	12.83	97.5% Chebyshev (MVUE) UCL	13.36
99% Chebyshev (MVUE) UCL	14.41		

Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	12.06	95% Jackknife UCL	12.08
95% Standard Bootstrap UCL	12.05	95% Bootstrap-t UCL	12.08
95% Hall's Bootstrap UCL	12.08	95% Percentile Bootstrap UCL	12.06
95% BCA Bootstrap UCL	12.08		
90% Chebyshev(Mean, Sd) UCL	12.44	95% Chebyshev(Mean, Sd) UCL	12.82
97.5% Chebyshev(Mean, Sd) UCL	13.35	99% Chebyshev(Mean, Sd) UCL	14.39
Suggested UCL to Use			
95% Student's-t UCL	12.08		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Arsenic			
General Statistics			
Total Number of Observations	31	Number of Distinct Observations	24
		Number of Missing Observations	5
Minimum	2.1	Mean	5.013
Maximum	9	Median	4.6
SD	1.684	Std. Error of Mean	0.302
Coefficient of Variation	0.336	Skewness	0.669
Normal GOF Test			
Shapiro Wilk Test Statistic	0.947	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.929	Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.172	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.156	Data Not Normal at 5% Significance Level	
Data appear Approximate Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	5.526	95% Adjusted-CLT UCL (Chen-1995)	5.549
		95% Modified-t UCL (Johnson-1978)	5.532
Gamma GOF Test			
A-D Test Statistic	0.367	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.746	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.129	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.158	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			

Gamma Statistics			
k hat (MLE)	9.396	k star (bias corrected MLE)	8.508
Theta hat (MLE)	0.534	Theta star (bias corrected MLE)	0.589
nu hat (MLE)	582.6	nu star (bias corrected)	527.5
MLE Mean (bias corrected)	5.013	MLE Sd (bias corrected)	1.719
		Approximate Chi Square Value (0.05)	475.3
Adjusted Level of Significance	0.0413	Adjusted Chi Square Value	472.5
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	5.564	95% Adjusted Gamma UCL (use when n<50)	5.597
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.978	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.929	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.108	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.156	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	0.742	Mean of logged Data	1.558
Maximum of Logged Data	2.197	SD of logged Data	0.337
Assuming Lognormal Distribution			
95% H-UCL	5.621	90% Chebyshev (MVUE) UCL	5.947
95% Chebyshev (MVUE) UCL	6.369	97.5% Chebyshev (MVUE) UCL	6.954
99% Chebyshev (MVUE) UCL	8.103		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	5.51	95% Jackknife UCL	5.526
95% Standard Bootstrap UCL	5.507	95% Bootstrap-t UCL	5.57
95% Hall's Bootstrap UCL	5.585	95% Percentile Bootstrap UCL	5.506
95% BCA Bootstrap UCL	5.513		
90% Chebyshev(Mean, Sd) UCL	5.92	95% Chebyshev(Mean, Sd) UCL	6.331
97.5% Chebyshev(Mean, Sd) UCL	6.902	99% Chebyshev(Mean, Sd) UCL	8.022
Suggested UCL to Use			
95% Student's-t UCL	5.526		
When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test			
When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			

Barium

General Statistics

Total Number of Observations	31	Number of Distinct Observations	29
		Number of Missing Observations	5
Minimum	83.8	Mean	271.6
Maximum	499	Median	278
SD	114.2	Std. Error of Mean	20.51
Coefficient of Variation	0.42	Skewness	0.0763

Normal GOF Test

Shapiro Wilk Test Statistic	0.966	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.929	Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.0761	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.156	Data appear Normal at 5% Significance Level

Data appear Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	306.4	95% Adjusted-CLT UCL (Chen-1995)	305.7
		95% Modified-t UCL (Johnson-1978)	306.5

Gamma GOF Test

A-D Test Statistic	0.519	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.747	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.118	**Kolmogorov-Smirnov Gamma GOF Test**
5% K-S Critical Value	0.158	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	4.912	k star (bias corrected MLE)	4.458
Theta hat (MLE)	55.3	Theta star (bias corrected MLE)	60.93
nu hat (MLE)	304.5	nu star (bias corrected)	276.4
MLE Mean (bias corrected)	271.6	MLE Sd (bias corrected)	128.6
		Approximate Chi Square Value (0.05)	238.9
Adjusted Level of Significance	0.0413	Adjusted Chi Square Value	237

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	314.3	95% Adjusted Gamma UCL (use when n<50)	316.8

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.917	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.929	Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.151	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.156	Data appear Lognormal at 5% Significance Level

Data appear Approximate Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	4.428	Mean of logged Data	5.499
Maximum of Logged Data	6.213	SD of logged Data	0.498
Assuming Lognormal Distribution			
95% H-UCL	329.8	90% Chebyshev (MVUE) UCL	352.8
95% Chebyshev (MVUE) UCL	387.8	97.5% Chebyshev (MVUE) UCL	436.4
99% Chebyshev (MVUE) UCL	531.8		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	305.4	95% Jackknife UCL	306.4
95% Standard Bootstrap UCL	306.2	95% Bootstrap-t UCL	305.2
95% Hall's Bootstrap UCL	306	95% Percentile Bootstrap UCL	303.6
95% BCA Bootstrap UCL	303.8		
90% Chebyshev(Mean, Sd) UCL	333.1	95% Chebyshev(Mean, Sd) UCL	361
97.5% Chebyshev(Mean, Sd) UCL	399.7	99% Chebyshev(Mean, Sd) UCL	475.7
Suggested UCL to Use			
95% Student's-t UCL	306.4		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
ChromiumVI_EST			
General Statistics			
Total Number of Observations	31	Number of Distinct Observations	26
		Number of Missing Observations	5
Minimum	0.177	Mean	0.311
Maximum	0.49	Median	0.305
SD	0.0877	Std. Error of Mean	0.0157
Coefficient of Variation	0.282	Skewness	0.254
Normal GOF Test			
Shapiro Wilk Test Statistic	0.934	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.929	Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.184	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.156	Data Not Normal at 5% Significance Level	
Data appear Approximate Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	0.338	95% Adjusted-CLT UCL (Chen-1995)	0.338
		95% Modified-t UCL (Johnson-1978)	0.338

Gamma GOF Test			
A-D Test Statistic	0.789	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.746	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.181	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.158	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	12.87	k star (bias corrected MLE)	11.65
Theta hat (MLE)	0.0242	Theta star (bias corrected MLE)	0.0267
nu hat (MLE)	797.9	nu star (bias corrected)	722
MLE Mean (bias corrected)	0.311	MLE Sd (bias corrected)	0.0911
		Approximate Chi Square Value (0.05)	660.7
Adjusted Level of Significance	0.0413	Adjusted Chi Square Value	657.4
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	0.34	95% Adjusted Gamma UCL (use when n<50)	0.342
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.937	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.929	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.173	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.156	Data Not Lognormal at 5% Significance Level	
Data appear Approximate Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	-1.734	Mean of logged Data	-1.207
Maximum of Logged Data	-0.714	SD of logged Data	0.287
Assuming Lognormal Distribution			
95% H-UCL	0.342	90% Chebyshev (MVUE) UCL	0.36
95% Chebyshev (MVUE) UCL	0.382	97.5% Chebyshev (MVUE) UCL	0.413
99% Chebyshev (MVUE) UCL	0.473		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	0.337	95% Jackknife UCL	0.338
95% Standard Bootstrap UCL	0.337	95% Bootstrap-t UCL	0.34
95% Hall's Bootstrap UCL	0.338	95% Percentile Bootstrap UCL	0.336
95% BCA Bootstrap UCL	0.335		
90% Chebyshev(Mean, Sd) UCL	0.358	95% Chebyshev(Mean, Sd) UCL	0.38
97.5% Chebyshev(Mean, Sd) UCL	0.409	99% Chebyshev(Mean, Sd) UCL	0.468
Suggested UCL to Use			
95% Student's-t UCL	0.338		

When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test

When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Cobalt

General Statistics

Total Number of Observations	31	Number of Distinct Observations	19
		Number of Missing Observations	5
Minimum	3.5	Mean	5.742
Maximum	7.2	Median	5.7
SD	0.826	Std. Error of Mean	0.148
Coefficient of Variation	0.144	Skewness	-0.397

Normal GOF Test

Shapiro Wilk Test Statistic	0.975	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.929	Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.0814	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.156	Data appear Normal at 5% Significance Level

Data appear Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	5.994	95% Adjusted-CLT UCL (Chen-1995)	5.975
		95% Modified-t UCL (Johnson-1978)	5.992

Gamma GOF Test

A-D Test Statistic	0.283	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.744	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.0993	**Kolmogorov-Smirnov Gamma GOF Test**
5% K-S Critical Value	0.157	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	46.55	k star (bias corrected MLE)	42.07
Theta hat (MLE)	0.123	Theta star (bias corrected MLE)	0.136
nu hat (MLE)	2886	nu star (bias corrected)	2608
MLE Mean (bias corrected)	5.742	MLE Sd (bias corrected)	0.885
		Approximate Chi Square Value (0.05)	2491
Adjusted Level of Significance	0.0413	Adjusted Chi Square Value	2484

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	6.013	95% Adjusted Gamma UCL (use when n<50)	6.029

Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.944	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.929	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.112	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.156	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	1.253	Mean of logged Data	1.737
Maximum of Logged Data	1.974	SD of logged Data	0.153
Assuming Lognormal Distribution			
95% H-UCL	6.029	90% Chebyshev (MVUE) UCL	6.219
95% Chebyshev (MVUE) UCL	6.434	97.5% Chebyshev (MVUE) UCL	6.732
99% Chebyshev (MVUE) UCL	7.318		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	5.986	95% Jackknife UCL	5.994
95% Standard Bootstrap UCL	5.981	95% Bootstrap-t UCL	5.999
95% Hall's Bootstrap UCL	5.977	95% Percentile Bootstrap UCL	5.984
95% BCA Bootstrap UCL	5.981		
90% Chebyshev(Mean, Sd) UCL	6.187	95% Chebyshev(Mean, Sd) UCL	6.389
97.5% Chebyshev(Mean, Sd) UCL	6.669	99% Chebyshev(Mean, Sd) UCL	7.218
Suggested UCL to Use			
95% Student's-t UCL	5.994		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Note: For highly negatively-skewed data, confidence limits (e.g., Chen, Johnson, Lognormal, and Gamma) may not be			
reliable. Chen's and Johnson's methods provide adjustments for positvely skewed data sets.			
Copper			
General Statistics			
Total Number of Observations	31	Number of Distinct Observations	28
		Number of Missing Observations	5
Minimum	7	Mean	16.25
Maximum	27	Median	16.1
SD	5.414	Std. Error of Mean	0.972
Coefficient of Variation	0.333	Skewness	0.438

Normal GOF Test			
Shapiro Wilk Test Statistic	0.954	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.929	Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.106	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.156	Data appear Normal at 5% Significance Level	
Data appear Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	17.9	95% Adjusted-CLT UCL (Chen-1995)	17.93
		95% Modified-t UCL (Johnson-1978)	17.91
Gamma GOF Test			
A-D Test Statistic	0.246	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.746	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.1	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.158	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	9.224	k star (bias corrected MLE)	8.352
Theta hat (MLE)	1.762	Theta star (bias corrected MLE)	1.946
nu hat (MLE)	571.9	nu star (bias corrected)	517.9
MLE Mean (bias corrected)	16.25	MLE Sd (bias corrected)	5.623
		Approximate Chi Square Value (0.05)	466.1
Adjusted Level of Significance	0.0413	Adjusted Chi Square Value	463.4
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	18.06	95% Adjusted Gamma UCL (use when n<50)	18.16
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.973	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.929	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.0924	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.156	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	1.946	Mean of logged Data	2.733
Maximum of Logged Data	3.296	SD of logged Data	0.342
Assuming Lognormal Distribution			
95% H-UCL	18.27	90% Chebyshev (MVUE) UCL	19.34
95% Chebyshev (MVUE) UCL	20.73	97.5% Chebyshev (MVUE) UCL	22.66
99% Chebyshev (MVUE) UCL	26.45		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			

Nonparametric Distribution Free UCLs			
95% CLT UCL	17.85	95% Jackknife UCL	17.9
95% Standard Bootstrap UCL	17.82	95% Bootstrap-t UCL	17.98
95% Hall's Bootstrap UCL	17.98	95% Percentile Bootstrap UCL	17.8
95% BCA Bootstrap UCL	17.96		
90% Chebyshev(Mean, Sd) UCL	19.17	95% Chebyshev(Mean, Sd) UCL	20.49
97.5% Chebyshev(Mean, Sd) UCL	22.32	99% Chebyshev(Mean, Sd) UCL	25.93
Suggested UCL to Use			
95% Student's-t UCL	17.9		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Vanadium			
General Statistics			
Total Number of Observations	31	Number of Distinct Observations	27
		Number of Missing Observations	5
Minimum	6.3	Mean	12.26
Maximum	17.3	Median	12.5
SD	2.711	Std. Error of Mean	0.487
Coefficient of Variation	0.221	Skewness	-0.262
Normal GOF Test			
Shapiro Wilk Test Statistic	0.973	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.929	Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.0889	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.156	Data appear Normal at 5% Significance Level	
Data appear Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	13.09	95% Adjusted-CLT UCL (Chen-1995)	13.04
		95% Modified-t UCL (Johnson-1978)	13.09
Gamma GOF Test			
A-D Test Statistic	0.385	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.745	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.102	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.157	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	19.05	k star (bias corrected MLE)	17.23
Theta hat (MLE)	0.644	Theta star (bias corrected MLE)	0.712

nu hat (MLE)	1181	nu star (bias corrected)	1068
MLE Mean (bias corrected)	12.26	MLE Sd (bias corrected)	2.955
		Approximate Chi Square Value (0.05)	993.2
Adjusted Level of Significance	0.0413	Adjusted Chi Square Value	989.2
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	13.19	95% Adjusted Gamma UCL (use when n<50)	13.24
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.928	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.929	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.101	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.156	Data appear Lognormal at 5% Significance Level	
Data appear Approximate Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	1.841	Mean of logged Data	2.48
Maximum of Logged Data	2.851	SD of logged Data	0.242
Assuming Lognormal Distribution			
95% H-UCL	13.3	90% Chebyshev (MVUE) UCL	13.91
95% Chebyshev (MVUE) UCL	14.64	97.5% Chebyshev (MVUE) UCL	15.66
99% Chebyshev (MVUE) UCL	17.67		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	13.07	95% Jackknife UCL	13.09
95% Standard Bootstrap UCL	13.06	95% Bootstrap-t UCL	13.05
95% Hall's Bootstrap UCL	13.07	95% Percentile Bootstrap UCL	13.05
95% BCA Bootstrap UCL	13.06		
90% Chebyshev(Mean, Sd) UCL	13.73	95% Chebyshev(Mean, Sd) UCL	14.39
97.5% Chebyshev(Mean, Sd) UCL	15.31	99% Chebyshev(Mean, Sd) UCL	17.11
Suggested UCL to Use			
95% Student's-t UCL	13.09		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Note: For highly negatively-skewed data, confidence limits (e.g., Chen, Johnson, Lognormal, and Gamma) may not be			
reliable. Chen's and Johnson's methods provide adjustments for positvely skewed data sets.			
Zinc			

ProUCL Output
Western Undeveloped Area Soil (0-0.5 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

General Statistics			
Total Number of Observations	31	Number of Distinct Observations	30
		Number of Missing Observations	5
Minimum	34.1	Mean	55.35
Maximum	89	Median	55.7
SD	14.82	Std. Error of Mean	2.661
Coefficient of Variation	0.268	Skewness	0.495
Normal GOF Test			
Shapiro Wilk Test Statistic	0.945	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.929	Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.134	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.156	Data appear Normal at 5% Significance Level	
Data appear Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	59.87	95% Adjusted-CLT UCL (Chen-1995)	59.98
		95% Modified-t UCL (Johnson-1978)	59.91
Gamma GOF Test			
A-D Test Statistic	0.443	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.745	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.127	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.158	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	14.78	k star (bias corrected MLE)	13.37
Theta hat (MLE)	3.745	Theta star (bias corrected MLE)	4.139
nu hat (MLE)	916.4	nu star (bias corrected)	829.1
MLE Mean (bias corrected)	55.35	MLE Sd (bias corrected)	15.14
		Approximate Chi Square Value (0.05)	763.3
Adjusted Level of Significance	0.0413	Adjusted Chi Square Value	759.8
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	60.13	95% Adjusted Gamma UCL (use when n<50)	60.41
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.958	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.929	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.116	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.156	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	3.529	Mean of logged Data	3.98
Maximum of Logged Data	4.489	SD of logged Data	0.266

Assuming Lognormal Distribution			
95% H-UCL	60.4	90% Chebyshev (MVUE) UCL	63.38
95% Chebyshev (MVUE) UCL	67.01	97.5% Chebyshev (MVUE) UCL	72.06
99% Chebyshev (MVUE) UCL	81.97		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	59.73	95% Jackknife UCL	59.87
95% Standard Bootstrap UCL	59.59	95% Bootstrap-t UCL	59.94
95% Hall's Bootstrap UCL	60.35	95% Percentile Bootstrap UCL	59.42
95% BCA Bootstrap UCL	59.88		
90% Chebyshev(Mean, Sd) UCL	63.34	95% Chebyshev(Mean, Sd) UCL	66.96
97.5% Chebyshev(Mean, Sd) UCL	71.97	99% Chebyshev(Mean, Sd) UCL	81.83
Suggested UCL to Use			
95% Student's-t UCL	59.87		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Naphthalene			
General Statistics			
Total Number of Observations	31	Number of Distinct Observations	20
		Number of Missing Observations	5
Number of Detects	13	Number of Non-Detects	18
Number of Distinct Detects	13	Number of Distinct Non-Detects	10
Minimum Detect	0.0015	Minimum Non-Detect	0.0014
Maximum Detect	0.013	Maximum Non-Detect	0.011
Variance Detects	1.3986E-5	Percent Non-Detects	58.06%
Mean Detects	0.00509	SD Detects	0.00374
Median Detects	0.004	CV Detects	0.734
Skewness Detects	1.061	Kurtosis Detects	-0.0076
Mean of Logged Detects	-5.521	SD of Logged Detects	0.722
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.856	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.866	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.199	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.234	Detected Data appear Normal at 5% Significance Level	
Detected Data appear Approximate Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.00341	KM Standard Error of Mean	6.2389E-4
KM SD	0.00303	95% KM (BCA) UCL	0.00453

95% KM (t) UCL	0.00447	95% KM (Percentile Bootstrap) UCL	0.00445
95% KM (z) UCL	0.00444	95% KM Bootstrap t UCL	0.00479
90% KM Chebyshev UCL	0.00529	95% KM Chebyshev UCL	0.00613
97.5% KM Chebyshev UCL	0.00731	99% KM Chebyshev UCL	0.00962
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	0.409	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.742	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.15	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.239	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	2.225	k star (bias corrected MLE)	1.763
Theta hat (MLE)	0.00229	Theta star (bias corrected MLE)	0.00289
nu hat (MLE)	57.86	nu star (bias corrected)	45.84
Mean (detects)	0.00509		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.0015	Mean	0.00794
Maximum	0.013	Median	0.01
SD	0.00341	CV	0.43
k hat (MLE)	3.41	k star (bias corrected MLE)	3.102
Theta hat (MLE)	0.00233	Theta star (bias corrected MLE)	0.00256
nu hat (MLE)	211.4	nu star (bias corrected)	192.3
Adjusted Level of Significance (β)	0.0413		
Approximate Chi Square Value (192.30, α)	161.2	Adjusted Chi Square Value (192.30, β)	159.6
95% Gamma Approximate UCL (use when n>=50)	0.00947	95% Gamma Adjusted UCL (use when n<50)	0.00957
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.00341	SD (KM)	0.00303
Variance (KM)	9.1580E-6	SE of Mean (KM)	6.2389E-4
k hat (KM)	1.273	k star (KM)	1.171
nu hat (KM)	78.93	nu star (KM)	72.62
theta hat (KM)	0.00268	theta star (KM)	0.00291
80% gamma percentile (KM)	0.00542	90% gamma percentile (KM)	0.00756
95% gamma percentile (KM)	0.00968	99% gamma percentile (KM)	0.0145
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (72.62, α)	54	Adjusted Chi Square Value (72.62, β)	53.11
95% Gamma Approximate KM-UCL (use when n>=50)	0.00459	95% Gamma Adjusted KM-UCL (use when n<50)	0.00467
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.944	**Shapiro Wilk GOF Test**	

5% Shapiro Wilk Critical Value	0.866	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.127	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.234	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.00304	Mean in Log Scale	-6.155
SD in Original Scale	0.00304	SD in Log Scale	0.823
95% t UCL (assumes normality of ROS data)	0.00397	95% Percentile Bootstrap UCL	0.004
95% BCA Bootstrap UCL	0.00411	95% Bootstrap t UCL	0.00436
95% H-UCL (Log ROS)	0.00416		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-5.964	KM Geo Mean	0.00257
KM SD (logged)	0.698	95% Critical H Value (KM-Log)	2.1
KM Standard Error of Mean (logged)	0.151	95% H-UCL (KM -Log)	0.00429
KM SD (logged)	0.698	95% Critical H Value (KM-Log)	2.1
KM Standard Error of Mean (logged)	0.151		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.00401	Mean in Log Scale	-5.843
SD in Original Scale	0.00303	SD in Log Scale	0.883
95% t UCL (Assumes normality)	0.00493	95% H-Stat UCL	0.0062
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Approximate Normal Distributed at 5% Significance Level			
Suggested UCL to Use			
95% KM (t) UCL	0.00447		
When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test			
When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			

ProUCL Output
Western Undeveloped Area Soil (0-12 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

UCL Statistics for Data Sets with Non-Detects

User Selected Options	
Date/Time of Computation	ProUCL 5.12/7/2019 10:15:35 AM
From File	20190128_WUndev_ProUCL_input_a.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Fluoride

General Statistics

Total Number of Observations	80	Number of Distinct Observations	77
		Number of Missing Observations	13
Number of Detects	78	Number of Non-Detects	2
Number of Distinct Detects	75	Number of Distinct Non-Detects	2
Minimum Detect	0.31	Minimum Non-Detect	0.21
Maximum Detect	15.4	Maximum Non-Detect	0.24
Variance Detects	11.93	Percent Non-Detects	2.5%
Mean Detects	4.175	SD Detects	3.454
Median Detects	3	CV Detects	0.827
Skewness Detects	1.278	Kurtosis Detects	1.115
Mean of Logged Detects	1.077	SD of Logged Detects	0.891

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.857	**Normal GOF Test on Detected Observations Only**
5% Shapiro Wilk P Value	2.750E-10	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.181	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.1	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	4.076	KM Standard Error of Mean	0.388
KM SD	3.444	95% KM (BCA) UCL	4.728
95% KM (t) UCL	4.721	95% KM (Percentile Bootstrap) UCL	4.726
95% KM (z) UCL	4.714	95% KM Bootstrap t UCL	4.805
90% KM Chebyshev UCL	5.239	95% KM Chebyshev UCL	5.766
97.5% KM Chebyshev UCL	6.497	99% KM Chebyshev UCL	7.933

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.479	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.769	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.0752	**Kolmogorov-Smirnov GOF**
5% K-S Critical Value	0.103	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	1.567	k star (bias corrected MLE)	1.515
Theta hat (MLE)	2.665	Theta star (bias corrected MLE)	2.756
nu hat (MLE)	244.4	nu star (bias corrected)	236.3

Mean (detects)	4.175		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	4.071
Maximum	15.4	Median	2.885
SD	3.472	CV	0.853
k hat (MLE)	1.206	k star (bias corrected MLE)	1.169
Theta hat (MLE)	3.376	Theta star (bias corrected MLE)	3.482
nu hat (MLE)	193	nu star (bias corrected)	187.1
Adjusted Level of Significance (β)	0.047		
Approximate Chi Square Value (187.07, α)	156.4	Adjusted Chi Square Value (187.07, β)	155.9
95% Gamma Approximate UCL (use when n>=50)	4.869	95% Gamma Adjusted UCL (use when n<50)	4.885
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	4.076	SD (KM)	3.444
Variance (KM)	11.86	SE of Mean (KM)	0.388
k hat (KM)	1.401	k star (KM)	1.356
nu hat (KM)	224.1	nu star (KM)	217
theta hat (KM)	2.911	theta star (KM)	3.005
80% gamma percentile (KM)	6.375	90% gamma percentile (KM)	8.706
95% gamma percentile (KM)	10.99	99% gamma percentile (KM)	16.17
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (217.01, α)	183.9	Adjusted Chi Square Value (217.01, β)	183.4
95% Gamma Approximate KM-UCL (use when n>=50)	4.81	95% Gamma Adjusted KM-UCL (use when n<50)	4.824
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Approximate Test Statistic	0.972	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	0.256	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.0538	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.1	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	4.079	Mean in Log Scale	1.021
SD in Original Scale	3.463	SD in Log Scale	0.947
95% t UCL (assumes normality of ROS data)	4.723	95% Percentile Bootstrap UCL	4.746
95% BCA Bootstrap UCL	4.728	95% Bootstrap t UCL	4.768
95% H-UCL (Log ROS)	5.51		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	1.011	KM Geo Mean	2.749
KM SD (logged)	0.967	95% Critical H Value (KM-Log)	2.235
KM Standard Error of Mean (logged)	0.109	95% H-UCL (KM -Log)	5.594
KM SD (logged)	0.967	95% Critical H Value (KM-Log)	2.235

KM Standard Error of Mean (logged)	0.109		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	4.074	Mean in Log Scale	0.996
SD in Original Scale	3.469	SD in Log Scale	1.019
95% t UCL (Assumes normality)	4.719	95% H-Stat UCL	5.91

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Gamma Distributed at 5% Significance Level

Suggested UCL to Use

95% KM Approximate Gamma UCL	4.81	95% GROS Approximate Gamma UCL	4.869

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

BenzoBFluoranthene

General Statistics

Total Number of Observations	80	Number of Distinct Observations	47
		Number of Missing Observations	13
Number of Detects	44	Number of Non-Detects	36
Number of Distinct Detects	37	Number of Distinct Non-Detects	12
Minimum Detect	0.003	Minimum Non-Detect	0.0017
Maximum Detect	0.35	Maximum Non-Detect	0.018
Variance Detects	0.00538	Percent Non-Detects	45%
Mean Detects	0.0574	SD Detects	0.0733
Median Detects	0.029	CV Detects	1.278
Skewness Detects	2.304	Kurtosis Detects	5.708
Mean of Logged Detects	-3.546	SD of Logged Detects	1.246

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.712	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.944	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.239	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.132	Detected Data Not Normal at 5% Significance Level	

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	0.0332	KM Standard Error of Mean	0.00681
KM SD	0.0601	95% KM (BCA) UCL	0.0457
95% KM (t) UCL	0.0445	95% KM (Percentile Bootstrap) UCL	0.0449
95% KM (z) UCL	0.0444	95% KM Bootstrap t UCL	0.0492
90% KM Chebyshev UCL	0.0536	95% KM Chebyshev UCL	0.0628
97.5% KM Chebyshev UCL	0.0757	99% KM Chebyshev UCL	0.101

Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	0.638	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.784	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.105	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.138	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.855	k star (bias corrected MLE)	0.812
Theta hat (MLE)	0.0671	Theta star (bias corrected MLE)	0.0707
nu hat (MLE)	75.24	nu star (bias corrected)	71.44
Mean (detects)	0.0574		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.003	Mean	0.0361
Maximum	0.35	Median	0.01
SD	0.0591	CV	1.638
k hat (MLE)	0.842	k star (bias corrected MLE)	0.819
Theta hat (MLE)	0.0428	Theta star (bias corrected MLE)	0.0441
nu hat (MLE)	134.7	nu star (bias corrected)	131
Adjusted Level of Significance (β)	0.047		
Approximate Chi Square Value (130.98, α)	105.5	Adjusted Chi Square Value (130.98, β)	105.1
95% Gamma Approximate UCL (use when n>=50)	0.0448	95% Gamma Adjusted UCL (use when n<50)	0.0449
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.0332	SD (KM)	0.0601
Variance (KM)	0.00361	SE of Mean (KM)	0.00681
k hat (KM)	0.304	k star (KM)	0.301
nu hat (KM)	48.71	nu star (KM)	48.21
theta hat (KM)	0.109	theta star (KM)	0.11
80% gamma percentile (KM)	0.0509	90% gamma percentile (KM)	0.0978
95% gamma percentile (KM)	0.152	99% gamma percentile (KM)	0.291
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (48.21, α)	33.27	Adjusted Chi Square Value (48.21, β)	33.05
95% Gamma Approximate KM-UCL (use when n>=50)	0.0481	95% Gamma Adjusted KM-UCL (use when n<50)	0.0484
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.968	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.944	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.0643	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.132	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			

Mean in Original Scale	0.033	Mean in Log Scale	-4.716
SD in Original Scale	0.0606	SD in Log Scale	1.701
95% t UCL (assumes normality of ROS data)	0.0442	95% Percentile Bootstrap UCL	0.0445
95% BCA Bootstrap UCL	0.0474	95% Bootstrap t UCL	0.0478
95% H-UCL (Log ROS)	0.0684		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-4.625	KM Geo Mean	0.00981
KM SD (logged)	1.573	95% Critical H Value (KM-Log)	2.904
KM Standard Error of Mean (logged)	0.19	95% H-UCL (KM -Log)	0.0564
KM SD (logged)	1.573	95% Critical H Value (KM-Log)	2.904
KM Standard Error of Mean (logged)	0.19		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.0339	Mean in Log Scale	-4.466
SD in Original Scale	0.0601	SD in Log Scale	1.524
95% t UCL (Assumes normality)	0.0451	95% H-Stat UCL	0.0597
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Gamma Distributed at 5% Significance Level			
Suggested UCL to Use			
95% KM Approximate Gamma UCL	0.0481		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
BenzoAPyrene			
General Statistics			
Total Number of Observations	80	Number of Distinct Observations	37
		Number of Missing Observations	13
Number of Detects	41	Number of Non-Detects	39
Number of Distinct Detects	31	Number of Distinct Non-Detects	10
Minimum Detect	0.002	Minimum Non-Detect	0.0015
Maximum Detect	0.27	Maximum Non-Detect	0.014
Variance Detects	0.00271	Percent Non-Detects	48.75%
Mean Detects	0.0375	SD Detects	0.0521
Median Detects	0.017	CV Detects	1.388
Skewness Detects	2.818	Kurtosis Detects	9.476
Mean of Logged Detects	-3.956	SD of Logged Detects	1.174
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.654	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.941	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.28	**Lilliefors GOF Test**	

5% Lilliefors Critical Value	0.137	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.0206	KM Standard Error of Mean	0.00462
KM SD	0.0408	95% KM (BCA) UCL	0.0293
95% KM (t) UCL	0.0283	95% KM (Percentile Bootstrap) UCL	0.0287
95% KM (z) UCL	0.0282	95% KM Bootstrap t UCL	0.032
90% KM Chebyshev UCL	0.0345	95% KM Chebyshev UCL	0.0407
97.5% KM Chebyshev UCL	0.0494	99% KM Chebyshev UCL	0.0666
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	1.111	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.784	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.164	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.143	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.871	k star (bias corrected MLE)	0.824
Theta hat (MLE)	0.0431	Theta star (bias corrected MLE)	0.0456
nu hat (MLE)	71.42	nu star (bias corrected)	67.53
Mean (detects)	0.0375		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.002	Mean	0.0241
Maximum	0.27	Median	0.01
SD	0.0396	CV	1.641
k hat (MLE)	1.048	k star (bias corrected MLE)	1.017
Theta hat (MLE)	0.023	Theta star (bias corrected MLE)	0.0237
nu hat (MLE)	167.7	nu star (bias corrected)	162.8
Adjusted Level of Significance (β)	0.047		
Approximate Chi Square Value (162.77, α)	134.3	Adjusted Chi Square Value (162.77, β)	133.8
95% Gamma Approximate UCL (use when n>=50)	0.0292	95% Gamma Adjusted UCL (use when n<50)	0.0293
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.0206	SD (KM)	0.0408
Variance (KM)	0.00166	SE of Mean (KM)	0.00462
k hat (KM)	0.255	k star (KM)	0.254
nu hat (KM)	40.82	nu star (KM)	40.62
theta hat (KM)	0.0807	theta star (KM)	0.0811
80% gamma percentile (KM)	0.0301	90% gamma percentile (KM)	0.0617
95% gamma percentile (KM)	0.0992	99% gamma percentile (KM)	0.199
Gamma Kaplan-Meier (KM) Statistics			

Approximate Chi Square Value (40.62, α)	27.02	Adjusted Chi Square Value (40.62, β)	26.81
95% Gamma Approximate KM-UCL (use when n>=50)	0.031	95% Gamma Adjusted KM-UCL (use when n<50)	0.0312
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.978	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.941	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.0801	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.137	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.0203	Mean in Log Scale	-5.198
SD in Original Scale	0.0411	SD in Log Scale	1.659
95% t UCL (assumes normality of ROS data)	0.028	95% Percentile Bootstrap UCL	0.0286
95% BCA Bootstrap UCL	0.0302	95% Bootstrap t UCL	0.0324
95% H-UCL (Log ROS)	0.0384		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-5.02	KM Geo Mean	0.00661
KM SD (logged)	1.439	95% Critical H Value (KM-Log)	2.744
KM Standard Error of Mean (logged)	0.174	95% H-UCL (KM -Log)	0.029
KM SD (logged)	1.439	95% Critical H Value (KM-Log)	2.744
KM Standard Error of Mean (logged)	0.174		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.0212	Mean in Log Scale	-4.882
SD in Original Scale	0.0408	SD in Log Scale	1.427
95% t UCL (Assumes normality)	0.0288	95% H-Stat UCL	0.0325
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Lognormal Distributed at 5% Significance Level			
Suggested UCL to Use			
KM H-UCL	0.029		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
BenzoAAnthracene			
General Statistics			
Total Number of Observations	80	Number of Distinct Observations	43
		Number of Missing Observations	13
Number of Detects	38	Number of Non-Detects	42
Number of Distinct Detects	33	Number of Distinct Non-Detects	13
Minimum Detect	0.0017	Minimum Non-Detect	0.0013

Maximum Detect	0.19	Maximum Non-Detect	0.038
Variance Detects	0.00164	Percent Non-Detects	52.5%
Mean Detects	0.0308	SD Detects	0.0405
Median Detects	0.0145	CV Detects	1.316
Skewness Detects	2.321	Kurtosis Detects	5.954
Mean of Logged Detects	-4.215	SD of Logged Detects	1.274
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.709	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.938	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.244	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.142	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.0176	KM Standard Error of Mean	0.00355
KM SD	0.0307	95% KM (BCA) UCL	0.0235
95% KM (t) UCL	0.0235	95% KM (Percentile Bootstrap) UCL	0.0238
95% KM (z) UCL	0.0234	95% KM Bootstrap t UCL	0.026
90% KM Chebyshev UCL	0.0282	95% KM Chebyshev UCL	0.033
97.5% KM Chebyshev UCL	0.0397	99% KM Chebyshev UCL	0.0529
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	0.713	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.786	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.119	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.148	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.807	k star (bias corrected MLE)	0.761
Theta hat (MLE)	0.0382	Theta star (bias corrected MLE)	0.0405
nu hat (MLE)	61.32	nu star (bias corrected)	57.81
Mean (detects)	0.0308		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.0017	Mean	0.0204
Maximum	0.19	Median	0.01
SD	0.0296	CV	1.446
k hat (MLE)	1.154	k star (bias corrected MLE)	1.119
Theta hat (MLE)	0.0177	Theta star (bias corrected MLE)	0.0183
nu hat (MLE)	184.6	nu star (bias corrected)	179
Adjusted Level of Significance (β)	0.047		
Approximate Chi Square Value (179.00, α)	149.1	Adjusted Chi Square Value (179.00, β)	148.6
95% Gamma Approximate UCL (use when n>=50)	0.0246	95% Gamma Adjusted UCL (use when n<50)	0.0246

Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.0176	SD (KM)	0.0307
Variance (KM)	9.4362E-4	SE of Mean (KM)	0.00355
k hat (KM)	0.327	k star (KM)	0.323
nu hat (KM)	52.35	nu star (KM)	51.72
theta hat (KM)	0.0537	theta star (KM)	0.0544
80% gamma percentile (KM)	0.0274	90% gamma percentile (KM)	0.0513
95% gamma percentile (KM)	0.0785	99% gamma percentile (KM)	0.148
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (51.72, α)	36.2	Adjusted Chi Square Value (51.72, β)	35.96
95% Gamma Approximate KM-UCL (use when n>=50)	0.0251	95% Gamma Adjusted KM-UCL (use when n<50)	0.0253
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.966	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.938	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.0824	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.142	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.0168	Mean in Log Scale	-5.162
SD in Original Scale	0.031	SD in Log Scale	1.471
95% t UCL (assumes normality of ROS data)	0.0225	95% Percentile Bootstrap UCL	0.023
95% BCA Bootstrap UCL	0.0241	95% Bootstrap t UCL	0.0249
95% H-UCL (Log ROS)	0.0268		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-5.048	KM Geo Mean	0.00642
KM SD (logged)	1.398	95% Critical H Value (KM-Log)	2.696
KM Standard Error of Mean (logged)	0.186	95% H-UCL (KM -Log)	0.0261
KM SD (logged)	1.398	95% Critical H Value (KM-Log)	2.696
KM Standard Error of Mean (logged)	0.186		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.0207	Mean in Log Scale	-4.637
SD in Original Scale	0.0298	SD in Log Scale	1.4
95% t UCL (Assumes normality)	0.0263	95% H-Stat UCL	0.0395
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Gamma Distributed at 5% Significance Level			
Suggested UCL to Use			
95% KM Approximate Gamma UCL	0.0251		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Cyanide

General Statistics

Total Number of Observations	80	Number of Distinct Observations	50
		Number of Missing Observations	13
Number of Detects	53	Number of Non-Detects	27
Number of Distinct Detects	34	Number of Distinct Non-Detects	21
Minimum Detect	0.017	Minimum Non-Detect	0.017
Maximum Detect	2.2	Maximum Non-Detect	0.084
Variance Detects	0.0941	Percent Non-Detects	33.75%
Mean Detects	0.168	SD Detects	0.307
Median Detects	0.093	CV Detects	1.822
Skewness Detects	5.876	Kurtosis Detects	38.52
Mean of Logged Detects	-2.332	SD of Logged Detects	0.967

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.409	**Normal GOF Test on Detected Observations Only**
5% Shapiro Wilk P Value	0	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.311	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.121	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	0.121	KM Standard Error of Mean	0.0289
KM SD	0.256	95% KM (BCA) UCL	0.178
95% KM (t) UCL	0.169	95% KM (Percentile Bootstrap) UCL	0.174
95% KM (z) UCL	0.168	95% KM Bootstrap t UCL	0.246
90% KM Chebyshev UCL	0.208	95% KM Chebyshev UCL	0.247
97.5% KM Chebyshev UCL	0.302	99% KM Chebyshev UCL	0.409

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	1.638	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.779	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.122	**Kolmogorov-Smirnov GOF**
5% K-S Critical Value	0.126	Detected data appear Gamma Distributed at 5% Significance Level

Detected data follow Appr. Gamma Distribution at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	1.044	k star (bias corrected MLE)	0.997
Theta hat (MLE)	0.161	Theta star (bias corrected MLE)	0.169
nu hat (MLE)	110.6	nu star (bias corrected)	105.7
Mean (detects)	0.168		

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)

For such situations, GROS method may yield incorrect values of UCLs and BTVs

This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	0.115
Maximum	2.2	Median	0.0545
SD	0.26	CV	2.263
k hat (MLE)	0.652	k star (bias corrected MLE)	0.636
Theta hat (MLE)	0.176	Theta star (bias corrected MLE)	0.181
nu hat (MLE)	104.4	nu star (bias corrected)	101.8
Adjusted Level of Significance (β)	0.047		
Approximate Chi Square Value (101.80, α)	79.52	Adjusted Chi Square Value (101.80, β)	79.16
95% Gamma Approximate UCL (use when n>=50)	0.147	95% Gamma Adjusted UCL (use when n<50)	0.148
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.121	SD (KM)	0.256
Variance (KM)	0.0657	SE of Mean (KM)	0.0289
k hat (KM)	0.222	k star (KM)	0.222
nu hat (KM)	35.58	nu star (KM)	35.58
theta hat (KM)	0.543	theta star (KM)	0.543
80% gamma percentile (KM)	0.168	90% gamma percentile (KM)	0.365
95% gamma percentile (KM)	0.605	99% gamma percentile (KM)	1.255
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (35.58, α)	22.93	Adjusted Chi Square Value (35.58, β)	22.74
95% Gamma Approximate KM-UCL (use when n>=50)	0.188	95% Gamma Adjusted KM-UCL (use when n<50)	0.189
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Approximate Test Statistic	0.959	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	0.131	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.0896	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.121	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.12	Mean in Log Scale	-2.824
SD in Original Scale	0.258	SD in Log Scale	1.081
95% t UCL (assumes normality of ROS data)	0.168	95% Percentile Bootstrap UCL	0.173
95% BCA Bootstrap UCL	0.207	95% Bootstrap t UCL	0.241
95% H-UCL (Log ROS)	0.142		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-2.788	KM Geo Mean	0.0616
KM SD (logged)	1.034	95% Critical H Value (KM-Log)	2.302
KM Standard Error of Mean (logged)	0.122	95% H-UCL (KM -Log)	0.137
KM SD (logged)	1.034	95% Critical H Value (KM-Log)	2.302
KM Standard Error of Mean (logged)	0.122		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.122	Mean in Log Scale	-2.755
SD in Original Scale	0.258	SD in Log Scale	1.022

95% t UCL (Assumes normality)	0.17	95% H-Stat UCL	0.14
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Approximate Gamma Distributed at 5% Significance Level			
Suggested UCL to Use			
95% KM Approximate Gamma UCL	0.188		
When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test			
When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Iron			
General Statistics			
Total Number of Observations	80	Number of Distinct Observations	57
		Number of Missing Observations	13
Minimum	7100	Mean	14685
Maximum	21100	Median	14350
SD	2718	Std. Error of Mean	303.9
Coefficient of Variation	0.185	Skewness	-0.0582
Normal GOF Test			
Shapiro Wilk Test Statistic	0.983	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	0.755	Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.0665	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.0991	Data appear Normal at 5% Significance Level	
Data appear Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	15191	95% Adjusted-CLT UCL (Chen-1995)	15183
		95% Modified-t UCL (Johnson-1978)	15190
Gamma GOF Test			
A-D Test Statistic	0.336	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.75	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.05	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.0994	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	27.87	k star (bias corrected MLE)	26.83
Theta hat (MLE)	527	Theta star (bias corrected MLE)	547.4

nu hat (MLE)	4459	nu star (bias corrected)	4293
MLE Mean (bias corrected)	14685	MLE Sd (bias corrected)	2835
		Approximate Chi Square Value (0.05)	4141
Adjusted Level of Significance	0.047	Adjusted Chi Square Value	4139
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	15221	95% Adjusted Gamma UCL (use when n<50)	15231
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.961	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk P Value	0.0564	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.0503	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.0991	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	8.868	Mean of logged Data	9.577
Maximum of Logged Data	9.957	SD of logged Data	0.196
Assuming Lognormal Distribution			
95% H-UCL	15263	90% Chebyshev (MVUE) UCL	15669
95% Chebyshev (MVUE) UCL	16110	97.5% Chebyshev (MVUE) UCL	16721
99% Chebyshev (MVUE) UCL	17922		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	15185	95% Jackknife UCL	15191
95% Standard Bootstrap UCL	15158	95% Bootstrap-t UCL	15187
95% Hall's Bootstrap UCL	15190	95% Percentile Bootstrap UCL	15207
95% BCA Bootstrap UCL	15190		
90% Chebyshev(Mean, Sd) UCL	15596	95% Chebyshev(Mean, Sd) UCL	16009
97.5% Chebyshev(Mean, Sd) UCL	16582	99% Chebyshev(Mean, Sd) UCL	17708
Suggested UCL to Use			
95% Student's-t UCL	15191		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Note: For highly negatively-skewed data, confidence limits (e.g., Chen, Johnson, Lognormal, and Gamma) may not be			
reliable. Chen's and Johnson's methods provide adjustments for positvely skewed data sets.			
Manganese			
General Statistics			

ProUCL Output
Western Undeveloped Area Soil (0-12 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Total Number of Observations	80	Number of Distinct Observations	77
		Number of Missing Observations	13
Minimum	53.7	Mean	410.2
Maximum	2210	Median	392.5
SD	285.2	Std. Error of Mean	31.88
Coefficient of Variation	0.695	Skewness	3.39
Normal GOF Test			
Shapiro Wilk Test Statistic	0.765	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	0	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.142	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.0991	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	463.3	95% Adjusted-CLT UCL (Chen-1995)	475.6
		95% Modified-t UCL (Johnson-1978)	465.3
Gamma GOF Test			
A-D Test Statistic	1.071	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.76	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.0994	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.101	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data follow Appr. Gamma Distribution at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	2.658	k star (bias corrected MLE)	2.566
Theta hat (MLE)	154.3	Theta star (bias corrected MLE)	159.8
nu hat (MLE)	425.2	nu star (bias corrected)	410.6
MLE Mean (bias corrected)	410.2	MLE Sd (bias corrected)	256.1
		Approximate Chi Square Value (0.05)	364.7
Adjusted Level of Significance	0.047	Adjusted Chi Square Value	363.9
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50)	461.9	95% Adjusted Gamma UCL (use when n<50)	462.9
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.94	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk P Value	0.00156	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.139	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.0991	Data Not Lognormal at 5% Significance Level	
Data Not Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	3.983	Mean of logged Data	5.817
Maximum of Logged Data	7.701	SD of logged Data	0.672
Assuming Lognormal Distribution			
95% H-UCL	488.4	90% Chebyshev (MVUE) UCL	522.9

95% Chebyshev (MVUE) UCL	569.8	97.5% Chebyshev (MVUE) UCL	634.8
99% Chebyshev (MVUE) UCL	762.6		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	462.6	95% Jackknife UCL	463.3
95% Standard Bootstrap UCL	462.6	95% Bootstrap-t UCL	481.9
95% Hall's Bootstrap UCL	518.3	95% Percentile Bootstrap UCL	468.2
95% BCA Bootstrap UCL	474.6		
90% Chebyshev(Mean, Sd) UCL	505.9	95% Chebyshev(Mean, Sd) UCL	549.2
97.5% Chebyshev(Mean, Sd) UCL	609.3	99% Chebyshev(Mean, Sd) UCL	727.4

Suggested UCL to Use

95% Approximate Gamma UCL	461.9		

When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test

When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Mercury

General Statistics

Total Number of Observations	80	Number of Distinct Observations	30
		Number of Missing Observations	13
Number of Detects	56	Number of Non-Detects	24
Number of Distinct Detects	26	Number of Distinct Non-Detects	8
Minimum Detect	0.01	Minimum Non-Detect	0.0096
Maximum Detect	0.063	Maximum Non-Detect	0.014
Variance Detects	1.1511E-4	Percent Non-Detects	30%
Mean Detects	0.0233	SD Detects	0.0107
Median Detects	0.0195	CV Detects	0.461
Skewness Detects	1.434	Kurtosis Detects	2.42
Mean of Logged Detects	-3.85	SD of Logged Detects	0.416

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.873	**Normal GOF Test on Detected Observations Only**	
5% Shapiro Wilk P Value	3.1297E-6	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.208	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.118	Detected Data Not Normal at 5% Significance Level	

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	0.0192	KM Standard Error of Mean	0.00122
KM SD	0.0108	95% KM (BCA) UCL	0.0214

95% KM (t) UCL	0.0212	95% KM (Percentile Bootstrap) UCL	0.0212
95% KM (z) UCL	0.0212	95% KM Bootstrap t UCL	0.0216
90% KM Chebyshev UCL	0.0229	95% KM Chebyshev UCL	0.0245
97.5% KM Chebyshev UCL	0.0269	99% KM Chebyshev UCL	0.0314
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	1.084	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.753	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.158	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.119	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	5.744	k star (bias corrected MLE)	5.448
Theta hat (MLE)	0.00405	Theta star (bias corrected MLE)	0.00427
nu hat (MLE)	643.3	nu star (bias corrected)	610.1
Mean (detects)	0.0233		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	0.0193
Maximum	0.063	Median	0.016
SD	0.0108	CV	0.562
k hat (MLE)	4.052	k star (bias corrected MLE)	3.909
Theta hat (MLE)	0.00476	Theta star (bias corrected MLE)	0.00493
nu hat (MLE)	648.4	nu star (bias corrected)	625.4
Adjusted Level of Significance (β)	0.047		
Approximate Chi Square Value (625.39, α)	568.4	Adjusted Chi Square Value (625.39, β)	567.4
95% Gamma Approximate UCL (use when n>=50)	0.0212	95% Gamma Adjusted UCL (use when n<50)	0.0213
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.0192	SD (KM)	0.0108
Variance (KM)	1.1757E-4	SE of Mean (KM)	0.00122
k hat (KM)	3.139	k star (KM)	3.03
nu hat (KM)	502.3	nu star (KM)	484.8
theta hat (KM)	0.00612	theta star (KM)	0.00634
80% gamma percentile (KM)	0.0274	90% gamma percentile (KM)	0.034
95% gamma percentile (KM)	0.0402	99% gamma percentile (KM)	0.0536
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (484.80, α)	434.7	Adjusted Chi Square Value (484.80, β)	433.9
95% Gamma Approximate KM-UCL (use when n>=50)	0.0214	95% Gamma Adjusted KM-UCL (use when n<50)	0.0215
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Approximate Test Statistic	0.962	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	0.149	Detected Data appear Lognormal at 5% Significance Level	

Lilliefors Test Statistic	0.129	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.118	Detected Data Not Lognormal at 5% Significance Level	
Detected Data appear Approximate Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.0188	Mean in Log Scale	-4.137
SD in Original Scale	0.0113	SD in Log Scale	0.572
95% t UCL (assumes normality of ROS data)	0.0209	95% Percentile Bootstrap UCL	0.0209
95% BCA Bootstrap UCL	0.0211	95% Bootstrap t UCL	0.0211
95% H-UCL (Log ROS)	0.0213		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-4.085	KM Geo Mean	0.0168
KM SD (logged)	0.498	95% Critical H Value (KM-Log)	1.858
KM Standard Error of Mean (logged)	0.0562	95% H-UCL (KM -Log)	0.0211
KM SD (logged)	0.498	95% Critical H Value (KM-Log)	1.858
KM Standard Error of Mean (logged)	0.0562		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.018	Mean in Log Scale	-4.248
SD in Original Scale	0.0121	SD in Log Scale	0.705
95% t UCL (Assumes normality)	0.0202	95% H-Stat UCL	0.0215
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Approximate Lognormal Distributed at 5% Significance Level			
Suggested UCL to Use			
KM Student's t	0.0192	KM H-UCL	0.0211
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Nickel			
General Statistics			
Total Number of Observations	80	Number of Distinct Observations	44
		Number of Missing Observations	13
Minimum	5.2	Mean	10.98
Maximum	14.3	Median	10.8
SD	1.698	Std. Error of Mean	0.19
Coefficient of Variation	0.155	Skewness	-0.301
Normal GOF Test			
Shapiro Wilk Test Statistic	0.973	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	0.293	Data appear Normal at 5% Significance Level	

Lilliefors Test Statistic	0.0769	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.0991	Data appear Normal at 5% Significance Level	
Data appear Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	11.3	95% Adjusted-CLT UCL (Chen-1995)	11.29
		95% Modified-t UCL (Johnson-1978)	11.3
Gamma GOF Test			
A-D Test Statistic	0.54	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.749	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.0971	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.0994	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	39.07	k star (bias corrected MLE)	37.61
Theta hat (MLE)	0.281	Theta star (bias corrected MLE)	0.292
nu hat (MLE)	6251	nu star (bias corrected)	6018
MLE Mean (bias corrected)	10.98	MLE Sd (bias corrected)	1.791
		Approximate Chi Square Value (0.05)	5838
Adjusted Level of Significance	0.047	Adjusted Chi Square Value	5835
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	11.32	95% Adjusted Gamma UCL (use when n<50)	11.32
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.936	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk P Value	7.2359E-4	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.11	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.0991	Data Not Lognormal at 5% Significance Level	
Data Not Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	1.649	Mean of logged Data	2.383
Maximum of Logged Data	2.66	SD of logged Data	0.166
Assuming Lognormal Distribution			
95% H-UCL	11.35	90% Chebyshev (MVUE) UCL	11.61
95% Chebyshev (MVUE) UCL	11.88	97.5% Chebyshev (MVUE) UCL	12.27
99% Chebyshev (MVUE) UCL	13.03		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	11.29	95% Jackknife UCL	11.3
95% Standard Bootstrap UCL	11.29	95% Bootstrap-t UCL	11.3
95% Hall's Bootstrap UCL	11.3	95% Percentile Bootstrap UCL	11.29

95% BCA Bootstrap UCL	11.29		
90% Chebyshev(Mean, Sd) UCL	11.55	95% Chebyshev(Mean, Sd) UCL	11.81
97.5% Chebyshev(Mean, Sd) UCL	12.17	99% Chebyshev(Mean, Sd) UCL	12.87

Suggested UCL to Use

95% Student's-t UCL	11.3		

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Note: For highly negatively-skewed data, confidence limits (e.g., Chen, Johnson, Lognormal, and Gamma) may not be reliable. Chen's and Johnson's methods provide adjustments for positvely skewed data sets.

Thallium

General Statistics

Total Number of Observations	80	Number of Distinct Observations	12
		Number of Missing Observations	13
Number of Detects	2	Number of Non-Detects	78
Number of Distinct Detects	2	Number of Distinct Non-Detects	12
Minimum Detect	0.12	Minimum Non-Detect	0.099
Maximum Detect	0.14	Maximum Non-Detect	0.2
Variance Detects	2.0000E-4	Percent Non-Detects	97.5%
Mean Detects	0.13	SD Detects	0.0141
Median Detects	0.13	CV Detects	0.109
Skewness Detects	N/A	Kurtosis Detects	N/A
Mean of Logged Detects	-2.043	SD of Logged Detects	0.109

Warning: Data set has only 2 Detected Values.
This is not enough to compute meaningful or reliable statistics and estimates.

Normal GOF Test on Detects Only
Not Enough Data to Perform GOF Test

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	0.1	KM Standard Error of Mean	0.00137
KM SD	0.00638	95% KM (BCA) UCL	N/A
95% KM (t) UCL	0.103	95% KM (Percentile Bootstrap) UCL	N/A
95% KM (z) UCL	0.103	95% KM Bootstrap t UCL	N/A
90% KM Chebyshev UCL	0.105	95% KM Chebyshev UCL	0.106
97.5% KM Chebyshev UCL	0.109	99% KM Chebyshev UCL	0.114

Gamma GOF Tests on Detected Observations Only
Not Enough Data to Perform GOF Test

Gamma Statistics on Detected Data Only

k hat (MLE)	168.7	k star (bias corrected MLE)	N/A

Theta hat (MLE)	7.7075E-4	Theta star (bias corrected MLE)	N/A
nu hat (MLE)	674.7	nu star (bias corrected)	N/A
Mean (detects)	0.13		
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.1	SD (KM)	0.00638
Variance (KM)	4.0651E-5	SE of Mean (KM)	0.00137
k hat (KM)	248	k star (KM)	238.7
nu hat (KM)	39674	nu star (KM)	38188
theta hat (KM)	4.0489E-4	theta star (KM)	4.2066E-4
80% gamma percentile (KM)	0.106	90% gamma percentile (KM)	0.109
95% gamma percentile (KM)	0.111	99% gamma percentile (KM)	0.116
Gamma Kaplan-Meier (KM) Statistics			
		Adjusted Level of Significance (β)	0.047
Approximate Chi Square Value (N/A, α)	37734	Adjusted Chi Square Value (N/A, β)	37726
95% Gamma Approximate KM-UCL (use when n>=50)	0.102	95% Gamma Adjusted KM-UCL (use when n<50)	0.102
Lognormal GOF Test on Detected Observations Only			
Not Enough Data to Perform GOF Test			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.0756	Mean in Log Scale	-2.606
SD in Original Scale	0.0169	SD in Log Scale	0.216
95% t UCL (assumes normality of ROS data)	0.0787	95% Percentile Bootstrap UCL	0.0786
95% BCA Bootstrap UCL	0.0788	95% Bootstrap t UCL	0.079
95% H-UCL (Log ROS)	0.0788		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-2.3	KM Geo Mean	0.1
KM SD (logged)	0.0555	95% Critical H Value (KM-Log)	N/A
KM Standard Error of Mean (logged)	0.0121	95% H-UCL (KM -Log)	N/A
KM SD (logged)	0.0555	95% Critical H Value (KM-Log)	N/A
KM Standard Error of Mean (logged)	0.0121		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.0689	Mean in Log Scale	-2.695
SD in Original Scale	0.0153	SD in Log Scale	0.197
95% t UCL (Assumes normality)	0.0718	95% H-Stat UCL	0.0715
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution at 5% Significance Level			
Suggested UCL to Use			
95% KM (t) UCL	0.103	KM H-UCL	N/A
95% KM (BCA) UCL	N/A		
Warning: One or more Recommended UCL(s) not available!			

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Antimony

General Statistics

Total Number of Observations	80	Number of Distinct Observations	26
		Number of Missing Observations	13
Number of Detects	1	Number of Non-Detects	79
Number of Distinct Detects	1	Number of Distinct Non-Detects	26

Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set!

It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable Antimony was not processed!

Arsenic

General Statistics

Total Number of Observations	80	Number of Distinct Observations	46
		Number of Missing Observations	13
Minimum	2	Mean	4.904
Maximum	10.8	Median	4.6
SD	1.852	Std. Error of Mean	0.207
Coefficient of Variation	0.378	Skewness	0.958

Normal GOF Test

Shapiro Wilk Test Statistic	0.933	**Shapiro Wilk GOF Test**
5% Shapiro Wilk P Value	4.4727E-4	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.126	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.0991	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	5.248	95% Adjusted-CLT UCL (Chen-1995)	5.268
		95% Modified-t UCL (Johnson-1978)	5.252

Gamma GOF Test

A-D Test Statistic	0.325	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.752	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.0774	**Kolmogorov-Smirnov Gamma GOF Test**
5% K-S Critical Value	0.0998	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	7.551	k star (bias corrected MLE)	7.276
Theta hat (MLE)	0.649	Theta star (bias corrected MLE)	0.674
nu hat (MLE)	1208	nu star (bias corrected)	1164
MLE Mean (bias corrected)	4.904	MLE Sd (bias corrected)	1.818
		Approximate Chi Square Value (0.05)	1086
Adjusted Level of Significance	0.047	Adjusted Chi Square Value	1085
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50)	5.257	95% Adjusted Gamma UCL (use when n<50)	5.264
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.978	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk P Value	0.513	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.0575	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.0991	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	0.693	Mean of logged Data	1.522
Maximum of Logged Data	2.38	SD of logged Data	0.372
Assuming Lognormal Distribution			
95% H-UCL	5.292	90% Chebyshev (MVUE) UCL	5.537
95% Chebyshev (MVUE) UCL	5.823	97.5% Chebyshev (MVUE) UCL	6.219
99% Chebyshev (MVUE) UCL	6.998		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	5.244	95% Jackknife UCL	5.248
95% Standard Bootstrap UCL	5.24	95% Bootstrap-t UCL	5.282
95% Hall's Bootstrap UCL	5.269	95% Percentile Bootstrap UCL	5.266
95% BCA Bootstrap UCL	5.283		
90% Chebyshev(Mean, Sd) UCL	5.525	95% Chebyshev(Mean, Sd) UCL	5.806
97.5% Chebyshev(Mean, Sd) UCL	6.197	99% Chebyshev(Mean, Sd) UCL	6.964
Suggested UCL to Use			
95% Approximate Gamma UCL	5.257		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Barium			
General Statistics			
Total Number of Observations	80	Number of Distinct Observations	74

		Number of Missing Observations	13
Minimum	30.3	Mean	213.9
Maximum	533	Median	204
SD	127.3	Std. Error of Mean	14.23
Coefficient of Variation	0.595	Skewness	0.535
Normal GOF Test			
Shapiro Wilk Test Statistic	0.928	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	1.7902E-4	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.12	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.0991	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	237.6	95% Adjusted-CLT UCL (Chen-1995)	238.2
		95% Modified-t UCL (Johnson-1978)	237.7
Gamma GOF Test			
A-D Test Statistic	0.765	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.761	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.0825	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.101	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data follow Appr. Gamma Distribution at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	2.557	k star (bias corrected MLE)	2.469
Theta hat (MLE)	83.64	Theta star (bias corrected MLE)	86.61
nu hat (MLE)	409.1	nu star (bias corrected)	395.1
MLE Mean (bias corrected)	213.9	MLE Sd (bias corrected)	136.1
		Approximate Chi Square Value (0.05)	350
Adjusted Level of Significance	0.047	Adjusted Chi Square Value	349.3
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50)	241.4	95% Adjusted Gamma UCL (use when n<50)	241.9
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.944	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk P Value	0.00344	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.116	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.0991	Data Not Lognormal at 5% Significance Level	
Data Not Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	3.411	Mean of logged Data	5.157
Maximum of Logged Data	6.279	SD of logged Data	0.692
Assuming Lognormal Distribution			
95% H-UCL	257.4	90% Chebyshev (MVUE) UCL	276
95% Chebyshev (MVUE) UCL	301.4	97.5% Chebyshev (MVUE) UCL	336.7

99% Chebyshev (MVUE) UCL	406		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	237.3	95% Jackknife UCL	237.6
95% Standard Bootstrap UCL	238.1	95% Bootstrap-t UCL	238.2
95% Hall's Bootstrap UCL	237.1	95% Percentile Bootstrap UCL	237.3
95% BCA Bootstrap UCL	237		
90% Chebyshev(Mean, Sd) UCL	256.6	95% Chebyshev(Mean, Sd) UCL	275.9
97.5% Chebyshev(Mean, Sd) UCL	302.8	99% Chebyshev(Mean, Sd) UCL	355.5
Suggested UCL to Use			
95% Approximate Gamma UCL	241.4		
When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test			
When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
ChromiumVI_EST			
General Statistics			
Total Number of Observations	80	Number of Distinct Observations	53
		Number of Missing Observations	13
Minimum	0.177	Mean	0.311
Maximum	0.693	Median	0.29
SD	0.098	Std. Error of Mean	0.011
Coefficient of Variation	0.315	Skewness	1.269
Normal GOF Test			
Shapiro Wilk Test Statistic	0.905	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	1.6870E-6	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.11	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.0991	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	0.33	95% Adjusted-CLT UCL (Chen-1995)	0.331
		95% Modified-t UCL (Johnson-1978)	0.33
Gamma GOF Test			
A-D Test Statistic	0.967	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.751	Data Not Gamma Distributed at 5% Significance Level	

K-S Test Statistic	0.0954	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.0997	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data follow Appr. Gamma Distribution at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	11.65	k star (bias corrected MLE)	11.22
Theta hat (MLE)	0.0267	Theta star (bias corrected MLE)	0.0278
nu hat (MLE)	1864	nu star (bias corrected)	1795
MLE Mean (bias corrected)	0.311	MLE Sd (bias corrected)	0.093
		Approximate Chi Square Value (0.05)	1698
Adjusted Level of Significance	0.047	Adjusted Chi Square Value	1696
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50)	0.329	95% Adjusted Gamma UCL (use when n<50)	0.33
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.962	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk P Value	0.0669	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.0932	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.0991	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	-1.734	Mean of logged Data	-1.21
Maximum of Logged Data	-0.366	SD of logged Data	0.291
Assuming Lognormal Distribution			
95% H-UCL	0.329	90% Chebyshev (MVUE) UCL	0.342
95% Chebyshev (MVUE) UCL	0.356	97.5% Chebyshev (MVUE) UCL	0.375
99% Chebyshev (MVUE) UCL	0.413		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	0.329	95% Jackknife UCL	0.33
95% Standard Bootstrap UCL	0.329	95% Bootstrap-t UCL	0.332
95% Hall's Bootstrap UCL	0.332	95% Percentile Bootstrap UCL	0.33
95% BCA Bootstrap UCL	0.331		
90% Chebyshev(Mean, Sd) UCL	0.344	95% Chebyshev(Mean, Sd) UCL	0.359
97.5% Chebyshev(Mean, Sd) UCL	0.38	99% Chebyshev(Mean, Sd) UCL	0.42
Suggested UCL to Use			
95% Approximate Gamma UCL	0.329		
When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test			
When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Cobalt

General Statistics

Total Number of Observations	80	Number of Distinct Observations	33
		Number of Missing Observations	13
Minimum	3.2	Mean	5.599
Maximum	7.4	Median	5.7
SD	0.982	Std. Error of Mean	0.11
Coefficient of Variation	0.175	Skewness	-0.142

Normal GOF Test

Shapiro Wilk Test Statistic	0.969	**Shapiro Wilk GOF Test**
5% Shapiro Wilk P Value	0.168	Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.0546	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.0991	Data appear Normal at 5% Significance Level

Data appear Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	5.781	95% Adjusted-CLT UCL (Chen-1995)	5.777
		95% Modified-t UCL (Johnson-1978)	5.781

Gamma GOF Test

A-D Test Statistic	0.437	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.75	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.0761	**Kolmogorov-Smirnov Gamma GOF Test**
5% K-S Critical Value	0.0994	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	31.3	k star (bias corrected MLE)	30.14
Theta hat (MLE)	0.179	Theta star (bias corrected MLE)	0.186
nu hat (MLE)	5008	nu star (bias corrected)	4822
MLE Mean (bias corrected)	5.599	MLE Sd (bias corrected)	1.02
		Approximate Chi Square Value (0.05)	4662
Adjusted Level of Significance	0.047	Adjusted Chi Square Value	4659

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	5.791	95% Adjusted Gamma UCL (use when n<50)	5.795

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.957	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk P Value	0.0325	Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.086	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.0991	Data appear Lognormal at 5% Significance Level

Data appear Approximate Lognormal at 5% Significance Level

Lognormal Statistics			
Minimum of Logged Data	1.163	Mean of logged Data	1.706
Maximum of Logged Data	2.001	SD of logged Data	0.183
Assuming Lognormal Distribution			
95% H-UCL	5.803	90% Chebyshev (MVUE) UCL	5.949
95% Chebyshev (MVUE) UCL	6.106	97.5% Chebyshev (MVUE) UCL	6.325
99% Chebyshev (MVUE) UCL	6.754		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	5.779	95% Jackknife UCL	5.781
95% Standard Bootstrap UCL	5.778	95% Bootstrap-t UCL	5.783
95% Hall's Bootstrap UCL	5.781	95% Percentile Bootstrap UCL	5.776
95% BCA Bootstrap UCL	5.773		
90% Chebyshev(Mean, Sd) UCL	5.928	95% Chebyshev(Mean, Sd) UCL	6.077
97.5% Chebyshev(Mean, Sd) UCL	6.284	99% Chebyshev(Mean, Sd) UCL	6.691
Suggested UCL to Use			
95% Student's-t UCL	5.781		

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Note: For highly negatively-skewed data, confidence limits (e.g., Chen, Johnson, Lognormal, and Gamma) may not be reliable. Chen's and Johnson's methods provide adjustments for positvely skewed data sets.

Copper

General Statistics			
Total Number of Observations	80	Number of Distinct Observations	62
		Number of Missing Observations	13
Minimum	3.7	Mean	15.01
Maximum	27	Median	13.45
SD	5.089	Std. Error of Mean	0.569
Coefficient of Variation	0.339	Skewness	0.564
Normal GOF Test			
Shapiro Wilk Test Statistic	0.947	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	0.0052	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.132	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.0991	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			

Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	15.96	95% Adjusted-CLT UCL (Chen-1995)	15.99
		95% Modified-t UCL (Johnson-1978)	15.97
Gamma GOF Test			
A-D Test Statistic	0.621	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.752	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.0933	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.0998	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	8.703	k star (bias corrected MLE)	8.385
Theta hat (MLE)	1.725	Theta star (bias corrected MLE)	1.791
nu hat (MLE)	1392	nu star (bias corrected)	1342
MLE Mean (bias corrected)	15.01	MLE Sd (bias corrected)	5.185
		Approximate Chi Square Value (0.05)	1258
Adjusted Level of Significance	0.047	Adjusted Chi Square Value	1256
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50)	16.02	95% Adjusted Gamma UCL (use when n<50)	16.04
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.965	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk P Value	0.101	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.0704	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.0991	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	1.308	Mean of logged Data	2.65
Maximum of Logged Data	3.296	SD of logged Data	0.353
Assuming Lognormal Distribution			
95% H-UCL	16.17	90% Chebyshev (MVUE) UCL	16.89
95% Chebyshev (MVUE) UCL	17.72	97.5% Chebyshev (MVUE) UCL	18.87
99% Chebyshev (MVUE) UCL	21.14		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	15.95	95% Jackknife UCL	15.96
95% Standard Bootstrap UCL	15.94	95% Bootstrap-t UCL	15.99
95% Hall's Bootstrap UCL	15.97	95% Percentile Bootstrap UCL	15.96
95% BCA Bootstrap UCL	15.98		
90% Chebyshev(Mean, Sd) UCL	16.72	95% Chebyshev(Mean, Sd) UCL	17.49
97.5% Chebyshev(Mean, Sd) UCL	18.57	99% Chebyshev(Mean, Sd) UCL	20.68

Suggested UCL to Use			
95% Approximate Gamma UCL	16.02		

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Vanadium

General Statistics			
Total Number of Observations	80	Number of Distinct Observations	58
		Number of Missing Observations	13
Minimum	4.9	Mean	11.42
Maximum	21.4	Median	11.3
SD	3.299	Std. Error of Mean	0.369
Coefficient of Variation	0.289	Skewness	0.365

Normal GOF Test		
Shapiro Wilk Test Statistic	0.979	**Shapiro Wilk GOF Test**
5% Shapiro Wilk P Value	0.535	Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.0652	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.0991	Data appear Normal at 5% Significance Level
Data appear Normal at 5% Significance Level		

Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	12.04	95% Adjusted-CLT UCL (Chen-1995)	12.05
		95% Modified-t UCL (Johnson-1978)	12.04

Gamma GOF Test		
A-D Test Statistic	0.284	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.751	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.0614	**Kolmogorov-Smirnov Gamma GOF Test**
5% K-S Critical Value	0.0997	Detected data appear Gamma Distributed at 5% Significance Level
Detected data appear Gamma Distributed at 5% Significance Level		

Gamma Statistics			
k hat (MLE)	11.78	k star (bias corrected MLE)	11.34
Theta hat (MLE)	0.97	Theta star (bias corrected MLE)	1.007
nu hat (MLE)	1884	nu star (bias corrected)	1815
MLE Mean (bias corrected)	11.42	MLE Sd (bias corrected)	3.392
		Approximate Chi Square Value (0.05)	1717
Adjusted Level of Significance	0.047	Adjusted Chi Square Value	1715

Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	12.07	95% Adjusted Gamma UCL (use when n<50)	12.09

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.976	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk P Value	0.413	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.0737	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.0991	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	1.589	Mean of logged Data	2.393
Maximum of Logged Data	3.063	SD of logged Data	0.301
Assuming Lognormal Distribution			
95% H-UCL	12.15	90% Chebyshev (MVUE) UCL	12.62
95% Chebyshev (MVUE) UCL	13.15	97.5% Chebyshev (MVUE) UCL	13.9
99% Chebyshev (MVUE) UCL	15.35		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	12.03	95% Jackknife UCL	12.04
95% Standard Bootstrap UCL	12.03	95% Bootstrap-t UCL	12.05
95% Hall's Bootstrap UCL	12.05	95% Percentile Bootstrap UCL	12.02
95% BCA Bootstrap UCL	12.03		
90% Chebyshev(Mean, Sd) UCL	12.53	95% Chebyshev(Mean, Sd) UCL	13.03
97.5% Chebyshev(Mean, Sd) UCL	13.73	99% Chebyshev(Mean, Sd) UCL	15.09
Suggested UCL to Use			
95% Student's-t UCL	12.04		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Zinc			
General Statistics			
Total Number of Observations	80	Number of Distinct Observations	69
		Number of Missing Observations	13
Minimum	16.9	Mean	45.45
Maximum	89	Median	42.1
SD	14.76	Std. Error of Mean	1.65
Coefficient of Variation	0.325	Skewness	0.713
Normal GOF Test			
Shapiro Wilk Test Statistic	0.954	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	0.018	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.121	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.0991	Data Not Normal at 5% Significance Level	

Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	48.2	95% Adjusted-CLT UCL (Chen-1995)	48.3
		95% Modified-t UCL (Johnson-1978)	48.22
Gamma GOF Test			
A-D Test Statistic	0.373	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.751	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.0785	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.0997	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	9.845	k star (bias corrected MLE)	9.484
Theta hat (MLE)	4.616	Theta star (bias corrected MLE)	4.792
nu hat (MLE)	1575	nu star (bias corrected)	1517
MLE Mean (bias corrected)	45.45	MLE Sd (bias corrected)	14.76
		Approximate Chi Square Value (0.05)	1428
Adjusted Level of Significance	0.047	Adjusted Chi Square Value	1426
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50)	48.3	95% Adjusted Gamma UCL (use when n<50)	48.35
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.982	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk P Value	0.69	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.0582	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.0991	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	2.827	Mean of logged Data	3.765
Maximum of Logged Data	4.489	SD of logged Data	0.327
Assuming Lognormal Distribution			
95% H-UCL	48.57	90% Chebyshev (MVUE) UCL	50.59
95% Chebyshev (MVUE) UCL	52.91	97.5% Chebyshev (MVUE) UCL	56.11
99% Chebyshev (MVUE) UCL	62.41		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	48.16	95% Jackknife UCL	48.2
95% Standard Bootstrap UCL	48.17	95% Bootstrap-t UCL	48.44
95% Hall's Bootstrap UCL	48.31	95% Percentile Bootstrap UCL	48.3
95% BCA Bootstrap UCL	48.33		
90% Chebyshev(Mean, Sd) UCL	50.4	95% Chebyshev(Mean, Sd) UCL	52.64

97.5% Chebyshev(Mean, Sd) UCL	55.76	99% Chebyshev(Mean, Sd) UCL	61.87
Suggested UCL to Use			
95% Approximate Gamma UCL	48.3		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Selenium			
General Statistics			
Total Number of Observations	80	Number of Distinct Observations	33
		Number of Missing Observations	13
Number of Detects	22	Number of Non-Detects	58
Number of Distinct Detects	19	Number of Distinct Non-Detects	17
Minimum Detect	0.29	Minimum Non-Detect	0.23
Maximum Detect	1.1	Maximum Non-Detect	0.44
Variance Detects	0.044	Percent Non-Detects	72.5%
Mean Detects	0.645	SD Detects	0.21
Median Detects	0.65	CV Detects	0.325
Skewness Detects	0.265	Kurtosis Detects	-0.359
Mean of Logged Detects	-0.493	SD of Logged Detects	0.346
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.98	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.911	Detected Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.098	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.184	Detected Data appear Normal at 5% Significance Level	
Detected Data appear Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.346	KM Standard Error of Mean	0.0245
KM SD	0.214	95% KM (BCA) UCL	0.388
95% KM (t) UCL	0.386	95% KM (Percentile Bootstrap) UCL	0.391
95% KM (z) UCL	0.386	95% KM Bootstrap t UCL	0.392
90% KM Chebyshev UCL	0.419	95% KM Chebyshev UCL	0.452
97.5% KM Chebyshev UCL	0.499	99% KM Chebyshev UCL	0.589
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	0.196	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.744	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.096	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.185	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	9.375	k star (bias corrected MLE)	8.127
Theta hat (MLE)	0.0688	Theta star (bias corrected MLE)	0.0794

nu hat (MLE)	412.5	nu star (bias corrected)	357.6
Mean (detects)	0.645		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	0.247
Maximum	1.1	Median	0.133
SD	0.281	CV	1.137
k hat (MLE)	0.632	k star (bias corrected MLE)	0.617
Theta hat (MLE)	0.391	Theta star (bias corrected MLE)	0.401
nu hat (MLE)	101.1	nu star (bias corrected)	98.67
Adjusted Level of Significance (β)	0.047		
Approximate Chi Square Value (98.67, α)	76.75	Adjusted Chi Square Value (98.67, β)	76.4
95% Gamma Approximate UCL (use when n>=50)	0.318	95% Gamma Adjusted UCL (use when n<50)	0.319
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.346	SD (KM)	0.214
Variance (KM)	0.0457	SE of Mean (KM)	0.0245
k hat (KM)	2.615	k star (KM)	2.526
nu hat (KM)	418.5	nu star (KM)	404.1
theta hat (KM)	0.132	theta star (KM)	0.137
80% gamma percentile (KM)	0.503	90% gamma percentile (KM)	0.637
95% gamma percentile (KM)	0.763	99% gamma percentile (KM)	1.038
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (404.11, α)	358.5	Adjusted Chi Square Value (404.11, β)	357.7
95% Gamma Approximate KM-UCL (use when n>=50)	0.39	95% Gamma Adjusted KM-UCL (use when n<50)	0.39
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.972	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.911	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.107	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.184	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.328	Mean in Log Scale	-1.312
SD in Original Scale	0.231	SD in Log Scale	0.609
95% t UCL (assumes normality of ROS data)	0.371	95% Percentile Bootstrap UCL	0.373
95% BCA Bootstrap UCL	0.375	95% Bootstrap t UCL	0.376
95% H-UCL (Log ROS)	0.37		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-1.196	KM Geo Mean	0.303
KM SD (logged)	0.469	95% Critical H Value (KM-Log)	1.84
KM Standard Error of Mean (logged)	0.0541	95% H-UCL (KM -Log)	0.372

KM SD (logged)	0.469	95% Critical H Value (KM-Log)	1.84
KM Standard Error of Mean (logged)	0.0541		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.288	Mean in Log Scale	-1.507
SD in Original Scale	0.247	SD in Log Scale	0.667
95% t UCL (Assumes normality)	0.334	95% H-Stat UCL	0.321

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Normal Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (t) UCL	0.386		

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Naphthalene

General Statistics

Total Number of Observations	80	Number of Distinct Observations	31
		Number of Missing Observations	13
Number of Detects	19	Number of Non-Detects	61
Number of Distinct Detects	16	Number of Distinct Non-Detects	18
Minimum Detect	0.0015	Minimum Non-Detect	0.0014
Maximum Detect	0.013	Maximum Non-Detect	0.011
Variance Detects	1.2624E-5	Percent Non-Detects	76.25%
Mean Detects	0.00524	SD Detects	0.00355
Median Detects	0.004	CV Detects	0.678
Skewness Detects	0.785	Kurtosis Detects	-0.604
Mean of Logged Detects	-5.48	SD of Logged Detects	0.705

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.878	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.901	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.2	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.197	Detected Data Not Normal at 5% Significance Level	

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	0.00269	KM Standard Error of Mean	3.4027E-4
KM SD	0.00255	95% KM (BCA) UCL	0.00328
95% KM (t) UCL	0.00325	95% KM (Percentile Bootstrap) UCL	0.00326
95% KM (z) UCL	0.00325	95% KM Bootstrap t UCL	0.00334
90% KM Chebyshev UCL	0.00371	95% KM Chebyshev UCL	0.00417
97.5% KM Chebyshev UCL	0.00481	99% KM Chebyshev UCL	0.00607

Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	0.554	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.751	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.169	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.201	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	2.349	k star (bias corrected MLE)	2.013
Theta hat (MLE)	0.00223	Theta star (bias corrected MLE)	0.0026
nu hat (MLE)	89.25	nu star (bias corrected)	76.49
Mean (detects)	0.00524		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.0015	Mean	0.00887
Maximum	0.013	Median	0.01
SD	0.00265	CV	0.299
k hat (MLE)	5.865	k star (bias corrected MLE)	5.653
Theta hat (MLE)	0.00151	Theta star (bias corrected MLE)	0.00157
nu hat (MLE)	938.4	nu star (bias corrected)	904.5
Adjusted Level of Significance (β)	0.047		
Approximate Chi Square Value (904.52, α)	835.7	Adjusted Chi Square Value (904.52, β)	834.5
95% Gamma Approximate UCL (use when n>=50)	0.0096	95% Gamma Adjusted UCL (use when n<50)	0.00961
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.00269	SD (KM)	0.00255
Variance (KM)	6.4801E-6	SE of Mean (KM)	3.4027E-4
k hat (KM)	1.114	k star (KM)	1.081
nu hat (KM)	178.3	nu star (KM)	172.9
theta hat (KM)	0.00241	theta star (KM)	0.00249
80% gamma percentile (KM)	0.0043	90% gamma percentile (KM)	0.00607
95% gamma percentile (KM)	0.00783	99% gamma percentile (KM)	0.0119
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (172.95, α)	143.5	Adjusted Chi Square Value (172.95, β)	143
95% Gamma Approximate KM-UCL (use when n>=50)	0.00324	95% Gamma Adjusted KM-UCL (use when n<50)	0.00325
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.933	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.901	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.137	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.197	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			

Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.00211	Mean in Log Scale	-6.64
SD in Original Scale	0.00255	SD in Log Scale	0.934
95% t UCL (assumes normality of ROS data)	0.00258	95% Percentile Bootstrap UCL	0.00259
95% BCA Bootstrap UCL	0.00268	95% Bootstrap t UCL	0.00271
95% H-UCL (Log ROS)	0.00255		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-6.184	KM Geo Mean	0.00206
KM SD (logged)	0.635	95% Critical H Value (KM-Log)	1.946
KM Standard Error of Mean (logged)	0.089	95% H-UCL (KM -Log)	0.0029
KM SD (logged)	0.635	95% Critical H Value (KM-Log)	1.946
KM Standard Error of Mean (logged)	0.089		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.00349	Mean in Log Scale	-6.03
SD in Original Scale	0.00268	SD in Log Scale	0.937
95% t UCL (Assumes normality)	0.00398	95% H-Stat UCL	0.00471
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Gamma Distributed at 5% Significance Level			
Suggested UCL to Use			
95% KM Approximate Gamma UCL	0.00324	95% GROS Approximate Gamma UCL	0.0096
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Aluminum			
General Statistics			
Total Number of Observations	80	Number of Distinct Observations	70
		Number of Missing Observations	13
Minimum	3840	Mean	15546
Maximum	30900	Median	15700
SD	6186	Std. Error of Mean	691.6
Coefficient of Variation	0.398	Skewness	0.193
Normal GOF Test			
Shapiro Wilk Test Statistic	0.966	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	0.115	Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.0792	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.0991	Data appear Normal at 5% Significance Level	
Data appear Normal at 5% Significance Level			

Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	16697	95% Adjusted-CLT UCL (Chen-1995)	16700
		95% Modified-t UCL (Johnson-1978)	16700
Gamma GOF Test			
A-D Test Statistic	0.846	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.754	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.0983	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.0999	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data follow Appr. Gamma Distribution at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	5.685	k star (bias corrected MLE)	5.48
Theta hat (MLE)	2735	Theta star (bias corrected MLE)	2837
nu hat (MLE)	909.5	nu star (bias corrected)	876.8
MLE Mean (bias corrected)	15546	MLE Sd (bias corrected)	6641
		Approximate Chi Square Value (0.05)	809
Adjusted Level of Significance	0.047	Adjusted Chi Square Value	807.8
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	16847	95% Adjusted Gamma UCL (use when n<50)	16872
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.947	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk P Value	0.00521	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.105	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.0991	Data Not Lognormal at 5% Significance Level	
Data Not Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	8.253	Mean of logged Data	9.561
Maximum of Logged Data	10.34	SD of logged Data	0.45
Assuming Lognormal Distribution			
95% H-UCL	17238	90% Chebyshev (MVUE) UCL	18165
95% Chebyshev (MVUE) UCL	19285	97.5% Chebyshev (MVUE) UCL	20839
99% Chebyshev (MVUE) UCL	23893		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	16684	95% Jackknife UCL	16697
95% Standard Bootstrap UCL	16678	95% Bootstrap-t UCL	16730
95% Hall's Bootstrap UCL	16689	95% Percentile Bootstrap UCL	16715
95% BCA Bootstrap UCL	16635		
90% Chebyshev(Mean, Sd) UCL	17621	95% Chebyshev(Mean, Sd) UCL	18561
97.5% Chebyshev(Mean, Sd) UCL	19865	99% Chebyshev(Mean, Sd) UCL	22427

Suggested UCL to Use			
95% Student's-t UCL	16697		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			

ProUCL Output
Western Undeveloped Area (Surface Water)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

UCL Statistics for Data Sets with Non-Detects	
User Selected Options	
Date/Time of Computation	ProUCL 5.11/28/2019 3:59:20 PM
From File	20190128_WCenUndev_ProUCL_input_b.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Fluoride

General Statistics			
Total Number of Observations	28	Number of Distinct Observations	18
		Number of Missing Observations	4
Number of Detects	22	Number of Non-Detects	6
Number of Distinct Detects	17	Number of Distinct Non-Detects	1
Minimum Detect	55.8	Minimum Non-Detect	12
Maximum Detect	137	Maximum Non-Detect	12
Variance Detects	504.7	Percent Non-Detects	21.43%
Mean Detects	118	SD Detects	22.47
Median Detects	124	CV Detects	0.19
Skewness Detects	-1.945	Kurtosis Detects	3.546
Mean of Logged Detects	4.747	SD of Logged Detects	0.244

Normal GOF Test on Detects Only		
Shapiro Wilk Test Statistic	0.751	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.911	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.227	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.184	Detected Data Not Normal at 5% Significance Level
Detected Data Not Normal at 5% Significance Level		

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	95.31	KM Standard Error of Mean	9.219
KM SD	47.66	95% KM (BCA) UCL	108.9
95% KM (t) UCL	111	95% KM (Percentile Bootstrap) UCL	109.7
95% KM (z) UCL	110.5	95% KM Bootstrap t UCL	109.3
90% KM Chebyshev UCL	123	95% KM Chebyshev UCL	135.5
97.5% KM Chebyshev UCL	152.9	99% KM Chebyshev UCL	187

Gamma GOF Tests on Detected Observations Only		
A-D Test Statistic	2.433	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.74	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.256	**Kolmogorov-Smirnov GOF**
5% K-S Critical Value	0.185	Detected Data Not Gamma Distributed at 5% Significance Level
Detected Data Not Gamma Distributed at 5% Significance Level		

Gamma Statistics on Detected Data Only			
k hat (MLE)	21	k star (bias corrected MLE)	18.17
Theta hat (MLE)	5.62	Theta star (bias corrected MLE)	6.497
nu hat (MLE)	924	nu star (bias corrected)	799.4
Mean (detects)	118		

Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	55.8	Mean	110.2
Maximum	137	Median	118.5
SD	25.14	CV	0.228
k hat (MLE)	16.78	k star (bias corrected MLE)	15
Theta hat (MLE)	6.57	Theta star (bias corrected MLE)	7.347
nu hat (MLE)	939.6	nu star (bias corrected)	840.2
Adjusted Level of Significance (β)	0.0404		
Approximate Chi Square Value (840.23, α)	774	Adjusted Chi Square Value (840.23, β)	770
95% Gamma Approximate UCL (use when n>=50)	119.7	95% Gamma Adjusted UCL (use when n<50)	120.3
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	95.31	SD (KM)	47.66
Variance (KM)	2271	SE of Mean (KM)	9.219
k hat (KM)	3.999	k star (KM)	3.595
nu hat (KM)	224	nu star (KM)	201.3
theta hat (KM)	23.83	theta star (KM)	26.52
80% gamma percentile (KM)	133.1	90% gamma percentile (KM)	162.7
95% gamma percentile (KM)	190.1	99% gamma percentile (KM)	249
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (201.30, α)	169.5	Adjusted Chi Square Value (201.30, β)	167.7
95% Gamma Approximate KM-UCL (use when n>=50)	113.2	95% Gamma Adjusted KM-UCL (use when n<50)	114.4
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.658	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.911	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.272	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.184	Detected Data Not Lognormal at 5% Significance Level	
Detected Data Not Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	109	Mean in Log Scale	4.657
SD in Original Scale	26.67	SD in Log Scale	0.281
95% t UCL (assumes normality of ROS data)	117.6	95% Percentile Bootstrap UCL	116.7
95% BCA Bootstrap UCL	116.8	95% Bootstrap t UCL	116.8
95% H-UCL (Log ROS)	120.7		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	4.262	KM Geo Mean	70.97
KM SD (logged)	0.952	95% Critical H Value (KM-Log)	2.398
KM Standard Error of Mean (logged)	0.184	95% H-UCL (KM -Log)	173.2
KM SD (logged)	0.952	95% Critical H Value (KM-Log)	2.398
KM Standard Error of Mean (logged)	0.184		

ProUCL Output
Western Undeveloped Area (Surface Water)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	94.03	Mean in Log Scale	4.114
SD in Original Scale	50.83	SD in Log Scale	1.253
95% t UCL (Assumes normality)	110.4	95% H-Stat UCL	262.7
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution at 5% Significance Level			
Suggested UCL to Use			
95% KM (t) UCL	111	KM H-UCL	173.2
95% KM (BCA) UCL	108.9		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
CyanideFREE			
General Statistics			
Total Number of Observations	20	Number of Distinct Observations	3
		Number of Missing Observations	12
Number of Detects	2	Number of Non-Detects	18
Number of Distinct Detects	2	Number of Distinct Non-Detects	1
Minimum Detect	1.9	Minimum Non-Detect	1.5
Maximum Detect	7.7	Maximum Non-Detect	1.5
Variance Detects	16.82	Percent Non-Detects	90%
Mean Detects	4.8	SD Detects	4.101
Median Detects	4.8	CV Detects	0.854
Skewness Detects	N/A	Kurtosis Detects	N/A
Mean of Logged Detects	1.342	SD of Logged Detects	0.99
Warning: Data set has only 2 Detected Values.			
This is not enough to compute meaningful or reliable statistics and estimates.			
Normal GOF Test on Detects Only			
Not Enough Data to Perform GOF Test			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	1.83	KM Standard Error of Mean	0.427
KM SD	1.349	95% KM (BCA) UCL	N/A
95% KM (t) UCL	2.568	95% KM (Percentile Bootstrap) UCL	N/A
95% KM (z) UCL	2.532	95% KM Bootstrap t UCL	N/A
90% KM Chebyshev UCL	3.11	95% KM Chebyshev UCL	3.69
97.5% KM Chebyshev UCL	4.495	99% KM Chebyshev UCL	6.076
Gamma GOF Tests on Detected Observations Only			
Not Enough Data to Perform GOF Test			

Gamma Statistics on Detected Data Only			
k hat (MLE)	2.355	k star (bias corrected MLE)	N/A
Theta hat (MLE)	2.038	Theta star (bias corrected MLE)	N/A
nu hat (MLE)	9.42	nu star (bias corrected)	N/A
Mean (detects)	4.8		
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	1.83	SD (KM)	1.349
Variance (KM)	1.821	SE of Mean (KM)	0.427
k hat (KM)	1.839	k star (KM)	1.596
nu hat (KM)	73.56	nu star (KM)	63.86
theta hat (KM)	0.995	theta star (KM)	1.146
80% gamma percentile (KM)	2.812	90% gamma percentile (KM)	3.756
95% gamma percentile (KM)	4.669	99% gamma percentile (KM)	6.723
Gamma Kaplan-Meier (KM) Statistics			
		Adjusted Level of Significance (β)	0.038
Approximate Chi Square Value (63.86, α)	46.47	Adjusted Chi Square Value (63.86, β)	45.3
95% Gamma Approximate KM-UCL (use when n>=50)	2.515	95% Gamma Adjusted KM-UCL (use when n<50)	2.58
Lognormal GOF Test on Detected Observations Only			
Not Enough Data to Perform GOF Test			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.508	Mean in Log Scale	-5.623
SD in Original Scale	1.745	SD in Log Scale	3.876
95% t UCL (assumes normality of ROS data)	1.183	95% Percentile Bootstrap UCL	1.266
95% BCA Bootstrap UCL	1.666	95% Bootstrap t UCL	13.9
95% H-UCL (Log ROS)	5539		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	0.499	KM Geo Mean	1.647
KM SD (logged)	0.358	95% Critical H Value (KM-Log)	1.894
KM Standard Error of Mean (logged)	0.113	95% H-UCL (KM -Log)	2.051
KM SD (logged)	0.358	95% Critical H Value (KM-Log)	1.894
KM Standard Error of Mean (logged)	0.113		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	1.155	Mean in Log Scale	-0.125
SD in Original Scale	1.562	SD in Log Scale	0.55
95% t UCL (Assumes normality)	1.759	95% H-Stat UCL	1.334
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution at 5% Significance Level			
Suggested UCL to Use			
95% KM (Chebyshev) UCL	3.69		

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

ProUCL Output
Western Undeveloped Area (Surface Water)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

UCL Statistics for Data Sets with Non-Detects	
User Selected Options	
Date/Time of Computation	ProUCL 5.12/8/2019 1:29:14 PM
From File	20190207_CYANIDE_PROUCL_INPUT_RERUNS.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Cyanide

General Statistics			
Total Number of Observations	32	Number of Distinct Observations	6
Number of Detects	7	Number of Non-Detects	25
Number of Distinct Detects	6	Number of Distinct Non-Detects	1
Minimum Detect	2	Minimum Non-Detect	2
Maximum Detect	15.3	Maximum Non-Detect	2
Variance Detects	28.47	Percent Non-Detects	78.13%
Mean Detects	5.414	SD Detects	5.336
Median Detects	2.7	CV Detects	0.986
Skewness Detects	1.477	Kurtosis Detects	0.776
Mean of Logged Detects	1.343	SD of Logged Detects	0.841

Normal GOF Test on Detects Only		
Shapiro Wilk Test Statistic	0.708	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.803	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.389	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.304	Detected Data Not Normal at 5% Significance Level
Detected Data Not Normal at 5% Significance Level		

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	2.747	KM Standard Error of Mean	0.517
KM SD	2.708	95% KM (BCA) UCL	3.691
95% KM (t) UCL	3.623	95% KM (Percentile Bootstrap) UCL	3.631
95% KM (z) UCL	3.597	95% KM Bootstrap t UCL	11.06
90% KM Chebyshev UCL	4.298	95% KM Chebyshev UCL	5
97.5% KM Chebyshev UCL	5.975	99% KM Chebyshev UCL	7.891

Gamma GOF Tests on Detected Observations Only		
A-D Test Statistic	0.951	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.72	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.37	**Kolmogorov-Smirnov GOF**
5% K-S Critical Value	0.317	Detected Data Not Gamma Distributed at 5% Significance Level
Detected Data Not Gamma Distributed at 5% Significance Level		

Gamma Statistics on Detected Data Only			
k hat (MLE)	1.59	k star (bias corrected MLE)	1.004
Theta hat (MLE)	3.404	Theta star (bias corrected MLE)	5.393
nu hat (MLE)	22.27	nu star (bias corrected)	14.06
Mean (detects)	5.414		

ProUCL Output
Western Undeveloped Area (Surface Water)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	1.192
Maximum	15.3	Median	0.01
SD	3.265	CV	2.739
k hat (MLE)	0.21	k star (bias corrected MLE)	0.211
Theta hat (MLE)	5.68	Theta star (bias corrected MLE)	5.649
nu hat (MLE)	13.43	nu star (bias corrected)	13.51
Adjusted Level of Significance (β)	0.0416		
Approximate Chi Square Value (13.51, α)	6.235	Adjusted Chi Square Value (13.51, β)	5.971
95% Gamma Approximate UCL (use when n>=50)	2.583	95% Gamma Adjusted UCL (use when n<50)	2.697
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	2.747	SD (KM)	2.708
Variance (KM)	7.331	SE of Mean (KM)	0.517
k hat (KM)	1.029	k star (KM)	0.954
nu hat (KM)	65.87	nu star (KM)	61.03
theta hat (KM)	2.669	theta star (KM)	2.88
80% gamma percentile (KM)	4.437	90% gamma percentile (KM)	6.399
95% gamma percentile (KM)	8.368	99% gamma percentile (KM)	12.96
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (61.03, α)	44.07	Adjusted Chi Square Value (61.03, β)	43.29
95% Gamma Approximate KM-UCL (use when n>=50)	3.805	95% Gamma Adjusted KM-UCL (use when n<50)	3.872
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.773	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.803	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.329	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.304	Detected Data Not Lognormal at 5% Significance Level	
Detected Data Not Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	1.374	Mean in Log Scale	-1.439
SD in Original Scale	3.207	SD in Log Scale	2.024
95% t UCL (assumes normality of ROS data)	2.336	95% Percentile Bootstrap UCL	2.412
95% BCA Bootstrap UCL	2.734	95% Bootstrap t UCL	4.67
95% H-UCL (Log ROS)	7.513		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	0.835	KM Geo Mean	2.305
KM SD (logged)	0.452	95% Critical H Value (KM-Log)	1.896
KM Standard Error of Mean (logged)	0.0864	95% H-UCL (KM -Log)	2.979
KM SD (logged)	0.452	95% Critical H Value (KM-Log)	1.896
KM Standard Error of Mean (logged)	0.0864		

ProUCL Output
Western Undeveloped Area (Surface Water)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	1.966	Mean in Log Scale	0.294
SD in Original Scale	2.991	SD in Log Scale	0.674
95% t UCL (Assumes normality)	2.862	95% H-Stat UCL	2.167
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution at 5% Significance Level			
Suggested UCL to Use			
95% KM (Chebyshev) UCL	5		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			

ProUCL Output
South Percolation Pond Area Soil (0-0.5 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

UCL Statistics for Data Sets with Non-Detects	
User Selected Options	
Date/Time of Computation	ProUCL 5.11/28/2019 5:38:43 PM
From File	20190128_SPercPond_ProUCL_input.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Fluoride

General Statistics			
Total Number of Observations	23	Number of Distinct Observations	23
		Number of Missing Observations	0
Minimum	1.8	Mean	14.19
Maximum	44.1	Median	14.4
SD	10.49	Std. Error of Mean	2.188
Coefficient of Variation	0.739	Skewness	1.066

Normal GOF Test		
Shapiro Wilk Test Statistic	0.901	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.914	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.133	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.18	Data appear Normal at 5% Significance Level

Data appear Approximate Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		95% UCLs (Adjusted for Skewness)	
95% Student's-t UCL	17.95	95% Adjusted-CLT UCL (Chen-1995)	18.31
		95% Modified-t UCL (Johnson-1978)	18.03

Gamma GOF Test		
A-D Test Statistic	0.652	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.758	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.185	**Kolmogorov-Smirnov Gamma GOF Test**
5% K-S Critical Value	0.185	Data Not Gamma Distributed at 5% Significance Level

Detected data follow Appr. Gamma Distribution at 5% Significance Level

Gamma Statistics			
k hat (MLE)	1.671	k star (bias corrected MLE)	1.482
Theta hat (MLE)	8.491	Theta star (bias corrected MLE)	9.574
nu hat (MLE)	76.89	nu star (bias corrected)	68.19
MLE Mean (bias corrected)	14.19	MLE Sd (bias corrected)	11.66
		Approximate Chi Square Value (0.05)	50.19
Adjusted Level of Significance	0.0389	Adjusted Chi Square Value	49.07

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	19.29	95% Adjusted Gamma UCL (use when n<50)	19.73

Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.914	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.914	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.233	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.18	Data Not Lognormal at 5% Significance Level	
Data Not Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	0.588	Mean of logged Data	2.325
Maximum of Logged Data	3.786	SD of logged Data	0.911
Assuming Lognormal Distribution			
95% H-UCL	24.74	90% Chebyshev (MVUE) UCL	24.69
95% Chebyshev (MVUE) UCL	29.03	97.5% Chebyshev (MVUE) UCL	35.05
99% Chebyshev (MVUE) UCL	46.88		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	17.79	95% Jackknife UCL	17.95
95% Standard Bootstrap UCL	17.73	95% Bootstrap-t UCL	18.74
95% Hall's Bootstrap UCL	19.02	95% Percentile Bootstrap UCL	17.74
95% BCA Bootstrap UCL	18.25		
90% Chebyshev(Mean, Sd) UCL	20.76	95% Chebyshev(Mean, Sd) UCL	23.73
97.5% Chebyshev(Mean, Sd) UCL	27.86	99% Chebyshev(Mean, Sd) UCL	35.96
Suggested UCL to Use			
95% Student's-t UCL	17.95		
When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test			
When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Indeno123CDPyrene			
General Statistics			
Total Number of Observations	23	Number of Distinct Observations	22
Number of Detects	20	Number of Non-Detects	3
Number of Distinct Detects	19	Number of Distinct Non-Detects	3
Minimum Detect	0.06	Minimum Non-Detect	0.028
Maximum Detect	3.1	Maximum Non-Detect	0.041
Variance Detects	0.443	Percent Non-Detects	13.04%
Mean Detects	0.347	SD Detects	0.665
Median Detects	0.19	CV Detects	1.917
Skewness Detects	4.11	Kurtosis Detects	17.64

Mean of Logged Detects	-1.694	SD of Logged Detects	0.958
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.416	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.905	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.35	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.192	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.306	KM Standard Error of Mean	0.131
KM SD	0.614	95% KM (BCA) UCL	0.567
95% KM (t) UCL	0.531	95% KM (Percentile Bootstrap) UCL	0.557
95% KM (z) UCL	0.522	95% KM Bootstrap t UCL	1.17
90% KM Chebyshev UCL	0.7	95% KM Chebyshev UCL	0.878
97.5% KM Chebyshev UCL	1.126	99% KM Chebyshev UCL	1.613
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	1.664	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.772	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.253	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.2	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.917	k star (bias corrected MLE)	0.813
Theta hat (MLE)	0.379	Theta star (bias corrected MLE)	0.427
nu hat (MLE)	36.69	nu star (bias corrected)	32.52
Mean (detects)	0.347		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	0.303
Maximum	3.1	Median	0.12
SD	0.629	CV	2.075
k hat (MLE)	0.688	k star (bias corrected MLE)	0.627
Theta hat (MLE)	0.441	Theta star (bias corrected MLE)	0.483
nu hat (MLE)	31.66	nu star (bias corrected)	28.86
Adjusted Level of Significance (β)	0.0389		
Approximate Chi Square Value (28.86, α)	17.6	Adjusted Chi Square Value (28.86, β)	16.97
95% Gamma Approximate UCL (use when n>=50)	0.497	95% Gamma Adjusted UCL (use when n<50)	0.516
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.306	SD (KM)	0.614
Variance (KM)	0.377	SE of Mean (KM)	0.131
k hat (KM)	0.247	k star (KM)	0.244

nu hat (KM)	11.38	nu star (KM)	11.23
theta hat (KM)	1.235	theta star (KM)	1.252
80% gamma percentile (KM)	0.44	90% gamma percentile (KM)	0.919
95% gamma percentile (KM)	1.49	99% gamma percentile (KM)	3.014
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (11.23, α)	4.724	Adjusted Chi Square Value (11.23, β)	4.421
95% Gamma Approximate KM-UCL (use when n>=50)	0.726	95% Gamma Adjusted KM-UCL (use when n<50)	0.776
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.891	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.905	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.158	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.192	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Approximate Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.305	Mean in Log Scale	-1.971
SD in Original Scale	0.628	SD in Log Scale	1.154
95% t UCL (assumes normality of ROS data)	0.53	95% Percentile Bootstrap UCL	0.558
95% BCA Bootstrap UCL	0.72	95% Bootstrap t UCL	1.167
95% H-UCL (Log ROS)	0.531		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-1.939	KM Geo Mean	0.144
KM SD (logged)	1.077	95% Critical H Value (KM-Log)	2.629
KM Standard Error of Mean (logged)	0.23	95% H-UCL (KM -Log)	0.47
KM SD (logged)	1.077	95% Critical H Value (KM-Log)	2.629
KM Standard Error of Mean (logged)	0.23		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.304	Mean in Log Scale	-2.011
SD in Original Scale	0.629	SD in Log Scale	1.225
95% t UCL (Assumes normality)	0.529	95% H-Stat UCL	0.594
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Approximate Lognormal Distributed at 5% Significance Level			
Suggested UCL to Use			
KM H-UCL	0.47		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
BenzoBFluoranthene			

ProUCL Output
South Percolation Pond Area Soil (0-0.5 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

General Statistics			
Total Number of Observations	23	Number of Distinct Observations	17
Number of Detects	20	Number of Non-Detects	3
Number of Distinct Detects	14	Number of Distinct Non-Detects	3
Minimum Detect	0.084	Minimum Non-Detect	0.016
Maximum Detect	6.6	Maximum Non-Detect	0.024
Variance Detects	2.047	Percent Non-Detects	13.04%
Mean Detects	0.557	SD Detects	1.431
Median Detects	0.23	CV Detects	2.566
Skewness Detects	4.387	Kurtosis Detects	19.45
Mean of Logged Detects	-1.435	SD of Logged Detects	0.979
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.319	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.905	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.433	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.192	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.487	KM Standard Error of Mean	0.281
KM SD	1.313	95% KM (BCA) UCL	1.074
95% KM (t) UCL	0.969	95% KM (Percentile Bootstrap) UCL	1.032
95% KM (z) UCL	0.949	95% KM Bootstrap t UCL	3.691
90% KM Chebyshev UCL	1.33	95% KM Chebyshev UCL	1.711
97.5% KM Chebyshev UCL	2.241	99% KM Chebyshev UCL	3.282
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	2.958	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.783	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.331	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.202	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.709	k star (bias corrected MLE)	0.636
Theta hat (MLE)	0.786	Theta star (bias corrected MLE)	0.877
nu hat (MLE)	28.35	nu star (bias corrected)	25.43
Mean (detects)	0.557		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	0.486
Maximum	6.6	Median	0.17
SD	1.343	CV	2.763
k hat (MLE)	0.555	k star (bias corrected MLE)	0.511

Theta hat (MLE)	0.877	Theta star (bias corrected MLE)	0.951
nu hat (MLE)	25.51	nu star (bias corrected)	23.51
Adjusted Level of Significance (β)	0.0389		
Approximate Chi Square Value (23.51, α)	13.48	Adjusted Chi Square Value (23.51, β)	12.93
95% Gamma Approximate UCL (use when n>=50)	0.848	95% Gamma Adjusted UCL (use when n<50)	0.884
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.487	SD (KM)	1.313
Variance (KM)	1.724	SE of Mean (KM)	0.281
k hat (KM)	0.137	k star (KM)	0.149
nu hat (KM)	6.323	nu star (KM)	6.832
theta hat (KM)	3.542	theta star (KM)	3.278
80% gamma percentile (KM)	0.526	90% gamma percentile (KM)	1.442
95% gamma percentile (KM)	2.685	99% gamma percentile (KM)	6.299
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (6.83, α)	2.079	Adjusted Chi Square Value (6.83, β)	1.894
95% Gamma Approximate KM-UCL (use when n>=50)	1.6	95% Gamma Adjusted KM-UCL (use when n<50)	1.756
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.796	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.905	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.197	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.192	Detected Data Not Lognormal at 5% Significance Level	
Detected Data Not Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.489	Mean in Log Scale	-1.703
SD in Original Scale	1.342	SD in Log Scale	1.151
95% t UCL (assumes normality of ROS data)	0.969	95% Percentile Bootstrap UCL	1.022
95% BCA Bootstrap UCL	1.337	95% Bootstrap t UCL	3.814
95% H-UCL (Log ROS)	0.691		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-1.788	KM Geo Mean	0.167
KM SD (logged)	1.272	95% Critical H Value (KM-Log)	2.905
KM Standard Error of Mean (logged)	0.272	95% H-UCL (KM -Log)	0.826
KM SD (logged)	1.272	95% Critical H Value (KM-Log)	2.905
KM Standard Error of Mean (logged)	0.272		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.486	Mean in Log Scale	-1.858
SD in Original Scale	1.343	SD in Log Scale	1.44
95% t UCL (Assumes normality)	0.967	95% H-Stat UCL	1.16
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution at 5% Significance Level			

Suggested UCL to Use			
95% KM (Chebyshev) UCL	1.711		

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

BenzoAPyrene

General Statistics			
Total Number of Observations	23	Number of Distinct Observations	21
Number of Detects	19	Number of Non-Detects	4
Number of Distinct Detects	18	Number of Distinct Non-Detects	3
Minimum Detect	0.059	Minimum Non-Detect	0.013
Maximum Detect	2.8	Maximum Non-Detect	0.019
Variance Detects	0.38	Percent Non-Detects	17.39%
Mean Detects	0.296	SD Detects	0.616
Median Detects	0.15	CV Detects	2.082
Skewness Detects	4.134	Kurtosis Detects	17.57
Mean of Logged Detects	-1.895	SD of Logged Detects	0.943

Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.384	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.901	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.372	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.197	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.247	KM Standard Error of Mean	0.119
KM SD	0.556	95% KM (BCA) UCL	0.484
95% KM (t) UCL	0.451	95% KM (Percentile Bootstrap) UCL	0.473
95% KM (z) UCL	0.443	95% KM Bootstrap t UCL	1.199
90% KM Chebyshev UCL	0.604	95% KM Chebyshev UCL	0.766
97.5% KM Chebyshev UCL	0.99	99% KM Chebyshev UCL	1.431

Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	2.127	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.774	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.258	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.205	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			

Gamma Statistics on Detected Data Only			
k hat (MLE)	0.866	k star (bias corrected MLE)	0.764
Theta hat (MLE)	0.342	Theta star (bias corrected MLE)	0.387
nu hat (MLE)	32.91	nu star (bias corrected)	29.05
Mean (detects)	0.296		

Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	0.246
Maximum	2.8	Median	0.084
SD	0.568	CV	2.308
k hat (MLE)	0.635	k star (bias corrected MLE)	0.581
Theta hat (MLE)	0.388	Theta star (bias corrected MLE)	0.424
nu hat (MLE)	29.2	nu star (bias corrected)	26.72
Adjusted Level of Significance (β)	0.0389		
Approximate Chi Square Value (26.72, α)	15.94	Adjusted Chi Square Value (26.72, β)	15.33
95% Gamma Approximate UCL (use when n>=50)	0.413	95% Gamma Adjusted UCL (use when n<50)	0.429
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.247	SD (KM)	0.556
Variance (KM)	0.309	SE of Mean (KM)	0.119
k hat (KM)	0.197	k star (KM)	0.2
nu hat (KM)	9.073	nu star (KM)	9.223
theta hat (KM)	1.251	theta star (KM)	1.231
80% gamma percentile (KM)	0.326	90% gamma percentile (KM)	0.747
95% gamma percentile (KM)	1.271	99% gamma percentile (KM)	2.714
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (9.22, α)	3.462	Adjusted Chi Square Value (9.22, β)	3.21
95% Gamma Approximate KM-UCL (use when n>=50)	0.658	95% Gamma Adjusted KM-UCL (use when n<50)	0.709
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.836	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.901	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.161	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.197	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Approximate Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.248	Mean in Log Scale	-2.253
SD in Original Scale	0.568	SD in Log Scale	1.169
95% t UCL (assumes normality of ROS data)	0.451	95% Percentile Bootstrap UCL	0.478
95% BCA Bootstrap UCL	0.617	95% Bootstrap t UCL	1.197
95% H-UCL (Log ROS)	0.414		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-2.321	KM Geo Mean	0.0982
KM SD (logged)	1.248	95% Critical H Value (KM-Log)	2.869
KM Standard Error of Mean (logged)	0.267	95% H-UCL (KM -Log)	0.459
KM SD (logged)	1.248	95% Critical H Value (KM-Log)	2.869
KM Standard Error of Mean (logged)	0.267		

DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.246	Mean in Log Scale	-2.422
SD in Original Scale	0.569	SD in Log Scale	1.452
95% t UCL (Assumes normality)	0.449	95% H-Stat UCL	0.68
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Approximate Lognormal Distributed at 5% Significance Level			
Suggested UCL to Use			
KM H-UCL	0.459		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
DibenzAHAnthracene			
General Statistics			
Total Number of Observations	23	Number of Distinct Observations	18
Number of Detects	9	Number of Non-Detects	14
Number of Distinct Detects	9	Number of Distinct Non-Detects	9
Minimum Detect	0.035	Minimum Non-Detect	0.018
Maximum Detect	0.14	Maximum Non-Detect	0.31
Variance Detects	0.00106	Percent Non-Detects	60.87%
Mean Detects	0.0603	SD Detects	0.0325
Median Detects	0.051	CV Detects	0.539
Skewness Detects	2.223	Kurtosis Detects	5.307
Mean of Logged Detects	-2.901	SD of Logged Detects	0.425
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.721	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.829	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.343	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.274	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.0354	KM Standard Error of Mean	0.00647
KM SD	0.0286	95% KM (BCA) UCL	0.0478
95% KM (t) UCL	0.0465	95% KM (Percentile Bootstrap) UCL	0.0467
95% KM (z) UCL	0.046	95% KM Bootstrap t UCL	0.0522
90% KM Chebyshev UCL	0.0548	95% KM Chebyshev UCL	0.0636
97.5% KM Chebyshev UCL	0.0758	99% KM Chebyshev UCL	0.0997
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	0.732	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.723	Detected Data Not Gamma Distributed at 5% Significance Level	

K-S Test Statistic	0.306	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.28	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	5.525	k star (bias corrected MLE)	3.758
Theta hat (MLE)	0.0109	Theta star (bias corrected MLE)	0.0161
nu hat (MLE)	99.45	nu star (bias corrected)	67.64
Mean (detects)	0.0603		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	0.0297
Maximum	0.14	Median	0.01
SD	0.0319	CV	1.073
k hat (MLE)	1.328	k star (bias corrected MLE)	1.184
Theta hat (MLE)	0.0224	Theta star (bias corrected MLE)	0.0251
nu hat (MLE)	61.08	nu star (bias corrected)	54.45
Adjusted Level of Significance (β)	0.0389		
Approximate Chi Square Value (54.45, α)	38.49	Adjusted Chi Square Value (54.45, β)	37.52
95% Gamma Approximate UCL (use when n>=50)	0.042	95% Gamma Adjusted UCL (use when n<50)	0.0431
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.0354	SD (KM)	0.0286
Variance (KM)	8.1662E-4	SE of Mean (KM)	0.00647
k hat (KM)	1.533	k star (KM)	1.362
nu hat (KM)	70.5	nu star (KM)	62.64
theta hat (KM)	0.0231	theta star (KM)	0.026
80% gamma percentile (KM)	0.0553	90% gamma percentile (KM)	0.0755
95% gamma percentile (KM)	0.0952	99% gamma percentile (KM)	0.14
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (62.64, α)	45.43	Adjusted Chi Square Value (62.64, β)	44.37
95% Gamma Approximate KM-UCL (use when n>=50)	0.0488	95% Gamma Adjusted KM-UCL (use when n<50)	0.0499
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.864	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.829	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.277	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.274	Detected Data Not Lognormal at 5% Significance Level	
Detected Data appear Approximate Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.0337	Mean in Log Scale	-3.649
SD in Original Scale	0.0295	SD in Log Scale	0.697
95% t UCL (assumes normality of ROS data)	0.0443	95% Percentile Bootstrap UCL	0.0448

95% BCA Bootstrap UCL	0.0481	95% Bootstrap t UCL	0.0511
95% H-UCL (Log ROS)	0.0458		

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution

KM Mean (logged)	-3.558	KM Geo Mean	0.0285
KM SD (logged)	0.605	95% Critical H Value (KM-Log)	2.07
KM Standard Error of Mean (logged)	0.137	95% H-UCL (KM -Log)	0.0447
KM SD (logged)	0.605	95% Critical H Value (KM-Log)	2.07
KM Standard Error of Mean (logged)	0.137		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.0368	Mean in Log Scale	-3.754
SD in Original Scale	0.0404	SD in Log Scale	0.934
95% t UCL (Assumes normality)	0.0513	95% H-Stat UCL	0.0589

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Approximate Lognormal Distributed at 5% Significance Level

Suggested UCL to Use

KM Student's t	0.0376	KM H-UCL	0.0447

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

BenzoAAnthracene

General Statistics

Total Number of Observations	23	Number of Distinct Observations	17
Number of Detects	20	Number of Non-Detects	3
Number of Distinct Detects	14	Number of Distinct Non-Detects	3
Minimum Detect	0.038	Minimum Non-Detect	0.035
Maximum Detect	0.36	Maximum Non-Detect	0.5
Variance Detects	0.00714	Percent Non-Detects	13.04%
Mean Detects	0.116	SD Detects	0.0845
Median Detects	0.11	CV Detects	0.728
Skewness Detects	1.535	Kurtosis Detects	2.465
Mean of Logged Detects	-2.375	SD of Logged Detects	0.673

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.831	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.905	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.185	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.192	Detected Data appear Normal at 5% Significance Level	

Detected Data appear Approximate Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	0.109	KM Standard Error of Mean	0.0179
KM SD	0.0819	95% KM (BCA) UCL	0.14
95% KM (t) UCL	0.14	95% KM (Percentile Bootstrap) UCL	0.138
95% KM (z) UCL	0.138	95% KM Bootstrap t UCL	0.149
90% KM Chebyshev UCL	0.162	95% KM Chebyshev UCL	0.187
97.5% KM Chebyshev UCL	0.221	99% KM Chebyshev UCL	0.287
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	0.609	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.75	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.164	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.196	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	2.413	k star (bias corrected MLE)	2.085
Theta hat (MLE)	0.0481	Theta star (bias corrected MLE)	0.0557
nu hat (MLE)	96.54	nu star (bias corrected)	83.39
Mean (detects)	0.116		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	0.106
Maximum	0.36	Median	0.0882
SD	0.0843	CV	0.798
k hat (MLE)	1.694	k star (bias corrected MLE)	1.502
Theta hat (MLE)	0.0624	Theta star (bias corrected MLE)	0.0703
nu hat (MLE)	77.92	nu star (bias corrected)	69.09
Adjusted Level of Significance (β)	0.0389		
Approximate Chi Square Value (69.09, α)	50.96	Adjusted Chi Square Value (69.09, β)	49.83
95% Gamma Approximate UCL (use when n>=50)	0.143	95% Gamma Adjusted UCL (use when n<50)	0.147
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.109	SD (KM)	0.0819
Variance (KM)	0.00671	SE of Mean (KM)	0.0179
k hat (KM)	1.761	k star (KM)	1.56
nu hat (KM)	81	nu star (KM)	71.77
theta hat (KM)	0.0617	theta star (KM)	0.0697
80% gamma percentile (KM)	0.167	90% gamma percentile (KM)	0.224
95% gamma percentile (KM)	0.28	99% gamma percentile (KM)	0.404
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (71.77, α)	53.26	Adjusted Chi Square Value (71.77, β)	52.11
95% Gamma Approximate KM-UCL (use when n>=50)	0.147	95% Gamma Adjusted KM-UCL (use when n<50)	0.15
Lognormal GOF Test on Detected Observations Only			

Shapiro Wilk Test Statistic	0.932	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.905	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.151	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.192	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.106	Mean in Log Scale	-2.517
SD in Original Scale	0.0835	SD in Log Scale	0.771
95% t UCL (assumes normality of ROS data)	0.136	95% Percentile Bootstrap UCL	0.135
95% BCA Bootstrap UCL	0.14	95% Bootstrap t UCL	0.148
95% H-UCL (Log ROS)	0.157		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-2.463	KM Geo Mean	0.0851
KM SD (logged)	0.686	95% Critical H Value (KM-Log)	2.152
KM Standard Error of Mean (logged)	0.15	95% H-UCL (KM -Log)	0.148
KM SD (logged)	0.686	95% Critical H Value (KM-Log)	2.152
KM Standard Error of Mean (logged)	0.15		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.113	Mean in Log Scale	-2.474
SD in Original Scale	0.0886	SD in Log Scale	0.819
95% t UCL (Assumes normality)	0.145	95% H-Stat UCL	0.176
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Approximate Normal Distributed at 5% Significance Level			
Suggested UCL to Use			
95% KM (t) UCL	0.14		
When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test			
When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Cyanide			
General Statistics			
Total Number of Observations	23	Number of Distinct Observations	22
Number of Detects	17	Number of Non-Detects	6
Number of Distinct Detects	16	Number of Distinct Non-Detects	6
Minimum Detect	0.03	Minimum Non-Detect	0.02
Maximum Detect	16.4	Maximum Non-Detect	0.095
Variance Detects	15.11	Percent Non-Detects	26.09%

Mean Detects	1.381	SD Detects	3.887
Median Detects	0.4	CV Detects	2.814
Skewness Detects	4.065	Kurtosis Detects	16.66
Mean of Logged Detects	-0.972	SD of Logged Detects	1.39
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.338	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.892	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.439	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.207	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	1.03	KM Standard Error of Mean	0.708
KM SD	3.295	95% KM (BCA) UCL	2.39
95% KM (t) UCL	2.246	95% KM (Percentile Bootstrap) UCL	2.407
95% KM (z) UCL	2.195	95% KM Bootstrap t UCL	10.88
90% KM Chebyshev UCL	3.155	95% KM Chebyshev UCL	4.117
97.5% KM Chebyshev UCL	5.453	99% KM Chebyshev UCL	8.077
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	1.912	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.8	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.297	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.221	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.492	k star (bias corrected MLE)	0.444
Theta hat (MLE)	2.809	Theta star (bias corrected MLE)	3.11
nu hat (MLE)	16.72	nu star (bias corrected)	15.1
Mean (detects)	1.381		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	1.024
Maximum	16.4	Median	0.24
SD	3.371	CV	3.294
k hat (MLE)	0.347	k star (bias corrected MLE)	0.33
Theta hat (MLE)	2.953	Theta star (bias corrected MLE)	3.098
nu hat (MLE)	15.94	nu star (bias corrected)	15.2
Adjusted Level of Significance (β)	0.0389		
Approximate Chi Square Value (15.20, α)	7.398	Adjusted Chi Square Value (15.20, β)	7.006
95% Gamma Approximate UCL (use when n>=50)	2.102	95% Gamma Adjusted UCL (use when n<50)	2.22
Estimates of Gamma Parameters using KM Estimates			

Mean (KM)	1.03	SD (KM)	3.295
Variance (KM)	10.86	SE of Mean (KM)	0.708
k hat (KM)	0.0977	k star (KM)	0.114
nu hat (KM)	4.493	nu star (KM)	5.24
theta hat (KM)	10.54	theta star (KM)	9.04
80% gamma percentile (KM)	0.85	90% gamma percentile (KM)	2.873
95% gamma percentile (KM)	5.913	99% gamma percentile (KM)	15.31
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (5.24, α)	1.265	Adjusted Chi Square Value (5.24, β)	1.131
95% Gamma Approximate KM-UCL (use when n>=50)	4.267	95% Gamma Adjusted KM-UCL (use when n<50)	4.773
95% Gamma Adjusted KM-UCL (use when k<=1 and 15 < n < 50)			
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.934	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.892	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.152	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.207	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	1.028	Mean in Log Scale	-1.677
SD in Original Scale	3.37	SD in Log Scale	1.712
95% t UCL (assumes normality of ROS data)	2.235	95% Percentile Bootstrap UCL	2.389
95% BCA Bootstrap UCL	3.254	95% Bootstrap t UCL	11.15
95% H-UCL (Log ROS)	2.988		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-1.629	KM Geo Mean	0.196
KM SD (logged)	1.619	95% Critical H Value (KM-Log)	3.433
KM Standard Error of Mean (logged)	0.356	95% H-UCL (KM -Log)	2.378
KM SD (logged)	1.619	95% Critical H Value (KM-Log)	3.433
KM Standard Error of Mean (logged)	0.356		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	1.029	Mean in Log Scale	-1.638
SD in Original Scale	3.369	SD in Log Scale	1.669
95% t UCL (Assumes normality)	2.236	95% H-Stat UCL	2.732
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Lognormal Distributed at 5% Significance Level			
Suggested UCL to Use			
95% KM (Chebyshev) UCL	4.117		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Aluminum

General Statistics

Total Number of Observations	23	Number of Distinct Observations	23
		Number of Missing Observations	0
Minimum	2570	Mean	8493
Maximum	16100	Median	8380
SD	2663	Std. Error of Mean	555.3
Coefficient of Variation	0.314	Skewness	0.595

Normal GOF Test

Shapiro Wilk Test Statistic	0.951	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.914	Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.127	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.18	Data appear Normal at 5% Significance Level

Data appear Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	9447	95% Adjusted-CLT UCL (Chen-1995)	9480
		95% Modified-t UCL (Johnson-1978)	9458

Gamma GOF Test

A-D Test Statistic	0.47	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.744	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.127	**Kolmogorov-Smirnov Gamma GOF Test**
5% K-S Critical Value	0.182	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	9.611	k star (bias corrected MLE)	8.386
Theta hat (MLE)	883.7	Theta star (bias corrected MLE)	1013
nu hat (MLE)	442.1	nu star (bias corrected)	385.8
MLE Mean (bias corrected)	8493	MLE Sd (bias corrected)	2933
		Approximate Chi Square Value (0.05)	341.2
Adjusted Level of Significance	0.0389	Adjusted Chi Square Value	338.2

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	9602	95% Adjusted Gamma UCL (use when n<50)	9688

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.9	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.914	Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.153	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.18	Data appear Lognormal at 5% Significance Level

Data appear Approximate Lognormal at 5% Significance Level

Lognormal Statistics			
Minimum of Logged Data	7.852	Mean of logged Data	8.994
Maximum of Logged Data	9.687	SD of logged Data	0.353
Assuming Lognormal Distribution			
95% H-UCL	9861	90% Chebyshev (MVUE) UCL	10476
95% Chebyshev (MVUE) UCL	11349	97.5% Chebyshev (MVUE) UCL	12560
99% Chebyshev (MVUE) UCL	14940		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	9407	95% Jackknife UCL	9447
95% Standard Bootstrap UCL	9406	95% Bootstrap-t UCL	9572
95% Hall's Bootstrap UCL	9748	95% Percentile Bootstrap UCL	9415
95% BCA Bootstrap UCL	9470		
90% Chebyshev(Mean, Sd) UCL	10159	95% Chebyshev(Mean, Sd) UCL	10914
97.5% Chebyshev(Mean, Sd) UCL	11961	99% Chebyshev(Mean, Sd) UCL	14019
Suggested UCL to Use			
95% Student's-t UCL	9447		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Iron			
General Statistics			
Total Number of Observations	23	Number of Distinct Observations	22
		Number of Missing Observations	0
Minimum	1760	Mean	10309
Maximum	15300	Median	11300
SD	4050	Std. Error of Mean	844.5
Coefficient of Variation	0.393	Skewness	-0.894
Normal GOF Test			
Shapiro Wilk Test Statistic	0.891	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.914	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.158	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.18	Data appear Normal at 5% Significance Level	
Data appear Approximate Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	11759	95% Adjusted-CLT UCL (Chen-1995)	11530
		95% Modified-t UCL (Johnson-1978)	11733

Gamma GOF Test			
A-D Test Statistic	1.687	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.749	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.217	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.182	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	4.183	k star (bias corrected MLE)	3.666
Theta hat (MLE)	2465	Theta star (bias corrected MLE)	2812
nu hat (MLE)	192.4	nu star (bias corrected)	168.6
MLE Mean (bias corrected)	10309	MLE Sd (bias corrected)	5384
		Approximate Chi Square Value (0.05)	139.6
Adjusted Level of Significance	0.0389	Adjusted Chi Square Value	137.7
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	12452	95% Adjusted Gamma UCL (use when n<50)	12625
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.773	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.914	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.235	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.18	Data Not Lognormal at 5% Significance Level	
Data Not Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	7.473	Mean of logged Data	9.116
Maximum of Logged Data	9.636	SD of logged Data	0.59
Assuming Lognormal Distribution			
95% H-UCL	14025	90% Chebyshev (MVUE) UCL	14911
95% Chebyshev (MVUE) UCL	16801	97.5% Chebyshev (MVUE) UCL	19425
99% Chebyshev (MVUE) UCL	24578		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	11698	95% Jackknife UCL	11759
95% Standard Bootstrap UCL	11631	95% Bootstrap-t UCL	11614
95% Hall's Bootstrap UCL	11509	95% Percentile Bootstrap UCL	11627
95% BCA Bootstrap UCL	11537		
90% Chebyshev(Mean, Sd) UCL	12842	95% Chebyshev(Mean, Sd) UCL	13990
97.5% Chebyshev(Mean, Sd) UCL	15582	99% Chebyshev(Mean, Sd) UCL	18711
Suggested UCL to Use			
95% Student's-t UCL	11759		
When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test			

When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Note: For highly negatively-skewed data, confidence limits (e.g., Chen, Johnson, Lognormal, and Gamma) may not be reliable. Chen's and Johnson's methods provide adjustments for positvely skewed data sets.

Manganese

General Statistics

Total Number of Observations	23	Number of Distinct Observations	23
		Number of Missing Observations	0
Minimum	14.8	Mean	205.3
Maximum	415	Median	215
SD	139.8	Std. Error of Mean	29.15
Coefficient of Variation	0.681	Skewness	0.0984

Normal GOF Test

Shapiro Wilk Test Statistic	0.891	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.914	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.185	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.18	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	255.3	95% Adjusted-CLT UCL (Chen-1995)	253.9
		95% Modified-t UCL (Johnson-1978)	255.4

Gamma GOF Test

A-D Test Statistic	0.852	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.759	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.187	**Kolmogorov-Smirnov Gamma GOF Test**
5% K-S Critical Value	0.185	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	1.604	k star (bias corrected MLE)	1.424
Theta hat (MLE)	127.9	Theta star (bias corrected MLE)	144.1
nu hat (MLE)	73.8	nu star (bias corrected)	65.51
MLE Mean (bias corrected)	205.3	MLE Sd (bias corrected)	172
		Approximate Chi Square Value (0.05)	47.88
Adjusted Level of Significance	0.0389	Adjusted Chi Square Value	46.79

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	280.8	95% Adjusted Gamma UCL (use when n<50)	287.4

Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.893	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.914	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.179	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.18	Data appear Lognormal at 5% Significance Level	
Data appear Approximate Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	2.695	Mean of logged Data	4.981
Maximum of Logged Data	6.028	SD of logged Data	0.964
Assuming Lognormal Distribution			
95% H-UCL	385.8	90% Chebyshev (MVUE) UCL	378
95% Chebyshev (MVUE) UCL	447.1	97.5% Chebyshev (MVUE) UCL	543
99% Chebyshev (MVUE) UCL	731.4		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	253.2	95% Jackknife UCL	255.3
95% Standard Bootstrap UCL	251.7	95% Bootstrap-t UCL	254.9
95% Hall's Bootstrap UCL	249.9	95% Percentile Bootstrap UCL	249.5
95% BCA Bootstrap UCL	251		
90% Chebyshev(Mean, Sd) UCL	292.7	95% Chebyshev(Mean, Sd) UCL	332.3
97.5% Chebyshev(Mean, Sd) UCL	387.3	99% Chebyshev(Mean, Sd) UCL	495.3
Suggested UCL to Use			
95% H-UCL	385.8		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
ProUCL computes and outputs H-statistic based UCLs for historical reasons only.			
H-statistic often results in unstable (both high and low) values of UCL95 as shown in examples in the Technical Guide.			
It is therefore recommended to avoid the use of H-statistic based 95% UCLs.			
Use of nonparametric methods are preferred to compute UCL95 for skewed data sets which do not follow a gamma distribution.			
Mercury			
General Statistics			
Total Number of Observations	23	Number of Distinct Observations	19
Number of Detects	22	Number of Non-Detects	1
Number of Distinct Detects	19	Number of Distinct Non-Detects	1
Minimum Detect	0.011	Minimum Non-Detect	0.018
Maximum Detect	1.4	Maximum Non-Detect	0.018
Variance Detects	0.0863	Percent Non-Detects	4.348%

Mean Detects	0.112	SD Detects	0.294
Median Detects	0.0245	CV Detects	2.626
Skewness Detects	4.402	Kurtosis Detects	19.99
Mean of Logged Detects	-3.238	SD of Logged Detects	1.15
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.349	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.911	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.371	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.184	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.108	KM Standard Error of Mean	0.0601
KM SD	0.281	95% KM (BCA) UCL	0.23
95% KM (t) UCL	0.211	95% KM (Percentile Bootstrap) UCL	0.217
95% KM (z) UCL	0.206	95% KM Bootstrap t UCL	0.692
90% KM Chebyshev UCL	0.288	95% KM Chebyshev UCL	0.369
97.5% KM Chebyshev UCL	0.483	99% KM Chebyshev UCL	0.705
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	3.032	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.796	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.301	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.195	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.591	k star (bias corrected MLE)	0.541
Theta hat (MLE)	0.189	Theta star (bias corrected MLE)	0.207
nu hat (MLE)	26.01	nu star (bias corrected)	23.8
Mean (detects)	0.112		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	0.107
Maximum	1.4	Median	0.024
SD	0.288	CV	2.678
k hat (MLE)	0.582	k star (bias corrected MLE)	0.535
Theta hat (MLE)	0.185	Theta star (bias corrected MLE)	0.201
nu hat (MLE)	26.77	nu star (bias corrected)	24.61
Adjusted Level of Significance (β)	0.0389		
Approximate Chi Square Value (24.61, α)	14.32	Adjusted Chi Square Value (24.61, β)	13.75
95% Gamma Approximate UCL (use when n>=50)	0.185	95% Gamma Adjusted UCL (use when n<50)	0.192
Estimates of Gamma Parameters using KM Estimates			

Mean (KM)	0.108	SD (KM)	0.281
Variance (KM)	0.0792	SE of Mean (KM)	0.0601
k hat (KM)	0.146	k star (KM)	0.156
nu hat (KM)	6.719	nu star (KM)	7.176
theta hat (KM)	0.736	theta star (KM)	0.689
80% gamma percentile (KM)	0.121	90% gamma percentile (KM)	0.32
95% gamma percentile (KM)	0.587	99% gamma percentile (KM)	1.355
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (7.18, α)	2.268	Adjusted Chi Square Value (7.18, β)	2.073
95% Gamma Approximate KM-UCL (use when n>=50)	0.34	95% Gamma Adjusted KM-UCL (use when n<50)	0.372
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.818	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.911	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.232	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.184	Detected Data Not Lognormal at 5% Significance Level	
Detected Data Not Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.107	Mean in Log Scale	-3.309
SD in Original Scale	0.288	SD in Log Scale	1.173
95% t UCL (assumes normality of ROS data)	0.21	95% Percentile Bootstrap UCL	0.223
95% BCA Bootstrap UCL	0.294	95% Bootstrap t UCL	0.677
95% H-UCL (Log ROS)	0.145		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-3.288	KM Geo Mean	0.0373
KM SD (logged)	1.124	95% Critical H Value (KM-Log)	2.693
KM Standard Error of Mean (logged)	0.24	95% H-UCL (KM -Log)	0.134
KM SD (logged)	1.124	95% Critical H Value (KM-Log)	2.693
KM Standard Error of Mean (logged)	0.24		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.107	Mean in Log Scale	-3.302
SD in Original Scale	0.288	SD in Log Scale	1.165
95% t UCL (Assumes normality)	0.21	95% H-Stat UCL	0.144
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution at 5% Significance Level			
Suggested UCL to Use			
95% KM (Chebyshev) UCL	0.369		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			

Nickel

General Statistics

Total Number of Observations	23	Number of Distinct Observations	21
		Number of Missing Observations	0
Minimum	4.4	Mean	15.17
Maximum	53.9	Median	12.7
SD	9.331	Std. Error of Mean	1.946
Coefficient of Variation	0.615	Skewness	3.482

Normal GOF Test

Shapiro Wilk Test Statistic	0.608	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.914	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.29	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.18	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	18.51	95% Adjusted-CLT UCL (Chen-1995)	19.88
		95% Modified-t UCL (Johnson-1978)	18.75

Gamma GOF Test

A-D Test Statistic	1.394	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.747	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.205	**Kolmogorov-Smirnov Gamma GOF Test**
5% K-S Critical Value	0.182	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	4.732	k star (bias corrected MLE)	4.144
Theta hat (MLE)	3.207	Theta star (bias corrected MLE)	3.662
nu hat (MLE)	217.7	nu star (bias corrected)	190.6
MLE Mean (bias corrected)	15.17	MLE Sd (bias corrected)	7.454
		Approximate Chi Square Value (0.05)	159.7
Adjusted Level of Significance	0.0389	Adjusted Chi Square Value	157.6

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	18.11	95% Adjusted Gamma UCL (use when n<50)	18.35

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.875	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.914	Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.173	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.18	Data appear Lognormal at 5% Significance Level

Data appear Approximate Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	1.482	Mean of logged Data	2.61
Maximum of Logged Data	3.987	SD of logged Data	0.445

Assuming Lognormal Distribution

95% H-UCL	18.03	90% Chebyshev (MVUE) UCL	19.24
95% Chebyshev (MVUE) UCL	21.19	97.5% Chebyshev (MVUE) UCL	23.88
99% Chebyshev (MVUE) UCL	29.19		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	18.37	95% Jackknife UCL	18.51
95% Standard Bootstrap UCL	18.33	95% Bootstrap-t UCL	22.76
95% Hall's Bootstrap UCL	33.08	95% Percentile Bootstrap UCL	18.6
95% BCA Bootstrap UCL	20.14		
90% Chebyshev(Mean, Sd) UCL	21.01	95% Chebyshev(Mean, Sd) UCL	23.65
97.5% Chebyshev(Mean, Sd) UCL	27.32	99% Chebyshev(Mean, Sd) UCL	34.53

Suggested UCL to Use

95% Student's-t UCL	18.51	or 95% Modified-t UCL	18.75
or 95% H-UCL	18.03		

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

ProUCL computes and outputs H-statistic based UCLs for historical reasons only.

H-statistic often results in unstable (both high and low) values of UCL95 as shown in examples in the Technical Guide.

It is therefore recommended to avoid the use of H-statistic based 95% UCLs.

Use of nonparametric methods are preferred to compute UCL95 for skewed data sets which do not follow a gamma distribution.

Thallium

General Statistics

Total Number of Observations	23	Number of Distinct Observations	13
Number of Detects	1	Number of Non-Detects	22
Number of Distinct Detects	1	Number of Distinct Non-Detects	13

Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set!

It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable Thallium was not processed!

Antimony

General Statistics

Total Number of Observations	23	Number of Distinct Observations	19

Number of Detects	1	Number of Non-Detects	22
Number of Distinct Detects	1	Number of Distinct Non-Detects	19

Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set!

It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable Antimony was not processed!

Arsenic

General Statistics

Total Number of Observations	23	Number of Distinct Observations	20
Number of Detects	22	Number of Non-Detects	1
Number of Distinct Detects	19	Number of Distinct Non-Detects	1
Minimum Detect	0.46	Minimum Non-Detect	0.84
Maximum Detect	5.7	Maximum Non-Detect	0.84
Variance Detects	2.283	Percent Non-Detects	4.348%
Mean Detects	3.08	SD Detects	1.511
Median Detects	3.3	CV Detects	0.491
Skewness Detects	0.0598	Kurtosis Detects	-0.928
Mean of Logged Detects	0.97	SD of Logged Detects	0.632

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.964	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.911	Detected Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.12	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.184	Detected Data appear Normal at 5% Significance Level

Detected Data appear Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	2.966	KM Standard Error of Mean	0.329
KM SD	1.539	95% KM (BCA) UCL	3.549
95% KM (t) UCL	3.53	95% KM (Percentile Bootstrap) UCL	3.485
95% KM (z) UCL	3.507	95% KM Bootstrap t UCL	3.503
90% KM Chebyshev UCL	3.952	95% KM Chebyshev UCL	4.398
97.5% KM Chebyshev UCL	5.018	99% KM Chebyshev UCL	6.235

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.458	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.748	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.145	**Kolmogorov-Smirnov GOF**
5% K-S Critical Value	0.186	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	3.378	k star (bias corrected MLE)	2.948
Theta hat (MLE)	0.912	Theta star (bias corrected MLE)	1.045
nu hat (MLE)	148.6	nu star (bias corrected)	129.7
Mean (detects)	3.08		

Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.46	Mean	2.981
Maximum	5.7	Median	3.2
SD	1.551	CV	0.52
k hat (MLE)	3.025	k star (bias corrected MLE)	2.66
Theta hat (MLE)	0.985	Theta star (bias corrected MLE)	1.121
nu hat (MLE)	139.2	nu star (bias corrected)	122.3
Adjusted Level of Significance (β)	0.0389		
Approximate Chi Square Value (122.34, α)	97.8	Adjusted Chi Square Value (122.34, β)	96.21
95% Gamma Approximate UCL (use when n>=50)	3.729	95% Gamma Adjusted UCL (use when n<50)	3.791
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	2.966	SD (KM)	1.539
Variance (KM)	2.37	SE of Mean (KM)	0.329
k hat (KM)	3.712	k star (KM)	3.257
nu hat (KM)	170.8	nu star (KM)	149.8
theta hat (KM)	0.799	theta star (KM)	0.911
80% gamma percentile (KM)	4.189	90% gamma percentile (KM)	5.17
95% gamma percentile (KM)	6.081	99% gamma percentile (KM)	8.047
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (149.83, α)	122.5	Adjusted Chi Square Value (149.83, β)	120.7
95% Gamma Approximate KM-UCL (use when n>=50)	3.627	95% Gamma Adjusted KM-UCL (use when n<50)	3.68
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.906	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.911	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.166	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.184	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Approximate Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	2.979	Mean in Log Scale	0.916
SD in Original Scale	1.553	SD in Log Scale	0.669
95% t UCL (assumes normality of ROS data)	3.535	95% Percentile Bootstrap UCL	3.507
95% BCA Bootstrap UCL	3.537	95% Bootstrap t UCL	3.562
95% H-UCL (Log ROS)	4.238		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	0.894	KM Geo Mean	2.444
KM SD (logged)	0.701	95% Critical H Value (KM-Log)	2.168
KM Standard Error of Mean (logged)	0.15	95% H-UCL (KM -Log)	4.319
KM SD (logged)	0.701	95% Critical H Value (KM-Log)	2.168
KM Standard Error of Mean (logged)	0.15		

DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	2.964	Mean in Log Scale	0.89
SD in Original Scale	1.577	SD in Log Scale	0.726
95% t UCL (Assumes normality)	3.529	95% H-Stat UCL	4.453
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Normal Distributed at 5% Significance Level			
Suggested UCL to Use			
95% KM (t) UCL	3.53		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
ChromiumVI_EST			
General Statistics			
Total Number of Observations	23	Number of Distinct Observations	21
		Number of Missing Observations	0
Minimum	0.0696	Mean	0.26
Maximum	0.878	Median	0.236
SD	0.148	Std. Error of Mean	0.0309
Coefficient of Variation	0.571	Skewness	3.465
Normal GOF Test			
Shapiro Wilk Test Statistic	0.614	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.914	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.293	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.18	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	0.313	95% Adjusted-CLT UCL (Chen-1995)	0.335
		95% Modified-t UCL (Johnson-1978)	0.317
Gamma GOF Test			
A-D Test Statistic	1.44	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.746	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.215	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.182	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			

k hat (MLE)	5.135	k star (bias corrected MLE)	4.495
Theta hat (MLE)	0.0506	Theta star (bias corrected MLE)	0.0578
nu hat (MLE)	236.2	nu star (bias corrected)	206.8
MLE Mean (bias corrected)	0.26	MLE Sd (bias corrected)	0.123
		Approximate Chi Square Value (0.05)	174.5
Adjusted Level of Significance	0.0389	Adjusted Chi Square Value	172.3
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	0.308	95% Adjusted Gamma UCL (use when n<50)	0.312
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.86	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.914	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.189	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.18	Data Not Lognormal at 5% Significance Level	
Data Not Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	-2.665	Mean of logged Data	-1.448
Maximum of Logged Data	-0.13	SD of logged Data	0.438
Assuming Lognormal Distribution			
95% H-UCL	0.31	90% Chebyshev (MVUE) UCL	0.33
95% Chebyshev (MVUE) UCL	0.363	97.5% Chebyshev (MVUE) UCL	0.409
99% Chebyshev (MVUE) UCL	0.499		
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution (0.05)			
Nonparametric Distribution Free UCLs			
95% CLT UCL	0.311	95% Jackknife UCL	0.313
95% Standard Bootstrap UCL	0.309	95% Bootstrap-t UCL	0.362
95% Hall's Bootstrap UCL	0.548	95% Percentile Bootstrap UCL	0.313
95% BCA Bootstrap UCL	0.343		
90% Chebyshev(Mean, Sd) UCL	0.353	95% Chebyshev(Mean, Sd) UCL	0.395
97.5% Chebyshev(Mean, Sd) UCL	0.453	99% Chebyshev(Mean, Sd) UCL	0.567
Suggested UCL to Use			
95% Student's-t UCL	0.313	or 95% Modified-t UCL	0.317
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Cobalt			
General Statistics			
Total Number of Observations	23	Number of Distinct Observations	17
Number of Detects	22	Number of Non-Detects	1

Number of Distinct Detects	16	Number of Distinct Non-Detects	1
Minimum Detect	1.2	Minimum Non-Detect	1.4
Maximum Detect	6.7	Maximum Non-Detect	1.4
Variance Detects	1.827	Percent Non-Detects	4.348%
Mean Detects	4.591	SD Detects	1.352
Median Detects	4.8	CV Detects	0.294
Skewness Detects	-0.911	Kurtosis Detects	0.847
Mean of Logged Detects	1.464	SD of Logged Detects	0.398
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.935	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.911	Detected Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.168	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.184	Detected Data appear Normal at 5% Significance Level	
Detected Data appear Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	4.443	KM Standard Error of Mean	0.313
KM SD	1.465	95% KM (BCA) UCL	4.922
95% KM (t) UCL	4.98	95% KM (Percentile Bootstrap) UCL	4.93
95% KM (z) UCL	4.958	95% KM Bootstrap t UCL	4.912
90% KM Chebyshev UCL	5.381	95% KM Chebyshev UCL	5.806
97.5% KM Chebyshev UCL	6.396	99% KM Chebyshev UCL	7.554
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	1.143	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.744	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.229	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.186	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	8.455	k star (bias corrected MLE)	7.332
Theta hat (MLE)	0.543	Theta star (bias corrected MLE)	0.626
nu hat (MLE)	372	nu star (bias corrected)	322.6
Mean (detects)	4.591		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	1.2	Mean	4.496
Maximum	6.7	Median	4.7
SD	1.397	CV	0.311
k hat (MLE)	7.864	k star (bias corrected MLE)	6.867
Theta hat (MLE)	0.572	Theta star (bias corrected MLE)	0.655
nu hat (MLE)	361.7	nu star (bias corrected)	315.9
Adjusted Level of Significance (β)	0.0389		

Approximate Chi Square Value (315.89, α)	275.7	Adjusted Chi Square Value (315.89, β)	273
95% Gamma Approximate UCL (use when n>=50)	5.151	95% Gamma Adjusted UCL (use when n<50)	5.202
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	4.443	SD (KM)	1.465
Variance (KM)	2.146	SE of Mean (KM)	0.313
k hat (KM)	9.201	k star (KM)	8.03
nu hat (KM)	423.2	nu star (KM)	369.4
theta hat (KM)	0.483	theta star (KM)	0.553
80% gamma percentile (KM)	5.681	90% gamma percentile (KM)	6.534
95% gamma percentile (KM)	7.297	99% gamma percentile (KM)	8.877
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (369.37, α)	325.8	Adjusted Chi Square Value (369.37, β)	322.9
95% Gamma Approximate KM-UCL (use when n>=50)	5.037	95% Gamma Adjusted KM-UCL (use when n<50)	5.083
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.794	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.911	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.262	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.184	Detected Data Not Lognormal at 5% Significance Level	
Detected Data Not Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	4.482	Mean in Log Scale	1.432
SD in Original Scale	1.419	SD in Log Scale	0.417
95% t UCL (assumes normality of ROS data)	4.991	95% Percentile Bootstrap UCL	4.926
95% BCA Bootstrap UCL	4.926	95% Bootstrap t UCL	4.967
95% H-UCL (Log ROS)	5.411		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	1.408	KM Geo Mean	4.088
KM SD (logged)	0.461	95% Critical H Value (KM-Log)	1.94
KM Standard Error of Mean (logged)	0.0984	95% H-UCL (KM -Log)	5.502
KM SD (logged)	0.461	95% Critical H Value (KM-Log)	1.94
KM Standard Error of Mean (logged)	0.0984		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	4.422	Mean in Log Scale	1.385
SD in Original Scale	1.55	SD in Log Scale	0.543
95% t UCL (Assumes normality)	4.977	95% H-Stat UCL	5.841
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Normal Distributed at 5% Significance Level			
Suggested UCL to Use			
95% KM (t) UCL	4.98		

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Copper

General Statistics

Total Number of Observations	23	Number of Distinct Observations	22
		Number of Missing Observations	0
Minimum	8.9	Mean	70.67
Maximum	694	Median	18.3
SD	147.2	Std. Error of Mean	30.69
Coefficient of Variation	2.083	Skewness	3.814

Normal GOF Test

Shapiro Wilk Test Statistic	0.455	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.914	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.354	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.18	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	123.4	95% Adjusted-CLT UCL (Chen-1995)	147.2
		95% Modified-t UCL (Johnson-1978)	127.4

Gamma GOF Test

A-D Test Statistic	2.599	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.79	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.286	**Kolmogorov-Smirnov Gamma GOF Test**
5% K-S Critical Value	0.19	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	0.661	k star (bias corrected MLE)	0.604
Theta hat (MLE)	106.9	Theta star (bias corrected MLE)	117
nu hat (MLE)	30.42	nu star (bias corrected)	27.79
MLE Mean (bias corrected)	70.67	MLE Sd (bias corrected)	90.93
		Approximate Chi Square Value (0.05)	16.76
Adjusted Level of Significance	0.0389	Adjusted Chi Square Value	16.14

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	117.1	95% Adjusted Gamma UCL (use when n<50)	121.7

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.834	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.914	Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.225	**Lilliefors Lognormal GOF Test**

5% Lilliefors Critical Value	0.18	Data Not Lognormal at 5% Significance Level	
Data Not Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	2.186	Mean of logged Data	3.337
Maximum of Logged Data	6.542	SD of logged Data	1.166
Assuming Lognormal Distribution			
95% H-UCL	110.1	90% Chebyshev (MVUE) UCL	98.01
95% Chebyshev (MVUE) UCL	118.4	97.5% Chebyshev (MVUE) UCL	146.7
99% Chebyshev (MVUE) UCL	202.2		
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution (0.05)			
Nonparametric Distribution Free UCLs			
95% CLT UCL	121.1	95% Jackknife UCL	123.4
95% Standard Bootstrap UCL	120.3	95% Bootstrap-t UCL	221
95% Hall's Bootstrap UCL	274.4	95% Percentile Bootstrap UCL	124.7
95% BCA Bootstrap UCL	157		
90% Chebyshev(Mean, Sd) UCL	162.7	95% Chebyshev(Mean, Sd) UCL	204.4
97.5% Chebyshev(Mean, Sd) UCL	262.3	99% Chebyshev(Mean, Sd) UCL	376
Suggested UCL to Use			
95% Chebyshev (Mean, Sd) UCL	204.4		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Vanadium			
General Statistics			
Total Number of Observations	23	Number of Distinct Observations	22
		Number of Missing Observations	0
Minimum	3.2	Mean	11.31
Maximum	26.2	Median	11.1
SD	5.294	Std. Error of Mean	1.104
Coefficient of Variation	0.468	Skewness	0.736
Normal GOF Test			
Shapiro Wilk Test Statistic	0.937	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.914	Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.125	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.18	Data appear Normal at 5% Significance Level	
Data appear Normal at 5% Significance Level			
Assuming Normal Distribution			

95% Normal UCL		95% UCLs (Adjusted for Skewness)	
95% Student's-t UCL	13.2	95% Adjusted-CLT UCL (Chen-1995)	13.31
		95% Modified-t UCL (Johnson-1978)	13.23
Gamma GOF Test			
A-D Test Statistic	0.446	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.748	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.136	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.182	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	4.435	k star (bias corrected MLE)	3.885
Theta hat (MLE)	2.55	Theta star (bias corrected MLE)	2.911
nu hat (MLE)	204	nu star (bias corrected)	178.7
MLE Mean (bias corrected)	11.31	MLE Sd (bias corrected)	5.737
		Approximate Chi Square Value (0.05)	148.8
Adjusted Level of Significance	0.0389	Adjusted Chi Square Value	146.8
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	13.58	95% Adjusted Gamma UCL (use when n<50)	13.77
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.94	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.914	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.151	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.18	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	1.163	Mean of logged Data	2.309
Maximum of Logged Data	3.266	SD of logged Data	0.521
Assuming Lognormal Distribution			
95% H-UCL	14.38	90% Chebyshev (MVUE) UCL	15.34
95% Chebyshev (MVUE) UCL	17.1	97.5% Chebyshev (MVUE) UCL	19.54
99% Chebyshev (MVUE) UCL	24.35		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	13.12	95% Jackknife UCL	13.2
95% Standard Bootstrap UCL	13.07	95% Bootstrap-t UCL	13.23
95% Hall's Bootstrap UCL	13.66	95% Percentile Bootstrap UCL	13.19
95% BCA Bootstrap UCL	13.19		
90% Chebyshev(Mean, Sd) UCL	14.62	95% Chebyshev(Mean, Sd) UCL	16.12
97.5% Chebyshev(Mean, Sd) UCL	18.2	99% Chebyshev(Mean, Sd) UCL	22.29
Suggested UCL to Use			

95% Student's-t UCL	13.2		

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Selenium

General Statistics

Total Number of Observations	23	Number of Distinct Observations	20
Number of Detects	3	Number of Non-Detects	20
Number of Distinct Detects	3	Number of Distinct Non-Detects	18
Minimum Detect	0.4	Minimum Non-Detect	0.27
Maximum Detect	1.3	Maximum Non-Detect	0.85
Variance Detects	0.223	Percent Non-Detects	86.96%
Mean Detects	0.933	SD Detects	0.473
Median Detects	1.1	CV Detects	0.506
Skewness Detects	-1.39	Kurtosis Detects	N/A
Mean of Logged Detects	-0.186	SD of Logged Detects	0.638

Warning: Data set has only 3 Detected Values.
This is not enough to compute meaningful or reliable statistics and estimates.

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.907	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.767	Detected Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.304	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.425	Detected Data appear Normal at 5% Significance Level	

Detected Data appear Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	0.361	KM Standard Error of Mean	0.0676
KM SD	0.263	95% KM (BCA) UCL	N/A
95% KM (t) UCL	0.477	95% KM (Percentile Bootstrap) UCL	N/A
95% KM (z) UCL	0.472	95% KM Bootstrap t UCL	N/A
90% KM Chebyshev UCL	0.563	95% KM Chebyshev UCL	0.655
97.5% KM Chebyshev UCL	0.783	99% KM Chebyshev UCL	1.033

Gamma GOF Tests on Detected Observations Only
Not Enough Data to Perform GOF Test

Gamma Statistics on Detected Data Only

k hat (MLE)	4.426	k star (bias corrected MLE)	N/A
Theta hat (MLE)	0.211	Theta star (bias corrected MLE)	N/A
nu hat (MLE)	26.55	nu star (bias corrected)	N/A
Mean (detects)	0.933		

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	0.13
Maximum	1.3	Median	0.01
SD	0.348	CV	2.671
k hat (MLE)	0.339	k star (bias corrected MLE)	0.324
Theta hat (MLE)	0.384	Theta star (bias corrected MLE)	0.403
nu hat (MLE)	15.61	nu star (bias corrected)	14.91
Adjusted Level of Significance (β)	0.0389		
Approximate Chi Square Value (14.91, α)	7.196	Adjusted Chi Square Value (14.91, β)	6.809
95% Gamma Approximate UCL (use when n>=50)	0.27	95% Gamma Adjusted UCL (use when n<50)	N/A
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.361	SD (KM)	0.263
Variance (KM)	0.0691	SE of Mean (KM)	0.0676
k hat (KM)	1.883	k star (KM)	1.666
nu hat (KM)	86.61	nu star (KM)	76.64
theta hat (KM)	0.192	theta star (KM)	0.217
80% gamma percentile (KM)	0.552	90% gamma percentile (KM)	0.733
95% gamma percentile (KM)	0.908	99% gamma percentile (KM)	1.3
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (76.64, α)	57.48	Adjusted Chi Square Value (76.64, β)	56.27
95% Gamma Approximate KM-UCL (use when n>=50)	0.481	95% Gamma Adjusted KM-UCL (use when n<50)	0.491
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.854	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.767	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.337	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.425	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.169	Mean in Log Scale	-2.589
SD in Original Scale	0.335	SD in Log Scale	1.006
95% t UCL (assumes normality of ROS data)	0.289	95% Percentile Bootstrap UCL	0.292
95% BCA Bootstrap UCL	0.333	95% Bootstrap t UCL	0.629
95% H-UCL (Log ROS)	0.215		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-1.15	KM Geo Mean	0.317
KM SD (logged)	0.424	95% Critical H Value (KM-Log)	1.91
KM Standard Error of Mean (logged)	0.111	95% H-UCL (KM -Log)	0.412
KM SD (logged)	0.424	95% Critical H Value (KM-Log)	1.91
KM Standard Error of Mean (logged)	0.111		
DL/2 Statistics			

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	0.313	Mean in Log Scale	-1.384
SD in Original Scale	0.293	SD in Log Scale	0.584
95% t UCL (Assumes normality)	0.417	95% H-Stat UCL	0.384

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Normal Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (t) UCL	0.477		

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Naphthalene

General Statistics

Total Number of Observations	23	Number of Distinct Observations	15
Number of Detects	1	Number of Non-Detects	22
Number of Distinct Detects	1	Number of Distinct Non-Detects	14

Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set!

It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable Naphthalene was not processed!

ProUCL Output
South Percolation Pond Area Soil (0-2 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

UCL Statistics for Data Sets with Non-Detects	
User Selected Options	
Date/Time of Computation	ProUCL 5.11/28/2019 5:33:33 PM
From File	20190128_SPercPond_ProUCL_input_a.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Bis2EthylhexylPhthalate

General Statistics			
Total Number of Observations	46	Number of Distinct Observations	17
Number of Detects	4	Number of Non-Detects	42
Number of Distinct Detects	4	Number of Distinct Non-Detects	13
Minimum Detect	0.074	Minimum Non-Detect	0.013
Maximum Detect	2.2	Maximum Non-Detect	0.23
Variance Detects	1.117	Percent Non-Detects	91.3%
Mean Detects	0.615	SD Detects	1.057
Median Detects	0.093	CV Detects	1.718
Skewness Detects	1.999	Kurtosis Detects	3.995
Mean of Logged Detects	-1.65	SD of Logged Detects	1.636

Normal GOF Test on Detects Only		
Shapiro Wilk Test Statistic	0.642	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.748	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.434	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.375	Detected Data Not Normal at 5% Significance Level
Detected Data Not Normal at 5% Significance Level		

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.0655	KM Standard Error of Mean	0.0543
KM SD	0.319	95% KM (BCA) UCL	N/A
95% KM (t) UCL	0.157	95% KM (Percentile Bootstrap) UCL	N/A
95% KM (z) UCL	0.155	95% KM Bootstrap t UCL	N/A
90% KM Chebyshev UCL	0.228	95% KM Chebyshev UCL	0.302
97.5% KM Chebyshev UCL	0.404	99% KM Chebyshev UCL	0.605

Gamma GOF Tests on Detected Observations Only		
A-D Test Statistic	0.815	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.679	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.442	**Kolmogorov-Smirnov GOF**
5% K-S Critical Value	0.409	Detected Data Not Gamma Distributed at 5% Significance Level
Detected Data Not Gamma Distributed at 5% Significance Level		

Gamma Statistics on Detected Data Only			
k hat (MLE)	0.539	k star (bias corrected MLE)	0.302
Theta hat (MLE)	1.14	Theta star (bias corrected MLE)	2.04
nu hat (MLE)	4.316	nu star (bias corrected)	2.412
Mean (detects)	0.615		

Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	0.0626
Maximum	2.2	Median	0.01
SD	0.323	CV	5.155
k hat (MLE)	0.415	k star (bias corrected MLE)	0.402
Theta hat (MLE)	0.151	Theta star (bias corrected MLE)	0.156
nu hat (MLE)	38.16	nu star (bias corrected)	37
Adjusted Level of Significance (β)	0.0448		
Approximate Chi Square Value (37.00, α)	24.08	Adjusted Chi Square Value (37.00, β)	23.74
95% Gamma Approximate UCL (use when n>=50)	0.0962	95% Gamma Adjusted UCL (use when n<50)	N/A
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.0655	SD (KM)	0.319
Variance (KM)	0.102	SE of Mean (KM)	0.0543
k hat (KM)	0.0422	k star (KM)	0.0539
nu hat (KM)	3.88	nu star (KM)	4.96
theta hat (KM)	1.552	theta star (KM)	1.214
80% gamma percentile (KM)	0.0114	90% gamma percentile (KM)	0.11
95% gamma percentile (KM)	0.357	99% gamma percentile (KM)	1.381
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (4.96, α)	1.134	Adjusted Chi Square Value (4.96, β)	1.077
95% Gamma Approximate KM-UCL (use when n>=50)	0.286	95% Gamma Adjusted KM-UCL (use when n<50)	0.301
95% Gamma Adjusted KM-UCL (use when k<=1 and 15 < n < 50)			
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.714	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.748	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.383	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.375	Detected Data Not Lognormal at 5% Significance Level	
Detected Data Not Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.054	Mean in Log Scale	-9.245
SD in Original Scale	0.324	SD in Log Scale	3.487
95% t UCL (assumes normality of ROS data)	0.134	95% Percentile Bootstrap UCL	0.15
95% BCA Bootstrap UCL	0.201	95% Bootstrap t UCL	1.555
95% H-UCL (Log ROS)	0.839		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-4.106	KM Geo Mean	0.0165
KM SD (logged)	0.868	95% Critical H Value (KM-Log)	2.193
KM Standard Error of Mean (logged)	0.148	95% H-UCL (KM -Log)	0.0319
KM SD (logged)	0.868	95% Critical H Value (KM-Log)	2.193

KM Standard Error of Mean (logged)	0.148		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.0633	Mean in Log Scale	-4.482
SD in Original Scale	0.323	SD in Log Scale	1.068
95% t UCL (Assumes normality)	0.143	95% H-Stat UCL	0.0293
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution at 5% Significance Level			
Suggested UCL to Use			
95% KM (Chebyshev) UCL	0.302		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Fluoride			
General Statistics			
Total Number of Observations	46	Number of Distinct Observations	43
		Number of Missing Observations	0
Minimum	1.26	Mean	13.57
Maximum	44.1	Median	13.5
SD	9.078	Std. Error of Mean	1.338
Coefficient of Variation	0.669	Skewness	0.909
Normal GOF Test			
Shapiro Wilk Test Statistic	0.922	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.945	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.126	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.129	Data appear Normal at 5% Significance Level	
Data appear Approximate Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	15.82	95% Adjusted-CLT UCL (Chen-1995)	15.97
		95% Modified-t UCL (Johnson-1978)	15.85
Gamma GOF Test			
A-D Test Statistic	1.366	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.764	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.158	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.132	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			

Gamma Statistics			
k hat (MLE)	1.781	k star (bias corrected MLE)	1.679
Theta hat (MLE)	7.62	Theta star (bias corrected MLE)	8.081
nu hat (MLE)	163.9	nu star (bias corrected)	154.5
MLE Mean (bias corrected)	13.57	MLE Sd (bias corrected)	10.47
		Approximate Chi Square Value (0.05)	126.8
Adjusted Level of Significance	0.0448	Adjusted Chi Square Value	126
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	16.54	95% Adjusted Gamma UCL (use when n<50)	16.65
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.883	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.945	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.202	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.129	Data Not Lognormal at 5% Significance Level	
Data Not Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	0.231	Mean of logged Data	2.302
Maximum of Logged Data	3.786	SD of logged Data	0.905
Assuming Lognormal Distribution			
95% H-UCL	20.33	90% Chebyshev (MVUE) UCL	21.69
95% Chebyshev (MVUE) UCL	24.78	97.5% Chebyshev (MVUE) UCL	29.07
99% Chebyshev (MVUE) UCL	37.49		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	15.77	95% Jackknife UCL	15.82
95% Standard Bootstrap UCL	15.74	95% Bootstrap-t UCL	16
95% Hall's Bootstrap UCL	16.09	95% Percentile Bootstrap UCL	15.8
95% BCA Bootstrap UCL	15.94		
90% Chebyshev(Mean, Sd) UCL	17.59	95% Chebyshev(Mean, Sd) UCL	19.41
97.5% Chebyshev(Mean, Sd) UCL	21.93	99% Chebyshev(Mean, Sd) UCL	26.89
Suggested UCL to Use			
95% Student's-t UCL	15.82		
When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test			
When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Indeno123CDPyrene			

General Statistics			
Total Number of Observations	46	Number of Distinct Observations	37
Number of Detects	34	Number of Non-Detects	12
Number of Distinct Detects	30	Number of Distinct Non-Detects	7
Minimum Detect	0.031	Minimum Non-Detect	0.023
Maximum Detect	3.1	Maximum Non-Detect	0.041
Variance Detects	0.391	Percent Non-Detects	26.09%
Mean Detects	0.331	SD Detects	0.626
Median Detects	0.12	CV Detects	1.89
Skewness Detects	3.638	Kurtosis Detects	13.59
Mean of Logged Detects	-1.834	SD of Logged Detects	1.035
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.468	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.933	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.358	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.15	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.251	KM Standard Error of Mean	0.0819
KM SD	0.547	95% KM (BCA) UCL	0.412
95% KM (t) UCL	0.388	95% KM (Percentile Bootstrap) UCL	0.399
95% KM (z) UCL	0.385	95% KM Bootstrap t UCL	0.662
90% KM Chebyshev UCL	0.496	95% KM Chebyshev UCL	0.607
97.5% KM Chebyshev UCL	0.762	99% KM Chebyshev UCL	1.065
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	2.949	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.785	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.265	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.157	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.813	k star (bias corrected MLE)	0.761
Theta hat (MLE)	0.407	Theta star (bias corrected MLE)	0.435
nu hat (MLE)	55.27	nu star (bias corrected)	51.72
Mean (detects)	0.331		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	0.247
Maximum	3.1	Median	0.0925
SD	0.554	CV	2.242

k hat (MLE)	0.541	k star (bias corrected MLE)	0.52
Theta hat (MLE)	0.457	Theta star (bias corrected MLE)	0.475
nu hat (MLE)	49.77	nu star (bias corrected)	47.86
Adjusted Level of Significance (β)	0.0448		
Approximate Chi Square Value (47.86, α)	32.98	Adjusted Chi Square Value (47.86, β)	32.58
95% Gamma Approximate UCL (use when n>=50)	0.359	95% Gamma Adjusted UCL (use when n<50)	0.363
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.251	SD (KM)	0.547
Variance (KM)	0.299	SE of Mean (KM)	0.0819
k hat (KM)	0.21	k star (KM)	0.211
nu hat (KM)	19.33	nu star (KM)	19.4
theta hat (KM)	1.193	theta star (KM)	1.189
80% gamma percentile (KM)	0.339	90% gamma percentile (KM)	0.758
95% gamma percentile (KM)	1.274	99% gamma percentile (KM)	2.681
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (19.40, α)	10.41	Adjusted Chi Square Value (19.40, β)	10.2
95% Gamma Approximate KM-UCL (use when n>=50)	0.467	95% Gamma Adjusted KM-UCL (use when n<50)	0.477
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.908	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.933	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.156	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.15	Detected Data Not Lognormal at 5% Significance Level	
Detected Data Not Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.249	Mean in Log Scale	-2.441
SD in Original Scale	0.554	SD in Log Scale	1.37
95% t UCL (assumes normality of ROS data)	0.386	95% Percentile Bootstrap UCL	0.392
95% BCA Bootstrap UCL	0.454	95% Bootstrap t UCL	0.683
95% H-UCL (Log ROS)	0.39		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-2.339	KM Geo Mean	0.0964
KM SD (logged)	1.221	95% Critical H Value (KM-Log)	2.573
KM Standard Error of Mean (logged)	0.183	95% H-UCL (KM -Log)	0.325
KM SD (logged)	1.221	95% Critical H Value (KM-Log)	2.573
KM Standard Error of Mean (logged)	0.183		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.248	Mean in Log Scale	-2.474
SD in Original Scale	0.554	SD in Log Scale	1.406
95% t UCL (Assumes normality)	0.385	95% H-Stat UCL	0.407
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution at 5% Significance Level			

Suggested UCL to Use			
95% KM (Chebyshev) UCL	0.607		

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

BenzoBFluoranthene

General Statistics			
Total Number of Observations	46	Number of Distinct Observations	26
Number of Detects	35	Number of Non-Detects	11
Number of Distinct Detects	22	Number of Distinct Non-Detects	4
Minimum Detect	0.029	Minimum Non-Detect	0.014
Maximum Detect	6.6	Maximum Non-Detect	0.024
Variance Detects	1.801	Percent Non-Detects	23.91%
Mean Detects	0.512	SD Detects	1.342
Median Detects	0.14	CV Detects	2.621
Skewness Detects	4.06	Kurtosis Detects	15.98
Mean of Logged Detects	-1.67	SD of Logged Detects	1.084
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.341	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.934	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.434	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.148	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.393	KM Standard Error of Mean	0.175
KM SD	1.173	95% KM (BCA) UCL	0.749
95% KM (t) UCL	0.688	95% KM (Percentile Bootstrap) UCL	0.71
95% KM (z) UCL	0.682	95% KM Bootstrap t UCL	2.584
90% KM Chebyshev UCL	0.919	95% KM Chebyshev UCL	1.158
97.5% KM Chebyshev UCL	1.489	99% KM Chebyshev UCL	2.139
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	5.139	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.801	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.323	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.156	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.615	k star (bias corrected MLE)	0.581
Theta hat (MLE)	0.832	Theta star (bias corrected MLE)	0.88
nu hat (MLE)	43.06	nu star (bias corrected)	40.7
Mean (detects)	0.512		

Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	0.392
Maximum	6.6	Median	0.115
SD	1.186	CV	3.027
k hat (MLE)	0.45	k star (bias corrected MLE)	0.435
Theta hat (MLE)	0.871	Theta star (bias corrected MLE)	0.901
nu hat (MLE)	41.39	nu star (bias corrected)	40.02
Adjusted Level of Significance (β)	0.0448		
Approximate Chi Square Value (40.02, α)	26.53	Adjusted Chi Square Value (40.02, β)	26.17
95% Gamma Approximate UCL (use when n>=50)	0.591	95% Gamma Adjusted UCL (use when n<50)	0.599
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.393	SD (KM)	1.173
Variance (KM)	1.376	SE of Mean (KM)	0.175
k hat (KM)	0.112	k star (KM)	0.119
nu hat (KM)	10.32	nu star (KM)	10.98
theta hat (KM)	3.503	theta star (KM)	3.292
80% gamma percentile (KM)	0.342	90% gamma percentile (KM)	1.111
95% gamma percentile (KM)	2.244	99% gamma percentile (KM)	5.704
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (10.98, α)	4.563	Adjusted Chi Square Value (10.98, β)	4.429
95% Gamma Approximate KM-UCL (use when n>=50)	0.945	95% Gamma Adjusted KM-UCL (use when n<50)	0.974
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.839	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.934	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.169	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.148	Detected Data Not Lognormal at 5% Significance Level	
Detected Data Not Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.394	Mean in Log Scale	-2.227
SD in Original Scale	1.186	SD in Log Scale	1.391
95% t UCL (assumes normality of ROS data)	0.688	95% Percentile Bootstrap UCL	0.731
95% BCA Bootstrap UCL	0.844	95% Bootstrap t UCL	2.606
95% H-UCL (Log ROS)	0.505		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-2.292	KM Geo Mean	0.101
KM SD (logged)	1.448	95% Critical H Value (KM-Log)	2.848
KM Standard Error of Mean (logged)	0.217	95% H-UCL (KM -Log)	0.533
KM SD (logged)	1.448	95% Critical H Value (KM-Log)	2.848
KM Standard Error of Mean (logged)	0.217		

DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.392	Mean in Log Scale	-2.422
SD in Original Scale	1.187	SD in Log Scale	1.652
95% t UCL (Assumes normality)	0.685	95% H-Stat UCL	0.748
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution at 5% Significance Level			
Suggested UCL to Use			
95% KM (Chebyshev) UCL	1.158		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
BenzoAPyrene			
General Statistics			
Total Number of Observations	46	Number of Distinct Observations	34
Number of Detects	33	Number of Non-Detects	13
Number of Distinct Detects	29	Number of Distinct Non-Detects	5
Minimum Detect	0.018	Minimum Non-Detect	0.01
Maximum Detect	4	Maximum Non-Detect	0.019
Variance Detects	0.663	Percent Non-Detects	28.26%
Mean Detects	0.321	SD Detects	0.814
Median Detects	0.084	CV Detects	2.533
Skewness Detects	3.985	Kurtosis Detects	15.66
Mean of Logged Detects	-2.157	SD of Logged Detects	1.136
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.364	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.931	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.414	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.152	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.233	KM Standard Error of Mean	0.104
KM SD	0.693	95% KM (BCA) UCL	0.411
95% KM (t) UCL	0.408	95% KM (Percentile Bootstrap) UCL	0.422
95% KM (z) UCL	0.404	95% KM Bootstrap t UCL	1.394
90% KM Chebyshev UCL	0.545	95% KM Chebyshev UCL	0.686
97.5% KM Chebyshev UCL	0.882	99% KM Chebyshev UCL	1.266
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	4.202	**Anderson-Darling GOF Test**	

5% A-D Critical Value	0.801	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.279	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.161	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.604	k star (bias corrected MLE)	0.569
Theta hat (MLE)	0.532	Theta star (bias corrected MLE)	0.564
nu hat (MLE)	39.86	nu star (bias corrected)	37.57
Mean (detects)	0.321		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	0.233
Maximum	4	Median	0.0645
SD	0.701	CV	3.004
k hat (MLE)	0.461	k star (bias corrected MLE)	0.446
Theta hat (MLE)	0.506	Theta star (bias corrected MLE)	0.523
nu hat (MLE)	42.45	nu star (bias corrected)	41.02
Adjusted Level of Significance (β)	0.0448		
Approximate Chi Square Value (41.02, α)	27.34	Adjusted Chi Square Value (41.02, β)	26.98
95% Gamma Approximate UCL (use when n>=50)	0.35	95% Gamma Adjusted UCL (use when n<50)	0.355
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.233	SD (KM)	0.693
Variance (KM)	0.481	SE of Mean (KM)	0.104
k hat (KM)	0.113	k star (KM)	0.12
nu hat (KM)	10.42	nu star (KM)	11.08
theta hat (KM)	2.06	theta star (KM)	1.938
80% gamma percentile (KM)	0.205	90% gamma percentile (KM)	0.662
95% gamma percentile (KM)	1.331	99% gamma percentile (KM)	3.372
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (11.08, α)	4.626	Adjusted Chi Square Value (11.08, β)	4.491
95% Gamma Approximate KM-UCL (use when n>=50)	0.559	95% Gamma Adjusted KM-UCL (use when n<50)	0.576
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.874	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.931	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.156	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.152	Detected Data Not Lognormal at 5% Significance Level	
Detected Data Not Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.233	Mean in Log Scale	-2.876
SD in Original Scale	0.701	SD in Log Scale	1.526

95% t UCL (assumes normality of ROS data)	0.407	95% Percentile Bootstrap UCL	0.413
95% BCA Bootstrap UCL	0.534	95% Bootstrap t UCL	1.368
95% H-UCL (Log ROS)	0.353		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-2.848	KM Geo Mean	0.058
KM SD (logged)	1.453	95% Critical H Value (KM-Log)	2.854
KM Standard Error of Mean (logged)	0.218	95% H-UCL (KM -Log)	0.309
KM SD (logged)	1.453	95% Critical H Value (KM-Log)	2.854
KM Standard Error of Mean (logged)	0.218		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.232	Mean in Log Scale	-2.977
SD in Original Scale	0.701	SD in Log Scale	1.634
95% t UCL (Assumes normality)	0.406	95% H-Stat UCL	0.411
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution at 5% Significance Level			
Suggested UCL to Use			
95% KM (Chebyshev) UCL	0.686		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
DibenzAHAnthracene			
General Statistics			
Total Number of Observations	46	Number of Distinct Observations	23
Number of Detects	15	Number of Non-Detects	31
Number of Distinct Detects	15	Number of Distinct Non-Detects	9
Minimum Detect	0.019	Minimum Non-Detect	0.018
Maximum Detect	0.44	Maximum Non-Detect	0.31
Variance Detects	0.0112	Percent Non-Detects	67.39%
Mean Detects	0.0872	SD Detects	0.106
Median Detects	0.051	CV Detects	1.212
Skewness Detects	3.042	Kurtosis Detects	9.986
Mean of Logged Detects	-2.798	SD of Logged Detects	0.765
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.566	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.881	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.353	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.22	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.0409	KM Standard Error of Mean	0.0102
KM SD	0.0668	95% KM (BCA) UCL	0.0584
95% KM (t) UCL	0.0581	95% KM (Percentile Bootstrap) UCL	0.0587
95% KM (z) UCL	0.0577	95% KM Bootstrap t UCL	0.0822
90% KM Chebyshev UCL	0.0716	95% KM Chebyshev UCL	0.0854
97.5% KM Chebyshev UCL	0.105	99% KM Chebyshev UCL	0.143
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	1.504	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.753	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.332	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.225	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	1.539	k star (bias corrected MLE)	1.276
Theta hat (MLE)	0.0566	Theta star (bias corrected MLE)	0.0683
nu hat (MLE)	46.18	nu star (bias corrected)	38.28
Mean (detects)	0.0872		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	0.0352
Maximum	0.44	Median	0.01
SD	0.0694	CV	1.972
k hat (MLE)	0.877	k star (bias corrected MLE)	0.835
Theta hat (MLE)	0.0401	Theta star (bias corrected MLE)	0.0421
nu hat (MLE)	80.71	nu star (bias corrected)	76.78
Adjusted Level of Significance (β)	0.0448		
Approximate Chi Square Value (76.78, α)	57.6	Adjusted Chi Square Value (76.78, β)	57.06
95% Gamma Approximate UCL (use when n>=50)	0.0469	95% Gamma Adjusted UCL (use when n<50)	0.0473
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.0409	SD (KM)	0.0668
Variance (KM)	0.00446	SE of Mean (KM)	0.0102
k hat (KM)	0.375	k star (KM)	0.365
nu hat (KM)	34.52	nu star (KM)	33.61
theta hat (KM)	0.109	theta star (KM)	0.112
80% gamma percentile (KM)	0.0652	90% gamma percentile (KM)	0.117
95% gamma percentile (KM)	0.175	99% gamma percentile (KM)	0.323
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (33.61, α)	21.35	Adjusted Chi Square Value (33.61, β)	21.03
95% Gamma Approximate KM-UCL (use when n>=50)	0.0644	95% Gamma Adjusted KM-UCL (use when n<50)	0.0654

Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.864	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.881	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.286	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.22	Detected Data Not Lognormal at 5% Significance Level	
Detected Data Not Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.0337	Mean in Log Scale	-4.322
SD in Original Scale	0.07	SD in Log Scale	1.286
95% t UCL (assumes normality of ROS data)	0.051	95% Percentile Bootstrap UCL	0.0521
95% BCA Bootstrap UCL	0.0628	95% Bootstrap t UCL	0.0773
95% H-UCL (Log ROS)	0.0504		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-3.61	KM Geo Mean	0.027
KM SD (logged)	0.712	95% Critical H Value (KM-Log)	2.043
KM Standard Error of Mean (logged)	0.11	95% H-UCL (KM -Log)	0.0433
KM SD (logged)	0.712	95% Critical H Value (KM-Log)	2.043
KM Standard Error of Mean (logged)	0.11		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.0388	Mean in Log Scale	-3.924
SD in Original Scale	0.0713	SD in Log Scale	0.992
95% t UCL (Assumes normality)	0.0564	95% H-Stat UCL	0.0455
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution at 5% Significance Level			
Suggested UCL to Use			
95% KM (Chebyshev) UCL	0.0854		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
BenzoAAnthracene			
General Statistics			
Total Number of Observations	46	Number of Distinct Observations	31
Number of Detects	30	Number of Non-Detects	16
Number of Distinct Detects	23	Number of Distinct Non-Detects	8
Minimum Detect	0.038	Minimum Non-Detect	0.029
Maximum Detect	0.75	Maximum Non-Detect	0.5
Variance Detects	0.0195	Percent Non-Detects	34.78%
Mean Detects	0.124	SD Detects	0.14
Median Detects	0.0705	CV Detects	1.123

Skewness Detects	3.453	Kurtosis Detects	14.16
Mean of Logged Detects	-2.41	SD of Logged Detects	0.737
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.598	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.927	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.268	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.159	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.0923	KM Standard Error of Mean	0.0181
KM SD	0.12	95% KM (BCA) UCL	0.129
95% KM (t) UCL	0.123	95% KM (Percentile Bootstrap) UCL	0.124
95% KM (z) UCL	0.122	95% KM Bootstrap t UCL	0.147
90% KM Chebyshev UCL	0.146	95% KM Chebyshev UCL	0.171
97.5% KM Chebyshev UCL	0.205	99% KM Chebyshev UCL	0.272
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	1.531	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.761	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.182	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.163	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	1.685	k star (bias corrected MLE)	1.539
Theta hat (MLE)	0.0738	Theta star (bias corrected MLE)	0.0808
nu hat (MLE)	101.1	nu star (bias corrected)	92.34
Mean (detects)	0.124		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	0.0849
Maximum	0.75	Median	0.0485
SD	0.125	CV	1.47
k hat (MLE)	0.855	k star (bias corrected MLE)	0.813
Theta hat (MLE)	0.0993	Theta star (bias corrected MLE)	0.104
nu hat (MLE)	78.63	nu star (bias corrected)	74.83
Adjusted Level of Significance (β)	0.0448		
Approximate Chi Square Value (74.83, α)	55.91	Adjusted Chi Square Value (74.83, β)	55.38
95% Gamma Approximate UCL (use when n>=50)	0.114	95% Gamma Adjusted UCL (use when n<50)	0.115
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.0923	SD (KM)	0.12
Variance (KM)	0.0144	SE of Mean (KM)	0.0181

k hat (KM)	0.591	k star (KM)	0.567
nu hat (KM)	54.4	nu star (KM)	52.19
theta hat (KM)	0.156	theta star (KM)	0.163
80% gamma percentile (KM)	0.152	90% gamma percentile (KM)	0.243
95% gamma percentile (KM)	0.339	99% gamma percentile (KM)	0.572
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (52.19, α)	36.59	Adjusted Chi Square Value (52.19, β)	36.17
95% Gamma Approximate KM-UCL (use when n>=50)	0.132	95% Gamma Adjusted KM-UCL (use when n<50)	0.133
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.901	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.927	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.151	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.159	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Approximate Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.0877	Mean in Log Scale	-2.978
SD in Original Scale	0.123	SD in Log Scale	1.009
95% t UCL (assumes normality of ROS data)	0.118	95% Percentile Bootstrap UCL	0.117
95% BCA Bootstrap UCL	0.129	95% Bootstrap t UCL	0.14
95% H-UCL (Log ROS)	0.12		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-2.788	KM Geo Mean	0.0616
KM SD (logged)	0.794	95% Critical H Value (KM-Log)	2.121
KM Standard Error of Mean (logged)	0.12	95% H-UCL (KM -Log)	0.108
KM SD (logged)	0.794	95% Critical H Value (KM-Log)	2.121
KM Standard Error of Mean (logged)	0.12		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.0919	Mean in Log Scale	-2.94
SD in Original Scale	0.125	SD in Log Scale	1.023
95% t UCL (Assumes normality)	0.123	95% H-Stat UCL	0.128
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Approximate Lognormal Distributed at 5% Significance Level			
Suggested UCL to Use			
KM H-UCL	0.108		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Cyanide			

General Statistics			
Total Number of Observations	46	Number of Distinct Observations	40
Number of Detects	34	Number of Non-Detects	12
Number of Distinct Detects	31	Number of Distinct Non-Detects	11
Minimum Detect	0.03	Minimum Non-Detect	0.017
Maximum Detect	16.4	Maximum Non-Detect	0.095
Variance Detects	7.667	Percent Non-Detects	26.09%
Mean Detects	0.822	SD Detects	2.769
Median Detects	0.32	CV Detects	3.37
Skewness Detects	5.724	Kurtosis Detects	33.13
Mean of Logged Detects	-1.364	SD of Logged Detects	1.269
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.255	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.933	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.428	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.15	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.617	KM Standard Error of Mean	0.355
KM SD	2.371	95% KM (BCA) UCL	1.341
95% KM (t) UCL	1.213	95% KM (Percentile Bootstrap) UCL	1.301
95% KM (z) UCL	1.2	95% KM Bootstrap t UCL	4.624
90% KM Chebyshev UCL	1.681	95% KM Chebyshev UCL	2.163
97.5% KM Chebyshev UCL	2.832	99% KM Chebyshev UCL	4.147
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	3.09	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.808	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.272	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.159	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.538	k star (bias corrected MLE)	0.51
Theta hat (MLE)	1.527	Theta star (bias corrected MLE)	1.61
nu hat (MLE)	36.59	nu star (bias corrected)	34.7
Mean (detects)	0.822		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	0.61
Maximum	16.4	Median	0.155
SD	2.398	CV	3.933

k hat (MLE)	0.386	k star (bias corrected MLE)	0.375
Theta hat (MLE)	1.58	Theta star (bias corrected MLE)	1.625
nu hat (MLE)	35.51	nu star (bias corrected)	34.53
Adjusted Level of Significance (β)	0.0448		
Approximate Chi Square Value (34.53, α)	22.09	Adjusted Chi Square Value (34.53, β)	21.76
95% Gamma Approximate UCL (use when n>=50)	0.953	95% Gamma Adjusted UCL (use when n<50)	0.968
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.617	SD (KM)	2.371
Variance (KM)	5.62	SE of Mean (KM)	0.355
k hat (KM)	0.0677	k star (KM)	0.0778
nu hat (KM)	6.227	nu star (KM)	7.155
theta hat (KM)	9.111	theta star (KM)	7.931
80% gamma percentile (KM)	0.277	90% gamma percentile (KM)	1.436
95% gamma percentile (KM)	3.581	99% gamma percentile (KM)	11.07
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (7.15, α)	2.256	Adjusted Chi Square Value (7.15, β)	2.168
95% Gamma Approximate KM-UCL (use when n>=50)	1.956	95% Gamma Adjusted KM-UCL (use when n<50)	2.036
95% Gamma Adjusted KM-UCL (use when k<=1 and 15 < n < 50)			
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.928	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.933	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.128	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.15	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Approximate Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.616	Mean in Log Scale	-1.921
SD in Original Scale	2.397	SD in Log Scale	1.468
95% t UCL (assumes normality of ROS data)	1.21	95% Percentile Bootstrap UCL	1.301
95% BCA Bootstrap UCL	1.729	95% Bootstrap t UCL	4.675
95% H-UCL (Log ROS)	0.807		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-1.906	KM Geo Mean	0.149
KM SD (logged)	1.435	95% Critical H Value (KM-Log)	2.832
KM Standard Error of Mean (logged)	0.22	95% H-UCL (KM -Log)	0.763
KM SD (logged)	1.435	95% Critical H Value (KM-Log)	2.832
KM Standard Error of Mean (logged)	0.22		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.615	Mean in Log Scale	-1.946
SD in Original Scale	2.397	SD in Log Scale	1.493
95% t UCL (Assumes normality)	1.209	95% H-Stat UCL	0.832
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			

Detected Data appear Approximate Lognormal Distributed at 5% Significance Level			
Suggested UCL to Use			
KM H-UCL	0.763		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Aluminum			
General Statistics			
Total Number of Observations	46	Number of Distinct Observations	46
		Number of Missing Observations	0
Minimum	2560	Mean	8036
Maximum	16100	Median	8010
SD	2373	Std. Error of Mean	349.9
Coefficient of Variation	0.295	Skewness	0.439
Normal GOF Test			
Shapiro Wilk Test Statistic	0.963	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.945	Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.103	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.129	Data appear Normal at 5% Significance Level	
Data appear Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	8623	95% Adjusted-CLT UCL (Chen-1995)	8636
		95% Modified-t UCL (Johnson-1978)	8627
Gamma GOF Test			
A-D Test Statistic	0.872	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.749	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.107	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.13	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data follow Appr. Gamma Distribution at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	10.36	k star (bias corrected MLE)	9.703
Theta hat (MLE)	775.4	Theta star (bias corrected MLE)	828.2
nu hat (MLE)	953.5	nu star (bias corrected)	892.6
MLE Mean (bias corrected)	8036	MLE Sd (bias corrected)	2580
		Approximate Chi Square Value (0.05)	824.3
Adjusted Level of Significance	0.0448	Adjusted Chi Square Value	822.2
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	8702	95% Adjusted Gamma UCL (use when n<50)	8725

Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.896	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.945	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.132	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.129	Data Not Lognormal at 5% Significance Level	
Data Not Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	7.848	Mean of logged Data	8.943
Maximum of Logged Data	9.687	SD of logged Data	0.337
Assuming Lognormal Distribution			
95% H-UCL	8855	90% Chebyshev (MVUE) UCL	9320
95% Chebyshev (MVUE) UCL	9879	97.5% Chebyshev (MVUE) UCL	10654
99% Chebyshev (MVUE) UCL	12176		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	8611	95% Jackknife UCL	8623
95% Standard Bootstrap UCL	8613	95% Bootstrap-t UCL	8634
95% Hall's Bootstrap UCL	8671	95% Percentile Bootstrap UCL	8588
95% BCA Bootstrap UCL	8620		
90% Chebyshev(Mean, Sd) UCL	9086	95% Chebyshev(Mean, Sd) UCL	9561
97.5% Chebyshev(Mean, Sd) UCL	10221	99% Chebyshev(Mean, Sd) UCL	11517
Suggested UCL to Use			
95% Student's-t UCL	8623		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Iron			
General Statistics			
Total Number of Observations	46	Number of Distinct Observations	39
		Number of Missing Observations	0
Minimum	1580	Mean	10908
Maximum	16300	Median	11950
SD	3813	Std. Error of Mean	562.2
Coefficient of Variation	0.35	Skewness	-1.106
Normal GOF Test			
Shapiro Wilk Test Statistic	0.878	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.945	Data Not Normal at 5% Significance Level	

Lilliefors Test Statistic	0.161	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.129	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	11852	95% Adjusted-CLT UCL (Chen-1995)	11735
		95% Modified-t UCL (Johnson-1978)	11837
Gamma GOF Test			
A-D Test Statistic	3.84	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.753	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.221	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.131	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	4.79	k star (bias corrected MLE)	4.492
Theta hat (MLE)	2277	Theta star (bias corrected MLE)	2428
nu hat (MLE)	440.7	nu star (bias corrected)	413.3
MLE Mean (bias corrected)	10908	MLE Sd (bias corrected)	5147
		Approximate Chi Square Value (0.05)	367.1
Adjusted Level of Significance	0.0448	Adjusted Chi Square Value	365.7
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	12278	95% Adjusted Gamma UCL (use when n<50)	12325
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.718	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.945	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.25	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.129	Data Not Lognormal at 5% Significance Level	
Data Not Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	7.365	Mean of logged Data	9.189
Maximum of Logged Data	9.699	SD of logged Data	0.557
Assuming Lognormal Distribution			
95% H-UCL	13411	90% Chebyshev (MVUE) UCL	14362
95% Chebyshev (MVUE) UCL	15709	97.5% Chebyshev (MVUE) UCL	17578
99% Chebyshev (MVUE) UCL	21251		
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution (0.05)			
Nonparametric Distribution Free UCLs			
95% CLT UCL	11833	95% Jackknife UCL	11852
95% Standard Bootstrap UCL	11839	95% Bootstrap-t UCL	11763
95% Hall's Bootstrap UCL	11765	95% Percentile Bootstrap UCL	11787

95% BCA Bootstrap UCL	11794		
90% Chebyshev(Mean, Sd) UCL	12594	95% Chebyshev(Mean, Sd) UCL	13358
97.5% Chebyshev(Mean, Sd) UCL	14419	99% Chebyshev(Mean, Sd) UCL	16502

Suggested UCL to Use

95% Chebyshev (Mean, Sd) UCL	13358		

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Note: For highly negatively-skewed data, confidence limits (e.g., Chen, Johnson, Lognormal, and Gamma) may not be reliable. Chen's and Johnson's methods provide adjustments for positvely skewed data sets.

Manganese

General Statistics

Total Number of Observations	46	Number of Distinct Observations	45
		Number of Missing Observations	0
Minimum	10.7	Mean	193.3
Maximum	415	Median	162.5
SD	128.4	Std. Error of Mean	18.93
Coefficient of Variation	0.664	Skewness	0.207

Normal GOF Test

Shapiro Wilk Test Statistic	0.88	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.945	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.196	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.129	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	225.1	95% Adjusted-CLT UCL (Chen-1995)	225.1
		95% Modified-t UCL (Johnson-1978)	225.2

Gamma GOF Test

A-D Test Statistic	1.501	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.764	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.182	**Kolmogorov-Smirnov Gamma GOF Test**
5% K-S Critical Value	0.132	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	1.753	k star (bias corrected MLE)	1.653
Theta hat (MLE)	110.3	Theta star (bias corrected MLE)	117
nu hat (MLE)	161.2	nu star (bias corrected)	152.1
MLE Mean (bias corrected)	193.3	MLE Sd (bias corrected)	150.4

		Approximate Chi Square Value (0.05)	124.6
Adjusted Level of Significance	0.0448	Adjusted Chi Square Value	123.8
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	236	95% Adjusted Gamma UCL (use when n<50)	237.6
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.891	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.945	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.185	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.129	Data Not Lognormal at 5% Significance Level	
Data Not Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	2.37	Mean of logged Data	4.953
Maximum of Logged Data	6.028	SD of logged Data	0.904
Assuming Lognormal Distribution			
95% H-UCL	287.6	90% Chebyshev (MVUE) UCL	306.8
95% Chebyshev (MVUE) UCL	350.5	97.5% Chebyshev (MVUE) UCL	411.1
99% Chebyshev (MVUE) UCL	530.1		
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution (0.05)			
Nonparametric Distribution Free UCLs			
95% CLT UCL	224.5	95% Jackknife UCL	225.1
95% Standard Bootstrap UCL	225.1	95% Bootstrap-t UCL	228.4
95% Hall's Bootstrap UCL	226	95% Percentile Bootstrap UCL	224.1
95% BCA Bootstrap UCL	227.5		
90% Chebyshev(Mean, Sd) UCL	250.1	95% Chebyshev(Mean, Sd) UCL	275.9
97.5% Chebyshev(Mean, Sd) UCL	311.6	99% Chebyshev(Mean, Sd) UCL	381.7
Suggested UCL to Use			
95% Chebyshev (Mean, Sd) UCL	275.9		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Mercury			
General Statistics			
Total Number of Observations	46	Number of Distinct Observations	30
Number of Detects	43	Number of Non-Detects	3
Number of Distinct Detects	30	Number of Distinct Non-Detects	3
Minimum Detect	0.011	Minimum Non-Detect	0.012
Maximum Detect	1.4	Maximum Non-Detect	0.018
Variance Detects	0.0609	Percent Non-Detects	6.522%

Mean Detects	0.0932	SD Detects	0.247
Median Detects	0.024	CV Detects	2.647
Skewness Detects	4.567	Kurtosis Detects	21.51
Mean of Logged Detects	-3.367	SD of Logged Detects	1.078
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.35	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.943	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.369	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.134	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.0879	KM Standard Error of Mean	0.0353
KM SD	0.237	95% KM (BCA) UCL	0.153
95% KM (t) UCL	0.147	95% KM (Percentile Bootstrap) UCL	0.148
95% KM (z) UCL	0.146	95% KM Bootstrap t UCL	0.396
90% KM Chebyshev UCL	0.194	95% KM Chebyshev UCL	0.242
97.5% KM Chebyshev UCL	0.308	99% KM Chebyshev UCL	0.439
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	6.093	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.802	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.289	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.141	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.619	k star (bias corrected MLE)	0.591
Theta hat (MLE)	0.151	Theta star (bias corrected MLE)	0.158
nu hat (MLE)	53.21	nu star (bias corrected)	50.83
Mean (detects)	0.0932		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	0.0878
Maximum	1.4	Median	0.023
SD	0.239	CV	2.726
k hat (MLE)	0.608	k star (bias corrected MLE)	0.582
Theta hat (MLE)	0.145	Theta star (bias corrected MLE)	0.151
nu hat (MLE)	55.9	nu star (bias corrected)	53.59
Adjusted Level of Significance (β)	0.0448		
Approximate Chi Square Value (53.59, α)	37.77	Adjusted Chi Square Value (53.59, β)	37.34
95% Gamma Approximate UCL (use when n>=50)	0.125	95% Gamma Adjusted UCL (use when n<50)	0.126
Estimates of Gamma Parameters using KM Estimates			

Mean (KM)	0.0879	SD (KM)	0.237
Variance (KM)	0.056	SE of Mean (KM)	0.0353
k hat (KM)	0.138	k star (KM)	0.144
nu hat (KM)	12.7	nu star (KM)	13.21
theta hat (KM)	0.637	theta star (KM)	0.613
80% gamma percentile (KM)	0.0923	90% gamma percentile (KM)	0.259
95% gamma percentile (KM)	0.488	99% gamma percentile (KM)	1.159
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (13.21, α)	6.034	Adjusted Chi Square Value (13.21, β)	5.877
95% Gamma Approximate KM-UCL (use when n>=50)	0.193	95% Gamma Adjusted KM-UCL (use when n<50)	0.198
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.8	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.943	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.231	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.134	Detected Data Not Lognormal at 5% Significance Level	
Detected Data Not Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.0876	Mean in Log Scale	-3.479
SD in Original Scale	0.239	SD in Log Scale	1.131
95% t UCL (assumes normality of ROS data)	0.147	95% Percentile Bootstrap UCL	0.154
95% BCA Bootstrap UCL	0.173	95% Bootstrap t UCL	0.364
95% H-UCL (Log ROS)	0.0887		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-3.435	KM Geo Mean	0.0322
KM SD (logged)	1.063	95% Critical H Value (KM-Log)	2.394
KM Standard Error of Mean (logged)	0.159	95% H-UCL (KM -Log)	0.0828
KM SD (logged)	1.063	95% Critical H Value (KM-Log)	2.394
KM Standard Error of Mean (logged)	0.159		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.0876	Mean in Log Scale	-3.469
SD in Original Scale	0.239	SD in Log Scale	1.113
95% t UCL (Assumes normality)	0.147	95% H-Stat UCL	0.0869
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution at 5% Significance Level			
Suggested UCL to Use			
95% KM (Chebyshev) UCL	0.242		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			

Nickel

General Statistics			
Total Number of Observations	46	Number of Distinct Observations	35
		Number of Missing Observations	0
Minimum	4.3	Mean	13.22
Maximum	53.9	Median	11.35
SD	7.329	Std. Error of Mean	1.081
Coefficient of Variation	0.554	Skewness	4.095
Normal GOF Test			
Shapiro Wilk Test Statistic	0.608	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.945	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.256	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.129	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	15.03	95% Adjusted-CLT UCL (Chen-1995)	15.69
		95% Modified-t UCL (Johnson-1978)	15.14
Gamma GOF Test			
A-D Test Statistic	2.739	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.753	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.2	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.131	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	5.842	k star (bias corrected MLE)	5.476
Theta hat (MLE)	2.262	Theta star (bias corrected MLE)	2.414
nu hat (MLE)	537.5	nu star (bias corrected)	503.8
MLE Mean (bias corrected)	13.22	MLE Sd (bias corrected)	5.648
		Approximate Chi Square Value (0.05)	452.7
Adjusted Level of Significance	0.0448	Adjusted Chi Square Value	451.1
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	14.71	95% Adjusted Gamma UCL (use when n<50)	14.76
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.874	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.945	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.166	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.129	Data Not Lognormal at 5% Significance Level	
Data Not Lognormal at 5% Significance Level			
Lognormal Statistics			

Minimum of Logged Data	1.459	Mean of logged Data	2.494
Maximum of Logged Data	3.987	SD of logged Data	0.394

Assuming Lognormal Distribution

95% H-UCL	14.55	90% Chebyshev (MVUE) UCL	15.4
95% Chebyshev (MVUE) UCL	16.46	97.5% Chebyshev (MVUE) UCL	17.93
99% Chebyshev (MVUE) UCL	20.83		

Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution (0.05)

Nonparametric Distribution Free UCLs

95% CLT UCL	14.99	95% Jackknife UCL	15.03
95% Standard Bootstrap UCL	14.95	95% Bootstrap-t UCL	16.49
95% Hall's Bootstrap UCL	23.16	95% Percentile Bootstrap UCL	15
95% BCA Bootstrap UCL	16.04		
90% Chebyshev(Mean, Sd) UCL	16.46	95% Chebyshev(Mean, Sd) UCL	17.93
97.5% Chebyshev(Mean, Sd) UCL	19.97	99% Chebyshev(Mean, Sd) UCL	23.97

Suggested UCL to Use

95% Student's-t UCL	15.03	or 95% Modified-t UCL	15.14

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Thallium

General Statistics

Total Number of Observations	46	Number of Distinct Observations	15
Number of Detects	1	Number of Non-Detects	45
Number of Distinct Detects	1	Number of Distinct Non-Detects	15

Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set!

It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable Thallium was not processed!

Arsenic

General Statistics

Total Number of Observations	46	Number of Distinct Observations	30
Number of Detects	44	Number of Non-Detects	2
Number of Distinct Detects	28	Number of Distinct Non-Detects	2
Minimum Detect	0.46	Minimum Non-Detect	0.7
Maximum Detect	8.2	Maximum Non-Detect	0.84
Variance Detects	2.686	Percent Non-Detects	4.348%
Mean Detects	3.135	SD Detects	1.639

Median Detects	3.2	CV Detects	0.523
Skewness Detects	0.582	Kurtosis Detects	0.502
Mean of Logged Detects	0.982	SD of Logged Detects	0.617
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.951	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.944	Detected Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.11	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.132	Detected Data appear Normal at 5% Significance Level	
Detected Data appear Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	3.023	KM Standard Error of Mean	0.249
KM SD	1.669	95% KM (BCA) UCL	3.465
95% KM (t) UCL	3.441	95% KM (Percentile Bootstrap) UCL	3.437
95% KM (z) UCL	3.432	95% KM Bootstrap t UCL	3.466
90% KM Chebyshev UCL	3.77	95% KM Chebyshev UCL	4.108
97.5% KM Chebyshev UCL	4.578	99% KM Chebyshev UCL	5.5
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	0.702	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.755	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.111	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.134	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	3.275	k star (bias corrected MLE)	3.067
Theta hat (MLE)	0.957	Theta star (bias corrected MLE)	1.022
nu hat (MLE)	288.2	nu star (bias corrected)	269.9
Mean (detects)	3.135		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.46	Mean	3.031
Maximum	8.2	Median	3.15
SD	1.676	CV	0.553
k hat (MLE)	2.904	k star (bias corrected MLE)	2.729
Theta hat (MLE)	1.044	Theta star (bias corrected MLE)	1.111
nu hat (MLE)	267.1	nu star (bias corrected)	251
Adjusted Level of Significance (β)	0.0448		
Approximate Chi Square Value (251.04, α)	215.4	Adjusted Chi Square Value (251.04, β)	214.3
95% Gamma Approximate UCL (use when n>=50)	3.533	95% Gamma Adjusted UCL (use when n<50)	3.551
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	3.023	SD (KM)	1.669

Variance (KM)	2.787	SE of Mean (KM)	0.249
k hat (KM)	3.278	k star (KM)	3.079
nu hat (KM)	301.6	nu star (KM)	283.3
theta hat (KM)	0.922	theta star (KM)	0.982
80% gamma percentile (KM)	4.298	90% gamma percentile (KM)	5.332
95% gamma percentile (KM)	6.296	99% gamma percentile (KM)	8.383
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (283.28, α)	245.3	Adjusted Chi Square Value (283.28, β)	244.2
95% Gamma Approximate KM-UCL (use when n>=50)	3.491	95% Gamma Adjusted KM-UCL (use when n<50)	3.507
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.938	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.944	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.141	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.132	Detected Data Not Lognormal at 5% Significance Level	
Detected Data Not Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	3.033	Mean in Log Scale	0.93
SD in Original Scale	1.672	SD in Log Scale	0.652
95% t UCL (assumes normality of ROS data)	3.447	95% Percentile Bootstrap UCL	3.44
95% BCA Bootstrap UCL	3.457	95% Bootstrap t UCL	3.473
95% H-UCL (Log ROS)	3.806		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	0.913	KM Geo Mean	2.493
KM SD (logged)	0.679	95% Critical H Value (KM-Log)	2.016
KM Standard Error of Mean (logged)	0.102	95% H-UCL (KM -Log)	3.851
KM SD (logged)	0.679	95% Critical H Value (KM-Log)	2.016
KM Standard Error of Mean (logged)	0.102		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	3.015	Mean in Log Scale	0.898
SD in Original Scale	1.699	SD in Log Scale	0.724
95% t UCL (Assumes normality)	3.436	95% H-Stat UCL	3.982
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Normal Distributed at 5% Significance Level			
Suggested UCL to Use			
95% KM (t) UCL	3.441		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			

Barium

General Statistics			
Total Number of Observations	46	Number of Distinct Observations	46
		Number of Missing Observations	0
Minimum	43.1	Mean	213.1
Maximum	972	Median	122
SD	218.8	Std. Error of Mean	32.26
Coefficient of Variation	1.027	Skewness	2.198
Normal GOF Test			
Shapiro Wilk Test Statistic	0.69	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.945	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.259	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.129	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	267.3	95% Adjusted-CLT UCL (Chen-1995)	277.3
		95% Modified-t UCL (Johnson-1978)	269
Gamma GOF Test			
A-D Test Statistic	2.217	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.767	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.168	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.133	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	1.586	k star (bias corrected MLE)	1.497
Theta hat (MLE)	134.3	Theta star (bias corrected MLE)	142.3
nu hat (MLE)	145.9	nu star (bias corrected)	137.8
MLE Mean (bias corrected)	213.1	MLE Sd (bias corrected)	174.1
		Approximate Chi Square Value (0.05)	111.6
Adjusted Level of Significance	0.0448	Adjusted Chi Square Value	110.9
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	262.9	95% Adjusted Gamma UCL (use when n<50)	264.7
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.925	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.945	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.135	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.129	Data Not Lognormal at 5% Significance Level	
Data Not Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	3.764	Mean of logged Data	5.014

Maximum of Logged Data	6.879	SD of logged Data	0.781
Assuming Lognormal Distribution			
95% H-UCL	261.1	90% Chebyshev (MVUE) UCL	280.4
95% Chebyshev (MVUE) UCL	315.7	97.5% Chebyshev (MVUE) UCL	364.7
99% Chebyshev (MVUE) UCL	460.8		
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution (0.05)			
Nonparametric Distribution Free UCLs			
95% CLT UCL	266.1	95% Jackknife UCL	267.3
95% Standard Bootstrap UCL	264.7	95% Bootstrap-t UCL	285.9
95% Hall's Bootstrap UCL	273.2	95% Percentile Bootstrap UCL	264.7
95% BCA Bootstrap UCL	276.5		
90% Chebyshev(Mean, Sd) UCL	309.9	95% Chebyshev(Mean, Sd) UCL	353.7
97.5% Chebyshev(Mean, Sd) UCL	414.5	99% Chebyshev(Mean, Sd) UCL	534.1
Suggested UCL to Use			
95% Chebyshev (Mean, Sd) UCL	353.7		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
ChromiumVI_EST			
General Statistics			
Total Number of Observations	46	Number of Distinct Observations	33
		Number of Missing Observations	0
Minimum	0.0696	Mean	0.243
Maximum	0.878	Median	0.23
SD	0.117	Std. Error of Mean	0.0173
Coefficient of Variation	0.482	Skewness	3.688
Normal GOF Test			
Shapiro Wilk Test Statistic	0.665	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.945	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.248	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.129	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	0.272	95% Adjusted-CLT UCL (Chen-1995)	0.282
		95% Modified-t UCL (Johnson-1978)	0.274
Gamma GOF Test			

A-D Test Statistic	2.343	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.752	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.18	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.131	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	6.493	k star (bias corrected MLE)	6.084
Theta hat (MLE)	0.0375	Theta star (bias corrected MLE)	0.04
nu hat (MLE)	597.3	nu star (bias corrected)	559.7
MLE Mean (bias corrected)	0.243	MLE Sd (bias corrected)	0.0986
		Approximate Chi Square Value (0.05)	505.8
Adjusted Level of Significance	0.0448	Adjusted Chi Square Value	504.2
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	0.269	95% Adjusted Gamma UCL (use when n<50)	0.27
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.882	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.945	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.177	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.129	Data Not Lognormal at 5% Significance Level	
Data Not Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	-2.665	Mean of logged Data	-1.492
Maximum of Logged Data	-0.13	SD of logged Data	0.393
Assuming Lognormal Distribution			
95% H-UCL	0.27	90% Chebyshev (MVUE) UCL	0.286
95% Chebyshev (MVUE) UCL	0.306	97.5% Chebyshev (MVUE) UCL	0.333
99% Chebyshev (MVUE) UCL	0.386		
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution (0.05)			
Nonparametric Distribution Free UCLs			
95% CLT UCL	0.272	95% Jackknife UCL	0.272
95% Standard Bootstrap UCL	0.271	95% Bootstrap-t UCL	0.292
95% Hall's Bootstrap UCL	0.42	95% Percentile Bootstrap UCL	0.274
95% BCA Bootstrap UCL	0.281		
90% Chebyshev(Mean, Sd) UCL	0.295	95% Chebyshev(Mean, Sd) UCL	0.319
97.5% Chebyshev(Mean, Sd) UCL	0.351	99% Chebyshev(Mean, Sd) UCL	0.415
Suggested UCL to Use			
95% Student's-t UCL	0.272	or 95% Modified-t UCL	0.274
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Cobalt

General Statistics

Total Number of Observations	46	Number of Distinct Observations	27
Number of Detects	45	Number of Non-Detects	1
Number of Distinct Detects	26	Number of Distinct Non-Detects	1
Minimum Detect	1.2	Minimum Non-Detect	1.4
Maximum Detect	6.7	Maximum Non-Detect	1.4
Variance Detects	1.676	Percent Non-Detects	2.174%
Mean Detects	4.618	SD Detects	1.295
Median Detects	4.8	CV Detects	0.28
Skewness Detects	-0.892	Kurtosis Detects	0.794
Mean of Logged Detects	1.475	SD of Logged Detects	0.374

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.925	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.945	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.134	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.131	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	4.543	KM Standard Error of Mean	0.203
KM SD	1.361	95% KM (BCA) UCL	4.874
95% KM (t) UCL	4.884	95% KM (Percentile Bootstrap) UCL	4.867
95% KM (z) UCL	4.877	95% KM Bootstrap t UCL	4.862
90% KM Chebyshev UCL	5.152	95% KM Chebyshev UCL	5.428
97.5% KM Chebyshev UCL	5.811	99% KM Chebyshev UCL	6.562

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	2.241	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.749	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.194	**Kolmogorov-Smirnov GOF**
5% K-S Critical Value	0.132	Detected Data Not Gamma Distributed at 5% Significance Level

Detected Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	9.219	k star (bias corrected MLE)	8.619
Theta hat (MLE)	0.501	Theta star (bias corrected MLE)	0.536
nu hat (MLE)	829.7	nu star (bias corrected)	775.7
Mean (detects)	4.618		

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)

For such situations, GROS method may yield incorrect values of UCLs and BTVs

This is especially true when the sample size is small.

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	1.2	Mean	4.57
Maximum	6.7	Median	4.8
SD	1.321	CV	0.289
k hat (MLE)	8.821	k star (bias corrected MLE)	8.26
Theta hat (MLE)	0.518	Theta star (bias corrected MLE)	0.553
nu hat (MLE)	811.6	nu star (bias corrected)	760
Adjusted Level of Significance (β)	0.0448		
Approximate Chi Square Value (759.96, α)	697	Adjusted Chi Square Value (759.96, β)	695.1
95% Gamma Approximate UCL (use when n>=50)	4.982	95% Gamma Adjusted UCL (use when n<50)	4.996
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	4.543	SD (KM)	1.361
Variance (KM)	1.852	SE of Mean (KM)	0.203
k hat (KM)	11.15	k star (KM)	10.44
nu hat (KM)	1026	nu star (KM)	960.1
theta hat (KM)	0.408	theta star (KM)	0.435
80% gamma percentile (KM)	5.665	90% gamma percentile (KM)	6.413
95% gamma percentile (KM)	7.077	99% gamma percentile (KM)	8.437
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (960.14, α)	889.2	Adjusted Chi Square Value (960.14, β)	887
95% Gamma Approximate KM-UCL (use when n>=50)	4.906	95% Gamma Adjusted KM-UCL (use when n<50)	4.918
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.794	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.945	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.225	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.131	Detected Data Not Lognormal at 5% Significance Level	
Detected Data Not Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	4.563	Mean in Log Scale	1.459
SD in Original Scale	1.334	SD in Log Scale	0.386
95% t UCL (assumes normality of ROS data)	4.893	95% Percentile Bootstrap UCL	4.889
95% BCA Bootstrap UCL	4.843	95% Bootstrap t UCL	4.862
95% H-UCL (Log ROS)	5.14		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	1.447	KM Geo Mean	4.249
KM SD (logged)	0.412	95% Critical H Value (KM-Log)	1.828
KM Standard Error of Mean (logged)	0.0614	95% H-UCL (KM -Log)	5.173
KM SD (logged)	0.412	95% Critical H Value (KM-Log)	1.828
KM Standard Error of Mean (logged)	0.0614		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	4.533	Mean in Log Scale	1.435
SD in Original Scale	1.404	SD in Log Scale	0.458
95% t UCL (Assumes normality)	4.88	95% H-Stat UCL	5.294
DL/2 is not a recommended method, provided for comparisons and historical reasons			

Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution at 5% Significance Level			
Suggested UCL to Use			
95% KM (t) UCL	4.884	KM H-UCL	5.173
95% KM (BCA) UCL	4.874		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Copper			
General Statistics			
Total Number of Observations	46	Number of Distinct Observations	44
		Number of Missing Observations	0
Minimum	3.3	Mean	55.91
Maximum	694	Median	16.15
SD	117.8	Std. Error of Mean	17.37
Coefficient of Variation	2.107	Skewness	4.217
Normal GOF Test			
Shapiro Wilk Test Statistic	0.453	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.945	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.342	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.129	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	85.07	95% Adjusted-CLT UCL (Chen-1995)	96.01
		95% Modified-t UCL (Johnson-1978)	86.87
Gamma GOF Test			
A-D Test Statistic	5.118	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.796	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.285	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.136	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	0.69	k star (bias corrected MLE)	0.659
Theta hat (MLE)	81.02	Theta star (bias corrected MLE)	84.77
nu hat (MLE)	63.48	nu star (bias corrected)	60.67
MLE Mean (bias corrected)	55.91	MLE Sd (bias corrected)	68.84
		Approximate Chi Square Value (0.05)	43.76
Adjusted Level of Significance	0.0448	Adjusted Chi Square Value	43.3

Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	77.51	95% Adjusted Gamma UCL (use when n<50)	78.35
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.858	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.945	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.22	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.129	Data Not Lognormal at 5% Significance Level	
Data Not Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	1.194	Mean of logged Data	3.146
Maximum of Logged Data	6.542	SD of logged Data	1.119
Assuming Lognormal Distribution			
95% H-UCL	65.51	90% Chebyshev (MVUE) UCL	68
95% Chebyshev (MVUE) UCL	79.52	97.5% Chebyshev (MVUE) UCL	95.5
99% Chebyshev (MVUE) UCL	126.9		
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution (0.05)			
Nonparametric Distribution Free UCLs			
95% CLT UCL	84.47	95% Jackknife UCL	85.07
95% Standard Bootstrap UCL	84.32	95% Bootstrap-t UCL	119.8
95% Hall's Bootstrap UCL	194.7	95% Percentile Bootstrap UCL	87.65
95% BCA Bootstrap UCL	97.49		
90% Chebyshev(Mean, Sd) UCL	108	95% Chebyshev(Mean, Sd) UCL	131.6
97.5% Chebyshev(Mean, Sd) UCL	164.4	99% Chebyshev(Mean, Sd) UCL	228.7
Suggested UCL to Use			
95% Chebyshev (Mean, Sd) UCL	131.6		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Vanadium			
General Statistics			
Total Number of Observations	46	Number of Distinct Observations	41
		Number of Missing Observations	0
Minimum	2.6	Mean	12.14
Maximum	55.7	Median	11.1
SD	8.069	Std. Error of Mean	1.19
Coefficient of Variation	0.665	Skewness	3.602

Normal GOF Test			
Shapiro Wilk Test Statistic	0.695	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.945	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.206	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.129	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	14.14	95% Adjusted-CLT UCL (Chen-1995)	14.77
		95% Modified-t UCL (Johnson-1978)	14.24
Gamma GOF Test			
A-D Test Statistic	0.967	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.755	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.139	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.131	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	3.384	k star (bias corrected MLE)	3.178
Theta hat (MLE)	3.588	Theta star (bias corrected MLE)	3.821
nu hat (MLE)	311.3	nu star (bias corrected)	292.4
MLE Mean (bias corrected)	12.14	MLE Sd (bias corrected)	6.811
		Approximate Chi Square Value (0.05)	253.8
Adjusted Level of Significance	0.0448	Adjusted Chi Square Value	252.6
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	13.99	95% Adjusted Gamma UCL (use when n<50)	14.05
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.935	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.945	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.133	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.129	Data Not Lognormal at 5% Significance Level	
Data Not Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	0.956	Mean of logged Data	2.342
Maximum of Logged Data	4.02	SD of logged Data	0.567
Assuming Lognormal Distribution			
95% H-UCL	14.38	90% Chebyshev (MVUE) UCL	15.4
95% Chebyshev (MVUE) UCL	16.87	97.5% Chebyshev (MVUE) UCL	18.91
99% Chebyshev (MVUE) UCL	22.91		
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution (0.05)			
Nonparametric Distribution Free UCLs			

95% CLT UCL	14.1	95% Jackknife UCL	14.14
95% Standard Bootstrap UCL	14.02	95% Bootstrap-t UCL	15.25
95% Hall's Bootstrap UCL	24.15	95% Percentile Bootstrap UCL	14.27
95% BCA Bootstrap UCL	14.97		
90% Chebyshev(Mean, Sd) UCL	15.71	95% Chebyshev(Mean, Sd) UCL	17.33
97.5% Chebyshev(Mean, Sd) UCL	19.57	99% Chebyshev(Mean, Sd) UCL	23.98
Suggested UCL to Use			
95% Chebyshev (Mean, Sd) UCL	17.33		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Zinc			
General Statistics			
Total Number of Observations	46	Number of Distinct Observations	43
		Number of Missing Observations	0
Minimum	13.1	Mean	62.18
Maximum	351	Median	41.9
SD	63.36	Std. Error of Mean	9.342
Coefficient of Variation	1.019	Skewness	3.343
Normal GOF Test			
Shapiro Wilk Test Statistic	0.547	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.945	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.292	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.129	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	77.87	95% Adjusted-CLT UCL (Chen-1995)	82.46
		95% Modified-t UCL (Johnson-1978)	78.63
Gamma GOF Test			
A-D Test Statistic	4.244	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.76	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.246	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.132	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	2.193	k star (bias corrected MLE)	2.064
Theta hat (MLE)	28.35	Theta star (bias corrected MLE)	30.12
nu hat (MLE)	201.8	nu star (bias corrected)	189.9
MLE Mean (bias corrected)	62.18	MLE Sd (bias corrected)	43.27

		Approximate Chi Square Value (0.05)	159
Adjusted Level of Significance	0.0448	Adjusted Chi Square Value	158.1
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	74.25	95% Adjusted Gamma UCL (use when n<50)	74.68
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.858	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.945	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.196	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.129	Data Not Lognormal at 5% Significance Level	
Data Not Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	2.573	Mean of logged Data	3.885
Maximum of Logged Data	5.861	SD of logged Data	0.613
Assuming Lognormal Distribution			
95% H-UCL	70.3	90% Chebyshev (MVUE) UCL	75.46
95% Chebyshev (MVUE) UCL	83.16	97.5% Chebyshev (MVUE) UCL	93.85
99% Chebyshev (MVUE) UCL	114.9		
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution (0.05)			
Nonparametric Distribution Free UCLs			
95% CLT UCL	77.54	95% Jackknife UCL	77.87
95% Standard Bootstrap UCL	76.94	95% Bootstrap-t UCL	89.71
95% Hall's Bootstrap UCL	84.68	95% Percentile Bootstrap UCL	78.72
95% BCA Bootstrap UCL	84.8		
90% Chebyshev(Mean, Sd) UCL	90.2	95% Chebyshev(Mean, Sd) UCL	102.9
97.5% Chebyshev(Mean, Sd) UCL	120.5	99% Chebyshev(Mean, Sd) UCL	155.1
Suggested UCL to Use			
95% Chebyshev (Mean, Sd) UCL	102.9		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Selenium			
General Statistics			
Total Number of Observations	46	Number of Distinct Observations	27
Number of Detects	4	Number of Non-Detects	42
Number of Distinct Detects	4	Number of Distinct Non-Detects	25
Minimum Detect	0.4	Minimum Non-Detect	0.25
Maximum Detect	1.3	Maximum Non-Detect	0.85
Variance Detects	0.175	Percent Non-Detects	91.3%

Mean Detects	0.853	SD Detects	0.418
Median Detects	0.855	CV Detects	0.491
Skewness Detects	-0.0195	Kurtosis Detects	-3.79
Mean of Logged Detects	-0.263	SD of Logged Detects	0.543
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.935	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.748	Detected Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.223	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.375	Detected Data appear Normal at 5% Significance Level	
Detected Data appear Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.305	KM Standard Error of Mean	0.0345
KM SD	0.201	95% KM (BCA) UCL	N/A
95% KM (t) UCL	0.363	95% KM (Percentile Bootstrap) UCL	N/A
95% KM (z) UCL	0.361	95% KM Bootstrap t UCL	N/A
90% KM Chebyshev UCL	0.408	95% KM Chebyshev UCL	0.455
97.5% KM Chebyshev UCL	0.52	99% KM Chebyshev UCL	0.648
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	0.308	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.659	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.271	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.396	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	4.985	k star (bias corrected MLE)	1.413
Theta hat (MLE)	0.171	Theta star (bias corrected MLE)	0.603
nu hat (MLE)	39.88	nu star (bias corrected)	11.3
Mean (detects)	0.853		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	0.0833
Maximum	1.3	Median	0.01
SD	0.263	CV	3.161
k hat (MLE)	0.381	k star (bias corrected MLE)	0.37
Theta hat (MLE)	0.219	Theta star (bias corrected MLE)	0.225
nu hat (MLE)	35.03	nu star (bias corrected)	34.08
Adjusted Level of Significance (β)	0.0448		
Approximate Chi Square Value (34.08, α)	21.73	Adjusted Chi Square Value (34.08, β)	21.41
95% Gamma Approximate UCL (use when n>=50)	0.131	95% Gamma Adjusted UCL (use when n<50)	N/A
Estimates of Gamma Parameters using KM Estimates			

Mean (KM)	0.305	SD (KM)	0.201
Variance (KM)	0.0405	SE of Mean (KM)	0.0345
k hat (KM)	2.295	k star (KM)	2.16
nu hat (KM)	211.1	nu star (KM)	198.7
theta hat (KM)	0.133	theta star (KM)	0.141
80% gamma percentile (KM)	0.452	90% gamma percentile (KM)	0.582
95% gamma percentile (KM)	0.706	99% gamma percentile (KM)	0.978
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (198.70, α)	167.1	Adjusted Chi Square Value (198.70, β)	166.2
95% Gamma Approximate KM-UCL (use when n>=50)	0.362	95% Gamma Adjusted KM-UCL (use when n<50)	0.364
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.934	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.748	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.245	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.375	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.122	Mean in Log Scale	-2.865
SD in Original Scale	0.254	SD in Log Scale	0.999
95% t UCL (assumes normality of ROS data)	0.185	95% Percentile Bootstrap UCL	0.184
95% BCA Bootstrap UCL	0.21	95% Bootstrap t UCL	0.284
95% H-UCL (Log ROS)	0.133		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-1.282	KM Geo Mean	0.278
KM SD (logged)	0.349	95% Critical H Value (KM-Log)	1.785
KM Standard Error of Mean (logged)	0.0606	95% H-UCL (KM -Log)	0.324
KM SD (logged)	0.349	95% Critical H Value (KM-Log)	1.785
KM Standard Error of Mean (logged)	0.0606		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.259	Mean in Log Scale	-1.52
SD in Original Scale	0.223	SD in Log Scale	0.493
95% t UCL (Assumes normality)	0.314	95% H-Stat UCL	0.284
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Normal Distributed at 5% Significance Level			
Suggested UCL to Use			
95% KM (t) UCL	0.363		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			

Naphthalene

General Statistics

Total Number of Observations	46	Number of Distinct Observations	20
Number of Detects	1	Number of Non-Detects	45
Number of Distinct Detects	1	Number of Distinct Non-Detects	19

Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set!

It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable Naphthalene was not processed!

ProUCL Output
South Percolation Pond Area Soil (0-12 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

UCL Statistics for Data Sets with Non-Detects	
User Selected Options	
Date/Time of Computation	ProUCL 5.11/28/2019 5:30:18 PM
From File	20190128_SPercPond_ProUCL_input_b.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Bis2EthylhexylPhthalate

General Statistics			
Total Number of Observations	66	Number of Distinct Observations	19
		Number of Missing Observations	3
Number of Detects	6	Number of Non-Detects	60
Number of Distinct Detects	6	Number of Distinct Non-Detects	13
Minimum Detect	0.028	Minimum Non-Detect	0.013
Maximum Detect	2.2	Maximum Non-Detect	0.23
Variance Detects	0.76	Percent Non-Detects	90.91%
Mean Detects	0.421	SD Detects	0.872
Median Detects	0.075	CV Detects	2.07
Skewness Detects	2.443	Kurtosis Detects	5.976
Mean of Logged Detects	-2.237	SD of Logged Detects	1.563

Normal GOF Test on Detects Only		
Shapiro Wilk Test Statistic	0.528	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.788	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.473	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.325	Detected Data Not Normal at 5% Significance Level
Detected Data Not Normal at 5% Significance Level		

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.0502	KM Standard Error of Mean	0.036
KM SD	0.267	95% KM (BCA) UCL	0.147
95% KM (t) UCL	0.11	95% KM (Percentile Bootstrap) UCL	0.116
95% KM (z) UCL	0.109	95% KM Bootstrap t UCL	0.723
90% KM Chebyshev UCL	0.158	95% KM Chebyshev UCL	0.207
97.5% KM Chebyshev UCL	0.275	99% KM Chebyshev UCL	0.409

Gamma GOF Tests on Detected Observations Only		
A-D Test Statistic	1.084	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.741	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.427	**Kolmogorov-Smirnov GOF**
5% K-S Critical Value	0.35	Detected Data Not Gamma Distributed at 5% Significance Level
Detected Data Not Gamma Distributed at 5% Significance Level		

Gamma Statistics on Detected Data Only			
k hat (MLE)	0.468	k star (bias corrected MLE)	0.345
Theta hat (MLE)	0.9	Theta star (bias corrected MLE)	1.221
nu hat (MLE)	5.614	nu star (bias corrected)	4.14

Mean (detects)	0.421		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	0.0474
Maximum	2.2	Median	0.01
SD	0.27	CV	5.69
k hat (MLE)	0.477	k star (bias corrected MLE)	0.466
Theta hat (MLE)	0.0993	Theta star (bias corrected MLE)	0.102
nu hat (MLE)	63.01	nu star (bias corrected)	61.48
Adjusted Level of Significance (β)	0.0464		
Approximate Chi Square Value (61.48, α)	44.45	Adjusted Chi Square Value (61.48, β)	44.12
95% Gamma Approximate UCL (use when n>=50)	0.0655	95% Gamma Adjusted UCL (use when n<50)	0.066
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.0502	SD (KM)	0.267
Variance (KM)	0.0714	SE of Mean (KM)	0.036
k hat (KM)	0.0353	k star (KM)	0.0438
nu hat (KM)	4.656	nu star (KM)	5.778
theta hat (KM)	1.422	theta star (KM)	1.146
80% gamma percentile (KM)	0.00409	90% gamma percentile (KM)	0.0633
95% gamma percentile (KM)	0.252	99% gamma percentile (KM)	1.148
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (5.78, α)	1.527	Adjusted Chi Square Value (5.78, β)	1.48
95% Gamma Approximate KM-UCL (use when n>=50)	0.19	95% Gamma Adjusted KM-UCL (use when n<50)	0.196
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.787	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.788	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.326	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.325	Detected Data Not Lognormal at 5% Significance Level	
Detected Data Not Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.0388	Mean in Log Scale	-9.342
SD in Original Scale	0.271	SD in Log Scale	3.475
95% t UCL (assumes normality of ROS data)	0.0944	95% Percentile Bootstrap UCL	0.105
95% BCA Bootstrap UCL	0.142	95% Bootstrap t UCL	0.818
95% H-UCL (Log ROS)	0.254		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-4.149	KM Geo Mean	0.0158
KM SD (logged)	0.744	95% Critical H Value (KM-Log)	2.049
KM Standard Error of Mean (logged)	0.101	95% H-UCL (KM -Log)	0.0251
KM SD (logged)	0.744	95% Critical H Value (KM-Log)	2.049

KM Standard Error of Mean (logged)	0.101		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.0472	Mean in Log Scale	-4.569
SD in Original Scale	0.27	SD in Log Scale	0.934
95% t UCL (Assumes normality)	0.103	95% H-Stat UCL	0.0207
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution at 5% Significance Level			
Suggested UCL to Use			
95% KM (Chebyshev) UCL	0.207		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Fluoride			
General Statistics			
Total Number of Observations	66	Number of Distinct Observations	63
		Number of Missing Observations	3
Minimum	0.8	Mean	12.05
Maximum	44.1	Median	12.2
SD	8.862	Std. Error of Mean	1.091
Coefficient of Variation	0.735	Skewness	0.977
Normal GOF Test			
Shapiro Wilk Test Statistic	0.916	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	1.4708E-4	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.102	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.109	Data appear Normal at 5% Significance Level	
Data appear Approximate Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	13.87	95% Adjusted-CLT UCL (Chen-1995)	13.98
		95% Modified-t UCL (Johnson-1978)	13.89
Gamma GOF Test			
A-D Test Statistic	1.154	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.768	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.124	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.112	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			

Gamma Statistics			
k hat (MLE)	1.546	k star (bias corrected MLE)	1.486
Theta hat (MLE)	7.794	Theta star (bias corrected MLE)	8.11
nu hat (MLE)	204.1	nu star (bias corrected)	196.1
MLE Mean (bias corrected)	12.05	MLE Sd (bias corrected)	9.886
		Approximate Chi Square Value (0.05)	164.7
Adjusted Level of Significance	0.0464	Adjusted Chi Square Value	164.1
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	14.35	95% Adjusted Gamma UCL (use when n<50)	14.4
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.916	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk P Value	1.5046E-4	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.162	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.109	Data Not Lognormal at 5% Significance Level	
Data Not Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	-0.223	Mean of logged Data	2.132
Maximum of Logged Data	3.786	SD of logged Data	0.96
Assuming Lognormal Distribution			
95% H-UCL	17.43	90% Chebyshev (MVUE) UCL	18.74
95% Chebyshev (MVUE) UCL	21.23	97.5% Chebyshev (MVUE) UCL	24.69
99% Chebyshev (MVUE) UCL	31.49		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	13.84	95% Jackknife UCL	13.87
95% Standard Bootstrap UCL	13.78	95% Bootstrap-t UCL	13.99
95% Hall's Bootstrap UCL	14.06	95% Percentile Bootstrap UCL	13.86
95% BCA Bootstrap UCL	14.1		
90% Chebyshev(Mean, Sd) UCL	15.32	95% Chebyshev(Mean, Sd) UCL	16.81
97.5% Chebyshev(Mean, Sd) UCL	18.86	99% Chebyshev(Mean, Sd) UCL	22.9
Suggested UCL to Use			
95% Student's-t UCL	13.87		
When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test			
When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Indeno123CDPyrene			

ProUCL Output
South Percolation Pond Area Soil (0-12 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

General Statistics			
Total Number of Observations	66	Number of Distinct Observations	42
		Number of Missing Observations	3
Number of Detects	42	Number of Non-Detects	24
Number of Distinct Detects	36	Number of Distinct Non-Detects	8
Minimum Detect	0.027	Minimum Non-Detect	0.023
Maximum Detect	3.1	Maximum Non-Detect	0.041
Variance Detects	0.326	Percent Non-Detects	36.36%
Mean Detects	0.281	SD Detects	0.571
Median Detects	0.11	CV Detects	2.035
Skewness Detects	4.055	Kurtosis Detects	17.16
Mean of Logged Detects	-2.039	SD of Logged Detects	1.06
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.433	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.942	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.369	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.135	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.187	KM Standard Error of Mean	0.0582
KM SD	0.467	95% KM (BCA) UCL	0.295
95% KM (t) UCL	0.284	95% KM (Percentile Bootstrap) UCL	0.294
95% KM (z) UCL	0.283	95% KM Bootstrap t UCL	0.46
90% KM Chebyshev UCL	0.362	95% KM Chebyshev UCL	0.441
97.5% KM Chebyshev UCL	0.551	99% KM Chebyshev UCL	0.766
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	3.316	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.788	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.247	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.142	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.775	k star (bias corrected MLE)	0.735
Theta hat (MLE)	0.362	Theta star (bias corrected MLE)	0.382
nu hat (MLE)	65.09	nu star (bias corrected)	61.78
Mean (detects)	0.281		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	0.182
Maximum	3.1	Median	0.0605

SD	0.472	CV	2.591
k hat (MLE)	0.5	k star (bias corrected MLE)	0.487
Theta hat (MLE)	0.365	Theta star (bias corrected MLE)	0.374
nu hat (MLE)	66	nu star (bias corrected)	64.34
Adjusted Level of Significance (β)	0.0464		
Approximate Chi Square Value (64.34, α)	46.88	Adjusted Chi Square Value (64.34, β)	46.55
95% Gamma Approximate UCL (use when n>=50)	0.25	95% Gamma Adjusted UCL (use when n<50)	0.252
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.187	SD (KM)	0.467
Variance (KM)	0.218	SE of Mean (KM)	0.0582
k hat (KM)	0.16	k star (KM)	0.163
nu hat (KM)	21.18	nu star (KM)	21.55
theta hat (KM)	1.166	theta star (KM)	1.146
80% gamma percentile (KM)	0.217	90% gamma percentile (KM)	0.56
95% gamma percentile (KM)	1.012	99% gamma percentile (KM)	2.301
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (21.55, α)	12	Adjusted Chi Square Value (21.55, β)	11.84
95% Gamma Approximate KM-UCL (use when n>=50)	0.336	95% Gamma Adjusted KM-UCL (use when n<50)	0.34
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.891	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.942	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.129	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.135	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Approximate Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.183	Mean in Log Scale	-2.953
SD in Original Scale	0.472	SD in Log Scale	1.517
95% t UCL (assumes normality of ROS data)	0.28	95% Percentile Bootstrap UCL	0.287
95% BCA Bootstrap UCL	0.337	95% Bootstrap t UCL	0.479
95% H-UCL (Log ROS)	0.261		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-2.667	KM Geo Mean	0.0695
KM SD (logged)	1.178	95% Critical H Value (KM-Log)	2.223
KM Standard Error of Mean (logged)	0.147	95% H-UCL (KM -Log)	0.192
KM SD (logged)	1.178	95% Critical H Value (KM-Log)	2.223
KM Standard Error of Mean (logged)	0.147		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.183	Mean in Log Scale	-2.878
SD in Original Scale	0.472	SD in Log Scale	1.402
95% t UCL (Assumes normality)	0.28	95% H-Stat UCL	0.223
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			

Detected Data appear Approximate Lognormal Distributed at 5% Significance Level			
Suggested UCL to Use			
KM H-UCL	0.192		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
BenzoBFluoranthene			
General Statistics			
Total Number of Observations	66	Number of Distinct Observations	35
		Number of Missing Observations	3
Number of Detects	47	Number of Non-Detects	19
Number of Distinct Detects	31	Number of Distinct Non-Detects	4
Minimum Detect	0.019	Minimum Non-Detect	0.014
Maximum Detect	6.6	Maximum Non-Detect	0.024
Variance Detects	1.37	Percent Non-Detects	28.79%
Mean Detects	0.398	SD Detects	1.171
Median Detects	0.12	CV Detects	2.941
Skewness Detects	4.741	Kurtosis Detects	22.22
Mean of Logged Detects	-2.006	SD of Logged Detects	1.154
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.306	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.946	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.431	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.128	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.287	KM Standard Error of Mean	0.124
KM SD	0.993	95% KM (BCA) UCL	0.513
95% KM (t) UCL	0.494	95% KM (Percentile Bootstrap) UCL	0.515
95% KM (z) UCL	0.491	95% KM Bootstrap t UCL	1.746
90% KM Chebyshev UCL	0.658	95% KM Chebyshev UCL	0.826
97.5% KM Chebyshev UCL	1.059	99% KM Chebyshev UCL	1.516
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	5.486	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.807	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.277	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.136	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.574	k star (bias corrected MLE)	0.551
Theta hat (MLE)	0.694	Theta star (bias corrected MLE)	0.722

nu hat (MLE)	53.91	nu star (bias corrected)	51.81
Mean (detects)	0.398		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	0.286
Maximum	6.6	Median	0.088
SD	1.001	CV	3.495
k hat (MLE)	0.432	k star (bias corrected MLE)	0.423
Theta hat (MLE)	0.662	Theta star (bias corrected MLE)	0.677
nu hat (MLE)	57.06	nu star (bias corrected)	55.8
Adjusted Level of Significance (β)	0.0464		
Approximate Chi Square Value (55.80, α)	39.63	Adjusted Chi Square Value (55.80, β)	39.33
95% Gamma Approximate UCL (use when n>=50)	0.403	95% Gamma Adjusted UCL (use when n<50)	0.406
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.287	SD (KM)	0.993
Variance (KM)	0.985	SE of Mean (KM)	0.124
k hat (KM)	0.0839	k star (KM)	0.0902
nu hat (KM)	11.07	nu star (KM)	11.9
theta hat (KM)	3.428	theta star (KM)	3.189
80% gamma percentile (KM)	0.17	90% gamma percentile (KM)	0.729
95% gamma percentile (KM)	1.675	99% gamma percentile (KM)	4.807
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (11.90, α)	5.162	Adjusted Chi Square Value (11.90, β)	5.062
95% Gamma Approximate KM-UCL (use when n>=50)	0.663	95% Gamma Adjusted KM-UCL (use when n<50)	0.676
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.903	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.946	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.125	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.128	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Approximate Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.287	Mean in Log Scale	-2.753
SD in Original Scale	1	SD in Log Scale	1.563
95% t UCL (assumes normality of ROS data)	0.492	95% Percentile Bootstrap UCL	0.528
95% BCA Bootstrap UCL	0.604	95% Bootstrap t UCL	1.715
95% H-UCL (Log ROS)	0.35		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-2.657	KM Geo Mean	0.0702
KM SD (logged)	1.406	95% Critical H Value (KM-Log)	2.276
KM Standard Error of Mean (logged)	0.175	95% H-UCL (KM -Log)	0.28

KM SD (logged)	1.406	95% Critical H Value (KM-Log)	2.276
KM Standard Error of Mean (logged)	0.175		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.286	Mean in Log Scale	-2.827
SD in Original Scale	1.001	SD in Log Scale	1.625
95% t UCL (Assumes normality)	0.491	95% H-Stat UCL	0.371

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Approximate Lognormal Distributed at 5% Significance Level

Suggested UCL to Use

KM H-UCL	0.28		

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

BenzoAPyrene

General Statistics

Total Number of Observations	66	Number of Distinct Observations	41
		Number of Missing Observations	3
Number of Detects	43	Number of Non-Detects	23
Number of Distinct Detects	37	Number of Distinct Non-Detects	6
Minimum Detect	0.014	Minimum Non-Detect	0.01
Maximum Detect	4	Maximum Non-Detect	0.019
Variance Detects	0.519	Percent Non-Detects	34.85%
Mean Detects	0.257	SD Detects	0.721
Median Detects	0.075	CV Detects	2.807
Skewness Detects	4.581	Kurtosis Detects	21.04
Mean of Logged Detects	-2.44	SD of Logged Detects	1.168

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.329	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.943	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.411	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.134	Detected Data Not Normal at 5% Significance Level	

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	0.171	KM Standard Error of Mean	0.0731
KM SD	0.587	95% KM (BCA) UCL	0.335
95% KM (t) UCL	0.293	95% KM (Percentile Bootstrap) UCL	0.302
95% KM (z) UCL	0.291	95% KM Bootstrap t UCL	0.961
90% KM Chebyshev UCL	0.39	95% KM Chebyshev UCL	0.489
97.5% KM Chebyshev UCL	0.627	99% KM Chebyshev UCL	0.898

Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	4.799	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.806	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.259	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.142	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.575	k star (bias corrected MLE)	0.551
Theta hat (MLE)	0.446	Theta star (bias corrected MLE)	0.466
nu hat (MLE)	49.49	nu star (bias corrected)	47.37
Mean (detects)	0.257		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	0.171
Maximum	4	Median	0.039
SD	0.591	CV	3.462
k hat (MLE)	0.452	k star (bias corrected MLE)	0.442
Theta hat (MLE)	0.378	Theta star (bias corrected MLE)	0.387
nu hat (MLE)	59.68	nu star (bias corrected)	58.31
Adjusted Level of Significance (β)	0.0464		
Approximate Chi Square Value (58.31, α)	41.75	Adjusted Chi Square Value (58.31, β)	41.44
95% Gamma Approximate UCL (use when n>=50)	0.238	95% Gamma Adjusted UCL (use when n<50)	0.24
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.171	SD (KM)	0.587
Variance (KM)	0.344	SE of Mean (KM)	0.0731
k hat (KM)	0.0847	k star (KM)	0.091
nu hat (KM)	11.18	nu star (KM)	12.01
theta hat (KM)	2.016	theta star (KM)	1.877
80% gamma percentile (KM)	0.102	90% gamma percentile (KM)	0.435
95% gamma percentile (KM)	0.995	99% gamma percentile (KM)	2.843
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (12.01, α)	5.232	Adjusted Chi Square Value (12.01, β)	5.132
95% Gamma Approximate KM-UCL (use when n>=50)	0.392	95% Gamma Adjusted KM-UCL (use when n<50)	0.4
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.906	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.943	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.129	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.134	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Approximate Lognormal at 5% Significance Level			

Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.17	Mean in Log Scale	-3.392
SD in Original Scale	0.592	SD in Log Scale	1.659
95% t UCL (assumes normality of ROS data)	0.291	95% Percentile Bootstrap UCL	0.302
95% BCA Bootstrap UCL	0.368	95% Bootstrap t UCL	0.897
95% H-UCL (Log ROS)	0.227		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-3.194	KM Geo Mean	0.041
KM SD (logged)	1.389	95% Critical H Value (KM-Log)	2.257
KM Standard Error of Mean (logged)	0.173	95% H-UCL (KM -Log)	0.159
KM SD (logged)	1.389	95% Critical H Value (KM-Log)	2.257
KM Standard Error of Mean (logged)	0.173		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.169	Mean in Log Scale	-3.369
SD in Original Scale	0.592	SD in Log Scale	1.59
95% t UCL (Assumes normality)	0.291	95% H-Stat UCL	0.2
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Approximate Lognormal Distributed at 5% Significance Level			
Suggested UCL to Use			
KM H-UCL	0.159		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
DibenzAHAnthracene			
General Statistics			
Total Number of Observations	66	Number of Distinct Observations	25
		Number of Missing Observations	3
Number of Detects	17	Number of Non-Detects	49
Number of Distinct Detects	16	Number of Distinct Non-Detects	10
Minimum Detect	0.019	Minimum Non-Detect	0.018
Maximum Detect	0.44	Maximum Non-Detect	0.31
Variance Detects	0.00994	Percent Non-Detects	74.24%
Mean Detects	0.0826	SD Detects	0.0997
Median Detects	0.051	CV Detects	1.207
Skewness Detects	3.258	Kurtosis Detects	11.47
Mean of Logged Detects	-2.828	SD of Logged Detects	0.722
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.535	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.892	Detected Data Not Normal at 5% Significance Level	

Lilliefors Test Statistic	0.374	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.207	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.0348	KM Standard Error of Mean	0.00721
KM SD	0.0567	95% KM (BCA) UCL	0.0488
95% KM (t) UCL	0.0468	95% KM (Percentile Bootstrap) UCL	0.0472
95% KM (z) UCL	0.0467	95% KM Bootstrap t UCL	0.0688
90% KM Chebyshev UCL	0.0564	95% KM Chebyshev UCL	0.0662
97.5% KM Chebyshev UCL	0.0798	99% KM Chebyshev UCL	0.107
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	1.88	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.754	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.351	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.213	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	1.645	k star (bias corrected MLE)	1.394
Theta hat (MLE)	0.0502	Theta star (bias corrected MLE)	0.0592
nu hat (MLE)	55.94	nu star (bias corrected)	47.41
Mean (detects)	0.0826		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	0.0287
Maximum	0.44	Median	0.01
SD	0.0589	CV	2.053
k hat (MLE)	0.971	k star (bias corrected MLE)	0.937
Theta hat (MLE)	0.0295	Theta star (bias corrected MLE)	0.0306
nu hat (MLE)	128.2	nu star (bias corrected)	123.7
Adjusted Level of Significance (β)	0.0464		
Approximate Chi Square Value (123.71, α)	99.03	Adjusted Chi Square Value (123.71, β)	98.54
95% Gamma Approximate UCL (use when n>=50)	0.0359	95% Gamma Adjusted UCL (use when n<50)	0.036
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.0348	SD (KM)	0.0567
Variance (KM)	0.00322	SE of Mean (KM)	0.00721
k hat (KM)	0.377	k star (KM)	0.37
nu hat (KM)	49.76	nu star (KM)	48.83
theta hat (KM)	0.0924	theta star (KM)	0.0941
80% gamma percentile (KM)	0.0556	90% gamma percentile (KM)	0.0997
95% gamma percentile (KM)	0.149	99% gamma percentile (KM)	0.273

Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (48.83, α)	33.79	Adjusted Chi Square Value (48.83, β)	33.51
95% Gamma Approximate KM-UCL (use when n>=50)	0.0503	95% Gamma Adjusted KM-UCL (use when n<50)	0.0507
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.839	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.892	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.305	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.207	Detected Data Not Lognormal at 5% Significance Level	
Detected Data Not Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.0267	Mean in Log Scale	-4.593
SD in Original Scale	0.0597	SD in Log Scale	1.313
95% t UCL (assumes normality of ROS data)	0.0389	95% Percentile Bootstrap UCL	0.0406
95% BCA Bootstrap UCL	0.0464	95% Bootstrap t UCL	0.0535
95% H-UCL (Log ROS)	0.0342		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-3.706	KM Geo Mean	0.0246
KM SD (logged)	0.632	95% Critical H Value (KM-Log)	1.959
KM Standard Error of Mean (logged)	0.0806	95% H-UCL (KM -Log)	0.035
KM SD (logged)	0.632	95% Critical H Value (KM-Log)	1.959
KM Standard Error of Mean (logged)	0.0806		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.0311	Mean in Log Scale	-4.099
SD in Original Scale	0.0608	SD in Log Scale	0.909
95% t UCL (Assumes normality)	0.0435	95% H-Stat UCL	0.0321
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution at 5% Significance Level			
Suggested UCL to Use			
95% KM (Chebyshev) UCL	0.0662		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
BenzoAAnthracene			
General Statistics			
Total Number of Observations	66	Number of Distinct Observations	34
		Number of Missing Observations	3
Number of Detects	32	Number of Non-Detects	34
Number of Distinct Detects	24	Number of Distinct Non-Detects	10

Minimum Detect	0.038	Minimum Non-Detect	0.029
Maximum Detect	0.75	Maximum Non-Detect	0.5
Variance Detects	0.0185	Percent Non-Detects	51.52%
Mean Detects	0.12	SD Detects	0.136
Median Detects	0.0665	CV Detects	1.134
Skewness Detects	3.565	Kurtosis Detects	15.09
Mean of Logged Detects	-2.44	SD of Logged Detects	0.723
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.585	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.93	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.273	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.154	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.0737	KM Standard Error of Mean	0.013
KM SD	0.104	95% KM (BCA) UCL	0.0979
95% KM (t) UCL	0.0954	95% KM (Percentile Bootstrap) UCL	0.096
95% KM (z) UCL	0.0951	95% KM Bootstrap t UCL	0.114
90% KM Chebyshev UCL	0.113	95% KM Chebyshev UCL	0.131
97.5% KM Chebyshev UCL	0.155	99% KM Chebyshev UCL	0.203
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	1.81	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.762	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.199	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.158	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	1.71	k star (bias corrected MLE)	1.57
Theta hat (MLE)	0.0702	Theta star (bias corrected MLE)	0.0765
nu hat (MLE)	109.4	nu star (bias corrected)	100.5
Mean (detects)	0.12		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	0.0634
Maximum	0.75	Median	0.01
SD	0.109	CV	1.722
k hat (MLE)	0.751	k star (bias corrected MLE)	0.727
Theta hat (MLE)	0.0844	Theta star (bias corrected MLE)	0.0871
nu hat (MLE)	99.18	nu star (bias corrected)	96
Adjusted Level of Significance (β)	0.0464		
Approximate Chi Square Value (96.00, α)	74.4	Adjusted Chi Square Value (96.00, β)	73.98

95% Gamma Approximate UCL (use when n>=50)	0.0818	95% Gamma Adjusted UCL (use when n<50)	0.0822
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.0737	SD (KM)	0.104
Variance (KM)	0.0108	SE of Mean (KM)	0.013
k hat (KM)	0.502	k star (KM)	0.49
nu hat (KM)	66.3	nu star (KM)	64.62
theta hat (KM)	0.147	theta star (KM)	0.151
80% gamma percentile (KM)	0.121	90% gamma percentile (KM)	0.2
95% gamma percentile (KM)	0.285	99% gamma percentile (KM)	0.495
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (64.62, α)	47.12	Adjusted Chi Square Value (64.62, β)	46.79
95% Gamma Approximate KM-UCL (use when n>=50)	0.101	95% Gamma Adjusted KM-UCL (use when n<50)	0.102
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.89	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.93	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.167	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.154	Detected Data Not Lognormal at 5% Significance Level	
Detected Data Not Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.0661	Mean in Log Scale	-3.399
SD in Original Scale	0.108	SD in Log Scale	1.127
95% t UCL (assumes normality of ROS data)	0.0883	95% Percentile Bootstrap UCL	0.0892
95% BCA Bootstrap UCL	0.0993	95% Bootstrap t UCL	0.104
95% H-UCL (Log ROS)	0.0863		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-2.999	KM Geo Mean	0.0498
KM SD (logged)	0.742	95% Critical H Value (KM-Log)	2.047
KM Standard Error of Mean (logged)	0.0933	95% H-UCL (KM -Log)	0.0792
KM SD (logged)	0.742	95% Critical H Value (KM-Log)	2.047
KM Standard Error of Mean (logged)	0.0933		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.07	Mean in Log Scale	-3.277
SD in Original Scale	0.11	SD in Log Scale	1.018
95% t UCL (Assumes normality)	0.0925	95% H-Stat UCL	0.0843
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution at 5% Significance Level			
Suggested UCL to Use			
95% KM (Chebyshev) UCL	0.131		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Aluminum

General Statistics

Total Number of Observations	66	Number of Distinct Observations	62
		Number of Missing Observations	3
Minimum	2560	Mean	7740
Maximum	16100	Median	7700
SD	2157	Std. Error of Mean	265.5
Coefficient of Variation	0.279	Skewness	0.624

Normal GOF Test

Shapiro Wilk Test Statistic	0.964	**Shapiro Wilk GOF Test**
5% Shapiro Wilk P Value	0.141	Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.0982	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.109	Data appear Normal at 5% Significance Level

Data appear Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	8183	95% Adjusted-CLT UCL (Chen-1995)	8198
		95% Modified-t UCL (Johnson-1978)	8186

Gamma GOF Test

A-D Test Statistic	0.871	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.75	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.117	**Kolmogorov-Smirnov Gamma GOF Test**
5% K-S Critical Value	0.11	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	12.15	k star (bias corrected MLE)	11.61
Theta hat (MLE)	636.9	Theta star (bias corrected MLE)	666.6
nu hat (MLE)	1604	nu star (bias corrected)	1533
MLE Mean (bias corrected)	7740	MLE Sd (bias corrected)	2271
		Approximate Chi Square Value (0.05)	1443
Adjusted Level of Significance	0.0464	Adjusted Chi Square Value	1441

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	8222	95% Adjusted Gamma UCL (use when n<50)	8233

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.925	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk P Value	5.4337E-4	Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.138	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.109	Data Not Lognormal at 5% Significance Level

Data Not Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	7.848	Mean of logged Data	8.912
Maximum of Logged Data	9.687	SD of logged Data	0.305
Assuming Lognormal Distribution			
95% H-UCL	8311	90% Chebyshev (MVUE) UCL	8663
95% Chebyshev (MVUE) UCL	9068	97.5% Chebyshev (MVUE) UCL	9629
99% Chebyshev (MVUE) UCL	10731		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	8176	95% Jackknife UCL	8183
95% Standard Bootstrap UCL	8186	95% Bootstrap-t UCL	8188
95% Hall's Bootstrap UCL	8218	95% Percentile Bootstrap UCL	8171
95% BCA Bootstrap UCL	8223		
90% Chebyshev(Mean, Sd) UCL	8536	95% Chebyshev(Mean, Sd) UCL	8897
97.5% Chebyshev(Mean, Sd) UCL	9397	99% Chebyshev(Mean, Sd) UCL	10381
Suggested UCL to Use			
95% Student's-t UCL	8183		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Iron			
General Statistics			
Total Number of Observations	66	Number of Distinct Observations	50
		Number of Missing Observations	3
Minimum	1580	Mean	11107
Maximum	16300	Median	11950
SD	3401	Std. Error of Mean	418.6
Coefficient of Variation	0.306	Skewness	-1.232
Normal GOF Test			
Shapiro Wilk Test Statistic	0.881	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	6.4766E-7	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.147	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.109	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	

95% Student's-t UCL	11806	95% Adjusted-CLT UCL (Chen-1995)	11728
		95% Modified-t UCL (Johnson-1978)	11795
Gamma GOF Test			
A-D Test Statistic	5.197	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.753	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.212	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.11	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	6.276	k star (bias corrected MLE)	6.001
Theta hat (MLE)	1770	Theta star (bias corrected MLE)	1851
nu hat (MLE)	828.4	nu star (bias corrected)	792.1
MLE Mean (bias corrected)	11107	MLE Sd (bias corrected)	4534
		Approximate Chi Square Value (0.05)	727.8
Adjusted Level of Significance	0.0464	Adjusted Chi Square Value	726.4
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	12089	95% Adjusted Gamma UCL (use when n<50)	12111
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.7	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk P Value	0	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.24	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.109	Data Not Lognormal at 5% Significance Level	
Data Not Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	7.365	Mean of logged Data	9.234
Maximum of Logged Data	9.699	SD of logged Data	0.483
Assuming Lognormal Distribution			
95% H-UCL	12849	90% Chebyshev (MVUE) UCL	13622
95% Chebyshev (MVUE) UCL	14594	97.5% Chebyshev (MVUE) UCL	15943
99% Chebyshev (MVUE) UCL	18593		
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution (0.05)			
Nonparametric Distribution Free UCLs			
95% CLT UCL	11796	95% Jackknife UCL	11806
95% Standard Bootstrap UCL	11771	95% Bootstrap-t UCL	11732
95% Hall's Bootstrap UCL	11728	95% Percentile Bootstrap UCL	11780
95% BCA Bootstrap UCL	11725		
90% Chebyshev(Mean, Sd) UCL	12363	95% Chebyshev(Mean, Sd) UCL	12932
97.5% Chebyshev(Mean, Sd) UCL	13721	99% Chebyshev(Mean, Sd) UCL	15272
Suggested UCL to Use			
95% Student's-t UCL	11806	or 95% Modified-t UCL	11795

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Note: For highly negatively-skewed data, confidence limits (e.g., Chen, Johnson, Lognormal, and Gamma) may not be reliable. Chen's and Johnson's methods provide adjustments for positvely skewed data sets.

Manganese

General Statistics

Total Number of Observations	66	Number of Distinct Observations	63
		Number of Missing Observations	3
Minimum	10.7	Mean	200.8
Maximum	415	Median	215.5
SD	119.6	Std. Error of Mean	14.72
Coefficient of Variation	0.596	Skewness	0.0823

Normal GOF Test

Shapiro Wilk Test Statistic	0.898	**Shapiro Wilk GOF Test**
5% Shapiro Wilk P Value	9.0243E-6	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.172	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.109	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	225.3	95% Adjusted-CLT UCL (Chen-1995)	225.1
		95% Modified-t UCL (Johnson-1978)	225.4

Gamma GOF Test

A-D Test Statistic	2.136	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.763	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.187	**Kolmogorov-Smirnov Gamma GOF Test**
5% K-S Critical Value	0.111	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	2.108	k star (bias corrected MLE)	2.023
Theta hat (MLE)	95.22	Theta star (bias corrected MLE)	99.26
nu hat (MLE)	278.3	nu star (bias corrected)	267
MLE Mean (bias corrected)	200.8	MLE Sd (bias corrected)	141.2
		Approximate Chi Square Value (0.05)	230.2
Adjusted Level of Significance	0.0464	Adjusted Chi Square Value	229.4

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	232.9	95% Adjusted Gamma UCL (use when n<50)	233.7

Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.88	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk P Value	6.1672E-7	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.189	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.109	Data Not Lognormal at 5% Significance Level	
Data Not Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	2.37	Mean of logged Data	5.047
Maximum of Logged Data	6.028	SD of logged Data	0.819
Assuming Lognormal Distribution			
95% H-UCL	269.6	90% Chebyshev (MVUE) UCL	290.1
95% Chebyshev (MVUE) UCL	323.6	97.5% Chebyshev (MVUE) UCL	370.1
99% Chebyshev (MVUE) UCL	461.5		
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution (0.05)			
Nonparametric Distribution Free UCLs			
95% CLT UCL	225	95% Jackknife UCL	225.3
95% Standard Bootstrap UCL	224.6	95% Bootstrap-t UCL	226.2
95% Hall's Bootstrap UCL	224.2	95% Percentile Bootstrap UCL	225
95% BCA Bootstrap UCL	222.8		
90% Chebyshev(Mean, Sd) UCL	244.9	95% Chebyshev(Mean, Sd) UCL	264.9
97.5% Chebyshev(Mean, Sd) UCL	292.7	99% Chebyshev(Mean, Sd) UCL	347.3
Suggested UCL to Use			
95% Chebyshev (Mean, Sd) UCL	264.9		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Mercury			
General Statistics			
Total Number of Observations	66	Number of Distinct Observations	31
		Number of Missing Observations	3
Number of Detects	55	Number of Non-Detects	11
Number of Distinct Detects	31	Number of Distinct Non-Detects	5
Minimum Detect	0.011	Minimum Non-Detect	0.011
Maximum Detect	1.4	Maximum Non-Detect	0.018
Variance Detects	0.0484	Percent Non-Detects	16.67%
Mean Detects	0.0766	SD Detects	0.22
Median Detects	0.021	CV Detects	2.873
Skewness Detects	5.19	Kurtosis Detects	28.02
Mean of Logged Detects	-3.527	SD of Logged Detects	1.003

Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.312	**Normal GOF Test on Detected Observations Only**	
5% Shapiro Wilk P Value	0	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.383	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.119	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.0657	KM Standard Error of Mean	0.0249
KM SD	0.2	95% KM (BCA) UCL	0.115
95% KM (t) UCL	0.107	95% KM (Percentile Bootstrap) UCL	0.112
95% KM (z) UCL	0.107	95% KM Bootstrap t UCL	0.25
90% KM Chebyshev UCL	0.14	95% KM Chebyshev UCL	0.174
97.5% KM Chebyshev UCL	0.221	99% KM Chebyshev UCL	0.313
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	8.88	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.803	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.323	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.126	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.639	k star (bias corrected MLE)	0.616
Theta hat (MLE)	0.12	Theta star (bias corrected MLE)	0.124
nu hat (MLE)	70.31	nu star (bias corrected)	67.81
Mean (detects)	0.0766		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	0.0655
Maximum	1.4	Median	0.019
SD	0.202	CV	3.086
k hat (MLE)	0.626	k star (bias corrected MLE)	0.608
Theta hat (MLE)	0.105	Theta star (bias corrected MLE)	0.108
nu hat (MLE)	82.64	nu star (bias corrected)	80.22
Adjusted Level of Significance (β)	0.0464		
Approximate Chi Square Value (80.22, α)	60.58	Adjusted Chi Square Value (80.22, β)	60.2
95% Gamma Approximate UCL (use when n>=50)	0.0867	95% Gamma Adjusted UCL (use when n<50)	0.0872
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.0657	SD (KM)	0.2
Variance (KM)	0.0402	SE of Mean (KM)	0.0249
k hat (KM)	0.107	k star (KM)	0.113
nu hat (KM)	14.18	nu star (KM)	14.87
theta hat (KM)	0.612	theta star (KM)	0.583

80% gamma percentile (KM)	0.0535	90% gamma percentile (KM)	0.183
95% gamma percentile (KM)	0.378	99% gamma percentile (KM)	0.983
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (14.87, α)	7.17	Adjusted Chi Square Value (14.87, β)	7.051
95% Gamma Approximate KM-UCL (use when n>=50)	0.136	95% Gamma Adjusted KM-UCL (use when n<50)	0.139
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Approximate Test Statistic	0.753	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	7.727E-12	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.258	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.119	Detected Data Not Lognormal at 5% Significance Level	
Detected Data Not Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.0646	Mean in Log Scale	-3.841
SD in Original Scale	0.202	SD in Log Scale	1.167
95% t UCL (assumes normality of ROS data)	0.106	95% Percentile Bootstrap UCL	0.112
95% BCA Bootstrap UCL	0.13	95% Bootstrap t UCL	0.269
95% H-UCL (Log ROS)	0.0586		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-3.686	KM Geo Mean	0.0251
KM SD (logged)	0.975	95% Critical H Value (KM-Log)	2.239
KM Standard Error of Mean (logged)	0.121	95% H-UCL (KM -Log)	0.0528
KM SD (logged)	0.975	95% Critical H Value (KM-Log)	2.239
KM Standard Error of Mean (logged)	0.121		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.0649	Mean in Log Scale	-3.779
SD in Original Scale	0.202	SD in Log Scale	1.077
95% t UCL (Assumes normality)	0.106	95% H-Stat UCL	0.0552
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution at 5% Significance Level			
Suggested UCL to Use			
95% KM (Chebyshev) UCL	0.174		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Nickel			
General Statistics			

Total Number of Observations	66	Number of Distinct Observations	44
		Number of Missing Observations	3
Minimum	3.5	Mean	12.06
Maximum	53.9	Median	11
SD	6.463	Std. Error of Mean	0.796
Coefficient of Variation	0.536	Skewness	4.499
Normal GOF Test			
Shapiro Wilk Test Statistic	0.619	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	0	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.257	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.109	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	13.39	95% Adjusted-CLT UCL (Chen-1995)	13.84
		95% Modified-t UCL (Johnson-1978)	13.46
Gamma GOF Test			
A-D Test Statistic	3.17	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.753	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.185	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.11	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	6.143	k star (bias corrected MLE)	5.874
Theta hat (MLE)	1.963	Theta star (bias corrected MLE)	2.053
nu hat (MLE)	810.9	nu star (bias corrected)	775.3
MLE Mean (bias corrected)	12.06	MLE Sd (bias corrected)	4.976
		Approximate Chi Square Value (0.05)	711.7
Adjusted Level of Significance	0.0464	Adjusted Chi Square Value	710.4
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	13.14	95% Adjusted Gamma UCL (use when n<50)	13.16
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.902	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk P Value	1.7631E-5	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.153	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.109	Data Not Lognormal at 5% Significance Level	
Data Not Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	1.253	Mean of logged Data	2.406
Maximum of Logged Data	3.987	SD of logged Data	0.387
Assuming Lognormal Distribution			
95% H-UCL	13.04	90% Chebyshev (MVUE) UCL	13.7

95% Chebyshev (MVUE) UCL	14.5	97.5% Chebyshev (MVUE) UCL	15.61
99% Chebyshev (MVUE) UCL	17.79		

Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution (0.05)

Nonparametric Distribution Free UCLs

95% CLT UCL	13.37	95% Jackknife UCL	13.39
95% Standard Bootstrap UCL	13.32	95% Bootstrap-t UCL	14.39
95% Hall's Bootstrap UCL	19.57	95% Percentile Bootstrap UCL	13.41
95% BCA Bootstrap UCL	14.2		
90% Chebyshev(Mean, Sd) UCL	14.45	95% Chebyshev(Mean, Sd) UCL	15.53
97.5% Chebyshev(Mean, Sd) UCL	17.03	99% Chebyshev(Mean, Sd) UCL	19.97

Suggested UCL to Use

95% Student's-t UCL	13.39	or 95% Modified-t UCL	13.46

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Thallium

General Statistics

Total Number of Observations	66	Number of Distinct Observations	15
		Number of Missing Observations	3
Number of Detects	1	Number of Non-Detects	65
Number of Distinct Detects	1	Number of Distinct Non-Detects	15

Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set!

It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable Thallium was not processed!

Arsenic

General Statistics

Total Number of Observations	66	Number of Distinct Observations	40
		Number of Missing Observations	3
Number of Detects	64	Number of Non-Detects	2
Number of Distinct Detects	38	Number of Distinct Non-Detects	2
Minimum Detect	0.46	Minimum Non-Detect	0.7
Maximum Detect	8.4	Maximum Non-Detect	0.84
Variance Detects	2.753	Percent Non-Detects	3.03%
Mean Detects	3.251	SD Detects	1.659
Median Detects	3.35	CV Detects	0.51
Skewness Detects	0.71	Kurtosis Detects	1.024
Mean of Logged Detects	1.026	SD of Logged Detects	0.606

Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.947	**Normal GOF Test on Detected Observations Only**	
5% Shapiro Wilk P Value	0.0155	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.075	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.111	Detected Data appear Normal at 5% Significance Level	
Detected Data appear Approximate Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	3.169	KM Standard Error of Mean	0.209
KM SD	1.686	95% KM (BCA) UCL	3.501
95% KM (t) UCL	3.518	95% KM (Percentile Bootstrap) UCL	3.506
95% KM (z) UCL	3.513	95% KM Bootstrap t UCL	3.53
90% KM Chebyshev UCL	3.797	95% KM Chebyshev UCL	4.081
97.5% KM Chebyshev UCL	4.475	99% KM Chebyshev UCL	5.25
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	0.793	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.756	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.108	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.112	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data follow Appr. Gamma Distribution at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	3.418	k star (bias corrected MLE)	3.269
Theta hat (MLE)	0.951	Theta star (bias corrected MLE)	0.995
nu hat (MLE)	437.6	nu star (bias corrected)	418.4
Mean (detects)	3.251		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.46	Mean	3.178
Maximum	8.4	Median	3.25
SD	1.686	CV	0.53
k hat (MLE)	3.153	k star (bias corrected MLE)	3.019
Theta hat (MLE)	1.008	Theta star (bias corrected MLE)	1.052
nu hat (MLE)	416.2	nu star (bias corrected)	398.6
Adjusted Level of Significance (β)	0.0464		
Approximate Chi Square Value (398.57, α)	353.3	Adjusted Chi Square Value (398.57, β)	352.4
95% Gamma Approximate UCL (use when n>=50)	3.585	95% Gamma Adjusted UCL (use when n<50)	3.595
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	3.169	SD (KM)	1.686
Variance (KM)	2.843	SE of Mean (KM)	0.209
k hat (KM)	3.533	k star (KM)	3.382
nu hat (KM)	466.3	nu star (KM)	446.4

theta hat (KM)	0.897	theta star (KM)	0.937
80% gamma percentile (KM)	4.456	90% gamma percentile (KM)	5.48
95% gamma percentile (KM)	6.429	99% gamma percentile (KM)	8.474
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (446.43, α)	398.4	Adjusted Chi Square Value (446.43, β)	397.4
95% Gamma Approximate KM-UCL (use when n>=50)	3.551	95% Gamma Adjusted KM-UCL (use when n<50)	3.56
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Approximate Test Statistic	0.931	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	0.00176	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.137	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.111	Detected Data Not Lognormal at 5% Significance Level	
Detected Data Not Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	3.179	Mean in Log Scale	0.99
SD in Original Scale	1.685	SD in Log Scale	0.63
95% t UCL (assumes normality of ROS data)	3.525	95% Percentile Bootstrap UCL	3.512
95% BCA Bootstrap UCL	3.536	95% Bootstrap t UCL	3.553
95% H-UCL (Log ROS)	3.824		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	0.976	KM Geo Mean	2.654
KM SD (logged)	0.655	95% Critical H Value (KM-Log)	1.978
KM Standard Error of Mean (logged)	0.0814	95% H-UCL (KM -Log)	3.864
KM SD (logged)	0.655	95% Critical H Value (KM-Log)	1.978
KM Standard Error of Mean (logged)	0.0814		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	3.164	Mean in Log Scale	0.965
SD in Original Scale	1.707	SD in Log Scale	0.688
95% t UCL (Assumes normality)	3.515	95% H-Stat UCL	3.948
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Approximate Normal Distributed at 5% Significance Level			
Suggested UCL to Use			
95% KM (t) UCL	3.518		
When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test			
When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			

Barium

General Statistics			
Total Number of Observations	66	Number of Distinct Observations	65
		Number of Missing Observations	3
Minimum	34.1	Mean	171.8
Maximum	972	Median	96.15
SD	193.5	Std. Error of Mean	23.82
Coefficient of Variation	1.126	Skewness	2.711
Normal GOF Test			
Shapiro Wilk Test Statistic	0.629	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	0	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.269	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.109	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	211.6	95% Adjusted-CLT UCL (Chen-1995)	219.5
		95% Modified-t UCL (Johnson-1978)	212.9
Gamma GOF Test			
A-D Test Statistic	3.563	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.769	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.194	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.112	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	1.523	k star (bias corrected MLE)	1.464
Theta hat (MLE)	112.8	Theta star (bias corrected MLE)	117.4
nu hat (MLE)	201.1	nu star (bias corrected)	193.3
MLE Mean (bias corrected)	171.8	MLE Sd (bias corrected)	142
		Approximate Chi Square Value (0.05)	162.1
Adjusted Level of Significance	0.0464	Adjusted Chi Square Value	161.5
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	204.9	95% Adjusted Gamma UCL (use when n<50)	205.7
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.922	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk P Value	3.3239E-4	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.152	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.109	Data Not Lognormal at 5% Significance Level	
Data Not Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	3.529	Mean of logged Data	4.784

Maximum of Logged Data	6.879	SD of logged Data	0.777
Assuming Lognormal Distribution			
95% H-UCL	197.5	90% Chebyshev (MVUE) UCL	212.4
95% Chebyshev (MVUE) UCL	235.8	97.5% Chebyshev (MVUE) UCL	268.2
99% Chebyshev (MVUE) UCL	332		
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution (0.05)			
Nonparametric Distribution Free UCLs			
95% CLT UCL	211	95% Jackknife UCL	211.6
95% Standard Bootstrap UCL	211.1	95% Bootstrap-t UCL	226.1
95% Hall's Bootstrap UCL	219.3	95% Percentile Bootstrap UCL	211.1
95% BCA Bootstrap UCL	221.7		
90% Chebyshev(Mean, Sd) UCL	243.3	95% Chebyshev(Mean, Sd) UCL	275.7
97.5% Chebyshev(Mean, Sd) UCL	320.6	99% Chebyshev(Mean, Sd) UCL	408.8
Suggested UCL to Use			
95% Chebyshev (Mean, Sd) UCL	275.7		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
ChromiumVI_EST			
General Statistics			
Total Number of Observations	66	Number of Distinct Observations	46
		Number of Missing Observations	3
Minimum	0.0696	Mean	0.239
Maximum	0.878	Median	0.227
SD	0.106	Std. Error of Mean	0.013
Coefficient of Variation	0.441	Skewness	3.555
Normal GOF Test			
Shapiro Wilk Test Statistic	0.728	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	2.220E-16	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.178	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.109	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	0.261	95% Adjusted-CLT UCL (Chen-1995)	0.267
		95% Modified-t UCL (Johnson-1978)	0.262
Gamma GOF Test			

A-D Test Statistic	2.16	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.753	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.122	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.11	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	7.146	k star (bias corrected MLE)	6.832
Theta hat (MLE)	0.0335	Theta star (bias corrected MLE)	0.035
nu hat (MLE)	943.3	nu star (bias corrected)	901.8
MLE Mean (bias corrected)	0.239	MLE Sd (bias corrected)	0.0916
		Approximate Chi Square Value (0.05)	833.1
Adjusted Level of Significance	0.0464	Adjusted Chi Square Value	831.6
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	0.259	95% Adjusted Gamma UCL (use when n<50)	0.26
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.91	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk P Value	5.8434E-5	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.143	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.109	Data Not Lognormal at 5% Significance Level	
Data Not Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	-2.665	Mean of logged Data	-1.501
Maximum of Logged Data	-0.13	SD of logged Data	0.378
Assuming Lognormal Distribution			
95% H-UCL	0.26	90% Chebyshev (MVUE) UCL	0.274
95% Chebyshev (MVUE) UCL	0.289	97.5% Chebyshev (MVUE) UCL	0.311
99% Chebyshev (MVUE) UCL	0.353		
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution (0.05)			
Nonparametric Distribution Free UCLs			
95% CLT UCL	0.261	95% Jackknife UCL	0.261
95% Standard Bootstrap UCL	0.261	95% Bootstrap-t UCL	0.272
95% Hall's Bootstrap UCL	0.367	95% Percentile Bootstrap UCL	0.263
95% BCA Bootstrap UCL	0.27		
90% Chebyshev(Mean, Sd) UCL	0.278	95% Chebyshev(Mean, Sd) UCL	0.296
97.5% Chebyshev(Mean, Sd) UCL	0.321	99% Chebyshev(Mean, Sd) UCL	0.369
Suggested UCL to Use			
95% Student's-t UCL	0.261	or 95% Modified-t UCL	0.262
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Cobalt

General Statistics

Total Number of Observations	66	Number of Distinct Observations	33
		Number of Missing Observations	3
Number of Detects	65	Number of Non-Detects	1
Number of Distinct Detects	32	Number of Distinct Non-Detects	1
Minimum Detect	1.2	Minimum Non-Detect	1.4
Maximum Detect	6.7	Maximum Non-Detect	1.4
Variance Detects	1.531	Percent Non-Detects	1.515%
Mean Detects	4.585	SD Detects	1.237
Median Detects	4.8	CV Detects	0.27
Skewness Detects	-0.802	Kurtosis Detects	0.586
Mean of Logged Detects	1.473	SD of Logged Detects	0.348

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.933	**Normal GOF Test on Detected Observations Only**
5% Shapiro Wilk P Value	0.00214	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.122	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.11	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	4.533	KM Standard Error of Mean	0.16
KM SD	1.287	95% KM (BCA) UCL	4.805
95% KM (t) UCL	4.8	95% KM (Percentile Bootstrap) UCL	4.792
95% KM (z) UCL	4.796	95% KM Bootstrap t UCL	4.79
90% KM Chebyshev UCL	5.012	95% KM Chebyshev UCL	5.229
97.5% KM Chebyshev UCL	5.53	99% KM Chebyshev UCL	6.122

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	2.74	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.751	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.175	**Kolmogorov-Smirnov GOF**
5% K-S Critical Value	0.111	Detected Data Not Gamma Distributed at 5% Significance Level

Detected Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	10.3	k star (bias corrected MLE)	9.831
Theta hat (MLE)	0.445	Theta star (bias corrected MLE)	0.466
nu hat (MLE)	1338	nu star (bias corrected)	1278
Mean (detects)	4.585		

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)

For such situations, GROS method may yield incorrect values of UCLs and BTVs

This is especially true when the sample size is small.

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	1.2	Mean	4.551
Maximum	6.7	Median	4.8
SD	1.258	CV	0.276
k hat (MLE)	9.915	k star (bias corrected MLE)	9.475
Theta hat (MLE)	0.459	Theta star (bias corrected MLE)	0.48
nu hat (MLE)	1309	nu star (bias corrected)	1251
Adjusted Level of Significance (β)	0.0464		
Approximate Chi Square Value (N/A, α)	1170	Adjusted Chi Square Value (N/A, β)	1168
95% Gamma Approximate UCL (use when n>=50)	4.867	95% Gamma Adjusted UCL (use when n<50)	4.874
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	4.533	SD (KM)	1.287
Variance (KM)	1.656	SE of Mean (KM)	0.16
k hat (KM)	12.41	k star (KM)	11.86
nu hat (KM)	1638	nu star (KM)	1565
theta hat (KM)	0.365	theta star (KM)	0.382
80% gamma percentile (KM)	5.588	90% gamma percentile (KM)	6.281
95% gamma percentile (KM)	6.894	99% gamma percentile (KM)	8.143
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (N/A, α)	1474	Adjusted Chi Square Value (N/A, β)	1472
95% Gamma Approximate KM-UCL (use when n>=50)	4.813	95% Gamma Adjusted KM-UCL (use when n<50)	4.819
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Approximate Test Statistic	0.819	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	1.203E-10	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.204	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.11	Detected Data Not Lognormal at 5% Significance Level	
Detected Data Not Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	4.547	Mean in Log Scale	1.462
SD in Original Scale	1.266	SD in Log Scale	0.357
95% t UCL (assumes normality of ROS data)	4.807	95% Percentile Bootstrap UCL	4.792
95% BCA Bootstrap UCL	4.777	95% Bootstrap t UCL	4.789
95% H-UCL (Log ROS)	4.978		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	1.454	KM Geo Mean	4.279
KM SD (logged)	0.377	95% Critical H Value (KM-Log)	1.794
KM Standard Error of Mean (logged)	0.0468	95% H-UCL (KM -Log)	4.998
KM SD (logged)	0.377	95% Critical H Value (KM-Log)	1.794
KM Standard Error of Mean (logged)	0.0468		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	4.526	Mean in Log Scale	1.446
SD in Original Scale	1.318	SD in Log Scale	0.413
95% t UCL (Assumes normality)	4.796	95% H-Stat UCL	5.071

DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution at 5% Significance Level			
Suggested UCL to Use			
95% KM (t) UCL	4.8	KM H-UCL	4.998
95% KM (BCA) UCL	4.805		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Copper			
General Statistics			
Total Number of Observations	66	Number of Distinct Observations	58
		Number of Missing Observations	3
Minimum	3.3	Mean	42.64
Maximum	694	Median	13.7
SD	100.1	Std. Error of Mean	12.32
Coefficient of Variation	2.348	Skewness	5.076
Normal GOF Test			
Shapiro Wilk Test Statistic	0.387	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	0	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.373	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.109	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	63.2	95% Adjusted-CLT UCL (Chen-1995)	71.14
		95% Modified-t UCL (Johnson-1978)	64.49
Gamma GOF Test			
A-D Test Statistic	8.832	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.795	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.319	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.114	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	0.727	k star (bias corrected MLE)	0.704
Theta hat (MLE)	58.64	Theta star (bias corrected MLE)	60.55
nu hat (MLE)	96	nu star (bias corrected)	92.97
MLE Mean (bias corrected)	42.64	MLE Sd (bias corrected)	50.81
		Approximate Chi Square Value (0.05)	71.73

Adjusted Level of Significance	0.0464	Adjusted Chi Square Value	71.31
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	55.27	95% Adjusted Gamma UCL (use when n<50)	55.59
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.83	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk P Value	3.491E-10	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.225	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.109	Data Not Lognormal at 5% Significance Level	
Data Not Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	1.194	Mean of logged Data	2.926
Maximum of Logged Data	6.542	SD of logged Data	1.016
Assuming Lognormal Distribution			
95% H-UCL	41.54	90% Chebyshev (MVUE) UCL	44.71
95% Chebyshev (MVUE) UCL	50.97	97.5% Chebyshev (MVUE) UCL	59.66
99% Chebyshev (MVUE) UCL	76.72		
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution (0.05)			
Nonparametric Distribution Free UCLs			
95% CLT UCL	62.91	95% Jackknife UCL	63.2
95% Standard Bootstrap UCL	62.41	95% Bootstrap-t UCL	89.36
95% Hall's Bootstrap UCL	140.4	95% Percentile Bootstrap UCL	63.93
95% BCA Bootstrap UCL	72.88		
90% Chebyshev(Mean, Sd) UCL	79.61	95% Chebyshev(Mean, Sd) UCL	96.36
97.5% Chebyshev(Mean, Sd) UCL	119.6	99% Chebyshev(Mean, Sd) UCL	165.3
Suggested UCL to Use			
95% Chebyshev (Mean, Sd) UCL	96.36		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Vanadium			
General Statistics			
Total Number of Observations	66	Number of Distinct Observations	54
		Number of Missing Observations	3
Minimum	2.6	Mean	11.43
Maximum	55.7	Median	11
SD	7.032	Std. Error of Mean	0.866
Coefficient of Variation	0.615	Skewness	3.951

Normal GOF Test			
Shapiro Wilk Test Statistic	0.701	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	0	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.18	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.109	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	12.87	95% Adjusted-CLT UCL (Chen-1995)	13.3
		95% Modified-t UCL (Johnson-1978)	12.94
Gamma GOF Test			
A-D Test Statistic	1.014	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.755	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.109	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.11	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data follow Appr. Gamma Distribution at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	3.963	k star (bias corrected MLE)	3.793
Theta hat (MLE)	2.884	Theta star (bias corrected MLE)	3.013
nu hat (MLE)	523.2	nu star (bias corrected)	500.7
MLE Mean (bias corrected)	11.43	MLE Sd (bias corrected)	5.868
		Approximate Chi Square Value (0.05)	449.8
Adjusted Level of Significance	0.0464	Adjusted Chi Square Value	448.8
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50)	12.72	95% Adjusted Gamma UCL (use when n<50)	12.75
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.948	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk P Value	0.016	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.107	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.109	Data appear Lognormal at 5% Significance Level	
Data appear Approximate Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	0.956	Mean of logged Data	2.305
Maximum of Logged Data	4.02	SD of logged Data	0.516
Assuming Lognormal Distribution			
95% H-UCL	12.91	90% Chebyshev (MVUE) UCL	13.72
95% Chebyshev (MVUE) UCL	14.77	97.5% Chebyshev (MVUE) UCL	16.21
99% Chebyshev (MVUE) UCL	19.05		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			

Nonparametric Distribution Free UCLs			
95% CLT UCL	12.85	95% Jackknife UCL	12.87
95% Standard Bootstrap UCL	12.82	95% Bootstrap-t UCL	13.53
95% Hall's Bootstrap UCL	19.39	95% Percentile Bootstrap UCL	12.87
95% BCA Bootstrap UCL	13.38		
90% Chebyshev(Mean, Sd) UCL	14.03	95% Chebyshev(Mean, Sd) UCL	15.2
97.5% Chebyshev(Mean, Sd) UCL	16.83	99% Chebyshev(Mean, Sd) UCL	20.04
Suggested UCL to Use			
95% Approximate Gamma UCL	12.72		
When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test			
When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Zinc			
General Statistics			
Total Number of Observations	66	Number of Distinct Observations	62
		Number of Missing Observations	3
Minimum	13.1	Mean	53.16
Maximum	351	Median	37.25
SD	54.6	Std. Error of Mean	6.721
Coefficient of Variation	1.027	Skewness	4.024
Normal GOF Test			
Shapiro Wilk Test Statistic	0.495	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	0	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.324	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.109	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	64.38	95% Adjusted-CLT UCL (Chen-1995)	67.77
		95% Modified-t UCL (Johnson-1978)	64.93
Gamma GOF Test			
A-D Test Statistic	6.351	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.761	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.251	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.111	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			

k hat (MLE)	2.449	k star (bias corrected MLE)	2.348
Theta hat (MLE)	21.71	Theta star (bias corrected MLE)	22.64
nu hat (MLE)	323.3	nu star (bias corrected)	309.9
MLE Mean (bias corrected)	53.16	MLE Sd (bias corrected)	34.69
		Approximate Chi Square Value (0.05)	270.1
Adjusted Level of Significance	0.0464	Adjusted Chi Square Value	269.3
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	60.99	95% Adjusted Gamma UCL (use when n<50)	61.18
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.84	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk P Value	1.5540E-9	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.195	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.109	Data Not Lognormal at 5% Significance Level	
Data Not Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	2.573	Mean of logged Data	3.755
Maximum of Logged Data	5.861	SD of logged Data	0.56
Assuming Lognormal Distribution			
95% H-UCL	57.09	90% Chebyshev (MVUE) UCL	60.86
95% Chebyshev (MVUE) UCL	65.83	97.5% Chebyshev (MVUE) UCL	72.74
99% Chebyshev (MVUE) UCL	86.3		
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution (0.05)			
Nonparametric Distribution Free UCLs			
95% CLT UCL	64.22	95% Jackknife UCL	64.38
95% Standard Bootstrap UCL	63.84	95% Bootstrap-t UCL	74.26
95% Hall's Bootstrap UCL	69.17	95% Percentile Bootstrap UCL	65.42
95% BCA Bootstrap UCL	68.99		
90% Chebyshev(Mean, Sd) UCL	73.32	95% Chebyshev(Mean, Sd) UCL	82.46
97.5% Chebyshev(Mean, Sd) UCL	95.13	99% Chebyshev(Mean, Sd) UCL	120
Suggested UCL to Use			
95% Chebyshev (Mean, Sd) UCL	82.46		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Selenium			
General Statistics			
Total Number of Observations	66	Number of Distinct Observations	29
		Number of Missing Observations	3

Number of Detects	4	Number of Non-Detects	62
Number of Distinct Detects	4	Number of Distinct Non-Detects	27
Minimum Detect	0.4	Minimum Non-Detect	0.25
Maximum Detect	1.3	Maximum Non-Detect	0.85
Variance Detects	0.175	Percent Non-Detects	93.94%
Mean Detects	0.853	SD Detects	0.418
Median Detects	0.855	CV Detects	0.491
Skewness Detects	-0.0195	Kurtosis Detects	-3.79
Mean of Logged Detects	-0.263	SD of Logged Detects	0.543
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.935	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.748	Detected Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.223	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.375	Detected Data appear Normal at 5% Significance Level	
Detected Data appear Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.288	KM Standard Error of Mean	0.0242
KM SD	0.17	95% KM (BCA) UCL	N/A
95% KM (t) UCL	0.328	95% KM (Percentile Bootstrap) UCL	N/A
95% KM (z) UCL	0.328	95% KM Bootstrap t UCL	N/A
90% KM Chebyshev UCL	0.36	95% KM Chebyshev UCL	0.393
97.5% KM Chebyshev UCL	0.439	99% KM Chebyshev UCL	0.529
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	0.308	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.659	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.271	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.396	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	4.985	k star (bias corrected MLE)	1.413
Theta hat (MLE)	0.171	Theta star (bias corrected MLE)	0.603
nu hat (MLE)	39.88	nu star (bias corrected)	11.3
Mean (detects)	0.853		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	0.0611
Maximum	1.3	Median	0.01
SD	0.222	CV	3.629
k hat (MLE)	0.422	k star (bias corrected MLE)	0.413
Theta hat (MLE)	0.145	Theta star (bias corrected MLE)	0.148
nu hat (MLE)	55.7	nu star (bias corrected)	54.5

Adjusted Level of Significance (β)	0.0464		
Approximate Chi Square Value (54.50, α)	38.54	Adjusted Chi Square Value (54.50, β)	38.24
95% Gamma Approximate UCL (use when n>=50)	0.0864	95% Gamma Adjusted UCL (use when n<50)	N/A
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.288	SD (KM)	0.17
Variance (KM)	0.0288	SE of Mean (KM)	0.0242
k hat (KM)	2.878	k star (KM)	2.757
nu hat (KM)	379.9	nu star (KM)	363.9
theta hat (KM)	0.1	theta star (KM)	0.104
80% gamma percentile (KM)	0.415	90% gamma percentile (KM)	0.52
95% gamma percentile (KM)	0.619	99% gamma percentile (KM)	0.834
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (363.95, α)	320.7	Adjusted Chi Square Value (363.95, β)	319.8
95% Gamma Approximate KM-UCL (use when n>=50)	0.327	95% Gamma Adjusted KM-UCL (use when n<50)	0.327
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.934	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.748	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.245	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.375	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.0887	Mean in Log Scale	-3.35
SD in Original Scale	0.217	SD in Log Scale	1.133
95% t UCL (assumes normality of ROS data)	0.133	95% Percentile Bootstrap UCL	0.136
95% BCA Bootstrap UCL	0.154	95% Bootstrap t UCL	0.204
95% H-UCL (Log ROS)	0.0914		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-1.314	KM Geo Mean	0.269
KM SD (logged)	0.294	95% Critical H Value (KM-Log)	1.753
KM Standard Error of Mean (logged)	0.0425	95% H-UCL (KM -Log)	0.299
KM SD (logged)	0.294	95% Critical H Value (KM-Log)	1.753
KM Standard Error of Mean (logged)	0.0425		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.235	Mean in Log Scale	-1.584
SD in Original Scale	0.19	SD in Log Scale	0.433
95% t UCL (Assumes normality)	0.274	95% H-Stat UCL	0.249
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Normal Distributed at 5% Significance Level			
Suggested UCL to Use			
95% KM (t) UCL	0.328		

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Naphthalene

General Statistics

Total Number of Observations	66	Number of Distinct Observations	22
		Number of Missing Observations	3
Number of Detects	1	Number of Non-Detects	65
Number of Distinct Detects	1	Number of Distinct Non-Detects	21

Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set!

It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable Naphthalene was not processed!

Cyanide

General Statistics

Total Number of Observations	66	Number of Distinct Observations	54
		Number of Missing Observations	3
Number of Detects	47	Number of Non-Detects	19
Number of Distinct Detects	43	Number of Distinct Non-Detects	14
Minimum Detect	0.022	Minimum Non-Detect	0.017
Maximum Detect	16.4	Maximum Non-Detect	0.095
Variance Detects	5.607	Percent Non-Detects	28.79%
Mean Detects	0.644	SD Detects	2.368
Median Detects	0.24	CV Detects	3.677
Skewness Detects	6.682	Kurtosis Detects	45.35
Mean of Logged Detects	-1.648	SD of Logged Detects	1.295

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.235	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.946	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.404	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.128	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	0.468	KM Standard Error of Mean	0.248
KM SD	1.996	95% KM (BCA) UCL	0.958
95% KM (t) UCL	0.882	95% KM (Percentile Bootstrap) UCL	0.964
95% KM (z) UCL	0.876	95% KM Bootstrap t UCL	2.932
90% KM Chebyshev UCL	1.213	95% KM Chebyshev UCL	1.55

97.5% KM Chebyshev UCL	2.019	99% KM Chebyshev UCL	2.939
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	3.539	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.812	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.211	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.136	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.522	k star (bias corrected MLE)	0.503
Theta hat (MLE)	1.233	Theta star (bias corrected MLE)	1.28
nu hat (MLE)	49.09	nu star (bias corrected)	47.29
Mean (detects)	0.644		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	0.461
Maximum	16.4	Median	0.0675
SD	2.013	CV	4.362
k hat (MLE)	0.384	k star (bias corrected MLE)	0.376
Theta hat (MLE)	1.202	Theta star (bias corrected MLE)	1.226
nu hat (MLE)	50.66	nu star (bias corrected)	49.69
Adjusted Level of Significance (β)	0.0464		
Approximate Chi Square Value (49.69, α)	34.5	Adjusted Chi Square Value (49.69, β)	34.22
95% Gamma Approximate UCL (use when n>=50)	0.664	95% Gamma Adjusted UCL (use when n<50)	0.67
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.468	SD (KM)	1.996
Variance (KM)	3.985	SE of Mean (KM)	0.248
k hat (KM)	0.0549	k star (KM)	0.0625
nu hat (KM)	7.248	nu star (KM)	8.252
theta hat (KM)	8.519	theta star (KM)	7.482
80% gamma percentile (KM)	0.126	90% gamma percentile (KM)	0.916
95% gamma percentile (KM)	2.644	99% gamma percentile (KM)	9.27
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (8.25, α)	2.882	Adjusted Chi Square Value (8.25, β)	2.811
95% Gamma Approximate KM-UCL (use when n>=50)	1.339	95% Gamma Adjusted KM-UCL (use when n<50)	1.373
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.942	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.946	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.102	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.128	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Approximate Lognormal at 5% Significance Level			

Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.466	Mean in Log Scale	-2.274
SD in Original Scale	2.012	SD in Log Scale	1.517
95% t UCL (assumes normality of ROS data)	0.879	95% Percentile Bootstrap UCL	0.943
95% BCA Bootstrap UCL	1.375	95% Bootstrap t UCL	2.844
95% H-UCL (Log ROS)	0.513		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-2.203	KM Geo Mean	0.11
KM SD (logged)	1.417	95% Critical H Value (KM-Log)	2.29
KM Standard Error of Mean (logged)	0.18	95% H-UCL (KM -Log)	0.451
KM SD (logged)	1.417	95% Critical H Value (KM-Log)	2.29
KM Standard Error of Mean (logged)	0.18		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.466	Mean in Log Scale	-2.248
SD in Original Scale	2.012	SD in Log Scale	1.48
95% t UCL (Assumes normality)	0.88	95% H-Stat UCL	0.488
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Approximate Lognormal Distributed at 5% Significance Level			
Suggested UCL to Use			
KM H-UCL	0.451		

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

ProUCL Output
South Percolation Pond Area (Surface Water)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

UCL Statistics for Data Sets with Non-Detects	
User Selected Options	
Date/Time of Computation	ProUCL 5.11/31/2019 9:50:21 PM
From File	20190128_SPercPond_ProUCL_input_c.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Fluoride

General Statistics

Total Number of Observations	35	Number of Distinct Observations	32
		Number of Missing Observations	0
Minimum	250	Mean	1484
Maximum	9240	Median	476
SD	1746	Std. Error of Mean	295.1
Coefficient of Variation	1.177	Skewness	2.741

Normal GOF Test

Shapiro Wilk Test Statistic	0.685	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.934	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.24	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.148	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		95% UCLs (Adjusted for Skewness)	
95% Student's-t UCL	1983	95% Adjusted-CLT UCL (Chen-1995)	2116
		95% Modified-t UCL (Johnson-1978)	2006

Gamma GOF Test

A-D Test Statistic	2.406	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.775	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.249	**Kolmogorov-Smirnov Gamma GOF Test**
5% K-S Critical Value	0.153	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	1.039	k star (bias corrected MLE)	0.969
Theta hat (MLE)	1428	Theta star (bias corrected MLE)	1532
nu hat (MLE)	72.72	nu star (bias corrected)	67.82
MLE Mean (bias corrected)	1484	MLE Sd (bias corrected)	1508
		Approximate Chi Square Value (0.05)	49.87
Adjusted Level of Significance	0.0425	Adjusted Chi Square Value	49.14

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	2018	95% Adjusted Gamma UCL (use when n<50)	2048

Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.839	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.934	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.235	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.148	Data Not Lognormal at 5% Significance Level	
Data Not Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	5.521	Mean of logged Data	6.749
Maximum of Logged Data	9.131	SD of logged Data	1.062
Assuming Lognormal Distribution			
95% H-UCL	2377	90% Chebyshev (MVUE) UCL	2389
95% Chebyshev (MVUE) UCL	2808	97.5% Chebyshev (MVUE) UCL	3390
99% Chebyshev (MVUE) UCL	4532		
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution (0.05)			
Nonparametric Distribution Free UCLs			
95% CLT UCL	1969	95% Jackknife UCL	1983
95% Standard Bootstrap UCL	1951	95% Bootstrap-t UCL	2227
95% Hall's Bootstrap UCL	4070	95% Percentile Bootstrap UCL	1998
95% BCA Bootstrap UCL	2198		
90% Chebyshev(Mean, Sd) UCL	2369	95% Chebyshev(Mean, Sd) UCL	2770
97.5% Chebyshev(Mean, Sd) UCL	3327	99% Chebyshev(Mean, Sd) UCL	4420
Suggested UCL to Use			
95% Chebyshev (Mean, Sd) UCL	2770		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Indeno123CDPyrene			
General Statistics			
Total Number of Observations	8	Number of Distinct Observations	4
		Number of Missing Observations	21
Number of Detects	1	Number of Non-Detects	7
Number of Distinct Detects	1	Number of Distinct Non-Detects	3
Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set!			
It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).			
The data set for variable Indeno123CDPyrene was not processed!			
BenzoBFluoranthene			

General Statistics			
Total Number of Observations	8	Number of Distinct Observations	4
		Number of Missing Observations	21
Number of Detects	1	Number of Non-Detects	7
Number of Distinct Detects	1	Number of Distinct Non-Detects	3

Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set!

It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable BenzoBFluoranthene was not processed!

BenzoAPyrene

General Statistics			
Total Number of Observations	8	Number of Distinct Observations	3
		Number of Missing Observations	21
Number of Detects	1	Number of Non-Detects	7
Number of Distinct Detects	1	Number of Distinct Non-Detects	2

Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set!

It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable BenzoAPyrene was not processed!

CyanideFREE

General Statistics			
Total Number of Observations	25	Number of Distinct Observations	21
		Number of Missing Observations	10
Number of Detects	21	Number of Non-Detects	4
Number of Distinct Detects	20	Number of Distinct Non-Detects	1
Minimum Detect	1.8	Minimum Non-Detect	1.5
Maximum Detect	26.1	Maximum Non-Detect	1.5
Variance Detects	44.8	Percent Non-Detects	16%
Mean Detects	7.524	SD Detects	6.693
Median Detects	4.9	CV Detects	0.89
Skewness Detects	1.616	Kurtosis Detects	2.198
Mean of Logged Detects	1.697	SD of Logged Detects	0.802
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.793	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.908	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.215	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.188	Detected Data Not Normal at 5% Significance Level	

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	6.56	KM Standard Error of Mean	1.308
KM SD	6.381	95% KM (BCA) UCL	8.788
95% KM (t) UCL	8.797	95% KM (Percentile Bootstrap) UCL	8.72
95% KM (z) UCL	8.711	95% KM Bootstrap t UCL	9.57
90% KM Chebyshev UCL	10.48	95% KM Chebyshev UCL	12.26
97.5% KM Chebyshev UCL	14.73	99% KM Chebyshev UCL	19.57
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	0.72	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.756	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.159	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.192	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	1.703	k star (bias corrected MLE)	1.491
Theta hat (MLE)	4.418	Theta star (bias corrected MLE)	5.045
nu hat (MLE)	71.52	nu star (bias corrected)	62.64
Mean (detects)	7.524		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	6.322
Maximum	26.1	Median	3.5
SD	6.726	CV	1.064
k hat (MLE)	0.543	k star (bias corrected MLE)	0.504
Theta hat (MLE)	11.65	Theta star (bias corrected MLE)	12.54
nu hat (MLE)	27.14	nu star (bias corrected)	25.21
Adjusted Level of Significance (β)	0.0395		
Approximate Chi Square Value (25.21, α)	14.78	Adjusted Chi Square Value (25.21, β)	14.23
95% Gamma Approximate UCL (use when n>=50)	10.79	95% Gamma Adjusted UCL (use when n<50)	11.2
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	6.56	SD (KM)	6.381
Variance (KM)	40.71	SE of Mean (KM)	1.308
k hat (KM)	1.057	k star (KM)	0.957
nu hat (KM)	52.85	nu star (KM)	47.84
theta hat (KM)	6.206	theta star (KM)	6.856
80% gamma percentile (KM)	10.59	90% gamma percentile (KM)	15.27
95% gamma percentile (KM)	19.96	99% gamma percentile (KM)	30.89
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (47.84, α)	32.96	Adjusted Chi Square Value (47.84, β)	32.12
95% Gamma Approximate KM-UCL (use when n>=50)	9.52	95% Gamma Adjusted KM-UCL (use when n<50)	9.77
Lognormal GOF Test on Detected Observations Only			

Shapiro Wilk Test Statistic	0.939	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.908	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.138	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.188	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	6.458	Mean in Log Scale	1.395
SD in Original Scale	6.599	SD in Log Scale	1.024
95% t UCL (assumes normality of ROS data)	8.716	95% Percentile Bootstrap UCL	8.786
95% BCA Bootstrap UCL	9.051	95% Bootstrap t UCL	9.714
95% H-UCL (Log ROS)	11.55		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	1.49	KM Geo Mean	4.437
KM SD (logged)	0.86	95% Critical H Value (KM-Log)	2.324
KM Standard Error of Mean (logged)	0.176	95% H-UCL (KM -Log)	9.653
KM SD (logged)	0.86	95% Critical H Value (KM-Log)	2.324
KM Standard Error of Mean (logged)	0.176		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	6.44	Mean in Log Scale	1.379
SD in Original Scale	6.615	SD in Log Scale	1.043
95% t UCL (Assumes normality)	8.703	95% H-Stat UCL	11.77
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Gamma Distributed at 5% Significance Level			
Suggested UCL to Use			
95% KM Adjusted Gamma UCL	9.77	95% GROS Adjusted Gamma UCL	11.2
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Aluminum			
General Statistics			
Total Number of Observations	35	Number of Distinct Observations	33
Number of Detects	31	Number of Non-Detects	4
Number of Distinct Detects	31	Number of Distinct Non-Detects	2
Minimum Detect	15.3	Minimum Non-Detect	13.5
Maximum Detect	32000	Maximum Non-Detect	18.2
Variance Detects	51753857	Percent Non-Detects	11.43%
Mean Detects	2892	SD Detects	7194
Median Detects	497	CV Detects	2.488
Skewness Detects	3.355	Kurtosis Detects	11.02

Mean of Logged Detects	6.015	SD of Logged Detects	2.037
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.444	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.929	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.371	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.156	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	2563	KM Standard Error of Mean	1155
KM SD	6723	95% KM (BCA) UCL	4610
95% KM (t) UCL	4516	95% KM (Percentile Bootstrap) UCL	4657
95% KM (z) UCL	4463	95% KM Bootstrap t UCL	7944
90% KM Chebyshev UCL	6029	95% KM Chebyshev UCL	7598
97.5% KM Chebyshev UCL	9777	99% KM Chebyshev UCL	14057
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	1.838	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.844	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.207	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.17	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.345	k star (bias corrected MLE)	0.333
Theta hat (MLE)	8384	Theta star (bias corrected MLE)	8683
nu hat (MLE)	21.38	nu star (bias corrected)	20.65
Mean (detects)	2892		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	2561
Maximum	32000	Median	285
SD	6822	CV	2.663
k hat (MLE)	0.235	k star (bias corrected MLE)	0.234
Theta hat (MLE)	10881	Theta star (bias corrected MLE)	10933
nu hat (MLE)	16.48	nu star (bias corrected)	16.4
Adjusted Level of Significance (β)	0.0425		
Approximate Chi Square Value (16.40, α)	8.245	Adjusted Chi Square Value (16.40, β)	7.97
95% Gamma Approximate UCL (use when n>=50)	5095	95% Gamma Adjusted UCL (use when n<50)	5270
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	2563	SD (KM)	6723
Variance (KM)	45198704	SE of Mean (KM)	1155
k hat (KM)	0.145	k star (KM)	0.152

nu hat (KM)	10.17	nu star (KM)	10.63
theta hat (KM)	17635	theta star (KM)	16870
80% gamma percentile (KM)	2819	90% gamma percentile (KM)	7613
95% gamma percentile (KM)	14071	99% gamma percentile (KM)	32763
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (10.63, α)	4.342	Adjusted Chi Square Value (10.63, β)	4.152
95% Gamma Approximate KM-UCL (use when n>=50)	6277	95% Gamma Adjusted KM-UCL (use when n<50)	6564
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.966	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.929	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.0881	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.156	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	2562	Mean in Log Scale	5.494
SD in Original Scale	6822	SD in Log Scale	2.424
95% t UCL (assumes normality of ROS data)	4512	95% Percentile Bootstrap UCL	4511
95% BCA Bootstrap UCL	5515	95% Bootstrap t UCL	8338
95% H-UCL (Log ROS)	30602		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	5.631	KM Geo Mean	278.9
KM SD (logged)	2.169	95% Critical H Value (KM-Log)	4.155
KM Standard Error of Mean (logged)	0.373	95% H-UCL (KM -Log)	13743
KM SD (logged)	2.169	95% Critical H Value (KM-Log)	4.155
KM Standard Error of Mean (logged)	0.373		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	2562	Mean in Log Scale	5.572
SD in Original Scale	6821	SD in Log Scale	2.288
95% t UCL (Assumes normality)	4512	95% H-Stat UCL	19793
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Lognormal Distributed at 5% Significance Level			
Suggested UCL to Use			
97.5% KM (Chebyshev) UCL	9777		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Iron			

ProUCL Output
South Percolation Pond Area (Surface Water)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

General Statistics			
Total Number of Observations	35	Number of Distinct Observations	34
Number of Detects	32	Number of Non-Detects	3
Number of Distinct Detects	32	Number of Distinct Non-Detects	2
Minimum Detect	43.1	Minimum Non-Detect	42.4
Maximum Detect	52100	Maximum Non-Detect	49.1
Variance Detects	1.025E+8	Percent Non-Detects	8.571%
Mean Detects	4115	SD Detects	10123
Median Detects	626.5	CV Detects	2.46
Skewness Detects	3.909	Kurtosis Detects	16.99
Mean of Logged Detects	6.539	SD of Logged Detects	1.889
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.453	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.93	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.35	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.154	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	3766	KM Standard Error of Mean	1648
KM SD	9595	95% KM (BCA) UCL	6628
95% KM (t) UCL	6553	95% KM (Percentile Bootstrap) UCL	6668
95% KM (z) UCL	6477	95% KM Bootstrap t UCL	11301
90% KM Chebyshev UCL	8710	95% KM Chebyshev UCL	10949
97.5% KM Chebyshev UCL	14057	99% KM Chebyshev UCL	20162
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	1.99	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.839	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.216	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.167	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.373	k star (bias corrected MLE)	0.359
Theta hat (MLE)	11031	Theta star (bias corrected MLE)	11466
nu hat (MLE)	23.88	nu star (bias corrected)	22.97
Mean (detects)	4115		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	3763
Maximum	52100	Median	451
SD	9736	CV	2.588
k hat (MLE)	0.265	k star (bias corrected MLE)	0.262

Theta hat (MLE)	14172	Theta star (bias corrected MLE)	14373
nu hat (MLE)	18.58	nu star (bias corrected)	18.32
Adjusted Level of Significance (β)	0.0425		
Approximate Chi Square Value (18.32, α)	9.626	Adjusted Chi Square Value (18.32, β)	9.327
95% Gamma Approximate UCL (use when n>=50)	7163	95% Gamma Adjusted UCL (use when n<50)	7393
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	3766	SD (KM)	9595
Variance (KM)	92062722	SE of Mean (KM)	1648
k hat (KM)	0.154	k star (KM)	0.16
nu hat (KM)	10.79	nu star (KM)	11.19
theta hat (KM)	24444	theta star (KM)	23551
80% gamma percentile (KM)	4310	90% gamma percentile (KM)	11256
95% gamma percentile (KM)	20462	99% gamma percentile (KM)	46837
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (11.19, α)	4.701	Adjusted Chi Square Value (11.19, β)	4.502
95% Gamma Approximate KM-UCL (use when n>=50)	8968	95% Gamma Adjusted KM-UCL (use when n<50)	9364
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.953	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.93	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.102	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.154	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	3763	Mean in Log Scale	6.173
SD in Original Scale	9736	SD in Log Scale	2.178
95% t UCL (assumes normality of ROS data)	6546	95% Percentile Bootstrap UCL	6648
95% BCA Bootstrap UCL	8407	95% Bootstrap t UCL	10069
95% H-UCL (Log ROS)	24393		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	6.3	KM Geo Mean	544.8
KM SD (logged)	1.941	95% Critical H Value (KM-Log)	3.796
KM Standard Error of Mean (logged)	0.333	95% H-UCL (KM -Log)	12675
KM SD (logged)	1.941	95% Critical H Value (KM-Log)	3.796
KM Standard Error of Mean (logged)	0.333		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	3764	Mean in Log Scale	6.244
SD in Original Scale	9736	SD in Log Scale	2.051
95% t UCL (Assumes normality)	6547	95% H-Stat UCL	17056
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Lognormal Distributed at 5% Significance Level			

Suggested UCL to Use			
95% KM (Chebyshev) UCL	10949		

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Manganese

General Statistics			
Total Number of Observations	35	Number of Distinct Observations	30
Number of Detects	32	Number of Non-Detects	3
Number of Distinct Detects	28	Number of Distinct Non-Detects	2
Minimum Detect	3.2	Minimum Non-Detect	2.5
Maximum Detect	2570	Maximum Non-Detect	3
Variance Detects	379920	Percent Non-Detects	8.571%
Mean Detects	256.5	SD Detects	616.4
Median Detects	18.9	CV Detects	2.403
Skewness Detects	3.07	Kurtosis Detects	8.741
Mean of Logged Detects	3.52	SD of Logged Detects	2.009

Normal GOF Test on Detects Only		
Shapiro Wilk Test Statistic	0.46	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.93	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.354	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.154	Detected Data Not Normal at 5% Significance Level
Detected Data Not Normal at 5% Significance Level		

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	234.7	KM Standard Error of Mean	100.4
KM SD	584.4	95% KM (BCA) UCL	415.9
95% KM (t) UCL	404.5	95% KM (Percentile Bootstrap) UCL	407
95% KM (z) UCL	399.8	95% KM Bootstrap t UCL	565.6
90% KM Chebyshev UCL	535.8	95% KM Chebyshev UCL	672.2
97.5% KM Chebyshev UCL	861.5	99% KM Chebyshev UCL	1233

Gamma GOF Tests on Detected Observations Only		
A-D Test Statistic	2.568	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.847	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.234	**Kolmogorov-Smirnov GOF**
5% K-S Critical Value	0.168	Detected Data Not Gamma Distributed at 5% Significance Level
Detected Data Not Gamma Distributed at 5% Significance Level		

Gamma Statistics on Detected Data Only			
k hat (MLE)	0.334	k star (bias corrected MLE)	0.324
Theta hat (MLE)	767.4	Theta star (bias corrected MLE)	792.3
nu hat (MLE)	21.39	nu star (bias corrected)	20.72
Mean (detects)	256.5		

Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	234.5
Maximum	2570	Median	14.9
SD	593	CV	2.529
k hat (MLE)	0.267	k star (bias corrected MLE)	0.263
Theta hat (MLE)	878.8	Theta star (bias corrected MLE)	891.6
nu hat (MLE)	18.68	nu star (bias corrected)	18.41
Adjusted Level of Significance (β)	0.0425		
Approximate Chi Square Value (18.41, α)	9.69	Adjusted Chi Square Value (18.41, β)	9.389
95% Gamma Approximate UCL (use when n>=50)	445.7	95% Gamma Adjusted UCL (use when n<50)	459.9
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	234.7	SD (KM)	584.4
Variance (KM)	341557	SE of Mean (KM)	100.4
k hat (KM)	0.161	k star (KM)	0.167
nu hat (KM)	11.29	nu star (KM)	11.66
theta hat (KM)	1455	theta star (KM)	1409
80% gamma percentile (KM)	276.7	90% gamma percentile (KM)	704.3
95% gamma percentile (KM)	1264	99% gamma percentile (KM)	2856
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (11.66, α)	5.003	Adjusted Chi Square Value (11.66, β)	4.797
95% Gamma Approximate KM-UCL (use when n>=50)	547	95% Gamma Adjusted KM-UCL (use when n<50)	570.5
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.897	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.93	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.167	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.154	Detected Data Not Lognormal at 5% Significance Level	
Detected Data Not Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	234.6	Mean in Log Scale	3.126
SD in Original Scale	593	SD in Log Scale	2.323
95% t UCL (assumes normality of ROS data)	404.1	95% Percentile Bootstrap UCL	410.7
95% BCA Bootstrap UCL	455.6	95% Bootstrap t UCL	574.7
95% H-UCL (Log ROS)	1955		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	3.297	KM Geo Mean	27.04
KM SD (logged)	2.026	95% Critical H Value (KM-Log)	3.931
KM Standard Error of Mean (logged)	0.348	95% H-UCL (KM -Log)	825.3
KM SD (logged)	2.026	95% Critical H Value (KM-Log)	3.931
KM Standard Error of Mean (logged)	0.348		

DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	234.6	Mean in Log Scale	3.243
SD in Original Scale	593	SD in Log Scale	2.127
95% t UCL (Assumes normality)	404.1	95% H-Stat UCL	1094
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution at 5% Significance Level			
Suggested UCL to Use			
97.5% KM (Chebyshev) UCL	861.5		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Mercury			
General Statistics			
Total Number of Observations	35	Number of Distinct Observations	5
Number of Detects	2	Number of Non-Detects	33
Number of Distinct Detects	2	Number of Distinct Non-Detects	3
Minimum Detect	0.19	Minimum Non-Detect	0.12
Maximum Detect	0.26	Maximum Non-Detect	0.17
Variance Detects	0.00245	Percent Non-Detects	94.29%
Mean Detects	0.225	SD Detects	0.0495
Median Detects	0.225	CV Detects	0.22
Skewness Detects	N/A	Kurtosis Detects	N/A
Mean of Logged Detects	-1.504	SD of Logged Detects	0.222
Warning: Data set has only 2 Detected Values.			
This is not enough to compute meaningful or reliable statistics and estimates.			
Normal GOF Test on Detects Only			
Not Enough Data to Perform GOF Test			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.126	KM Standard Error of Mean	0.00616
KM SD	0.0258	95% KM (BCA) UCL	N/A
95% KM (t) UCL	0.136	95% KM (Percentile Bootstrap) UCL	N/A
95% KM (z) UCL	0.136	95% KM Bootstrap t UCL	N/A
90% KM Chebyshev UCL	0.144	95% KM Chebyshev UCL	0.153
97.5% KM Chebyshev UCL	0.164	99% KM Chebyshev UCL	0.187
Gamma GOF Tests on Detected Observations Only			
Not Enough Data to Perform GOF Test			

Gamma Statistics on Detected Data Only			
k hat (MLE)	40.99	k star (bias corrected MLE)	N/A
Theta hat (MLE)	0.00549	Theta star (bias corrected MLE)	N/A
nu hat (MLE)	164	nu star (bias corrected)	N/A
Mean (detects)	0.225		
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.126	SD (KM)	0.0258
Variance (KM)	6.6400E-4	SE of Mean (KM)	0.00616
k hat (KM)	23.91	k star (KM)	21.88
nu hat (KM)	1674	nu star (KM)	1532
theta hat (KM)	0.00527	theta star (KM)	0.00576
80% gamma percentile (KM)	0.148	90% gamma percentile (KM)	0.162
95% gamma percentile (KM)	0.173	99% gamma percentile (KM)	0.197
Gamma Kaplan-Meier (KM) Statistics			
		Adjusted Level of Significance (β)	0.0425
Approximate Chi Square Value (N/A, α)	1442	Adjusted Chi Square Value (N/A, β)	1438
95% Gamma Approximate KM-UCL (use when n>=50)	0.134	95% Gamma Adjusted KM-UCL (use when n<50)	0.134
Lognormal GOF Test on Detected Observations Only			
Not Enough Data to Perform GOF Test			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.0466	Mean in Log Scale	-3.495
SD in Original Scale	0.0524	SD in Log Scale	0.919
95% t UCL (assumes normality of ROS data)	0.0615	95% Percentile Bootstrap UCL	0.0616
95% BCA Bootstrap UCL	0.0652	95% Bootstrap t UCL	0.0699
95% H-UCL (Log ROS)	0.0672		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-2.085	KM Geo Mean	0.124
KM SD (logged)	0.148	95% Critical H Value (KM-Log)	1.725
KM Standard Error of Mean (logged)	0.0354	95% H-UCL (KM -Log)	0.131
KM SD (logged)	0.148	95% Critical H Value (KM-Log)	1.725
KM Standard Error of Mean (logged)	0.0354		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.0789	Mean in Log Scale	-2.606
SD in Original Scale	0.0392	SD in Log Scale	0.321
95% t UCL (Assumes normality)	0.0901	95% H-Stat UCL	0.0859
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution at 5% Significance Level			
Suggested UCL to Use			
95% KM (t) UCL	0.136	KM H-UCL	0.131
95% KM (BCA) UCL	N/A		

Warning: One or more Recommended UCL(s) not available!

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Nickel

General Statistics

Total Number of Observations	35	Number of Distinct Observations	15
Number of Detects	14	Number of Non-Detects	21
Number of Distinct Detects	13	Number of Distinct Non-Detects	3
Minimum Detect	1.6	Minimum Non-Detect	1.3
Maximum Detect	51.7	Maximum Non-Detect	1.6
Variance Detects	281.1	Percent Non-Detects	60%
Mean Detects	11.07	SD Detects	16.77
Median Detects	3.5	CV Detects	1.514
Skewness Detects	2.055	Kurtosis Detects	3.037
Mean of Logged Detects	1.641	SD of Logged Detects	1.159

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.598	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.874	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.371	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.226	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	5.209	KM Standard Error of Mean	1.979
KM SD	11.28	95% KM (BCA) UCL	8.726
95% KM (t) UCL	8.555	95% KM (Percentile Bootstrap) UCL	8.674
95% KM (z) UCL	8.464	95% KM Bootstrap t UCL	17.35
90% KM Chebyshev UCL	11.15	95% KM Chebyshev UCL	13.84
97.5% KM Chebyshev UCL	17.57	99% KM Chebyshev UCL	24.9

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	1.562	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.769	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.34	**Kolmogorov-Smirnov GOF**
5% K-S Critical Value	0.237	Detected Data Not Gamma Distributed at 5% Significance Level

Detected Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	0.78	k star (bias corrected MLE)	0.661
Theta hat (MLE)	14.19	Theta star (bias corrected MLE)	16.76
nu hat (MLE)	21.85	nu star (bias corrected)	18.5
Mean (detects)	11.07		

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	4.435
Maximum	51.7	Median	0.01
SD	11.73	CV	2.646
k hat (MLE)	0.204	k star (bias corrected MLE)	0.206
Theta hat (MLE)	21.74	Theta star (bias corrected MLE)	21.57
nu hat (MLE)	14.28	nu star (bias corrected)	14.39
Adjusted Level of Significance (β)	0.0425		
Approximate Chi Square Value (14.39, α)	6.839	Adjusted Chi Square Value (14.39, β)	6.593
95% Gamma Approximate UCL (use when n>=50)	9.33	95% Gamma Adjusted UCL (use when n<50)	9.68
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	5.209	SD (KM)	11.28
Variance (KM)	127.3	SE of Mean (KM)	1.979
k hat (KM)	0.213	k star (KM)	0.214
nu hat (KM)	14.92	nu star (KM)	14.97
theta hat (KM)	24.45	theta star (KM)	24.36
80% gamma percentile (KM)	7.095	90% gamma percentile (KM)	15.75
95% gamma percentile (KM)	26.36	99% gamma percentile (KM)	55.28
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (14.97, α)	7.241	Adjusted Chi Square Value (14.97, β)	6.986
95% Gamma Approximate KM-UCL (use when n>=50)	10.77	95% Gamma Adjusted KM-UCL (use when n<50)	11.16
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.831	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.874	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.277	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.226	Detected Data Not Lognormal at 5% Significance Level	
Detected Data Not Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	4.58	Mean in Log Scale	-0.485
SD in Original Scale	11.68	SD in Log Scale	2.107
95% t UCL (assumes normality of ROS data)	7.919	95% Percentile Bootstrap UCL	7.954
95% BCA Bootstrap UCL	9.456	95% Bootstrap t UCL	15.49
95% H-UCL (Log ROS)	24.52		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	0.814	KM Geo Mean	2.257
KM SD (logged)	0.977	95% Critical H Value (KM-Log)	2.429
KM Standard Error of Mean (logged)	0.171	95% H-UCL (KM -Log)	5.467
KM SD (logged)	0.977	95% Critical H Value (KM-Log)	2.429
KM Standard Error of Mean (logged)	0.171		
DL/2 Statistics			

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	4.843	Mean in Log Scale	0.433
SD in Original Scale	11.58	SD in Log Scale	1.233
95% t UCL (Assumes normality)	8.153	95% H-Stat UCL	5.9

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution at 5% Significance Level

Suggested UCL to Use

95% KM (Chebyshev) UCL	13.84		

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Thallium

General Statistics

Total Number of Observations	35	Number of Distinct Observations	5
Number of Detects	2	Number of Non-Detects	33
Number of Distinct Detects	2	Number of Distinct Non-Detects	3
Minimum Detect	0.32	Minimum Non-Detect	0.24
Maximum Detect	0.33	Maximum Non-Detect	0.31
Variance Detects	5.0000E-5	Percent Non-Detects	94.29%
Mean Detects	0.325	SD Detects	0.00707
Median Detects	0.325	CV Detects	0.0218
Skewness Detects	N/A	Kurtosis Detects	N/A
Mean of Logged Detects	-1.124	SD of Logged Detects	0.0218

Warning: Data set has only 2 Detected Values.

This is not enough to compute meaningful or reliable statistics and estimates.

Normal GOF Test on Detects Only

Not Enough Data to Perform GOF Test

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	0.245	KM Standard Error of Mean	0.00472
KM SD	0.0198	95% KM (BCA) UCL	N/A
95% KM (t) UCL	0.253	95% KM (Percentile Bootstrap) UCL	N/A
95% KM (z) UCL	0.253	95% KM Bootstrap t UCL	N/A
90% KM Chebyshev UCL	0.259	95% KM Chebyshev UCL	0.265
97.5% KM Chebyshev UCL	0.274	99% KM Chebyshev UCL	0.292

Gamma GOF Tests on Detected Observations Only

Not Enough Data to Perform GOF Test

Gamma Statistics on Detected Data Only

k hat (MLE)	4225	k star (bias corrected MLE)	N/A
Theta hat (MLE)	7.6929E-5	Theta star (bias corrected MLE)	N/A
nu hat (MLE)	16899	nu star (bias corrected)	N/A
Mean (detects)	0.325		
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.245	SD (KM)	0.0198
Variance (KM)	3.9069E-4	SE of Mean (KM)	0.00472
k hat (KM)	153.5	k star (KM)	140.3
nu hat (KM)	10742	nu star (KM)	9823
theta hat (KM)	0.0016	theta star (KM)	0.00174
80% gamma percentile (KM)	0.262	90% gamma percentile (KM)	0.272
95% gamma percentile (KM)	0.28	99% gamma percentile (KM)	0.295
Gamma Kaplan-Meier (KM) Statistics			
		Adjusted Level of Significance (β)	0.0425
Approximate Chi Square Value (N/A, α)	9593	Adjusted Chi Square Value (N/A, β)	9583
95% Gamma Approximate KM-UCL (use when n>=50)	0.251	95% Gamma Adjusted KM-UCL (use when n<50)	0.251
Lognormal GOF Test on Detected Observations Only			
Not Enough Data to Perform GOF Test			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.268	Mean in Log Scale	-1.319
SD in Original Scale	0.0245	SD in Log Scale	0.0902
95% t UCL (assumes normality of ROS data)	0.275	95% Percentile Bootstrap UCL	0.275
95% BCA Bootstrap UCL	0.276	95% Bootstrap t UCL	0.275
95% H-UCL (Log ROS)	N/A		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-1.41	KM Geo Mean	0.244
KM SD (logged)	0.0704	95% Critical H Value (KM-Log)	N/A
KM Standard Error of Mean (logged)	0.0168	95% H-UCL (KM -Log)	N/A
KM SD (logged)	0.0704	95% Critical H Value (KM-Log)	N/A
KM Standard Error of Mean (logged)	0.0168		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.138	Mean in Log Scale	-2.014
SD in Original Scale	0.0477	SD in Log Scale	0.234
95% t UCL (Assumes normality)	0.152	95% H-Stat UCL	0.147
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution at 5% Significance Level			
Suggested UCL to Use			
95% KM (t) UCL	0.253	KM H-UCL	N/A
95% KM (BCA) UCL	N/A		
Warning: One or more Recommended UCL(s) not available!			

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Antimony

General Statistics

Total Number of Observations	35	Number of Distinct Observations	5
Number of Detects	3	Number of Non-Detects	32
Number of Distinct Detects	3	Number of Distinct Non-Detects	2
Minimum Detect	0.69	Minimum Non-Detect	0.62
Maximum Detect	1.1	Maximum Non-Detect	0.76
Variance Detects	0.0422	Percent Non-Detects	91.43%
Mean Detects	0.903	SD Detects	0.206
Median Detects	0.92	CV Detects	0.227
Skewness Detects	-0.363	Kurtosis Detects	N/A
Mean of Logged Detects	-0.12	SD of Logged Detects	0.235

Warning: Data set has only 3 Detected Values.

This is not enough to compute meaningful or reliable statistics and estimates.

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.995	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.767	Detected Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.199	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.425	Detected Data appear Normal at 5% Significance Level

Detected Data appear Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	0.644	KM Standard Error of Mean	0.0193
KM SD	0.0933	95% KM (BCA) UCL	N/A
95% KM (t) UCL	0.677	95% KM (Percentile Bootstrap) UCL	N/A
95% KM (z) UCL	0.676	95% KM Bootstrap t UCL	N/A
90% KM Chebyshev UCL	0.702	95% KM Chebyshev UCL	0.729
97.5% KM Chebyshev UCL	0.765	99% KM Chebyshev UCL	0.837

Gamma GOF Tests on Detected Observations Only

Not Enough Data to Perform GOF Test

Gamma Statistics on Detected Data Only

k hat (MLE)	27.87	k star (bias corrected MLE)	N/A
Theta hat (MLE)	0.0324	Theta star (bias corrected MLE)	N/A
nu hat (MLE)	167.2	nu star (bias corrected)	N/A
Mean (detects)	0.903		

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	0.153
Maximum	1.1	Median	0.01
SD	0.273	CV	1.781
k hat (MLE)	0.432	k star (bias corrected MLE)	0.414
Theta hat (MLE)	0.355	Theta star (bias corrected MLE)	0.37
nu hat (MLE)	30.23	nu star (bias corrected)	28.98
Adjusted Level of Significance (β)	0.0425		
Approximate Chi Square Value (28.98, α)	17.69	Adjusted Chi Square Value (28.98, β)	17.27
95% Gamma Approximate UCL (use when n>=50)	0.251	95% Gamma Adjusted UCL (use when n<50)	N/A
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.644	SD (KM)	0.0933
Variance (KM)	0.00871	SE of Mean (KM)	0.0193
k hat (KM)	47.69	k star (KM)	43.63
nu hat (KM)	3339	nu star (KM)	3054
theta hat (KM)	0.0135	theta star (KM)	0.0148
80% gamma percentile (KM)	0.725	90% gamma percentile (KM)	0.772
95% gamma percentile (KM)	0.813	99% gamma percentile (KM)	0.893
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (N/A, α)	2926	Adjusted Chi Square Value (N/A, β)	2921
95% Gamma Approximate KM-UCL (use when n>=50)	0.673	95% Gamma Adjusted KM-UCL (use when n<50)	0.674
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.982	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.767	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.228	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.425	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.3	Mean in Log Scale	-1.445
SD in Original Scale	0.232	SD in Log Scale	0.698
95% t UCL (assumes normality of ROS data)	0.366	95% Percentile Bootstrap UCL	0.368
95% BCA Bootstrap UCL	0.379	95% Bootstrap t UCL	0.395
95% H-UCL (Log ROS)	0.387		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-0.447	KM Geo Mean	0.64
KM SD (logged)	0.115	95% Critical H Value (KM-Log)	1.712
KM Standard Error of Mean (logged)	0.0239	95% H-UCL (KM -Log)	0.666
KM SD (logged)	0.115	95% Critical H Value (KM-Log)	1.712
KM Standard Error of Mean (logged)	0.0239		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	

Mean in Original Scale	0.367	Mean in Log Scale	-1.064
SD in Original Scale	0.175	SD in Log Scale	0.304
95% t UCL (Assumes normality)	0.417	95% H-Stat UCL	0.397
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Normal Distributed at 5% Significance Level			
Suggested UCL to Use			
95% KM (t) UCL	0.677		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Arsenic			
General Statistics			
Total Number of Observations	35	Number of Distinct Observations	16
Number of Detects	15	Number of Non-Detects	20
Number of Distinct Detects	14	Number of Distinct Non-Detects	3
Minimum Detect	0.71	Minimum Non-Detect	0.64
Maximum Detect	18.5	Maximum Non-Detect	0.77
Variance Detects	20.18	Percent Non-Detects	57.14%
Mean Detects	3.886	SD Detects	4.492
Median Detects	1.9	CV Detects	1.156
Skewness Detects	2.744	Kurtosis Detects	8.679
Mean of Logged Detects	0.939	SD of Logged Detects	0.9
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.663	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.881	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.24	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.22	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	2.033	KM Standard Error of Mean	0.571
KM SD	3.263	95% KM (BCA) UCL	3.122
95% KM (t) UCL	2.998	95% KM (Percentile Bootstrap) UCL	3.03
95% KM (z) UCL	2.972	95% KM Bootstrap t UCL	4.016
90% KM Chebyshev UCL	3.745	95% KM Chebyshev UCL	4.521
97.5% KM Chebyshev UCL	5.598	99% KM Chebyshev UCL	7.714
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	0.627	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.757	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.201	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.226	Detected data appear Gamma Distributed at 5% Significance Level	

Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	1.336	k star (bias corrected MLE)	1.114
Theta hat (MLE)	2.908	Theta star (bias corrected MLE)	3.49
nu hat (MLE)	40.09	nu star (bias corrected)	33.41
Mean (detects)	3.886		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	1.671
Maximum	18.5	Median	0.01
SD	3.478	CV	2.081
k hat (MLE)	0.258	k star (bias corrected MLE)	0.255
Theta hat (MLE)	6.485	Theta star (bias corrected MLE)	6.562
nu hat (MLE)	18.04	nu star (bias corrected)	17.83
Adjusted Level of Significance (β)	0.0425		
Approximate Chi Square Value (17.83, α)	9.266	Adjusted Chi Square Value (17.83, β)	8.973
95% Gamma Approximate UCL (use when n>=50)	3.215	95% Gamma Adjusted UCL (use when n<50)	3.32
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	2.033	SD (KM)	3.263
Variance (KM)	10.65	SE of Mean (KM)	0.571
k hat (KM)	0.388	k star (KM)	0.374
nu hat (KM)	27.16	nu star (KM)	26.17
theta hat (KM)	5.239	theta star (KM)	5.438
80% gamma percentile (KM)	3.252	90% gamma percentile (KM)	5.808
95% gamma percentile (KM)	8.644	99% gamma percentile (KM)	15.83
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (26.17, α)	15.51	Adjusted Chi Square Value (26.17, β)	15.12
95% Gamma Approximate KM-UCL (use when n>=50)	3.43	95% Gamma Adjusted KM-UCL (use when n<50)	3.518
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.946	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.881	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.163	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.22	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	1.803	Mean in Log Scale	-0.59
SD in Original Scale	3.417	SD in Log Scale	1.603
95% t UCL (assumes normality of ROS data)	2.78	95% Percentile Bootstrap UCL	2.841
95% BCA Bootstrap UCL	3.328	95% Bootstrap t UCL	3.812
95% H-UCL (Log ROS)	4.942		

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	0.15	KM Geo Mean	1.161
KM SD (logged)	0.889	95% Critical H Value (KM-Log)	2.327
KM Standard Error of Mean (logged)	0.156	95% H-UCL (KM -Log)	2.46
KM SD (logged)	0.889	95% Critical H Value (KM-Log)	2.327
KM Standard Error of Mean (logged)	0.156		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	1.867	Mean in Log Scale	-0.195
SD in Original Scale	3.385	SD in Log Scale	1.154
95% t UCL (Assumes normality)	2.834	95% H-Stat UCL	2.702
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Gamma Distributed at 5% Significance Level			
Suggested UCL to Use			
95% KM Adjusted Gamma UCL	3.518	95% GROS Adjusted Gamma UCL	3.32
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Barium			
General Statistics			
Total Number of Observations	35	Number of Distinct Observations	33
		Number of Missing Observations	0
Minimum	122	Mean	370.9
Maximum	2710	Median	263
SD	448.8	Std. Error of Mean	75.86
Coefficient of Variation	1.21	Skewness	4.62
Normal GOF Test			
Shapiro Wilk Test Statistic	0.404	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.934	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.369	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.148	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	499.2	95% Adjusted-CLT UCL (Chen-1995)	559
		95% Modified-t UCL (Johnson-1978)	509.1
Gamma GOF Test			

A-D Test Statistic	5.021	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.758	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.327	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.15	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	2.216	k star (bias corrected MLE)	2.045
Theta hat (MLE)	167.4	Theta star (bias corrected MLE)	181.4
nu hat (MLE)	155.1	nu star (bias corrected)	143.1
MLE Mean (bias corrected)	370.9	MLE Sd (bias corrected)	259.4
		Approximate Chi Square Value (0.05)	116.5
Adjusted Level of Significance	0.0425	Adjusted Chi Square Value	115.4
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	455.8	95% Adjusted Gamma UCL (use when n<50)	460.3
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.741	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.934	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.284	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.148	Data Not Lognormal at 5% Significance Level	
Data Not Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	4.804	Mean of logged Data	5.674
Maximum of Logged Data	7.905	SD of logged Data	0.557
Assuming Lognormal Distribution			
95% H-UCL	411.2	90% Chebyshev (MVUE) UCL	439.3
95% Chebyshev (MVUE) UCL	485	97.5% Chebyshev (MVUE) UCL	548.5
99% Chebyshev (MVUE) UCL	673.3		
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution (0.05)			
Nonparametric Distribution Free UCLs			
95% CLT UCL	495.7	95% Jackknife UCL	499.2
95% Standard Bootstrap UCL	495.8	95% Bootstrap-t UCL	868.8
95% Hall's Bootstrap UCL	982.8	95% Percentile Bootstrap UCL	500.1
95% BCA Bootstrap UCL	578.3		
90% Chebyshev(Mean, Sd) UCL	598.5	95% Chebyshev(Mean, Sd) UCL	701.6
97.5% Chebyshev(Mean, Sd) UCL	844.7	99% Chebyshev(Mean, Sd) UCL	1126
Suggested UCL to Use			
95% Chebyshev (Mean, Sd) UCL	701.6		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Cadmium

General Statistics

Total Number of Observations	35	Number of Distinct Observations	6
Number of Detects	3	Number of Non-Detects	32
Number of Distinct Detects	3	Number of Distinct Non-Detects	3
Minimum Detect	0.66	Minimum Non-Detect	0.61
Maximum Detect	1	Maximum Non-Detect	0.72
Variance Detects	0.0305	Percent Non-Detects	91.43%
Mean Detects	0.853	SD Detects	0.175
Median Detects	0.9	CV Detects	0.205
Skewness Detects	-1.116	Kurtosis Detects	N/A
Mean of Logged Detects	-0.174	SD of Logged Detects	0.216

Warning: Data set has only 3 Detected Values.

This is not enough to compute meaningful or reliable statistics and estimates.

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.946	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.767	Detected Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.272	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.425	Detected Data appear Normal at 5% Significance Level	

Detected Data appear Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	0.632	KM Standard Error of Mean	0.0167
KM SD	0.08	95% KM (BCA) UCL	N/A
95% KM (t) UCL	0.66	95% KM (Percentile Bootstrap) UCL	N/A
95% KM (z) UCL	0.659	95% KM Bootstrap t UCL	N/A
90% KM Chebyshev UCL	0.682	95% KM Chebyshev UCL	0.705
97.5% KM Chebyshev UCL	0.736	99% KM Chebyshev UCL	0.798

Gamma GOF Tests on Detected Observations Only

Not Enough Data to Perform GOF Test

Gamma Statistics on Detected Data Only

k hat (MLE)	33.45	k star (bias corrected MLE)	N/A
Theta hat (MLE)	0.0255	Theta star (bias corrected MLE)	N/A
nu hat (MLE)	200.7	nu star (bias corrected)	N/A
Mean (detects)	0.853		

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)

For such situations, GROS method may yield incorrect values of UCLs and BTVs

This is especially true when the sample size is small.

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	0.194
Maximum	1	Median	0.053
SD	0.263	CV	1.353
k hat (MLE)	0.515	k star (bias corrected MLE)	0.49
Theta hat (MLE)	0.377	Theta star (bias corrected MLE)	0.397
nu hat (MLE)	36.04	nu star (bias corrected)	34.28
Adjusted Level of Significance (β)	0.0425		
Approximate Chi Square Value (34.28, α)	21.89	Adjusted Chi Square Value (34.28, β)	21.42
95% Gamma Approximate UCL (use when n>=50)	0.304	95% Gamma Adjusted UCL (use when n<50)	N/A
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.632	SD (KM)	0.08
Variance (KM)	0.00639	SE of Mean (KM)	0.0167
k hat (KM)	62.48	k star (KM)	57.15
nu hat (KM)	4374	nu star (KM)	4000
theta hat (KM)	0.0101	theta star (KM)	0.0111
80% gamma percentile (KM)	0.701	90% gamma percentile (KM)	0.741
95% gamma percentile (KM)	0.776	99% gamma percentile (KM)	0.843
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (N/A, α)	3854	Adjusted Chi Square Value (N/A, β)	3848
95% Gamma Approximate KM-UCL (use when n>=50)	0.656	95% Gamma Adjusted KM-UCL (use when n<50)	0.657
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.925	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.767	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.291	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.425	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.339	Mean in Log Scale	-1.228
SD in Original Scale	0.204	SD in Log Scale	0.542
95% t UCL (assumes normality of ROS data)	0.398	95% Percentile Bootstrap UCL	0.396
95% BCA Bootstrap UCL	0.408	95% Bootstrap t UCL	0.419
95% H-UCL (Log ROS)	0.408		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-0.465	KM Geo Mean	0.628
KM SD (logged)	0.104	95% Critical H Value (KM-Log)	1.707
KM Standard Error of Mean (logged)	0.0217	95% H-UCL (KM -Log)	0.651
KM SD (logged)	0.104	95% Critical H Value (KM-Log)	1.707
KM Standard Error of Mean (logged)	0.0217		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.374	Mean in Log Scale	-1.034
SD in Original Scale	0.157	SD in Log Scale	0.283
95% t UCL (Assumes normality)	0.419	95% H-Stat UCL	0.404
DL/2 is not a recommended method, provided for comparisons and historical reasons			

Nonparametric Distribution Free UCL Statistics			
Detected Data appear Normal Distributed at 5% Significance Level			
Suggested UCL to Use			
95% KM (t) UCL	0.66		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Cobalt			
General Statistics			
Total Number of Observations	35	Number of Distinct Observations	10
Number of Detects	10	Number of Non-Detects	25
Number of Distinct Detects	9	Number of Distinct Non-Detects	2
Minimum Detect	1.4	Minimum Non-Detect	1.3
Maximum Detect	22.7	Maximum Non-Detect	1.5
Variance Detects	54.24	Percent Non-Detects	71.43%
Mean Detects	6.14	SD Detects	7.365
Median Detects	2.5	CV Detects	1.2
Skewness Detects	1.694	Kurtosis Detects	1.975
Mean of Logged Detects	1.279	SD of Logged Detects	1.025
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.705	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.842	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.36	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.262	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	2.683	KM Standard Error of Mean	0.771
KM SD	4.328	95% KM (BCA) UCL	4.043
95% KM (t) UCL	3.987	95% KM (Percentile Bootstrap) UCL	4.015
95% KM (z) UCL	3.952	95% KM Bootstrap t UCL	6.324
90% KM Chebyshev UCL	4.996	95% KM Chebyshev UCL	6.044
97.5% KM Chebyshev UCL	7.499	99% KM Chebyshev UCL	10.36
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	0.988	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.747	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.316	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.273	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	1.069	k star (bias corrected MLE)	0.815

Theta hat (MLE)	5.744	Theta star (bias corrected MLE)	7.534
nu hat (MLE)	21.38	nu star (bias corrected)	16.3
Mean (detects)	6.14		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	1.761
Maximum	22.7	Median	0.01
SD	4.717	CV	2.678
k hat (MLE)	0.209	k star (bias corrected MLE)	0.21
Theta hat (MLE)	8.414	Theta star (bias corrected MLE)	8.37
nu hat (MLE)	14.65	nu star (bias corrected)	14.73
Adjusted Level of Significance (β)	0.0425		
Approximate Chi Square Value (14.73, α)	7.076	Adjusted Chi Square Value (14.73, β)	6.824
95% Gamma Approximate UCL (use when n>=50)	3.667	95% Gamma Adjusted UCL (use when n<50)	3.803
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	2.683	SD (KM)	4.328
Variance (KM)	18.73	SE of Mean (KM)	0.771
k hat (KM)	0.384	k star (KM)	0.371
nu hat (KM)	26.91	nu star (KM)	25.94
theta hat (KM)	6.98	theta star (KM)	7.242
80% gamma percentile (KM)	4.287	90% gamma percentile (KM)	7.679
95% gamma percentile (KM)	11.45	99% gamma percentile (KM)	21
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (25.94, α)	15.33	Adjusted Chi Square Value (25.94, β)	14.94
95% Gamma Approximate KM-UCL (use when n>=50)	4.54	95% Gamma Adjusted KM-UCL (use when n<50)	4.657
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.835	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.842	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.257	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.262	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Approximate Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	1.884	Mean in Log Scale	-1.394
SD in Original Scale	4.674	SD in Log Scale	2.175
95% t UCL (assumes normality of ROS data)	3.22	95% Percentile Bootstrap UCL	3.296
95% BCA Bootstrap UCL	3.63	95% Bootstrap t UCL	6.106
95% H-UCL (Log ROS)	12.51		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	0.553	KM Geo Mean	1.739
KM SD (logged)	0.693	95% Critical H Value (KM-Log)	2.117

KM Standard Error of Mean (logged)	0.124	95% H-UCL (KM -Log)	2.844
KM SD (logged)	0.693	95% Critical H Value (KM-Log)	2.117
KM Standard Error of Mean (logged)	0.124		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	2.227	Mean in Log Scale	0.07
SD in Original Scale	4.546	SD in Log Scale	0.939
95% t UCL (Assumes normality)	3.526	95% H-Stat UCL	2.446

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Approximate Lognormal Distributed at 5% Significance Level

Suggested UCL to Use

KM H-UCL	2.844		

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Copper

General Statistics

Total Number of Observations	35	Number of Distinct Observations	25
Number of Detects	28	Number of Non-Detects	7
Number of Distinct Detects	24	Number of Distinct Non-Detects	2
Minimum Detect	1.6	Minimum Non-Detect	1.4
Maximum Detect	183	Maximum Non-Detect	1.9
Variance Detects	1377	Percent Non-Detects	20%
Mean Detects	17.85	SD Detects	37.11
Median Detects	4.5	CV Detects	2.079
Skewness Detects	3.72	Kurtosis Detects	15.23
Mean of Logged Detects	1.875	SD of Logged Detects	1.267

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.476	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.924	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.333	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.164	Detected Data Not Normal at 5% Significance Level	

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	14.58	KM Standard Error of Mean	5.722
KM SD	33.24	95% KM (BCA) UCL	25.34
95% KM (t) UCL	24.26	95% KM (Percentile Bootstrap) UCL	24.61
95% KM (z) UCL	23.99	95% KM Bootstrap t UCL	39.3
90% KM Chebyshev UCL	31.75	95% KM Chebyshev UCL	39.52
97.5% KM Chebyshev UCL	50.32	99% KM Chebyshev UCL	71.52

Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	2.361	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.799	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.21	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.174	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.612	k star (bias corrected MLE)	0.57
Theta hat (MLE)	29.17	Theta star (bias corrected MLE)	31.3
nu hat (MLE)	34.27	nu star (bias corrected)	31.93
Mean (detects)	17.85		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	14.28
Maximum	183	Median	3.3
SD	33.85	CV	2.37
k hat (MLE)	0.327	k star (bias corrected MLE)	0.318
Theta hat (MLE)	43.69	Theta star (bias corrected MLE)	44.92
nu hat (MLE)	22.89	nu star (bias corrected)	22.26
Adjusted Level of Significance (β)	0.0425		
Approximate Chi Square Value (22.26, α)	12.53	Adjusted Chi Square Value (22.26, β)	12.18
95% Gamma Approximate UCL (use when n>=50)	25.37	95% Gamma Adjusted UCL (use when n<50)	26.09
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	14.58	SD (KM)	33.24
Variance (KM)	1105	SE of Mean (KM)	5.722
k hat (KM)	0.192	k star (KM)	0.195
nu hat (KM)	13.46	nu star (KM)	13.64
theta hat (KM)	75.81	theta star (KM)	74.81
80% gamma percentile (KM)	18.95	90% gamma percentile (KM)	44.08
95% gamma percentile (KM)	75.62	99% gamma percentile (KM)	162.8
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (13.64, α)	6.327	Adjusted Chi Square Value (13.64, β)	6.091
95% Gamma Approximate KM-UCL (use when n>=50)	31.43	95% Gamma Adjusted KM-UCL (use when n<50)	32.65
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.888	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.924	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.169	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.164	Detected Data Not Lognormal at 5% Significance Level	
Detected Data Not Lognormal at 5% Significance Level			

Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	14.38	Mean in Log Scale	1.337
SD in Original Scale	33.81	SD in Log Scale	1.593
95% t UCL (assumes normality of ROS data)	24.05	95% Percentile Bootstrap UCL	24.74
95% BCA Bootstrap UCL	29.36	95% Bootstrap t UCL	39.07
95% H-UCL (Log ROS)	33.03		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	1.58	KM Geo Mean	4.853
KM SD (logged)	1.261	95% Critical H Value (KM-Log)	2.796
KM Standard Error of Mean (logged)	0.217	95% H-UCL (KM -Log)	19.68
KM SD (logged)	1.261	95% Critical H Value (KM-Log)	2.796
KM Standard Error of Mean (logged)	0.217		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	14.45	Mean in Log Scale	1.464
SD in Original Scale	33.78	SD in Log Scale	1.406
95% t UCL (Assumes normality)	24.1	95% H-Stat UCL	23.93
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution at 5% Significance Level			
Suggested UCL to Use			
95% KM (Chebyshev) UCL	39.52		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Vanadium			
General Statistics			
Total Number of Observations	35	Number of Distinct Observations	12
Number of Detects	12	Number of Non-Detects	23
Number of Distinct Detects	10	Number of Distinct Non-Detects	2
Minimum Detect	1.6	Minimum Non-Detect	1.2
Maximum Detect	46.8	Maximum Non-Detect	1.9
Variance Detects	191.9	Percent Non-Detects	65.71%
Mean Detects	9.417	SD Detects	13.85
Median Detects	3.1	CV Detects	1.471
Skewness Detects	2.194	Kurtosis Detects	4.669
Mean of Logged Detects	1.522	SD of Logged Detects	1.137
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.632	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.859	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.383	**Lilliefors GOF Test**	

5% Lilliefors Critical Value	0.243	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	4.036	KM Standard Error of Mean	1.533
KM SD	8.684	95% KM (BCA) UCL	7.31
95% KM (t) UCL	6.629	95% KM (Percentile Bootstrap) UCL	6.629
95% KM (z) UCL	6.558	95% KM Bootstrap t UCL	10.76
90% KM Chebyshev UCL	8.636	95% KM Chebyshev UCL	10.72
97.5% KM Chebyshev UCL	13.61	99% KM Chebyshev UCL	19.29
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	1.398	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.763	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.32	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.254	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.821	k star (bias corrected MLE)	0.671
Theta hat (MLE)	11.48	Theta star (bias corrected MLE)	14.03
nu hat (MLE)	19.69	nu star (bias corrected)	16.1
Mean (detects)	9.417		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	3.235
Maximum	46.8	Median	0.01
SD	9.088	CV	2.809
k hat (MLE)	0.2	k star (bias corrected MLE)	0.202
Theta hat (MLE)	16.17	Theta star (bias corrected MLE)	16.02
nu hat (MLE)	14	nu star (bias corrected)	14.14
Adjusted Level of Significance (β)	0.0425		
Approximate Chi Square Value (14.14, α)	6.665	Adjusted Chi Square Value (14.14, β)	6.421
95% Gamma Approximate UCL (use when n>=50)	6.862	95% Gamma Adjusted UCL (use when n<50)	7.122
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	4.036	SD (KM)	8.684
Variance (KM)	75.42	SE of Mean (KM)	1.533
k hat (KM)	0.216	k star (KM)	0.217
nu hat (KM)	15.12	nu star (KM)	15.16
theta hat (KM)	18.69	theta star (KM)	18.64
80% gamma percentile (KM)	5.53	90% gamma percentile (KM)	12.2
95% gamma percentile (KM)	20.36	99% gamma percentile (KM)	42.54
Gamma Kaplan-Meier (KM) Statistics			

Approximate Chi Square Value (15.16, α)	7.371	Adjusted Chi Square Value (15.16, β)	7.114
95% Gamma Approximate KM-UCL (use when n>=50)	8.3	95% Gamma Adjusted KM-UCL (use when n<50)	8.6
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.813	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.859	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.251	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.243	Detected Data Not Lognormal at 5% Significance Level	
Detected Data Not Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	3.395	Mean in Log Scale	-0.82
SD in Original Scale	9.033	SD in Log Scale	2.126
95% t UCL (assumes normality of ROS data)	5.977	95% Percentile Bootstrap UCL	6.21
95% BCA Bootstrap UCL	7.773	95% Bootstrap t UCL	10.33
95% H-UCL (Log ROS)	18.74		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	0.655	KM Geo Mean	1.925
KM SD (logged)	0.896	95% Critical H Value (KM-Log)	2.335
KM Standard Error of Mean (logged)	0.159	95% H-UCL (KM -Log)	4.116
KM SD (logged)	0.896	95% Critical H Value (KM-Log)	2.335
KM Standard Error of Mean (logged)	0.159		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	3.723	Mean in Log Scale	0.317
SD in Original Scale	8.917	SD in Log Scale	1.11
95% t UCL (Assumes normality)	6.271	95% H-Stat UCL	4.166
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution at 5% Significance Level			
Suggested UCL to Use			
95% KM (Chebyshev) UCL	10.72		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Lead			
General Statistics			
Total Number of Observations	35	Number of Distinct Observations	22
Number of Detects	20	Number of Non-Detects	15
Number of Distinct Detects	19	Number of Distinct Non-Detects	3
Minimum Detect	0.4	Minimum Non-Detect	0.37
Maximum Detect	38.5	Maximum Non-Detect	0.44

Variance Detects	121.2	Percent Non-Detects	42.86%
Mean Detects	5.902	SD Detects	11.01
Median Detects	1.45	CV Detects	1.866
Skewness Detects	2.563	Kurtosis Detects	5.685
Mean of Logged Detects	0.727	SD of Logged Detects	1.326
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.531	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.905	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.364	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.192	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	3.531	KM Standard Error of Mean	1.485
KM SD	8.561	95% KM (BCA) UCL	6.354
95% KM (t) UCL	6.041	95% KM (Percentile Bootstrap) UCL	6.127
95% KM (z) UCL	5.973	95% KM Bootstrap t UCL	12.61
90% KM Chebyshev UCL	7.985	95% KM Chebyshev UCL	10
97.5% KM Chebyshev UCL	12.8	99% KM Chebyshev UCL	18.3
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	1.997	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.794	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.281	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.204	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.591	k star (bias corrected MLE)	0.535
Theta hat (MLE)	9.992	Theta star (bias corrected MLE)	11.02
nu hat (MLE)	23.63	nu star (bias corrected)	21.41
Mean (detects)	5.902		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	3.377
Maximum	38.5	Median	0.58
SD	8.745	CV	2.59
k hat (MLE)	0.255	k star (bias corrected MLE)	0.252
Theta hat (MLE)	13.24	Theta star (bias corrected MLE)	13.38
nu hat (MLE)	17.86	nu star (bias corrected)	17.66
Adjusted Level of Significance (β)	0.0425		
Approximate Chi Square Value (17.66, α)	9.145	Adjusted Chi Square Value (17.66, β)	8.855
95% Gamma Approximate UCL (use when n>=50)	6.52	95% Gamma Adjusted UCL (use when n<50)	6.734

Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	3.531	SD (KM)	8.561
Variance (KM)	73.29	SE of Mean (KM)	1.485
k hat (KM)	0.17	k star (KM)	0.175
nu hat (KM)	11.91	nu star (KM)	12.22
theta hat (KM)	20.76	theta star (KM)	20.22
80% gamma percentile (KM)	4.297	90% gamma percentile (KM)	10.63
95% gamma percentile (KM)	18.81	99% gamma percentile (KM)	41.88
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (12.22, α)	5.373	Adjusted Chi Square Value (12.22, β)	5.158
95% Gamma Approximate KM-UCL (use when n>=50)	8.031	95% Gamma Adjusted KM-UCL (use when n<50)	8.366
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.879	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.905	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.17	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.192	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Approximate Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	3.413	Mean in Log Scale	-0.735
SD in Original Scale	8.731	SD in Log Scale	2.064
95% t UCL (assumes normality of ROS data)	5.908	95% Percentile Bootstrap UCL	6.063
95% BCA Bootstrap UCL	7.051	95% Bootstrap t UCL	11.85
95% H-UCL (Log ROS)	16.54		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-0.0104	KM Geo Mean	0.99
KM SD (logged)	1.296	95% Critical H Value (KM-Log)	2.843
KM Standard Error of Mean (logged)	0.225	95% H-UCL (KM -Log)	4.308
KM SD (logged)	1.296	95% Critical H Value (KM-Log)	2.843
KM Standard Error of Mean (logged)	0.225		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	3.455	Mean in Log Scale	-0.289
SD in Original Scale	8.715	SD in Log Scale	1.549
95% t UCL (Assumes normality)	5.946	95% H-Stat UCL	5.821
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Approximate Lognormal Distributed at 5% Significance Level			
Suggested UCL to Use			
KM H-UCL	4.308		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

ProUCL Output
South Percolation Pond Area (Surface Water)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

UCL Statistics for Data Sets with Non-Detects			
User Selected Options			
Date/Time of Computation	ProUCL 5.12/8/2019 1:27:11 PM		
From File	20190207_CYANIDE_PROUCL_INPUT_RERUNS_a.xls		
Full Precision	OFF		
Confidence Coefficient	95%		
Number of Bootstrap Operations	2000		
Cyanide			
General Statistics			
Total Number of Observations	35	Number of Distinct Observations	26
Number of Detects	24	Number of Non-Detects	11
Number of Distinct Detects	24	Number of Distinct Non-Detects	2
Minimum Detect	3	Minimum Non-Detect	2
Maximum Detect	690	Maximum Non-Detect	4
Variance Detects	35312	Percent Non-Detects	31.43%
Mean Detects	106.1	SD Detects	187.9
Median Detects	16.45	CV Detects	1.771
Skewness Detects	2.432	Kurtosis Detects	5.376
Mean of Logged Detects	3.353	SD of Logged Detects	1.675
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.594	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.916	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.292	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.177	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	73.39	KM Standard Error of Mean	27.59
KM SD	159.8	95% KM (BCA) UCL	121.9
95% KM (t) UCL	120	95% KM (Percentile Bootstrap) UCL	120.3
95% KM (z) UCL	118.8	95% KM Bootstrap t UCL	174
90% KM Chebyshev UCL	156.2	95% KM Chebyshev UCL	193.7
97.5% KM Chebyshev UCL	245.7	99% KM Chebyshev UCL	347.9
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	1.265	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.809	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.228	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.188	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.486	k star (bias corrected MLE)	0.453
Theta hat (MLE)	218.1	Theta star (bias corrected MLE)	234
nu hat (MLE)	23.35	nu star (bias corrected)	21.76
Mean (detects)	106.1		

ProUCL Output
South Percolation Pond Area (Surface Water)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	72.75
Maximum	690	Median	9.6
SD	162.4	CV	2.233
k hat (MLE)	0.212	k star (bias corrected MLE)	0.213
Theta hat (MLE)	342.8	Theta star (bias corrected MLE)	341.4
nu hat (MLE)	14.86	nu star (bias corrected)	14.92
Adjusted Level of Significance (β)	0.0425		
Approximate Chi Square Value (14.92, α)	7.203	Adjusted Chi Square Value (14.92, β)	6.949
95% Gamma Approximate UCL (use when n>=50)	150.6	95% Gamma Adjusted UCL (use when n<50)	156.1
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	73.39	SD (KM)	159.8
Variance (KM)	25537	SE of Mean (KM)	27.59
k hat (KM)	0.211	k star (KM)	0.212
nu hat (KM)	14.76	nu star (KM)	14.83
theta hat (KM)	348	theta star (KM)	346.4
80% gamma percentile (KM)	99.54	90% gamma percentile (KM)	221.9
95% gamma percentile (KM)	372.4	99% gamma percentile (KM)	782.9
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (14.83, α)	7.145	Adjusted Chi Square Value (14.83, β)	6.891
95% Gamma Approximate KM-UCL (use when n>=50)	152.4	95% Gamma Adjusted KM-UCL (use when n<50)	157.9
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.934	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.916	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.17	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.177	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	72.98	Mean in Log Scale	2.089
SD in Original Scale	162.3	SD in Log Scale	2.408
95% t UCL (assumes normality of ROS data)	119.4	95% Percentile Bootstrap UCL	118.5
95% BCA Bootstrap UCL	138.1	95% Bootstrap t UCL	174
95% H-UCL (Log ROS)	956.1		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	2.524	KM Geo Mean	12.48
KM SD (logged)	1.829	95% Critical H Value (KM-Log)	3.623
KM Standard Error of Mean (logged)	0.316	95% H-UCL (KM -Log)	207.1
KM SD (logged)	1.829	95% Critical H Value (KM-Log)	3.623
KM Standard Error of Mean (logged)	0.316		

ProUCL Output
South Percolation Pond Area (Surface Water)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	73.11	Mean in Log Scale	2.339
SD in Original Scale	162.3	SD in Log Scale	2.057
95% t UCL (Assumes normality)	119.5	95% H-Stat UCL	349.8
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Lognormal Distributed at 5% Significance Level			
Suggested UCL to Use			
95% KM (Chebyshev) UCL	193.7		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			

ProUCL Output
South Percolation Pond Area (Sediment)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

UCL Statistics for Data Sets with Non-Detects	
User Selected Options	
Date/Time of Computation	ProUCL 5.11/28/2019 5:24:09 PM
From File	20190128_SPercPond_ProUCL_input_d.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

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General Statistics			
Total Number of Observations	20	Number of Distinct Observations	19
Number of Detects	18	Number of Non-Detects	2
Number of Distinct Detects	17	Number of Distinct Non-Detects	2
Minimum Detect	0.011	Minimum Non-Detect	0.031
Maximum Detect	1.2	Maximum Non-Detect	0.033
Variance Detects	0.124	Percent Non-Detects	10%
Mean Detects	0.366	SD Detects	0.352
Median Detects	0.22	CV Detects	0.964
Skewness Detects	1.192	Kurtosis Detects	0.382
Mean of Logged Detects	-1.569	SD of Logged Detects	1.27

Normal GOF Test on Detects Only		
Shapiro Wilk Test Statistic	0.841	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.897	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.229	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.202	Detected Data Not Normal at 5% Significance Level
Detected Data Not Normal at 5% Significance Level		

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.331	KM Standard Error of Mean	0.0785
KM SD	0.341	95% KM (BCA) UCL	0.469
95% KM (t) UCL	0.466	95% KM (Percentile Bootstrap) UCL	0.461
95% KM (z) UCL	0.46	95% KM Bootstrap t UCL	0.507
90% KM Chebyshev UCL	0.566	95% KM Chebyshev UCL	0.673
97.5% KM Chebyshev UCL	0.821	99% KM Chebyshev UCL	1.112

Gamma GOF Tests on Detected Observations Only		
A-D Test Statistic	0.283	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.766	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.111	**Kolmogorov-Smirnov GOF**
5% K-S Critical Value	0.209	Detected data appear Gamma Distributed at 5% Significance Level
Detected data appear Gamma Distributed at 5% Significance Level		

Gamma Statistics on Detected Data Only			
k hat (MLE)	1.022	k star (bias corrected MLE)	0.889
Theta hat (MLE)	0.358	Theta star (bias corrected MLE)	0.411
nu hat (MLE)	36.81	nu star (bias corrected)	32.01

Mean (detects)	0.366		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	0.33
Maximum	1.2	Median	0.185
SD	0.351	CV	1.063
k hat (MLE)	0.779	k star (bias corrected MLE)	0.696
Theta hat (MLE)	0.424	Theta star (bias corrected MLE)	0.474
nu hat (MLE)	31.17	nu star (bias corrected)	27.83
Adjusted Level of Significance (β)	0.038		
Approximate Chi Square Value (27.83, α)	16.79	Adjusted Chi Square Value (27.83, β)	16.12
95% Gamma Approximate UCL (use when n>=50)	0.547	95% Gamma Adjusted UCL (use when n<50)	0.57
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.331	SD (KM)	0.341
Variance (KM)	0.116	SE of Mean (KM)	0.0785
k hat (KM)	0.938	k star (KM)	0.831
nu hat (KM)	37.54	nu star (KM)	33.24
theta hat (KM)	0.352	theta star (KM)	0.398
80% gamma percentile (KM)	0.539	90% gamma percentile (KM)	0.797
95% gamma percentile (KM)	1.058	99% gamma percentile (KM)	1.674
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (33.24, α)	21.06	Adjusted Chi Square Value (33.24, β)	20.29
95% Gamma Approximate KM-UCL (use when n>=50)	0.522	95% Gamma Adjusted KM-UCL (use when n<50)	0.542
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.932	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.897	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.166	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.202	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.332	Mean in Log Scale	-1.78
SD in Original Scale	0.349	SD in Log Scale	1.365
95% t UCL (assumes normality of ROS data)	0.467	95% Percentile Bootstrap UCL	0.46
95% BCA Bootstrap UCL	0.477	95% Bootstrap t UCL	0.507
95% H-UCL (Log ROS)	1.167		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-1.831	KM Geo Mean	0.16
KM SD (logged)	1.414	95% Critical H Value (KM-Log)	3.28
KM Standard Error of Mean (logged)	0.327	95% H-UCL (KM -Log)	1.261

KM SD (logged)	1.414	95% Critical H Value (KM-Log)	3.28
KM Standard Error of Mean (logged)	0.327		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.331	Mean in Log Scale	-1.826
SD in Original Scale	0.35	SD in Log Scale	1.438
95% t UCL (Assumes normality)	0.466	95% H-Stat UCL	1.354

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Gamma Distributed at 5% Significance Level

Suggested UCL to Use

Adjusted KM-UCL (use when k<=1 and 15 < n < 50 but k<=1)	0.542		

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

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General Statistics

Total Number of Observations	20	Number of Distinct Observations	18
		Number of Missing Observations	0
Minimum	0.03	Mean	0.445
Maximum	1.9	Median	0.305
SD	0.473	Std. Error of Mean	0.106
Coefficient of Variation	1.063	Skewness	2.038

Normal GOF Test

Shapiro Wilk Test Statistic	0.766	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.905	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.263	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.192	Data Not Normal at 5% Significance Level	

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	0.627	95% Adjusted-CLT UCL (Chen-1995)	0.67
		95% Modified-t UCL (Johnson-1978)	0.635

Gamma GOF Test

A-D Test Statistic	0.348	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.766	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.144	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.199	Detected data appear Gamma Distributed at 5% Significance Level	

Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	1.091	k star (bias corrected MLE)	0.961
Theta hat (MLE)	0.407	Theta star (bias corrected MLE)	0.463
nu hat (MLE)	43.64	nu star (bias corrected)	38.43
MLE Mean (bias corrected)	0.445	MLE Sd (bias corrected)	0.454
		Approximate Chi Square Value (0.05)	25.23
Adjusted Level of Significance	0.038	Adjusted Chi Square Value	24.39
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50)	0.677	95% Adjusted Gamma UCL (use when n<50)	0.701
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.947	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.905	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.159	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.192	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	-3.507	Mean of logged Data	-1.334
Maximum of Logged Data	0.642	SD of logged Data	1.142
Assuming Lognormal Distribution			
95% H-UCL	1.065	90% Chebyshev (MVUE) UCL	0.902
95% Chebyshev (MVUE) UCL	1.092	97.5% Chebyshev (MVUE) UCL	1.357
99% Chebyshev (MVUE) UCL	1.877		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	0.618	95% Jackknife UCL	0.627
95% Standard Bootstrap UCL	0.614	95% Bootstrap-t UCL	0.736
95% Hall's Bootstrap UCL	1.485	95% Percentile Bootstrap UCL	0.618
95% BCA Bootstrap UCL	0.659		
90% Chebyshev(Mean, Sd) UCL	0.762	95% Chebyshev(Mean, Sd) UCL	0.905
97.5% Chebyshev(Mean, Sd) UCL	1.104	99% Chebyshev(Mean, Sd) UCL	1.496
Suggested UCL to Use			
95% Adjusted Gamma UCL	0.701		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
BenzoAPyrene			

General Statistics			
Total Number of Observations	20	Number of Distinct Observations	18
Number of Detects	18	Number of Non-Detects	2
Number of Distinct Detects	16	Number of Distinct Non-Detects	2
Minimum Detect	0.013	Minimum Non-Detect	0.014
Maximum Detect	0.86	Maximum Non-Detect	0.015
Variance Detects	0.0573	Percent Non-Detects	10%
Mean Detects	0.28	SD Detects	0.239
Median Detects	0.22	CV Detects	0.854
Skewness Detects	1.307	Kurtosis Detects	1.341
Mean of Logged Detects	-1.718	SD of Logged Detects	1.135
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.866	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.897	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.2	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.202	Detected Data appear Normal at 5% Significance Level	
Detected Data appear Approximate Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.254	KM Standard Error of Mean	0.054
KM SD	0.235	95% KM (BCA) UCL	0.349
95% KM (t) UCL	0.347	95% KM (Percentile Bootstrap) UCL	0.343
95% KM (z) UCL	0.342	95% KM Bootstrap t UCL	0.372
90% KM Chebyshev UCL	0.416	95% KM Chebyshev UCL	0.489
97.5% KM Chebyshev UCL	0.591	99% KM Chebyshev UCL	0.791
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	0.277	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.761	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.14	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.208	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	1.261	k star (bias corrected MLE)	1.088
Theta hat (MLE)	0.222	Theta star (bias corrected MLE)	0.258
nu hat (MLE)	45.4	nu star (bias corrected)	39.17
Mean (detects)	0.28		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	0.253
Maximum	0.86	Median	0.2

SD	0.241	CV	0.953
k hat (MLE)	0.92	k star (bias corrected MLE)	0.816
Theta hat (MLE)	0.275	Theta star (bias corrected MLE)	0.31
nu hat (MLE)	36.81	nu star (bias corrected)	32.62
Adjusted Level of Significance (β)	0.038		
Approximate Chi Square Value (32.62, α)	20.57	Adjusted Chi Square Value (32.62, β)	19.81
95% Gamma Approximate UCL (use when n>=50)	0.402	95% Gamma Adjusted UCL (use when n<50)	0.417
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.254	SD (KM)	0.235
Variance (KM)	0.0551	SE of Mean (KM)	0.054
k hat (KM)	1.166	k star (KM)	1.024
nu hat (KM)	46.63	nu star (KM)	40.96
theta hat (KM)	0.217	theta star (KM)	0.248
80% gamma percentile (KM)	0.407	90% gamma percentile (KM)	0.58
95% gamma percentile (KM)	0.753	99% gamma percentile (KM)	1.154
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (40.96, α)	27.3	Adjusted Chi Square Value (40.96, β)	26.42
95% Gamma Approximate KM-UCL (use when n>=50)	0.38	95% Gamma Adjusted KM-UCL (use when n<50)	0.393
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.917	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.897	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.203	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.202	Detected Data Not Lognormal at 5% Significance Level	
Detected Data appear Approximate Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.254	Mean in Log Scale	-1.932
SD in Original Scale	0.24	SD in Log Scale	1.259
95% t UCL (assumes normality of ROS data)	0.347	95% Percentile Bootstrap UCL	0.348
95% BCA Bootstrap UCL	0.363	95% Bootstrap t UCL	0.379
95% H-UCL (Log ROS)	0.767		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-1.981	KM Geo Mean	0.138
KM SD (logged)	1.31	95% Critical H Value (KM-Log)	3.11
KM Standard Error of Mean (logged)	0.301	95% H-UCL (KM -Log)	0.828
KM SD (logged)	1.31	95% Critical H Value (KM-Log)	3.11
KM Standard Error of Mean (logged)	0.301		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.253	Mean in Log Scale	-2.039
SD in Original Scale	0.242	SD in Log Scale	1.459
95% t UCL (Assumes normality)	0.346	95% H-Stat UCL	1.16
DL/2 is not a recommended method, provided for comparisons and historical reasons			

Nonparametric Distribution Free UCL Statistics			
Detected Data appear Approximate Normal Distributed at 5% Significance Level			
Suggested UCL to Use			
95% KM (t) UCL	0.347		
When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test			
When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
DibenzAHAnthracene			
General Statistics			
Total Number of Observations	20	Number of Distinct Observations	20
Number of Detects	14	Number of Non-Detects	6
Number of Distinct Detects	14	Number of Distinct Non-Detects	6
Minimum Detect	0.0061	Minimum Non-Detect	0.0052
Maximum Detect	0.28	Maximum Non-Detect	0.082
Variance Detects	0.00668	Percent Non-Detects	30%
Mean Detects	0.0945	SD Detects	0.0818
Median Detects	0.0565	CV Detects	0.865
Skewness Detects	1.152	Kurtosis Detects	0.507
Mean of Logged Detects	-2.778	SD of Logged Detects	1.063
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.869	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.874	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.244	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.226	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.0704	KM Standard Error of Mean	0.0177
KM SD	0.076	95% KM (BCA) UCL	0.104
95% KM (t) UCL	0.101	95% KM (Percentile Bootstrap) UCL	0.099
95% KM (z) UCL	0.0995	95% KM Bootstrap t UCL	0.112
90% KM Chebyshev UCL	0.124	95% KM Chebyshev UCL	0.148
97.5% KM Chebyshev UCL	0.181	99% KM Chebyshev UCL	0.247
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	0.279	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.754	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.159	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.234	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			

Gamma Statistics on Detected Data Only			
k hat (MLE)	1.337	k star (bias corrected MLE)	1.098
Theta hat (MLE)	0.0707	Theta star (bias corrected MLE)	0.0861
nu hat (MLE)	37.42	nu star (bias corrected)	30.74
Mean (detects)	0.0945		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.0061	Mean	0.0698
Maximum	0.28	Median	0.0455
SD	0.0779	CV	1.116
k hat (MLE)	0.949	k star (bias corrected MLE)	0.84
Theta hat (MLE)	0.0736	Theta star (bias corrected MLE)	0.0832
nu hat (MLE)	37.94	nu star (bias corrected)	33.59
Adjusted Level of Significance (β)	0.038		
Approximate Chi Square Value (33.59, α)	21.33	Adjusted Chi Square Value (33.59, β)	20.56
95% Gamma Approximate UCL (use when n>=50)	0.11	95% Gamma Adjusted UCL (use when n<50)	0.114
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.0704	SD (KM)	0.076
Variance (KM)	0.00578	SE of Mean (KM)	0.0177
k hat (KM)	0.858	k star (KM)	0.762
nu hat (KM)	34.31	nu star (KM)	30.5
theta hat (KM)	0.0821	theta star (KM)	0.0923
80% gamma percentile (KM)	0.115	90% gamma percentile (KM)	0.173
95% gamma percentile (KM)	0.232	99% gamma percentile (KM)	0.373
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (30.50, α)	18.88	Adjusted Chi Square Value (30.50, β)	18.16
95% Gamma Approximate KM-UCL (use when n>=50)	0.114	95% Gamma Adjusted KM-UCL (use when n<50)	0.118
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.938	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.874	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.17	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.226	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.07	Mean in Log Scale	-3.294
SD in Original Scale	0.0779	SD in Log Scale	1.234
95% t UCL (assumes normality of ROS data)	0.1	95% Percentile Bootstrap UCL	0.0997
95% BCA Bootstrap UCL	0.104	95% Bootstrap t UCL	0.113
95% H-UCL (Log ROS)	0.185		

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-3.345	KM Geo Mean	0.0353
KM SD (logged)	1.295	95% Critical H Value (KM-Log)	3.086
KM Standard Error of Mean (logged)	0.315	95% H-UCL (KM -Log)	0.204
KM SD (logged)	1.295	95% Critical H Value (KM-Log)	3.086
KM Standard Error of Mean (logged)	0.315		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.0723	Mean in Log Scale	-3.212
SD in Original Scale	0.0765	SD in Log Scale	1.225
95% t UCL (Assumes normality)	0.102	95% H-Stat UCL	0.197
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Gamma Distributed at 5% Significance Level			
Suggested UCL to Use			
95% KM Adjusted Gamma UCL	0.118	95% GROS Adjusted Gamma UCL	0.114
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Cyanide			
General Statistics			
Total Number of Observations	20	Number of Distinct Observations	20
Number of Detects	18	Number of Non-Detects	2
Number of Distinct Detects	18	Number of Distinct Non-Detects	2
Minimum Detect	0.14	Minimum Non-Detect	0.1
Maximum Detect	8.5	Maximum Non-Detect	0.13
Variance Detects	3.607	Percent Non-Detects	10%
Mean Detects	1.189	SD Detects	1.899
Median Detects	0.66	CV Detects	1.597
Skewness Detects	3.735	Kurtosis Detects	14.83
Mean of Logged Detects	-0.357	SD of Logged Detects	0.931
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.485	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.897	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.318	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.202	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	1.081	KM Standard Error of Mean	0.41

KM SD	1.781	95% KM (BCA) UCL	1.86
95% KM (t) UCL	1.789	95% KM (Percentile Bootstrap) UCL	1.847
95% KM (z) UCL	1.755	95% KM Bootstrap t UCL	3.367
90% KM Chebyshev UCL	2.31	95% KM Chebyshev UCL	2.867
97.5% KM Chebyshev UCL	3.64	99% KM Chebyshev UCL	5.158
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	1.152	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.765	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.217	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.209	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	1.079	k star (bias corrected MLE)	0.936
Theta hat (MLE)	1.102	Theta star (bias corrected MLE)	1.271
nu hat (MLE)	38.84	nu star (bias corrected)	33.7
Mean (detects)	1.189		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	1.072
Maximum	8.5	Median	0.645
SD	1.833	CV	1.71
k hat (MLE)	0.709	k star (bias corrected MLE)	0.636
Theta hat (MLE)	1.511	Theta star (bias corrected MLE)	1.685
nu hat (MLE)	28.36	nu star (bias corrected)	25.44
Adjusted Level of Significance (β)	0.038		
Approximate Chi Square Value (25.44, α)	14.95	Adjusted Chi Square Value (25.44, β)	14.32
95% Gamma Approximate UCL (use when n>=50)	1.823	95% Gamma Adjusted UCL (use when n<50)	1.904
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	1.081	SD (KM)	1.781
Variance (KM)	3.173	SE of Mean (KM)	0.41
k hat (KM)	0.368	k star (KM)	0.346
nu hat (KM)	14.72	nu star (KM)	13.84
theta hat (KM)	2.936	theta star (KM)	3.122
80% gamma percentile (KM)	1.708	90% gamma percentile (KM)	3.125
95% gamma percentile (KM)	4.716	99% gamma percentile (KM)	8.78
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (13.84, α)	6.465	Adjusted Chi Square Value (13.84, β)	6.069
95% Gamma Approximate KM-UCL (use when n>=50)	2.314	95% Gamma Adjusted KM-UCL (use when n<50)	2.465
Lognormal GOF Test on Detected Observations Only			

Shapiro Wilk Test Statistic	0.945	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.897	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.129	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.202	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	1.079	Mean in Log Scale	-0.57
SD in Original Scale	1.828	SD in Log Scale	1.098
95% t UCL (assumes normality of ROS data)	1.786	95% Percentile Bootstrap UCL	1.827
95% BCA Bootstrap UCL	2.298	95% Bootstrap t UCL	3.199
95% H-UCL (Log ROS)	2.082		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-0.551	KM Geo Mean	0.576
KM SD (logged)	1.038	95% Critical H Value (KM-Log)	2.691
KM Standard Error of Mean (logged)	0.239	95% H-UCL (KM -Log)	1.875
KM SD (logged)	1.038	95% Critical H Value (KM-Log)	2.691
KM Standard Error of Mean (logged)	0.239		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	1.076	Mean in Log Scale	-0.608
SD in Original Scale	1.83	SD in Log Scale	1.172
95% t UCL (Assumes normality)	1.784	95% H-Stat UCL	2.356
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Lognormal Distributed at 5% Significance Level			
Suggested UCL to Use			
KM H-UCL	1.875		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Aluminum			
General Statistics			
Total Number of Observations	20	Number of Distinct Observations	20
		Number of Missing Observations	0
Minimum	2360	Mean	8005
Maximum	13300	Median	8165
SD	2850	Std. Error of Mean	637.3
Coefficient of Variation	0.356	Skewness	-0.0343

Normal GOF Test			
Shapiro Wilk Test Statistic	0.971	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.905	Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.134	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.192	Data appear Normal at 5% Significance Level	
Data appear Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	9106	95% Adjusted-CLT UCL (Chen-1995)	9048
		95% Modified-t UCL (Johnson-1978)	9106
Gamma GOF Test			
A-D Test Statistic	0.481	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.744	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.186	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.194	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	6.886	k star (bias corrected MLE)	5.886
Theta hat (MLE)	1162	Theta star (bias corrected MLE)	1360
nu hat (MLE)	275.4	nu star (bias corrected)	235.5
MLE Mean (bias corrected)	8005	MLE Sd (bias corrected)	3299
		Approximate Chi Square Value (0.05)	200.9
Adjusted Level of Significance	0.038	Adjusted Chi Square Value	198.4
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	9380	95% Adjusted Gamma UCL (use when n<50)	9499
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.911	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.905	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.206	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.192	Data Not Lognormal at 5% Significance Level	
Data appear Approximate Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	7.766	Mean of logged Data	8.913
Maximum of Logged Data	9.496	SD of logged Data	0.425
Assuming Lognormal Distribution			
95% H-UCL	9834	90% Chebyshev (MVUE) UCL	10461
95% Chebyshev (MVUE) UCL	11534	97.5% Chebyshev (MVUE) UCL	13023
99% Chebyshev (MVUE) UCL	15947		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			

Nonparametric Distribution Free UCLs			
95% CLT UCL	9053	95% Jackknife UCL	9106
95% Standard Bootstrap UCL	9066	95% Bootstrap-t UCL	9075
95% Hall's Bootstrap UCL	9033	95% Percentile Bootstrap UCL	9028
95% BCA Bootstrap UCL	8987		
90% Chebyshev(Mean, Sd) UCL	9916	95% Chebyshev(Mean, Sd) UCL	10782
97.5% Chebyshev(Mean, Sd) UCL	11984	99% Chebyshev(Mean, Sd) UCL	14346

Suggested UCL to Use			
95% Student's-t UCL	9106		

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Note: For highly negatively-skewed data, confidence limits (e.g., Chen, Johnson, Lognormal, and Gamma) may not be reliable. Chen's and Johnson's methods provide adjustments for positvely skewed data sets.

Iron

General Statistics			
Total Number of Observations	20	Number of Distinct Observations	20
		Number of Missing Observations	0
Minimum	1490	Mean	9025
Maximum	19100	Median	8735
SD	5394	Std. Error of Mean	1206
Coefficient of Variation	0.598	Skewness	0.1

Normal GOF Test		
Shapiro Wilk Test Statistic	0.938	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.905	Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.131	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.192	Data appear Normal at 5% Significance Level
Data appear Normal at 5% Significance Level		

Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	11110	95% Adjusted-CLT UCL (Chen-1995)	11038
		95% Modified-t UCL (Johnson-1978)	11115

Gamma GOF Test		
A-D Test Statistic	0.673	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.751	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.148	**Kolmogorov-Smirnov Gamma GOF Test**
5% K-S Critical Value	0.196	Detected data appear Gamma Distributed at 5% Significance Level
Detected data appear Gamma Distributed at 5% Significance Level		

Gamma Statistics			
k hat (MLE)	2.212	k star (bias corrected MLE)	1.914
Theta hat (MLE)	4079	Theta star (bias corrected MLE)	4716
nu hat (MLE)	88.49	nu star (bias corrected)	76.55
MLE Mean (bias corrected)	9025	MLE Sd (bias corrected)	6524
		Approximate Chi Square Value (0.05)	57.4
Adjusted Level of Significance	0.038	Adjusted Chi Square Value	56.09
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	12037	95% Adjusted Gamma UCL (use when n<50)	12318
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.892	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.905	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.168	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.192	Data appear Lognormal at 5% Significance Level	
Data appear Approximate Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	7.307	Mean of logged Data	8.865
Maximum of Logged Data	9.857	SD of logged Data	0.792
Assuming Lognormal Distribution			
95% H-UCL	14846	90% Chebyshev (MVUE) UCL	14961
95% Chebyshev (MVUE) UCL	17435	97.5% Chebyshev (MVUE) UCL	20870
99% Chebyshev (MVUE) UCL	27616		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	11009	95% Jackknife UCL	11110
95% Standard Bootstrap UCL	10949	95% Bootstrap-t UCL	11179
95% Hall's Bootstrap UCL	10995	95% Percentile Bootstrap UCL	10941
95% BCA Bootstrap UCL	10961		
90% Chebyshev(Mean, Sd) UCL	12643	95% Chebyshev(Mean, Sd) UCL	14282
97.5% Chebyshev(Mean, Sd) UCL	16557	99% Chebyshev(Mean, Sd) UCL	21025
Suggested UCL to Use			
95% Student's-t UCL	11110		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Manganese			

ProUCL Output
South Percolation Pond Area (Sediment)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

General Statistics			
Total Number of Observations	20	Number of Distinct Observations	19
		Number of Missing Observations	0
Minimum	18.1	Mean	116.7
Maximum	252	Median	117
SD	72.55	Std. Error of Mean	16.22
Coefficient of Variation	0.622	Skewness	0.202
Normal GOF Test			
Shapiro Wilk Test Statistic	0.943	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.905	Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.116	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.192	Data appear Normal at 5% Significance Level	
Data appear Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	144.8	95% Adjusted-CLT UCL (Chen-1995)	144.2
		95% Modified-t UCL (Johnson-1978)	144.9
Gamma GOF Test			
A-D Test Statistic	0.568	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.752	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.139	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.196	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	2.028	k star (bias corrected MLE)	1.757
Theta hat (MLE)	57.55	Theta star (bias corrected MLE)	66.42
nu hat (MLE)	81.12	nu star (bias corrected)	70.29
MLE Mean (bias corrected)	116.7	MLE Sd (bias corrected)	88.04
		Approximate Chi Square Value (0.05)	51.99
Adjusted Level of Significance	0.038	Adjusted Chi Square Value	50.74
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	157.8	95% Adjusted Gamma UCL (use when n<50)	161.7
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.894	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.905	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.172	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.192	Data appear Lognormal at 5% Significance Level	
Data appear Approximate Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	2.896	Mean of logged Data	4.493
Maximum of Logged Data	5.529	SD of logged Data	0.837

Assuming Lognormal Distribution			
95% H-UCL	201.6	90% Chebyshev (MVUE) UCL	200.2
95% Chebyshev (MVUE) UCL	234.6	97.5% Chebyshev (MVUE) UCL	282.4
99% Chebyshev (MVUE) UCL	376.3		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	143.4	95% Jackknife UCL	144.8
95% Standard Bootstrap UCL	142.9	95% Bootstrap-t UCL	145.8
95% Hall's Bootstrap UCL	145	95% Percentile Bootstrap UCL	142.2
95% BCA Bootstrap UCL	143.9		
90% Chebyshev(Mean, Sd) UCL	165.4	95% Chebyshev(Mean, Sd) UCL	187.4
97.5% Chebyshev(Mean, Sd) UCL	218	99% Chebyshev(Mean, Sd) UCL	278.1
Suggested UCL to Use			
95% Student's-t UCL	144.8		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Arsenic			
General Statistics			
Total Number of Observations	20	Number of Distinct Observations	15
Number of Detects	19	Number of Non-Detects	1
Number of Distinct Detects	14	Number of Distinct Non-Detects	1
Minimum Detect	0.82	Minimum Non-Detect	0.65
Maximum Detect	6.1	Maximum Non-Detect	0.65
Variance Detects	1.949	Percent Non-Detects	5%
Mean Detects	2.327	SD Detects	1.396
Median Detects	1.9	CV Detects	0.6
Skewness Detects	1.26	Kurtosis Detects	1.546
Mean of Logged Detects	0.688	SD of Logged Detects	0.572
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.881	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.901	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.159	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.197	Detected Data appear Normal at 5% Significance Level	
Detected Data appear Approximate Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	2.244	KM Standard Error of Mean	0.316
KM SD	1.374	95% KM (BCA) UCL	2.825
95% KM (t) UCL	2.789	95% KM (Percentile Bootstrap) UCL	2.783

95% KM (z) UCL	2.763	95% KM Bootstrap t UCL	2.96
90% KM Chebyshev UCL	3.19	95% KM Chebyshev UCL	3.619
97.5% KM Chebyshev UCL	4.215	99% KM Chebyshev UCL	5.384
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	0.382	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.747	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.151	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.2	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	3.342	k star (bias corrected MLE)	2.85
Theta hat (MLE)	0.696	Theta star (bias corrected MLE)	0.817
nu hat (MLE)	127	nu star (bias corrected)	108.3
Mean (detects)	2.327		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	2.212
Maximum	6.1	Median	1.9
SD	1.454	CV	0.658
k hat (MLE)	1.494	k star (bias corrected MLE)	1.303
Theta hat (MLE)	1.48	Theta star (bias corrected MLE)	1.697
nu hat (MLE)	59.76	nu star (bias corrected)	52.13
Adjusted Level of Significance (β)	0.038		
Approximate Chi Square Value (52.13, α)	36.55	Adjusted Chi Square Value (52.13, β)	35.52
95% Gamma Approximate UCL (use when n>=50)	3.155	95% Gamma Adjusted UCL (use when n<50)	3.246
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	2.244	SD (KM)	1.374
Variance (KM)	1.887	SE of Mean (KM)	0.316
k hat (KM)	2.667	k star (KM)	2.3
nu hat (KM)	106.7	nu star (KM)	92
theta hat (KM)	0.841	theta star (KM)	0.975
80% gamma percentile (KM)	3.304	90% gamma percentile (KM)	4.224
95% gamma percentile (KM)	5.095	99% gamma percentile (KM)	7.01
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (92.00, α)	70.88	Adjusted Chi Square Value (92.00, β)	69.42
95% Gamma Approximate KM-UCL (use when n>=50)	2.912	95% Gamma Adjusted KM-UCL (use when n<50)	2.973
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.961	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.901	Detected Data appear Lognormal at 5% Significance Level	

Lilliefors Test Statistic	0.14	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.197	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	2.235	Mean in Log Scale	0.617
SD in Original Scale	1.42	SD in Log Scale	0.641
95% t UCL (assumes normality of ROS data)	2.784	95% Percentile Bootstrap UCL	2.765
95% BCA Bootstrap UCL	2.845	95% Bootstrap t UCL	2.841
95% H-UCL (Log ROS)	3.129		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	0.632	KM Geo Mean	1.881
KM SD (logged)	0.595	95% Critical H Value (KM-Log)	2.117
KM Standard Error of Mean (logged)	0.137	95% H-UCL (KM -Log)	2.997
KM SD (logged)	0.595	95% Critical H Value (KM-Log)	2.117
KM Standard Error of Mean (logged)	0.137		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	2.227	Mean in Log Scale	0.597
SD in Original Scale	1.431	SD in Log Scale	0.689
95% t UCL (Assumes normality)	2.78	95% H-Stat UCL	3.271
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Approximate Normal Distributed at 5% Significance Level			
Suggested UCL to Use			
95% KM (t) UCL	2.789		
When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test			
When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Cobalt			
General Statistics			
Total Number of Observations	20	Number of Distinct Observations	16
Number of Detects	19	Number of Non-Detects	1
Number of Distinct Detects	15	Number of Distinct Non-Detects	1
Minimum Detect	1.4	Minimum Non-Detect	1.6
Maximum Detect	7.6	Maximum Non-Detect	1.6
Variance Detects	3.456	Percent Non-Detects	5%
Mean Detects	4.563	SD Detects	1.859

Median Detects	4.6	CV Detects	0.407
Skewness Detects	-0.333	Kurtosis Detects	-0.731
Mean of Logged Detects	1.411	SD of Logged Detects	0.519
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.944	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.901	Detected Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.128	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.197	Detected Data appear Normal at 5% Significance Level	
Detected Data appear Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	4.405	KM Standard Error of Mean	0.435
KM SD	1.894	95% KM (BCA) UCL	5.035
95% KM (t) UCL	5.157	95% KM (Percentile Bootstrap) UCL	5.08
95% KM (z) UCL	5.121	95% KM Bootstrap t UCL	5.134
90% KM Chebyshev UCL	5.71	95% KM Chebyshev UCL	6.301
97.5% KM Chebyshev UCL	7.122	99% KM Chebyshev UCL	8.733
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	0.819	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.743	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.185	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.199	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data follow Appr. Gamma Distribution at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	4.827	k star (bias corrected MLE)	4.1
Theta hat (MLE)	0.945	Theta star (bias corrected MLE)	1.113
nu hat (MLE)	183.4	nu star (bias corrected)	155.8
Mean (detects)	4.563		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	1.4	Mean	4.433
Maximum	7.6	Median	4.35
SD	1.901	CV	0.429
k hat (MLE)	4.503	k star (bias corrected MLE)	3.861
Theta hat (MLE)	0.985	Theta star (bias corrected MLE)	1.148
nu hat (MLE)	180.1	nu star (bias corrected)	154.4
Adjusted Level of Significance (β)	0.038		
Approximate Chi Square Value (154.42, α)	126.7	Adjusted Chi Square Value (154.42, β)	124.7
95% Gamma Approximate UCL (use when n>=50)	5.403	95% Gamma Adjusted UCL (use when n<50)	5.489
Estimates of Gamma Parameters using KM Estimates			

Mean (KM)	4.405	SD (KM)	1.894
Variance (KM)	3.585	SE of Mean (KM)	0.435
k hat (KM)	5.412	k star (KM)	4.633
nu hat (KM)	216.5	nu star (KM)	185.3
theta hat (KM)	0.814	theta star (KM)	0.951
80% gamma percentile (KM)	5.972	90% gamma percentile (KM)	7.146
95% gamma percentile (KM)	8.22	99% gamma percentile (KM)	10.5
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (185.34, α)	154.8	Adjusted Chi Square Value (185.34, β)	152.6
95% Gamma Approximate KM-UCL (use when n>=50)	5.272	95% Gamma Adjusted KM-UCL (use when n<50)	5.348
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.859	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.901	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.218	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.197	Detected Data Not Lognormal at 5% Significance Level	
Detected Data Not Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	4.423	Mean in Log Scale	1.369
SD in Original Scale	1.914	SD in Log Scale	0.54
95% t UCL (assumes normality of ROS data)	5.164	95% Percentile Bootstrap UCL	5.077
95% BCA Bootstrap UCL	5.095	95% Bootstrap t UCL	5.144
95% H-UCL (Log ROS)	5.866		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	1.357	KM Geo Mean	3.885
KM SD (logged)	0.546	95% Critical H Value (KM-Log)	2.065
KM Standard Error of Mean (logged)	0.125	95% H-UCL (KM -Log)	5.838
KM SD (logged)	0.546	95% Critical H Value (KM-Log)	2.065
KM Standard Error of Mean (logged)	0.125		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	4.375	Mean in Log Scale	1.329
SD in Original Scale	1.995	SD in Log Scale	0.624
95% t UCL (Assumes normality)	5.147	95% H-Stat UCL	6.242
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Normal Distributed at 5% Significance Level			
Suggested UCL to Use			
95% KM (t) UCL	5.157		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

ProUCL Output
Flathead River Area (Surface Water)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

UCL Statistics for Data Sets with Non-Detects	
User Selected Options	
Date/Time of Computation	ProUCL 5.11/28/2019 5:58:36 PM
From File	20190128_FltHdRvr_ProUCL_input.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Bis2EthylhexylPhthalate

General Statistics			
Total Number of Observations	4	Number of Distinct Observations	4
		Number of Missing Observations	40
Number of Detects	1	Number of Non-Detects	3
Number of Distinct Detects	1	Number of Distinct Non-Detects	3

Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set!

It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable Bis2EthylhexylPhthalate was not processed!

Fluoride

General Statistics			
Total Number of Observations	58	Number of Distinct Observations	37
		Number of Missing Observations	3
Number of Detects	44	Number of Non-Detects	14
Number of Distinct Detects	36	Number of Distinct Non-Detects	1
Minimum Detect	28.6	Minimum Non-Detect	12
Maximum Detect	2160	Maximum Non-Detect	12
Variance Detects	276760	Percent Non-Detects	24.14%
Mean Detects	232.4	SD Detects	526.1
Median Detects	95.9	CV Detects	2.263
Skewness Detects	3.388	Kurtosis Detects	10.29
Mean of Logged Detects	4.465	SD of Logged Detects	1.144

Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.392	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.944	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.423	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.132	Detected Data Not Normal at 5% Significance Level	

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	179.2	KM Standard Error of Mean	61.46
KM SD	462.7	95% KM (BCA) UCL	286
95% KM (t) UCL	282	95% KM (Percentile Bootstrap) UCL	286.2
95% KM (z) UCL	280.3	95% KM Bootstrap t UCL	579.2

90% KM Chebyshev UCL	363.6	95% KM Chebyshev UCL	447.1
97.5% KM Chebyshev UCL	563	99% KM Chebyshev UCL	790.7
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	5.771	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.802	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.344	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.14	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.624	k star (bias corrected MLE)	0.597
Theta hat (MLE)	372.3	Theta star (bias corrected MLE)	389.4
nu hat (MLE)	54.94	nu star (bias corrected)	52.53
Mean (detects)	232.4		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	176.3
Maximum	2160	Median	35.85
SD	467.8	CV	2.653
k hat (MLE)	0.246	k star (bias corrected MLE)	0.245
Theta hat (MLE)	717.2	Theta star (bias corrected MLE)	720.8
nu hat (MLE)	28.52	nu star (bias corrected)	28.38
Adjusted Level of Significance (β)	0.0459		
Approximate Chi Square Value (28.38, α)	17.22	Adjusted Chi Square Value (28.38, β)	17
95% Gamma Approximate UCL (use when n>=50)	290.5	95% Gamma Adjusted UCL (use when n<50)	294.3
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	179.2	SD (KM)	462.7
Variance (KM)	214081	SE of Mean (KM)	61.46
k hat (KM)	0.15	k star (KM)	0.154
nu hat (KM)	17.4	nu star (KM)	17.84
theta hat (KM)	1195	theta star (KM)	1166
80% gamma percentile (KM)	199	90% gamma percentile (KM)	533.2
95% gamma percentile (KM)	981.6	99% gamma percentile (KM)	2276
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (17.84, α)	9.273	Adjusted Chi Square Value (17.84, β)	9.115
95% Gamma Approximate KM-UCL (use when n>=50)	344.7	95% Gamma Adjusted KM-UCL (use when n<50)	350.7
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.799	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.944	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.219	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.132	Detected Data Not Lognormal at 5% Significance Level	

Detected Data Not Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	178.3	Mean in Log Scale	3.851
SD in Original Scale	467.1	SD in Log Scale	1.511
95% t UCL (assumes normality of ROS data)	280.8	95% Percentile Bootstrap UCL	285.6
95% BCA Bootstrap UCL	319.9	95% Bootstrap t UCL	329.4
95% H-UCL (Log ROS)	276.1		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	3.987	KM Geo Mean	53.88
KM SD (logged)	1.299	95% Critical H Value (KM-Log)	2.867
KM Standard Error of Mean (logged)	0.173	95% H-UCL (KM -Log)	205.1
KM SD (logged)	1.299	95% Critical H Value (KM-Log)	2.867
KM Standard Error of Mean (logged)	0.173		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	177.8	Mean in Log Scale	3.819
SD in Original Scale	467.3	SD in Log Scale	1.522
95% t UCL (Assumes normality)	280.4	95% H-Stat UCL	274.1
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution at 5% Significance Level			
Suggested UCL to Use			
95% KM (Chebyshev) UCL	447.1		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
BenzoBFluoranthene			
General Statistics			
Total Number of Observations	4	Number of Distinct Observations	4
		Number of Missing Observations	40
Number of Detects	2	Number of Non-Detects	2
Number of Distinct Detects	2	Number of Distinct Non-Detects	2
Minimum Detect	0.1	Minimum Non-Detect	0.0042
Maximum Detect	0.7	Maximum Non-Detect	0.44
Variance Detects	0.18	Percent Non-Detects	50%
Mean Detects	0.4	SD Detects	0.424
Median Detects	0.4	CV Detects	1.061
Skewness Detects	N/A	Kurtosis Detects	N/A
Mean of Logged Detects	-1.33	SD of Logged Detects	1.376
Warning: Data set has only 2 Detected Values.			

This is not enough to compute meaningful or reliable statistics and estimates.			
Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use			
guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.			
For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).			
Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1			
Normal GOF Test on Detects Only			
Not Enough Data to Perform GOF Test			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.214	KM Standard Error of Mean	0.202
KM SD	0.284	95% KM (BCA) UCL	N/A
95% KM (t) UCL	0.689	95% KM (Percentile Bootstrap) UCL	N/A
95% KM (z) UCL	0.546	95% KM Bootstrap t UCL	N/A
90% KM Chebyshev UCL	0.819	95% KM Chebyshev UCL	1.093
97.5% KM Chebyshev UCL	1.473	99% KM Chebyshev UCL	2.22
Gamma GOF Tests on Detected Observations Only			
Not Enough Data to Perform GOF Test			
Gamma Statistics on Detected Data Only			
k hat (MLE)	1.352	k star (bias corrected MLE)	N/A
Theta hat (MLE)	0.296	Theta star (bias corrected MLE)	N/A
nu hat (MLE)	5.408	nu star (bias corrected)	N/A
Mean (detects)	0.4		
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.214	SD (KM)	0.284
Variance (KM)	0.0804	SE of Mean (KM)	0.202
k hat (KM)	0.57	k star (KM)	0.309
nu hat (KM)	4.558	nu star (KM)	2.473
theta hat (KM)	0.376	theta star (KM)	0.693
80% gamma percentile (KM)	0.331	90% gamma percentile (KM)	0.629
95% gamma percentile (KM)	0.97	99% gamma percentile (KM)	1.852
Gamma Kaplan-Meier (KM) Statistics			
		Adjusted Level of Significance (β)	0.00498
Approximate Chi Square Value (2.47, α)	0.235	Adjusted Chi Square Value (2.47, β)	0.0632
95% Gamma Approximate KM-UCL (use when n>=50)	2.252	95% Gamma Adjusted KM-UCL (use when n<50)	8.382
Lognormal GOF Test on Detected Observations Only			
Not Enough Data to Perform GOF Test			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.213	Mean in Log Scale	-2.561
SD in Original Scale	0.327	SD in Log Scale	1.691
95% t UCL (assumes normality of ROS data)	0.597	95% Percentile Bootstrap UCL	N/A
95% BCA Bootstrap UCL	N/A	95% Bootstrap t UCL	N/A

95% H-UCL (Log ROS)	16536		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-3.005	KM Geo Mean	0.0495
KM SD (logged)	2.055	95% Critical H Value (KM-Log)	13.46
KM Standard Error of Mean (logged)	1.607	95% H-UCL (KM -Log)	3538877
KM SD (logged)	2.055	95% Critical H Value (KM-Log)	13.46
KM Standard Error of Mean (logged)	1.607		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.256	Mean in Log Scale	-2.585
SD in Original Scale	0.309	SD in Log Scale	2.518
95% t UCL (Assumes normality)	0.62	95% H-Stat UCL	4.432E+10
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution at 5% Significance Level			
Suggested UCL to Use			
95% KM (Chebyshev) UCL	1.093		
Warning: Recommended UCL exceeds the maximum observation			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
BenzoAPyrene			
General Statistics			
Total Number of Observations	4	Number of Distinct Observations	4
		Number of Missing Observations	40
Number of Detects	2	Number of Non-Detects	2
Number of Distinct Detects	2	Number of Distinct Non-Detects	2
Minimum Detect	0.041	Minimum Non-Detect	0.0024
Maximum Detect	0.25	Maximum Non-Detect	0.16
Variance Detects	0.0218	Percent Non-Detects	50%
Mean Detects	0.146	SD Detects	0.148
Median Detects	0.146	CV Detects	1.016
Skewness Detects	N/A	Kurtosis Detects	N/A
Mean of Logged Detects	-2.29	SD of Logged Detects	1.278
Warning: Data set has only 2 Detected Values.			
This is not enough to compute meaningful or reliable statistics and estimates.			
Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use			
guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.			
For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).			

Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1			
Normal GOF Test on Detects Only			
Not Enough Data to Perform GOF Test			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.0788	KM Standard Error of Mean	0.0714
KM SD	0.1	95% KM (BCA) UCL	N/A
95% KM (t) UCL	0.247	95% KM (Percentile Bootstrap) UCL	N/A
95% KM (z) UCL	0.196	95% KM Bootstrap t UCL	N/A
90% KM Chebyshev UCL	0.293	95% KM Chebyshev UCL	0.39
97.5% KM Chebyshev UCL	0.525	99% KM Chebyshev UCL	0.789
Gamma GOF Tests on Detected Observations Only			
Not Enough Data to Perform GOF Test			
Gamma Statistics on Detected Data Only			
k hat (MLE)	1.524	k star (bias corrected MLE)	N/A
Theta hat (MLE)	0.0955	Theta star (bias corrected MLE)	N/A
nu hat (MLE)	6.096	nu star (bias corrected)	N/A
Mean (detects)	0.146		
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.0788	SD (KM)	0.1
Variance (KM)	0.0101	SE of Mean (KM)	0.0714
k hat (KM)	0.617	k star (KM)	0.321
nu hat (KM)	4.939	nu star (KM)	2.568
theta hat (KM)	0.128	theta star (KM)	0.245
80% gamma percentile (KM)	0.123	90% gamma percentile (KM)	0.23
95% gamma percentile (KM)	0.353	99% gamma percentile (KM)	0.667
Gamma Kaplan-Meier (KM) Statistics			
		Adjusted Level of Significance (β)	0.00498
Approximate Chi Square Value (2.57, α)	0.257	Adjusted Chi Square Value (2.57, β)	0.0691
95% Gamma Approximate KM-UCL (use when n>=50)	0.788	95% Gamma Adjusted KM-UCL (use when n<50)	2.927
Lognormal GOF Test on Detected Observations Only			
Not Enough Data to Perform GOF Test			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.0786	Mean in Log Scale	-3.434
SD in Original Scale	0.115	SD in Log Scale	1.571
95% t UCL (assumes normality of ROS data)	0.214	95% Percentile Bootstrap UCL	N/A
95% BCA Bootstrap UCL	N/A	95% Bootstrap t UCL	N/A
95% H-UCL (Log ROS)	1302		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-3.806	KM Geo Mean	0.0222
KM SD (logged)	1.861	95% Critical H Value (KM-Log)	12.21
KM Standard Error of Mean (logged)	1.452	95% H-UCL (KM -Log)	62344

KM SD (logged)	1.861	95% Critical H Value (KM-Log)	12.21
KM Standard Error of Mean (logged)	1.452		

DL/2 Statistics

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	0.0931	Mean in Log Scale	-3.458
SD in Original Scale	0.109	SD in Log Scale	2.303
95% t UCL (Assumes normality)	0.222	95% H-Stat UCL	2.246E+8

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution at 5% Significance Level

Suggested UCL to Use

95% KM (Chebyshev) UCL	0.39		

Warning: Recommended UCL exceeds the maximum observation

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

DibenzAHAnthracene

General Statistics

Total Number of Observations	4	Number of Distinct Observations	4
		Number of Missing Observations	40
Number of Detects	1	Number of Non-Detects	3
Number of Distinct Detects	1	Number of Distinct Non-Detects	3

Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set!

It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable DibenzAHAnthracene was not processed!

BenzoAAnthracene

General Statistics

Total Number of Observations	4	Number of Distinct Observations	4
		Number of Missing Observations	40
Number of Detects	2	Number of Non-Detects	2
Number of Distinct Detects	2	Number of Distinct Non-Detects	2
Minimum Detect	0.071	Minimum Non-Detect	0.0028
Maximum Detect	0.63	Maximum Non-Detect	0.55
Variance Detects	0.156	Percent Non-Detects	50%
Mean Detects	0.351	SD Detects	0.395
Median Detects	0.351	CV Detects	1.128
Skewness Detects	N/A	Kurtosis Detects	N/A
Mean of Logged Detects	-1.554	SD of Logged Detects	1.544

Warning: Data set has only 2 Detected Values.

This is not enough to compute meaningful or reliable statistics and estimates.

Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.

For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).

Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1

Normal GOF Test on Detects Only

Not Enough Data to Perform GOF Test

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	0.185	KM Standard Error of Mean	0.183
KM SD	0.259	95% KM (BCA) UCL	N/A
95% KM (t) UCL	0.617	95% KM (Percentile Bootstrap) UCL	N/A
95% KM (z) UCL	0.487	95% KM Bootstrap t UCL	N/A
90% KM Chebyshev UCL	0.735	95% KM Chebyshev UCL	0.985
97.5% KM Chebyshev UCL	1.33	99% KM Chebyshev UCL	2.01

Gamma GOF Tests on Detected Observations Only

Not Enough Data to Perform GOF Test

Gamma Statistics on Detected Data Only

k hat (MLE)	1.127	k star (bias corrected MLE)	N/A
Theta hat (MLE)	0.311	Theta star (bias corrected MLE)	N/A
nu hat (MLE)	4.509	nu star (bias corrected)	N/A
Mean (detects)	0.351		

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	0.185	SD (KM)	0.259
Variance (KM)	0.0668	SE of Mean (KM)	0.183
k hat (KM)	0.513	k star (KM)	0.295
nu hat (KM)	4.105	nu star (KM)	2.36
theta hat (KM)	0.361	theta star (KM)	0.628
80% gamma percentile (KM)	0.283	90% gamma percentile (KM)	0.547
95% gamma percentile (KM)	0.852	99% gamma percentile (KM)	1.645

Gamma Kaplan-Meier (KM) Statistics

		Adjusted Level of Significance (β)	0.00498
Approximate Chi Square Value (2.36, α)	0.211	Adjusted Chi Square Value (2.36, β)	0.0565
95% Gamma Approximate KM-UCL (use when n>=50)	2.07	95% Gamma Adjusted KM-UCL (use when n<50)	7.737

Lognormal GOF Test on Detected Observations Only

Not Enough Data to Perform GOF Test

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	0.183	Mean in Log Scale	-2.935
SD in Original Scale	0.299	SD in Log Scale	1.897

95% t UCL (assumes normality of ROS data)	0.535	95% Percentile Bootstrap UCL	N/A
95% BCA Bootstrap UCL	N/A	95% Bootstrap t UCL	N/A
95% H-UCL (Log ROS)	266233		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-3.312	KM Geo Mean	0.0365
KM SD (logged)	2.16	95% Critical H Value (KM-Log)	14.15
KM Standard Error of Mean (logged)	1.68	95% H-UCL (KM -Log)	17334241
KM SD (logged)	2.16	95% Critical H Value (KM-Log)	14.15
KM Standard Error of Mean (logged)	1.68		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.244	Mean in Log Scale	-2.742
SD in Original Scale	0.282	SD in Log Scale	2.707
95% t UCL (Assumes normality)	0.576	95% H-Stat UCL	2.546E+12
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution at 5% Significance Level			
Suggested UCL to Use			
975% KM (Chebyshev) UCL	1.33		
Warning: Recommended UCL exceeds the maximum observation			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
CyanideFREE			
General Statistics			
Total Number of Observations	32	Number of Distinct Observations	7
		Number of Missing Observations	27
Number of Detects	10	Number of Non-Detects	22
Number of Distinct Detects	7	Number of Distinct Non-Detects	1
Minimum Detect	1.5	Minimum Non-Detect	1.5
Maximum Detect	56.4	Maximum Non-Detect	1.5
Variance Detects	295.5	Percent Non-Detects	68.75%
Mean Detects	7.53	SD Detects	17.19
Median Detects	1.8	CV Detects	2.283
Skewness Detects	3.15	Kurtosis Detects	9.941
Mean of Logged Detects	1.018	SD of Logged Detects	1.108
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.401	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.842	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.488	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.262	Detected Data Not Normal at 5% Significance Level	

Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	3.384	KM Standard Error of Mean	1.777
KM SD	9.535	95% KM (BCA) UCL	6.791
95% KM (t) UCL	6.397	95% KM (Percentile Bootstrap) UCL	6.784
95% KM (z) UCL	6.307	95% KM Bootstrap t UCL	53.1
90% KM Chebyshev UCL	8.715	95% KM Chebyshev UCL	11.13
97.5% KM Chebyshev UCL	14.48	99% KM Chebyshev UCL	21.06
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	2.383	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.768	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.421	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.279	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.615	k star (bias corrected MLE)	0.497
Theta hat (MLE)	12.24	Theta star (bias corrected MLE)	15.14
nu hat (MLE)	12.3	nu star (bias corrected)	9.945
Mean (detects)	7.53		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	2.36
Maximum	56.4	Median	0.01
SD	9.916	CV	4.202
k hat (MLE)	0.199	k star (bias corrected MLE)	0.201
Theta hat (MLE)	11.87	Theta star (bias corrected MLE)	11.74
nu hat (MLE)	12.72	nu star (bias corrected)	12.86
Adjusted Level of Significance (β)	0.0416		
Approximate Chi Square Value (12.86, α)	5.799	Adjusted Chi Square Value (12.86, β)	5.546
95% Gamma Approximate UCL (use when n>=50)	5.234	95% Gamma Adjusted UCL (use when n<50)	5.473
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	3.384	SD (KM)	9.535
Variance (KM)	90.92	SE of Mean (KM)	1.777
k hat (KM)	0.126	k star (KM)	0.135
nu hat (KM)	8.063	nu star (KM)	8.64
theta hat (KM)	26.86	theta star (KM)	25.07
80% gamma percentile (KM)	3.356	90% gamma percentile (KM)	9.86
95% gamma percentile (KM)	18.98	99% gamma percentile (KM)	46.06
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (8.64, α)	3.111	Adjusted Chi Square Value (8.64, β)	2.936

95% Gamma Approximate KM-UCL (use when n>=50)	9.399	95% Gamma Adjusted KM-UCL (use when n<50)	9.961
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.599	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.842	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.315	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.262	Detected Data Not Lognormal at 5% Significance Level	
Detected Data Not Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	2.473	Mean in Log Scale	-1.35
SD in Original Scale	9.89	SD in Log Scale	2.069
95% t UCL (assumes normality of ROS data)	5.437	95% Percentile Bootstrap UCL	5.915
95% BCA Bootstrap UCL	7.793	95% Bootstrap t UCL	26.07
95% H-UCL (Log ROS)	9.509		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	0.597	KM Geo Mean	1.816
KM SD (logged)	0.653	95% Critical H Value (KM-Log)	2.062
KM Standard Error of Mean (logged)	0.122	95% H-UCL (KM -Log)	2.862
KM SD (logged)	0.653	95% Critical H Value (KM-Log)	2.062
KM Standard Error of Mean (logged)	0.122		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	2.869	Mean in Log Scale	0.12
SD in Original Scale	9.797	SD in Log Scale	0.857
95% t UCL (Assumes normality)	5.805	95% H-Stat UCL	2.31
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution at 5% Significance Level			
Suggested UCL to Use			
95% KM (Chebyshev) UCL	11.13		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Aluminum			
General Statistics			
Total Number of Observations	58	Number of Distinct Observations	51
		Number of Missing Observations	3
Number of Detects	54	Number of Non-Detects	4
Number of Distinct Detects	49	Number of Distinct Non-Detects	2
Minimum Detect	17.5	Minimum Non-Detect	15
Maximum Detect	5090	Maximum Non-Detect	18.2

Variance Detects	553262	Percent Non-Detects	6.897%
Mean Detects	370.7	SD Detects	743.8
Median Detects	118	CV Detects	2.006
Skewness Detects	5.124	Kurtosis Detects	31.34
Mean of Logged Detects	4.852	SD of Logged Detects	1.476
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.477	**Normal GOF Test on Detected Observations Only**	
5% Shapiro Wilk P Value	0	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.317	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.12	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	346.2	KM Standard Error of Mean	94.99
KM SD	716.7	95% KM (BCA) UCL	537.2
95% KM (t) UCL	505	95% KM (Percentile Bootstrap) UCL	505
95% KM (z) UCL	502.5	95% KM Bootstrap t UCL	669.2
90% KM Chebyshev UCL	631.2	95% KM Chebyshev UCL	760.3
97.5% KM Chebyshev UCL	939.4	99% KM Chebyshev UCL	1291
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	2.506	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.808	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.204	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.127	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.583	k star (bias corrected MLE)	0.563
Theta hat (MLE)	635.6	Theta star (bias corrected MLE)	658.2
nu hat (MLE)	62.99	nu star (bias corrected)	60.82
Mean (detects)	370.7		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	345.1
Maximum	5090	Median	60.25
SD	723.5	CV	2.096
k hat (MLE)	0.4	k star (bias corrected MLE)	0.391
Theta hat (MLE)	862.6	Theta star (bias corrected MLE)	882.9
nu hat (MLE)	46.41	nu star (bias corrected)	45.35
Adjusted Level of Significance (β)	0.0459		
Approximate Chi Square Value (45.35, α)	30.9	Adjusted Chi Square Value (45.35, β)	30.59
95% Gamma Approximate UCL (use when n>=50)	506.5	95% Gamma Adjusted UCL (use when n<50)	511.6

Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	346.2	SD (KM)	716.7
Variance (KM)	513672	SE of Mean (KM)	94.99
k hat (KM)	0.233	k star (KM)	0.233
nu hat (KM)	27.07	nu star (KM)	27
theta hat (KM)	1484	theta star (KM)	1487
80% gamma percentile (KM)	489.4	90% gamma percentile (KM)	1044
95% gamma percentile (KM)	1711	99% gamma percentile (KM)	3507
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (27.00, α)	16.15	Adjusted Chi Square Value (27.00, β)	15.94
95% Gamma Approximate KM-UCL (use when n>=50)	578.7	95% Gamma Adjusted KM-UCL (use when n<50)	586.5
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Approximate Test Statistic	0.894	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	5.8742E-5	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.181	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.12	Detected Data Not Lognormal at 5% Significance Level	
Detected Data Not Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	345.5	Mean in Log Scale	4.623
SD in Original Scale	723.3	SD in Log Scale	1.659
95% t UCL (assumes normality of ROS data)	504.3	95% Percentile Bootstrap UCL	510.7
95% BCA Bootstrap UCL	601.1	95% Bootstrap t UCL	663.4
95% H-UCL (Log ROS)	838		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	4.706	KM Geo Mean	110.6
KM SD (logged)	1.509	95% Critical H Value (KM-Log)	3.133
KM Standard Error of Mean (logged)	0.2	95% H-UCL (KM -Log)	646
KM SD (logged)	1.509	95% Critical H Value (KM-Log)	3.133
KM Standard Error of Mean (logged)	0.2		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	345.7	Mean in Log Scale	4.663
SD in Original Scale	723.2	SD in Log Scale	1.586
95% t UCL (Assumes normality)	504.5	95% H-Stat UCL	735.4
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution at 5% Significance Level			
Suggested UCL to Use			
95% KM (Chebyshev) UCL	760.3		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Iron

General Statistics

Total Number of Observations	58	Number of Distinct Observations	31
		Number of Missing Observations	3
Number of Detects	31	Number of Non-Detects	27
Number of Distinct Detects	29	Number of Distinct Non-Detects	2
Minimum Detect	63.1	Minimum Non-Detect	42.4
Maximum Detect	11100	Maximum Non-Detect	45.7
Variance Detects	3853022	Percent Non-Detects	46.55%
Mean Detects	993	SD Detects	1963
Median Detects	483	CV Detects	1.977
Skewness Detects	4.866	Kurtosis Detects	25.35
Mean of Logged Detects	6.236	SD of Logged Detects	1.055

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.403	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.929	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.327	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.156	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	550.5	KM Standard Error of Mean	198.8
KM SD	1489	95% KM (BCA) UCL	948.1
95% KM (t) UCL	882.8	95% KM (Percentile Bootstrap) UCL	930.2
95% KM (z) UCL	877.4	95% KM Bootstrap t UCL	1555
90% KM Chebyshev UCL	1147	95% KM Chebyshev UCL	1417
97.5% KM Chebyshev UCL	1792	99% KM Chebyshev UCL	2528

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	1.652	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.781	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.198	**Kolmogorov-Smirnov GOF**
5% K-S Critical Value	0.163	Detected Data Not Gamma Distributed at 5% Significance Level

Detected Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	0.881	k star (bias corrected MLE)	0.818
Theta hat (MLE)	1127	Theta star (bias corrected MLE)	1215
nu hat (MLE)	54.64	nu star (bias corrected)	50.69
Mean (detects)	993		

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)

For such situations, GROS method may yield incorrect values of UCLs and BTVs

This is especially true when the sample size is small.

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	530.7
Maximum	11100	Median	102.2
SD	1509	CV	2.844
k hat (MLE)	0.151	k star (bias corrected MLE)	0.155
Theta hat (MLE)	3515	Theta star (bias corrected MLE)	3431
nu hat (MLE)	17.52	nu star (bias corrected)	17.94
Adjusted Level of Significance (β)	0.0459		
Approximate Chi Square Value (17.94, α)	9.35	Adjusted Chi Square Value (17.94, β)	9.191
95% Gamma Approximate UCL (use when n>=50)	1019	95% Gamma Adjusted UCL (use when n<50)	1036
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	550.5	SD (KM)	1489
Variance (KM)	2217755	SE of Mean (KM)	198.8
k hat (KM)	0.137	k star (KM)	0.141
nu hat (KM)	15.85	nu star (KM)	16.36
theta hat (KM)	4029	theta star (KM)	3902
80% gamma percentile (KM)	568.4	90% gamma percentile (KM)	1617
95% gamma percentile (KM)	3065	99% gamma percentile (KM)	7321
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (16.36, α)	8.218	Adjusted Chi Square Value (16.36, β)	8.071
95% Gamma Approximate KM-UCL (use when n>=50)	1096	95% Gamma Adjusted KM-UCL (use when n<50)	1116
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.958	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.929	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.141	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.156	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	552	Mean in Log Scale	4.972
SD in Original Scale	1502	SD in Log Scale	1.674
95% t UCL (assumes normality of ROS data)	881.7	95% Percentile Bootstrap UCL	904.7
95% BCA Bootstrap UCL	1148	95% Bootstrap t UCL	1530
95% H-UCL (Log ROS)	1232		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	5.077	KM Geo Mean	160.3
KM SD (logged)	1.455	95% Critical H Value (KM-Log)	3.071
KM Standard Error of Mean (logged)	0.194	95% H-UCL (KM -Log)	834.8
KM SD (logged)	1.455	95% Critical H Value (KM-Log)	3.071
KM Standard Error of Mean (logged)	0.194		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	541	Mean in Log Scale	4.771
SD in Original Scale	1506	SD in Log Scale	1.758
95% t UCL (Assumes normality)	871.5	95% H-Stat UCL	1243

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Lognormal Distributed at 5% Significance Level

Suggested UCL to Use

KM H-UCL	834.8		

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Manganese

General Statistics

Total Number of Observations	58	Number of Distinct Observations	34
		Number of Missing Observations	3
Number of Detects	34	Number of Non-Detects	24
Number of Distinct Detects	32	Number of Distinct Non-Detects	2
Minimum Detect	2.6	Minimum Non-Detect	2.5
Maximum Detect	1140	Maximum Non-Detect	2.7
Variance Detects	56675	Percent Non-Detects	41.38%
Mean Detects	77.91	SD Detects	238.1
Median Detects	16.2	CV Detects	3.056
Skewness Detects	4.023	Kurtosis Detects	15.55
Mean of Logged Detects	2.935	SD of Logged Detects	1.285

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.319	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.933	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.455	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.15	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	46.71	KM Standard Error of Mean	24.44
KM SD	183.4	95% KM (BCA) UCL	95.51
95% KM (t) UCL	87.57	95% KM (Percentile Bootstrap) UCL	92.8
95% KM (z) UCL	86.91	95% KM Bootstrap t UCL	507
90% KM Chebyshev UCL	120	95% KM Chebyshev UCL	153.2
97.5% KM Chebyshev UCL	199.3	99% KM Chebyshev UCL	289.9

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	5.442	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.822	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.322	**Kolmogorov-Smirnov GOF**
5% K-S Critical Value	0.161	Detected Data Not Gamma Distributed at 5% Significance Level

Detected Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only			
k hat (MLE)	0.454	k star (bias corrected MLE)	0.433
Theta hat (MLE)	171.6	Theta star (bias corrected MLE)	179.7
nu hat (MLE)	30.87	nu star (bias corrected)	29.48
Mean (detects)	77.91		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	45.67
Maximum	1140	Median	4.55
SD	185.2	CV	4.055
k hat (MLE)	0.186	k star (bias corrected MLE)	0.188
Theta hat (MLE)	245.9	Theta star (bias corrected MLE)	243.4
nu hat (MLE)	21.55	nu star (bias corrected)	21.77
Adjusted Level of Significance (β)	0.0459		
Approximate Chi Square Value (21.77, α)	12.17	Adjusted Chi Square Value (21.77, β)	11.98
95% Gamma Approximate UCL (use when n>=50)	81.73	95% Gamma Adjusted UCL (use when n<50)	82.98
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	46.71	SD (KM)	183.4
Variance (KM)	33625	SE of Mean (KM)	24.44
k hat (KM)	0.0649	k star (KM)	0.073
nu hat (KM)	7.526	nu star (KM)	8.47
theta hat (KM)	719.9	theta star (KM)	639.7
80% gamma percentile (KM)	18.4	90% gamma percentile (KM)	104.1
95% gamma percentile (KM)	269.9	99% gamma percentile (KM)	863.3
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (8.47, α)	3.01	Adjusted Chi Square Value (8.47, β)	2.927
95% Gamma Approximate KM-UCL (use when n>=50)	131.4	95% Gamma Adjusted KM-UCL (use when n<50)	135.1
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.847	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.933	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.178	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.15	Detected Data Not Lognormal at 5% Significance Level	
Detected Data Not Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	46.17	Mean in Log Scale	1.654
SD in Original Scale	185.1	SD in Log Scale	1.917
95% t UCL (assumes normality of ROS data)	86.81	95% Percentile Bootstrap UCL	87.57
95% BCA Bootstrap UCL	106.9	95% Bootstrap t UCL	478.5
95% H-UCL (Log ROS)	83.94		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			

KM Mean (logged)	2.1	KM Geo Mean	8.168
KM SD (logged)	1.388	95% Critical H Value (KM-Log)	2.989
KM Standard Error of Mean (logged)	0.185	95% H-UCL (KM -Log)	37.06
KM SD (logged)	1.388	95% Critical H Value (KM-Log)	2.989
KM Standard Error of Mean (logged)	0.185		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	46.21	Mean in Log Scale	1.829
SD in Original Scale	185.1	SD in Log Scale	1.649
95% t UCL (Assumes normality)	86.85	95% H-Stat UCL	50.11

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution at 5% Significance Level

Suggested UCL to Use

95% KM (Chebyshev) UCL	153.2		

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Arsenic

General Statistics

Total Number of Observations	58	Number of Distinct Observations	6
		Number of Missing Observations	3
Number of Detects	4	Number of Non-Detects	54
Number of Distinct Detects	4	Number of Distinct Non-Detects	2
Minimum Detect	0.84	Minimum Non-Detect	0.64
Maximum Detect	4.9	Maximum Non-Detect	0.77
Variance Detects	4.83	Percent Non-Detects	93.1%
Mean Detects	2.755	SD Detects	2.198
Median Detects	2.64	CV Detects	0.798
Skewness Detects	0.0443	Kurtosis Detects	-5.741
Mean of Logged Detects	0.692	SD of Logged Detects	0.975

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.789	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.748	Detected Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.303	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.375	Detected Data appear Normal at 5% Significance Level	

Detected Data appear Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	0.786	KM Standard Error of Mean	0.111
KM SD	0.733	95% KM (BCA) UCL	N/A
95% KM (t) UCL	0.972	95% KM (Percentile Bootstrap) UCL	N/A

95% KM (z) UCL	0.969	95% KM Bootstrap t UCL	N/A
90% KM Chebyshev UCL	1.119	95% KM Chebyshev UCL	1.27
97.5% KM Chebyshev UCL	1.48	99% KM Chebyshev UCL	1.891
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	0.627	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.662	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.336	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.399	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	1.704	k star (bias corrected MLE)	0.593
Theta hat (MLE)	1.617	Theta star (bias corrected MLE)	4.648
nu hat (MLE)	13.63	nu star (bias corrected)	4.741
Mean (detects)	2.755		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	0.199
Maximum	4.9	Median	0.01
SD	0.864	CV	4.335
k hat (MLE)	0.267	k star (bias corrected MLE)	0.265
Theta hat (MLE)	0.745	Theta star (bias corrected MLE)	0.752
nu hat (MLE)	31.02	nu star (bias corrected)	30.75
Adjusted Level of Significance (β)	0.0459		
Approximate Chi Square Value (30.75, α)	19.09	Adjusted Chi Square Value (30.75, β)	18.85
95% Gamma Approximate UCL (use when n>=50)	0.321	95% Gamma Adjusted UCL (use when n<50)	N/A
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.786	SD (KM)	0.733
Variance (KM)	0.537	SE of Mean (KM)	0.111
k hat (KM)	1.15	k star (KM)	1.102
nu hat (KM)	133.4	nu star (KM)	127.8
theta hat (KM)	0.683	theta star (KM)	0.713
80% gamma percentile (KM)	1.254	90% gamma percentile (KM)	1.767
95% gamma percentile (KM)	2.275	99% gamma percentile (KM)	3.448
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (127.83, α)	102.7	Adjusted Chi Square Value (127.83, β)	102.1
95% Gamma Approximate KM-UCL (use when n>=50)	0.978	95% Gamma Adjusted KM-UCL (use when n<50)	0.983
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.77	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.748	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.3	**Lilliefors GOF Test**	

5% Lilliefors Critical Value	0.375	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.217	Mean in Log Scale	-5.461
SD in Original Scale	0.862	SD in Log Scale	3.1
95% t UCL (assumes normality of ROS data)	0.406	95% Percentile Bootstrap UCL	0.418
95% BCA Bootstrap UCL	0.524	95% Bootstrap t UCL	1.291
95% H-UCL (Log ROS)	5.325		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-0.368	KM Geo Mean	0.692
KM SD (logged)	0.364	95% Critical H Value (KM-Log)	1.755
KM Standard Error of Mean (logged)	0.0552	95% H-UCL (KM -Log)	0.805
KM SD (logged)	0.364	95% Critical H Value (KM-Log)	1.755
KM Standard Error of Mean (logged)	0.0552		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.523	Mean in Log Scale	-0.914
SD in Original Scale	0.794	SD in Log Scale	0.502
95% t UCL (Assumes normality)	0.697	95% H-Stat UCL	0.516
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Normal Distributed at 5% Significance Level			
Suggested UCL to Use			
95% KM (t) UCL	0.972		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Barium			
General Statistics			
Total Number of Observations	58	Number of Distinct Observations	38
		Number of Missing Observations	3
Minimum	62.8	Mean	109.4
Maximum	466	Median	102
SD	60.96	Std. Error of Mean	8.005
Coefficient of Variation	0.557	Skewness	4.257
Normal GOF Test			
Shapiro Wilk Test Statistic	0.526	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	0	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.355	**Lilliefors GOF Test**	

5% Lilliefors Critical Value	0.116	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	122.7	95% Adjusted-CLT UCL (Chen-1995)	127.3
		95% Modified-t UCL (Johnson-1978)	123.5
Gamma GOF Test			
A-D Test Statistic	5.95	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.753	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.299	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.117	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	6.582	k star (bias corrected MLE)	6.253
Theta hat (MLE)	16.61	Theta star (bias corrected MLE)	17.49
nu hat (MLE)	763.6	nu star (bias corrected)	725.4
MLE Mean (bias corrected)	109.4	MLE Sd (bias corrected)	43.73
		Approximate Chi Square Value (0.05)	663.9
Adjusted Level of Significance	0.0459	Adjusted Chi Square Value	662.4
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	119.5	95% Adjusted Gamma UCL (use when n<50)	119.7
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.764	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk P Value	4.391E-12	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.267	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.116	Data Not Lognormal at 5% Significance Level	
Data Not Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	4.14	Mean of logged Data	4.617
Maximum of Logged Data	6.144	SD of logged Data	0.345
Assuming Lognormal Distribution			
95% H-UCL	116.2	90% Chebyshev (MVUE) UCL	122.2
95% Chebyshev (MVUE) UCL	129	97.5% Chebyshev (MVUE) UCL	138.4
99% Chebyshev (MVUE) UCL	156.8		
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution (0.05)			
Nonparametric Distribution Free UCLs			
95% CLT UCL	122.5	95% Jackknife UCL	122.7
95% Standard Bootstrap UCL	122.2	95% Bootstrap-t UCL	135.4
95% Hall's Bootstrap UCL	175.2	95% Percentile Bootstrap UCL	123.2
95% BCA Bootstrap UCL	127.6		

90% Chebyshev(Mean, Sd) UCL	133.4	95% Chebyshev(Mean, Sd) UCL	144.2
97.5% Chebyshev(Mean, Sd) UCL	159.3	99% Chebyshev(Mean, Sd) UCL	189
Suggested UCL to Use			
95% Student's-t UCL	122.7	or 95% Modified-t UCL	123.5
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Cobalt			
General Statistics			
Total Number of Observations	58	Number of Distinct Observations	2
		Number of Missing Observations	3
Number of Detects	1	Number of Non-Detects	57
Number of Distinct Detects	1	Number of Distinct Non-Detects	1
Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set!			
It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).			
The data set for variable Cobalt was not processed!			

ProUCL Output
Flathead River Area (Surface Water)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

UCL Statistics for Data Sets with Non-Detects	
User Selected Options	
Date/Time of Computation	ProUCL 5.12/8/2019 1:10:34 PM
From File	20190207_CYANIDE_PROUCL_INPUT_RERUNS_b.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Cyanide

General Statistics

Total Number of Observations	53	Number of Distinct Observations	7
Number of Detects	6	Number of Non-Detects	47
Number of Distinct Detects	6	Number of Distinct Non-Detects	1
Minimum Detect	3.2	Minimum Non-Detect	2
Maximum Detect	285	Maximum Non-Detect	2
Variance Detects	12035	Percent Non-Detects	88.68%
Mean Detects	71.93	SD Detects	109.7
Median Detects	18.8	CV Detects	1.525
Skewness Detects	2.005	Kurtosis Detects	3.968
Mean of Logged Detects	3.258	SD of Logged Detects	1.61

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.702	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.788	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.349	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.325	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	9.917	KM Standard Error of Mean	6.068
KM SD	40.33	95% KM (BCA) UCL	20.3
95% KM (t) UCL	20.08	95% KM (Percentile Bootstrap) UCL	20.42
95% KM (z) UCL	19.9	95% KM Bootstrap t UCL	79.71
90% KM Chebyshev UCL	28.12	95% KM Chebyshev UCL	36.37
97.5% KM Chebyshev UCL	47.81	99% KM Chebyshev UCL	70.3

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.416	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.73	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.311	**Kolmogorov-Smirnov GOF**
5% K-S Critical Value	0.346	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	0.606	k star (bias corrected MLE)	0.414
Theta hat (MLE)	118.7	Theta star (bias corrected MLE)	173.7
nu hat (MLE)	7.272	nu star (bias corrected)	4.969
Mean (detects)	71.93		

ProUCL Output
Flathead River Area (Surface Water)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	8.152
Maximum	285	Median	0.01
SD	41.07	CV	5.038
k hat (MLE)	0.134	k star (bias corrected MLE)	0.139
Theta hat (MLE)	60.7	Theta star (bias corrected MLE)	58.53
nu hat (MLE)	14.24	nu star (bias corrected)	14.76
Adjusted Level of Significance (β)	0.0455		
Approximate Chi Square Value (14.76, α)	7.098	Adjusted Chi Square Value (14.76, β)	6.949
95% Gamma Approximate UCL (use when n>=50)	16.96	95% Gamma Adjusted UCL (use when n<50)	17.32
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	9.917	SD (KM)	40.33
Variance (KM)	1626	SE of Mean (KM)	6.068
k hat (KM)	0.0605	k star (KM)	0.0696
nu hat (KM)	6.41	nu star (KM)	7.38
theta hat (KM)	164	theta star (KM)	142.4
80% gamma percentile (KM)	3.508	90% gamma percentile (KM)	21.31
95% gamma percentile (KM)	57	99% gamma percentile (KM)	187.3
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (7.38, α)	2.382	Adjusted Chi Square Value (7.38, β)	2.303
95% Gamma Approximate KM-UCL (use when n>=50)	30.73	95% Gamma Adjusted KM-UCL (use when n<50)	31.78
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.962	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.788	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.234	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.325	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	8.255	Mean in Log Scale	-5.069
SD in Original Scale	41.05	SD in Log Scale	4.862
95% t UCL (assumes normality of ROS data)	17.7	95% Percentile Bootstrap UCL	19.07
95% BCA Bootstrap UCL	24.25	95% Bootstrap t UCL	99.87
95% H-UCL (Log ROS)	177094		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	0.983	KM Geo Mean	2.674
KM SD (logged)	0.951	95% Critical H Value (KM-Log)	2.264
KM Standard Error of Mean (logged)	0.143	95% H-UCL (KM -Log)	5.665
KM SD (logged)	0.951	95% Critical H Value (KM-Log)	2.264
KM Standard Error of Mean (logged)	0.143		

ProUCL Output
Flathead River Area (Surface Water)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	9.03	Mean in Log Scale	0.369
SD in Original Scale	40.89	SD in Log Scale	1.155
95% t UCL (Assumes normality)	18.44	95% H-Stat UCL	4.213
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Gamma Distributed at 5% Significance Level			
Suggested UCL to Use			
95% KM Approximate Gamma UCL	30.73		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			

ProUCL Output
Flathead River Area (Sediment)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

UCL Statistics for Data Sets with Non-Detects			
User Selected Options			
Date/Time of Computation	ProUCL 5.11/28/2019 6:00:46 PM		
From File	20190128_FltHdRvr_ProUCL_input_a.xls		
Full Precision	OFF		
Confidence Coefficient	95%		
Number of Bootstrap Operations	2000		
BenzoBFluoranthene			
General Statistics			
Total Number of Observations	21	Number of Distinct Observations	18
		Number of Missing Observations	2
Number of Detects	12	Number of Non-Detects	9
Number of Distinct Detects	12	Number of Distinct Non-Detects	6
Minimum Detect	0.0012	Minimum Non-Detect	0.0019
Maximum Detect	2.7	Maximum Non-Detect	0.018
Variance Detects	0.581	Percent Non-Detects	42.86%
Mean Detects	0.303	SD Detects	0.762
Median Detects	0.0175	CV Detects	2.512
Skewness Detects	3.347	Kurtosis Detects	11.4
Mean of Logged Detects	-3.587	SD of Logged Detects	2.51
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.436	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.859	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.434	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.243	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.175	KM Standard Error of Mean	0.13
KM SD	0.571	95% KM (BCA) UCL	0.424
95% KM (t) UCL	0.399	95% KM (Percentile Bootstrap) UCL	0.407
95% KM (z) UCL	0.389	95% KM Bootstrap t UCL	1.401
90% KM Chebyshev UCL	0.565	95% KM Chebyshev UCL	0.742
97.5% KM Chebyshev UCL	0.988	99% KM Chebyshev UCL	1.47
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	0.805	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.829	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.226	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.266	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.29	k star (bias corrected MLE)	0.273
Theta hat (MLE)	1.048	Theta star (bias corrected MLE)	1.112
nu hat (MLE)	6.951	nu star (bias corrected)	6.546

Mean (detects)	0.303		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.0012	Mean	0.178
Maximum	2.7	Median	0.01
SD	0.584	CV	3.29
k hat (MLE)	0.3	k star (bias corrected MLE)	0.289
Theta hat (MLE)	0.592	Theta star (bias corrected MLE)	0.614
nu hat (MLE)	12.61	nu star (bias corrected)	12.14
Adjusted Level of Significance (β)	0.0383		
Approximate Chi Square Value (12.14, α)	5.323	Adjusted Chi Square Value (12.14, β)	4.978
95% Gamma Approximate UCL (use when n>=50)	0.405	95% Gamma Adjusted UCL (use when n<50)	0.433
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.175	SD (KM)	0.571
Variance (KM)	0.326	SE of Mean (KM)	0.13
k hat (KM)	0.0934	k star (KM)	0.112
nu hat (KM)	3.925	nu star (KM)	4.698
theta hat (KM)	1.869	theta star (KM)	1.561
80% gamma percentile (KM)	0.141	90% gamma percentile (KM)	0.484
95% gamma percentile (KM)	1.005	99% gamma percentile (KM)	2.621
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (4.70, α)	1.015	Adjusted Chi Square Value (4.70, β)	0.893
95% Gamma Approximate KM-UCL (use when n>=50)	0.808	95% Gamma Adjusted KM-UCL (use when n<50)	0.919
95% Gamma Adjusted KM-UCL (use when k<=1 and 15 < n < 50)			
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.922	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.859	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.189	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.243	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.175	Mean in Log Scale	-4.823
SD in Original Scale	0.585	SD in Log Scale	2.464
95% t UCL (assumes normality of ROS data)	0.395	95% Percentile Bootstrap UCL	0.422
95% BCA Bootstrap UCL	0.576	95% Bootstrap t UCL	1.517
95% H-UCL (Log ROS)	2.558		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-4.716	KM Geo Mean	0.00895
KM SD (logged)	2.29	95% Critical H Value (KM-Log)	4.642
KM Standard Error of Mean (logged)	0.539	95% H-UCL (KM -Log)	1.326

KM SD (logged)	2.29	95% Critical H Value (KM-Log)	4.642
KM Standard Error of Mean (logged)	0.539		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.176	Mean in Log Scale	-4.392
SD in Original Scale	0.585	SD in Log Scale	2.196
95% t UCL (Assumes normality)	0.396	95% H-Stat UCL	1.244

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Gamma Distributed at 5% Significance Level

Suggested UCL to Use

Adjusted KM-UCL (use when k<=1 and 15 < n < 50 but k<=1)	0.919		

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

BenzoAPyrene

General Statistics

Total Number of Observations	21	Number of Distinct Observations	15
		Number of Missing Observations	2
Number of Detects	8	Number of Non-Detects	13
Number of Distinct Detects	8	Number of Distinct Non-Detects	8
Minimum Detect	0.0014	Minimum Non-Detect	9.2000E-4
Maximum Detect	0.59	Maximum Non-Detect	0.014
Variance Detects	0.0404	Percent Non-Detects	61.9%
Mean Detects	0.0972	SD Detects	0.201
Median Detects	0.028	CV Detects	2.067
Skewness Detects	2.725	Kurtosis Detects	7.546
Mean of Logged Detects	-3.973	SD of Logged Detects	2.033

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.536	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.818	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.409	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.283	Detected Data Not Normal at 5% Significance Level	

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	0.038	KM Standard Error of Mean	0.0292
KM SD	0.125	95% KM (BCA) UCL	0.0941
95% KM (t) UCL	0.0883	95% KM (Percentile Bootstrap) UCL	0.0916
95% KM (z) UCL	0.086	95% KM Bootstrap t UCL	0.349
90% KM Chebyshev UCL	0.126	95% KM Chebyshev UCL	0.165
97.5% KM Chebyshev UCL	0.22	99% KM Chebyshev UCL	0.328

Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	0.507	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.78	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.214	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.313	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.401	k star (bias corrected MLE)	0.334
Theta hat (MLE)	0.243	Theta star (bias corrected MLE)	0.291
nu hat (MLE)	6.409	nu star (bias corrected)	5.339
Mean (detects)	0.0972		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.0014	Mean	0.0432
Maximum	0.59	Median	0.01
SD	0.127	CV	2.928
k hat (MLE)	0.517	k star (bias corrected MLE)	0.475
Theta hat (MLE)	0.0837	Theta star (bias corrected MLE)	0.0911
nu hat (MLE)	21.7	nu star (bias corrected)	19.93
Adjusted Level of Significance (β)	0.0383		
Approximate Chi Square Value (19.93, α)	10.8	Adjusted Chi Square Value (19.93, β)	10.29
95% Gamma Approximate UCL (use when n>=50)	0.0798	95% Gamma Adjusted UCL (use when n<50)	0.0838
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.038	SD (KM)	0.125
Variance (KM)	0.0156	SE of Mean (KM)	0.0292
k hat (KM)	0.0925	k star (KM)	0.111
nu hat (KM)	3.886	nu star (KM)	4.664
theta hat (KM)	0.411	theta star (KM)	0.342
80% gamma percentile (KM)	0.0304	90% gamma percentile (KM)	0.105
95% gamma percentile (KM)	0.219	99% gamma percentile (KM)	0.573
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (4.66, α)	1	Adjusted Chi Square Value (4.66, β)	0.879
95% Gamma Approximate KM-UCL (use when n>=50)	0.177	95% Gamma Adjusted KM-UCL (use when n<50)	0.202
95% Gamma Adjusted KM-UCL (use when k<=1 and 15 < n < 50)			
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.956	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.818	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.158	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.283	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			

Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.0374	Mean in Log Scale	-6.753
SD in Original Scale	0.128	SD in Log Scale	2.746
95% t UCL (assumes normality of ROS data)	0.0857	95% Percentile Bootstrap UCL	0.0934
95% BCA Bootstrap UCL	0.125	95% Bootstrap t UCL	0.359
95% H-UCL (Log ROS)	1.437		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-5.655	KM Geo Mean	0.0035
KM SD (logged)	1.817	95% Critical H Value (KM-Log)	3.831
KM Standard Error of Mean (logged)	0.442	95% H-UCL (KM -Log)	0.0865
KM SD (logged)	1.817	95% Critical H Value (KM-Log)	3.831
KM Standard Error of Mean (logged)	0.442		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.0395	Mean in Log Scale	-5.248
SD in Original Scale	0.128	SD in Log Scale	1.819
95% t UCL (Assumes normality)	0.0875	95% H-Stat UCL	0.131
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Gamma Distributed at 5% Significance Level			
Suggested UCL to Use			
Adjusted KM-UCL (use when k<=1 and 15 < n < 50 but k<=1)	0.202		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
DibenzAHAnthracene			
General Statistics			
Total Number of Observations	21	Number of Distinct Observations	17
		Number of Missing Observations	2
Number of Detects	5	Number of Non-Detects	16
Number of Distinct Detects	5	Number of Distinct Non-Detects	12
Minimum Detect	0.0013	Minimum Non-Detect	9.0000E-4
Maximum Detect	0.23	Maximum Non-Detect	0.027
Variance Detects	0.0096	Percent Non-Detects	76.19%
Mean Detects	0.0557	SD Detects	0.098
Median Detects	0.018	CV Detects	1.759
Skewness Detects	2.175	Kurtosis Detects	4.779
Mean of Logged Detects	-4.305	SD of Logged Detects	2.006
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.646	**Shapiro Wilk GOF Test**	

5% Shapiro Wilk Critical Value	0.762	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.419	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.343	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.0147	KM Standard Error of Mean	0.0119
KM SD	0.0486	95% KM (BCA) UCL	0.0375
95% KM (t) UCL	0.0353	95% KM (Percentile Bootstrap) UCL	0.0364
95% KM (z) UCL	0.0343	95% KM Bootstrap t UCL	0.107
90% KM Chebyshev UCL	0.0504	95% KM Chebyshev UCL	0.0666
97.5% KM Chebyshev UCL	0.0891	99% KM Chebyshev UCL	0.133
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	0.377	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.717	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.277	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.373	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.455	k star (bias corrected MLE)	0.315
Theta hat (MLE)	0.122	Theta star (bias corrected MLE)	0.177
nu hat (MLE)	4.548	nu star (bias corrected)	3.152
Mean (detects)	0.0557		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.0013	Mean	0.0209
Maximum	0.23	Median	0.01
SD	0.0481	CV	2.306
k hat (MLE)	0.882	k star (bias corrected MLE)	0.787
Theta hat (MLE)	0.0237	Theta star (bias corrected MLE)	0.0265
nu hat (MLE)	37.03	nu star (bias corrected)	33.07
Adjusted Level of Significance (β)	0.0383		
Approximate Chi Square Value (33.07, α)	20.92	Adjusted Chi Square Value (33.07, β)	20.18
95% Gamma Approximate UCL (use when n>=50)	0.033	95% Gamma Adjusted UCL (use when n<50)	0.0342
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.0147	SD (KM)	0.0486
Variance (KM)	0.00236	SE of Mean (KM)	0.0119
k hat (KM)	0.0918	k star (KM)	0.11
nu hat (KM)	3.856	nu star (KM)	4.639
theta hat (KM)	0.16	theta star (KM)	0.133
80% gamma percentile (KM)	0.0117	90% gamma percentile (KM)	0.0407
95% gamma percentile (KM)	0.0849	99% gamma percentile (KM)	0.223

Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (4.64, α)	0.989	Adjusted Chi Square Value (4.64, β)	0.869
95% Gamma Approximate KM-UCL (use when n>=50)	0.0691	95% Gamma Adjusted KM-UCL (use when n<50)	0.0786
95% Gamma Adjusted KM-UCL (use when k<=1 and 15 < n < 50)			
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.967	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.762	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.172	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.343	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.0135	Mean in Log Scale	-7.73
SD in Original Scale	0.0501	SD in Log Scale	2.344
95% t UCL (assumes normality of ROS data)	0.0323	95% Percentile Bootstrap UCL	0.0345
95% BCA Bootstrap UCL	0.0471	95% Bootstrap t UCL	0.172
95% H-UCL (Log ROS)	0.082		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-6.163	KM Geo Mean	0.00211
KM SD (logged)	1.483	95% Critical H Value (KM-Log)	3.284
KM Standard Error of Mean (logged)	0.406	95% H-UCL (KM -Log)	0.0188
KM SD (logged)	1.483	95% Critical H Value (KM-Log)	3.284
KM Standard Error of Mean (logged)	0.406		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.018	Mean in Log Scale	-5.463
SD in Original Scale	0.0491	SD in Log Scale	1.679
95% t UCL (Assumes normality)	0.0365	95% H-Stat UCL	0.067
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Gamma Distributed at 5% Significance Level			
Suggested UCL to Use			
Adjusted KM-UCL (use when k<=1 and 15 < n < 50 but k<=1)	0.0786		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
BenzoAAnthracene			
General Statistics			
Total Number of Observations	21	Number of Distinct Observations	16
		Number of Missing Observations	2

Number of Detects	10	Number of Non-Detects	11
Number of Distinct Detects	9	Number of Distinct Non-Detects	8
Minimum Detect	9.5000E-4	Minimum Non-Detect	0.0015
Maximum Detect	1.4	Maximum Non-Detect	0.043
Variance Detects	0.189	Percent Non-Detects	52.38%
Mean Detects	0.169	SD Detects	0.435
Median Detects	0.00815	CV Detects	2.566
Skewness Detects	3.104	Kurtosis Detects	9.719
Mean of Logged Detects	-4.255	SD of Logged Detects	2.414
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.444	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.842	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.436	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.262	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.0818	KM Standard Error of Mean	0.0682
KM SD	0.297	95% KM (BCA) UCL	0.211
95% KM (t) UCL	0.199	95% KM (Percentile Bootstrap) UCL	0.213
95% KM (z) UCL	0.194	95% KM Bootstrap t UCL	1.129
90% KM Chebyshev UCL	0.286	95% KM Chebyshev UCL	0.379
97.5% KM Chebyshev UCL	0.508	99% KM Chebyshev UCL	0.76
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	0.866	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.821	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.241	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.289	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data follow Appr. Gamma Distribution at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.281	k star (bias corrected MLE)	0.263
Theta hat (MLE)	0.603	Theta star (bias corrected MLE)	0.643
nu hat (MLE)	5.621	nu star (bias corrected)	5.268
Mean (detects)	0.169		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	9.5000E-4	Mean	0.0859
Maximum	1.4	Median	0.01
SD	0.303	CV	3.525
k hat (MLE)	0.34	k star (bias corrected MLE)	0.324
Theta hat (MLE)	0.252	Theta star (bias corrected MLE)	0.265
nu hat (MLE)	14.3	nu star (bias corrected)	13.59

Adjusted Level of Significance (β)	0.0383		
Approximate Chi Square Value (13.59, α)	6.292	Adjusted Chi Square Value (13.59, β)	5.913
95% Gamma Approximate UCL (use when n>=50)	0.186	95% Gamma Adjusted UCL (use when n<50)	0.197
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.0818	SD (KM)	0.297
Variance (KM)	0.0879	SE of Mean (KM)	0.0682
k hat (KM)	0.0761	k star (KM)	0.097
nu hat (KM)	3.196	nu star (KM)	4.073
theta hat (KM)	1.075	theta star (KM)	0.844
80% gamma percentile (KM)	0.0542	90% gamma percentile (KM)	0.215
95% gamma percentile (KM)	0.476	99% gamma percentile (KM)	1.319
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (4.07, α)	0.751	Adjusted Chi Square Value (4.07, β)	0.652
95% Gamma Approximate KM-UCL (use when n>=50)	0.444	95% Gamma Adjusted KM-UCL (use when n<50)	0.511
95% Gamma Adjusted KM-UCL (use when k<=1 and 15 < n < 50)			
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.921	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.842	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.158	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.262	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.0816	Mean in Log Scale	-5.532
SD in Original Scale	0.304	SD in Log Scale	2.136
95% t UCL (assumes normality of ROS data)	0.196	95% Percentile Bootstrap UCL	0.211
95% BCA Bootstrap UCL	0.281	95% Bootstrap t UCL	1.164
95% H-UCL (Log ROS)	0.313		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-5.426	KM Geo Mean	0.0044
KM SD (logged)	2.003	95% Critical H Value (KM-Log)	4.147
KM Standard Error of Mean (logged)	0.484	95% H-UCL (KM -Log)	0.21
KM SD (logged)	2.003	95% Critical H Value (KM-Log)	4.147
KM Standard Error of Mean (logged)	0.484		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.087	Mean in Log Scale	-4.711
SD in Original Scale	0.303	SD in Log Scale	2.018
95% t UCL (Assumes normality)	0.201	95% H-Stat UCL	0.453
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Approximate Gamma Distributed at 5% Significance Level			
Suggested UCL to Use			

Adjusted KM-UCL (use when k<=1 and 15 < n < 50 but k<=1)	0.511		
When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test			
When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Cyanide			
General Statistics			
Total Number of Observations	21	Number of Distinct Observations	19
		Number of Missing Observations	2
Number of Detects	6	Number of Non-Detects	15
Number of Distinct Detects	6	Number of Distinct Non-Detects	15
Minimum Detect	0.067	Minimum Non-Detect	0.032
Maximum Detect	2.7	Maximum Non-Detect	0.097
Variance Detects	1.015	Percent Non-Detects	71.43%
Mean Detects	0.857	SD Detects	1.008
Median Detects	0.545	CV Detects	1.175
Skewness Detects	1.508	Kurtosis Detects	2.171
Mean of Logged Detects	-0.913	SD of Logged Detects	1.486
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.831	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.788	Detected Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.22	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.325	Detected Data appear Normal at 5% Significance Level	
Detected Data appear Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.27	KM Standard Error of Mean	0.147
KM SD	0.616	95% KM (BCA) UCL	0.521
95% KM (t) UCL	0.525	95% KM (Percentile Bootstrap) UCL	0.53
95% KM (z) UCL	0.513	95% KM Bootstrap t UCL	0.851
90% KM Chebyshev UCL	0.712	95% KM Chebyshev UCL	0.913
97.5% KM Chebyshev UCL	1.19	99% KM Chebyshev UCL	1.736
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	0.267	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.72	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.19	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.343	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.784	k star (bias corrected MLE)	0.503
Theta hat (MLE)	1.093	Theta star (bias corrected MLE)	1.704

nu hat (MLE)	9.409	nu star (bias corrected)	6.038
Mean (detects)	0.857		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	0.252
Maximum	2.7	Median	0.01
SD	0.639	CV	2.533
k hat (MLE)	0.315	k star (bias corrected MLE)	0.302
Theta hat (MLE)	0.8	Theta star (bias corrected MLE)	0.836
nu hat (MLE)	13.23	nu star (bias corrected)	12.67
Adjusted Level of Significance (β)	0.0383		
Approximate Chi Square Value (12.67, α)	5.672	Adjusted Chi Square Value (12.67, β)	5.315
95% Gamma Approximate UCL (use when n>=50)	0.563	95% Gamma Adjusted UCL (use when n<50)	0.601
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.27	SD (KM)	0.616
Variance (KM)	0.38	SE of Mean (KM)	0.147
k hat (KM)	0.193	k star (KM)	0.197
nu hat (KM)	8.093	nu star (KM)	8.27
theta hat (KM)	1.404	theta star (KM)	1.374
80% gamma percentile (KM)	0.353	90% gamma percentile (KM)	0.818
95% gamma percentile (KM)	1.399	99% gamma percentile (KM)	3.004
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (8.27, α)	2.892	Adjusted Chi Square Value (8.27, β)	2.653
95% Gamma Approximate KM-UCL (use when n>=50)	0.773	95% Gamma Adjusted KM-UCL (use when n<50)	0.843
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.933	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.788	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.185	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.325	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.247	Mean in Log Scale	-4.321
SD in Original Scale	0.64	SD in Log Scale	2.343
95% t UCL (assumes normality of ROS data)	0.488	95% Percentile Bootstrap UCL	0.503
95% BCA Bootstrap UCL	0.6	95% Bootstrap t UCL	0.959
95% H-UCL (Log ROS)	2.473		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-2.665	KM Geo Mean	0.0696
KM SD (logged)	1.339	95% Critical H Value (KM-Log)	3.058
KM Standard Error of Mean (logged)	0.326	95% H-UCL (KM -Log)	0.426

KM SD (logged)	1.339	95% Critical H Value (KM-Log)	3.058
KM Standard Error of Mean (logged)	0.326		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.268	Mean in Log Scale	-2.753
SD in Original Scale	0.632	SD in Log Scale	1.45
95% t UCL (Assumes normality)	0.506	95% H-Stat UCL	0.519

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Normal Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (t) UCL	0.525		

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Aluminum

General Statistics

Total Number of Observations	21	Number of Distinct Observations	21
		Number of Missing Observations	2
Minimum	5750	Mean	7829
Maximum	12000	Median	7480
SD	1628	Std. Error of Mean	355.3
Coefficient of Variation	0.208	Skewness	1.444

Normal GOF Test

Shapiro Wilk Test Statistic	0.86	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.908	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.159	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.188	Data appear Normal at 5% Significance Level

Data appear Approximate Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	8441	95% Adjusted-CLT UCL (Chen-1995)	8533
		95% Modified-t UCL (Johnson-1978)	8460

Gamma GOF Test

A-D Test Statistic	0.594	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.742	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.127	**Kolmogorov-Smirnov Gamma GOF Test**
5% K-S Critical Value	0.189	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics			
k hat (MLE)	27.51	k star (bias corrected MLE)	23.61
Theta hat (MLE)	284.5	Theta star (bias corrected MLE)	331.5
nu hat (MLE)	1156	nu star (bias corrected)	991.8
MLE Mean (bias corrected)	7829	MLE Sd (bias corrected)	1611
		Approximate Chi Square Value (0.05)	919.7
Adjusted Level of Significance	0.0383	Adjusted Chi Square Value	914.4
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	8442	95% Adjusted Gamma UCL (use when n<50)	8491
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.928	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.908	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.117	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.188	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	8.657	Mean of logged Data	8.947
Maximum of Logged Data	9.393	SD of logged Data	0.191
Assuming Lognormal Distribution			
95% H-UCL	8441	90% Chebyshev (MVUE) UCL	8804
95% Chebyshev (MVUE) UCL	9249	97.5% Chebyshev (MVUE) UCL	9867
99% Chebyshev (MVUE) UCL	11081		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	8413	95% Jackknife UCL	8441
95% Standard Bootstrap UCL	8405	95% Bootstrap-t UCL	8670
95% Hall's Bootstrap UCL	9162	95% Percentile Bootstrap UCL	8418
95% BCA Bootstrap UCL	8566		
90% Chebyshev(Mean, Sd) UCL	8894	95% Chebyshev(Mean, Sd) UCL	9377
97.5% Chebyshev(Mean, Sd) UCL	10047	99% Chebyshev(Mean, Sd) UCL	11364
Suggested UCL to Use			
95% Student's-t UCL	8441		
When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test			
When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			

Iron

General Statistics			
Total Number of Observations	21	Number of Distinct Observations	17
		Number of Missing Observations	2
Minimum	10000	Mean	13176
Maximum	18300	Median	13100
SD	2084	Std. Error of Mean	454.9
Coefficient of Variation	0.158	Skewness	0.405
Normal GOF Test			
Shapiro Wilk Test Statistic	0.931	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.908	Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.165	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.188	Data appear Normal at 5% Significance Level	
Data appear Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	13961	95% Adjusted-CLT UCL (Chen-1995)	13967
		95% Modified-t UCL (Johnson-1978)	13967
Gamma GOF Test			
A-D Test Statistic	0.615	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.742	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.183	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.189	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	42.52	k star (bias corrected MLE)	36.47
Theta hat (MLE)	309.9	Theta star (bias corrected MLE)	361.2
nu hat (MLE)	1786	nu star (bias corrected)	1532
MLE Mean (bias corrected)	13176	MLE Sd (bias corrected)	2182
		Approximate Chi Square Value (0.05)	1442
Adjusted Level of Significance	0.0383	Adjusted Chi Square Value	1435
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	13998	95% Adjusted Gamma UCL (use when n<50)	14063
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.939	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.908	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.185	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.188	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	9.21	Mean of logged Data	9.474

Maximum of Logged Data	9.815	SD of logged Data	0.157
Assuming Lognormal Distribution			
95% H-UCL	14020	90% Chebyshev (MVUE) UCL	14539
95% Chebyshev (MVUE) UCL	15156	97.5% Chebyshev (MVUE) UCL	16013
99% Chebyshev (MVUE) UCL	17695		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	13924	95% Jackknife UCL	13961
95% Standard Bootstrap UCL	13911	95% Bootstrap-t UCL	14063
95% Hall's Bootstrap UCL	14010	95% Percentile Bootstrap UCL	13957
95% BCA Bootstrap UCL	13924		
90% Chebyshev(Mean, Sd) UCL	14541	95% Chebyshev(Mean, Sd) UCL	15159
97.5% Chebyshev(Mean, Sd) UCL	16017	99% Chebyshev(Mean, Sd) UCL	17702
Suggested UCL to Use			
95% Student's-t UCL	13961		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Manganese			
General Statistics			
Total Number of Observations	21	Number of Distinct Observations	20
		Number of Missing Observations	2
Minimum	129	Mean	204.7
Maximum	297	Median	199
SD	43.75	Std. Error of Mean	9.546
Coefficient of Variation	0.214	Skewness	0.428
Normal GOF Test			
Shapiro Wilk Test Statistic	0.97	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.908	Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.108	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.188	Data appear Normal at 5% Significance Level	
Data appear Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	221.1	95% Adjusted-CLT UCL (Chen-1995)	221.3
		95% Modified-t UCL (Johnson-1978)	221.3
Gamma GOF Test			

A-D Test Statistic	0.181	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.742	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.0907	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.189	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	23.12	k star (bias corrected MLE)	19.85
Theta hat (MLE)	8.854	Theta star (bias corrected MLE)	10.31
nu hat (MLE)	970.9	nu star (bias corrected)	833.5
MLE Mean (bias corrected)	204.7	MLE Sd (bias corrected)	45.94
		Approximate Chi Square Value (0.05)	767.5
Adjusted Level of Significance	0.0383	Adjusted Chi Square Value	762.7
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	222.3	95% Adjusted Gamma UCL (use when n<50)	223.7
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.98	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.908	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.0914	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.188	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	4.86	Mean of logged Data	5.3
Maximum of Logged Data	5.694	SD of logged Data	0.215
Assuming Lognormal Distribution			
95% H-UCL	223.2	90% Chebyshev (MVUE) UCL	233.7
95% Chebyshev (MVUE) UCL	246.8	97.5% Chebyshev (MVUE) UCL	265.1
99% Chebyshev (MVUE) UCL	300.9		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	220.4	95% Jackknife UCL	221.1
95% Standard Bootstrap UCL	220.4	95% Bootstrap-t UCL	222.2
95% Hall's Bootstrap UCL	222.9	95% Percentile Bootstrap UCL	220.1
95% BCA Bootstrap UCL	220.6		
90% Chebyshev(Mean, Sd) UCL	233.3	95% Chebyshev(Mean, Sd) UCL	246.3
97.5% Chebyshev(Mean, Sd) UCL	264.3	99% Chebyshev(Mean, Sd) UCL	299.6
Suggested UCL to Use			
95% Student's-t UCL	221.1		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Arsenic

General Statistics

Total Number of Observations	21	Number of Distinct Observations	16
		Number of Missing Observations	2
Minimum	2.5	Mean	3.5
Maximum	4.4	Median	3.6
SD	0.508	Std. Error of Mean	0.111
Coefficient of Variation	0.145	Skewness	-0.195

Normal GOF Test

Shapiro Wilk Test Statistic	0.97	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.908	Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.119	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.188	Data appear Normal at 5% Significance Level

Data appear Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	3.691	95% Adjusted-CLT UCL (Chen-1995)	3.677
		95% Modified-t UCL (Johnson-1978)	3.69

Gamma GOF Test

A-D Test Statistic	0.37	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.741	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.138	**Kolmogorov-Smirnov Gamma GOF Test**
5% K-S Critical Value	0.189	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	47.92	k star (bias corrected MLE)	41.1
Theta hat (MLE)	0.073	Theta star (bias corrected MLE)	0.0852
nu hat (MLE)	2013	nu star (bias corrected)	1726
MLE Mean (bias corrected)	3.5	MLE Sd (bias corrected)	0.546
		Approximate Chi Square Value (0.05)	1631
Adjusted Level of Significance	0.0383	Adjusted Chi Square Value	1624

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	3.705	95% Adjusted Gamma UCL (use when n<50)	3.721

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.956	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.908	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.147	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.188	Data appear Lognormal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Lognormal Statistics			
Minimum of Logged Data	0.916	Mean of logged Data	1.242
Maximum of Logged Data	1.482	SD of logged Data	0.15
Assuming Lognormal Distribution			
95% H-UCL	3.714	90% Chebyshev (MVUE) UCL	3.846
95% Chebyshev (MVUE) UCL	4.003	97.5% Chebyshev (MVUE) UCL	4.22
99% Chebyshev (MVUE) UCL	4.646		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	3.682	95% Jackknife UCL	3.691
95% Standard Bootstrap UCL	3.678	95% Bootstrap-t UCL	3.687
95% Hall's Bootstrap UCL	3.681	95% Percentile Bootstrap UCL	3.676
95% BCA Bootstrap UCL	3.676		
90% Chebyshev(Mean, Sd) UCL	3.833	95% Chebyshev(Mean, Sd) UCL	3.983
97.5% Chebyshev(Mean, Sd) UCL	4.192	99% Chebyshev(Mean, Sd) UCL	4.603
Suggested UCL to Use			
95% Student's-t UCL	3.691		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Note: For highly negatively-skewed data, confidence limits (e.g., Chen, Johnson, Lognormal, and Gamma) may not be			
reliable. Chen's and Johnson's methods provide adjustments for positvely skewed data sets.			
Cobalt			
General Statistics			
Total Number of Observations	21	Number of Distinct Observations	16
		Number of Missing Observations	2
Minimum	4.1	Mean	5.233
Maximum	7.7	Median	5.2
SD	0.838	Std. Error of Mean	0.183
Coefficient of Variation	0.16	Skewness	1.07
Normal GOF Test			
Shapiro Wilk Test Statistic	0.911	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.908	Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.133	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.188	Data appear Normal at 5% Significance Level	
Data appear Normal at 5% Significance Level			
Assuming Normal Distribution			

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	5.549	95% Adjusted-CLT UCL (Chen-1995)	5.58
		95% Modified-t UCL (Johnson-1978)	5.556
Gamma GOF Test			
A-D Test Statistic	0.353	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.741	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.117	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.189	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	43.69	k star (bias corrected MLE)	37.48
Theta hat (MLE)	0.12	Theta star (bias corrected MLE)	0.14
nu hat (MLE)	1835	nu star (bias corrected)	1574
MLE Mean (bias corrected)	5.233	MLE Sd (bias corrected)	0.855
		Approximate Chi Square Value (0.05)	1483
Adjusted Level of Significance	0.0383	Adjusted Chi Square Value	1476
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	5.555	95% Adjusted Gamma UCL (use when n<50)	5.58
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.947	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.908	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.119	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.188	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	1.411	Mean of logged Data	1.644
Maximum of Logged Data	2.041	SD of logged Data	0.153
Assuming Lognormal Distribution			
95% H-UCL	5.558	90% Chebyshev (MVUE) UCL	5.759
95% Chebyshev (MVUE) UCL	5.998	97.5% Chebyshev (MVUE) UCL	6.33
99% Chebyshev (MVUE) UCL	6.981		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	5.534	95% Jackknife UCL	5.549
95% Standard Bootstrap UCL	5.528	95% Bootstrap-t UCL	5.599
95% Hall's Bootstrap UCL	5.695	95% Percentile Bootstrap UCL	5.529
95% BCA Bootstrap UCL	5.586		
90% Chebyshev(Mean, Sd) UCL	5.782	95% Chebyshev(Mean, Sd) UCL	6.03
97.5% Chebyshev(Mean, Sd) UCL	6.375	99% Chebyshev(Mean, Sd) UCL	7.053
Suggested UCL to Use			

95% Student's-t UCL	5.549		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			

ProUCL Output
Backwater Seep Sampling Area Soil (0-2 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

UCL Statistics for Data Sets with Non-Detects	
User Selected Options	
Date/Time of Computation	ProUCL 5.11/28/2019 8:29:45 PM
From File	20190128_BkwtrSeep_ProUCL_input.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Fluoride

General Statistics

Total Number of Observations	16	Number of Distinct Observations	16
		Number of Missing Observations	2
Minimum	1.58	Mean	18.46
Maximum	33.5	Median	16.55
SD	7.922	Std. Error of Mean	1.981
Coefficient of Variation	0.429	Skewness	0.216

Normal GOF Test

Shapiro Wilk Test Statistic	0.933	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.887	Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.198	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.213	Data appear Normal at 5% Significance Level	

Data appear Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	21.93	95% Adjusted-CLT UCL (Chen-1995)	21.83
		95% Modified-t UCL (Johnson-1978)	21.94

Gamma GOF Test

A-D Test Statistic	0.937	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.743	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.218	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.216	Data Not Gamma Distributed at 5% Significance Level	

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	3.612	k star (bias corrected MLE)	2.977
Theta hat (MLE)	5.109	Theta star (bias corrected MLE)	6.2
nu hat (MLE)	115.6	nu star (bias corrected)	95.26
MLE Mean (bias corrected)	18.46	MLE Sd (bias corrected)	10.7
		Approximate Chi Square Value (0.05)	73.75
Adjusted Level of Significance	0.0335	Adjusted Chi Square Value	71.59

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	23.84	95% Adjusted Gamma UCL (use when n<50)	24.55

Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.702	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.887	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.277	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.213	Data Not Lognormal at 5% Significance Level	
Data Not Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	0.457	Mean of logged Data	2.771
Maximum of Logged Data	3.512	SD of logged Data	0.689
Assuming Lognormal Distribution			
95% H-UCL	30.31	90% Chebyshev (MVUE) UCL	30.75
95% Chebyshev (MVUE) UCL	35.67	97.5% Chebyshev (MVUE) UCL	42.5
99% Chebyshev (MVUE) UCL	55.9		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	21.71	95% Jackknife UCL	21.93
95% Standard Bootstrap UCL	21.57	95% Bootstrap-t UCL	22.24
95% Hall's Bootstrap UCL	22.08	95% Percentile Bootstrap UCL	21.68
95% BCA Bootstrap UCL	21.77		
90% Chebyshev(Mean, Sd) UCL	24.4	95% Chebyshev(Mean, Sd) UCL	27.09
97.5% Chebyshev(Mean, Sd) UCL	30.82	99% Chebyshev(Mean, Sd) UCL	38.16
Suggested UCL to Use			
95% Student's-t UCL	21.93		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
BenzoBFluoranthene			
General Statistics			
Total Number of Observations	16	Number of Distinct Observations	14
		Number of Missing Observations	2
Number of Detects	9	Number of Non-Detects	7
Number of Distinct Detects	9	Number of Distinct Non-Detects	5
Minimum Detect	0.045	Minimum Non-Detect	0.014
Maximum Detect	0.4	Maximum Non-Detect	0.019
Variance Detects	0.0127	Percent Non-Detects	43.75%
Mean Detects	0.121	SD Detects	0.113
Median Detects	0.073	CV Detects	0.934
Skewness Detects	2.331	Kurtosis Detects	5.696
Mean of Logged Detects	-2.372	SD of Logged Detects	0.692

Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.678	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.829	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.311	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.274	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.074	KM Standard Error of Mean	0.0254
KM SD	0.0957	95% KM (BCA) UCL	0.121
95% KM (t) UCL	0.118	95% KM (Percentile Bootstrap) UCL	0.117
95% KM (z) UCL	0.116	95% KM Bootstrap t UCL	0.178
90% KM Chebyshev UCL	0.15	95% KM Chebyshev UCL	0.185
97.5% KM Chebyshev UCL	0.232	99% KM Chebyshev UCL	0.326
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	0.774	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.729	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.297	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.282	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	2.094	k star (bias corrected MLE)	1.47
Theta hat (MLE)	0.0576	Theta star (bias corrected MLE)	0.0821
nu hat (MLE)	37.69	nu star (bias corrected)	26.46
Mean (detects)	0.121		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	0.0723
Maximum	0.4	Median	0.0465
SD	0.0999	CV	1.383
k hat (MLE)	0.82	k star (bias corrected MLE)	0.708
Theta hat (MLE)	0.0881	Theta star (bias corrected MLE)	0.102
nu hat (MLE)	26.24	nu star (bias corrected)	22.65
Adjusted Level of Significance (β)	0.0335		
Approximate Chi Square Value (22.65, α)	12.83	Adjusted Chi Square Value (22.65, β)	11.99
95% Gamma Approximate UCL (use when n>=50)	0.128	95% Gamma Adjusted UCL (use when n<50)	0.136
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.074	SD (KM)	0.0957
Variance (KM)	0.00915	SE of Mean (KM)	0.0254
k hat (KM)	0.598	k star (KM)	0.528
nu hat (KM)	19.15	nu star (KM)	16.89
theta hat (KM)	0.124	theta star (KM)	0.14

80% gamma percentile (KM)	0.122	90% gamma percentile (KM)	0.198
95% gamma percentile (KM)	0.279	99% gamma percentile (KM)	0.477
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (16.89, α)	8.597	Adjusted Chi Square Value (16.89, β)	7.93
95% Gamma Approximate KM-UCL (use when n>=50)	0.145	95% Gamma Adjusted KM-UCL (use when n<50)	0.158
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.876	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.829	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.262	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.274	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.0746	Mean in Log Scale	-3.174
SD in Original Scale	0.0984	SD in Log Scale	1.079
95% t UCL (assumes normality of ROS data)	0.118	95% Percentile Bootstrap UCL	0.117
95% BCA Bootstrap UCL	0.14	95% Bootstrap t UCL	0.176
95% H-UCL (Log ROS)	0.165		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-3.202	KM Geo Mean	0.0407
KM SD (logged)	1.061	95% Critical H Value (KM-Log)	2.798
KM Standard Error of Mean (logged)	0.281	95% H-UCL (KM -Log)	0.154
KM SD (logged)	1.061	95% Critical H Value (KM-Log)	2.798
KM Standard Error of Mean (logged)	0.281		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.0714	Mean in Log Scale	-3.445
SD in Original Scale	0.101	SD in Log Scale	1.356
95% t UCL (Assumes normality)	0.115	95% H-Stat UCL	0.253
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Lognormal Distributed at 5% Significance Level			
Suggested UCL to Use			
KM H-UCL	0.154		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
BenzoAPyrene			
General Statistics			
Total Number of Observations	16	Number of Distinct Observations	8

		Number of Missing Observations	2
Number of Detects	3	Number of Non-Detects	13
Number of Distinct Detects	3	Number of Distinct Non-Detects	5
Minimum Detect	0.027	Minimum Non-Detect	0.011
Maximum Detect	0.036	Maximum Non-Detect	0.015
Variance Detects	2.1000E-5	Percent Non-Detects	81.25%
Mean Detects	0.032	SD Detects	0.00458
Median Detects	0.033	CV Detects	0.143
Skewness Detects	-0.935	Kurtosis Detects	N/A
Mean of Logged Detects	-3.449	SD of Logged Detects	0.148
Warning: Data set has only 3 Detected Values.			
This is not enough to compute meaningful or reliable statistics and estimates.			
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.964	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.767	Detected Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.253	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.425	Detected Data appear Normal at 5% Significance Level	
Detected Data appear Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.0149	KM Standard Error of Mean	0.00256
KM SD	0.00836	95% KM (BCA) UCL	N/A
95% KM (t) UCL	0.0194	95% KM (Percentile Bootstrap) UCL	N/A
95% KM (z) UCL	0.0191	95% KM Bootstrap t UCL	N/A
90% KM Chebyshev UCL	0.0226	95% KM Chebyshev UCL	0.0261
97.5% KM Chebyshev UCL	0.0309	99% KM Chebyshev UCL	0.0404
Gamma GOF Tests on Detected Observations Only			
Not Enough Data to Perform GOF Test			
Gamma Statistics on Detected Data Only			
k hat (MLE)	70.44	k star (bias corrected MLE)	N/A
Theta hat (MLE)	4.5427E-4	Theta star (bias corrected MLE)	N/A
nu hat (MLE)	422.7	nu star (bias corrected)	N/A
Mean (detects)	0.032		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	0.0161
Maximum	0.036	Median	0.0125
SD	0.00855	CV	0.532
k hat (MLE)	4.904	k star (bias corrected MLE)	4.026
Theta hat (MLE)	0.00328	Theta star (bias corrected MLE)	0.00399

nu hat (MLE)	156.9	nu star (bias corrected)	128.8
Adjusted Level of Significance (β)	0.0335		
Approximate Chi Square Value (128.83, α)	103.6	Adjusted Chi Square Value (128.83, β)	101
95% Gamma Approximate UCL (use when n>=50)	0.02	95% Gamma Adjusted UCL (use when n<50)	N/A
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.0149	SD (KM)	0.00836
Variance (KM)	6.9809E-5	SE of Mean (KM)	0.00256
k hat (KM)	3.196	k star (KM)	2.639
nu hat (KM)	102.3	nu star (KM)	84.44
theta hat (KM)	0.00467	theta star (KM)	0.00566
80% gamma percentile (KM)	0.0216	90% gamma percentile (KM)	0.0273
95% gamma percentile (KM)	0.0325	99% gamma percentile (KM)	0.0441
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (84.44, α)	64.26	Adjusted Chi Square Value (84.44, β)	62.26
95% Gamma Approximate KM-UCL (use when n>=50)	0.0196	95% Gamma Adjusted KM-UCL (use when n<50)	0.0203
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.951	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.767	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.268	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.425	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.0185	Mean in Log Scale	-4.057
SD in Original Scale	0.00746	SD in Log Scale	0.357
95% t UCL (assumes normality of ROS data)	0.0217	95% Percentile Bootstrap UCL	0.0216
95% BCA Bootstrap UCL	0.022	95% Bootstrap t UCL	0.023
95% H-UCL (Log ROS)	0.022		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-4.311	KM Geo Mean	0.0134
KM SD (logged)	0.417	95% Critical H Value (KM-Log)	1.97
KM Standard Error of Mean (logged)	0.128	95% H-UCL (KM -Log)	0.0181
KM SD (logged)	0.417	95% Critical H Value (KM-Log)	1.97
KM Standard Error of Mean (logged)	0.128		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.0114	Mean in Log Scale	-4.729
SD in Original Scale	0.0104	SD in Log Scale	0.645
95% t UCL (Assumes normality)	0.0159	95% H-Stat UCL	0.0157
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Normal Distributed at 5% Significance Level			
Suggested UCL to Use			

95% KM (t) UCL	0.0194		

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

BenzoAAnthracene

General Statistics

Total Number of Observations	16	Number of Distinct Observations	12
		Number of Missing Observations	2
Number of Detects	2	Number of Non-Detects	14
Number of Distinct Detects	2	Number of Distinct Non-Detects	10
Minimum Detect	0.049	Minimum Non-Detect	0.03
Maximum Detect	0.091	Maximum Non-Detect	0.043
Variance Detects	8.8200E-4	Percent Non-Detects	87.5%
Mean Detects	0.07	SD Detects	0.0297
Median Detects	0.07	CV Detects	0.424
Skewness Detects	N/A	Kurtosis Detects	N/A
Mean of Logged Detects	-2.706	SD of Logged Detects	0.438

Warning: Data set has only 2 Detected Values.

This is not enough to compute meaningful or reliable statistics and estimates.

Normal GOF Test on Detects Only

Not Enough Data to Perform GOF Test

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	0.035	KM Standard Error of Mean	0.00536
KM SD	0.0152	95% KM (BCA) UCL	N/A
95% KM (t) UCL	0.0444	95% KM (Percentile Bootstrap) UCL	N/A
95% KM (z) UCL	0.0438	95% KM Bootstrap t UCL	N/A
90% KM Chebyshev UCL	0.0511	95% KM Chebyshev UCL	0.0584
97.5% KM Chebyshev UCL	0.0685	99% KM Chebyshev UCL	0.0884

Gamma GOF Tests on Detected Observations Only

Not Enough Data to Perform GOF Test

Gamma Statistics on Detected Data Only

k hat (MLE)	10.77	k star (bias corrected MLE)	N/A
Theta hat (MLE)	0.0065	Theta star (bias corrected MLE)	N/A
nu hat (MLE)	43.07	nu star (bias corrected)	N/A
Mean (detects)	0.07		

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	0.035	SD (KM)	0.0152
Variance (KM)	2.3013E-4	SE of Mean (KM)	0.00536
k hat (KM)	5.323	k star (KM)	4.367

nu hat (KM)	170.3	nu star (KM)	139.7
theta hat (KM)	0.00658	theta star (KM)	0.00802
80% gamma percentile (KM)	0.0478	90% gamma percentile (KM)	0.0574
95% gamma percentile (KM)	0.0663	99% gamma percentile (KM)	0.0852
Gamma Kaplan-Meier (KM) Statistics			
		Adjusted Level of Significance (β)	0.0335
Approximate Chi Square Value (139.74, α)	113.4	Adjusted Chi Square Value (139.74, β)	110.7
95% Gamma Approximate KM-UCL (use when n>=50)	0.0431	95% Gamma Adjusted KM-UCL (use when n<50)	0.0442
Lognormal GOF Test on Detected Observations Only			
Not Enough Data to Perform GOF Test			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.0119	Mean in Log Scale	-5.382
SD in Original Scale	0.024	SD in Log Scale	1.171
95% t UCL (assumes normality of ROS data)	0.0224	95% Percentile Bootstrap UCL	0.0228
95% BCA Bootstrap UCL	0.0262	95% Bootstrap t UCL	0.124
95% H-UCL (Log ROS)	0.0224		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-3.407	KM Geo Mean	0.0332
KM SD (logged)	0.286	95% Critical H Value (KM-Log)	1.86
KM Standard Error of Mean (logged)	0.101	95% H-UCL (KM -Log)	0.0396
KM SD (logged)	0.286	95% Critical H Value (KM-Log)	1.86
KM Standard Error of Mean (logged)	0.101		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.0248	Mean in Log Scale	-3.841
SD in Original Scale	0.0193	SD in Log Scale	0.468
95% t UCL (Assumes normality)	0.0333	95% H-Stat UCL	0.0306
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution at 5% Significance Level			
Suggested UCL to Use			
95% KM (t) UCL	0.0444	KM H-UCL	0.0396
95% KM (BCA) UCL	N/A		
Warning: One or more Recommended UCL(s) not available!			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Cyanide			
General Statistics			

Total Number of Observations	16	Number of Distinct Observations	14
		Number of Missing Observations	2
Number of Detects	12	Number of Non-Detects	4
Number of Distinct Detects	11	Number of Distinct Non-Detects	3
Minimum Detect	0.079	Minimum Non-Detect	0.069
Maximum Detect	3.7	Maximum Non-Detect	0.077
Variance Detects	1.224	Percent Non-Detects	25%
Mean Detects	1.38	SD Detects	1.106
Median Detects	1.4	CV Detects	0.802
Skewness Detects	0.688	Kurtosis Detects	0.201
Mean of Logged Detects	-0.188	SD of Logged Detects	1.269
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.933	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.859	Detected Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.121	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.243	Detected Data appear Normal at 5% Significance Level	
Detected Data appear Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	1.052	KM Standard Error of Mean	0.282
KM SD	1.079	95% KM (BCA) UCL	1.515
95% KM (t) UCL	1.546	95% KM (Percentile Bootstrap) UCL	1.49
95% KM (z) UCL	1.516	95% KM Bootstrap t UCL	1.638
90% KM Chebyshev UCL	1.897	95% KM Chebyshev UCL	2.28
97.5% KM Chebyshev UCL	2.811	99% KM Chebyshev UCL	3.855
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	0.463	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.754	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.214	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.252	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	1.118	k star (bias corrected MLE)	0.894
Theta hat (MLE)	1.234	Theta star (bias corrected MLE)	1.543
nu hat (MLE)	26.84	nu star (bias corrected)	21.46
Mean (detects)	1.38		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	1.037
Maximum	3.7	Median	0.74
SD	1.128	CV	1.088
k hat (MLE)	0.481	k star (bias corrected MLE)	0.432

Theta hat (MLE)	2.157	Theta star (bias corrected MLE)	2.399
nu hat (MLE)	15.39	nu star (bias corrected)	13.84
Adjusted Level of Significance (β)	0.0335		
Approximate Chi Square Value (13.84, α)	6.46	Adjusted Chi Square Value (13.84, β)	5.894
95% Gamma Approximate UCL (use when n>=50)	2.222	95% Gamma Adjusted UCL (use when n<50)	2.435
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	1.052	SD (KM)	1.079
Variance (KM)	1.164	SE of Mean (KM)	0.282
k hat (KM)	0.951	k star (KM)	0.815
nu hat (KM)	30.44	nu star (KM)	26.07
theta hat (KM)	1.106	theta star (KM)	1.292
80% gamma percentile (KM)	1.718	90% gamma percentile (KM)	2.547
95% gamma percentile (KM)	3.391	99% gamma percentile (KM)	5.381
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (26.07, α)	15.43	Adjusted Chi Square Value (26.07, β)	14.51
95% Gamma Approximate KM-UCL (use when n>=50)	1.777	95% Gamma Adjusted KM-UCL (use when n<50)	1.891
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.874	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.859	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.244	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.243	Detected Data Not Lognormal at 5% Significance Level	
Detected Data appear Approximate Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	1.048	Mean in Log Scale	-0.885
SD in Original Scale	1.118	SD in Log Scale	1.659
95% t UCL (assumes normality of ROS data)	1.538	95% Percentile Bootstrap UCL	1.511
95% BCA Bootstrap UCL	1.557	95% Bootstrap t UCL	1.629
95% H-UCL (Log ROS)	8.449		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-0.809	KM Geo Mean	0.445
KM SD (logged)	1.505	95% Critical H Value (KM-Log)	3.553
KM Standard Error of Mean (logged)	0.393	95% H-UCL (KM -Log)	5.5
KM SD (logged)	1.505	95% Critical H Value (KM-Log)	3.553
KM Standard Error of Mean (logged)	0.393		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	1.044	Mean in Log Scale	-0.972
SD in Original Scale	1.122	SD in Log Scale	1.775
95% t UCL (Assumes normality)	1.536	95% H-Stat UCL	11.67
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Normal Distributed at 5% Significance Level			

Suggested UCL to Use			
95% KM (t) UCL	1.546		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Aluminum			
General Statistics			
Total Number of Observations	16	Number of Distinct Observations	16
		Number of Missing Observations	2
Minimum	8270	Mean	9403
Maximum	10800	Median	9325
SD	749.7	Std. Error of Mean	187.4
Coefficient of Variation	0.0797	Skewness	0.511
Normal GOF Test			
Shapiro Wilk Test Statistic	0.946	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.887	Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.129	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.213	Data appear Normal at 5% Significance Level	
Data appear Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	9731	95% Adjusted-CLT UCL (Chen-1995)	9736
		95% Modified-t UCL (Johnson-1978)	9735
Gamma GOF Test			
A-D Test Statistic	0.32	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.736	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.123	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.214	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	170.9	k star (bias corrected MLE)	138.9
Theta hat (MLE)	55.02	Theta star (bias corrected MLE)	67.69
nu hat (MLE)	5469	nu star (bias corrected)	4445
MLE Mean (bias corrected)	9403	MLE Sd (bias corrected)	797.8
		Approximate Chi Square Value (0.05)	4291
Adjusted Level of Significance	0.0335	Adjusted Chi Square Value	4274
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	9740	95% Adjusted Gamma UCL (use when n<50)	9779
Lognormal GOF Test			

Shapiro Wilk Test Statistic	0.957	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.887	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.117	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.213	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	9.02	Mean of logged Data	9.146
Maximum of Logged Data	9.287	SD of logged Data	0.0787
Assuming Lognormal Distribution			
95% H-UCL	N/A	90% Chebyshev (MVUE) UCL	9958
95% Chebyshev (MVUE) UCL	10210	97.5% Chebyshev (MVUE) UCL	10559
99% Chebyshev (MVUE) UCL	11245		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	9711	95% Jackknife UCL	9731
95% Standard Bootstrap UCL	9702	95% Bootstrap-t UCL	9782
95% Hall's Bootstrap UCL	9745	95% Percentile Bootstrap UCL	9715
95% BCA Bootstrap UCL	9693		
90% Chebyshev(Mean, Sd) UCL	9965	95% Chebyshev(Mean, Sd) UCL	10219
97.5% Chebyshev(Mean, Sd) UCL	10573	99% Chebyshev(Mean, Sd) UCL	11267
Suggested UCL to Use			
95% Student's-t UCL	9731		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Iron			
General Statistics			
Total Number of Observations	16	Number of Distinct Observations	13
		Number of Missing Observations	2
Minimum	13000	Mean	15350
Maximum	17600	Median	15250
SD	1088	Std. Error of Mean	272
Coefficient of Variation	0.0709	Skewness	0.121
Normal GOF Test			
Shapiro Wilk Test Statistic	0.95	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.887	Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.195	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.213	Data appear Normal at 5% Significance Level	

ProUCL Output
Backwater Seep Sampling Area Soil (0-2 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Data appear Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	15827	95% Adjusted-CLT UCL (Chen-1995)	15806
		95% Modified-t UCL (Johnson-1978)	15828
Gamma GOF Test			
A-D Test Statistic	0.478	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.736	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.185	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.214	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	211.8	k star (bias corrected MLE)	172.1
Theta hat (MLE)	72.48	Theta star (bias corrected MLE)	89.18
nu hat (MLE)	6777	nu star (bias corrected)	5508
MLE Mean (bias corrected)	15350	MLE Sd (bias corrected)	1170
		Approximate Chi Square Value (0.05)	5337
Adjusted Level of Significance	0.0335	Adjusted Chi Square Value	5317
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	15843	95% Adjusted Gamma UCL (use when n<50)	15901
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.949	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.887	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.183	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.213	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	9.473	Mean of logged Data	9.637
Maximum of Logged Data	9.776	SD of logged Data	0.0711
Assuming Lognormal Distribution			
95% H-UCL	N/A	90% Chebyshev (MVUE) UCL	16169
95% Chebyshev (MVUE) UCL	16540	97.5% Chebyshev (MVUE) UCL	17055
99% Chebyshev (MVUE) UCL	18067		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	15797	95% Jackknife UCL	15827
95% Standard Bootstrap UCL	15787	95% Bootstrap-t UCL	15867
95% Hall's Bootstrap UCL	15851	95% Percentile Bootstrap UCL	15781
95% BCA Bootstrap UCL	15788		
90% Chebyshev(Mean, Sd) UCL	16166	95% Chebyshev(Mean, Sd) UCL	16536

97.5% Chebyshev(Mean, Sd) UCL	17049	99% Chebyshev(Mean, Sd) UCL	18057
Suggested UCL to Use			
95% Student's-t UCL	15827		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Manganese			
General Statistics			
Total Number of Observations	16	Number of Distinct Observations	16
		Number of Missing Observations	2
Minimum	111	Mean	288.6
Maximum	467	Median	299.5
SD	96.72	Std. Error of Mean	24.18
Coefficient of Variation	0.335	Skewness	-0.254
Normal GOF Test			
Shapiro Wilk Test Statistic	0.967	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.887	Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.144	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.213	Data appear Normal at 5% Significance Level	
Data appear Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	331	95% Adjusted-CLT UCL (Chen-1995)	326.7
		95% Modified-t UCL (Johnson-1978)	330.7
Gamma GOF Test			
A-D Test Statistic	0.527	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.74	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.193	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.215	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	7.937	k star (bias corrected MLE)	6.491
Theta hat (MLE)	36.35	Theta star (bias corrected MLE)	44.46
nu hat (MLE)	254	nu star (bias corrected)	207.7
MLE Mean (bias corrected)	288.6	MLE Sd (bias corrected)	113.3
		Approximate Chi Square Value (0.05)	175.4
Adjusted Level of Significance	0.0335	Adjusted Chi Square Value	172
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	341.8	95% Adjusted Gamma UCL (use when n<50)	348.5

Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.909	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.887	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.215	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.213	Data Not Lognormal at 5% Significance Level	
Data appear Approximate Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	4.71	Mean of logged Data	5.601
Maximum of Logged Data	6.146	SD of logged Data	0.393
Assuming Lognormal Distribution			
95% H-UCL	356.1	90% Chebyshev (MVUE) UCL	378.2
95% Chebyshev (MVUE) UCL	417.7	97.5% Chebyshev (MVUE) UCL	472.7
99% Chebyshev (MVUE) UCL	580.6		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	328.3	95% Jackknife UCL	331
95% Standard Bootstrap UCL	327.3	95% Bootstrap-t UCL	328.8
95% Hall's Bootstrap UCL	326.1	95% Percentile Bootstrap UCL	327.6
95% BCA Bootstrap UCL	324.9		
90% Chebyshev(Mean, Sd) UCL	361.1	95% Chebyshev(Mean, Sd) UCL	394
97.5% Chebyshev(Mean, Sd) UCL	439.6	99% Chebyshev(Mean, Sd) UCL	529.1
Suggested UCL to Use			
95% Student's-t UCL	331		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Note: For highly negatively-skewed data, confidence limits (e.g., Chen, Johnson, Lognormal, and Gamma) may not be			
reliable. Chen's and Johnson's methods provide adjustments for positvely skewed data sets.			
Mercury			
General Statistics			
Total Number of Observations	16	Number of Distinct Observations	9
		Number of Missing Observations	2
Minimum	0.012	Mean	0.0196
Maximum	0.03	Median	0.02
SD	0.00477	Std. Error of Mean	0.00119
Coefficient of Variation	0.243	Skewness	0.232

Normal GOF Test			
Shapiro Wilk Test Statistic	0.954	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.887	Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.156	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.213	Data appear Normal at 5% Significance Level	
Data appear Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	0.0217	95% Adjusted-CLT UCL (Chen-1995)	0.0217
		95% Modified-t UCL (Johnson-1978)	0.0217
Gamma GOF Test			
A-D Test Statistic	0.417	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.737	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.188	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.215	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	17.56	k star (bias corrected MLE)	14.31
Theta hat (MLE)	0.00112	Theta star (bias corrected MLE)	0.00137
nu hat (MLE)	561.9	nu star (bias corrected)	457.8
MLE Mean (bias corrected)	0.0196	MLE Sd (bias corrected)	0.00519
		Approximate Chi Square Value (0.05)	409.2
Adjusted Level of Significance	0.0335	Adjusted Chi Square Value	404
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	0.022	95% Adjusted Gamma UCL (use when n<50)	0.0222
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.949	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.887	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.2	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.213	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	-4.423	Mean of logged Data	-3.96
Maximum of Logged Data	-3.507	SD of logged Data	0.251
Assuming Lognormal Distribution			
95% H-UCL	0.0222	90% Chebyshev (MVUE) UCL	0.0234
95% Chebyshev (MVUE) UCL	0.0251	97.5% Chebyshev (MVUE) UCL	0.0274
99% Chebyshev (MVUE) UCL	0.032		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			

95% CLT UCL	0.0216	95% Jackknife UCL	0.0217
95% Standard Bootstrap UCL	0.0215	95% Bootstrap-t UCL	0.0217
95% Hall's Bootstrap UCL	0.0219	95% Percentile Bootstrap UCL	0.0216
95% BCA Bootstrap UCL	0.0218		
90% Chebyshev(Mean, Sd) UCL	0.0232	95% Chebyshev(Mean, Sd) UCL	0.0248
97.5% Chebyshev(Mean, Sd) UCL	0.0271	99% Chebyshev(Mean, Sd) UCL	0.0315
Suggested UCL to Use			
95% Student's-t UCL	0.0217		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Nickel			
General Statistics			
Total Number of Observations	16	Number of Distinct Observations	12
		Number of Missing Observations	2
Minimum	11.5	Mean	13.57
Maximum	16.4	Median	13.25
SD	1.195	Std. Error of Mean	0.299
Coefficient of Variation	0.0881	Skewness	0.706
Normal GOF Test			
Shapiro Wilk Test Statistic	0.949	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.887	Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.153	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.213	Data appear Normal at 5% Significance Level	
Data appear Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	14.09	95% Adjusted-CLT UCL (Chen-1995)	14.12
		95% Modified-t UCL (Johnson-1978)	14.1
Gamma GOF Test			
A-D Test Statistic	0.365	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.736	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.151	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.214	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	141.1	k star (bias corrected MLE)	114.7
Theta hat (MLE)	0.0962	Theta star (bias corrected MLE)	0.118
nu hat (MLE)	4515	nu star (bias corrected)	3670
MLE Mean (bias corrected)	13.57	MLE Sd (bias corrected)	1.267

		Approximate Chi Square Value (0.05)	3530
Adjusted Level of Significance	0.0335	Adjusted Chi Square Value	3515
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	14.11	95% Adjusted Gamma UCL (use when n<50)	14.17
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.963	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.887	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.143	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.213	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	2.442	Mean of logged Data	2.604
Maximum of Logged Data	2.797	SD of logged Data	0.0865
Assuming Lognormal Distribution			
95% H-UCL	N/A	90% Chebyshev (MVUE) UCL	14.45
95% Chebyshev (MVUE) UCL	14.85	97.5% Chebyshev (MVUE) UCL	15.4
99% Chebyshev (MVUE) UCL	16.49		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	14.06	95% Jackknife UCL	14.09
95% Standard Bootstrap UCL	14.04	95% Bootstrap-t UCL	14.17
95% Hall's Bootstrap UCL	14.27	95% Percentile Bootstrap UCL	14.07
95% BCA Bootstrap UCL	14.08		
90% Chebyshev(Mean, Sd) UCL	14.47	95% Chebyshev(Mean, Sd) UCL	14.87
97.5% Chebyshev(Mean, Sd) UCL	15.44	99% Chebyshev(Mean, Sd) UCL	16.54
Suggested UCL to Use			
95% Student's-t UCL	14.09		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Arsenic			
General Statistics			
Total Number of Observations	16	Number of Distinct Observations	14
		Number of Missing Observations	2
Minimum	2.8	Mean	4.675
Maximum	5.6	Median	4.8
SD	0.713	Std. Error of Mean	0.178

Coefficient of Variation	0.153	Skewness	-1.213
Normal GOF Test			
Shapiro Wilk Test Statistic	0.917	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.887	Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.128	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.213	Data appear Normal at 5% Significance Level	
Data appear Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	4.988	95% Adjusted-CLT UCL (Chen-1995)	4.911
		95% Modified-t UCL (Johnson-1978)	4.979
Gamma GOF Test			
A-D Test Statistic	0.598	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.736	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.147	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.215	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	39.33	k star (bias corrected MLE)	31.99
Theta hat (MLE)	0.119	Theta star (bias corrected MLE)	0.146
nu hat (MLE)	1258	nu star (bias corrected)	1024
MLE Mean (bias corrected)	4.675	MLE Sd (bias corrected)	0.827
		Approximate Chi Square Value (0.05)	950.5
Adjusted Level of Significance	0.0335	Adjusted Chi Square Value	942.5
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	5.035	95% Adjusted Gamma UCL (use when n<50)	5.078
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.85	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.887	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.167	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.213	Data appear Lognormal at 5% Significance Level	
Data appear Approximate Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	1.03	Mean of logged Data	1.529
Maximum of Logged Data	1.723	SD of logged Data	0.172
Assuming Lognormal Distribution			
95% H-UCL	5.071	90% Chebyshev (MVUE) UCL	5.287
95% Chebyshev (MVUE) UCL	5.562	97.5% Chebyshev (MVUE) UCL	5.944
99% Chebyshev (MVUE) UCL	6.694		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			

Nonparametric Distribution Free UCLs			
95% CLT UCL	4.968	95% Jackknife UCL	4.988
95% Standard Bootstrap UCL	4.964	95% Bootstrap-t UCL	4.96
95% Hall's Bootstrap UCL	4.925	95% Percentile Bootstrap UCL	4.944
95% BCA Bootstrap UCL	4.925		
90% Chebyshev(Mean, Sd) UCL	5.21	95% Chebyshev(Mean, Sd) UCL	5.452
97.5% Chebyshev(Mean, Sd) UCL	5.788	99% Chebyshev(Mean, Sd) UCL	6.449
Suggested UCL to Use			
95% Student's-t UCL	4.988		

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Note: For highly negatively-skewed data, confidence limits (e.g., Chen, Johnson, Lognormal, and Gamma) may not be reliable. Chen's and Johnson's methods provide adjustments for positvely skewed data sets.

Barium

General Statistics			
Total Number of Observations	16	Number of Distinct Observations	13
		Number of Missing Observations	2
Minimum	125	Mean	162.6
Maximum	236	Median	156
SD	31.38	Std. Error of Mean	7.845
Coefficient of Variation	0.193	Skewness	1.002
Normal GOF Test			
Shapiro Wilk Test Statistic	0.905	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.887	Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.195	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.213	Data appear Normal at 5% Significance Level	
Data appear Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	176.3	95% Adjusted-CLT UCL (Chen-1995)	177.6
		95% Modified-t UCL (Johnson-1978)	176.6
Gamma GOF Test			
A-D Test Statistic	0.468	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.736	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.171	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.215	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			

Gamma Statistics			
k hat (MLE)	30.92	k star (bias corrected MLE)	25.16
Theta hat (MLE)	5.257	Theta star (bias corrected MLE)	6.46
nu hat (MLE)	989.4	nu star (bias corrected)	805.3
MLE Mean (bias corrected)	162.6	MLE Sd (bias corrected)	32.41
		Approximate Chi Square Value (0.05)	740.4
Adjusted Level of Significance	0.0335	Adjusted Chi Square Value	733.3
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	176.8	95% Adjusted Gamma UCL (use when n<50)	178.5
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.937	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.887	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.16	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.213	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	4.828	Mean of logged Data	5.075
Maximum of Logged Data	5.464	SD of logged Data	0.183
Assuming Lognormal Distribution			
95% H-UCL	177	90% Chebyshev (MVUE) UCL	184.9
95% Chebyshev (MVUE) UCL	195.1	97.5% Chebyshev (MVUE) UCL	209.2
99% Chebyshev (MVUE) UCL	236.9		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	175.5	95% Jackknife UCL	176.3
95% Standard Bootstrap UCL	175.3	95% Bootstrap-t UCL	179.1
95% Hall's Bootstrap UCL	180.2	95% Percentile Bootstrap UCL	175.4
95% BCA Bootstrap UCL	177.1		
90% Chebyshev(Mean, Sd) UCL	186.1	95% Chebyshev(Mean, Sd) UCL	196.8
97.5% Chebyshev(Mean, Sd) UCL	211.6	99% Chebyshev(Mean, Sd) UCL	240.6
Suggested UCL to Use			
95% Student's-t UCL	176.3		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
ChromiumVI_EST			
General Statistics			

ProUCL Output
Backwater Seep Sampling Area Soil (0-2 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Total Number of Observations	16	Number of Distinct Observations	14
		Number of Missing Observations	2
Minimum	0.254	Mean	0.29
Maximum	0.335	Median	0.284
SD	0.0223	Std. Error of Mean	0.00559
Coefficient of Variation	0.0771	Skewness	0.644
Normal GOF Test			
Shapiro Wilk Test Statistic	0.945	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.887	Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.172	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.213	Data appear Normal at 5% Significance Level	
Data appear Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	0.3	95% Adjusted-CLT UCL (Chen-1995)	0.3
		95% Modified-t UCL (Johnson-1978)	0.3
Gamma GOF Test			
A-D Test Statistic	0.334	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.736	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.168	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.214	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	183.7	k star (bias corrected MLE)	149.3
Theta hat (MLE)	0.00158	Theta star (bias corrected MLE)	0.00194
nu hat (MLE)	5878	nu star (bias corrected)	4777
MLE Mean (bias corrected)	0.29	MLE Sd (bias corrected)	0.0237
		Approximate Chi Square Value (0.05)	4618
Adjusted Level of Significance	0.0335	Adjusted Chi Square Value	4600
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	0.3	95% Adjusted Gamma UCL (use when n<50)	0.301
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.958	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.887	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.161	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.213	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	-1.369	Mean of logged Data	-1.241
Maximum of Logged Data	-1.095	SD of logged Data	0.0759
Assuming Lognormal Distribution			
95% H-UCL	N/A	90% Chebyshev (MVUE) UCL	0.306

95% Chebyshev (MVUE) UCL	0.314	97.5% Chebyshev (MVUE) UCL	0.324
99% Chebyshev (MVUE) UCL	0.345		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	0.299	95% Jackknife UCL	0.3
95% Standard Bootstrap UCL	0.299	95% Bootstrap-t UCL	0.301
95% Hall's Bootstrap UCL	0.302	95% Percentile Bootstrap UCL	0.299
95% BCA Bootstrap UCL	0.299		
90% Chebyshev(Mean, Sd) UCL	0.307	95% Chebyshev(Mean, Sd) UCL	0.314
97.5% Chebyshev(Mean, Sd) UCL	0.325	99% Chebyshev(Mean, Sd) UCL	0.345
Suggested UCL to Use			
95% Student's-t UCL	0.3		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Cobalt			
General Statistics			
Total Number of Observations	16	Number of Distinct Observations	11
		Number of Missing Observations	2
Minimum	6	Mean	6.6
Maximum	7.6	Median	6.6
SD	0.449	Std. Error of Mean	0.112
Coefficient of Variation	0.068	Skewness	0.466
Normal GOF Test			
Shapiro Wilk Test Statistic	0.94	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.887	Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.124	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.213	Data appear Normal at 5% Significance Level	
Data appear Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	6.797	95% Adjusted-CLT UCL (Chen-1995)	6.798
		95% Modified-t UCL (Johnson-1978)	6.799
Gamma GOF Test			
A-D Test Statistic	0.365	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.736	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.128	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.214	Detected data appear Gamma Distributed at 5% Significance Level	

Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	234	k star (bias corrected MLE)	190.2
Theta hat (MLE)	0.0282	Theta star (bias corrected MLE)	0.0347
nu hat (MLE)	7490	nu star (bias corrected)	6087
MLE Mean (bias corrected)	6.6	MLE Sd (bias corrected)	0.479
		Approximate Chi Square Value (0.05)	5906
Adjusted Level of Significance	0.0335	Adjusted Chi Square Value	5886
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	6.802	95% Adjusted Gamma UCL (use when n<50)	6.825
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.945	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.887	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.12	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.213	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	1.792	Mean of logged Data	1.885
Maximum of Logged Data	2.028	SD of logged Data	0.0673
Assuming Lognormal Distribution			
95% H-UCL	N/A	90% Chebyshev (MVUE) UCL	6.933
95% Chebyshev (MVUE) UCL	7.084	97.5% Chebyshev (MVUE) UCL	7.294
99% Chebyshev (MVUE) UCL	7.706		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	6.785	95% Jackknife UCL	6.797
95% Standard Bootstrap UCL	6.779	95% Bootstrap-t UCL	6.823
95% Hall's Bootstrap UCL	6.802	95% Percentile Bootstrap UCL	6.775
95% BCA Bootstrap UCL	6.8		
90% Chebyshev(Mean, Sd) UCL	6.937	95% Chebyshev(Mean, Sd) UCL	7.089
97.5% Chebyshev(Mean, Sd) UCL	7.301	99% Chebyshev(Mean, Sd) UCL	7.716
Suggested UCL to Use			
95% Student's-t UCL	6.797		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Copper			

General Statistics			
Total Number of Observations	16	Number of Distinct Observations	13
		Number of Missing Observations	2
Minimum	14.3	Mean	16.83
Maximum	22.7	Median	16.1
SD	2.278	Std. Error of Mean	0.57
Coefficient of Variation	0.135	Skewness	1.124
Normal GOF Test			
Shapiro Wilk Test Statistic	0.88	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.887	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.186	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.213	Data appear Normal at 5% Significance Level	
Data appear Approximate Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	17.82	95% Adjusted-CLT UCL (Chen-1995)	17.93
		95% Modified-t UCL (Johnson-1978)	17.85
Gamma GOF Test			
A-D Test Statistic	0.628	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.736	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.194	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.214	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	62.27	k star (bias corrected MLE)	50.64
Theta hat (MLE)	0.27	Theta star (bias corrected MLE)	0.332
nu hat (MLE)	1993	nu star (bias corrected)	1620
MLE Mean (bias corrected)	16.83	MLE Sd (bias corrected)	2.364
		Approximate Chi Square Value (0.05)	1528
Adjusted Level of Significance	0.0335	Adjusted Chi Square Value	1518
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	17.84	95% Adjusted Gamma UCL (use when n<50)	17.96
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.905	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.887	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.187	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.213	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	2.66	Mean of logged Data	2.815
Maximum of Logged Data	3.122	SD of logged Data	0.129

Assuming Lognormal Distribution			
95% H-UCL	17.85	90% Chebyshev (MVUE) UCL	18.45
95% Chebyshev (MVUE) UCL	19.19	97.5% Chebyshev (MVUE) UCL	20.22
99% Chebyshev (MVUE) UCL	22.23		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	17.76	95% Jackknife UCL	17.82
95% Standard Bootstrap UCL	17.74	95% Bootstrap-t UCL	18.07
95% Hall's Bootstrap UCL	18.14	95% Percentile Bootstrap UCL	17.81
95% BCA Bootstrap UCL	17.85		
90% Chebyshev(Mean, Sd) UCL	18.53	95% Chebyshev(Mean, Sd) UCL	19.31
97.5% Chebyshev(Mean, Sd) UCL	20.38	99% Chebyshev(Mean, Sd) UCL	22.49
Suggested UCL to Use			
95% Student's-t UCL	17.82		
When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test			
When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Vanadium			
General Statistics			
Total Number of Observations	16	Number of Distinct Observations	14
		Number of Missing Observations	2
Minimum	11.2	Mean	15.03
Maximum	17.2	Median	15.05
SD	1.635	Std. Error of Mean	0.409
Coefficient of Variation	0.109	Skewness	-0.764
Normal GOF Test			
Shapiro Wilk Test Statistic	0.945	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.887	Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.14	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.213	Data appear Normal at 5% Significance Level	
Data appear Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	15.75	95% Adjusted-CLT UCL (Chen-1995)	15.62
		95% Modified-t UCL (Johnson-1978)	15.73

Gamma GOF Test			
A-D Test Statistic	0.372	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.736	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.15	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.214	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	84.55	k star (bias corrected MLE)	68.74
Theta hat (MLE)	0.178	Theta star (bias corrected MLE)	0.219
nu hat (MLE)	2706	nu star (bias corrected)	2200
MLE Mean (bias corrected)	15.03	MLE Sd (bias corrected)	1.813
		Approximate Chi Square Value (0.05)	2092
Adjusted Level of Significance	0.0335	Adjusted Chi Square Value	2080
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	15.81	95% Adjusted Gamma UCL (use when n<50)	15.9
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.92	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.887	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.163	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.213	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	2.416	Mean of logged Data	2.704
Maximum of Logged Data	2.845	SD of logged Data	0.114
Assuming Lognormal Distribution			
95% H-UCL	15.84	90% Chebyshev (MVUE) UCL	16.33
95% Chebyshev (MVUE) UCL	16.91	97.5% Chebyshev (MVUE) UCL	17.73
99% Chebyshev (MVUE) UCL	19.32		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	15.7	95% Jackknife UCL	15.75
95% Standard Bootstrap UCL	15.68	95% Bootstrap-t UCL	15.69
95% Hall's Bootstrap UCL	15.64	95% Percentile Bootstrap UCL	15.67
95% BCA Bootstrap UCL	15.58		
90% Chebyshev(Mean, Sd) UCL	16.26	95% Chebyshev(Mean, Sd) UCL	16.81
97.5% Chebyshev(Mean, Sd) UCL	17.58	99% Chebyshev(Mean, Sd) UCL	19.1
Suggested UCL to Use			
95% Student's-t UCL	15.75		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Note: For highly negatively-skewed data, confidence limits (e.g., Chen, Johnson, Lognormal, and Gamma) may not be reliable. Chen's and Johnson's methods provide adjustments for positvely skewed data sets.

Zinc

General Statistics

Total Number of Observations	16	Number of Distinct Observations	16
		Number of Missing Observations	2
Minimum	39.2	Mean	46.44
Maximum	56.3	Median	46.2
SD	4.056	Std. Error of Mean	1.014
Coefficient of Variation	0.0873	Skewness	0.621

Normal GOF Test

Shapiro Wilk Test Statistic	0.971	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.887	Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.0926	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.213	Data appear Normal at 5% Significance Level

Data appear Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	48.22	95% Adjusted-CLT UCL (Chen-1995)	48.27
		95% Modified-t UCL (Johnson-1978)	48.24

Gamma GOF Test

A-D Test Statistic	0.17	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.736	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.0783	**Kolmogorov-Smirnov Gamma GOF Test**
5% K-S Critical Value	0.214	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	142.8	k star (bias corrected MLE)	116.1
Theta hat (MLE)	0.325	Theta star (bias corrected MLE)	0.4
nu hat (MLE)	4569	nu star (bias corrected)	3714
MLE Mean (bias corrected)	46.44	MLE Sd (bias corrected)	4.311
		Approximate Chi Square Value (0.05)	3573
Adjusted Level of Significance	0.0335	Adjusted Chi Square Value	3557

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	48.26	95% Adjusted Gamma UCL (use when n<50)	48.48

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.984	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.887	Data appear Lognormal at 5% Significance Level

Lilliefors Test Statistic	0.0843	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.213	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	3.669	Mean of logged Data	3.835
Maximum of Logged Data	4.031	SD of logged Data	0.0861
Assuming Lognormal Distribution			
95% H-UCL	N/A	90% Chebyshev (MVUE) UCL	49.44
95% Chebyshev (MVUE) UCL	50.8	97.5% Chebyshev (MVUE) UCL	52.69
99% Chebyshev (MVUE) UCL	56.4		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	48.11	95% Jackknife UCL	48.22
95% Standard Bootstrap UCL	48.09	95% Bootstrap-t UCL	48.41
95% Hall's Bootstrap UCL	48.57	95% Percentile Bootstrap UCL	48.09
95% BCA Bootstrap UCL	48.16		
90% Chebyshev(Mean, Sd) UCL	49.48	95% Chebyshev(Mean, Sd) UCL	50.86
97.5% Chebyshev(Mean, Sd) UCL	52.77	99% Chebyshev(Mean, Sd) UCL	56.53
Suggested UCL to Use			
95% Student's-t UCL	48.22		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Selenium			
General Statistics			
Total Number of Observations	16	Number of Distinct Observations	9
		Number of Missing Observations	2
Number of Detects	1	Number of Non-Detects	15
Number of Distinct Detects	1	Number of Distinct Non-Detects	8
Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set!			
It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).			
The data set for variable Selenium was not processed!			
Naphthalene			
General Statistics			
Total Number of Observations	16	Number of Distinct Observations	11

		Number of Missing Observations	2
Number of Detects	6	Number of Non-Detects	10
Number of Distinct Detects	5	Number of Distinct Non-Detects	6
Minimum Detect	0.04	Minimum Non-Detect	0.0092
Maximum Detect	0.81	Maximum Non-Detect	0.013
Variance Detects	0.0906	Percent Non-Detects	62.5%
Mean Detects	0.28	SD Detects	0.301
Median Detects	0.214	CV Detects	1.075
Skewness Detects	1.245	Kurtosis Detects	1.219
Mean of Logged Detects	-1.887	SD of Logged Detects	1.291
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.821	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.788	Detected Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.26	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.325	Detected Data appear Normal at 5% Significance Level	
Detected Data appear Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.111	KM Standard Error of Mean	0.0584
KM SD	0.213	95% KM (BCA) UCL	0.209
95% KM (t) UCL	0.213	95% KM (Percentile Bootstrap) UCL	0.207
95% KM (z) UCL	0.207	95% KM Bootstrap t UCL	0.283
90% KM Chebyshev UCL	0.286	95% KM Chebyshev UCL	0.365
97.5% KM Chebyshev UCL	0.476	99% KM Chebyshev UCL	0.692
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	0.497	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.716	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.275	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.341	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.946	k star (bias corrected MLE)	0.584
Theta hat (MLE)	0.296	Theta star (bias corrected MLE)	0.479
nu hat (MLE)	11.35	nu star (bias corrected)	7.01
Mean (detects)	0.28		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	0.111
Maximum	0.81	Median	0.01
SD	0.22	CV	1.978
k hat (MLE)	0.463	k star (bias corrected MLE)	0.418
Theta hat (MLE)	0.24	Theta star (bias corrected MLE)	0.266

nu hat (MLE)	14.8	nu star (bias corrected)	13.36
Adjusted Level of Significance (β)	0.0335		
Approximate Chi Square Value (13.36, α)	6.136	Adjusted Chi Square Value (13.36, β)	5.587
95% Gamma Approximate UCL (use when n>=50)	0.242	95% Gamma Adjusted UCL (use when n<50)	0.266
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.111	SD (KM)	0.213
Variance (KM)	0.0455	SE of Mean (KM)	0.0584
k hat (KM)	0.27	k star (KM)	0.261
nu hat (KM)	8.628	nu star (KM)	8.344
theta hat (KM)	0.411	theta star (KM)	0.425
80% gamma percentile (KM)	0.163	90% gamma percentile (KM)	0.331
95% gamma percentile (KM)	0.529	99% gamma percentile (KM)	1.053
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (8.34, α)	2.936	Adjusted Chi Square Value (8.34, β)	2.582
95% Gamma Approximate KM-UCL (use when n>=50)	0.315	95% Gamma Adjusted KM-UCL (use when n<50)	0.358
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.86	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.788	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.249	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.325	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.107	Mean in Log Scale	-4.538
SD in Original Scale	0.222	SD in Log Scale	2.359
95% t UCL (assumes normality of ROS data)	0.204	95% Percentile Bootstrap UCL	0.208
95% BCA Bootstrap UCL	0.235	95% Bootstrap t UCL	0.295
95% H-UCL (Log ROS)	4.003		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-3.638	KM Geo Mean	0.0263
KM SD (logged)	1.536	95% Critical H Value (KM-Log)	3.609
KM Standard Error of Mean (logged)	0.421	95% H-UCL (KM -Log)	0.358
KM SD (logged)	1.536	95% Critical H Value (KM-Log)	3.609
KM Standard Error of Mean (logged)	0.421		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.108	Mean in Log Scale	-3.954
SD in Original Scale	0.221	SD in Log Scale	1.816
95% t UCL (Assumes normality)	0.206	95% H-Stat UCL	0.689
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Normal Distributed at 5% Significance Level			
Suggested UCL to Use			

95% KM (t) UCL	0.213		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			

ProUCL Output
Backwater Seep Sampling Area (Surface Water)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

UCL Statistics for Data Sets with Non-Detects	
User Selected Options	
Date/Time of Computation	ProUCL 5.11/28/2019 8:28:14 PM
From File	20190128_BkwtrSeep_ProUCL_input_a.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Bis2EthylhexylPhthalate

General Statistics

Total Number of Observations	10	Number of Distinct Observations	7
		Number of Missing Observations	20
Number of Detects	3	Number of Non-Detects	7
Number of Distinct Detects	3	Number of Distinct Non-Detects	4
Minimum Detect	1.2	Minimum Non-Detect	0.72
Maximum Detect	8.6	Maximum Non-Detect	4.3
Variance Detects	13.72	Percent Non-Detects	70%
Mean Detects	4.8	SD Detects	3.704
Median Detects	4.6	CV Detects	0.772
Skewness Detects	0.242	Kurtosis Detects	N/A
Mean of Logged Detects	1.287	SD of Logged Detects	1.006

Warning: Data set has only 3 Detected Values.
This is not enough to compute meaningful or reliable statistics and estimates.

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.998	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.767	Detected Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.188	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.425	Detected Data appear Normal at 5% Significance Level

Detected Data appear Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	1.96	KM Standard Error of Mean	0.966
KM SD	2.492	95% KM (BCA) UCL	N/A
95% KM (t) UCL	3.73	95% KM (Percentile Bootstrap) UCL	N/A
95% KM (z) UCL	3.548	95% KM Bootstrap t UCL	N/A
90% KM Chebyshev UCL	4.857	95% KM Chebyshev UCL	6.169
97.5% KM Chebyshev UCL	7.99	99% KM Chebyshev UCL	11.57

Gamma GOF Tests on Detected Observations Only
Not Enough Data to Perform GOF Test

Gamma Statistics on Detected Data Only

k hat (MLE)	1.924	k star (bias corrected MLE)	N/A
Theta hat (MLE)	2.495	Theta star (bias corrected MLE)	N/A
nu hat (MLE)	11.54	nu star (bias corrected)	N/A

Mean (detects)	4.8		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	1.447
Maximum	8.6	Median	0.01
SD	2.899	CV	2.003
k hat (MLE)	0.225	k star (bias corrected MLE)	0.224
Theta hat (MLE)	6.425	Theta star (bias corrected MLE)	6.451
nu hat (MLE)	4.504	nu star (bias corrected)	4.486
Adjusted Level of Significance (β)	0.0267		
Approximate Chi Square Value (4.49, α)	0.923	Adjusted Chi Square Value (4.49, β)	0.679
95% Gamma Approximate UCL (use when n>=50)	7.036	95% Gamma Adjusted UCL (use when n<50)	N/A
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	1.96	SD (KM)	2.492
Variance (KM)	6.208	SE of Mean (KM)	0.966
k hat (KM)	0.619	k star (KM)	0.5
nu hat (KM)	12.38	nu star (KM)	9.997
theta hat (KM)	3.167	theta star (KM)	3.921
80% gamma percentile (KM)	3.219	90% gamma percentile (KM)	5.303
95% gamma percentile (KM)	7.53	99% gamma percentile (KM)	13.01
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (10.00, α)	3.94	Adjusted Chi Square Value (10.00, β)	3.306
95% Gamma Approximate KM-UCL (use when n>=50)	4.973	95% Gamma Adjusted KM-UCL (use when n<50)	5.927
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.958	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.767	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.261	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.425	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	1.555	Mean in Log Scale	-1.051
SD in Original Scale	2.841	SD in Log Scale	1.794
95% t UCL (assumes normality of ROS data)	3.202	95% Percentile Bootstrap UCL	3.047
95% BCA Bootstrap UCL	3.69	95% Bootstrap t UCL	12.18
95% H-UCL (Log ROS)	32.7		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	0.173	KM Geo Mean	1.189
KM SD (logged)	0.862	95% Critical H Value (KM-Log)	2.827
KM Standard Error of Mean (logged)	0.336	95% H-UCL (KM -Log)	3.881
KM SD (logged)	0.862	95% Critical H Value (KM-Log)	2.827

KM Standard Error of Mean (logged)	0.336		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	2.053	Mean in Log Scale	0.0351
SD in Original Scale	2.674	SD in Log Scale	1.213
95% t UCL (Assumes normality)	3.602	95% H-Stat UCL	9.093
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Normal Distributed at 5% Significance Level			
Suggested UCL to Use			
95% KM (t) UCL	3.73		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Fluoride			
General Statistics			
Total Number of Observations	30	Number of Distinct Observations	30
		Number of Missing Observations	0
Minimum	40.2	Mean	1080
Maximum	2640	Median	553.5
SD	1005	Std. Error of Mean	183.4
Coefficient of Variation	0.93	Skewness	0.571
Normal GOF Test			
Shapiro Wilk Test Statistic	0.773	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.927	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.267	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.159	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	1392	95% Adjusted-CLT UCL (Chen-1995)	1403
		95% Modified-t UCL (Johnson-1978)	1395
Gamma GOF Test			
A-D Test Statistic	1.57	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.775	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.18	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.165	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			

Gamma Statistics			
k hat (MLE)	1.018	k star (bias corrected MLE)	0.939
Theta hat (MLE)	1061	Theta star (bias corrected MLE)	1151
nu hat (MLE)	61.09	nu star (bias corrected)	56.31
MLE Mean (bias corrected)	1080	MLE Sd (bias corrected)	1115
		Approximate Chi Square Value (0.05)	40.06
Adjusted Level of Significance	0.041	Adjusted Chi Square Value	39.27
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	1519	95% Adjusted Gamma UCL (use when n<50)	1549
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.896	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.927	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.187	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.159	Data Not Lognormal at 5% Significance Level	
Data Not Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	3.694	Mean of logged Data	6.419
Maximum of Logged Data	7.879	SD of logged Data	1.18
Assuming Lognormal Distribution			
95% H-UCL	2231	90% Chebyshev (MVUE) UCL	2100
95% Chebyshev (MVUE) UCL	2514	97.5% Chebyshev (MVUE) UCL	3089
99% Chebyshev (MVUE) UCL	4217		
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution (0.05)			
Nonparametric Distribution Free UCLs			
95% CLT UCL	1382	95% Jackknife UCL	1392
95% Standard Bootstrap UCL	1376	95% Bootstrap-t UCL	1440
95% Hall's Bootstrap UCL	1372	95% Percentile Bootstrap UCL	1384
95% BCA Bootstrap UCL	1391		
90% Chebyshev(Mean, Sd) UCL	1631	95% Chebyshev(Mean, Sd) UCL	1880
97.5% Chebyshev(Mean, Sd) UCL	2226	99% Chebyshev(Mean, Sd) UCL	2906
Suggested UCL to Use			
95% Chebyshev (Mean, Sd) UCL	1880		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
BenzoBFluoranthene			
General Statistics			
Total Number of Observations	10	Number of Distinct Observations	7

		Number of Missing Observations	20
Number of Detects	2	Number of Non-Detects	8
Number of Distinct Detects	2	Number of Distinct Non-Detects	5
Minimum Detect	0.0056	Minimum Non-Detect	0.0042
Maximum Detect	0.081	Maximum Non-Detect	0.46
Variance Detects	0.00284	Percent Non-Detects	80%
Mean Detects	0.0433	SD Detects	0.0533
Median Detects	0.0433	CV Detects	1.231
Skewness Detects	N/A	Kurtosis Detects	N/A
Mean of Logged Detects	-3.849	SD of Logged Detects	1.889
Warning: Data set has only 2 Detected Values.			
This is not enough to compute meaningful or reliable statistics and estimates.			
Normal GOF Test on Detects Only			
Not Enough Data to Perform GOF Test			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.0238	KM Standard Error of Mean	0.0234
KM SD	0.0331	95% KM (BCA) UCL	N/A
95% KM (t) UCL	0.0666	95% KM (Percentile Bootstrap) UCL	N/A
95% KM (z) UCL	0.0622	95% KM Bootstrap t UCL	N/A
90% KM Chebyshev UCL	0.0939	95% KM Chebyshev UCL	0.126
97.5% KM Chebyshev UCL	0.17	99% KM Chebyshev UCL	0.256
Gamma GOF Tests on Detected Observations Only			
Not Enough Data to Perform GOF Test			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.832	k star (bias corrected MLE)	N/A
Theta hat (MLE)	0.052	Theta star (bias corrected MLE)	N/A
nu hat (MLE)	3.329	nu star (bias corrected)	N/A
Mean (detects)	0.0433		
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.0238	SD (KM)	0.0331
Variance (KM)	0.00109	SE of Mean (KM)	0.0234
k hat (KM)	0.516	k star (KM)	0.428
nu hat (KM)	10.32	nu star (KM)	8.559
theta hat (KM)	0.046	theta star (KM)	0.0555
80% gamma percentile (KM)	0.0386	90% gamma percentile (KM)	0.0663
95% gamma percentile (KM)	0.0964	99% gamma percentile (KM)	0.172
Gamma Kaplan-Meier (KM) Statistics			
		Adjusted Level of Significance (β)	0.0267
Approximate Chi Square Value (8.56, α)	3.063	Adjusted Chi Square Value (8.56, β)	2.52
95% Gamma Approximate KM-UCL (use when n>=50)	0.0664	95% Gamma Adjusted KM-UCL (use when n<50)	0.0807
Lognormal GOF Test on Detected Observations Only			

Not Enough Data to Perform GOF Test			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.0113	Mean in Log Scale	-7.305
SD in Original Scale	0.0252	SD in Log Scale	3.02
95% t UCL (assumes normality of ROS data)	0.0259	95% Percentile Bootstrap UCL	0.0261
95% BCA Bootstrap UCL	0.0355	95% Bootstrap t UCL	0.121
95% H-UCL (Log ROS)	185.1		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-4.661	KM Geo Mean	0.00946
KM SD (logged)	1.245	95% Critical H Value (KM-Log)	3.629
KM Standard Error of Mean (logged)	0.881	95% H-UCL (KM -Log)	0.0927
KM SD (logged)	1.245	95% Critical H Value (KM-Log)	3.629
KM Standard Error of Mean (logged)	0.881		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.144	Mean in Log Scale	-2.898
SD in Original Scale	0.106	SD in Log Scale	2.065
95% t UCL (Assumes normality)	0.205	95% H-Stat UCL	21.29
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution at 5% Significance Level			
Suggested UCL to Use			
975% KM (Chebyshev) UCL	0.17		
Warning: Recommended UCL exceeds the maximum observation			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
BenzoAPyrene			
General Statistics			
Total Number of Observations	10	Number of Distinct Observations	4
		Number of Missing Observations	20
Number of Detects	1	Number of Non-Detects	9
Number of Distinct Detects	1	Number of Distinct Non-Detects	3
Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set!			
It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).			
The data set for variable BenzoAPyrene was not processed!			
DibenzAHAnthracene			

General Statistics			
Total Number of Observations	10	Number of Distinct Observations	6
		Number of Missing Observations	20
Number of Detects	1	Number of Non-Detects	9
Number of Distinct Detects	1	Number of Distinct Non-Detects	5

Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set!

It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable DibenzAHAnthracene was not processed!

BenzoAAnthracene

General Statistics			
Total Number of Observations	10	Number of Distinct Observations	7
		Number of Missing Observations	20
Number of Detects	2	Number of Non-Detects	8
Number of Distinct Detects	2	Number of Distinct Non-Detects	5
Minimum Detect	0.0048	Minimum Non-Detect	0.0028
Maximum Detect	0.043	Maximum Non-Detect	0.57
Variance Detects	7.2962E-4	Percent Non-Detects	80%
Mean Detects	0.0239	SD Detects	0.027
Median Detects	0.0239	CV Detects	1.13
Skewness Detects	N/A	Kurtosis Detects	N/A
Mean of Logged Detects	-4.243	SD of Logged Detects	1.55

Warning: Data set has only 2 Detected Values.

This is not enough to compute meaningful or reliable statistics and estimates.

Normal GOF Test on Detects Only

Not Enough Data to Perform GOF Test

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.0134	KM Standard Error of Mean	0.0121
KM SD	0.0171	95% KM (BCA) UCL	N/A
95% KM (t) UCL	0.0356	95% KM (Percentile Bootstrap) UCL	N/A
95% KM (z) UCL	0.0333	95% KM Bootstrap t UCL	N/A
90% KM Chebyshev UCL	0.0497	95% KM Chebyshev UCL	0.0662
97.5% KM Chebyshev UCL	0.089	99% KM Chebyshev UCL	0.134

Gamma GOF Tests on Detected Observations Only

Not Enough Data to Perform GOF Test

Gamma Statistics on Detected Data Only			
k hat (MLE)	1.12	k star (bias corrected MLE)	N/A
Theta hat (MLE)	0.0213	Theta star (bias corrected MLE)	N/A
nu hat (MLE)	4.479	nu star (bias corrected)	N/A

Mean (detects)	0.0239		
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.0134	SD (KM)	0.0171
Variance (KM)	2.9371E-4	SE of Mean (KM)	0.0121
k hat (KM)	0.607	k star (KM)	0.491
nu hat (KM)	12.14	nu star (KM)	9.829
theta hat (KM)	0.022	theta star (KM)	0.0272
80% gamma percentile (KM)	0.0219	90% gamma percentile (KM)	0.0362
95% gamma percentile (KM)	0.0516	99% gamma percentile (KM)	0.0894
Gamma Kaplan-Meier (KM) Statistics			
		Adjusted Level of Significance (β)	0.0267
Approximate Chi Square Value (9.83, α)	3.835	Adjusted Chi Square Value (9.83, β)	3.211
95% Gamma Approximate KM-UCL (use when n>=50)	0.0342	95% Gamma Adjusted KM-UCL (use when n<50)	0.0409
Lognormal GOF Test on Detected Observations Only			
Not Enough Data to Perform GOF Test			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.00675	Mean in Log Scale	-7.079
SD in Original Scale	0.0134	SD in Log Scale	2.478
95% t UCL (assumes normality of ROS data)	0.0145	95% Percentile Bootstrap UCL	0.0144
95% BCA Bootstrap UCL	0.0185	95% Bootstrap t UCL	0.0453
95% H-UCL (Log ROS)	4.126		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-5.06	KM Geo Mean	0.00634
KM SD (logged)	1.127	95% Critical H Value (KM-Log)	3.369
KM Standard Error of Mean (logged)	0.797	95% H-UCL (KM -Log)	0.0424
KM SD (logged)	1.127	95% Critical H Value (KM-Log)	3.369
KM Standard Error of Mean (logged)	0.797		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.173	Mean in Log Scale	-2.925
SD in Original Scale	0.138	SD in Log Scale	2.322
95% t UCL (Assumes normality)	0.253	95% H-Stat UCL	95.19
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution at 5% Significance Level			
Suggested UCL to Use			
975% KM (Chebyshev) UCL	0.089		
Warning: Recommended UCL exceeds the maximum observation			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

CyanideFREE

General Statistics

Total Number of Observations	24	Number of Distinct Observations	22
		Number of Missing Observations	6
Number of Detects	22	Number of Non-Detects	2
Number of Distinct Detects	22	Number of Distinct Non-Detects	1
Minimum Detect	1.5	Minimum Non-Detect	1.5
Maximum Detect	140	Maximum Non-Detect	1.5
Variance Detects	1681	Percent Non-Detects	8.333%
Mean Detects	33.43	SD Detects	40.99
Median Detects	17.8	CV Detects	1.226
Skewness Detects	1.777	Kurtosis Detects	2.563
Mean of Logged Detects	2.763	SD of Logged Detects	1.329

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.745	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.911	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.218	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.184	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	30.77	KM Standard Error of Mean	8.221
KM SD	39.35	95% KM (BCA) UCL	44.41
95% KM (t) UCL	44.86	95% KM (Percentile Bootstrap) UCL	44.82
95% KM (z) UCL	44.29	95% KM Bootstrap t UCL	50.72
90% KM Chebyshev UCL	55.43	95% KM Chebyshev UCL	66.61
97.5% KM Chebyshev UCL	82.11	99% KM Chebyshev UCL	112.6

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.479	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.781	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.145	**Kolmogorov-Smirnov GOF**
5% K-S Critical Value	0.192	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	0.795	k star (bias corrected MLE)	0.717
Theta hat (MLE)	42.03	Theta star (bias corrected MLE)	46.61
nu hat (MLE)	35	nu star (bias corrected)	31.56
Mean (detects)	33.43		

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)

For such situations, GROS method may yield incorrect values of UCLs and BTVs

This is especially true when the sample size is small.

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	30.65
Maximum	140	Median	13.3
SD	40.29	CV	1.315
k hat (MLE)	0.499	k star (bias corrected MLE)	0.464
Theta hat (MLE)	61.43	Theta star (bias corrected MLE)	66.01
nu hat (MLE)	23.95	nu star (bias corrected)	22.29
Adjusted Level of Significance (β)	0.0392		
Approximate Chi Square Value (22.29, α)	12.55	Adjusted Chi Square Value (22.29, β)	12.04
95% Gamma Approximate UCL (use when n>=50)	54.41	95% Gamma Adjusted UCL (use when n<50)	56.73
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	30.77	SD (KM)	39.35
Variance (KM)	1548	SE of Mean (KM)	8.221
k hat (KM)	0.612	k star (KM)	0.563
nu hat (KM)	29.35	nu star (KM)	27.02
theta hat (KM)	50.32	theta star (KM)	54.67
80% gamma percentile (KM)	50.7	90% gamma percentile (KM)	81.17
95% gamma percentile (KM)	113.3	99% gamma percentile (KM)	191.4
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (27.02, α)	16.16	Adjusted Chi Square Value (27.02, β)	15.57
95% Gamma Approximate KM-UCL (use when n>=50)	51.43	95% Gamma Adjusted KM-UCL (use when n<50)	53.38
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.962	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.911	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.116	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.184	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	30.7	Mean in Log Scale	2.5
SD in Original Scale	40.25	SD in Log Scale	1.554
95% t UCL (assumes normality of ROS data)	44.78	95% Percentile Bootstrap UCL	44.94
95% BCA Bootstrap UCL	47.86	95% Bootstrap t UCL	53.17
95% H-UCL (Log ROS)	121.1		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	2.566	KM Geo Mean	13.02
KM SD (logged)	1.404	95% Critical H Value (KM-Log)	3.125
KM Standard Error of Mean (logged)	0.293	95% H-UCL (KM -Log)	87.09
KM SD (logged)	1.404	95% Critical H Value (KM-Log)	3.125
KM Standard Error of Mean (logged)	0.293		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	30.71	Mean in Log Scale	2.509
SD in Original Scale	40.24	SD in Log Scale	1.535
95% t UCL (Assumes normality)	44.79	95% H-Stat UCL	115.8

DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Gamma Distributed at 5% Significance Level			
Suggested UCL to Use			
Adjusted KM-UCL (use when k<=1 and 15 < n < 50 but k<=1)	53.38		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Iron			
General Statistics			
Total Number of Observations	30	Number of Distinct Observations	29
Number of Detects	29	Number of Non-Detects	1
Number of Distinct Detects	28	Number of Distinct Non-Detects	1
Minimum Detect	62.4	Minimum Non-Detect	45.7
Maximum Detect	1620	Maximum Non-Detect	45.7
Variance Detects	137986	Percent Non-Detects	3.333%
Mean Detects	536.3	SD Detects	371.5
Median Detects	443	CV Detects	0.693
Skewness Detects	1.064	Kurtosis Detects	0.951
Mean of Logged Detects	6.036	SD of Logged Detects	0.757
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.904	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.926	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.157	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.161	Detected Data appear Normal at 5% Significance Level	
Detected Data appear Approximate Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	519.9	KM Standard Error of Mean	68.66
KM SD	369.5	95% KM (BCA) UCL	634.4
95% KM (t) UCL	636.6	95% KM (Percentile Bootstrap) UCL	629.9
95% KM (z) UCL	632.8	95% KM Bootstrap t UCL	653.8
90% KM Chebyshev UCL	725.9	95% KM Chebyshev UCL	819.2
97.5% KM Chebyshev UCL	948.7	99% KM Chebyshev UCL	1203
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	0.335	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.757	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.11	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.165	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			

k hat (MLE)	2.161	k star (bias corrected MLE)	1.961
Theta hat (MLE)	248.1	Theta star (bias corrected MLE)	273.5
nu hat (MLE)	125.4	nu star (bias corrected)	113.7
Mean (detects)	536.3		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	518.4
Maximum	1620	Median	405.5
SD	377.9	CV	0.729
k hat (MLE)	1.012	k star (bias corrected MLE)	0.933
Theta hat (MLE)	512.3	Theta star (bias corrected MLE)	555.6
nu hat (MLE)	60.72	nu star (bias corrected)	55.98
Adjusted Level of Significance (β)	0.041		
Approximate Chi Square Value (55.98, α)	39.78	Adjusted Chi Square Value (55.98, β)	38.99
95% Gamma Approximate UCL (use when n>=50)	729.4	95% Gamma Adjusted UCL (use when n<50)	744.1
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	519.9	SD (KM)	369.5
Variance (KM)	136541	SE of Mean (KM)	68.66
k hat (KM)	1.98	k star (KM)	1.804
nu hat (KM)	118.8	nu star (KM)	108.2
theta hat (KM)	262.6	theta star (KM)	288.2
80% gamma percentile (KM)	787.8	90% gamma percentile (KM)	1036
95% gamma percentile (KM)	1275	99% gamma percentile (KM)	1807
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (108.23, α)	85.22	Adjusted Chi Square Value (108.23, β)	84.05
95% Gamma Approximate KM-UCL (use when n>=50)	660.3	95% Gamma Adjusted KM-UCL (use when n<50)	669.5
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.972	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.926	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.106	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.161	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	520.5	Mean in Log Scale	5.973
SD in Original Scale	375.1	SD in Log Scale	0.819
95% t UCL (assumes normality of ROS data)	636.8	95% Percentile Bootstrap UCL	637.5
95% BCA Bootstrap UCL	646.7	95% Bootstrap t UCL	659.1
95% H-UCL (Log ROS)	775		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	5.962	KM Geo Mean	388.4

KM SD (logged)	0.832	95% Critical H Value (KM-Log)	2.276
KM Standard Error of Mean (logged)	0.155	95% H-UCL (KM -Log)	780.4
KM SD (logged)	0.832	95% Critical H Value (KM-Log)	2.276
KM Standard Error of Mean (logged)	0.155		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	519.1	Mean in Log Scale	5.939
SD in Original Scale	376.8	SD in Log Scale	0.913
95% t UCL (Assumes normality)	636	95% H-Stat UCL	861.2

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Approximate Normal Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (t) UCL	636.6		

When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test

When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Manganese

General Statistics

Total Number of Observations	30	Number of Distinct Observations	30
Number of Detects	29	Number of Non-Detects	1
Number of Distinct Detects	29	Number of Distinct Non-Detects	1
Minimum Detect	8.7	Minimum Non-Detect	2.5
Maximum Detect	405	Maximum Non-Detect	2.5
Variance Detects	9537	Percent Non-Detects	3.333%
Mean Detects	68.3	SD Detects	97.66
Median Detects	31.1	CV Detects	1.43
Skewness Detects	2.76	Kurtosis Detects	7.193
Mean of Logged Detects	3.662	SD of Logged Detects	0.981

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.576	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.926	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.325	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.161	Detected Data Not Normal at 5% Significance Level	

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	66.11	KM Standard Error of Mean	17.67
KM SD	95.08	95% KM (BCA) UCL	101.3

95% KM (t) UCL	96.13	95% KM (Percentile Bootstrap) UCL	96.22
95% KM (z) UCL	95.17	95% KM Bootstrap t UCL	130.8
90% KM Chebyshev UCL	119.1	95% KM Chebyshev UCL	143.1
97.5% KM Chebyshev UCL	176.4	99% KM Chebyshev UCL	241.9
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	1.681	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.774	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.189	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.167	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	1.024	k star (bias corrected MLE)	0.941
Theta hat (MLE)	66.69	Theta star (bias corrected MLE)	72.57
nu hat (MLE)	59.4	nu star (bias corrected)	54.59
Mean (detects)	68.3		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	66.03
Maximum	405	Median	31.05
SD	96.77	CV	1.466
k hat (MLE)	0.745	k star (bias corrected MLE)	0.693
Theta hat (MLE)	88.57	Theta star (bias corrected MLE)	95.26
nu hat (MLE)	44.73	nu star (bias corrected)	41.59
Adjusted Level of Significance (β)	0.041		
Approximate Chi Square Value (41.59, α)	27.81	Adjusted Chi Square Value (41.59, β)	27.16
95% Gamma Approximate UCL (use when n>=50)	98.75	95% Gamma Adjusted UCL (use when n<50)	101.1
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	66.11	SD (KM)	95.08
Variance (KM)	9041	SE of Mean (KM)	17.67
k hat (KM)	0.483	k star (KM)	0.457
nu hat (KM)	29	nu star (KM)	27.44
theta hat (KM)	136.8	theta star (KM)	144.6
80% gamma percentile (KM)	108	90% gamma percentile (KM)	182.1
95% gamma percentile (KM)	262.1	99% gamma percentile (KM)	460.6
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (27.44, α)	16.49	Adjusted Chi Square Value (27.44, β)	16
95% Gamma Approximate KM-UCL (use when n>=50)	110	95% Gamma Adjusted KM-UCL (use when n<50)	113.4
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.938	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.926	Detected Data appear Lognormal at 5% Significance Level	

Lilliefors Test Statistic	0.108	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.161	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	66.14	Mean in Log Scale	3.581
SD in Original Scale	96.69	SD in Log Scale	1.061
95% t UCL (assumes normality of ROS data)	96.14	95% Percentile Bootstrap UCL	97.46
95% BCA Bootstrap UCL	108.8	95% Bootstrap t UCL	128.6
95% H-UCL (Log ROS)	104.3		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	3.57	KM Geo Mean	35.53
KM SD (logged)	1.068	95% Critical H Value (KM-Log)	2.564
KM Standard Error of Mean (logged)	0.198	95% H-UCL (KM -Log)	104.5
KM SD (logged)	1.068	95% Critical H Value (KM-Log)	2.564
KM Standard Error of Mean (logged)	0.198		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	66.07	Mean in Log Scale	3.547
SD in Original Scale	96.74	SD in Log Scale	1.15
95% t UCL (Assumes normality)	96.08	95% H-Stat UCL	119
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Lognormal Distributed at 5% Significance Level			
Suggested UCL to Use			
KM H-UCL	104.5		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Arsenic			
General Statistics			
Total Number of Observations	30	Number of Distinct Observations	6
Number of Detects	4	Number of Non-Detects	26
Number of Distinct Detects	4	Number of Distinct Non-Detects	2
Minimum Detect	0.66	Minimum Non-Detect	0.64
Maximum Detect	0.99	Maximum Non-Detect	0.77
Variance Detects	0.0235	Percent Non-Detects	86.67%
Mean Detects	0.845	SD Detects	0.153
Median Detects	0.865	CV Detects	0.181
Skewness Detects	-0.444	Kurtosis Detects	-2.92
Mean of Logged Detects	-0.181	SD of Logged Detects	0.188

Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.924	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.748	Detected Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.253	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.375	Detected Data appear Normal at 5% Significance Level	
Detected Data appear Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.668	KM Standard Error of Mean	0.0179
KM SD	0.0848	95% KM (BCA) UCL	N/A
95% KM (t) UCL	0.698	95% KM (Percentile Bootstrap) UCL	N/A
95% KM (z) UCL	0.697	95% KM Bootstrap t UCL	N/A
90% KM Chebyshev UCL	0.721	95% KM Chebyshev UCL	0.746
97.5% KM Chebyshev UCL	0.78	99% KM Chebyshev UCL	0.846
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	0.33	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.656	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.288	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.394	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	38.89	k star (bias corrected MLE)	9.889
Theta hat (MLE)	0.0217	Theta star (bias corrected MLE)	0.0854
nu hat (MLE)	311.1	nu star (bias corrected)	79.12
Mean (detects)	0.845		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	0.295
Maximum	0.99	Median	0.237
SD	0.287	CV	0.972
k hat (MLE)	0.707	k star (bias corrected MLE)	0.658
Theta hat (MLE)	0.417	Theta star (bias corrected MLE)	0.448
nu hat (MLE)	42.41	nu star (bias corrected)	39.51
Adjusted Level of Significance (β)	0.041		
Approximate Chi Square Value (39.51, α)	26.11	Adjusted Chi Square Value (39.51, β)	25.48
95% Gamma Approximate UCL (use when n>=50)	0.447	95% Gamma Adjusted UCL (use when n<50)	N/A
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.668	SD (KM)	0.0848
Variance (KM)	0.00719	SE of Mean (KM)	0.0179
k hat (KM)	62.02	k star (KM)	55.84
nu hat (KM)	3721	nu star (KM)	3351
theta hat (KM)	0.0108	theta star (KM)	0.012

80% gamma percentile (KM)	0.742	90% gamma percentile (KM)	0.785
95% gamma percentile (KM)	0.821	99% gamma percentile (KM)	0.893
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (N/A, α)	3217	Adjusted Chi Square Value (N/A, β)	3210
95% Gamma Approximate KM-UCL (use when n>=50)	0.696	95% Gamma Adjusted KM-UCL (use when n<50)	0.697
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.92	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.748	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.256	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.375	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.421	Mean in Log Scale	-0.973
SD in Original Scale	0.211	SD in Log Scale	0.468
95% t UCL (assumes normality of ROS data)	0.487	95% Percentile Bootstrap UCL	0.484
95% BCA Bootstrap UCL	0.496	95% Bootstrap t UCL	0.499
95% H-UCL (Log ROS)	0.499		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-0.41	KM Geo Mean	0.663
KM SD (logged)	0.108	95% Critical H Value (KM-Log)	1.712
KM Standard Error of Mean (logged)	0.0227	95% H-UCL (KM -Log)	0.691
KM SD (logged)	0.108	95% Critical H Value (KM-Log)	1.712
KM Standard Error of Mean (logged)	0.0227		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.414	Mean in Log Scale	-0.944
SD in Original Scale	0.182	SD in Log Scale	0.322
95% t UCL (Assumes normality)	0.47	95% H-Stat UCL	0.457
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Normal Distributed at 5% Significance Level			
Suggested UCL to Use			
95% KM (t) UCL	0.698		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Cobalt			
General Statistics			
Total Number of Observations	30	Number of Distinct Observations	4

Number of Detects	7	Number of Non-Detects	23
Number of Distinct Detects	4	Number of Distinct Non-Detects	1
Minimum Detect	1.3	Minimum Non-Detect	1.3
Maximum Detect	1.7	Maximum Non-Detect	1.3
Variance Detects	0.0357	Percent Non-Detects	76.67%
Mean Detects	1.471	SD Detects	0.189
Median Detects	1.4	CV Detects	0.128
Skewness Detects	0.364	Kurtosis Detects	-2.345
Mean of Logged Detects	0.379	SD of Logged Detects	0.127
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.794	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.803	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.246	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.304	Detected Data appear Normal at 5% Significance Level	
Detected Data appear Approximate Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	1.34	KM Standard Error of Mean	0.022
KM SD	0.111	95% KM (BCA) UCL	N/A
95% KM (t) UCL	1.377	95% KM (Percentile Bootstrap) UCL	N/A
95% KM (z) UCL	1.376	95% KM Bootstrap t UCL	N/A
90% KM Chebyshev UCL	1.406	95% KM Chebyshev UCL	1.436
97.5% KM Chebyshev UCL	1.477	99% KM Chebyshev UCL	1.558
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	0.728	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.708	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.267	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.311	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data follow Appr. Gamma Distribution at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	71.87	k star (bias corrected MLE)	41.16
Theta hat (MLE)	0.0205	Theta star (bias corrected MLE)	0.0357
nu hat (MLE)	1006	nu star (bias corrected)	576.3
Mean (detects)	1.471		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.181	Mean	0.925
Maximum	1.7	Median	0.904
SD	0.399	CV	0.432
k hat (MLE)	4.663	k star (bias corrected MLE)	4.219
Theta hat (MLE)	0.198	Theta star (bias corrected MLE)	0.219
nu hat (MLE)	279.8	nu star (bias corrected)	253.1

Adjusted Level of Significance (β)	0.041		
Approximate Chi Square Value (253.13, α)	217.3	Adjusted Chi Square Value (253.13, β)	215.4
95% Gamma Approximate UCL (use when n>=50)	1.078	95% Gamma Adjusted UCL (use when n<50)	1.087
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	1.34	SD (KM)	0.111
Variance (KM)	0.0124	SE of Mean (KM)	0.022
k hat (KM)	144.8	k star (KM)	130.3
nu hat (KM)	8688	nu star (KM)	7821
theta hat (KM)	0.00925	theta star (KM)	0.0103
80% gamma percentile (KM)	1.438	90% gamma percentile (KM)	1.492
95% gamma percentile (KM)	1.539	99% gamma percentile (KM)	1.628
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (N/A, α)	7616	Adjusted Chi Square Value (N/A, β)	7605
95% Gamma Approximate KM-UCL (use when n>=50)	1.376	95% Gamma Adjusted KM-UCL (use when n<50)	1.378
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.795	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.803	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.25	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.304	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Approximate Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	1.026	Mean in Log Scale	-0.0168
SD in Original Scale	0.309	SD in Log Scale	0.296
95% t UCL (assumes normality of ROS data)	1.122	95% Percentile Bootstrap UCL	1.122
95% BCA Bootstrap UCL	1.124	95% Bootstrap t UCL	1.136
95% H-UCL (Log ROS)	1.135		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	0.29	KM Geo Mean	1.336
KM SD (logged)	0.0753	95% Critical H Value (KM-Log)	N/A
KM Standard Error of Mean (logged)	0.0149	95% H-UCL (KM -Log)	N/A
KM SD (logged)	0.0753	95% Critical H Value (KM-Log)	N/A
KM Standard Error of Mean (logged)	0.0149		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.842	Mean in Log Scale	-0.242
SD in Original Scale	0.364	SD in Log Scale	0.353
95% t UCL (Assumes normality)	0.954	95% H-Stat UCL	0.943
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Approximate Normal Distributed at 5% Significance Level			
Suggested UCL to Use			
95% KM (t) UCL	1.377		

When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test
When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

ProUCL Output
Backwater Seep Sampling Area (Surface Water)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

UCL Statistics for Data Sets with Non-Detects	
User Selected Options	
Date/Time of Computation	ProUCL 5.12/8/2019 1:08:56 PM
From File	20190207_CYANIDE_PROUCL_INPUT_RERUNS_c.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Cyanide

General Statistics			
Total Number of Observations	30	Number of Distinct Observations	29
Number of Detects	28	Number of Non-Detects	2
Number of Distinct Detects	28	Number of Distinct Non-Detects	1
Minimum Detect	7.7	Minimum Non-Detect	2
Maximum Detect	378	Maximum Non-Detect	2
Variance Detects	15503	Percent Non-Detects	6.667%
Mean Detects	130.6	SD Detects	124.5
Median Detects	75.6	CV Detects	0.953
Skewness Detects	0.766	Kurtosis Detects	-0.869
Mean of Logged Detects	4.271	SD of Logged Detects	1.228

Normal GOF Test on Detects Only		
Shapiro Wilk Test Statistic	0.837	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.924	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.205	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.164	Detected Data Not Normal at 5% Significance Level
Detected Data Not Normal at 5% Significance Level		

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	122	KM Standard Error of Mean	22.76
KM SD	122.4	95% KM (BCA) UCL	159.6
95% KM (t) UCL	160.7	95% KM (Percentile Bootstrap) UCL	160.5
95% KM (z) UCL	159.4	95% KM Bootstrap t UCL	162.5
90% KM Chebyshev UCL	190.3	95% KM Chebyshev UCL	221.2
97.5% KM Chebyshev UCL	264.1	99% KM Chebyshev UCL	348.4

Gamma GOF Tests on Detected Observations Only		
A-D Test Statistic	0.845	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.775	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.175	**Kolmogorov-Smirnov GOF**
5% K-S Critical Value	0.17	Detected Data Not Gamma Distributed at 5% Significance Level
Detected Data Not Gamma Distributed at 5% Significance Level		

Gamma Statistics on Detected Data Only			
k hat (MLE)	0.965	k star (bias corrected MLE)	0.885
Theta hat (MLE)	135.3	Theta star (bias corrected MLE)	147.5
nu hat (MLE)	54.03	nu star (bias corrected)	49.58
Mean (detects)	130.6		

ProUCL Output
Backwater Seep Sampling Area (Surface Water)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	121.9
Maximum	378	Median	67
SD	124.6	CV	1.023
k hat (MLE)	0.556	k star (bias corrected MLE)	0.523
Theta hat (MLE)	219.1	Theta star (bias corrected MLE)	233.1
nu hat (MLE)	33.37	nu star (bias corrected)	31.37
Adjusted Level of Significance (β)	0.041		
Approximate Chi Square Value (31.37, α)	19.57	Adjusted Chi Square Value (31.37, β)	19.03
95% Gamma Approximate UCL (use when n>=50)	195.3	95% Gamma Adjusted UCL (use when n<50)	200.9
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	122	SD (KM)	122.4
Variance (KM)	14982	SE of Mean (KM)	22.76
k hat (KM)	0.994	k star (KM)	0.917
nu hat (KM)	59.62	nu star (KM)	54.99
theta hat (KM)	122.8	theta star (KM)	133.1
80% gamma percentile (KM)	197.7	90% gamma percentile (KM)	287
95% gamma percentile (KM)	377	99% gamma percentile (KM)	587.3
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (54.99, α)	38.95	Adjusted Chi Square Value (54.99, β)	38.17
95% Gamma Approximate KM-UCL (use when n>=50)	172.3	95% Gamma Adjusted KM-UCL (use when n<50)	175.8
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.922	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.924	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.164	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.164	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Approximate Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	122.2	Mean in Log Scale	4.08
SD in Original Scale	124.4	SD in Log Scale	1.393
95% t UCL (assumes normality of ROS data)	160.7	95% Percentile Bootstrap UCL	159.3
95% BCA Bootstrap UCL	165.5	95% Bootstrap t UCL	165
95% H-UCL (Log ROS)	339.5		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	4.033	KM Geo Mean	56.41
KM SD (logged)	1.468	95% Critical H Value (KM-Log)	3.117
KM Standard Error of Mean (logged)	0.273	95% H-UCL (KM -Log)	387.2
KM SD (logged)	1.468	95% Critical H Value (KM-Log)	3.117
KM Standard Error of Mean (logged)	0.273		

ProUCL Output
Backwater Seep Sampling Area (Surface Water)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	122	Mean in Log Scale	3.987
SD in Original Scale	124.6	SD in Log Scale	1.606
95% t UCL (Assumes normality)	160.6	95% H-Stat UCL	526.5
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Approximate Lognormal Distributed at 5% Significance Level			
Suggested UCL to Use			
KM H-UCL	387.2		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			

ProUCL Output
Backwater Seep Sampling Area (Sediment)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

UCL Statistics for Data Sets with Non-Detects	
User Selected Options	
Date/Time of Computation	ProUCL 5.11/28/2019 8:26:35 PM
From File	20190128_BkwtrSeep_ProUCL_input_b.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Indeno123CDPyrene

General Statistics			
Total Number of Observations	15	Number of Distinct Observations	14
Number of Detects	12	Number of Non-Detects	3
Number of Distinct Detects	11	Number of Distinct Non-Detects	3
Minimum Detect	0.0059	Minimum Non-Detect	0.036
Maximum Detect	1.5	Maximum Non-Detect	0.075
Variance Detects	0.179	Percent Non-Detects	20%
Mean Detects	0.241	SD Detects	0.423
Median Detects	0.101	CV Detects	1.756
Skewness Detects	2.839	Kurtosis Detects	8.407
Mean of Logged Detects	-2.43	SD of Logged Detects	1.518

Normal GOF Test on Detects Only		
Shapiro Wilk Test Statistic	0.57	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.859	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.372	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.243	Detected Data Not Normal at 5% Significance Level
Detected Data Not Normal at 5% Significance Level		

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.197	KM Standard Error of Mean	0.101
KM SD	0.373	95% KM (BCA) UCL	0.387
95% KM (t) UCL	0.374	95% KM (Percentile Bootstrap) UCL	0.373
95% KM (z) UCL	0.363	95% KM Bootstrap t UCL	1.089
90% KM Chebyshev UCL	0.499	95% KM Chebyshev UCL	0.636
97.5% KM Chebyshev UCL	0.826	99% KM Chebyshev UCL	1.198

Gamma GOF Tests on Detected Observations Only		
A-D Test Statistic	0.583	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.776	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.229	**Kolmogorov-Smirnov GOF**
5% K-S Critical Value	0.257	Detected data appear Gamma Distributed at 5% Significance Level
Detected data appear Gamma Distributed at 5% Significance Level		

Gamma Statistics on Detected Data Only			
k hat (MLE)	0.612	k star (bias corrected MLE)	0.514
Theta hat (MLE)	0.394	Theta star (bias corrected MLE)	0.469
nu hat (MLE)	14.68	nu star (bias corrected)	12.34
Mean (detects)	0.241		

Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.0059	Mean	0.195
Maximum	1.5	Median	0.052
SD	0.387	CV	1.987
k hat (MLE)	0.514	k star (bias corrected MLE)	0.456
Theta hat (MLE)	0.379	Theta star (bias corrected MLE)	0.427
nu hat (MLE)	15.43	nu star (bias corrected)	13.68
Adjusted Level of Significance (β)	0.0324		
Approximate Chi Square Value (13.68, α)	6.352	Adjusted Chi Square Value (13.68, β)	5.747
95% Gamma Approximate UCL (use when n>=50)	0.42	95% Gamma Adjusted UCL (use when n<50)	0.464
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.197	SD (KM)	0.373
Variance (KM)	0.139	SE of Mean (KM)	0.101
k hat (KM)	0.279	k star (KM)	0.268
nu hat (KM)	8.384	nu star (KM)	8.04
theta hat (KM)	0.706	theta star (KM)	0.736
80% gamma percentile (KM)	0.293	90% gamma percentile (KM)	0.589
95% gamma percentile (KM)	0.935	99% gamma percentile (KM)	1.847
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (8.04, α)	2.758	Adjusted Chi Square Value (8.04, β)	2.392
95% Gamma Approximate KM-UCL (use when n>=50)	0.575	95% Gamma Adjusted KM-UCL (use when n<50)	0.663
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.971	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.859	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.135	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.243	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.196	Mean in Log Scale	-2.775
SD in Original Scale	0.386	SD in Log Scale	1.535
95% t UCL (assumes normality of ROS data)	0.372	95% Percentile Bootstrap UCL	0.371
95% BCA Bootstrap UCL	0.47	95% Bootstrap t UCL	1.071
95% H-UCL (Log ROS)	0.916		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-2.79	KM Geo Mean	0.0614
KM SD (logged)	1.537	95% Critical H Value (KM-Log)	3.681
KM Standard Error of Mean (logged)	0.429	95% H-UCL (KM -Log)	0.908
KM SD (logged)	1.537	95% Critical H Value (KM-Log)	3.681
KM Standard Error of Mean (logged)	0.429		

DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.199	Mean in Log Scale	-2.656
SD in Original Scale	0.385	SD in Log Scale	1.433
95% t UCL (Assumes normality)	0.374	95% H-Stat UCL	0.746
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Gamma Distributed at 5% Significance Level			
Suggested UCL to Use			
Adjusted KM-UCL (use when k<=1 and 15 < n < 50 but k<=1)	0.663		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
BenzoBFluoranthene			
General Statistics			
Total Number of Observations	15	Number of Distinct Observations	14
Number of Detects	13	Number of Non-Detects	2
Number of Distinct Detects	12	Number of Distinct Non-Detects	2
Minimum Detect	0.017	Minimum Non-Detect	0.04
Maximum Detect	4.1	Maximum Non-Detect	0.044
Variance Detects	1.303	Percent Non-Detects	13.33%
Mean Detects	0.627	SD Detects	1.142
Median Detects	0.17	CV Detects	1.82
Skewness Detects	2.804	Kurtosis Detects	8.077
Mean of Logged Detects	-1.508	SD of Logged Detects	1.474
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.558	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.866	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.401	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.234	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.547	KM Standard Error of Mean	0.28
KM SD	1.041	95% KM (BCA) UCL	1.058
95% KM (t) UCL	1.04	95% KM (Percentile Bootstrap) UCL	1.044
95% KM (z) UCL	1.007	95% KM Bootstrap t UCL	3.143
90% KM Chebyshev UCL	1.387	95% KM Chebyshev UCL	1.767
97.5% KM Chebyshev UCL	2.295	99% KM Chebyshev UCL	3.332
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	0.771	**Anderson-Darling GOF Test**	

5% A-D Critical Value	0.783	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.254	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.248	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected data follow Appr. Gamma Distribution at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.594	k star (bias corrected MLE)	0.508
Theta hat (MLE)	1.056	Theta star (bias corrected MLE)	1.234
nu hat (MLE)	15.45	nu star (bias corrected)	13.22
Mean (detects)	0.627		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	0.545
Maximum	4.1	Median	0.17
SD	1.079	CV	1.98
k hat (MLE)	0.486	k star (bias corrected MLE)	0.433
Theta hat (MLE)	1.122	Theta star (bias corrected MLE)	1.259
nu hat (MLE)	14.57	nu star (bias corrected)	12.99
Adjusted Level of Significance (β)	0.0324		
Approximate Chi Square Value (12.99, α)	5.886	Adjusted Chi Square Value (12.99, β)	5.307
95% Gamma Approximate UCL (use when n>=50)	1.203	95% Gamma Adjusted UCL (use when n<50)	1.334
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.547	SD (KM)	1.041
Variance (KM)	1.085	SE of Mean (KM)	0.28
k hat (KM)	0.276	k star (KM)	0.265
nu hat (KM)	8.278	nu star (KM)	7.956
theta hat (KM)	1.983	theta star (KM)	2.063
80% gamma percentile (KM)	0.81	90% gamma percentile (KM)	1.634
95% gamma percentile (KM)	2.601	99% gamma percentile (KM)	5.154
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (7.96, α)	2.71	Adjusted Chi Square Value (7.96, β)	2.347
95% Gamma Approximate KM-UCL (use when n>=50)	1.606	95% Gamma Adjusted KM-UCL (use when n<50)	1.855
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.974	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.866	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.151	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.234	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.547	Mean in Log Scale	-1.811
SD in Original Scale	1.078	SD in Log Scale	1.582

95% t UCL (assumes normality of ROS data)	1.037	95% Percentile Bootstrap UCL	1.031
95% BCA Bootstrap UCL	1.375	95% Bootstrap t UCL	3.292
95% H-UCL (Log ROS)	2.808		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-1.802	KM Geo Mean	0.165
KM SD (logged)	1.523	95% Critical H Value (KM-Log)	3.654
KM Standard Error of Mean (logged)	0.412	95% H-UCL (KM -Log)	2.326
KM SD (logged)	1.523	95% Critical H Value (KM-Log)	3.654
KM Standard Error of Mean (logged)	0.412		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.546	Mean in Log Scale	-1.822
SD in Original Scale	1.078	SD in Log Scale	1.597
95% t UCL (Assumes normality)	1.037	95% H-Stat UCL	2.921
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Approximate Gamma Distributed at 5% Significance Level			
Suggested UCL to Use			
Adjusted KM-UCL (use when k<=1 and 15 < n < 50 but k<=1)	1.855		
When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test			
When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
BenzoAPyrene			
General Statistics			
Total Number of Observations	15	Number of Distinct Observations	14
Number of Detects	10	Number of Non-Detects	5
Number of Distinct Detects	9	Number of Distinct Non-Detects	5
Minimum Detect	0.0089	Minimum Non-Detect	0.0018
Maximum Detect	0.87	Maximum Non-Detect	0.034
Variance Detects	0.0724	Percent Non-Detects	33.33%
Mean Detects	0.18	SD Detects	0.269
Median Detects	0.0855	CV Detects	1.494
Skewness Detects	2.326	Kurtosis Detects	5.332
Mean of Logged Detects	-2.493	SD of Logged Detects	1.303
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.639	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.842	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.403	**Lilliefors GOF Test**	

5% Lilliefors Critical Value	0.262	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.122	KM Standard Error of Mean	0.061
KM SD	0.224	95% KM (BCA) UCL	0.24
95% KM (t) UCL	0.23	95% KM (Percentile Bootstrap) UCL	0.229
95% KM (z) UCL	0.222	95% KM Bootstrap t UCL	0.589
90% KM Chebyshev UCL	0.305	95% KM Chebyshev UCL	0.388
97.5% KM Chebyshev UCL	0.503	99% KM Chebyshev UCL	0.729
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	0.623	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.756	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.301	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.276	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected data follow Appr. Gamma Distribution at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.766	k star (bias corrected MLE)	0.603
Theta hat (MLE)	0.235	Theta star (bias corrected MLE)	0.299
nu hat (MLE)	15.33	nu star (bias corrected)	12.06
Mean (detects)	0.18		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.0089	Mean	0.123
Maximum	0.87	Median	0.038
SD	0.231	CV	1.873
k hat (MLE)	0.564	k star (bias corrected MLE)	0.496
Theta hat (MLE)	0.219	Theta star (bias corrected MLE)	0.249
nu hat (MLE)	16.93	nu star (bias corrected)	14.88
Adjusted Level of Significance (β)	0.0324		
Approximate Chi Square Value (14.88, α)	7.177	Adjusted Chi Square Value (14.88, β)	6.528
95% Gamma Approximate UCL (use when n>=50)	0.256	95% Gamma Adjusted UCL (use when n<50)	0.281
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.122	SD (KM)	0.224
Variance (KM)	0.0501	SE of Mean (KM)	0.061
k hat (KM)	0.298	k star (KM)	0.283
nu hat (KM)	8.935	nu star (KM)	8.481
theta hat (KM)	0.41	theta star (KM)	0.432
80% gamma percentile (KM)	0.185	90% gamma percentile (KM)	0.363
95% gamma percentile (KM)	0.57	99% gamma percentile (KM)	1.111
Gamma Kaplan-Meier (KM) Statistics			

Approximate Chi Square Value (8.48, α)	3.017	Adjusted Chi Square Value (8.48, β)	2.629
95% Gamma Approximate KM-UCL (use when n>=50)	0.344	95% Gamma Adjusted KM-UCL (use when n<50)	0.394
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.963	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.842	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.213	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.262	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.122	Mean in Log Scale	-3.406
SD in Original Scale	0.232	SD in Log Scale	1.715
95% t UCL (assumes normality of ROS data)	0.227	95% Percentile Bootstrap UCL	0.23
95% BCA Bootstrap UCL	0.302	95% Bootstrap t UCL	0.604
95% H-UCL (Log ROS)	0.909		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-3.504	KM Geo Mean	0.0301
KM SD (logged)	1.832	95% Critical H Value (KM-Log)	4.238
KM Standard Error of Mean (logged)	0.537	95% H-UCL (KM -Log)	1.285
KM SD (logged)	1.832	95% Critical H Value (KM-Log)	4.238
KM Standard Error of Mean (logged)	0.537		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.123	Mean in Log Scale	-3.319
SD in Original Scale	0.231	SD in Log Scale	1.72
95% t UCL (Assumes normality)	0.229	95% H-Stat UCL	1.009
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Approximate Gamma Distributed at 5% Significance Level			
Suggested UCL to Use			
Adjusted KM-UCL (use when k<=1 and 15 < n < 50 but k<=1)	0.394		
When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test			
When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
DibenzAHAnthracene			
General Statistics			
Total Number of Observations	15	Number of Distinct Observations	15
Number of Detects	7	Number of Non-Detects	8

Number of Distinct Detects	7	Number of Distinct Non-Detects	8
Minimum Detect	0.0033	Minimum Non-Detect	0.0019
Maximum Detect	0.41	Maximum Non-Detect	0.073
Variance Detects	0.0219	Percent Non-Detects	53.33%
Mean Detects	0.109	SD Detects	0.148
Median Detects	0.044	CV Detects	1.363
Skewness Detects	1.821	Kurtosis Detects	2.92
Mean of Logged Detects	-3.112	SD of Logged Detects	1.589
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.73	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.803	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.381	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.304	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.0562	KM Standard Error of Mean	0.0298
KM SD	0.106	95% KM (BCA) UCL	0.108
95% KM (t) UCL	0.109	95% KM (Percentile Bootstrap) UCL	0.108
95% KM (z) UCL	0.105	95% KM Bootstrap t UCL	0.26
90% KM Chebyshev UCL	0.145	95% KM Chebyshev UCL	0.186
97.5% KM Chebyshev UCL	0.242	99% KM Chebyshev UCL	0.352
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	0.383	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.74	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.296	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.324	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.68	k star (bias corrected MLE)	0.484
Theta hat (MLE)	0.16	Theta star (bias corrected MLE)	0.224
nu hat (MLE)	9.521	nu star (bias corrected)	6.774
Mean (detects)	0.109		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.0033	Mean	0.056
Maximum	0.41	Median	0.01
SD	0.11	CV	1.955
k hat (MLE)	0.602	k star (bias corrected MLE)	0.526
Theta hat (MLE)	0.0931	Theta star (bias corrected MLE)	0.107
nu hat (MLE)	18.05	nu star (bias corrected)	15.77
Adjusted Level of Significance (β)	0.0324		

Approximate Chi Square Value (15.77, α)	7.803	Adjusted Chi Square Value (15.77, β)	7.122
95% Gamma Approximate UCL (use when n>=50)	0.113	95% Gamma Adjusted UCL (use when n<50)	0.124
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.0562	SD (KM)	0.106
Variance (KM)	0.0113	SE of Mean (KM)	0.0298
k hat (KM)	0.28	k star (KM)	0.269
nu hat (KM)	8.407	nu star (KM)	8.059
theta hat (KM)	0.201	theta star (KM)	0.209
80% gamma percentile (KM)	0.0836	90% gamma percentile (KM)	0.168
95% gamma percentile (KM)	0.266	99% gamma percentile (KM)	0.526
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (8.06, α)	2.769	Adjusted Chi Square Value (8.06, β)	2.401
95% Gamma Approximate KM-UCL (use when n>=50)	0.164	95% Gamma Adjusted KM-UCL (use when n<50)	0.189
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.952	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.803	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.211	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.304	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.0535	Mean in Log Scale	-4.358
SD in Original Scale	0.111	SD in Log Scale	1.681
95% t UCL (assumes normality of ROS data)	0.104	95% Percentile Bootstrap UCL	0.105
95% BCA Bootstrap UCL	0.128	95% Bootstrap t UCL	0.324
95% H-UCL (Log ROS)	0.31		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-4.251	KM Geo Mean	0.0143
KM SD (logged)	1.674	95% Critical H Value (KM-Log)	3.936
KM Standard Error of Mean (logged)	0.559	95% H-UCL (KM -Log)	0.337
KM SD (logged)	1.674	95% Critical H Value (KM-Log)	3.936
KM Standard Error of Mean (logged)	0.559		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.0604	Mean in Log Scale	-3.773
SD in Original Scale	0.108	SD in Log Scale	1.463
95% t UCL (Assumes normality)	0.109	95% H-Stat UCL	0.268
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Gamma Distributed at 5% Significance Level			
Suggested UCL to Use			
Adjusted KM-UCL (use when k<=1 and 15 < n < 50 but k<=1)	0.189		

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

BenzoAAnthracene

General Statistics

Total Number of Observations	15	Number of Distinct Observations	15
Number of Detects	9	Number of Non-Detects	6
Number of Distinct Detects	9	Number of Distinct Non-Detects	6
Minimum Detect	0.0076	Minimum Non-Detect	0.035
Maximum Detect	2.1	Maximum Non-Detect	0.12
Variance Detects	0.456	Percent Non-Detects	40%
Mean Detects	0.404	SD Detects	0.675
Median Detects	0.084	CV Detects	1.67
Skewness Detects	2.445	Kurtosis Detects	6.212
Mean of Logged Detects	-2.085	SD of Logged Detects	1.755

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.639	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.829	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.327	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.274	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	0.252	KM Standard Error of Mean	0.144
KM SD	0.527	95% KM (BCA) UCL	0.498
95% KM (t) UCL	0.507	95% KM (Percentile Bootstrap) UCL	0.513
95% KM (z) UCL	0.49	95% KM Bootstrap t UCL	1.372
90% KM Chebyshev UCL	0.686	95% KM Chebyshev UCL	0.882
97.5% KM Chebyshev UCL	1.155	99% KM Chebyshev UCL	1.69

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.354	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.768	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.22	**Kolmogorov-Smirnov GOF**
5% K-S Critical Value	0.293	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	0.533	k star (bias corrected MLE)	0.43
Theta hat (MLE)	0.758	Theta star (bias corrected MLE)	0.941
nu hat (MLE)	9.598	nu star (bias corrected)	7.732
Mean (detects)	0.404		

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)

For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.0076	Mean	0.247
Maximum	2.1	Median	0.018
SD	0.548	CV	2.223
k hat (MLE)	0.39	k star (bias corrected MLE)	0.357
Theta hat (MLE)	0.632	Theta star (bias corrected MLE)	0.691
nu hat (MLE)	11.71	nu star (bias corrected)	10.7
Adjusted Level of Significance (β)	0.0324		
Approximate Chi Square Value (10.70, α)	4.384	Adjusted Chi Square Value (10.70, β)	3.898
95% Gamma Approximate UCL (use when n>=50)	0.602	95% Gamma Adjusted UCL (use when n<50)	0.677
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.252	SD (KM)	0.527
Variance (KM)	0.278	SE of Mean (KM)	0.144
k hat (KM)	0.229	k star (KM)	0.228
nu hat (KM)	6.881	nu star (KM)	6.838
theta hat (KM)	1.101	theta star (KM)	1.108
80% gamma percentile (KM)	0.354	90% gamma percentile (KM)	0.762
95% gamma percentile (KM)	1.255	99% gamma percentile (KM)	2.587
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (6.84, α)	2.082	Adjusted Chi Square Value (6.84, β)	1.775
95% Gamma Approximate KM-UCL (use when n>=50)	0.829	95% Gamma Adjusted KM-UCL (use when n<50)	0.973
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.98	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.829	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.147	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.274	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.25	Mean in Log Scale	-2.885
SD in Original Scale	0.547	SD in Log Scale	1.692
95% t UCL (assumes normality of ROS data)	0.498	95% Percentile Bootstrap UCL	0.49
95% BCA Bootstrap UCL	0.629	95% Bootstrap t UCL	1.373
95% H-UCL (Log ROS)	1.407		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-2.889	KM Geo Mean	0.0556
KM SD (logged)	1.7	95% Critical H Value (KM-Log)	3.986
KM Standard Error of Mean (logged)	0.5	95% H-UCL (KM -Log)	1.443
KM SD (logged)	1.7	95% Critical H Value (KM-Log)	3.986
KM Standard Error of Mean (logged)	0.5		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.256	Mean in Log Scale	-2.638

SD in Original Scale	0.544	SD in Log Scale	1.533
95% t UCL (Assumes normality)	0.504	95% H-Stat UCL	1.042
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Gamma Distributed at 5% Significance Level			
Suggested UCL to Use			
Adjusted KM-UCL (use when k<=1 and 15 < n < 50 but k<=1)	0.973		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Cyanide			
General Statistics			
Total Number of Observations	15	Number of Distinct Observations	13
		Number of Missing Observations	0
Minimum	0.35	Mean	1.687
Maximum	8.3	Median	1.1
SD	1.962	Std. Error of Mean	0.507
Coefficient of Variation	1.163	Skewness	3.109
Normal GOF Test			
Shapiro Wilk Test Statistic	0.585	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.881	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.312	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.22	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	2.58	95% Adjusted-CLT UCL (Chen-1995)	2.955
		95% Modified-t UCL (Johnson-1978)	2.647
Gamma GOF Test			
A-D Test Statistic	0.98	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.752	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.251	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.225	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	1.603	k star (bias corrected MLE)	1.327
Theta hat (MLE)	1.052	Theta star (bias corrected MLE)	1.271
nu hat (MLE)	48.1	nu star (bias corrected)	39.81
MLE Mean (bias corrected)	1.687	MLE Sd (bias corrected)	1.465

		Approximate Chi Square Value (0.05)	26.36
Adjusted Level of Significance	0.0324	Adjusted Chi Square Value	25.01
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	2.549	95% Adjusted Gamma UCL (use when n<50)	2.686
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.929	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.881	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.191	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.22	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	-1.05	Mean of logged Data	0.18
Maximum of Logged Data	2.116	SD of logged Data	0.773
Assuming Lognormal Distribution			
95% H-UCL	2.651	90% Chebyshev (MVUE) UCL	2.576
95% Chebyshev (MVUE) UCL	3.03	97.5% Chebyshev (MVUE) UCL	3.66
99% Chebyshev (MVUE) UCL	4.898		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	2.521	95% Jackknife UCL	2.58
95% Standard Bootstrap UCL	2.489	95% Bootstrap-t UCL	4.491
95% Hall's Bootstrap UCL	6.031	95% Percentile Bootstrap UCL	2.573
95% BCA Bootstrap UCL	3.03		
90% Chebyshev(Mean, Sd) UCL	3.207	95% Chebyshev(Mean, Sd) UCL	3.896
97.5% Chebyshev(Mean, Sd) UCL	4.851	99% Chebyshev(Mean, Sd) UCL	6.728
Suggested UCL to Use			
95% H-UCL	2.651		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
ProUCL computes and outputs H-statistic based UCLs for historical reasons only.			
H-statistic often results in unstable (both high and low) values of UCL95 as shown in examples in the Technical Guide.			
It is therefore recommended to avoid the use of H-statistic based 95% UCLs.			
Use of nonparametric methods are preferred to compute UCL95 for skewed data sets which do not follow a gamma distribution.			
Aluminum			
General Statistics			

ProUCL Output
Backwater Seep Sampling Area (Sediment)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Total Number of Observations	15	Number of Distinct Observations	15
		Number of Missing Observations	0
Minimum	7410	Mean	8448
Maximum	12200	Median	8150
SD	1146	Std. Error of Mean	296
Coefficient of Variation	0.136	Skewness	2.751
Normal GOF Test			
Shapiro Wilk Test Statistic	0.691	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.881	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.248	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.22	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	8969	95% Adjusted-CLT UCL (Chen-1995)	9159
		95% Modified-t UCL (Johnson-1978)	9004
Gamma GOF Test			
A-D Test Statistic	1.213	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.734	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.217	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.221	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data follow Appr. Gamma Distribution at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	69.34	k star (bias corrected MLE)	55.52
Theta hat (MLE)	121.8	Theta star (bias corrected MLE)	152.2
nu hat (MLE)	2080	nu star (bias corrected)	1665
MLE Mean (bias corrected)	8448	MLE Sd (bias corrected)	1134
		Approximate Chi Square Value (0.05)	1572
Adjusted Level of Significance	0.0324	Adjusted Chi Square Value	1560
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50)	8952	95% Adjusted Gamma UCL (use when n<50)	9016
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.76	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.881	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.211	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.22	Data appear Lognormal at 5% Significance Level	
Data appear Approximate Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	8.911	Mean of logged Data	9.034
Maximum of Logged Data	9.409	SD of logged Data	0.119
Assuming Lognormal Distribution			
95% H-UCL	8935	90% Chebyshev (MVUE) UCL	9225

95% Chebyshev (MVUE) UCL	9580	97.5% Chebyshev (MVUE) UCL	10071
99% Chebyshev (MVUE) UCL	11037		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	8935	95% Jackknife UCL	8969
95% Standard Bootstrap UCL	8916	95% Bootstrap-t UCL	9470
95% Hall's Bootstrap UCL	10967	95% Percentile Bootstrap UCL	8991
95% BCA Bootstrap UCL	9185		
90% Chebyshev(Mean, Sd) UCL	9336	95% Chebyshev(Mean, Sd) UCL	9738
97.5% Chebyshev(Mean, Sd) UCL	10296	99% Chebyshev(Mean, Sd) UCL	11393

Suggested UCL to Use

95% Adjusted Gamma UCL	9016		

When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test

When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Iron

General Statistics

Total Number of Observations	15	Number of Distinct Observations	14
		Number of Missing Observations	0
Minimum	10000	Mean	13800
Maximum	18800	Median	13800
SD	2112	Std. Error of Mean	545.3
Coefficient of Variation	0.153	Skewness	0.53

Normal GOF Test

Shapiro Wilk Test Statistic	0.966	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.881	Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.117	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.22	Data appear Normal at 5% Significance Level	

Data appear Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	14760	95% Adjusted-CLT UCL (Chen-1995)	14777
		95% Modified-t UCL (Johnson-1978)	14773

Gamma GOF Test

A-D Test Statistic	0.21	**Anderson-Darling Gamma GOF Test**	

5% A-D Critical Value	0.734	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.12	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.221	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	46.46	k star (bias corrected MLE)	37.21
Theta hat (MLE)	297.1	Theta star (bias corrected MLE)	370.9
nu hat (MLE)	1394	nu star (bias corrected)	1116
MLE Mean (bias corrected)	13800	MLE Sd (bias corrected)	2262
		Approximate Chi Square Value (0.05)	1040
Adjusted Level of Significance	0.0324	Adjusted Chi Square Value	1031
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	14816	95% Adjusted Gamma UCL (use when n<50)	14947
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.979	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.881	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.128	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.22	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	9.21	Mean of logged Data	9.522
Maximum of Logged Data	9.842	SD of logged Data	0.152
Assuming Lognormal Distribution			
95% H-UCL	14847	90% Chebyshev (MVUE) UCL	15431
95% Chebyshev (MVUE) UCL	16170	97.5% Chebyshev (MVUE) UCL	17196
99% Chebyshev (MVUE) UCL	19210		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	14697	95% Jackknife UCL	14760
95% Standard Bootstrap UCL	14679	95% Bootstrap-t UCL	14884
95% Hall's Bootstrap UCL	15039	95% Percentile Bootstrap UCL	14640
95% BCA Bootstrap UCL	14767		
90% Chebyshev(Mean, Sd) UCL	15436	95% Chebyshev(Mean, Sd) UCL	16177
97.5% Chebyshev(Mean, Sd) UCL	17205	99% Chebyshev(Mean, Sd) UCL	19225
Suggested UCL to Use			
95% Student's-t UCL	14760		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			

Manganese

General Statistics

Total Number of Observations	15	Number of Distinct Observations	14
		Number of Missing Observations	0
Minimum	133	Mean	194.9
Maximum	286	Median	202
SD	44.31	Std. Error of Mean	11.44
Coefficient of Variation	0.227	Skewness	0.306

Normal GOF Test

Shapiro Wilk Test Statistic	0.957	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.881	Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.0981	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.22	Data appear Normal at 5% Significance Level	

Data appear Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	215	95% Adjusted-CLT UCL (Chen-1995)	214.7
		95% Modified-t UCL (Johnson-1978)	215.2

Gamma GOF Test

A-D Test Statistic	0.284	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.735	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.127	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.221	Detected data appear Gamma Distributed at 5% Significance Level	

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	20.66	k star (bias corrected MLE)	16.58
Theta hat (MLE)	9.43	Theta star (bias corrected MLE)	11.76
nu hat (MLE)	619.9	nu star (bias corrected)	497.3
MLE Mean (bias corrected)	194.9	MLE Sd (bias corrected)	47.86
		Approximate Chi Square Value (0.05)	446.6
Adjusted Level of Significance	0.0324	Adjusted Chi Square Value	440.6

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	217	95% Adjusted Gamma UCL (use when n<50)	219.9

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.957	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.881	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.137	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.22	Data appear Lognormal at 5% Significance Level	

Data appear Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	4.89	Mean of logged Data	5.248
Maximum of Logged Data	5.656	SD of logged Data	0.23
Assuming Lognormal Distribution			
95% H-UCL	218.5	90% Chebyshev (MVUE) UCL	229.8
95% Chebyshev (MVUE) UCL	245.6	97.5% Chebyshev (MVUE) UCL	267.6
99% Chebyshev (MVUE) UCL	310.7		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	213.7	95% Jackknife UCL	215
95% Standard Bootstrap UCL	213.4	95% Bootstrap-t UCL	215.4
95% Hall's Bootstrap UCL	214.5	95% Percentile Bootstrap UCL	214
95% BCA Bootstrap UCL	213.7		
90% Chebyshev(Mean, Sd) UCL	229.2	95% Chebyshev(Mean, Sd) UCL	244.7
97.5% Chebyshev(Mean, Sd) UCL	266.3	99% Chebyshev(Mean, Sd) UCL	308.7
Suggested UCL to Use			
95% Student's-t UCL	215		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Thallium			
General Statistics			
Total Number of Observations	15	Number of Distinct Observations	9
Number of Detects	1	Number of Non-Detects	14
Number of Distinct Detects	1	Number of Distinct Non-Detects	9
Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set!			
It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).			
The data set for variable Thallium was not processed!			
Arsenic			
General Statistics			
Total Number of Observations	15	Number of Distinct Observations	11
		Number of Missing Observations	0
Minimum	2.8	Mean	4.347
Maximum	6.2	Median	4.1
SD	1.064	Std. Error of Mean	0.275
Coefficient of Variation	0.245	Skewness	0.284

Normal GOF Test			
Shapiro Wilk Test Statistic	0.947	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.881	Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.155	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.22	Data appear Normal at 5% Significance Level	
Data appear Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	4.83	95% Adjusted-CLT UCL (Chen-1995)	4.82
		95% Modified-t UCL (Johnson-1978)	4.834
Gamma GOF Test			
A-D Test Statistic	0.315	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.735	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.138	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.221	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	17.78	k star (bias corrected MLE)	14.27
Theta hat (MLE)	0.245	Theta star (bias corrected MLE)	0.305
nu hat (MLE)	533.3	nu star (bias corrected)	428
MLE Mean (bias corrected)	4.347	MLE Sd (bias corrected)	1.151
		Approximate Chi Square Value (0.05)	381
Adjusted Level of Significance	0.0324	Adjusted Chi Square Value	375.6
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	4.882	95% Adjusted Gamma UCL (use when n<50)	4.953
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.952	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.881	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.132	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.22	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	1.03	Mean of logged Data	1.441
Maximum of Logged Data	1.825	SD of logged Data	0.248
Assuming Lognormal Distribution			
95% H-UCL	4.924	90% Chebyshev (MVUE) UCL	5.191
95% Chebyshev (MVUE) UCL	5.572	97.5% Chebyshev (MVUE) UCL	6.102
99% Chebyshev (MVUE) UCL	7.143		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			

Nonparametric Distribution Free UCLs			
95% CLT UCL	4.798	95% Jackknife UCL	4.83
95% Standard Bootstrap UCL	4.773	95% Bootstrap-t UCL	4.834
95% Hall's Bootstrap UCL	4.806	95% Percentile Bootstrap UCL	4.78
95% BCA Bootstrap UCL	4.8		
90% Chebyshev(Mean, Sd) UCL	5.171	95% Chebyshev(Mean, Sd) UCL	5.544
97.5% Chebyshev(Mean, Sd) UCL	6.062	99% Chebyshev(Mean, Sd) UCL	7.079
Suggested UCL to Use			
95% Student's-t UCL	4.83		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Cobalt			
General Statistics			
Total Number of Observations	15	Number of Distinct Observations	11
		Number of Missing Observations	0
Minimum	4.1	Mean	5.507
Maximum	6.9	Median	5.7
SD	0.724	Std. Error of Mean	0.187
Coefficient of Variation	0.131	Skewness	-0.0956
Normal GOF Test			
Shapiro Wilk Test Statistic	0.984	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.881	Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.139	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.22	Data appear Normal at 5% Significance Level	
Data appear Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	5.836	95% Adjusted-CLT UCL (Chen-1995)	5.809
		95% Modified-t UCL (Johnson-1978)	5.835
Gamma GOF Test			
A-D Test Statistic	0.23	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.734	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.156	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.221	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	60.43	k star (bias corrected MLE)	48.39
Theta hat (MLE)	0.0911	Theta star (bias corrected MLE)	0.114
nu hat (MLE)	1813	nu star (bias corrected)	1452

MLE Mean (bias corrected)	5.507	MLE Sd (bias corrected)	0.792
		Approximate Chi Square Value (0.05)	1364
Adjusted Level of Significance	0.0324	Adjusted Chi Square Value	1354
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	5.86	95% Adjusted Gamma UCL (use when n<50)	5.905
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.974	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.881	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.158	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.22	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	1.411	Mean of logged Data	1.698
Maximum of Logged Data	1.932	SD of logged Data	0.135
Assuming Lognormal Distribution			
95% H-UCL	5.873	90% Chebyshev (MVUE) UCL	6.083
95% Chebyshev (MVUE) UCL	6.343	97.5% Chebyshev (MVUE) UCL	6.705
99% Chebyshev (MVUE) UCL	7.415		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	5.814	95% Jackknife UCL	5.836
95% Standard Bootstrap UCL	5.805	95% Bootstrap-t UCL	5.824
95% Hall's Bootstrap UCL	5.845	95% Percentile Bootstrap UCL	5.793
95% BCA Bootstrap UCL	5.8		
90% Chebyshev(Mean, Sd) UCL	6.067	95% Chebyshev(Mean, Sd) UCL	6.321
97.5% Chebyshev(Mean, Sd) UCL	6.673	99% Chebyshev(Mean, Sd) UCL	7.365
Suggested UCL to Use			
95% Student's-t UCL	5.836		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Note: For highly negatively-skewed data, confidence limits (e.g., Chen, Johnson, Lognormal, and Gamma) may not be			
reliable. Chen's and Johnson's methods provide adjustments for positvely skewed data sets.			

ProUCL Output
Plume Area Upper Hydrogeologic Unit Groundwater
Columbia Falls Aluminum Facility
Columbia Falls, Montana

UCL Statistics for Data Sets with Non-Detects	
User Selected Options	
Date/Time of Computation	ProUCL 5.11/29/2019 5:59:15 AM
From File	20190128_GW_ProUCL_input.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Fluoride

General Statistics			
Total Number of Observations	177	Number of Distinct Observations	160
Number of Detects	176	Number of Non-Detects	1
Number of Distinct Detects	159	Number of Distinct Non-Detects	1
Minimum Detect	25.5	Minimum Non-Detect	60
Maximum Detect	52900	Maximum Non-Detect	60
Variance Detects	60491516	Percent Non-Detects	0.565%
Mean Detects	4771	SD Detects	7778
Median Detects	2605	CV Detects	1.63
Skewness Detects	3.894	Kurtosis Detects	16.94
Mean of Logged Detects	7.809	SD of Logged Detects	1.155

Normal GOF Test on Detects Only		
Shapiro Wilk Test Statistic	0.507	**Normal GOF Test on Detected Observations Only**
5% Shapiro Wilk P Value	0	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.326	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.0672	Detected Data Not Normal at 5% Significance Level
Detected Data Not Normal at 5% Significance Level		

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	4744	KM Standard Error of Mean	583.6
KM SD	7742	95% KM (BCA) UCL	5684
95% KM (t) UCL	5709	95% KM (Percentile Bootstrap) UCL	5772
95% KM (z) UCL	5704	95% KM Bootstrap t UCL	5920
90% KM Chebyshev UCL	6494	95% KM Chebyshev UCL	7287
97.5% KM Chebyshev UCL	8388	99% KM Chebyshev UCL	10550

Gamma GOF Tests on Detected Observations Only		
A-D Test Statistic	9.805	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.789	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.206	**Kolmogorov-Smirnov GOF**
5% K-S Critical Value	0.0722	Detected Data Not Gamma Distributed at 5% Significance Level
Detected Data Not Gamma Distributed at 5% Significance Level		

Gamma Statistics on Detected Data Only			
k hat (MLE)	0.886	k star (bias corrected MLE)	0.875
Theta hat (MLE)	5382	Theta star (bias corrected MLE)	5452
nu hat (MLE)	312	nu star (bias corrected)	308
Mean (detects)	4771		

Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	4744
Maximum	52900	Median	2600
SD	7764	CV	1.637
k hat (MLE)	0.816	k star (bias corrected MLE)	0.806
Theta hat (MLE)	5812	Theta star (bias corrected MLE)	5885
nu hat (MLE)	288.9	nu star (bias corrected)	285.3
Adjusted Level of Significance (β)	0.0486		
Approximate Chi Square Value (285.34, α)	247.2	Adjusted Chi Square Value (285.34, β)	246.9
95% Gamma Approximate UCL (use when n>=50)	5475	95% Gamma Adjusted UCL (use when n<50)	5481
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	4744	SD (KM)	7742
Variance (KM)	59934482	SE of Mean (KM)	583.6
k hat (KM)	0.375	k star (KM)	0.373
nu hat (KM)	132.9	nu star (KM)	132
theta hat (KM)	12635	theta star (KM)	12723
80% gamma percentile (KM)	7586	90% gamma percentile (KM)	13561
95% gamma percentile (KM)	20191	99% gamma percentile (KM)	36989
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (131.99, α)	106.5	Adjusted Chi Square Value (131.99, β)	106.3
95% Gamma Approximate KM-UCL (use when n>=50)	5882	95% Gamma Adjusted KM-UCL (use when n<50)	5892
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Approximate Test Statistic	0.921	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	9.122E-13	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.186	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.0672	Detected Data Not Lognormal at 5% Significance Level	
Detected Data Not Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	4744	Mean in Log Scale	7.793
SD in Original Scale	7763	SD in Log Scale	1.172
95% t UCL (assumes normality of ROS data)	5709	95% Percentile Bootstrap UCL	5696
95% BCA Bootstrap UCL	5914	95% Bootstrap t UCL	5944
95% H-UCL (Log ROS)	5914		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	7.784	KM Geo Mean	2401
KM SD (logged)	1.198	95% Critical H Value (KM-Log)	2.347
KM Standard Error of Mean (logged)	0.0903	95% H-UCL (KM -Log)	6085
KM SD (logged)	1.198	95% Critical H Value (KM-Log)	2.347
KM Standard Error of Mean (logged)	0.0903		

DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	4744	Mean in Log Scale	7.784
SD in Original Scale	7764	SD in Log Scale	1.198
95% t UCL (Assumes normality)	5709	95% H-Stat UCL	6090
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution at 5% Significance Level			
Suggested UCL to Use			
95% KM (Chebyshev) UCL	7287		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Cyanide			
General Statistics			
Total Number of Observations	177	Number of Distinct Observations	156
Number of Detects	170	Number of Non-Detects	7
Number of Distinct Detects	156	Number of Distinct Non-Detects	1
Minimum Detect	2	Minimum Non-Detect	2
Maximum Detect	10800	Maximum Non-Detect	2
Variance Detects	2552135	Percent Non-Detects	3.955%
Mean Detects	873.4	SD Detects	1598
Median Detects	384.5	CV Detects	1.829
Skewness Detects	3.633	Kurtosis Detects	14.49
Mean of Logged Detects	5.782	SD of Logged Detects	1.601
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.519	**Normal GOF Test on Detected Observations Only**	
5% Shapiro Wilk P Value	0	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.314	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.0684	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	838.9	KM Standard Error of Mean	118.4
KM SD	1570	95% KM (BCA) UCL	1077
95% KM (t) UCL	1035	95% KM (Percentile Bootstrap) UCL	1043
95% KM (z) UCL	1034	95% KM Bootstrap t UCL	1086
90% KM Chebyshev UCL	1194	95% KM Chebyshev UCL	1355
97.5% KM Chebyshev UCL	1578	99% KM Chebyshev UCL	2017
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	5.895	**Anderson-Darling GOF Test**	

5% A-D Critical Value	0.808	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.155	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.0749	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.621	k star (bias corrected MLE)	0.614
Theta hat (MLE)	1407	Theta star (bias corrected MLE)	1423
nu hat (MLE)	211.1	nu star (bias corrected)	208.7
Mean (detects)	873.4		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	838.8
Maximum	10800	Median	366
SD	1575	CV	1.877
k hat (MLE)	0.471	k star (bias corrected MLE)	0.467
Theta hat (MLE)	1780	Theta star (bias corrected MLE)	1796
nu hat (MLE)	166.8	nu star (bias corrected)	165.3
Adjusted Level of Significance (β)	0.0486		
Approximate Chi Square Value (165.32, α)	136.6	Adjusted Chi Square Value (165.32, β)	136.4
95% Gamma Approximate UCL (use when n>=50)	1015	95% Gamma Adjusted UCL (use when n<50)	1017
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	838.9	SD (KM)	1570
Variance (KM)	2465626	SE of Mean (KM)	118.4
k hat (KM)	0.285	k star (KM)	0.284
nu hat (KM)	101	nu star (KM)	100.7
theta hat (KM)	2939	theta star (KM)	2950
80% gamma percentile (KM)	1269	90% gamma percentile (KM)	2489
95% gamma percentile (KM)	3903	99% gamma percentile (KM)	7604
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (100.67, α)	78.52	Adjusted Chi Square Value (100.67, β)	78.36
95% Gamma Approximate KM-UCL (use when n>=50)	1076	95% Gamma Adjusted KM-UCL (use when n<50)	1078
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Approximate Test Statistic	0.9	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	0	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.13	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.0684	Detected Data Not Lognormal at 5% Significance Level	
Detected Data Not Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	839.2	Mean in Log Scale	5.638
SD in Original Scale	1575	SD in Log Scale	1.725

95% t UCL (assumes normality of ROS data)	1035	95% Percentile Bootstrap UCL	1045
95% BCA Bootstrap UCL	1073	95% Bootstrap t UCL	1080
95% H-UCL (Log ROS)	1811		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	5.581	KM Geo Mean	265.4
KM SD (logged)	1.852	95% Critical H Value (KM-Log)	3.034
KM Standard Error of Mean (logged)	0.14	95% H-UCL (KM -Log)	2253
KM SD (logged)	1.852	95% Critical H Value (KM-Log)	3.034
KM Standard Error of Mean (logged)	0.14		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	838.9	Mean in Log Scale	5.554
SD in Original Scale	1575	SD in Log Scale	1.933
95% t UCL (Assumes normality)	1035	95% H-Stat UCL	2640
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution at 5% Significance Level			
Suggested UCL to Use			
95% KM (Chebyshev) UCL	1355		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
CyanideFREE			
General Statistics			
Total Number of Observations	119	Number of Distinct Observations	94
		Number of Missing Observations	58
Number of Detects	104	Number of Non-Detects	15
Number of Distinct Detects	93	Number of Distinct Non-Detects	1
Minimum Detect	1.6	Minimum Non-Detect	1.5
Maximum Detect	306	Maximum Non-Detect	1.5
Variance Detects	2618	Percent Non-Detects	12.61%
Mean Detects	34.35	SD Detects	51.16
Median Detects	16.05	CV Detects	1.489
Skewness Detects	3.389	Kurtosis Detects	14.16
Mean of Logged Detects	2.839	SD of Logged Detects	1.163
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.604	**Normal GOF Test on Detected Observations Only**	
5% Shapiro Wilk P Value	0	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.261	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.0872	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	30.21	KM Standard Error of Mean	4.498
KM SD	48.83	95% KM (BCA) UCL	37.43
95% KM (t) UCL	37.67	95% KM (Percentile Bootstrap) UCL	37.88
95% KM (z) UCL	37.61	95% KM Bootstrap t UCL	40.03
90% KM Chebyshev UCL	43.71	95% KM Chebyshev UCL	49.82
97.5% KM Chebyshev UCL	58.3	99% KM Chebyshev UCL	74.97
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	2.87	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.79	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.135	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.0916	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.845	k star (bias corrected MLE)	0.827
Theta hat (MLE)	40.65	Theta star (bias corrected MLE)	41.53
nu hat (MLE)	175.8	nu star (bias corrected)	172
Mean (detects)	34.35		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	30.02
Maximum	306	Median	10.8
SD	49.15	CV	1.637
k hat (MLE)	0.433	k star (bias corrected MLE)	0.428
Theta hat (MLE)	69.36	Theta star (bias corrected MLE)	70.22
nu hat (MLE)	103	nu star (bias corrected)	101.8
Adjusted Level of Significance (β)	0.048		
Approximate Chi Square Value (101.76, α)	79.49	Adjusted Chi Square Value (101.76, β)	79.25
95% Gamma Approximate UCL (use when n>=50)	38.44	95% Gamma Adjusted UCL (use when n<50)	38.55
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	30.21	SD (KM)	48.83
Variance (KM)	2385	SE of Mean (KM)	4.498
k hat (KM)	0.383	k star (KM)	0.379
nu hat (KM)	91.1	nu star (KM)	90.14
theta hat (KM)	78.93	theta star (KM)	79.77
80% gamma percentile (KM)	48.42	90% gamma percentile (KM)	86.14
95% gamma percentile (KM)	127.9	99% gamma percentile (KM)	233.5
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (90.14, α)	69.25	Adjusted Chi Square Value (90.14, β)	69.02
95% Gamma Approximate KM-UCL (use when n>=50)	39.33	95% Gamma Adjusted KM-UCL (use when n<50)	39.45

Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Approximate Test Statistic	0.969	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	0.109	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.0961	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.0872	Detected Data Not Lognormal at 5% Significance Level	
Detected Data appear Approximate Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	30.19	Mean in Log Scale	2.503
SD in Original Scale	49.05	SD in Log Scale	1.415
95% t UCL (assumes normality of ROS data)	37.64	95% Percentile Bootstrap UCL	38.17
95% BCA Bootstrap UCL	39.33	95% Bootstrap t UCL	40.18
95% H-UCL (Log ROS)	46.97		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	2.533	KM Geo Mean	12.59
KM SD (logged)	1.35	95% Critical H Value (KM-Log)	2.576
KM Standard Error of Mean (logged)	0.124	95% H-UCL (KM -Log)	43.13
KM SD (logged)	1.35	95% Critical H Value (KM-Log)	2.576
KM Standard Error of Mean (logged)	0.124		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	30.12	Mean in Log Scale	2.445
SD in Original Scale	49.09	SD in Log Scale	1.506
95% t UCL (Assumes normality)	37.58	95% H-Stat UCL	52.42
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Approximate Lognormal Distributed at 5% Significance Level			
Suggested UCL to Use			
KM H-UCL	43.13		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Aluminum			
General Statistics			
Total Number of Observations	92	Number of Distinct Observations	60
		Number of Missing Observations	85
Number of Detects	59	Number of Non-Detects	33
Number of Distinct Detects	58	Number of Distinct Non-Detects	2
Minimum Detect	15.4	Minimum Non-Detect	15
Maximum Detect	4230	Maximum Non-Detect	18.2
Variance Detects	336207	Percent Non-Detects	35.87%

Mean Detects	223.8	SD Detects	579.8
Median Detects	79.1	CV Detects	2.591
Skewness Detects	6.06	Kurtosis Detects	40.79
Mean of Logged Detects	4.474	SD of Logged Detects	1.172
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.355	**Normal GOF Test on Detected Observations Only**	
5% Shapiro Wilk P Value	0	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.36	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.115	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	148.9	KM Standard Error of Mean	49.54
KM SD	471.1	95% KM (BCA) UCL	246.1
95% KM (t) UCL	231.2	95% KM (Percentile Bootstrap) UCL	238.1
95% KM (z) UCL	230.4	95% KM Bootstrap t UCL	379.5
90% KM Chebyshev UCL	297.5	95% KM Chebyshev UCL	364.8
97.5% KM Chebyshev UCL	458.3	99% KM Chebyshev UCL	641.8
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	3.895	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.801	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.198	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.121	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.652	k star (bias corrected MLE)	0.63
Theta hat (MLE)	343.4	Theta star (bias corrected MLE)	355.3
nu hat (MLE)	76.89	nu star (bias corrected)	74.31
Mean (detects)	223.8		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	143.5
Maximum	4230	Median	28.65
SD	475.3	CV	3.312
k hat (MLE)	0.197	k star (bias corrected MLE)	0.198
Theta hat (MLE)	729.2	Theta star (bias corrected MLE)	726.2
nu hat (MLE)	36.21	nu star (bias corrected)	36.36
Adjusted Level of Significance (β)	0.0474		
Approximate Chi Square Value (36.36, α)	23.56	Adjusted Chi Square Value (36.36, β)	23.4
95% Gamma Approximate UCL (use when n>=50)	221.5	95% Gamma Adjusted UCL (use when n<50)	223
Estimates of Gamma Parameters using KM Estimates			

Mean (KM)	148.9	SD (KM)	471.1
Variance (KM)	221981	SE of Mean (KM)	49.54
k hat (KM)	0.0999	k star (KM)	0.104
nu hat (KM)	18.37	nu star (KM)	19.11
theta hat (KM)	1491	theta star (KM)	1434
80% gamma percentile (KM)	109	90% gamma percentile (KM)	402.3
95% gamma percentile (KM)	862	99% gamma percentile (KM)	2321
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (19.11, α)	10.2	Adjusted Chi Square Value (19.11, β)	10.09
95% Gamma Approximate KM-UCL (use when n>=50)	279	95% Gamma Adjusted KM-UCL (use when n<50)	281.9
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Approximate Test Statistic	0.937	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	0.00652	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.0908	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.115	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Approximate Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	145.8	Mean in Log Scale	3.442
SD in Original Scale	474.6	SD in Log Scale	1.748
95% t UCL (assumes normality of ROS data)	228.1	95% Percentile Bootstrap UCL	233.9
95% BCA Bootstrap UCL	287.9	95% Bootstrap t UCL	377.5
95% H-UCL (Log ROS)	252.9		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	3.84	KM Geo Mean	46.55
KM SD (logged)	1.258	95% Critical H Value (KM-Log)	2.512
KM Standard Error of Mean (logged)	0.132	95% H-UCL (KM -Log)	143.1
KM SD (logged)	1.258	95% Critical H Value (KM-Log)	2.512
KM Standard Error of Mean (logged)	0.132		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	146.4	Mean in Log Scale	3.613
SD in Original Scale	474.5	SD in Log Scale	1.489
95% t UCL (Assumes normality)	228.6	95% H-Stat UCL	173.2
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Approximate Lognormal Distributed at 5% Significance Level			
Suggested UCL to Use			
KM H-UCL	143.1		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			

Iron

General Statistics

Total Number of Observations	92	Number of Distinct Observations	86
		Number of Missing Observations	85
Number of Detects	88	Number of Non-Detects	4
Number of Distinct Detects	84	Number of Distinct Non-Detects	2
Minimum Detect	46.4	Minimum Non-Detect	42.4
Maximum Detect	20400	Maximum Non-Detect	45.7
Variance Detects	5255183	Percent Non-Detects	4.348%
Mean Detects	877.6	SD Detects	2292
Median Detects	329	CV Detects	2.612
Skewness Detects	7.377	Kurtosis Detects	61.86
Mean of Logged Detects	5.872	SD of Logged Detects	1.187

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.344	**Normal GOF Test on Detected Observations Only**
5% Shapiro Wilk P Value	0	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.358	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.0946	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	841.3	KM Standard Error of Mean	234.4
KM SD	2236	95% KM (BCA) UCL	1349
95% KM (t) UCL	1231	95% KM (Percentile Bootstrap) UCL	1253
95% KM (z) UCL	1227	95% KM Bootstrap t UCL	1763
90% KM Chebyshev UCL	1545	95% KM Chebyshev UCL	1863
97.5% KM Chebyshev UCL	2305	99% KM Chebyshev UCL	3174

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	4.8	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.801	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.202	**Kolmogorov-Smirnov GOF**
5% K-S Critical Value	0.0996	Detected Data Not Gamma Distributed at 5% Significance Level

Detected Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	0.672	k star (bias corrected MLE)	0.656
Theta hat (MLE)	1307	Theta star (bias corrected MLE)	1337
nu hat (MLE)	118.2	nu star (bias corrected)	115.5
Mean (detects)	877.6		

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)

For such situations, GROS method may yield incorrect values of UCLs and BTVs

This is especially true when the sample size is small.

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	839.5
Maximum	20400	Median	316
SD	2249	CV	2.679
k hat (MLE)	0.485	k star (bias corrected MLE)	0.476
Theta hat (MLE)	1731	Theta star (bias corrected MLE)	1762
nu hat (MLE)	89.23	nu star (bias corrected)	87.65
Adjusted Level of Significance (β)	0.0474		
Approximate Chi Square Value (87.65, α)	67.07	Adjusted Chi Square Value (87.65, β)	66.78
95% Gamma Approximate UCL (use when n>=50)	1097	95% Gamma Adjusted UCL (use when n<50)	1102
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	841.3	SD (KM)	2236
Variance (KM)	4998587	SE of Mean (KM)	234.4
k hat (KM)	0.142	k star (KM)	0.144
nu hat (KM)	26.05	nu star (KM)	26.54
theta hat (KM)	5941	theta star (KM)	5833
80% gamma percentile (KM)	886	90% gamma percentile (KM)	2480
95% gamma percentile (KM)	4665	99% gamma percentile (KM)	11057
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (26.54, α)	15.79	Adjusted Chi Square Value (26.54, β)	15.66
95% Gamma Approximate KM-UCL (use when n>=50)	1414	95% Gamma Adjusted KM-UCL (use when n<50)	1426
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Approximate Test Statistic	0.959	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	0.0308	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.0891	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.0946	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Approximate Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	840.4	Mean in Log Scale	5.749
SD in Original Scale	2248	SD in Log Scale	1.298
95% t UCL (assumes normality of ROS data)	1230	95% Percentile Bootstrap UCL	1276
95% BCA Bootstrap UCL	1535	95% Bootstrap t UCL	1832
95% H-UCL (Log ROS)	1033		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	5.78	KM Geo Mean	323.7
KM SD (logged)	1.233	95% Critical H Value (KM-Log)	2.484
KM Standard Error of Mean (logged)	0.129	95% H-UCL (KM -Log)	954.6
KM SD (logged)	1.233	95% Critical H Value (KM-Log)	2.484
KM Standard Error of Mean (logged)	0.129		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	840.4	Mean in Log Scale	5.751
SD in Original Scale	2248	SD in Log Scale	1.293
95% t UCL (Assumes normality)	1230	95% H-Stat UCL	1026
DL/2 is not a recommended method, provided for comparisons and historical reasons			

Nonparametric Distribution Free UCL Statistics

Detected Data appear Approximate Lognormal Distributed at 5% Significance Level

Suggested UCL to Use

KM H-UCL	954.6		

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Manganese

General Statistics

Total Number of Observations	92	Number of Distinct Observations	49
		Number of Missing Observations	85
Number of Detects	49	Number of Non-Detects	43
Number of Distinct Detects	48	Number of Distinct Non-Detects	2
Minimum Detect	2.5	Minimum Non-Detect	2.5
Maximum Detect	829	Maximum Non-Detect	2.7
Variance Detects	15147	Percent Non-Detects	46.74%
Mean Detects	47.52	SD Detects	123.1
Median Detects	10.3	CV Detects	2.59
Skewness Detects	5.628	Kurtosis Detects	35.3
Mean of Logged Detects	2.696	SD of Logged Detects	1.375

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.381	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.947	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.357	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.126	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	26.48	KM Standard Error of Mean	9.658
KM SD	91.69	95% KM (BCA) UCL	42.52
95% KM (t) UCL	42.53	95% KM (Percentile Bootstrap) UCL	44.15
95% KM (z) UCL	42.37	95% KM Bootstrap t UCL	70.09
90% KM Chebyshev UCL	55.46	95% KM Chebyshev UCL	68.58
97.5% KM Chebyshev UCL	86.8	99% KM Chebyshev UCL	122.6

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	3.221	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.811	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.21	**Kolmogorov-Smirnov GOF**
5% K-S Critical Value	0.133	Detected Data Not Gamma Distributed at 5% Significance Level

Detected Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	0.539	k star (bias corrected MLE)	0.519
Theta hat (MLE)	88.21	Theta star (bias corrected MLE)	91.5
nu hat (MLE)	52.79	nu star (bias corrected)	50.9
Mean (detects)	47.52		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	25.31
Maximum	829	Median	2.85
SD	92.51	CV	3.654
k hat (MLE)	0.188	k star (bias corrected MLE)	0.189
Theta hat (MLE)	134.5	Theta star (bias corrected MLE)	133.7
nu hat (MLE)	34.62	nu star (bias corrected)	34.83
Adjusted Level of Significance (β)	0.0474		
Approximate Chi Square Value (34.83, α)	22.33	Adjusted Chi Square Value (34.83, β)	22.17
95% Gamma Approximate UCL (use when n>=50)	39.49	95% Gamma Adjusted UCL (use when n<50)	39.77
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	26.48	SD (KM)	91.69
Variance (KM)	8407	SE of Mean (KM)	9.658
k hat (KM)	0.0834	k star (KM)	0.0879
nu hat (KM)	15.35	nu star (KM)	16.18
theta hat (KM)	317.5	theta star (KM)	301.1
80% gamma percentile (KM)	14.99	90% gamma percentile (KM)	66.33
95% gamma percentile (KM)	154.3	99% gamma percentile (KM)	448.2
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (16.18, α)	8.089	Adjusted Chi Square Value (16.18, β)	7.998
95% Gamma Approximate KM-UCL (use when n>=50)	52.97	95% Gamma Adjusted KM-UCL (use when n<50)	53.57
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.926	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.947	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.132	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.126	Detected Data Not Lognormal at 5% Significance Level	
Detected Data Not Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	25.63	Mean in Log Scale	1
SD in Original Scale	92.42	SD in Log Scale	2.237
95% t UCL (assumes normality of ROS data)	41.64	95% Percentile Bootstrap UCL	43.31
95% BCA Bootstrap UCL	53.08	95% Bootstrap t UCL	66.01
95% H-UCL (Log ROS)	79.12		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	1.865	KM Geo Mean	6.454

KM SD (logged)	1.332	95% Critical H Value (KM-Log)	2.592
KM Standard Error of Mean (logged)	0.14	95% H-UCL (KM -Log)	22.49
KM SD (logged)	1.332	95% Critical H Value (KM-Log)	2.592
KM Standard Error of Mean (logged)	0.14		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	25.92	Mean in Log Scale	1.563
SD in Original Scale	92.34	SD in Log Scale	1.573
95% t UCL (Assumes normality)	41.92	95% H-Stat UCL	26.41

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution at 5% Significance Level

Suggested UCL to Use

95% KM (Chebyshev) UCL	68.58		

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Mercury

General Statistics

Total Number of Observations	92	Number of Distinct Observations	3
		Number of Missing Observations	85
Number of Detects	1	Number of Non-Detects	91
Number of Distinct Detects	1	Number of Distinct Non-Detects	2

Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set!

It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable Mercury was not processed!

Antimony

General Statistics

Total Number of Observations	92	Number of Distinct Observations	13
		Number of Missing Observations	85
Number of Detects	18	Number of Non-Detects	74
Number of Distinct Detects	12	Number of Distinct Non-Detects	1
Minimum Detect	0.66	Minimum Non-Detect	0.62
Maximum Detect	4.4	Maximum Non-Detect	0.62
Variance Detects	0.892	Percent Non-Detects	80.43%
Mean Detects	1.388	SD Detects	0.945
Median Detects	1.1	CV Detects	0.68
Skewness Detects	2.497	Kurtosis Detects	6.28

Mean of Logged Detects	0.189	SD of Logged Detects	0.49
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.66	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.897	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.301	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.202	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.77	KM Standard Error of Mean	0.0545
KM SD	0.508	95% KM (BCA) UCL	0.885
95% KM (t) UCL	0.861	95% KM (Percentile Bootstrap) UCL	0.867
95% KM (z) UCL	0.86	95% KM Bootstrap t UCL	0.966
90% KM Chebyshev UCL	0.934	95% KM Chebyshev UCL	1.008
97.5% KM Chebyshev UCL	1.11	99% KM Chebyshev UCL	1.312
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	1.378	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.743	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.263	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.205	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	3.763	k star (bias corrected MLE)	3.173
Theta hat (MLE)	0.369	Theta star (bias corrected MLE)	0.438
nu hat (MLE)	135.5	nu star (bias corrected)	114.2
Mean (detects)	1.388		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	0.288
Maximum	4.4	Median	0.01
SD	0.683	CV	2.374
k hat (MLE)	0.302	k star (bias corrected MLE)	0.299
Theta hat (MLE)	0.953	Theta star (bias corrected MLE)	0.961
nu hat (MLE)	55.52	nu star (bias corrected)	55.04
Adjusted Level of Significance (β)	0.0474		
Approximate Chi Square Value (55.04, α)	38.99	Adjusted Chi Square Value (55.04, β)	38.78
95% Gamma Approximate UCL (use when n>=50)	0.406	95% Gamma Adjusted UCL (use when n<50)	0.408
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.77	SD (KM)	0.508
Variance (KM)	0.258	SE of Mean (KM)	0.0545
k hat (KM)	2.302	k star (KM)	2.234

nu hat (KM)	423.6	nu star (KM)	411.1
theta hat (KM)	0.335	theta star (KM)	0.345
80% gamma percentile (KM)	1.138	90% gamma percentile (KM)	1.46
95% gamma percentile (KM)	1.765	99% gamma percentile (KM)	2.437
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (411.09, α)	365.1	Adjusted Chi Square Value (411.09, β)	364.4
95% Gamma Approximate KM-UCL (use when n>=50)	0.867	95% Gamma Adjusted KM-UCL (use when n<50)	0.869
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.859	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.897	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.228	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.202	Detected Data Not Lognormal at 5% Significance Level	
Detected Data Not Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.449	Mean in Log Scale	-1.432
SD in Original Scale	0.636	SD in Log Scale	1.138
95% t UCL (assumes normality of ROS data)	0.559	95% Percentile Bootstrap UCL	0.569
95% BCA Bootstrap UCL	0.582	95% Bootstrap t UCL	0.611
95% H-UCL (Log ROS)	0.607		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-0.347	KM Geo Mean	0.706
KM SD (logged)	0.338	95% Critical H Value (KM-Log)	1.761
KM Standard Error of Mean (logged)	0.0363	95% H-UCL (KM -Log)	0.796
KM SD (logged)	0.338	95% Critical H Value (KM-Log)	1.761
KM Standard Error of Mean (logged)	0.0363		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.521	Mean in Log Scale	-0.905
SD in Original Scale	0.593	SD in Log Scale	0.583
95% t UCL (Assumes normality)	0.624	95% H-Stat UCL	0.538
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution at 5% Significance Level			
Suggested UCL to Use			
95% KM (t) UCL	0.861	KM H-UCL	0.796
95% KM (BCA) UCL	0.885		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Arsenic			

General Statistics			
Total Number of Observations	92	Number of Distinct Observations	25
		Number of Missing Observations	85
Number of Detects	24	Number of Non-Detects	68
Number of Distinct Detects	23	Number of Distinct Non-Detects	3
Minimum Detect	0.66	Minimum Non-Detect	0.64
Maximum Detect	82.1	Maximum Non-Detect	7.7
Variance Detects	855.2	Percent Non-Detects	73.91%
Mean Detects	18.51	SD Detects	29.24
Median Detects	3.65	CV Detects	1.58
Skewness Detects	1.539	Kurtosis Detects	0.616
Mean of Logged Detects	1.57	SD of Logged Detects	1.72

Normal GOF Test on Detects Only		
Shapiro Wilk Test Statistic	0.624	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.916	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.357	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.177	Detected Data Not Normal at 5% Significance Level
Detected Data Not Normal at 5% Significance Level		

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	5.304	KM Standard Error of Mean	1.767
KM SD	16.59	95% KM (BCA) UCL	8.726
95% KM (t) UCL	8.241	95% KM (Percentile Bootstrap) UCL	8.299
95% KM (z) UCL	8.211	95% KM Bootstrap t UCL	9.709
90% KM Chebyshev UCL	10.61	95% KM Chebyshev UCL	13.01
97.5% KM Chebyshev UCL	16.34	99% KM Chebyshev UCL	22.89

Gamma GOF Tests on Detected Observations Only		
A-D Test Statistic	1.799	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.812	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.185	**Kolmogorov-Smirnov GOF**
5% K-S Critical Value	0.189	Detected data appear Gamma Distributed at 5% Significance Level
Detected data follow Appr. Gamma Distribution at 5% Significance Level		

Gamma Statistics on Detected Data Only			
k hat (MLE)	0.475	k star (bias corrected MLE)	0.443
Theta hat (MLE)	38.97	Theta star (bias corrected MLE)	41.74
nu hat (MLE)	22.8	nu star (bias corrected)	21.28
Mean (detects)	18.51		

Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	4.836
Maximum	82.1	Median	0.01

SD	16.82	CV	3.478
k hat (MLE)	0.166	k star (bias corrected MLE)	0.168
Theta hat (MLE)	29.18	Theta star (bias corrected MLE)	28.86
nu hat (MLE)	30.49	nu star (bias corrected)	30.83
Adjusted Level of Significance (β)	0.0474		
Approximate Chi Square Value (30.83, α)	19.15	Adjusted Chi Square Value (30.83, β)	19
95% Gamma Approximate UCL (use when n>=50)	7.786	95% Gamma Adjusted UCL (use when n<50)	7.846
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	5.304	SD (KM)	16.59
Variance (KM)	275.3	SE of Mean (KM)	1.767
k hat (KM)	0.102	k star (KM)	0.106
nu hat (KM)	18.8	nu star (KM)	19.52
theta hat (KM)	51.91	theta star (KM)	49.99
80% gamma percentile (KM)	3.997	90% gamma percentile (KM)	14.45
95% gamma percentile (KM)	30.66	99% gamma percentile (KM)	81.78
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (19.52, α)	10.5	Adjusted Chi Square Value (19.52, β)	10.39
95% Gamma Approximate KM-UCL (use when n>=50)	9.862	95% Gamma Adjusted KM-UCL (use when n<50)	9.962
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.869	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.916	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.167	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.177	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Approximate Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	4.881	Mean in Log Scale	-2.832
SD in Original Scale	16.81	SD in Log Scale	3.463
95% t UCL (assumes normality of ROS data)	7.793	95% Percentile Bootstrap UCL	7.979
95% BCA Bootstrap UCL	8.688	95% Bootstrap t UCL	9.297
95% H-UCL (Log ROS)	166		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	0.0819	KM Geo Mean	1.085
KM SD (logged)	1.234	95% Critical H Value (KM-Log)	2.486
KM Standard Error of Mean (logged)	0.132	95% H-UCL (KM -Log)	3.207
KM SD (logged)	1.234	95% Critical H Value (KM-Log)	2.486
KM Standard Error of Mean (logged)	0.132		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	5.135	Mean in Log Scale	-0.315
SD in Original Scale	16.74	SD in Log Scale	1.443
95% t UCL (Assumes normality)	8.034	95% H-Stat UCL	3.117
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			

Detected Data appear Approximate Gamma Distributed at 5% Significance Level

Suggested UCL to Use

95% KM Approximate Gamma UCL	9.862		

When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test

When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Cobalt

General Statistics

Total Number of Observations	92	Number of Distinct Observations	23
		Number of Missing Observations	85
Number of Detects	40	Number of Non-Detects	52
Number of Distinct Detects	23	Number of Distinct Non-Detects	1
Minimum Detect	1.3	Minimum Non-Detect	1.3
Maximum Detect	39.5	Maximum Non-Detect	1.3
Variance Detects	70.88	Percent Non-Detects	56.52%
Mean Detects	5.59	SD Detects	8.419
Median Detects	1.7	CV Detects	1.506
Skewness Detects	2.581	Kurtosis Detects	6.868
Mean of Logged Detects	1.069	SD of Logged Detects	1.006

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.579	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.94	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.327	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.139	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	3.165	KM Standard Error of Mean	0.621
KM SD	5.88	95% KM (BCA) UCL	4.249
95% KM (t) UCL	4.197	95% KM (Percentile Bootstrap) UCL	4.19
95% KM (z) UCL	4.186	95% KM Bootstrap t UCL	4.745
90% KM Chebyshev UCL	5.028	95% KM Chebyshev UCL	5.871
97.5% KM Chebyshev UCL	7.042	99% KM Chebyshev UCL	9.342

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	5.045	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.783	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.279	**Kolmogorov-Smirnov GOF**
5% K-S Critical Value	0.144	Detected Data Not Gamma Distributed at 5% Significance Level

Detected Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only			
k hat (MLE)	0.897	k star (bias corrected MLE)	0.846
Theta hat (MLE)	6.235	Theta star (bias corrected MLE)	6.608
nu hat (MLE)	71.72	nu star (bias corrected)	67.68
Mean (detects)	5.59		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	2.436
Maximum	39.5	Median	0.01
SD	6.174	CV	2.534
k hat (MLE)	0.237	k star (bias corrected MLE)	0.236
Theta hat (MLE)	10.3	Theta star (bias corrected MLE)	10.32
nu hat (MLE)	43.54	nu star (bias corrected)	43.45
Adjusted Level of Significance (β)	0.0474		
Approximate Chi Square Value (43.45, α)	29.33	Adjusted Chi Square Value (43.45, β)	29.15
95% Gamma Approximate UCL (use when n>=50)	3.608	95% Gamma Adjusted UCL (use when n<50)	3.631
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	3.165	SD (KM)	5.88
Variance (KM)	34.57	SE of Mean (KM)	0.621
k hat (KM)	0.29	k star (KM)	0.288
nu hat (KM)	53.32	nu star (KM)	52.92
theta hat (KM)	10.92	theta star (KM)	11.01
80% gamma percentile (KM)	4.802	90% gamma percentile (KM)	9.381
95% gamma percentile (KM)	14.68	99% gamma percentile (KM)	28.51
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (52.92, α)	37.21	Adjusted Chi Square Value (52.92, β)	37
95% Gamma Approximate KM-UCL (use when n>=50)	4.502	95% Gamma Adjusted KM-UCL (use when n<50)	4.527
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.762	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.94	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.254	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.139	Detected Data Not Lognormal at 5% Significance Level	
Detected Data Not Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	2.58	Mean in Log Scale	-0.534
SD in Original Scale	6.12	SD in Log Scale	1.757
95% t UCL (assumes normality of ROS data)	3.64	95% Percentile Bootstrap UCL	3.665
95% BCA Bootstrap UCL	4.004	95% Bootstrap t UCL	4.142
95% H-UCL (Log ROS)	4.848		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			

KM Mean (logged)	0.613	KM Geo Mean	1.846
KM SD (logged)	0.768	95% Critical H Value (KM-Log)	2.057
KM Standard Error of Mean (logged)	0.081	95% H-UCL (KM -Log)	2.924
KM SD (logged)	0.768	95% Critical H Value (KM-Log)	2.057
KM Standard Error of Mean (logged)	0.081		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	2.798	Mean in Log Scale	0.221
SD in Original Scale	6.037	SD in Log Scale	0.996
95% t UCL (Assumes normality)	3.844	95% H-Stat UCL	2.59

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution at 5% Significance Level

Suggested UCL to Use

95% KM (Chebyshev) UCL	5.871		

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Copper

General Statistics

Total Number of Observations	92	Number of Distinct Observations	41
		Number of Missing Observations	85
Number of Detects	47	Number of Non-Detects	45
Number of Distinct Detects	40	Number of Distinct Non-Detects	2
Minimum Detect	1.5	Minimum Non-Detect	1.4
Maximum Detect	977	Maximum Non-Detect	1.9
Variance Detects	20076	Percent Non-Detects	48.91%
Mean Detects	30.01	SD Detects	141.7
Median Detects	4.7	CV Detects	4.722
Skewness Detects	6.774	Kurtosis Detects	46.22
Mean of Logged Detects	1.764	SD of Logged Detects	1.265

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.198	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.946	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.421	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.128	Detected Data Not Normal at 5% Significance Level	

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	16.03	KM Standard Error of Mean	10.67
KM SD	101.2	95% KM (BCA) UCL	37.66
95% KM (t) UCL	33.76	95% KM (Percentile Bootstrap) UCL	37.29

95% KM (z) UCL	33.58	95% KM Bootstrap t UCL	178.2
90% KM Chebyshev UCL	48.03	95% KM Chebyshev UCL	62.52
97.5% KM Chebyshev UCL	82.64	99% KM Chebyshev UCL	122.2
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	7.023	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.838	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.287	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.138	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.402	k star (bias corrected MLE)	0.39
Theta hat (MLE)	74.74	Theta star (bias corrected MLE)	76.93
nu hat (MLE)	37.74	nu star (bias corrected)	36.67
Mean (detects)	30.01		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	15.34
Maximum	977	Median	1.5
SD	101.9	CV	6.642
k hat (MLE)	0.183	k star (bias corrected MLE)	0.184
Theta hat (MLE)	83.88	Theta star (bias corrected MLE)	83.3
nu hat (MLE)	33.64	nu star (bias corrected)	33.87
Adjusted Level of Significance (β)	0.0474		
Approximate Chi Square Value (33.87, α)	21.56	Adjusted Chi Square Value (33.87, β)	21.41
95% Gamma Approximate UCL (use when n>=50)	24.09	95% Gamma Adjusted UCL (use when n<50)	24.27
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	16.03	SD (KM)	101.2
Variance (KM)	10242	SE of Mean (KM)	10.67
k hat (KM)	0.0251	k star (KM)	0.0315
nu hat (KM)	4.618	nu star (KM)	5.8
theta hat (KM)	638.8	theta star (KM)	508.6
80% gamma percentile (KM)	0.247	90% gamma percentile (KM)	10.57
95% gamma percentile (KM)	64.9	99% gamma percentile (KM)	408.4
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (5.80, α)	1.539	Adjusted Chi Square Value (5.80, β)	1.505
95% Gamma Approximate KM-UCL (use when n>=50)	60.44	95% Gamma Adjusted KM-UCL (use when n<50)	61.81
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.857	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.946	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.142	**Lilliefors GOF Test**	

5% Lilliefors Critical Value	0.128	Detected Data Not Lognormal at 5% Significance Level	
Detected Data Not Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	15.53	Mean in Log Scale	0.221
SD in Original Scale	101.8	SD in Log Scale	1.987
95% t UCL (assumes normality of ROS data)	33.17	95% Percentile Bootstrap UCL	37.01
95% BCA Bootstrap UCL	48.9	95% Bootstrap t UCL	176.4
95% H-UCL (Log ROS)	18.14		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	1.077	KM Geo Mean	2.935
KM SD (logged)	1.138	95% Critical H Value (KM-Log)	2.384
KM Standard Error of Mean (logged)	0.12	95% H-UCL (KM -Log)	7.452
KM SD (logged)	1.138	95% Critical H Value (KM-Log)	2.384
KM Standard Error of Mean (logged)	0.12		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	15.75	Mean in Log Scale	0.819
SD in Original Scale	101.8	SD in Log Scale	1.327
95% t UCL (Assumes normality)	33.39	95% H-Stat UCL	7.844
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution at 5% Significance Level			
Suggested UCL to Use			
95% KM (Chebyshev) UCL	62.52		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Vanadium			
General Statistics			
Total Number of Observations	92	Number of Distinct Observations	20
		Number of Missing Observations	85
Number of Detects	19	Number of Non-Detects	73
Number of Distinct Detects	19	Number of Distinct Non-Detects	2
Minimum Detect	1.4	Minimum Non-Detect	1.2
Maximum Detect	481	Maximum Non-Detect	1.9
Variance Detects	31931	Percent Non-Detects	79.35%
Mean Detects	112.9	SD Detects	178.7
Median Detects	9.2	CV Detects	1.582
Skewness Detects	1.379	Kurtosis Detects	0.151
Mean of Logged Detects	2.972	SD of Logged Detects	2.084

Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.649	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.901	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.343	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.197	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	24.28	KM Standard Error of Mean	9.755
KM SD	91.07	95% KM (BCA) UCL	40.82
95% KM (t) UCL	40.49	95% KM (Percentile Bootstrap) UCL	41.96
95% KM (z) UCL	40.32	95% KM Bootstrap t UCL	52.43
90% KM Chebyshev UCL	53.54	95% KM Chebyshev UCL	66.8
97.5% KM Chebyshev UCL	85.2	99% KM Chebyshev UCL	121.3
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	1.433	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.827	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.252	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.213	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.378	k star (bias corrected MLE)	0.354
Theta hat (MLE)	298.5	Theta star (bias corrected MLE)	319.3
nu hat (MLE)	14.38	nu star (bias corrected)	13.44
Mean (detects)	112.9		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	23.33
Maximum	481	Median	0.01
SD	91.81	CV	3.935
k hat (MLE)	0.127	k star (bias corrected MLE)	0.13
Theta hat (MLE)	183.6	Theta star (bias corrected MLE)	179.2
nu hat (MLE)	23.39	nu star (bias corrected)	23.96
Adjusted Level of Significance (β)	0.0474		
Approximate Chi Square Value (23.96, α)	13.82	Adjusted Chi Square Value (23.96, β)	13.69
95% Gamma Approximate UCL (use when n>=50)	40.46	95% Gamma Adjusted UCL (use when n<50)	40.82
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	24.28	SD (KM)	91.07
Variance (KM)	8293	SE of Mean (KM)	9.755
k hat (KM)	0.0711	k star (KM)	0.076
nu hat (KM)	13.08	nu star (KM)	13.98
theta hat (KM)	341.6	theta star (KM)	319.4

80% gamma percentile (KM)	10.42	90% gamma percentile (KM)	55.66
95% gamma percentile (KM)	140.8	99% gamma percentile (KM)	440.5
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (13.98, α)	6.561	Adjusted Chi Square Value (13.98, β)	6.479
95% Gamma Approximate KM-UCL (use when n>=50)	51.75	95% Gamma Adjusted KM-UCL (use when n<50)	52.4
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.881	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.901	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.176	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.197	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Approximate Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	23.41	Mean in Log Scale	-3.589
SD in Original Scale	91.79	SD in Log Scale	4.654
95% t UCL (assumes normality of ROS data)	39.31	95% Percentile Bootstrap UCL	39.54
95% BCA Bootstrap UCL	43.69	95% Bootstrap t UCL	50.4
95% H-UCL (Log ROS)	43462		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	0.759	KM Geo Mean	2.137
KM SD (logged)	1.457	95% Critical H Value (KM-Log)	2.733
KM Standard Error of Mean (logged)	0.156	95% H-UCL (KM -Log)	9.382
KM SD (logged)	1.457	95% Critical H Value (KM-Log)	2.733
KM Standard Error of Mean (logged)	0.156		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	23.9	Mean in Log Scale	0.333
SD in Original Scale	91.66	SD in Log Scale	1.652
95% t UCL (Assumes normality)	39.78	95% H-Stat UCL	9.124
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Approximate Lognormal Distributed at 5% Significance Level			
Suggested UCL to Use			
KM H-UCL	9.382		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Selenium			
General Statistics			
Total Number of Observations	92	Number of Distinct Observations	18

		Number of Missing Observations	85
Number of Detects	15	Number of Non-Detects	77
Number of Distinct Detects	15	Number of Distinct Non-Detects	3
Minimum Detect	0.74	Minimum Non-Detect	0.69
Maximum Detect	13	Maximum Non-Detect	6.9
Variance Detects	12.68	Percent Non-Detects	83.7%
Mean Detects	3.307	SD Detects	3.561
Median Detects	1.7	CV Detects	1.077
Skewness Detects	1.737	Kurtosis Detects	2.847
Mean of Logged Detects	0.727	SD of Logged Detects	0.976
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.755	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.881	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.267	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.22	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	1.118	KM Standard Error of Mean	0.183
KM SD	1.693	95% KM (BCA) UCL	1.477
95% KM (t) UCL	1.422	95% KM (Percentile Bootstrap) UCL	1.451
95% KM (z) UCL	1.419	95% KM Bootstrap t UCL	1.7
90% KM Chebyshev UCL	1.667	95% KM Chebyshev UCL	1.915
97.5% KM Chebyshev UCL	2.26	99% KM Chebyshev UCL	2.938
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	0.868	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.759	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.223	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.227	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data follow Appr. Gamma Distribution at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	1.205	k star (bias corrected MLE)	1.008
Theta hat (MLE)	2.745	Theta star (bias corrected MLE)	3.28
nu hat (MLE)	36.14	nu star (bias corrected)	30.25
Mean (detects)	3.307		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	0.548
Maximum	13	Median	0.01
SD	1.857	CV	3.393
k hat (MLE)	0.23	k star (bias corrected MLE)	0.23
Theta hat (MLE)	2.383	Theta star (bias corrected MLE)	2.385

nu hat (MLE)	42.28	nu star (bias corrected)	42.23
Adjusted Level of Significance (β)	0.0474		
Approximate Chi Square Value (42.23, α)	28.33	Adjusted Chi Square Value (42.23, β)	28.15
95% Gamma Approximate UCL (use when n>=50)	0.816	95% Gamma Adjusted UCL (use when n<50)	0.821
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	1.118	SD (KM)	1.693
Variance (KM)	2.867	SE of Mean (KM)	0.183
k hat (KM)	0.436	k star (KM)	0.429
nu hat (KM)	80.26	nu star (KM)	78.98
theta hat (KM)	2.564	theta star (KM)	2.605
80% gamma percentile (KM)	1.818	90% gamma percentile (KM)	3.118
95% gamma percentile (KM)	4.534	99% gamma percentile (KM)	8.067
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (78.98, α)	59.5	Adjusted Chi Square Value (78.98, β)	59.24
95% Gamma Approximate KM-UCL (use when n>=50)	1.484	95% Gamma Adjusted KM-UCL (use when n<50)	1.491
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.885	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.881	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.208	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.22	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.622	Mean in Log Scale	-2.686
SD in Original Scale	1.84	SD in Log Scale	2.203
95% t UCL (assumes normality of ROS data)	0.941	95% Percentile Bootstrap UCL	0.971
95% BCA Bootstrap UCL	1.085	95% Bootstrap t UCL	1.111
95% H-UCL (Log ROS)	1.794		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-0.191	KM Geo Mean	0.826
KM SD (logged)	0.557	95% Critical H Value (KM-Log)	1.885
KM Standard Error of Mean (logged)	0.0602	95% H-UCL (KM -Log)	1.077
KM SD (logged)	0.557	95% Critical H Value (KM-Log)	1.885
KM Standard Error of Mean (logged)	0.0602		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.867	Mean in Log Scale	-0.731
SD in Original Scale	1.796	SD in Log Scale	0.789
95% t UCL (Assumes normality)	1.179	95% H-Stat UCL	0.78
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Approximate Gamma Distributed at 5% Significance Level			
Suggested UCL to Use			

95% KM Approximate Gamma UCL	1.484	95% GROS Approximate Gamma UCL	0.816
When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test			
When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			

ProUCL Output
Western Undeveloped Area Upper Hydrogeologic Unit Groundwater
Columbia Falls Aluminum Facility
Columbia Falls, Montana

UCL Statistics for Data Sets with Non-Detects

User Selected Options	
Date/Time of Computation	ProUCL 5.12/18/2019 9:38:20 AM
From File	20190218_rev_GW_ProUCL input.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Bis2EthylhexylPhthalate

General Statistics

Total Number of Observations	10	Number of Distinct Observations	5
		Number of Missing Observations	12
Number of Detects	1	Number of Non-Detects	9
Number of Distinct Detects	1	Number of Distinct Non-Detects	4

Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set!

It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable Bis2EthylhexylPhthalate was not processed!

Fluoride

General Statistics

Total Number of Observations	22	Number of Distinct Observations	16
Number of Detects	17	Number of Non-Detects	5
Number of Distinct Detects	15	Number of Distinct Non-Detects	1
Minimum Detect	59.5	Minimum Non-Detect	12
Maximum Detect	1050	Maximum Non-Detect	12
Variance Detects	90604	Percent Non-Detects	22.73%
Mean Detects	241.6	SD Detects	301
Median Detects	124	CV Detects	1.246
Skewness Detects	2.478	Kurtosis Detects	4.993
Mean of Logged Detects	5.095	SD of Logged Detects	0.778

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.534	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.892	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.386	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.207	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	189.4	KM Standard Error of Mean	60.24
KM SD	274.1	95% KM (BCA) UCL	303.2
95% KM (t) UCL	293.1	95% KM (Percentile Bootstrap) UCL	290
95% KM (z) UCL	288.5	95% KM Bootstrap t UCL	556.3
90% KM Chebyshev UCL	370.1	95% KM Chebyshev UCL	452

97.5% KM Chebyshev UCL	565.6	99% KM Chebyshev UCL	788.8
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	2.197	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.757	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.309	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.213	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	1.418	k star (bias corrected MLE)	1.207
Theta hat (MLE)	170.4	Theta star (bias corrected MLE)	200.2
nu hat (MLE)	48.21	nu star (bias corrected)	41.04
Mean (detects)	241.6		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	186.7
Maximum	1050	Median	108
SD	282.4	CV	1.513
k hat (MLE)	0.296	k star (bias corrected MLE)	0.286
Theta hat (MLE)	631.7	Theta star (bias corrected MLE)	653.8
nu hat (MLE)	13	nu star (bias corrected)	12.56
Adjusted Level of Significance (β)	0.0386		
Approximate Chi Square Value (12.56, α)	5.6	Adjusted Chi Square Value (12.56, β)	5.256
95% Gamma Approximate UCL (use when n>=50)	418.8	95% Gamma Adjusted UCL (use when n<50)	446.3
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	189.4	SD (KM)	274.1
Variance (KM)	75151	SE of Mean (KM)	60.24
k hat (KM)	0.477	k star (KM)	0.443
nu hat (KM)	21.01	nu star (KM)	19.47
theta hat (KM)	396.8	theta star (KM)	427.9
80% gamma percentile (KM)	308.8	90% gamma percentile (KM)	525.1
95% gamma percentile (KM)	759.7	99% gamma percentile (KM)	1344
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (19.47, α)	10.46	Adjusted Chi Square Value (19.47, β)	9.973
95% Gamma Approximate KM-UCL (use when n>=50)	352.5	95% Gamma Adjusted KM-UCL (use when n<50)	369.9
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.799	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.892	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.236	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.207	Detected Data Not Lognormal at 5% Significance Level	
Detected Data Not Lognormal at 5% Significance Level			

Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	193.6	Mean in Log Scale	4.702
SD in Original Scale	277.9	SD in Log Scale	1.019
95% t UCL (assumes normality of ROS data)	295.6	95% Percentile Bootstrap UCL	303.9
95% BCA Bootstrap UCL	334.7	95% Bootstrap t UCL	586.7
95% H-UCL (Log ROS)	330.8		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	4.502	KM Geo Mean	90.17
KM SD (logged)	1.279	95% Critical H Value (KM-Log)	2.993
KM Standard Error of Mean (logged)	0.281	95% H-UCL (KM -Log)	471.3
KM SD (logged)	1.279	95% Critical H Value (KM-Log)	2.993
KM Standard Error of Mean (logged)	0.281		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	188.1	Mean in Log Scale	4.344
SD in Original Scale	281.5	SD in Log Scale	1.571
95% t UCL (Assumes normality)	291.3	95% H-Stat UCL	866.3
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution at 5% Significance Level			
Suggested UCL to Use			
95% KM (Chebyshev) UCL	452		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Cyanide			
General Statistics			
Total Number of Observations	22	Number of Distinct Observations	4
Number of Detects	3	Number of Non-Detects	19
Number of Distinct Detects	3	Number of Distinct Non-Detects	1
Minimum Detect	2.6	Minimum Non-Detect	2
Maximum Detect	22.1	Maximum Non-Detect	2
Variance Detects	117.8	Percent Non-Detects	86.36%
Mean Detects	15.1	SD Detects	10.85
Median Detects	20.6	CV Detects	0.719
Skewness Detects	-1.695	Kurtosis Detects	N/A
Mean of Logged Detects	2.359	SD of Logged Detects	1.216
Warning: Data set has only 3 Detected Values.			
This is not enough to compute meaningful or reliable statistics and estimates.			

Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.807	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.767	Detected Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.361	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.425	Detected Data appear Normal at 5% Significance Level	
Detected Data appear Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	3.786	KM Standard Error of Mean	1.452
KM SD	5.56	95% KM (BCA) UCL	N/A
95% KM (t) UCL	6.285	95% KM (Percentile Bootstrap) UCL	N/A
95% KM (z) UCL	6.174	95% KM Bootstrap t UCL	N/A
90% KM Chebyshev UCL	8.142	95% KM Chebyshev UCL	10.11
97.5% KM Chebyshev UCL	12.85	99% KM Chebyshev UCL	18.23
Gamma GOF Tests on Detected Observations Only			
Not Enough Data to Perform GOF Test			
Gamma Statistics on Detected Data Only			
k hat (MLE)	1.551	k star (bias corrected MLE)	N/A
Theta hat (MLE)	9.739	Theta star (bias corrected MLE)	N/A
nu hat (MLE)	9.303	nu star (bias corrected)	N/A
Mean (detects)	15.1		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	2.068
Maximum	22.1	Median	0.01
SD	6.27	CV	3.032
k hat (MLE)	0.172	k star (bias corrected MLE)	0.179
Theta hat (MLE)	12.03	Theta star (bias corrected MLE)	11.57
nu hat (MLE)	7.563	nu star (bias corrected)	7.865
Adjusted Level of Significance (β)	0.0386		
Approximate Chi Square Value (7.87, α)	2.657	Adjusted Chi Square Value (7.87, β)	2.436
95% Gamma Approximate UCL (use when n>=50)	6.12	95% Gamma Adjusted UCL (use when n<50)	N/A
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	3.786	SD (KM)	5.56
Variance (KM)	30.91	SE of Mean (KM)	1.452
k hat (KM)	0.464	k star (KM)	0.431
nu hat (KM)	20.4	nu star (KM)	18.96
theta hat (KM)	8.165	theta star (KM)	8.789
80% gamma percentile (KM)	6.158	90% gamma percentile (KM)	10.55
95% gamma percentile (KM)	15.33	99% gamma percentile (KM)	27.26

Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (18.96, α)	10.08	Adjusted Chi Square Value (18.96, β)	9.603
95% Gamma Approximate KM-UCL (use when n>=50)	7.117	95% Gamma Adjusted KM-UCL (use when n<50)	7.474
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.775	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.767	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.375	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.425	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	2.202	Mean in Log Scale	-3.044
SD in Original Scale	6.23	SD in Log Scale	3.302
95% t UCL (assumes normality of ROS data)	4.487	95% Percentile Bootstrap UCL	4.317
95% BCA Bootstrap UCL	5.937	95% Bootstrap t UCL	23.12
95% H-UCL (Log ROS)	1232		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	0.92	KM Geo Mean	2.51
KM SD (logged)	0.679	95% Critical H Value (KM-Log)	2.18
KM Standard Error of Mean (logged)	0.177	95% H-UCL (KM -Log)	4.366
KM SD (logged)	0.679	95% Critical H Value (KM-Log)	2.18
KM Standard Error of Mean (logged)	0.177		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	2.923	Mean in Log Scale	0.322
SD in Original Scale	5.979	SD in Log Scale	0.91
95% t UCL (Assumes normality)	5.116	95% H-Stat UCL	3.4
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Normal Distributed at 5% Significance Level			
Suggested UCL to Use			
95% KM (t) UCL	6.285		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
CyanideFREE			
General Statistics			
Total Number of Observations	14	Number of Distinct Observations	3
		Number of Missing Observations	8
Number of Detects	2	Number of Non-Detects	12
Number of Distinct Detects	2	Number of Distinct Non-Detects	1

Minimum Detect	1.7	Minimum Non-Detect	1.5
Maximum Detect	2.2	Maximum Non-Detect	1.5
Variance Detects	0.125	Percent Non-Detects	85.71%
Mean Detects	1.95	SD Detects	0.354
Median Detects	1.95	CV Detects	0.181
Skewness Detects	N/A	Kurtosis Detects	N/A
Mean of Logged Detects	0.66	SD of Logged Detects	0.182

Warning: Data set has only 2 Detected Values.

This is not enough to compute meaningful or reliable statistics and estimates.

Normal GOF Test on Detects Only

Not Enough Data to Perform GOF Test

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	1.564	KM Standard Error of Mean	0.0694
KM SD	0.184	95% KM (BCA) UCL	N/A
95% KM (t) UCL	1.687	95% KM (Percentile Bootstrap) UCL	N/A
95% KM (z) UCL	1.678	95% KM Bootstrap t UCL	N/A
90% KM Chebyshev UCL	1.773	95% KM Chebyshev UCL	1.867
97.5% KM Chebyshev UCL	1.998	99% KM Chebyshev UCL	2.255

Gamma GOF Tests on Detected Observations Only

Not Enough Data to Perform GOF Test

Gamma Statistics on Detected Data Only

k hat (MLE)	60.5	k star (bias corrected MLE)	N/A
Theta hat (MLE)	0.0322	Theta star (bias corrected MLE)	N/A
nu hat (MLE)	242	nu star (bias corrected)	N/A
Mean (detects)	1.95		

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	1.564	SD (KM)	0.184
Variance (KM)	0.0337	SE of Mean (KM)	0.0694
k hat (KM)	72.56	k star (KM)	57.06
nu hat (KM)	2032	nu star (KM)	1598
theta hat (KM)	0.0216	theta star (KM)	0.0274
80% gamma percentile (KM)	1.735	90% gamma percentile (KM)	1.835
95% gamma percentile (KM)	1.92	99% gamma percentile (KM)	2.086

Gamma Kaplan-Meier (KM) Statistics

		Adjusted Level of Significance (β)	0.0312
Approximate Chi Square Value (N/A, α)	1506	Adjusted Chi Square Value (N/A, β)	1494
95% Gamma Approximate KM-UCL (use when n>=50)	1.66	95% Gamma Adjusted KM-UCL (use when n<50)	1.673

Lognormal GOF Test on Detected Observations Only

Not Enough Data to Perform GOF Test

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	0.818	Mean in Log Scale	-0.399
SD in Original Scale	0.561	SD in Log Scale	0.65
95% t UCL (assumes normality of ROS data)	1.083	95% Percentile Bootstrap UCL	1.074
95% BCA Bootstrap UCL	1.124	95% Bootstrap t UCL	1.232
95% H-UCL (Log ROS)	1.25		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	0.442	KM Geo Mean	1.555
KM SD (logged)	0.101	95% Critical H Value (KM-Log)	1.757
KM Standard Error of Mean (logged)	0.0383	95% H-UCL (KM -Log)	1.643
KM SD (logged)	0.101	95% Critical H Value (KM-Log)	1.757
KM Standard Error of Mean (logged)	0.0383		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.921	Mean in Log Scale	-0.152
SD in Original Scale	0.447	SD in Log Scale	0.348
95% t UCL (Assumes normality)	1.133	95% H-Stat UCL	1.099
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution at 5% Significance Level			
Suggested UCL to Use			
95% KM (t) UCL	1.687	KM H-UCL	1.643
95% KM (BCA) UCL	N/A		
Warning: One or more Recommended UCL(s) not available!			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Manganese			
General Statistics			
Total Number of Observations	16	Number of Distinct Observations	14
		Number of Missing Observations	6
Number of Detects	12	Number of Non-Detects	4
Number of Distinct Detects	12	Number of Distinct Non-Detects	2
Minimum Detect	3.5	Minimum Non-Detect	2.5
Maximum Detect	82.2	Maximum Non-Detect	2.7
Variance Detects	851.2	Percent Non-Detects	25%
Mean Detects	25	SD Detects	29.18
Median Detects	10.65	CV Detects	1.167
Skewness Detects	1.424	Kurtosis Detects	0.708
Mean of Logged Detects	2.617	SD of Logged Detects	1.129
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.725	**Shapiro Wilk GOF Test**	

5% Shapiro Wilk Critical Value	0.859	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.332	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.243	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	19.38	KM Standard Error of Mean	6.81
KM SD	26.08	95% KM (BCA) UCL	32.04
95% KM (t) UCL	31.31	95% KM (Percentile Bootstrap) UCL	30.53
95% KM (z) UCL	30.58	95% KM Bootstrap t UCL	40.85
90% KM Chebyshev UCL	39.8	95% KM Chebyshev UCL	49.06
97.5% KM Chebyshev UCL	61.9	99% KM Chebyshev UCL	87.13
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	0.814	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.758	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.266	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.253	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.964	k star (bias corrected MLE)	0.778
Theta hat (MLE)	25.94	Theta star (bias corrected MLE)	32.12
nu hat (MLE)	23.13	nu star (bias corrected)	18.68
Mean (detects)	25		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	18.75
Maximum	82.2	Median	6.35
SD	27.37	CV	1.46
k hat (MLE)	0.322	k star (bias corrected MLE)	0.303
Theta hat (MLE)	58.3	Theta star (bias corrected MLE)	61.89
nu hat (MLE)	10.29	nu star (bias corrected)	9.696
Adjusted Level of Significance (β)	0.0335		
Approximate Chi Square Value (9.70, α)	3.753	Adjusted Chi Square Value (9.70, β)	3.342
95% Gamma Approximate UCL (use when n>=50)	48.45	95% Gamma Adjusted UCL (use when n<50)	54.4
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	19.38	SD (KM)	26.08
Variance (KM)	680.2	SE of Mean (KM)	6.81
k hat (KM)	0.552	k star (KM)	0.49
nu hat (KM)	17.66	nu star (KM)	15.68
theta hat (KM)	35.1	theta star (KM)	39.53
80% gamma percentile (KM)	31.79	90% gamma percentile (KM)	52.64
95% gamma percentile (KM)	74.96	99% gamma percentile (KM)	130

Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (15.68, α)	7.739	Adjusted Chi Square Value (15.68, β)	7.111
95% Gamma Approximate KM-UCL (use when n>=50)	39.26	95% Gamma Adjusted KM-UCL (use when n<50)	42.73
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.894	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.859	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.199	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.243	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	19	Mean in Log Scale	1.94
SD in Original Scale	27.2	SD in Log Scale	1.564
95% t UCL (assumes normality of ROS data)	30.91	95% Percentile Bootstrap UCL	30.74
95% BCA Bootstrap UCL	32.81	95% Bootstrap t UCL	42.21
95% H-UCL (Log ROS)	103.5		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	2.192	KM Geo Mean	8.953
KM SD (logged)	1.191	95% Critical H Value (KM-Log)	3.01
KM Standard Error of Mean (logged)	0.311	95% H-UCL (KM -Log)	45.95
KM SD (logged)	1.191	95% Critical H Value (KM-Log)	3.01
KM Standard Error of Mean (logged)	0.311		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	19.08	Mean in Log Scale	2.033
SD in Original Scale	27.14	SD in Log Scale	1.424
95% t UCL (Assumes normality)	30.97	95% H-Stat UCL	73.69
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Lognormal Distributed at 5% Significance Level			
Suggested UCL to Use			
95% KM (Chebyshev) UCL	49.06		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Antimony			
General Statistics			
Total Number of Observations	16	Number of Distinct Observations	4
		Number of Missing Observations	6
Number of Detects	3	Number of Non-Detects	13

Number of Distinct Detects	3	Number of Distinct Non-Detects	1
Minimum Detect	0.64	Minimum Non-Detect	0.62
Maximum Detect	1.1	Maximum Non-Detect	0.62
Variance Detects	0.053	Percent Non-Detects	81.25%
Mean Detects	0.877	SD Detects	0.23
Median Detects	0.89	CV Detects	0.263
Skewness Detects	-0.26	Kurtosis Detects	N/A
Mean of Logged Detects	-0.156	SD of Logged Detects	0.273
Warning: Data set has only 3 Detected Values.			
This is not enough to compute meaningful or reliable statistics and estimates.			
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.997	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.767	Detected Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.19	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.425	Detected Data appear Normal at 5% Significance Level	
Detected Data appear Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.668	KM Standard Error of Mean	0.0395
KM SD	0.129	95% KM (BCA) UCL	N/A
95% KM (t) UCL	0.737	95% KM (Percentile Bootstrap) UCL	N/A
95% KM (z) UCL	0.733	95% KM Bootstrap t UCL	N/A
90% KM Chebyshev UCL	0.787	95% KM Chebyshev UCL	0.84
97.5% KM Chebyshev UCL	0.915	99% KM Chebyshev UCL	1.061
Gamma GOF Tests on Detected Observations Only			
Not Enough Data to Perform GOF Test			
Gamma Statistics on Detected Data Only			
k hat (MLE)	20.82	k star (bias corrected MLE)	N/A
Theta hat (MLE)	0.0421	Theta star (bias corrected MLE)	N/A
nu hat (MLE)	124.9	nu star (bias corrected)	N/A
Mean (detects)	0.877		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	0.227
Maximum	1.1	Median	0.01
SD	0.352	CV	1.549
k hat (MLE)	0.421	k star (bias corrected MLE)	0.384
Theta hat (MLE)	0.539	Theta star (bias corrected MLE)	0.592
nu hat (MLE)	13.47	nu star (bias corrected)	12.28
Adjusted Level of Significance (β)	0.0335		

Approximate Chi Square Value (12.28, α)	5.409	Adjusted Chi Square Value (12.28, β)	4.899
95% Gamma Approximate UCL (use when n>=50)	0.515	95% Gamma Adjusted UCL (use when n<50)	N/A
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.668	SD (KM)	0.129
Variance (KM)	0.0167	SE of Mean (KM)	0.0395
k hat (KM)	26.79	k star (KM)	21.81
nu hat (KM)	857.1	nu star (KM)	697.8
theta hat (KM)	0.0249	theta star (KM)	0.0306
80% gamma percentile (KM)	0.785	90% gamma percentile (KM)	0.857
95% gamma percentile (KM)	0.92	99% gamma percentile (KM)	1.045
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (697.76, α)	637.5	Adjusted Chi Square Value (697.76, β)	630.9
95% Gamma Approximate KM-UCL (use when n>=50)	0.731	95% Gamma Adjusted KM-UCL (use when n<50)	0.739
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.984	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.767	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.224	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.425	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.353	Mean in Log Scale	-1.341
SD in Original Scale	0.296	SD in Log Scale	0.803
95% t UCL (assumes normality of ROS data)	0.482	95% Percentile Bootstrap UCL	0.476
95% BCA Bootstrap UCL	0.505	95% Bootstrap t UCL	0.536
95% H-UCL (Log ROS)	0.595		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-0.418	KM Geo Mean	0.659
KM SD (logged)	0.159	95% Critical H Value (KM-Log)	1.775
KM Standard Error of Mean (logged)	0.0485	95% H-UCL (KM -Log)	0.717
KM SD (logged)	0.159	95% Critical H Value (KM-Log)	1.775
KM Standard Error of Mean (logged)	0.0485		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.416	Mean in Log Scale	-0.981
SD in Original Scale	0.243	SD in Log Scale	0.421
95% t UCL (Assumes normality)	0.523	95% H-Stat UCL	0.508
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Normal Distributed at 5% Significance Level			
Suggested UCL to Use			
95% KM (t) UCL	0.737		

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Naphthalene

General Statistics

Total Number of Observations	10	Number of Distinct Observations	4
		Number of Missing Observations	12
Number of Detects	1	Number of Non-Detects	9
Number of Distinct Detects	1	Number of Distinct Non-Detects	3

Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set!

It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable Naphthalene was not processed!

ProUCL Output
Below Upper Hydrogeologic Unit Groundwater
Columbia Falls Aluminum Facility
Columbia Falls, Montana

UCL Statistics for Data Sets with Non-Detects	
User Selected Options	
Date/Time of Computation	ProUCL 5.12/18/2019 9:28:11 AM
From File	20190218_rev_GW_ProUCL input_a.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

12Dichloroethane

General Statistics			
Total Number of Observations	4	Number of Distinct Observations	2
		Number of Missing Observations	36
Number of Detects	1	Number of Non-Detects	3
Number of Distinct Detects	1	Number of Distinct Non-Detects	1

Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set!

It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable 12Dichloroethane was not processed!

Fluoride

General Statistics			
Total Number of Observations	78	Number of Distinct Observations	70
Number of Detects	71	Number of Non-Detects	7
Number of Distinct Detects	68	Number of Distinct Non-Detects	2
Minimum Detect	22.3	Minimum Non-Detect	12
Maximum Detect	762	Maximum Non-Detect	15
Variance Detects	20344	Percent Non-Detects	8.974%
Mean Detects	235.8	SD Detects	142.6
Median Detects	194	CV Detects	0.605
Skewness Detects	1.266	Kurtosis Detects	1.713
Mean of Logged Detects	5.286	SD of Logged Detects	0.625

Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.896	**Normal GOF Test on Detected Observations Only**	
5% Shapiro Wilk P Value	2.3203E-6	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.16	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.105	Detected Data Not Normal at 5% Significance Level	

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	215.7	KM Standard Error of Mean	17.05
KM SD	149.5	95% KM (BCA) UCL	242.4
95% KM (t) UCL	244.1	95% KM (Percentile Bootstrap) UCL	244.3
95% KM (z) UCL	243.7	95% KM Bootstrap t UCL	245.4
90% KM Chebyshev UCL	266.8	95% KM Chebyshev UCL	290

97.5% KM Chebyshev UCL	322.2	99% KM Chebyshev UCL	385.3
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	0.628	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.758	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.0899	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.106	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	2.975	k star (bias corrected MLE)	2.859
Theta hat (MLE)	79.25	Theta star (bias corrected MLE)	82.47
nu hat (MLE)	422.5	nu star (bias corrected)	406
Mean (detects)	235.8		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	216.1
Maximum	762	Median	181
SD	150	CV	0.694
k hat (MLE)	1.358	k star (bias corrected MLE)	1.314
Theta hat (MLE)	159.1	Theta star (bias corrected MLE)	164.4
nu hat (MLE)	211.8	nu star (bias corrected)	205
Adjusted Level of Significance (β)	0.0469		
Approximate Chi Square Value (205.03, α)	172.9	Adjusted Chi Square Value (205.03, β)	172.3
95% Gamma Approximate UCL (use when n>=50)	256.3	95% Gamma Adjusted UCL (use when n<50)	257.1
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	215.7	SD (KM)	149.5
Variance (KM)	22349	SE of Mean (KM)	17.05
k hat (KM)	2.082	k star (KM)	2.01
nu hat (KM)	324.8	nu star (KM)	313.6
theta hat (KM)	103.6	theta star (KM)	107.3
80% gamma percentile (KM)	322.7	90% gamma percentile (KM)	419
95% gamma percentile (KM)	510.8	99% gamma percentile (KM)	714.3
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (313.60, α)	273.6	Adjusted Chi Square Value (313.60, β)	272.9
95% Gamma Approximate KM-UCL (use when n>=50)	247.3	95% Gamma Adjusted KM-UCL (use when n<50)	247.9
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Approximate Test Statistic	0.974	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	0.36	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.0671	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.105	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			

Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	219.1	Mean in Log Scale	5.161
SD in Original Scale	146.2	SD in Log Scale	0.719
95% t UCL (assumes normality of ROS data)	246.6	95% Percentile Bootstrap UCL	246.8
95% BCA Bootstrap UCL	248.2	95% Bootstrap t UCL	250.4
95% H-UCL (Log ROS)	266		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	5.034	KM Geo Mean	153.6
KM SD (logged)	0.995	95% Critical H Value (KM-Log)	2.26
KM Standard Error of Mean (logged)	0.114	95% H-UCL (KM -Log)	325.7
KM SD (logged)	0.995	95% Critical H Value (KM-Log)	2.26
KM Standard Error of Mean (logged)	0.114		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	215.2	Mean in Log Scale	4.978
SD in Original Scale	151.2	SD in Log Scale	1.153
95% t UCL (Assumes normality)	243.7	95% H-Stat UCL	387.7
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Gamma Distributed at 5% Significance Level			
Suggested UCL to Use			
95% KM Approximate Gamma UCL	247.3	95% GROS Approximate Gamma UCL	256.3
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Cyanide			
General Statistics			
Total Number of Observations	78	Number of Distinct Observations	15
Number of Detects	14	Number of Non-Detects	64
Number of Distinct Detects	14	Number of Distinct Non-Detects	1
Minimum Detect	2.1	Minimum Non-Detect	2
Maximum Detect	13.9	Maximum Non-Detect	2
Variance Detects	12.8	Percent Non-Detects	82.05%
Mean Detects	5.836	SD Detects	3.577
Median Detects	5.2	CV Detects	0.613
Skewness Detects	1.009	Kurtosis Detects	0.346
Mean of Logged Detects	1.594	SD of Logged Detects	0.607
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.895	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.874	Detected Data appear Normal at 5% Significance Level	

Lilliefors Test Statistic	0.185	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.226	Detected Data appear Normal at 5% Significance Level	
Detected Data appear Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	2.688	KM Standard Error of Mean	0.244
KM SD	2.074	95% KM (BCA) UCL	3.131
95% KM (t) UCL	3.094	95% KM (Percentile Bootstrap) UCL	3.109
95% KM (z) UCL	3.089	95% KM Bootstrap t UCL	3.31
90% KM Chebyshev UCL	3.419	95% KM Chebyshev UCL	3.75
97.5% KM Chebyshev UCL	4.21	99% KM Chebyshev UCL	5.113
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	0.295	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.742	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.121	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.23	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	3.096	k star (bias corrected MLE)	2.48
Theta hat (MLE)	1.885	Theta star (bias corrected MLE)	2.353
nu hat (MLE)	86.68	nu star (bias corrected)	69.44
Mean (detects)	5.836		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	1.088
Maximum	13.9	Median	0.01
SD	2.68	CV	2.464
k hat (MLE)	0.216	k star (bias corrected MLE)	0.216
Theta hat (MLE)	5.047	Theta star (bias corrected MLE)	5.041
nu hat (MLE)	33.62	nu star (bias corrected)	33.66
Adjusted Level of Significance (β)	0.0469		
Approximate Chi Square Value (33.66, α)	21.39	Adjusted Chi Square Value (33.66, β)	21.21
95% Gamma Approximate UCL (use when n>=50)	1.711	95% Gamma Adjusted UCL (use when n<50)	1.726
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	2.688	SD (KM)	2.074
Variance (KM)	4.299	SE of Mean (KM)	0.244
k hat (KM)	1.681	k star (KM)	1.625
nu hat (KM)	262.3	nu star (KM)	253.5
theta hat (KM)	1.599	theta star (KM)	1.654
80% gamma percentile (KM)	4.123	90% gamma percentile (KM)	5.494
95% gamma percentile (KM)	6.819	99% gamma percentile (KM)	9.796

Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (253.50, α)	217.6	Adjusted Chi Square Value (253.50, β)	217
95% Gamma Approximate KM-UCL (use when n>=50)	3.132	95% Gamma Adjusted KM-UCL (use when n<50)	3.14
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.954	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.874	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.102	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.226	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	1.522	Mean in Log Scale	-0.589
SD in Original Scale	2.553	SD in Log Scale	1.482
95% t UCL (assumes normality of ROS data)	2.003	95% Percentile Bootstrap UCL	2.034
95% BCA Bootstrap UCL	2.19	95% Bootstrap t UCL	2.186
95% H-UCL (Log ROS)	2.662		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	0.855	KM Geo Mean	2.351
KM SD (logged)	0.425	95% Critical H Value (KM-Log)	1.813
KM Standard Error of Mean (logged)	0.05	95% H-UCL (KM -Log)	2.81
KM SD (logged)	0.425	95% Critical H Value (KM-Log)	1.813
KM Standard Error of Mean (logged)	0.05		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	1.868	Mean in Log Scale	0.286
SD in Original Scale	2.377	SD in Log Scale	0.664
95% t UCL (Assumes normality)	2.316	95% H-Stat UCL	1.926
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Normal Distributed at 5% Significance Level			
Suggested UCL to Use			
95% KM (t) UCL	3.094		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
CyanideFREE			
General Statistics			
Total Number of Observations	33	Number of Distinct Observations	6
		Number of Missing Observations	40
Number of Detects	6	Number of Non-Detects	27
Number of Distinct Detects	5	Number of Distinct Non-Detects	1

Minimum Detect	2	Minimum Non-Detect	1.5
Maximum Detect	3.9	Maximum Non-Detect	1.5
Variance Detects	0.519	Percent Non-Detects	81.82%
Mean Detects	2.767	SD Detects	0.72
Median Detects	2.8	CV Detects	0.26
Skewness Detects	0.477	Kurtosis Detects	-0.126
Mean of Logged Detects	0.989	SD of Logged Detects	0.261
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.924	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.788	Detected Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.19	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.325	Detected Data appear Normal at 5% Significance Level	
Detected Data appear Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	1.73	KM Standard Error of Mean	0.107
KM SD	0.563	95% KM (BCA) UCL	1.912
95% KM (t) UCL	1.912	95% KM (Percentile Bootstrap) UCL	1.906
95% KM (z) UCL	1.907	95% KM Bootstrap t UCL	1.888
90% KM Chebyshev UCL	2.053	95% KM Chebyshev UCL	2.198
97.5% KM Chebyshev UCL	2.401	99% KM Chebyshev UCL	2.799
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	0.32	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.697	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.222	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.332	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	17.89	k star (bias corrected MLE)	9.058
Theta hat (MLE)	0.155	Theta star (bias corrected MLE)	0.305
nu hat (MLE)	214.7	nu star (bias corrected)	108.7
Mean (detects)	2.767		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	0.791
Maximum	3.9	Median	0.184
SD	1.088	CV	1.375
k hat (MLE)	0.357	k star (bias corrected MLE)	0.345
Theta hat (MLE)	2.217	Theta star (bias corrected MLE)	2.296
nu hat (MLE)	23.56	nu star (bias corrected)	22.75
Adjusted Level of Significance (β)	0.0419		
Approximate Chi Square Value (22.75, α)	12.9	Adjusted Chi Square Value (22.75, β)	12.52

95% Gamma Approximate UCL (use when n>=50)	1.395	95% Gamma Adjusted UCL (use when n<50)	1.438
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	1.73	SD (KM)	0.563
Variance (KM)	0.317	SE of Mean (KM)	0.107
k hat (KM)	9.437	k star (KM)	8.599
nu hat (KM)	622.8	nu star (KM)	567.5
theta hat (KM)	0.183	theta star (KM)	0.201
80% gamma percentile (KM)	2.197	90% gamma percentile (KM)	2.516
95% gamma percentile (KM)	2.801	99% gamma percentile (KM)	3.389
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (567.54, α)	513.3	Adjusted Chi Square Value (567.54, β)	510.6
95% Gamma Approximate KM-UCL (use when n>=50)	1.913	95% Gamma Adjusted KM-UCL (use when n<50)	1.923
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.92	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.788	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.206	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.325	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	1.224	Mean in Log Scale	-0.0236
SD in Original Scale	0.877	SD in Log Scale	0.685
95% t UCL (assumes normality of ROS data)	1.482	95% Percentile Bootstrap UCL	1.478
95% BCA Bootstrap UCL	1.516	95% Bootstrap t UCL	1.536
95% H-UCL (Log ROS)	1.593		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	0.512	KM Geo Mean	1.668
KM SD (logged)	0.247	95% Critical H Value (KM-Log)	1.768
KM Standard Error of Mean (logged)	0.0471	95% H-UCL (KM -Log)	1.858
KM SD (logged)	0.247	95% Critical H Value (KM-Log)	1.768
KM Standard Error of Mean (logged)	0.0471		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	1.117	Mean in Log Scale	-0.0555
SD in Original Scale	0.84	SD in Log Scale	0.511
95% t UCL (Assumes normality)	1.364	95% H-Stat UCL	1.285
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Normal Distributed at 5% Significance Level			
Suggested UCL to Use			
95% KM (t) UCL	1.912		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Aluminum

General Statistics

Total Number of Observations	39	Number of Distinct Observations	34
		Number of Missing Observations	34
Number of Detects	32	Number of Non-Detects	7
Number of Distinct Detects	32	Number of Distinct Non-Detects	2
Minimum Detect	16.7	Minimum Non-Detect	15
Maximum Detect	6370	Maximum Non-Detect	18.2
Variance Detects	1352542	Percent Non-Detects	17.95%
Mean Detects	636.7	SD Detects	1163
Median Detects	249	CV Detects	1.827
Skewness Detects	4.16	Kurtosis Detects	19.95
Mean of Logged Detects	5.538	SD of Logged Detects	1.395

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.516	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.93	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.297	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.154	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	525.1	KM Standard Error of Mean	173.1
KM SD	1064	95% KM (BCA) UCL	858.7
95% KM (t) UCL	816.9	95% KM (Percentile Bootstrap) UCL	842.7
95% KM (z) UCL	809.8	95% KM Bootstrap t UCL	1138
90% KM Chebyshev UCL	1044	95% KM Chebyshev UCL	1280
97.5% KM Chebyshev UCL	1606	99% KM Chebyshev UCL	2247

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.729	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.796	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.133	**Kolmogorov-Smirnov GOF**
5% K-S Critical Value	0.163	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	0.663	k star (bias corrected MLE)	0.622
Theta hat (MLE)	959.6	Theta star (bias corrected MLE)	1023
nu hat (MLE)	42.46	nu star (bias corrected)	39.81
Mean (detects)	636.7		

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)

For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	522.4
Maximum	6370	Median	151
SD	1079	CV	2.066
k hat (MLE)	0.275	k star (bias corrected MLE)	0.271
Theta hat (MLE)	1898	Theta star (bias corrected MLE)	1926
nu hat (MLE)	21.47	nu star (bias corrected)	21.15
Adjusted Level of Significance (β)	0.0437		
Approximate Chi Square Value (21.15, α)	11.7	Adjusted Chi Square Value (21.15, β)	11.43
95% Gamma Approximate UCL (use when n>=50)	944	95% Gamma Adjusted UCL (use when n<50)	967
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	525.1	SD (KM)	1064
Variance (KM)	1132004	SE of Mean (KM)	173.1
k hat (KM)	0.244	k star (KM)	0.242
nu hat (KM)	19	nu star (KM)	18.87
theta hat (KM)	2156	theta star (KM)	2170
80% gamma percentile (KM)	753.5	90% gamma percentile (KM)	1579
95% gamma percentile (KM)	2566	99% gamma percentile (KM)	5206
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (18.87, α)	10.02	Adjusted Chi Square Value (18.87, β)	9.767
95% Gamma Approximate KM-UCL (use when n>=50)	988.6	95% Gamma Adjusted KM-UCL (use when n<50)	1014
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.989	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.93	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.06	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.154	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	524.5	Mean in Log Scale	4.964
SD in Original Scale	1078	SD in Log Scale	1.786
95% t UCL (assumes normality of ROS data)	815.6	95% Percentile Bootstrap UCL	834
95% BCA Bootstrap UCL	1038	95% Bootstrap t UCL	1188
95% H-UCL (Log ROS)	1914		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	5.031	KM Geo Mean	153.1
KM SD (logged)	1.651	95% Critical H Value (KM-Log)	3.25
KM Standard Error of Mean (logged)	0.269	95% H-UCL (KM -Log)	1427
KM SD (logged)	1.651	95% Critical H Value (KM-Log)	3.25
KM Standard Error of Mean (logged)	0.269		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	523.8	Mean in Log Scale	4.911

SD in Original Scale	1079	SD in Log Scale	1.853
95% t UCL (Assumes normality)	814.9	95% H-Stat UCL	2195
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Gamma Distributed at 5% Significance Level			
Suggested UCL to Use			
Adjusted KM-UCL (use when k<=1 and 15 < n < 50 but k<=1)	1014		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Iron			
General Statistics			
Total Number of Observations	39	Number of Distinct Observations	37
		Number of Missing Observations	34
Number of Detects	37	Number of Non-Detects	2
Number of Distinct Detects	36	Number of Distinct Non-Detects	1
Minimum Detect	60.5	Minimum Non-Detect	45.7
Maximum Detect	17400	Maximum Non-Detect	45.7
Variance Detects	10626683	Percent Non-Detects	5.128%
Mean Detects	2172	SD Detects	3260
Median Detects	977	CV Detects	1.501
Skewness Detects	3.209	Kurtosis Detects	12.97
Mean of Logged Detects	6.787	SD of Logged Detects	1.444
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.644	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.936	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.259	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.144	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	2063	KM Standard Error of Mean	514.1
KM SD	3167	95% KM (BCA) UCL	3031
95% KM (t) UCL	2930	95% KM (Percentile Bootstrap) UCL	2936
95% KM (z) UCL	2909	95% KM Bootstrap t UCL	3598
90% KM Chebyshev UCL	3606	95% KM Chebyshev UCL	4304
97.5% KM Chebyshev UCL	5274	99% KM Chebyshev UCL	7179
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	0.628	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.795	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.127	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.151	Detected data appear Gamma Distributed at 5% Significance Level	

Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.677	k star (bias corrected MLE)	0.64
Theta hat (MLE)	3209	Theta star (bias corrected MLE)	3394
nu hat (MLE)	50.1	nu star (bias corrected)	47.37
Mean (detects)	2172		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	2061
Maximum	17400	Median	960
SD	3210	CV	1.557
k hat (MLE)	0.452	k star (bias corrected MLE)	0.434
Theta hat (MLE)	4562	Theta star (bias corrected MLE)	4747
nu hat (MLE)	35.24	nu star (bias corrected)	33.86
Adjusted Level of Significance (β)	0.0437		
Approximate Chi Square Value (33.86, α)	21.55	Adjusted Chi Square Value (33.86, β)	21.17
95% Gamma Approximate UCL (use when n>=50)	3238	95% Gamma Adjusted UCL (use when n<50)	3297
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	2063	SD (KM)	3167
Variance (KM)	10029284	SE of Mean (KM)	514.1
k hat (KM)	0.424	k star (KM)	0.409
nu hat (KM)	33.11	nu star (KM)	31.9
theta hat (KM)	4861	theta star (KM)	5046
80% gamma percentile (KM)	3338	90% gamma percentile (KM)	5805
95% gamma percentile (KM)	8508	99% gamma percentile (KM)	15288
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (31.90, α)	19.99	Adjusted Chi Square Value (31.90, β)	19.62
95% Gamma Approximate KM-UCL (use when n>=50)	3292	95% Gamma Adjusted KM-UCL (use when n<50)	3355
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.968	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.936	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.104	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.144	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	2062	Mean in Log Scale	6.608
SD in Original Scale	3209	SD in Log Scale	1.609
95% t UCL (assumes normality of ROS data)	2929	95% Percentile Bootstrap UCL	2961
95% BCA Bootstrap UCL	3284	95% Bootstrap t UCL	3485
95% H-UCL (Log ROS)	6215		

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	6.635	KM Geo Mean	761
KM SD (logged)	1.534	95% Critical H Value (KM-Log)	3.086
KM Standard Error of Mean (logged)	0.249	95% H-UCL (KM -Log)	5320
KM SD (logged)	1.534	95% Critical H Value (KM-Log)	3.086
KM Standard Error of Mean (logged)	0.249		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	2062	Mean in Log Scale	6.599
SD in Original Scale	3209	SD in Log Scale	1.626
95% t UCL (Assumes normality)	2928	95% H-Stat UCL	6434
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Gamma Distributed at 5% Significance Level			
Suggested UCL to Use			
Adjusted KM-UCL (use when k<=1 and 15 < n < 50 but k<=1)	3355		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Lead			
General Statistics			
Total Number of Observations	39	Number of Distinct Observations	26
		Number of Missing Observations	34
Number of Detects	26	Number of Non-Detects	13
Number of Distinct Detects	25	Number of Distinct Non-Detects	2
Minimum Detect	0.38	Minimum Non-Detect	0.37
Maximum Detect	26.8	Maximum Non-Detect	0.38
Variance Detects	27.88	Percent Non-Detects	33.33%
Mean Detects	2.488	SD Detects	5.28
Median Detects	0.82	CV Detects	2.122
Skewness Detects	4.263	Kurtosis Detects	19.55
Mean of Logged Detects	0.15	SD of Logged Detects	1.002
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.408	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.92	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.383	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.17	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	1.782	KM Standard Error of Mean	0.709

KM SD	4.344	95% KM (BCA) UCL	3.173
95% KM (t) UCL	2.978	95% KM (Percentile Bootstrap) UCL	2.983
95% KM (z) UCL	2.949	95% KM Bootstrap t UCL	5.532
90% KM Chebyshev UCL	3.91	95% KM Chebyshev UCL	4.874
97.5% KM Chebyshev UCL	6.212	99% KM Chebyshev UCL	8.839
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	3.153	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.783	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.278	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.178	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.782	k star (bias corrected MLE)	0.717
Theta hat (MLE)	3.181	Theta star (bias corrected MLE)	3.468
nu hat (MLE)	40.67	nu star (bias corrected)	37.31
Mean (detects)	2.488		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	1.662
Maximum	26.8	Median	0.63
SD	4.443	CV	2.673
k hat (MLE)	0.347	k star (bias corrected MLE)	0.337
Theta hat (MLE)	4.795	Theta star (bias corrected MLE)	4.931
nu hat (MLE)	27.04	nu star (bias corrected)	26.29
Adjusted Level of Significance (β)	0.0437		
Approximate Chi Square Value (26.29, α)	15.6	Adjusted Chi Square Value (26.29, β)	15.28
95% Gamma Approximate UCL (use when n>=50)	2.8	95% Gamma Adjusted UCL (use when n<50)	2.86
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	1.782	SD (KM)	4.344
Variance (KM)	18.87	SE of Mean (KM)	0.709
k hat (KM)	0.168	k star (KM)	0.172
nu hat (KM)	13.13	nu star (KM)	13.45
theta hat (KM)	10.59	theta star (KM)	10.33
80% gamma percentile (KM)	2.151	90% gamma percentile (KM)	5.361
95% gamma percentile (KM)	9.522	99% gamma percentile (KM)	21.27
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (13.45, α)	6.199	Adjusted Chi Square Value (13.45, β)	6.004
95% Gamma Approximate KM-UCL (use when n>=50)	3.868	95% Gamma Adjusted KM-UCL (use when n<50)	3.993
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.829	**Shapiro Wilk GOF Test**	

5% Shapiro Wilk Critical Value	0.92	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.18	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.17	Detected Data Not Lognormal at 5% Significance Level	
Detected Data Not Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	1.701	Mean in Log Scale	-0.643
SD in Original Scale	4.429	SD in Log Scale	1.444
95% t UCL (assumes normality of ROS data)	2.897	95% Percentile Bootstrap UCL	3
95% BCA Bootstrap UCL	4.044	95% Bootstrap t UCL	5.649
95% H-UCL (Log ROS)	2.985		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-0.231	KM Geo Mean	0.794
KM SD (logged)	0.967	95% Critical H Value (KM-Log)	2.364
KM Standard Error of Mean (logged)	0.158	95% H-UCL (KM -Log)	1.835
KM SD (logged)	0.967	95% Critical H Value (KM-Log)	2.364
KM Standard Error of Mean (logged)	0.158		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	1.721	Mean in Log Scale	-0.462
SD in Original Scale	4.421	SD in Log Scale	1.196
95% t UCL (Assumes normality)	2.914	95% H-Stat UCL	2.149
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution at 5% Significance Level			
Suggested UCL to Use			
95% KM (Chebyshev) UCL	4.874		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Manganese			
General Statistics			
Total Number of Observations	39	Number of Distinct Observations	34
		Number of Missing Observations	34
Number of Detects	32	Number of Non-Detects	7
Number of Distinct Detects	32	Number of Distinct Non-Detects	2
Minimum Detect	3.8	Minimum Non-Detect	2.5
Maximum Detect	1810	Maximum Non-Detect	2.7
Variance Detects	108521	Percent Non-Detects	17.95%
Mean Detects	207	SD Detects	329.4
Median Detects	101.1	CV Detects	1.592
Skewness Detects	3.972	Kurtosis Detects	18.77

Mean of Logged Detects	4.522	SD of Logged Detects	1.395
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.559	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.93	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.269	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.154	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	170.3	KM Standard Error of Mean	49.46
KM SD	304	95% KM (BCA) UCL	247.5
95% KM (t) UCL	253.7	95% KM (Percentile Bootstrap) UCL	257.7
95% KM (z) UCL	251.6	95% KM Bootstrap t UCL	342.7
90% KM Chebyshev UCL	318.7	95% KM Chebyshev UCL	385.9
97.5% KM Chebyshev UCL	479.1	99% KM Chebyshev UCL	662.4
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	0.471	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.789	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.128	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.162	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.739	k star (bias corrected MLE)	0.691
Theta hat (MLE)	279.9	Theta star (bias corrected MLE)	299.5
nu hat (MLE)	47.33	nu star (bias corrected)	44.22
Mean (detects)	207		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	169.8
Maximum	1810	Median	85.7
SD	308.2	CV	1.815
k hat (MLE)	0.305	k star (bias corrected MLE)	0.299
Theta hat (MLE)	556.1	Theta star (bias corrected MLE)	568
nu hat (MLE)	23.82	nu star (bias corrected)	23.32
Adjusted Level of Significance (β)	0.0437		
Approximate Chi Square Value (23.32, α)	13.33	Adjusted Chi Square Value (23.32, β)	13.04
95% Gamma Approximate UCL (use when n>=50)	297	95% Gamma Adjusted UCL (use when n<50)	303.8
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	170.3	SD (KM)	304
Variance (KM)	92418	SE of Mean (KM)	49.46
k hat (KM)	0.314	k star (KM)	0.307

nu hat (KM)	24.47	nu star (KM)	23.92
theta hat (KM)	542.8	theta star (KM)	555.2
80% gamma percentile (KM)	262.5	90% gamma percentile (KM)	500.9
95% gamma percentile (KM)	773.4	99% gamma percentile (KM)	1480
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (23.92, α)	13.79	Adjusted Chi Square Value (23.92, β)	13.48
95% Gamma Approximate KM-UCL (use when n>=50)	295.4	95% Gamma Adjusted KM-UCL (use when n<50)	302.1
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.975	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.93	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.105	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.154	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	170.6	Mean in Log Scale	3.96
SD in Original Scale	307.8	SD in Log Scale	1.766
95% t UCL (assumes normality of ROS data)	253.7	95% Percentile Bootstrap UCL	261.6
95% BCA Bootstrap UCL	294.8	95% Bootstrap t UCL	339.3
95% H-UCL (Log ROS)	663.4		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	3.874	KM Geo Mean	48.15
KM SD (logged)	1.86	95% Critical H Value (KM-Log)	3.553
KM Standard Error of Mean (logged)	0.303	95% H-UCL (KM -Log)	794
KM SD (logged)	1.86	95% Critical H Value (KM-Log)	3.553
KM Standard Error of Mean (logged)	0.303		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	170.1	Mean in Log Scale	3.762
SD in Original Scale	308.1	SD in Log Scale	2.072
95% t UCL (Assumes normality)	253.2	95% H-Stat UCL	1352
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Gamma Distributed at 5% Significance Level			
Suggested UCL to Use			
Adjusted KM-UCL (use when k<=1 and 15 < n < 50 but k<=1)	302.1		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Antimony			

ProUCL Output
Below Upper Hydrogeologic Unit Groundwater
Columbia Falls Aluminum Facility
Columbia Falls, Montana

General Statistics			
Total Number of Observations	39	Number of Distinct Observations	12
		Number of Missing Observations	34
Number of Detects	13	Number of Non-Detects	26
Number of Distinct Detects	11	Number of Distinct Non-Detects	1
Minimum Detect	0.64	Minimum Non-Detect	0.62
Maximum Detect	70.7	Maximum Non-Detect	0.62
Variance Detects	582.9	Percent Non-Detects	66.67%
Mean Detects	12.1	SD Detects	24.14
Median Detects	1.5	CV Detects	1.996
Skewness Detects	2.164	Kurtosis Detects	3.311
Mean of Logged Detects	1.065	SD of Logged Detects	1.544
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.52	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.866	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.415	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.234	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	4.445	KM Standard Error of Mean	2.407
KM SD	14.44	95% KM (BCA) UCL	9.146
95% KM (t) UCL	8.504	95% KM (Percentile Bootstrap) UCL	8.147
95% KM (z) UCL	8.405	95% KM Bootstrap t UCL	74.58
90% KM Chebyshev UCL	11.67	95% KM Chebyshev UCL	14.94
97.5% KM Chebyshev UCL	19.48	99% KM Chebyshev UCL	28.4
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	2.027	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.8	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.358	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.251	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.452	k star (bias corrected MLE)	0.399
Theta hat (MLE)	26.77	Theta star (bias corrected MLE)	30.32
nu hat (MLE)	11.75	nu star (bias corrected)	10.37
Mean (detects)	12.1		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	4.038
Maximum	70.7	Median	0.01
SD	14.74	CV	3.651

k hat (MLE)	0.182	k star (bias corrected MLE)	0.185
Theta hat (MLE)	22.23	Theta star (bias corrected MLE)	21.85
nu hat (MLE)	14.17	nu star (bias corrected)	14.41
Adjusted Level of Significance (β)	0.0437		
Approximate Chi Square Value (14.41, α)	6.856	Adjusted Chi Square Value (14.41, β)	6.65
95% Gamma Approximate UCL (use when n>=50)	8.491	95% Gamma Adjusted UCL (use when n<50)	8.753
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	4.445	SD (KM)	14.44
Variance (KM)	208.6	SE of Mean (KM)	2.407
k hat (KM)	0.0947	k star (KM)	0.105
nu hat (KM)	7.388	nu star (KM)	8.153
theta hat (KM)	46.93	theta star (KM)	42.53
80% gamma percentile (KM)	3.283	90% gamma percentile (KM)	12.04
95% gamma percentile (KM)	25.72	99% gamma percentile (KM)	69.05
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (8.15, α)	2.824	Adjusted Chi Square Value (8.15, β)	2.701
95% Gamma Approximate KM-UCL (use when n>=50)	12.83	95% Gamma Adjusted KM-UCL (use when n<50)	13.42
95% Gamma Adjusted KM-UCL (use when k<=1 and 15 < n < 50)			
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.782	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.866	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.265	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.234	Detected Data Not Lognormal at 5% Significance Level	
Detected Data Not Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	4.074	Mean in Log Scale	-2.347
SD in Original Scale	14.73	SD in Log Scale	3.077
95% t UCL (assumes normality of ROS data)	8.051	95% Percentile Bootstrap UCL	8.41
95% BCA Bootstrap UCL	9.684	95% Bootstrap t UCL	57.85
95% H-UCL (Log ROS)	163.1		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	0.0362	KM Geo Mean	1.037
KM SD (logged)	1.124	95% Critical H Value (KM-Log)	2.548
KM Standard Error of Mean (logged)	0.187	95% H-UCL (KM -Log)	3.102
KM SD (logged)	1.124	95% Critical H Value (KM-Log)	2.548
KM Standard Error of Mean (logged)	0.187		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	4.238	Mean in Log Scale	-0.426
SD in Original Scale	14.69	SD in Log Scale	1.376
95% t UCL (Assumes normality)	8.204	95% H-Stat UCL	3.195
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			

Data do not follow a Discernible Distribution at 5% Significance Level			
Suggested UCL to Use			
95% KM (Chebyshev) UCL	14.94		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Arsenic			
General Statistics			
Total Number of Observations	39	Number of Distinct Observations	19
		Number of Missing Observations	34
Number of Detects	22	Number of Non-Detects	17
Number of Distinct Detects	18	Number of Distinct Non-Detects	2
Minimum Detect	0.64	Minimum Non-Detect	0.64
Maximum Detect	6.2	Maximum Non-Detect	0.77
Variance Detects	2.625	Percent Non-Detects	43.59%
Mean Detects	2.252	SD Detects	1.62
Median Detects	1.8	CV Detects	0.719
Skewness Detects	1.071	Kurtosis Detects	0.263
Mean of Logged Detects	0.572	SD of Logged Detects	0.711
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.861	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.911	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.219	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.184	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	1.555	KM Standard Error of Mean	0.234
KM SD	1.429	95% KM (BCA) UCL	1.919
95% KM (t) UCL	1.95	95% KM (Percentile Bootstrap) UCL	1.938
95% KM (z) UCL	1.941	95% KM Bootstrap t UCL	2.06
90% KM Chebyshev UCL	2.258	95% KM Chebyshev UCL	2.577
97.5% KM Chebyshev UCL	3.019	99% KM Chebyshev UCL	3.887
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	0.649	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.755	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.148	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.188	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	2.235	k star (bias corrected MLE)	1.96
Theta hat (MLE)	1.008	Theta star (bias corrected MLE)	1.149

nu hat (MLE)	98.32	nu star (bias corrected)	86.25
Mean (detects)	2.252		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	1.294
Maximum	6.2	Median	0.78
SD	1.635	CV	1.264
k hat (MLE)	0.389	k star (bias corrected MLE)	0.376
Theta hat (MLE)	3.331	Theta star (bias corrected MLE)	3.444
nu hat (MLE)	30.31	nu star (bias corrected)	29.31
Adjusted Level of Significance (β)	0.0437		
Approximate Chi Square Value (29.31, α)	17.95	Adjusted Chi Square Value (29.31, β)	17.6
95% Gamma Approximate UCL (use when n>=50)	2.113	95% Gamma Adjusted UCL (use when n<50)	2.156
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	1.555	SD (KM)	1.429
Variance (KM)	2.043	SE of Mean (KM)	0.234
k hat (KM)	1.184	k star (KM)	1.11
nu hat (KM)	92.32	nu star (KM)	86.56
theta hat (KM)	1.314	theta star (KM)	1.401
80% gamma percentile (KM)	2.48	90% gamma percentile (KM)	3.49
95% gamma percentile (KM)	4.491	99% gamma percentile (KM)	6.799
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (86.56, α)	66.11	Adjusted Chi Square Value (86.56, β)	65.4
95% Gamma Approximate KM-UCL (use when n>=50)	2.036	95% Gamma Adjusted KM-UCL (use when n<50)	2.058
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.932	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.911	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.148	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.184	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	1.424	Mean in Log Scale	-0.193
SD in Original Scale	1.541	SD in Log Scale	1.092
95% t UCL (assumes normality of ROS data)	1.84	95% Percentile Bootstrap UCL	1.821
95% BCA Bootstrap UCL	1.873	95% Bootstrap t UCL	1.927
95% H-UCL (Log ROS)	2.336		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	0.136	KM Geo Mean	1.146
KM SD (logged)	0.72	95% Critical H Value (KM-Log)	2.106
KM Standard Error of Mean (logged)	0.118	95% H-UCL (KM -Log)	1.9

KM SD (logged)	0.72	95% Critical H Value (KM-Log)	2.106
KM Standard Error of Mean (logged)	0.118		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	1.432	Mean in Log Scale	-0.112
SD in Original Scale	1.531	SD in Log Scale	0.951
95% t UCL (Assumes normality)	1.845	95% H-Stat UCL	2.017

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Gamma Distributed at 5% Significance Level

Suggested UCL to Use

95% KM Adjusted Gamma UCL	2.058	95% GROS Adjusted Gamma UCL	2.156

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Barium

General Statistics

Total Number of Observations	39	Number of Distinct Observations	38
		Number of Missing Observations	34
Minimum	21	Mean	262.8
Maximum	2310	Median	121
SD	468	Std. Error of Mean	74.95
Coefficient of Variation	1.781	Skewness	3.38

Normal GOF Test

Shapiro Wilk Test Statistic	0.502	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.939	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.308	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.14	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	389.2	95% Adjusted-CLT UCL (Chen-1995)	429.4
		95% Modified-t UCL (Johnson-1978)	395.9

Gamma GOF Test

A-D Test Statistic	2.486	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.786	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.206	**Kolmogorov-Smirnov Gamma GOF Test**
5% K-S Critical Value	0.147	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics			
k hat (MLE)	0.808	k star (bias corrected MLE)	0.763
Theta hat (MLE)	325	Theta star (bias corrected MLE)	344.2
nu hat (MLE)	63.06	nu star (bias corrected)	59.55
MLE Mean (bias corrected)	262.8	MLE Sd (bias corrected)	300.8
		Approximate Chi Square Value (0.05)	42.8
Adjusted Level of Significance	0.0437	Adjusted Chi Square Value	42.24
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	365.6	95% Adjusted Gamma UCL (use when n<50)	370.4
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.944	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.939	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.103	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.14	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	3.045	Mean of logged Data	4.838
Maximum of Logged Data	7.745	SD of logged Data	1.088
Assuming Lognormal Distribution			
95% H-UCL	355.1	90% Chebyshev (MVUE) UCL	361.4
95% Chebyshev (MVUE) UCL	424.1	97.5% Chebyshev (MVUE) UCL	511.1
99% Chebyshev (MVUE) UCL	682.1		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	386.1	95% Jackknife UCL	389.2
95% Standard Bootstrap UCL	387.2	95% Bootstrap-t UCL	515.3
95% Hall's Bootstrap UCL	427.5	95% Percentile Bootstrap UCL	396.2
95% BCA Bootstrap UCL	433.4		
90% Chebyshev(Mean, Sd) UCL	487.6	95% Chebyshev(Mean, Sd) UCL	589.5
97.5% Chebyshev(Mean, Sd) UCL	730.8	99% Chebyshev(Mean, Sd) UCL	1009
Suggested UCL to Use			
95% H-UCL	355.1		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
ProUCL computes and outputs H-statistic based UCLs for historical reasons only.			
H-statistic often results in unstable (both high and low) values of UCL95 as shown in examples in the Technical Guide.			
It is therefore recommended to avoid the use of H-statistic based 95% UCLs.			

Use of nonparametric methods are preferred to compute UCL95 for skewed data sets which do not follow a gamma distribution.

Cobalt

General Statistics

Total Number of Observations	39	Number of Distinct Observations	3
		Number of Missing Observations	34
Number of Detects	2	Number of Non-Detects	37
Number of Distinct Detects	2	Number of Distinct Non-Detects	1
Minimum Detect	1.8	Minimum Non-Detect	1.3
Maximum Detect	4.4	Maximum Non-Detect	1.3
Variance Detects	3.38	Percent Non-Detects	94.87%
Mean Detects	3.1	SD Detects	1.838
Median Detects	3.1	CV Detects	0.593
Skewness Detects	N/A	Kurtosis Detects	N/A
Mean of Logged Detects	1.035	SD of Logged Detects	0.632

Warning: Data set has only 2 Detected Values.

This is not enough to compute meaningful or reliable statistics and estimates.

Normal GOF Test on Detects Only

Not Enough Data to Perform GOF Test

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	1.392	KM Standard Error of Mean	0.112
KM SD	0.494	95% KM (BCA) UCL	N/A
95% KM (t) UCL	1.581	95% KM (Percentile Bootstrap) UCL	N/A
95% KM (z) UCL	1.576	95% KM Bootstrap t UCL	N/A
90% KM Chebyshev UCL	1.728	95% KM Chebyshev UCL	1.88
97.5% KM Chebyshev UCL	2.091	99% KM Chebyshev UCL	2.506

Gamma GOF Tests on Detected Observations Only

Not Enough Data to Perform GOF Test

Gamma Statistics on Detected Data Only

k hat (MLE)	5.331	k star (bias corrected MLE)	N/A
Theta hat (MLE)	0.581	Theta star (bias corrected MLE)	N/A
nu hat (MLE)	21.33	nu star (bias corrected)	N/A
Mean (detects)	3.1		

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	1.392	SD (KM)	0.494
Variance (KM)	0.244	SE of Mean (KM)	0.112
k hat (KM)	7.935	k star (KM)	7.342
nu hat (KM)	618.9	nu star (KM)	572.7
theta hat (KM)	0.175	theta star (KM)	0.19
80% gamma percentile (KM)	1.796	90% gamma percentile (KM)	2.078
95% gamma percentile (KM)	2.331	99% gamma percentile (KM)	2.856

Gamma Kaplan-Meier (KM) Statistics			
		Adjusted Level of Significance (β)	0.0437
Approximate Chi Square Value (572.65, α)	518.1	Adjusted Chi Square Value (572.65, β)	516.1
95% Gamma Approximate KM-UCL (use when n>=50)	1.539	95% Gamma Adjusted KM-UCL (use when n<50)	1.545

Lognormal GOF Test on Detected Observations Only
Not Enough Data to Perform GOF Test

Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.207	Mean in Log Scale	-4.909
SD in Original Scale	0.752	SD in Log Scale	2.868
95% t UCL (assumes normality of ROS data)	0.41	95% Percentile Bootstrap UCL	0.426
95% BCA Bootstrap UCL	0.573	95% Bootstrap t UCL	1.455
95% H-UCL (Log ROS)	4.834		

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	0.302	KM Geo Mean	1.353
KM SD (logged)	0.198	95% Critical H Value (KM-Log)	1.737
KM Standard Error of Mean (logged)	0.0449	95% H-UCL (KM -Log)	1.459
KM SD (logged)	0.198	95% Critical H Value (KM-Log)	1.737
KM Standard Error of Mean (logged)	0.0449		

DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.776	Mean in Log Scale	-0.356
SD in Original Scale	0.623	SD in Log Scale	0.343
95% t UCL (Assumes normality)	0.944	95% H-Stat UCL	0.822
DL/2 is not a recommended method, provided for comparisons and historical reasons			

Nonparametric Distribution Free UCL Statistics
Data do not follow a Discernible Distribution at 5% Significance Level

Suggested UCL to Use			
95% KM (Chebyshev) UCL	1.88		

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Vanadium

General Statistics			
Total Number of Observations	39	Number of Distinct Observations	7
		Number of Missing Observations	34
Number of Detects	9	Number of Non-Detects	30
Number of Distinct Detects	7	Number of Distinct Non-Detects	2
Minimum Detect	1.2	Minimum Non-Detect	1.2
Maximum Detect	9.9	Maximum Non-Detect	1.9
Variance Detects	10.39	Percent Non-Detects	76.92%

Mean Detects	4.244	SD Detects	3.223
Median Detects	2.1	CV Detects	0.759
Skewness Detects	0.948	Kurtosis Detects	-0.583
Mean of Logged Detects	1.19	SD of Logged Detects	0.758
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.822	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.829	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.303	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.274	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	1.903	KM Standard Error of Mean	0.33
KM SD	1.943	95% KM (BCA) UCL	2.513
95% KM (t) UCL	2.459	95% KM (Percentile Bootstrap) UCL	2.451
95% KM (z) UCL	2.445	95% KM Bootstrap t UCL	2.824
90% KM Chebyshev UCL	2.893	95% KM Chebyshev UCL	3.341
97.5% KM Chebyshev UCL	3.964	99% KM Chebyshev UCL	5.186
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	0.66	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.729	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.305	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.282	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected data follow Appr. Gamma Distribution at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	2.104	k star (bias corrected MLE)	1.477
Theta hat (MLE)	2.017	Theta star (bias corrected MLE)	2.874
nu hat (MLE)	37.87	nu star (bias corrected)	26.58
Mean (detects)	4.244		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	0.987
Maximum	9.9	Median	0.01
SD	2.335	CV	2.366
k hat (MLE)	0.222	k star (bias corrected MLE)	0.222
Theta hat (MLE)	4.44	Theta star (bias corrected MLE)	4.44
nu hat (MLE)	17.34	nu star (bias corrected)	17.34
Adjusted Level of Significance (β)	0.0437		
Approximate Chi Square Value (17.34, α)	8.917	Adjusted Chi Square Value (17.34, β)	8.678
95% Gamma Approximate UCL (use when n>=50)	1.92	95% Gamma Adjusted UCL (use when n<50)	1.973
Estimates of Gamma Parameters using KM Estimates			

Mean (KM)	1.903	SD (KM)	1.943
Variance (KM)	3.776	SE of Mean (KM)	0.33
k hat (KM)	0.959	k star (KM)	0.902
nu hat (KM)	74.77	nu star (KM)	70.35
theta hat (KM)	1.985	theta star (KM)	2.109
80% gamma percentile (KM)	3.086	90% gamma percentile (KM)	4.493
95% gamma percentile (KM)	5.912	99% gamma percentile (KM)	9.233
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (70.35, α)	52.04	Adjusted Chi Square Value (70.35, β)	51.42
95% Gamma Approximate KM-UCL (use when n>=50)	2.572	95% Gamma Adjusted KM-UCL (use when n<50)	2.603
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.884	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.829	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.278	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.274	Detected Data Not Lognormal at 5% Significance Level	
Detected Data appear Approximate Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	1.198	Mean in Log Scale	-1.123
SD in Original Scale	2.259	SD in Log Scale	1.694
95% t UCL (assumes normality of ROS data)	1.807	95% Percentile Bootstrap UCL	1.822
95% BCA Bootstrap UCL	1.968	95% Bootstrap t UCL	2.131
95% H-UCL (Log ROS)	3.388		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	0.415	KM Geo Mean	1.514
KM SD (logged)	0.546	95% Critical H Value (KM-Log)	1.954
KM Standard Error of Mean (logged)	0.0927	95% H-UCL (KM -Log)	2.089
KM SD (logged)	0.546	95% Critical H Value (KM-Log)	1.954
KM Standard Error of Mean (logged)	0.0927		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	1.513	Mean in Log Scale	-0.0242
SD in Original Scale	2.122	SD in Log Scale	0.779
95% t UCL (Assumes normality)	2.086	95% H-Stat UCL	1.738
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Approximate Gamma Distributed at 5% Significance Level			
Suggested UCL to Use			
95% KM Adjusted Gamma UCL	2.603	95% GROS Adjusted Gamma UCL	1.973
When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test			
When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Zinc

General Statistics

Total Number of Observations	39	Number of Distinct Observations	29
		Number of Missing Observations	34
Number of Detects	29	Number of Non-Detects	10
Number of Distinct Detects	27	Number of Distinct Non-Detects	2
Minimum Detect	5.7	Minimum Non-Detect	5.4
Maximum Detect	907	Maximum Non-Detect	7
Variance Detects	48309	Percent Non-Detects	25.64%
Mean Detects	106.6	SD Detects	219.8
Median Detects	15.5	CV Detects	2.063
Skewness Detects	2.934	Kurtosis Detects	8.256
Mean of Logged Detects	3.361	SD of Logged Detects	1.498

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.512	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.926	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.323	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.161	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	80.65	KM Standard Error of Mean	31.19
KM SD	191.4	95% KM (BCA) UCL	140.6
95% KM (t) UCL	133.2	95% KM (Percentile Bootstrap) UCL	140.1
95% KM (z) UCL	131.9	95% KM Bootstrap t UCL	215.9
90% KM Chebyshev UCL	174.2	95% KM Chebyshev UCL	216.6
97.5% KM Chebyshev UCL	275.4	99% KM Chebyshev UCL	391

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	2.729	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.814	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.248	**Kolmogorov-Smirnov GOF**
5% K-S Critical Value	0.172	Detected Data Not Gamma Distributed at 5% Significance Level

Detected Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	0.487	k star (bias corrected MLE)	0.46
Theta hat (MLE)	218.6	Theta star (bias corrected MLE)	231.6
nu hat (MLE)	28.27	nu star (bias corrected)	26.68
Mean (detects)	106.6		

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)

For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	79.24
Maximum	907	Median	11.3
SD	194.5	CV	2.454
k hat (MLE)	0.235	k star (bias corrected MLE)	0.234
Theta hat (MLE)	337.4	Theta star (bias corrected MLE)	338.8
nu hat (MLE)	18.32	nu star (bias corrected)	18.25
Adjusted Level of Significance (β)	0.0437		
Approximate Chi Square Value (18.25, α)	9.568	Adjusted Chi Square Value (18.25, β)	9.32
95% Gamma Approximate UCL (use when n>=50)	151.1	95% Gamma Adjusted UCL (use when n<50)	155.1
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	80.65	SD (KM)	191.4
Variance (KM)	36631	SE of Mean (KM)	31.19
k hat (KM)	0.178	k star (KM)	0.181
nu hat (KM)	13.85	nu star (KM)	14.12
theta hat (KM)	454.2	theta star (KM)	445.6
80% gamma percentile (KM)	100.4	90% gamma percentile (KM)	243.3
95% gamma percentile (KM)	426.1	99% gamma percentile (KM)	937.9
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (14.12, α)	6.651	Adjusted Chi Square Value (14.12, β)	6.449
95% Gamma Approximate KM-UCL (use when n>=50)	171.2	95% Gamma Adjusted KM-UCL (use when n<50)	176.5
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.862	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.926	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.212	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.161	Detected Data Not Lognormal at 5% Significance Level	
Detected Data Not Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	79.55	Mean in Log Scale	2.491
SD in Original Scale	194.3	SD in Log Scale	2.013
95% t UCL (assumes normality of ROS data)	132	95% Percentile Bootstrap UCL	132.7
95% BCA Bootstrap UCL	160.2	95% Bootstrap t UCL	218
95% H-UCL (Log ROS)	314.2		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	2.935	KM Geo Mean	18.82
KM SD (logged)	1.462	95% Critical H Value (KM-Log)	2.987
KM Standard Error of Mean (logged)	0.238	95% H-UCL (KM -Log)	111.3
KM SD (logged)	1.462	95% Critical H Value (KM-Log)	2.987
KM Standard Error of Mean (logged)	0.238		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	79.99	Mean in Log Scale	2.774

SD in Original Scale	194.2	SD in Log Scale	1.638
95% t UCL (Assumes normality)	132.4	95% H-Stat UCL	144.6
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution at 5% Significance Level			
Suggested UCL to Use			
95% KM (Chebyshev) UCL	216.6		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			

ProUCL Output
Recreational Trespasser (ATV Riding) Surface Water
Columbia Falls Aluminum Facility
Columbia Falls, Montana

UCL Statistics for Data Sets with Non-Detects	
User Selected Options	
Date/Time of Computation	ProUCL 5.12/4/2019 7:51:36 PM
From File	20190204_MPAISM0-2_ATV_Hunt_ProUCL_input REv2_a.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Fluoride

General Statistics			
Total Number of Observations	64	Number of Distinct Observations	49
		Number of Missing Observations	5
Number of Detects	58	Number of Non-Detects	6
Number of Distinct Detects	48	Number of Distinct Non-Detects	1
Minimum Detect	38.7	Minimum Non-Detect	12
Maximum Detect	2600	Maximum Non-Detect	12
Variance Detects	109612	Percent Non-Detects	9.375%
Mean Detects	188.2	SD Detects	331.1
Median Detects	130	CV Detects	1.759
Skewness Detects	7.021	Kurtosis Detects	51.75
Mean of Logged Detects	4.906	SD of Logged Detects	0.654

Normal GOF Test on Detects Only		
Shapiro Wilk Test Statistic	0.301	**Normal GOF Test on Detected Observations Only**
5% Shapiro Wilk P Value	0	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.365	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.116	Detected Data Not Normal at 5% Significance Level
Detected Data Not Normal at 5% Significance Level		

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	171.7	KM Standard Error of Mean	39.93
KM SD	316.6	95% KM (BCA) UCL	256.1
95% KM (t) UCL	238.3	95% KM (Percentile Bootstrap) UCL	249
95% KM (z) UCL	237.3	95% KM Bootstrap t UCL	388.3
90% KM Chebyshev UCL	291.4	95% KM Chebyshev UCL	345.7
97.5% KM Chebyshev UCL	421	99% KM Chebyshev UCL	568.9

Gamma GOF Tests on Detected Observations Only		
A-D Test Statistic	4.176	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.767	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.212	**Kolmogorov-Smirnov GOF**
5% K-S Critical Value	0.119	Detected Data Not Gamma Distributed at 5% Significance Level
Detected Data Not Gamma Distributed at 5% Significance Level		

Gamma Statistics on Detected Data Only			
k hat (MLE)	1.655	k star (bias corrected MLE)	1.581
Theta hat (MLE)	113.7	Theta star (bias corrected MLE)	119
nu hat (MLE)	192	nu star (bias corrected)	183.4

Mean (detects)	188.2		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	170.5
Maximum	2600	Median	125.5
SD	319.7	CV	1.875
k hat (MLE)	0.556	k star (bias corrected MLE)	0.54
Theta hat (MLE)	306.9	Theta star (bias corrected MLE)	315.8
nu hat (MLE)	71.13	nu star (bias corrected)	69.13
Adjusted Level of Significance (β)	0.0463		
Approximate Chi Square Value (69.13, α)	50.99	Adjusted Chi Square Value (69.13, β)	50.63
95% Gamma Approximate UCL (use when n>=50)	231.2	95% Gamma Adjusted UCL (use when n<50)	232.8
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	171.7	SD (KM)	316.6
Variance (KM)	100260	SE of Mean (KM)	39.93
k hat (KM)	0.294	k star (KM)	0.291
nu hat (KM)	37.62	nu star (KM)	37.19
theta hat (KM)	584.1	theta star (KM)	590.8
80% gamma percentile (KM)	261.1	90% gamma percentile (KM)	508.2
95% gamma percentile (KM)	793.3	99% gamma percentile (KM)	1537
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (37.19, α)	24.23	Adjusted Chi Square Value (37.19, β)	23.99
95% Gamma Approximate KM-UCL (use when n>=50)	263.5	95% Gamma Adjusted KM-UCL (use when n<50)	266.1
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Approximate Test Statistic	0.889	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	1.3491E-5	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.147	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.116	Detected Data Not Lognormal at 5% Significance Level	
Detected Data Not Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	173.7	Mean in Log Scale	4.774
SD in Original Scale	318.2	SD in Log Scale	0.75
95% t UCL (assumes normality of ROS data)	240.1	95% Percentile Bootstrap UCL	248.8
95% BCA Bootstrap UCL	313.3	95% Bootstrap t UCL	403.2
95% H-UCL (Log ROS)	190.3		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	4.679	KM Geo Mean	107.7
KM SD (logged)	0.938	95% Critical H Value (KM-Log)	2.213
KM Standard Error of Mean (logged)	0.118	95% H-UCL (KM -Log)	217
KM SD (logged)	0.938	95% Critical H Value (KM-Log)	2.213

KM Standard Error of Mean (logged)	0.118		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	171.1	Mean in Log Scale	4.614
SD in Original Scale	319.4	SD in Log Scale	1.107
95% t UCL (Assumes normality)	237.8	95% H-Stat UCL	255.3
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution at 5% Significance Level			
Suggested UCL to Use			
95% KM (Chebyshev) UCL	345.7		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Cyanide			
General Statistics			
Total Number of Observations	58	Number of Distinct Observations	8
		Number of Missing Observations	10
Number of Detects	8	Number of Non-Detects	50
Number of Distinct Detects	7	Number of Distinct Non-Detects	2
Minimum Detect	2	Minimum Non-Detect	2
Maximum Detect	15.3	Maximum Non-Detect	4
Variance Detects	24.26	Percent Non-Detects	86.21%
Mean Detects	5.325	SD Detects	4.926
Median Detects	2.85	CV Detects	0.925
Skewness Detects	1.619	Kurtosis Detects	1.531
Mean of Logged Detects	1.378	SD of Logged Detects	0.764
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.72	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.818	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.324	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.283	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	2.463	KM Standard Error of Mean	0.289
KM SD	2.06	95% KM (BCA) UCL	3.036
95% KM (t) UCL	2.947	95% KM (Percentile Bootstrap) UCL	2.943
95% KM (z) UCL	2.939	95% KM Bootstrap t UCL	4.765
90% KM Chebyshev UCL	3.331	95% KM Chebyshev UCL	3.724
97.5% KM Chebyshev UCL	4.27	99% KM Chebyshev UCL	5.341

Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	0.873	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.725	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.3	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.298	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	1.845	k star (bias corrected MLE)	1.237
Theta hat (MLE)	2.886	Theta star (bias corrected MLE)	4.306
nu hat (MLE)	29.53	nu star (bias corrected)	19.79
Mean (detects)	5.325		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	0.743
Maximum	15.3	Median	0.01
SD	2.529	CV	3.404
k hat (MLE)	0.21	k star (bias corrected MLE)	0.21
Theta hat (MLE)	3.543	Theta star (bias corrected MLE)	3.532
nu hat (MLE)	24.33	nu star (bias corrected)	24.4
Adjusted Level of Significance (β)	0.0459		
Approximate Chi Square Value (24.40, α)	14.16	Adjusted Chi Square Value (24.40, β)	13.96
95% Gamma Approximate UCL (use when n>=50)	1.281	95% Gamma Adjusted UCL (use when n<50)	1.299
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	2.463	SD (KM)	2.06
Variance (KM)	4.242	SE of Mean (KM)	0.289
k hat (KM)	1.431	k star (KM)	1.368
nu hat (KM)	166	nu star (KM)	158.7
theta hat (KM)	1.722	theta star (KM)	1.801
80% gamma percentile (KM)	3.849	90% gamma percentile (KM)	5.25
95% gamma percentile (KM)	6.619	99% gamma percentile (KM)	9.729
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (158.71, α)	130.6	Adjusted Chi Square Value (158.71, β)	129.9
95% Gamma Approximate KM-UCL (use when n>=50)	2.994	95% Gamma Adjusted KM-UCL (use when n<50)	3.009
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.823	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.818	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.267	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.283	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			

Mean in Original Scale	0.987	Mean in Log Scale	-1.534
SD in Original Scale	2.478	SD in Log Scale	1.786
95% t UCL (assumes normality of ROS data)	1.531	95% Percentile Bootstrap UCL	1.568
95% BCA Bootstrap UCL	1.78	95% Bootstrap t UCL	2.383
95% H-UCL (Log ROS)	2.44		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	0.79	KM Geo Mean	2.203
KM SD (logged)	0.356	95% Critical H Value (KM-Log)	1.743
KM Standard Error of Mean (logged)	0.05	95% H-UCL (KM -Log)	2.547
KM SD (logged)	0.356	95% Critical H Value (KM-Log)	1.743
KM Standard Error of Mean (logged)	0.05		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	1.7	Mean in Log Scale	0.262
SD in Original Scale	2.283	SD in Log Scale	0.565
95% t UCL (Assumes normality)	2.201	95% H-Stat UCL	1.761
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Lognormal Distributed at 5% Significance Level			
Suggested UCL to Use			
KM H-UCL	2.547		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
CyanideFREE			
General Statistics			
Total Number of Observations	37	Number of Distinct Observations	10
		Number of Missing Observations	32
Number of Detects	9	Number of Non-Detects	28
Number of Distinct Detects	9	Number of Distinct Non-Detects	1
Minimum Detect	1.6	Minimum Non-Detect	1.5
Maximum Detect	7.7	Maximum Non-Detect	1.5
Variance Detects	3.588	Percent Non-Detects	75.68%
Mean Detects	3.133	SD Detects	1.894
Median Detects	2.5	CV Detects	0.604
Skewness Detects	2.072	Kurtosis Detects	4.738
Mean of Logged Detects	1.021	SD of Logged Detects	0.489
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.764	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.829	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.257	**Lilliefors GOF Test**	

5% Lilliefors Critical Value	0.274	Detected Data appear Normal at 5% Significance Level	
Detected Data appear Approximate Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	1.897	KM Standard Error of Mean	0.196
KM SD	1.125	95% KM (BCA) UCL	2.262
95% KM (t) UCL	2.229	95% KM (Percentile Bootstrap) UCL	2.235
95% KM (z) UCL	2.22	95% KM Bootstrap t UCL	2.655
90% KM Chebyshev UCL	2.486	95% KM Chebyshev UCL	2.753
97.5% KM Chebyshev UCL	3.123	99% KM Chebyshev UCL	3.85
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	0.498	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.724	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.221	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.28	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	4.291	k star (bias corrected MLE)	2.935
Theta hat (MLE)	0.73	Theta star (bias corrected MLE)	1.068
nu hat (MLE)	77.24	nu star (bias corrected)	52.82
Mean (detects)	3.133		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	0.789
Maximum	7.7	Median	0.01
SD	1.619	CV	2.052
k hat (MLE)	0.252	k star (bias corrected MLE)	0.25
Theta hat (MLE)	3.126	Theta star (bias corrected MLE)	3.156
nu hat (MLE)	18.68	nu star (bias corrected)	18.5
Adjusted Level of Significance (β)	0.0431		
Approximate Chi Square Value (18.50, α)	9.753	Adjusted Chi Square Value (18.50, β)	9.476
95% Gamma Approximate UCL (use when n>=50)	1.497	95% Gamma Adjusted UCL (use when n<50)	1.54
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	1.897	SD (KM)	1.125
Variance (KM)	1.267	SE of Mean (KM)	0.196
k hat (KM)	2.842	k star (KM)	2.629
nu hat (KM)	210.3	nu star (KM)	194.6
theta hat (KM)	0.668	theta star (KM)	0.722
80% gamma percentile (KM)	2.749	90% gamma percentile (KM)	3.465
95% gamma percentile (KM)	4.138	99% gamma percentile (KM)	5.607
Gamma Kaplan-Meier (KM) Statistics			

Approximate Chi Square Value (194.57, α)	163.3	Adjusted Chi Square Value (194.57, β)	162.1
95% Gamma Approximate KM-UCL (use when n>=50)	2.261	95% Gamma Adjusted KM-UCL (use when n<50)	2.278
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.916	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.829	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.189	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.274	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	1.138	Mean in Log Scale	-0.498
SD in Original Scale	1.484	SD in Log Scale	1.158
95% t UCL (assumes normality of ROS data)	1.55	95% Percentile Bootstrap UCL	1.559
95% BCA Bootstrap UCL	1.694	95% Bootstrap t UCL	1.836
95% H-UCL (Log ROS)	1.954		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	0.555	KM Geo Mean	1.742
KM SD (logged)	0.349	95% Critical H Value (KM-Log)	1.812
KM Standard Error of Mean (logged)	0.0608	95% H-UCL (KM -Log)	2.057
KM SD (logged)	0.349	95% Critical H Value (KM-Log)	1.812
KM Standard Error of Mean (logged)	0.0608		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	1.33	Mean in Log Scale	0.0307
SD in Original Scale	1.368	SD in Log Scale	0.614
95% t UCL (Assumes normality)	1.709	95% H-Stat UCL	1.529
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Approximate Normal Distributed at 5% Significance Level			
Suggested UCL to Use			
95% KM (t) UCL	2.229		
When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test			
When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Aluminum			
General Statistics			
Total Number of Observations	64	Number of Distinct Observations	46
		Number of Missing Observations	5

Number of Detects	48	Number of Non-Detects	16
Number of Distinct Detects	44	Number of Distinct Non-Detects	2
Minimum Detect	16.1	Minimum Non-Detect	15
Maximum Detect	5750	Maximum Non-Detect	18.2
Variance Detects	735187	Percent Non-Detects	25%
Mean Detects	227.6	SD Detects	857.4
Median Detects	37.05	CV Detects	3.767
Skewness Detects	6.028	Kurtosis Detects	38.58
Mean of Logged Detects	3.902	SD of Logged Detects	1.228
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.268	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.947	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.437	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.127	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	174.5	KM Standard Error of Mean	93.54
KM SD	740.5	95% KM (BCA) UCL	348.8
95% KM (t) UCL	330.7	95% KM (Percentile Bootstrap) UCL	338.9
95% KM (z) UCL	328.4	95% KM Bootstrap t UCL	887
90% KM Chebyshev UCL	455.2	95% KM Chebyshev UCL	582.3
97.5% KM Chebyshev UCL	758.7	99% KM Chebyshev UCL	1105
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	9.087	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.832	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.365	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.137	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.427	k star (bias corrected MLE)	0.414
Theta hat (MLE)	533.3	Theta star (bias corrected MLE)	549.8
nu hat (MLE)	40.97	nu star (bias corrected)	39.74
Mean (detects)	227.6		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	170.7
Maximum	5750	Median	27.8
SD	747.2	CV	4.377
k hat (MLE)	0.216	k star (bias corrected MLE)	0.216
Theta hat (MLE)	790.1	Theta star (bias corrected MLE)	789
nu hat (MLE)	27.66	nu star (bias corrected)	27.69

Adjusted Level of Significance (β)	0.0463		
Approximate Chi Square Value (27.69, α)	16.69	Adjusted Chi Square Value (27.69, β)	16.49
95% Gamma Approximate UCL (use when n>=50)	283.3	95% Gamma Adjusted UCL (use when n<50)	286.6
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	174.5	SD (KM)	740.5
Variance (KM)	548355	SE of Mean (KM)	93.54
k hat (KM)	0.0555	k star (KM)	0.0634
nu hat (KM)	7.11	nu star (KM)	8.11
theta hat (KM)	3142	theta star (KM)	2754
80% gamma percentile (KM)	48.87	90% gamma percentile (KM)	346
95% gamma percentile (KM)	988.9	99% gamma percentile (KM)	3439
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (8.11, α)	2.799	Adjusted Chi Square Value (8.11, β)	2.728
95% Gamma Approximate KM-UCL (use when n>=50)	505.7	95% Gamma Adjusted KM-UCL (use when n<50)	519
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.746	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.947	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.243	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.127	Detected Data Not Lognormal at 5% Significance Level	
Detected Data Not Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	171.9	Mean in Log Scale	3.271
SD in Original Scale	747	SD in Log Scale	1.561
95% t UCL (assumes normality of ROS data)	327.8	95% Percentile Bootstrap UCL	349.4
95% BCA Bootstrap UCL	455.3	95% Bootstrap t UCL	925.8
95% H-UCL (Log ROS)	146.3		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	3.608	KM Geo Mean	36.89
KM SD (logged)	1.169	95% Critical H Value (KM-Log)	2.254
KM Standard Error of Mean (logged)	0.148	95% H-UCL (KM -Log)	101.8
KM SD (logged)	1.169	95% Critical H Value (KM-Log)	2.254
KM Standard Error of Mean (logged)	0.148		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	172.8	Mean in Log Scale	3.451
SD in Original Scale	746.8	SD in Log Scale	1.321
95% t UCL (Assumes normality)	328.6	95% H-Stat UCL	109.8
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution at 5% Significance Level			
Suggested UCL to Use			
95% KM (Chebyshev) UCL	582.3		

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Iron

General Statistics

Total Number of Observations	64	Number of Distinct Observations	20
		Number of Missing Observations	5
Number of Detects	17	Number of Non-Detects	47
Number of Distinct Detects	17	Number of Distinct Non-Detects	3
Minimum Detect	49.3	Minimum Non-Detect	42.4
Maximum Detect	4760	Maximum Non-Detect	49.1
Variance Detects	1627296	Percent Non-Detects	73.44%
Mean Detects	570.6	SD Detects	1276
Median Detects	99.2	CV Detects	2.236
Skewness Detects	2.897	Kurtosis Detects	7.991
Mean of Logged Detects	5.073	SD of Logged Detects	1.357

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.461	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.892	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.438	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.207	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	182.7	KM Standard Error of Mean	87.51
KM SD	679.2	95% KM (BCA) UCL	323.7
95% KM (t) UCL	328.8	95% KM (Percentile Bootstrap) UCL	346.8
95% KM (z) UCL	326.6	95% KM Bootstrap t UCL	1634
90% KM Chebyshev UCL	445.2	95% KM Chebyshev UCL	564.1
97.5% KM Chebyshev UCL	729.2	99% KM Chebyshev UCL	1053

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	2.545	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.798	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.289	**Kolmogorov-Smirnov GOF**
5% K-S Critical Value	0.221	Detected Data Not Gamma Distributed at 5% Significance Level

Detected Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	0.499	k star (bias corrected MLE)	0.45
Theta hat (MLE)	1144	Theta star (bias corrected MLE)	1268
nu hat (MLE)	16.96	nu star (bias corrected)	15.3
Mean (detects)	570.6		

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	151.6
Maximum	4760	Median	0.01
SD	691.2	CV	4.56
k hat (MLE)	0.113	k star (bias corrected MLE)	0.118
Theta hat (MLE)	1338	Theta star (bias corrected MLE)	1280
nu hat (MLE)	14.5	nu star (bias corrected)	15.15
Adjusted Level of Significance (β)	0.0463		
Approximate Chi Square Value (15.15, α)	7.368	Adjusted Chi Square Value (15.15, β)	7.242
95% Gamma Approximate UCL (use when n>=50)	311.7	95% Gamma Adjusted UCL (use when n<50)	317.1
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	182.7	SD (KM)	679.2
Variance (KM)	461245	SE of Mean (KM)	87.51
k hat (KM)	0.0724	k star (KM)	0.0794
nu hat (KM)	9.263	nu star (KM)	10.16
theta hat (KM)	2525	theta star (KM)	2301
80% gamma percentile (KM)	85.66	90% gamma percentile (KM)	431.1
95% gamma percentile (KM)	1062	99% gamma percentile (KM)	3247
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (10.16, α)	4.043	Adjusted Chi Square Value (10.16, β)	3.955
95% Gamma Approximate KM-UCL (use when n>=50)	459.2	95% Gamma Adjusted KM-UCL (use when n<50)	469.5
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.789	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.892	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.223	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.207	Detected Data Not Lognormal at 5% Significance Level	
Detected Data Not Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	154.6	Mean in Log Scale	1.484
SD in Original Scale	690.6	SD in Log Scale	2.816
95% t UCL (assumes normality of ROS data)	298.7	95% Percentile Bootstrap UCL	308.8
95% BCA Bootstrap UCL	387.3	95% Bootstrap t UCL	1321
95% H-UCL (Log ROS)	849.4		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	4.099	KM Geo Mean	60.3
KM SD (logged)	0.896	95% Critical H Value (KM-Log)	2.181
KM Standard Error of Mean (logged)	0.115	95% H-UCL (KM -Log)	115.3
KM SD (logged)	0.896	95% Critical H Value (KM-Log)	2.181
KM Standard Error of Mean (logged)	0.115		
DL/2 Statistics			

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	167.9	Mean in Log Scale	3.625
SD in Original Scale	687.7	SD in Log Scale	1.113
95% t UCL (Assumes normality)	311.4	95% H-Stat UCL	95.9
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution at 5% Significance Level			
Suggested UCL to Use			
95% KM (Chebyshev) UCL	564.1		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Manganese			
General Statistics			
Total Number of Observations	64	Number of Distinct Observations	55
		Number of Missing Observations	5
Number of Detects	61	Number of Non-Detects	3
Number of Distinct Detects	53	Number of Distinct Non-Detects	2
Minimum Detect	3	Minimum Non-Detect	2.5
Maximum Detect	3750	Maximum Non-Detect	2.7
Variance Detects	229426	Percent Non-Detects	4.688%
Mean Detects	72.89	SD Detects	479
Median Detects	7.5	CV Detects	6.572
Skewness Detects	7.794	Kurtosis Detects	60.82
Mean of Logged Detects	2.18	SD of Logged Detects	1.057
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.144	**Normal GOF Test on Detected Observations Only**	
5% Shapiro Wilk P Value	0	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.481	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.113	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	69.59	KM Standard Error of Mean	58.48
KM SD	464	95% KM (BCA) UCL	186.4
95% KM (t) UCL	167.2	95% KM (Percentile Bootstrap) UCL	186.4
95% KM (z) UCL	165.8	95% KM Bootstrap t UCL	3478
90% KM Chebyshev UCL	245	95% KM Chebyshev UCL	324.5
97.5% KM Chebyshev UCL	434.8	99% KM Chebyshev UCL	651.5
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	15.98	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.858	Detected Data Not Gamma Distributed at 5% Significance Level	

K-S Test Statistic	0.43	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.123	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.323	k star (bias corrected MLE)	0.318
Theta hat (MLE)	225.7	Theta star (bias corrected MLE)	229.2
nu hat (MLE)	39.41	nu star (bias corrected)	38.8
Mean (detects)	72.89		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	69.47
Maximum	3750	Median	7
SD	467.7	CV	6.732
k hat (MLE)	0.291	k star (bias corrected MLE)	0.288
Theta hat (MLE)	238.5	Theta star (bias corrected MLE)	241.2
nu hat (MLE)	37.28	nu star (bias corrected)	36.86
Adjusted Level of Significance (β)	0.0463		
Approximate Chi Square Value (36.86, α)	23.96	Adjusted Chi Square Value (36.86, β)	23.72
95% Gamma Approximate UCL (use when n>=50)	106.9	95% Gamma Adjusted UCL (use when n<50)	107.9
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	69.59	SD (KM)	464
Variance (KM)	215308	SE of Mean (KM)	58.48
k hat (KM)	0.0225	k star (KM)	0.0319
nu hat (KM)	2.879	nu star (KM)	4.077
theta hat (KM)	3094	theta star (KM)	2185
80% gamma percentile (KM)	1.142	90% gamma percentile (KM)	47.03
95% gamma percentile (KM)	284.2	99% gamma percentile (KM)	1767
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (4.08, α)	0.752	Adjusted Chi Square Value (4.08, β)	0.722
95% Gamma Approximate KM-UCL (use when n>=50)	377.1	95% Gamma Adjusted KM-UCL (use when n<50)	393.1
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Approximate Test Statistic	0.702	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	5.551E-16	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.208	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.113	Detected Data Not Lognormal at 5% Significance Level	
Detected Data Not Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	69.52	Mean in Log Scale	2.081
SD in Original Scale	467.7	SD in Log Scale	1.125
95% t UCL (assumes normality of ROS data)	167.1	95% Percentile Bootstrap UCL	186.4

95% BCA Bootstrap UCL	245.6	95% Bootstrap t UCL	3212
95% H-UCL (Log ROS)	20.81		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	2.12	KM Geo Mean	8.335
KM SD (logged)	1.058	95% Critical H Value (KM-Log)	2.269
KM Standard Error of Mean (logged)	0.133	95% H-UCL (KM -Log)	19.73
KM SD (logged)	1.058	95% Critical H Value (KM-Log)	2.269
KM Standard Error of Mean (logged)	0.133		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	69.53	Mean in Log Scale	2.09
SD in Original Scale	467.7	SD in Log Scale	1.109
95% t UCL (Assumes normality)	167.1	95% H-Stat UCL	20.53
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution at 5% Significance Level			
Suggested UCL to Use			
95% KM (Chebyshev) UCL	324.5		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Antimony			
General Statistics			
Total Number of Observations	64	Number of Distinct Observations	10
		Number of Missing Observations	5
Number of Detects	8	Number of Non-Detects	56
Number of Distinct Detects	8	Number of Distinct Non-Detects	2
Minimum Detect	0.64	Minimum Non-Detect	0.62
Maximum Detect	2.9	Maximum Non-Detect	0.76
Variance Detects	1.013	Percent Non-Detects	87.5%
Mean Detects	1.629	SD Detects	1.007
Median Detects	1.49	CV Detects	0.618
Skewness Detects	0.143	Kurtosis Detects	-2.451
Mean of Logged Detects	0.291	SD of Logged Detects	0.691
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.798	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.818	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.3	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.283	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.746	KM Standard Error of Mean	0.063
KM SD	0.471	95% KM (BCA) UCL	0.845
95% KM (t) UCL	0.852	95% KM (Percentile Bootstrap) UCL	0.844
95% KM (z) UCL	0.85	95% KM Bootstrap t UCL	0.891
90% KM Chebyshev UCL	0.935	95% KM Chebyshev UCL	1.021
97.5% KM Chebyshev UCL	1.14	99% KM Chebyshev UCL	1.373
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	0.897	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.722	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.306	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.297	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	2.692	k star (bias corrected MLE)	1.766
Theta hat (MLE)	0.605	Theta star (bias corrected MLE)	0.923
nu hat (MLE)	43.07	nu star (bias corrected)	28.25
Mean (detects)	1.629		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	0.219
Maximum	2.9	Median	0.01
SD	0.634	CV	2.899
k hat (MLE)	0.291	k star (bias corrected MLE)	0.288
Theta hat (MLE)	0.751	Theta star (bias corrected MLE)	0.76
nu hat (MLE)	37.28	nu star (bias corrected)	36.86
Adjusted Level of Significance (β)	0.0463		
Approximate Chi Square Value (36.86, α)	23.96	Adjusted Chi Square Value (36.86, β)	23.72
95% Gamma Approximate UCL (use when n>=50)	0.337	95% Gamma Adjusted UCL (use when n<50)	0.34
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.746	SD (KM)	0.471
Variance (KM)	0.222	SE of Mean (KM)	0.063
k hat (KM)	2.509	k star (KM)	2.402
nu hat (KM)	321.2	nu star (KM)	307.4
theta hat (KM)	0.297	theta star (KM)	0.311
80% gamma percentile (KM)	1.093	90% gamma percentile (KM)	1.391
95% gamma percentile (KM)	1.673	99% gamma percentile (KM)	2.29
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (307.44, α)	267.8	Adjusted Chi Square Value (307.44, β)	267
95% Gamma Approximate KM-UCL (use when n>=50)	0.857	95% Gamma Adjusted KM-UCL (use when n<50)	0.86

Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.783	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.818	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.282	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.283	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Approximate Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.3	Mean in Log Scale	-2.508
SD in Original Scale	0.618	SD in Log Scale	1.663
95% t UCL (assumes normality of ROS data)	0.429	95% Percentile Bootstrap UCL	0.434
95% BCA Bootstrap UCL	0.463	95% Bootstrap t UCL	0.499
95% H-UCL (Log ROS)	0.565		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-0.381	KM Geo Mean	0.683
KM SD (logged)	0.342	95% Critical H Value (KM-Log)	1.774
KM Standard Error of Mean (logged)	0.0457	95% H-UCL (KM -Log)	0.781
KM SD (logged)	0.342	95% Critical H Value (KM-Log)	1.774
KM Standard Error of Mean (logged)	0.0457		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.481	Mean in Log Scale	-0.969
SD in Original Scale	0.551	SD in Log Scale	0.536
95% t UCL (Assumes normality)	0.596	95% H-Stat UCL	0.497
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Approximate Lognormal Distributed at 5% Significance Level			
Suggested UCL to Use			
KM H-UCL	0.781		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Arsenic			
General Statistics			
Total Number of Observations	64	Number of Distinct Observations	14
		Number of Missing Observations	5
Number of Detects	13	Number of Non-Detects	51
Number of Distinct Detects	11	Number of Distinct Non-Detects	3
Minimum Detect	0.78	Minimum Non-Detect	0.64
Maximum Detect	3.7	Maximum Non-Detect	0.77
Variance Detects	0.699	Percent Non-Detects	79.69%
Mean Detects	1.333	SD Detects	0.836

Median Detects	0.95	CV Detects	0.627
Skewness Detects	2.216	Kurtosis Detects	5.212
Mean of Logged Detects	0.162	SD of Logged Detects	0.479
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.696	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.866	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.292	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.234	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.781	KM Standard Error of Mean	0.0595
KM SD	0.457	95% KM (BCA) UCL	0.888
95% KM (t) UCL	0.88	95% KM (Percentile Bootstrap) UCL	0.879
95% KM (z) UCL	0.879	95% KM Bootstrap t UCL	1.001
90% KM Chebyshev UCL	0.959	95% KM Chebyshev UCL	1.04
97.5% KM Chebyshev UCL	1.152	99% KM Chebyshev UCL	1.372
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	1.183	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.737	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.301	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.238	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	4.135	k star (bias corrected MLE)	3.232
Theta hat (MLE)	0.322	Theta star (bias corrected MLE)	0.412
nu hat (MLE)	107.5	nu star (bias corrected)	84.04
Mean (detects)	1.333		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	0.284
Maximum	3.7	Median	0.01
SD	0.647	CV	2.276
k hat (MLE)	0.303	k star (bias corrected MLE)	0.299
Theta hat (MLE)	0.938	Theta star (bias corrected MLE)	0.95
nu hat (MLE)	38.8	nu star (bias corrected)	38.32
Adjusted Level of Significance (β)	0.0463		
Approximate Chi Square Value (38.32, α)	25.14	Adjusted Chi Square Value (38.32, β)	24.89
95% Gamma Approximate UCL (use when n>=50)	0.433	95% Gamma Adjusted UCL (use when n<50)	0.438
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.781	SD (KM)	0.457

Variance (KM)	0.209	SE of Mean (KM)	0.0595
k hat (KM)	2.918	k star (KM)	2.792
nu hat (KM)	373.6	nu star (KM)	357.4
theta hat (KM)	0.268	theta star (KM)	0.28
80% gamma percentile (KM)	1.123	90% gamma percentile (KM)	1.407
95% gamma percentile (KM)	1.673	99% gamma percentile (KM)	2.252
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (357.38, α)	314.6	Adjusted Chi Square Value (357.38, β)	313.7
95% Gamma Approximate KM-UCL (use when n>=50)	0.887	95% Gamma Adjusted KM-UCL (use when n<50)	0.89
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.814	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.866	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.287	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.234	Detected Data Not Lognormal at 5% Significance Level	
Detected Data Not Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.439	Mean in Log Scale	-1.429
SD in Original Scale	0.598	SD in Log Scale	1.103
95% t UCL (assumes normality of ROS data)	0.563	95% Percentile Bootstrap UCL	0.568
95% BCA Bootstrap UCL	0.61	95% Bootstrap t UCL	0.627
95% H-UCL (Log ROS)	0.603		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-0.323	KM Geo Mean	0.724
KM SD (logged)	0.321	95% Critical H Value (KM-Log)	1.764
KM Standard Error of Mean (logged)	0.0417	95% H-UCL (KM -Log)	0.819
KM SD (logged)	0.321	95% Critical H Value (KM-Log)	1.764
KM Standard Error of Mean (logged)	0.0417		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.551	Mean in Log Scale	-0.804
SD in Original Scale	0.541	SD in Log Scale	0.54
95% t UCL (Assumes normality)	0.664	95% H-Stat UCL	0.589
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution at 5% Significance Level			
Suggested UCL to Use			
95% KM (t) UCL	0.88	KM H-UCL	0.819
95% KM (BCA) UCL	0.888		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			

Cobalt

General Statistics

Total Number of Observations	64	Number of Distinct Observations	4
		Number of Missing Observations	5
Number of Detects	2	Number of Non-Detects	62
Number of Distinct Detects	2	Number of Distinct Non-Detects	2
Minimum Detect	2	Minimum Non-Detect	1.3
Maximum Detect	2.4	Maximum Non-Detect	1.5
Variance Detects	0.08	Percent Non-Detects	96.88%
Mean Detects	2.2	SD Detects	0.283
Median Detects	2.2	CV Detects	0.129
Skewness Detects	N/A	Kurtosis Detects	N/A
Mean of Logged Detects	0.784	SD of Logged Detects	0.129

Warning: Data set has only 2 Detected Values.

This is not enough to compute meaningful or reliable statistics and estimates.

Normal GOF Test on Detects Only

Not Enough Data to Perform GOF Test

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	1.328	KM Standard Error of Mean	0.0284
KM SD	0.161	95% KM (BCA) UCL	N/A
95% KM (t) UCL	1.376	95% KM (Percentile Bootstrap) UCL	N/A
95% KM (z) UCL	1.375	95% KM Bootstrap t UCL	N/A
90% KM Chebyshev UCL	1.413	95% KM Chebyshev UCL	1.452
97.5% KM Chebyshev UCL	1.505	99% KM Chebyshev UCL	1.61

Gamma GOF Tests on Detected Observations Only

Not Enough Data to Perform GOF Test

Gamma Statistics on Detected Data Only

k hat (MLE)	120.7	k star (bias corrected MLE)	N/A
Theta hat (MLE)	0.0182	Theta star (bias corrected MLE)	N/A
nu hat (MLE)	482.7	nu star (bias corrected)	N/A
Mean (detects)	2.2		

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	1.328	SD (KM)	0.161
Variance (KM)	0.0258	SE of Mean (KM)	0.0284
k hat (KM)	68.44	k star (KM)	65.25
nu hat (KM)	8761	nu star (KM)	8352
theta hat (KM)	0.0194	theta star (KM)	0.0204
80% gamma percentile (KM)	1.464	90% gamma percentile (KM)	1.543
95% gamma percentile (KM)	1.61	99% gamma percentile (KM)	1.74

Gamma Kaplan-Meier (KM) Statistics

		Adjusted Level of Significance (β)	0.0463
Approximate Chi Square Value (N/A, α)	8140	Adjusted Chi Square Value (N/A, β)	8135
95% Gamma Approximate KM-UCL (use when n>=50)	1.363	95% Gamma Adjusted KM-UCL (use when n<50)	1.363
Lognormal GOF Test on Detected Observations Only			
Not Enough Data to Perform GOF Test			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.63	Mean in Log Scale	-0.657
SD in Original Scale	0.431	SD in Log Scale	0.627
95% t UCL (assumes normality of ROS data)	0.72	95% Percentile Bootstrap UCL	0.72
95% BCA Bootstrap UCL	0.736	95% Bootstrap t UCL	0.737
95% H-UCL (Log ROS)	0.736		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	0.279	KM Geo Mean	1.321
KM SD (logged)	0.0922	95% Critical H Value (KM-Log)	N/A
KM Standard Error of Mean (logged)	0.0163	95% H-UCL (KM -Log)	N/A
KM SD (logged)	0.0922	95% Critical H Value (KM-Log)	N/A
KM Standard Error of Mean (logged)	0.0163		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.708	Mean in Log Scale	-0.379
SD in Original Scale	0.274	SD in Log Scale	0.215
95% t UCL (Assumes normality)	0.765	95% H-Stat UCL	0.734
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution at 5% Significance Level			
Suggested UCL to Use			
95% KM (t) UCL	1.376	KM H-UCL	N/A
95% KM (BCA) UCL	N/A		
Warning: One or more Recommended UCL(s) not available!			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			

ProUCL Output
Recreational Trespasser (ATV Riding) Surface Water
Columbia Falls Aluminum Facility
Columbia Falls, Montana

UCL Statistics for Data Sets with Non-Detects	
User Selected Options	
Date/Time of Computation	ProUCL 5.12/8/2019 12:47:25 PM
From File	20190207_CYANIDE_PROUCL_INPUT_RERUNS_d.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Cyanide

General Statistics			
Total Number of Observations	68	Number of Distinct Observations	8
		Number of Missing Observations	1
Number of Detects	8	Number of Non-Detects	60
Number of Distinct Detects	7	Number of Distinct Non-Detects	2
Minimum Detect	2	Minimum Non-Detect	2
Maximum Detect	15.3	Maximum Non-Detect	4
Variance Detects	24.26	Percent Non-Detects	88.24%
Mean Detects	5.325	SD Detects	4.926
Median Detects	2.85	CV Detects	0.925
Skewness Detects	1.619	Kurtosis Detects	1.531
Mean of Logged Detects	1.378	SD of Logged Detects	0.764

Normal GOF Test on Detects Only		
Shapiro Wilk Test Statistic	0.72	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.818	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.324	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.283	Detected Data Not Normal at 5% Significance Level
Detected Data Not Normal at 5% Significance Level		

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	2.395	KM Standard Error of Mean	0.248
KM SD	1.909	95% KM (BCA) UCL	2.881
95% KM (t) UCL	2.808	95% KM (Percentile Bootstrap) UCL	2.858
95% KM (z) UCL	2.802	95% KM Bootstrap t UCL	4.177
90% KM Chebyshev UCL	3.137	95% KM Chebyshev UCL	3.474
97.5% KM Chebyshev UCL	3.941	99% KM Chebyshev UCL	4.858

Gamma GOF Tests on Detected Observations Only		
A-D Test Statistic	0.873	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.725	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.3	**Kolmogorov-Smirnov GOF**
5% K-S Critical Value	0.298	Detected Data Not Gamma Distributed at 5% Significance Level
Detected Data Not Gamma Distributed at 5% Significance Level		

Gamma Statistics on Detected Data Only			
k hat (MLE)	1.845	k star (bias corrected MLE)	1.237
Theta hat (MLE)	2.886	Theta star (bias corrected MLE)	4.306
nu hat (MLE)	29.53	nu star (bias corrected)	19.79

Mean (detects)	5.325		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	0.635
Maximum	15.3	Median	0.01
SD	2.348	CV	3.695
k hat (MLE)	0.212	k star (bias corrected MLE)	0.212
Theta hat (MLE)	3.003	Theta star (bias corrected MLE)	2.996
nu hat (MLE)	28.77	nu star (bias corrected)	28.84
Adjusted Level of Significance (β)	0.0465		
Approximate Chi Square Value (28.84, α)	17.58	Adjusted Chi Square Value (28.84, β)	17.39
95% Gamma Approximate UCL (use when n>=50)	1.042	95% Gamma Adjusted UCL (use when n<50)	1.053
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	2.395	SD (KM)	1.909
Variance (KM)	3.645	SE of Mean (KM)	0.248
k hat (KM)	1.573	k star (KM)	1.514
nu hat (KM)	213.9	nu star (KM)	205.8
theta hat (KM)	1.522	theta star (KM)	1.582
80% gamma percentile (KM)	3.701	90% gamma percentile (KM)	4.979
95% gamma percentile (KM)	6.219	99% gamma percentile (KM)	9.018
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (205.84, α)	173.6	Adjusted Chi Square Value (205.84, β)	173
95% Gamma Approximate KM-UCL (use when n>=50)	2.839	95% Gamma Adjusted KM-UCL (use when n<50)	2.849
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.823	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.818	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.267	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.283	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.853	Mean in Log Scale	-1.818
SD in Original Scale	2.309	SD in Log Scale	1.87
95% t UCL (assumes normality of ROS data)	1.32	95% Percentile Bootstrap UCL	1.341
95% BCA Bootstrap UCL	1.608	95% Bootstrap t UCL	2.108
95% H-UCL (Log ROS)	1.763		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	0.775	KM Geo Mean	2.171
KM SD (logged)	0.33	95% Critical H Value (KM-Log)	1.771
KM Standard Error of Mean (logged)	0.0429	95% H-UCL (KM -Log)	2.462
KM SD (logged)	0.33	95% Critical H Value (KM-Log)	1.771

ProUCL Output
Recreational Trespasser (ATV Riding) Surface Water
Columbia Falls Aluminum Facility
Columbia Falls, Montana

KM Standard Error of Mean (logged)	0.0429		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	1.597	Mean in Log Scale	0.223
SD in Original Scale	2.12	SD in Log Scale	0.529
95% t UCL (Assumes normality)	2.026	95% H-Stat UCL	1.625
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Lognormal Distributed at 5% Significance Level			
Suggested UCL to Use			
KM H-UCL	2.462		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			

ProUCL Output
Recreational Trespasser (ATV Riding) Sediment
Columbia Falls Aluminum Facility
Columbia Falls, Montana

UCL Statistics for Data Sets with Non-Detects	
User Selected Options	
Date/Time of Computation	ProUCL 5.12/4/2019 7:30:25 PM
From File	20190204_MPAISM0-2_ATV_Hunt_ProUCL_input REv2_b.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

BenzoBFluoranthene

General Statistics			
Total Number of Observations	25	Number of Distinct Observations	24
Number of Detects	20	Number of Non-Detects	5
Number of Distinct Detects	19	Number of Distinct Non-Detects	5
Minimum Detect	0.0035	Minimum Non-Detect	0.002
Maximum Detect	1.8	Maximum Non-Detect	0.04
Variance Detects	0.259	Percent Non-Detects	20%
Mean Detects	0.284	SD Detects	0.509
Median Detects	0.103	CV Detects	1.789
Skewness Detects	2.278	Kurtosis Detects	4.107
Mean of Logged Detects	-2.364	SD of Logged Detects	1.492

Normal GOF Test on Detects Only		
Shapiro Wilk Test Statistic	0.551	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.905	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.424	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.192	Detected Data Not Normal at 5% Significance Level
Detected Data Not Normal at 5% Significance Level		

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.229	KM Standard Error of Mean	0.0938
KM SD	0.457	95% KM (BCA) UCL	0.417
95% KM (t) UCL	0.39	95% KM (Percentile Bootstrap) UCL	0.388
95% KM (z) UCL	0.383	95% KM Bootstrap t UCL	0.481
90% KM Chebyshev UCL	0.51	95% KM Chebyshev UCL	0.638
97.5% KM Chebyshev UCL	0.815	99% KM Chebyshev UCL	1.162

Gamma GOF Tests on Detected Observations Only		
A-D Test Statistic	1.675	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.797	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.281	**Kolmogorov-Smirnov GOF**
5% K-S Critical Value	0.204	Detected Data Not Gamma Distributed at 5% Significance Level
Detected Data Not Gamma Distributed at 5% Significance Level		

Gamma Statistics on Detected Data Only			
k hat (MLE)	0.564	k star (bias corrected MLE)	0.513
Theta hat (MLE)	0.504	Theta star (bias corrected MLE)	0.555
nu hat (MLE)	22.55	nu star (bias corrected)	20.5
Mean (detects)	0.284		

Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.0035	Mean	0.23
Maximum	1.8	Median	0.052
SD	0.466	CV	2.031
k hat (MLE)	0.477	k star (bias corrected MLE)	0.447
Theta hat (MLE)	0.481	Theta star (bias corrected MLE)	0.514
nu hat (MLE)	23.87	nu star (bias corrected)	22.34
Adjusted Level of Significance (β)	0.0395		
Approximate Chi Square Value (22.34, α)	12.59	Adjusted Chi Square Value (22.34, β)	12.1
95% Gamma Approximate UCL (use when n>=50)	0.407	95% Gamma Adjusted UCL (use when n<50)	0.424
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.229	SD (KM)	0.457
Variance (KM)	0.209	SE of Mean (KM)	0.0938
k hat (KM)	0.251	k star (KM)	0.248
nu hat (KM)	12.56	nu star (KM)	12.39
theta hat (KM)	0.912	theta star (KM)	0.925
80% gamma percentile (KM)	0.332	90% gamma percentile (KM)	0.688
95% gamma percentile (KM)	1.112	99% gamma percentile (KM)	2.241
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (12.39, α)	5.482	Adjusted Chi Square Value (12.39, β)	5.171
95% Gamma Approximate KM-UCL (use when n>=50)	0.518	95% Gamma Adjusted KM-UCL (use when n<50)	0.549
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.934	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.905	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.169	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.192	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.229	Mean in Log Scale	-2.94
SD in Original Scale	0.467	SD in Log Scale	1.793
95% t UCL (assumes normality of ROS data)	0.388	95% Percentile Bootstrap UCL	0.386
95% BCA Bootstrap UCL	0.434	95% Bootstrap t UCL	0.486
95% H-UCL (Log ROS)	1.001		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-3.013	KM Geo Mean	0.0491
KM SD (logged)	1.897	95% Critical H Value (KM-Log)	3.812
KM Standard Error of Mean (logged)	0.398	95% H-UCL (KM -Log)	1.301
KM SD (logged)	1.897	95% Critical H Value (KM-Log)	3.812
KM Standard Error of Mean (logged)	0.398		

DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.229	Mean in Log Scale	-2.988
SD in Original Scale	0.466	SD in Log Scale	1.936
95% t UCL (Assumes normality)	0.389	95% H-Stat UCL	1.517
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Lognormal Distributed at 5% Significance Level			
Suggested UCL to Use			
KM H-UCL	1.301		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
BenzoAPyrene			
General Statistics			
Total Number of Observations	25	Number of Distinct Observations	23
Number of Detects	21	Number of Non-Detects	4
Number of Distinct Detects	19	Number of Distinct Non-Detects	4
Minimum Detect	0.0032	Minimum Non-Detect	0.0017
Maximum Detect	1.1	Maximum Non-Detect	0.031
Variance Detects	0.107	Percent Non-Detects	16%
Mean Detects	0.184	SD Detects	0.328
Median Detects	0.071	CV Detects	1.781
Skewness Detects	2.24	Kurtosis Detects	3.602
Mean of Logged Detects	-2.747	SD of Logged Detects	1.433
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.53	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.908	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.446	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.188	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.155	KM Standard Error of Mean	0.0616
KM SD	0.3	95% KM (BCA) UCL	0.264
95% KM (t) UCL	0.26	95% KM (Percentile Bootstrap) UCL	0.255
95% KM (z) UCL	0.256	95% KM Bootstrap t UCL	0.313
90% KM Chebyshev UCL	0.34	95% KM Chebyshev UCL	0.423
97.5% KM Chebyshev UCL	0.54	99% KM Chebyshev UCL	0.768
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	1.953	**Anderson-Darling GOF Test**	

5% A-D Critical Value	0.797	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.322	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.199	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.588	k star (bias corrected MLE)	0.536
Theta hat (MLE)	0.313	Theta star (bias corrected MLE)	0.343
nu hat (MLE)	24.7	nu star (bias corrected)	22.5
Mean (detects)	0.184		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.0032	Mean	0.156
Maximum	1.1	Median	0.043
SD	0.306	CV	1.961
k hat (MLE)	0.53	k star (bias corrected MLE)	0.493
Theta hat (MLE)	0.294	Theta star (bias corrected MLE)	0.316
nu hat (MLE)	26.51	nu star (bias corrected)	24.67
Adjusted Level of Significance (β)	0.0395		
Approximate Chi Square Value (24.67, α)	14.36	Adjusted Chi Square Value (24.67, β)	13.82
95% Gamma Approximate UCL (use when n>=50)	0.268	95% Gamma Adjusted UCL (use when n<50)	0.279
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.155	SD (KM)	0.3
Variance (KM)	0.0902	SE of Mean (KM)	0.0616
k hat (KM)	0.267	k star (KM)	0.261
nu hat (KM)	13.34	nu star (KM)	13.07
theta hat (KM)	0.581	theta star (KM)	0.593
80% gamma percentile (KM)	0.229	90% gamma percentile (KM)	0.464
95% gamma percentile (KM)	0.741	99% gamma percentile (KM)	1.473
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (13.07, α)	5.942	Adjusted Chi Square Value (13.07, β)	5.616
95% Gamma Approximate KM-UCL (use when n>=50)	0.341	95% Gamma Adjusted KM-UCL (use when n<50)	0.361
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.918	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.908	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.21	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.188	Detected Data Not Lognormal at 5% Significance Level	
Detected Data appear Approximate Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.155	Mean in Log Scale	-3.205
SD in Original Scale	0.307	SD in Log Scale	1.701

95% t UCL (assumes normality of ROS data)	0.26	95% Percentile Bootstrap UCL	0.262
95% BCA Bootstrap UCL	0.296	95% Bootstrap t UCL	0.944
95% H-UCL (Log ROS)	0.582		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-3.269	KM Geo Mean	0.038
KM SD (logged)	1.781	95% Critical H Value (KM-Log)	3.627
KM Standard Error of Mean (logged)	0.369	95% H-UCL (KM -Log)	0.694
KM SD (logged)	1.781	95% Critical H Value (KM-Log)	3.627
KM Standard Error of Mean (logged)	0.369		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.155	Mean in Log Scale	-3.274
SD in Original Scale	0.306	SD in Log Scale	1.857
95% t UCL (Assumes normality)	0.26	95% H-Stat UCL	0.88
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Approximate Lognormal Distributed at 5% Significance Level			
Suggested UCL to Use			
KM H-UCL	0.694		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
DibenzAHAnthracene			
General Statistics			
Total Number of Observations	25	Number of Distinct Observations	24
Number of Detects	12	Number of Non-Detects	13
Number of Distinct Detects	11	Number of Distinct Non-Detects	13
Minimum Detect	0.0066	Minimum Non-Detect	0.0018
Maximum Detect	0.28	Maximum Non-Detect	0.058
Variance Detects	0.00905	Percent Non-Detects	52%
Mean Detects	0.0618	SD Detects	0.0951
Median Detects	0.014	CV Detects	1.538
Skewness Detects	1.62	Kurtosis Detects	1.329
Mean of Logged Detects	-3.823	SD of Logged Detects	1.417
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.643	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.859	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.416	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.243	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.0322	KM Standard Error of Mean	0.0145
KM SD	0.0693	95% KM (BCA) UCL	0.057
95% KM (t) UCL	0.057	95% KM (Percentile Bootstrap) UCL	0.0564
95% KM (z) UCL	0.056	95% KM Bootstrap t UCL	0.0761
90% KM Chebyshev UCL	0.0757	95% KM Chebyshev UCL	0.0954
97.5% KM Chebyshev UCL	0.123	99% KM Chebyshev UCL	0.176
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	1.573	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.778	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.348	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.257	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.595	k star (bias corrected MLE)	0.502
Theta hat (MLE)	0.104	Theta star (bias corrected MLE)	0.123
nu hat (MLE)	14.28	nu star (bias corrected)	12.04
Mean (detects)	0.0618		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.0066	Mean	0.0349
Maximum	0.28	Median	0.01
SD	0.0696	CV	1.995
k hat (MLE)	0.692	k star (bias corrected MLE)	0.636
Theta hat (MLE)	0.0504	Theta star (bias corrected MLE)	0.0548
nu hat (MLE)	34.62	nu star (bias corrected)	31.8
Adjusted Level of Significance (β)	0.0395		
Approximate Chi Square Value (31.80, α)	19.91	Adjusted Chi Square Value (31.80, β)	19.27
95% Gamma Approximate UCL (use when n>=50)	0.0557	95% Gamma Adjusted UCL (use when n<50)	0.0576
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.0322	SD (KM)	0.0693
Variance (KM)	0.00481	SE of Mean (KM)	0.0145
k hat (KM)	0.215	k star (KM)	0.216
nu hat (KM)	10.76	nu star (KM)	10.8
theta hat (KM)	0.149	theta star (KM)	0.149
80% gamma percentile (KM)	0.044	90% gamma percentile (KM)	0.0972
95% gamma percentile (KM)	0.162	99% gamma percentile (KM)	0.339
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (10.80, α)	4.45	Adjusted Chi Square Value (10.80, β)	4.175
95% Gamma Approximate KM-UCL (use when n>=50)	0.0781	95% Gamma Adjusted KM-UCL (use when n<50)	0.0832

Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.781	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.859	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.261	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.243	Detected Data Not Lognormal at 5% Significance Level	
Detected Data Not Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.0312	Mean in Log Scale	-5.013
SD in Original Scale	0.0711	SD in Log Scale	1.609
95% t UCL (assumes normality of ROS data)	0.0555	95% Percentile Bootstrap UCL	0.0561
95% BCA Bootstrap UCL	0.0668	95% Bootstrap t UCL	0.0745
95% H-UCL (Log ROS)	0.0733		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-4.834	KM Geo Mean	0.00796
KM SD (logged)	1.481	95% Critical H Value (KM-Log)	3.166
KM Standard Error of Mean (logged)	0.332	95% H-UCL (KM -Log)	0.062
KM SD (logged)	1.481	95% Critical H Value (KM-Log)	3.166
KM Standard Error of Mean (logged)	0.332		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.0355	Mean in Log Scale	-4.521
SD in Original Scale	0.0698	SD in Log Scale	1.522
95% t UCL (Assumes normality)	0.0594	95% H-Stat UCL	0.0946
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution at 5% Significance Level			
Suggested UCL to Use			
95% KM (Chebyshev) UCL	0.0954		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Aluminum			
General Statistics			
Total Number of Observations	25	Number of Distinct Observations	24
		Number of Missing Observations	0
Minimum	6900	Mean	16656
Maximum	35400	Median	15300
SD	7443	Std. Error of Mean	1489
Coefficient of Variation	0.447	Skewness	1.227

Normal GOF Test			
Shapiro Wilk Test Statistic	0.89	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.918	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.151	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.173	Data appear Normal at 5% Significance Level	
Data appear Approximate Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	19203	95% Adjusted-CLT UCL (Chen-1995)	19495
		95% Modified-t UCL (Johnson-1978)	19264
Gamma GOF Test			
A-D Test Statistic	0.301	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.747	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.102	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.175	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	5.946	k star (bias corrected MLE)	5.259
Theta hat (MLE)	2801	Theta star (bias corrected MLE)	3167
nu hat (MLE)	297.3	nu star (bias corrected)	263
MLE Mean (bias corrected)	16656	MLE Sd (bias corrected)	7263
		Approximate Chi Square Value (0.05)	226.4
Adjusted Level of Significance	0.0395	Adjusted Chi Square Value	224.1
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	19345	95% Adjusted Gamma UCL (use when n<50)	19545
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.98	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.918	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.0771	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.173	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	8.839	Mean of logged Data	9.634
Maximum of Logged Data	10.47	SD of logged Data	0.419
Assuming Lognormal Distribution			
95% H-UCL	19615	90% Chebyshev (MVUE) UCL	20917
95% Chebyshev (MVUE) UCL	22866	97.5% Chebyshev (MVUE) UCL	25570
99% Chebyshev (MVUE) UCL	30881		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			

95% CLT UCL	19105	95% Jackknife UCL	19203
95% Standard Bootstrap UCL	19048	95% Bootstrap-t UCL	19734
95% Hall's Bootstrap UCL	19815	95% Percentile Bootstrap UCL	19076
95% BCA Bootstrap UCL	19566		
90% Chebyshev(Mean, Sd) UCL	21122	95% Chebyshev(Mean, Sd) UCL	23145
97.5% Chebyshev(Mean, Sd) UCL	25953	99% Chebyshev(Mean, Sd) UCL	31468
Suggested UCL to Use			
95% Student's-t UCL	19203		
When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test			
When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Iron			
General Statistics			
Total Number of Observations	25	Number of Distinct Observations	23
		Number of Missing Observations	0
Minimum	7770	Mean	14154
Maximum	25200	Median	14200
SD	4219	Std. Error of Mean	843.9
Coefficient of Variation	0.298	Skewness	0.6
Normal GOF Test			
Shapiro Wilk Test Statistic	0.96	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.918	Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.105	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.173	Data appear Normal at 5% Significance Level	
Data appear Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	15598	95% Adjusted-CLT UCL (Chen-1995)	15650
		95% Modified-t UCL (Johnson-1978)	15615
Gamma GOF Test			
A-D Test Statistic	0.239	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.745	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.0839	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.174	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	11.79	k star (bias corrected MLE)	10.4

Theta hat (MLE)	1201	Theta star (bias corrected MLE)	1361
nu hat (MLE)	589.4	nu star (bias corrected)	520
MLE Mean (bias corrected)	14154	MLE Sd (bias corrected)	4389
		Approximate Chi Square Value (0.05)	468.1
Adjusted Level of Significance	0.0395	Adjusted Chi Square Value	464.8
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	15723	95% Adjusted Gamma UCL (use when n<50)	15836
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.97	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.918	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.102	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.173	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	8.958	Mean of logged Data	9.515
Maximum of Logged Data	10.13	SD of logged Data	0.303
Assuming Lognormal Distribution			
95% H-UCL	15876	90% Chebyshev (MVUE) UCL	16777
95% Chebyshev (MVUE) UCL	17960	97.5% Chebyshev (MVUE) UCL	19602
99% Chebyshev (MVUE) UCL	22827		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	15542	95% Jackknife UCL	15598
95% Standard Bootstrap UCL	15502	95% Bootstrap-t UCL	15822
95% Hall's Bootstrap UCL	15729	95% Percentile Bootstrap UCL	15530
95% BCA Bootstrap UCL	15614		
90% Chebyshev(Mean, Sd) UCL	16686	95% Chebyshev(Mean, Sd) UCL	17832
97.5% Chebyshev(Mean, Sd) UCL	19424	99% Chebyshev(Mean, Sd) UCL	22550
Suggested UCL to Use			
95% Student's-t UCL	15598		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Manganese			
General Statistics			
Total Number of Observations	25	Number of Distinct Observations	25
		Number of Missing Observations	0

Minimum	34.1	Mean	434.8
Maximum	1280	Median	280
SD	403.5	Std. Error of Mean	80.7
Coefficient of Variation	0.928	Skewness	1.027
Normal GOF Test			
Shapiro Wilk Test Statistic	0.826	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.918	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.244	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.173	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	572.8	95% Adjusted-CLT UCL (Chen-1995)	585.2
		95% Modified-t UCL (Johnson-1978)	575.6
Gamma GOF Test			
A-D Test Statistic	0.514	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.768	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.125	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.179	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	1.2	k star (bias corrected MLE)	1.082
Theta hat (MLE)	362.4	Theta star (bias corrected MLE)	401.7
nu hat (MLE)	59.98	nu star (bias corrected)	54.12
MLE Mean (bias corrected)	434.8	MLE Sd (bias corrected)	417.9
		Approximate Chi Square Value (0.05)	38.21
Adjusted Level of Significance	0.0395	Adjusted Chi Square Value	37.3
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50)	615.7	95% Adjusted Gamma UCL (use when n<50)	630.7
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.952	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.918	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.103	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.173	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	3.529	Mean of logged Data	5.603
Maximum of Logged Data	7.155	SD of logged Data	1.054
Assuming Lognormal Distribution			
95% H-UCL	820.8	90% Chebyshev (MVUE) UCL	789.7
95% Chebyshev (MVUE) UCL	940.1	97.5% Chebyshev (MVUE) UCL	1149
99% Chebyshev (MVUE) UCL	1559		

Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	567.5	95% Jackknife UCL	572.8
95% Standard Bootstrap UCL	567.5	95% Bootstrap-t UCL	599.9
95% Hall's Bootstrap UCL	574.4	95% Percentile Bootstrap UCL	564.2
95% BCA Bootstrap UCL	580.6		
90% Chebyshev(Mean, Sd) UCL	676.9	95% Chebyshev(Mean, Sd) UCL	786.5
97.5% Chebyshev(Mean, Sd) UCL	938.8	99% Chebyshev(Mean, Sd) UCL	1238
Suggested UCL to Use			
95% Adjusted Gamma UCL	630.7		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Arsenic			
General Statistics			
Total Number of Observations	25	Number of Distinct Observations	23
		Number of Missing Observations	0
Minimum	1.8	Mean	5.252
Maximum	14.5	Median	4.2
SD	3.426	Std. Error of Mean	0.685
Coefficient of Variation	0.652	Skewness	1.525
Normal GOF Test			
Shapiro Wilk Test Statistic	0.832	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.918	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.186	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.173	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	6.424	95% Adjusted-CLT UCL (Chen-1995)	6.602
		95% Modified-t UCL (Johnson-1978)	6.459
Gamma GOF Test			
A-D Test Statistic	0.482	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.751	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.117	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.176	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			

Gamma Statistics			
k hat (MLE)	3.044	k star (bias corrected MLE)	2.705
Theta hat (MLE)	1.725	Theta star (bias corrected MLE)	1.941
nu hat (MLE)	152.2	nu star (bias corrected)	135.3
MLE Mean (bias corrected)	5.252	MLE Sd (bias corrected)	3.193
		Approximate Chi Square Value (0.05)	109.4
Adjusted Level of Significance	0.0395	Adjusted Chi Square Value	107.8
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50)	6.494	95% Adjusted Gamma UCL (use when n<50)	6.59
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.96	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.918	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.114	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.173	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	0.588	Mean of logged Data	1.485
Maximum of Logged Data	2.674	SD of logged Data	0.587
Assuming Lognormal Distribution			
95% H-UCL	6.697	90% Chebyshev (MVUE) UCL	7.14
95% Chebyshev (MVUE) UCL	8.017	97.5% Chebyshev (MVUE) UCL	9.233
99% Chebyshev (MVUE) UCL	11.62		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	6.379	95% Jackknife UCL	6.424
95% Standard Bootstrap UCL	6.331	95% Bootstrap-t UCL	6.699
95% Hall's Bootstrap UCL	6.982	95% Percentile Bootstrap UCL	6.432
95% BCA Bootstrap UCL	6.516		
90% Chebyshev(Mean, Sd) UCL	7.307	95% Chebyshev(Mean, Sd) UCL	8.238
97.5% Chebyshev(Mean, Sd) UCL	9.53	99% Chebyshev(Mean, Sd) UCL	12.07
Suggested UCL to Use			
95% Adjusted Gamma UCL	6.59		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Cobalt			
General Statistics			

ProUCL Output
Recreational Trespasser (ATV Riding) Sediment
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Total Number of Observations	25	Number of Distinct Observations	21
		Number of Missing Observations	0
Minimum	1.9	Mean	5.484
Maximum	9.2	Median	5.4
SD	1.854	Std. Error of Mean	0.371
Coefficient of Variation	0.338	Skewness	0.159
Normal GOF Test			
Shapiro Wilk Test Statistic	0.98	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.918	Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.0936	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.173	Data appear Normal at 5% Significance Level	
Data appear Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	6.118	95% Adjusted-CLT UCL (Chen-1995)	6.107
		95% Modified-t UCL (Johnson-1978)	6.12
Gamma GOF Test			
A-D Test Statistic	0.265	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.746	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.129	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.175	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	8.213	k star (bias corrected MLE)	7.254
Theta hat (MLE)	0.668	Theta star (bias corrected MLE)	0.756
nu hat (MLE)	410.6	nu star (bias corrected)	362.7
MLE Mean (bias corrected)	5.484	MLE Sd (bias corrected)	2.036
		Approximate Chi Square Value (0.05)	319.6
Adjusted Level of Significance	0.0395	Adjusted Chi Square Value	316.8
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	6.224	95% Adjusted Gamma UCL (use when n<50)	6.278
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.954	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.918	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.149	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.173	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	0.642	Mean of logged Data	1.64
Maximum of Logged Data	2.219	SD of logged Data	0.376
Assuming Lognormal Distribution			
95% H-UCL	6.382	90% Chebyshev (MVUE) UCL	6.789

95% Chebyshev (MVUE) UCL	7.366	97.5% Chebyshev (MVUE) UCL	8.167
99% Chebyshev (MVUE) UCL	9.741		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	6.094	95% Jackknife UCL	6.118
95% Standard Bootstrap UCL	6.082	95% Bootstrap-t UCL	6.121
95% Hall's Bootstrap UCL	6.121	95% Percentile Bootstrap UCL	6.064
95% BCA Bootstrap UCL	6.024		
90% Chebyshev(Mean, Sd) UCL	6.596	95% Chebyshev(Mean, Sd) UCL	7.1
97.5% Chebyshev(Mean, Sd) UCL	7.8	99% Chebyshev(Mean, Sd) UCL	9.173
Suggested UCL to Use			
95% Student's-t UCL	6.118		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
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ProUCL Output
Recreational Trespasser (Hunting) Surface Water
Columbia Falls Aluminum Facility
Columbia Falls, Montana

UCL Statistics for Data Sets with Non-Detects	
User Selected Options	
Date/Time of Computation	ProUCL 5.12/4/2019 7:16:30 PM
From File	20190204_MPAISM0-2_ATV_Hunt_ProUCL_input REv2_c.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Fluoride

General Statistics			
Total Number of Observations	51	Number of Distinct Observations	39
		Number of Missing Observations	5
Number of Detects	45	Number of Non-Detects	6
Number of Distinct Detects	38	Number of Distinct Non-Detects	1
Minimum Detect	39.2	Minimum Non-Detect	12
Maximum Detect	473	Maximum Non-Detect	12
Variance Detects	6129	Percent Non-Detects	11.76%
Mean Detects	159.5	SD Detects	78.29
Median Detects	134	CV Detects	0.491
Skewness Detects	1.61	Kurtosis Detects	4.655
Mean of Logged Detects	4.963	SD of Logged Detects	0.479

Normal GOF Test on Detects Only		
Shapiro Wilk Test Statistic	0.88	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.945	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.213	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.131	Detected Data Not Normal at 5% Significance Level
Detected Data Not Normal at 5% Significance Level		

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	142.2	KM Standard Error of Mean	12.3
KM SD	86.87	95% KM (BCA) UCL	163
95% KM (t) UCL	162.8	95% KM (Percentile Bootstrap) UCL	162.1
95% KM (z) UCL	162.4	95% KM Bootstrap t UCL	165
90% KM Chebyshev UCL	179.1	95% KM Chebyshev UCL	195.8
97.5% KM Chebyshev UCL	219	99% KM Chebyshev UCL	264.6

Gamma GOF Tests on Detected Observations Only		
A-D Test Statistic	0.758	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.753	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.167	**Kolmogorov-Smirnov GOF**
5% K-S Critical Value	0.132	Detected Data Not Gamma Distributed at 5% Significance Level
Detected Data Not Gamma Distributed at 5% Significance Level		

Gamma Statistics on Detected Data Only			
k hat (MLE)	4.755	k star (bias corrected MLE)	4.452
Theta hat (MLE)	33.55	Theta star (bias corrected MLE)	35.83
nu hat (MLE)	427.9	nu star (bias corrected)	400.7

Mean (detects)	159.5		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	8.084	Mean	144.2
Maximum	473	Median	129
SD	84.89	CV	0.589
k hat (MLE)	2.53	k star (bias corrected MLE)	2.394
Theta hat (MLE)	57	Theta star (bias corrected MLE)	60.23
nu hat (MLE)	258.1	nu star (bias corrected)	244.2
Adjusted Level of Significance (β)	0.0453		
Approximate Chi Square Value (244.21, α)	209	Adjusted Chi Square Value (244.21, β)	208.1
95% Gamma Approximate UCL (use when n>=50)	168.5	95% Gamma Adjusted UCL (use when n<50)	169.2
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	142.2	SD (KM)	86.87
Variance (KM)	7546	SE of Mean (KM)	12.3
k hat (KM)	2.678	k star (KM)	2.534
nu hat (KM)	273.2	nu star (KM)	258.4
theta hat (KM)	53.08	theta star (KM)	56.11
80% gamma percentile (KM)	206.9	90% gamma percentile (KM)	261.8
95% gamma percentile (KM)	313.5	99% gamma percentile (KM)	426.6
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (258.43, α)	222.2	Adjusted Chi Square Value (258.43, β)	221.2
95% Gamma Approximate KM-UCL (use when n>=50)	165.3	95% Gamma Adjusted KM-UCL (use when n<50)	166.1
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.967	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.945	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.136	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.131	Detected Data Not Lognormal at 5% Significance Level	
Detected Data appear Approximate Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	146.6	Mean in Log Scale	4.838
SD in Original Scale	81.7	SD in Log Scale	0.571
95% t UCL (assumes normality of ROS data)	165.8	95% Percentile Bootstrap UCL	165.6
95% BCA Bootstrap UCL	167.8	95% Bootstrap t UCL	169.7
95% H-UCL (Log ROS)	173.5		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	4.672	KM Geo Mean	106.9
KM SD (logged)	0.914	95% Critical H Value (KM-Log)	2.22
KM Standard Error of Mean (logged)	0.129	95% H-UCL (KM -Log)	216.3
KM SD (logged)	0.914	95% Critical H Value (KM-Log)	2.22

KM Standard Error of Mean (logged)	0.129		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	141.5	Mean in Log Scale	4.59
SD in Original Scale	88.82	SD in Log Scale	1.126
95% t UCL (Assumes normality)	162.3	95% H-Stat UCL	273.7
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Approximate Lognormal Distributed at 5% Significance Level			
Suggested UCL to Use			
KM Student's t	133.8	KM H-UCL	216.3
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Cyanide			
General Statistics			
Total Number of Observations	45	Number of Distinct Observations	8
		Number of Missing Observations	10
Number of Detects	8	Number of Non-Detects	37
Number of Distinct Detects	7	Number of Distinct Non-Detects	2
Minimum Detect	2	Minimum Non-Detect	2
Maximum Detect	15.3	Maximum Non-Detect	4
Variance Detects	24.26	Percent Non-Detects	82.22%
Mean Detects	5.325	SD Detects	4.926
Median Detects	2.85	CV Detects	0.925
Skewness Detects	1.619	Kurtosis Detects	1.531
Mean of Logged Detects	1.378	SD of Logged Detects	0.764
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.72	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.818	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.324	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.283	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	2.595	KM Standard Error of Mean	0.37
KM SD	2.321	95% KM (BCA) UCL	3.261
95% KM (t) UCL	3.217	95% KM (Percentile Bootstrap) UCL	3.177
95% KM (z) UCL	3.204	95% KM Bootstrap t UCL	5.535
90% KM Chebyshev UCL	3.705	95% KM Chebyshev UCL	4.208
97.5% KM Chebyshev UCL	4.906	99% KM Chebyshev UCL	6.277

Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	0.873	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.725	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.3	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.298	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	1.845	k star (bias corrected MLE)	1.237
Theta hat (MLE)	2.886	Theta star (bias corrected MLE)	4.306
nu hat (MLE)	29.53	nu star (bias corrected)	19.79
Mean (detects)	5.325		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	0.955
Maximum	15.3	Median	0.01
SD	2.843	CV	2.977
k hat (MLE)	0.209	k star (bias corrected MLE)	0.21
Theta hat (MLE)	4.567	Theta star (bias corrected MLE)	4.548
nu hat (MLE)	18.82	nu star (bias corrected)	18.9
Adjusted Level of Significance (β)	0.0447		
Approximate Chi Square Value (18.90, α)	10.04	Adjusted Chi Square Value (18.90, β)	9.827
95% Gamma Approximate UCL (use when n>=50)	1.797	95% Gamma Adjusted UCL (use when n<50)	1.836
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	2.595	SD (KM)	2.321
Variance (KM)	5.388	SE of Mean (KM)	0.37
k hat (KM)	1.25	k star (KM)	1.181
nu hat (KM)	112.5	nu star (KM)	106.3
theta hat (KM)	2.076	theta star (KM)	2.197
80% gamma percentile (KM)	4.115	90% gamma percentile (KM)	5.734
95% gamma percentile (KM)	7.333	99% gamma percentile (KM)	11
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (106.32, α)	83.52	Adjusted Chi Square Value (106.32, β)	82.85
95% Gamma Approximate KM-UCL (use when n>=50)	3.303	95% Gamma Adjusted KM-UCL (use when n<50)	3.33
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.823	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.818	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.267	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.283	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			

Mean in Original Scale	1.22	Mean in Log Scale	-1.186
SD in Original Scale	2.772	SD in Log Scale	1.709
95% t UCL (assumes normality of ROS data)	1.914	95% Percentile Bootstrap UCL	1.958
95% BCA Bootstrap UCL	2.357	95% Bootstrap t UCL	3.051
95% H-UCL (Log ROS)	3.057		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	0.817	KM Geo Mean	2.263
KM SD (logged)	0.399	95% Critical H Value (KM-Log)	1.837
KM Standard Error of Mean (logged)	0.0637	95% H-UCL (KM -Log)	2.737
KM SD (logged)	0.399	95% Critical H Value (KM-Log)	1.837
KM Standard Error of Mean (logged)	0.0637		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	1.836	Mean in Log Scale	0.291
SD in Original Scale	2.572	SD in Log Scale	0.62
95% t UCL (Assumes normality)	2.48	95% H-Stat UCL	1.954
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Lognormal Distributed at 5% Significance Level			
Suggested UCL to Use			
KM H-UCL	2.737		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
CyanideFREE			
General Statistics			
Total Number of Observations	33	Number of Distinct Observations	10
		Number of Missing Observations	23
Number of Detects	9	Number of Non-Detects	24
Number of Distinct Detects	9	Number of Distinct Non-Detects	1
Minimum Detect	1.6	Minimum Non-Detect	1.5
Maximum Detect	7.7	Maximum Non-Detect	1.5
Variance Detects	3.588	Percent Non-Detects	72.73%
Mean Detects	3.133	SD Detects	1.894
Median Detects	2.5	CV Detects	0.604
Skewness Detects	2.072	Kurtosis Detects	4.738
Mean of Logged Detects	1.021	SD of Logged Detects	0.489
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.764	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.829	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.257	**Lilliefors GOF Test**	

5% Lilliefors Critical Value	0.274	Detected Data appear Normal at 5% Significance Level	
Detected Data appear Approximate Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	1.945	KM Standard Error of Mean	0.218
KM SD	1.183	95% KM (BCA) UCL	2.333
95% KM (t) UCL	2.315	95% KM (Percentile Bootstrap) UCL	2.318
95% KM (z) UCL	2.305	95% KM Bootstrap t UCL	2.712
90% KM Chebyshev UCL	2.601	95% KM Chebyshev UCL	2.897
97.5% KM Chebyshev UCL	3.309	99% KM Chebyshev UCL	4.118
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	0.498	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.724	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.221	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.28	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	4.291	k star (bias corrected MLE)	2.935
Theta hat (MLE)	0.73	Theta star (bias corrected MLE)	1.068
nu hat (MLE)	77.24	nu star (bias corrected)	52.82
Mean (detects)	3.133		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	0.883
Maximum	7.7	Median	0.01
SD	1.692	CV	1.917
k hat (MLE)	0.258	k star (bias corrected MLE)	0.255
Theta hat (MLE)	3.417	Theta star (bias corrected MLE)	3.461
nu hat (MLE)	17.05	nu star (bias corrected)	16.83
Adjusted Level of Significance (β)	0.0419		
Approximate Chi Square Value (16.83, α)	8.552	Adjusted Chi Square Value (16.83, β)	8.248
95% Gamma Approximate UCL (use when n>=50)	1.737	95% Gamma Adjusted UCL (use when n<50)	1.801
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	1.945	SD (KM)	1.183
Variance (KM)	1.399	SE of Mean (KM)	0.218
k hat (KM)	2.706	k star (KM)	2.48
nu hat (KM)	178.6	nu star (KM)	163.7
theta hat (KM)	0.719	theta star (KM)	0.784
80% gamma percentile (KM)	2.839	90% gamma percentile (KM)	3.6
95% gamma percentile (KM)	4.318	99% gamma percentile (KM)	5.89
Gamma Kaplan-Meier (KM) Statistics			

Approximate Chi Square Value (163.67, α)	135.1	Adjusted Chi Square Value (163.67, β)	133.8
95% Gamma Approximate KM-UCL (use when n>=50)	2.357	95% Gamma Adjusted KM-UCL (use when n<50)	2.381
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.916	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.829	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.189	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.274	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	1.239	Mean in Log Scale	-0.369
SD in Original Scale	1.54	SD in Log Scale	1.117
95% t UCL (assumes normality of ROS data)	1.693	95% Percentile Bootstrap UCL	1.699
95% BCA Bootstrap UCL	1.847	95% Bootstrap t UCL	1.957
95% H-UCL (Log ROS)	2.15		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	0.573	KM Geo Mean	1.774
KM SD (logged)	0.365	95% Critical H Value (KM-Log)	1.838
KM Standard Error of Mean (logged)	0.0674	95% H-UCL (KM -Log)	2.135
KM SD (logged)	0.365	95% Critical H Value (KM-Log)	1.838
KM Standard Error of Mean (logged)	0.0674		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	1.4	Mean in Log Scale	0.0693
SD in Original Scale	1.435	SD in Log Scale	0.64
95% t UCL (Assumes normality)	1.823	95% H-Stat UCL	1.66
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Approximate Normal Distributed at 5% Significance Level			
Suggested UCL to Use			
95% KM (t) UCL	2.315		
When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test			
When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Aluminum			
General Statistics			
Total Number of Observations	51	Number of Distinct Observations	38
		Number of Missing Observations	5

Number of Detects	38	Number of Non-Detects	13
Number of Distinct Detects	36	Number of Distinct Non-Detects	2
Minimum Detect	16.1	Minimum Non-Detect	15
Maximum Detect	5750	Maximum Non-Detect	18.2
Variance Detects	920926	Percent Non-Detects	25.49%
Mean Detects	266.5	SD Detects	959.6
Median Detects	37.05	CV Detects	3.601
Skewness Detects	5.398	Kurtosis Detects	30.76
Mean of Logged Detects	3.957	SD of Logged Detects	1.293
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.286	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.938	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.447	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.142	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	202.4	KM Standard Error of Mean	117
KM SD	824.7	95% KM (BCA) UCL	413.7
95% KM (t) UCL	398.6	95% KM (Percentile Bootstrap) UCL	420.1
95% KM (z) UCL	394.9	95% KM Bootstrap t UCL	1167
90% KM Chebyshev UCL	553.5	95% KM Chebyshev UCL	712.5
97.5% KM Chebyshev UCL	933.3	99% KM Chebyshev UCL	1367
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	7.23	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.834	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.356	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.153	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.403	k star (bias corrected MLE)	0.389
Theta hat (MLE)	660.5	Theta star (bias corrected MLE)	684.8
nu hat (MLE)	30.66	nu star (bias corrected)	29.58
Mean (detects)	266.5		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	198.6
Maximum	5750	Median	27.4
SD	833.8	CV	4.199
k hat (MLE)	0.208	k star (bias corrected MLE)	0.209
Theta hat (MLE)	954.7	Theta star (bias corrected MLE)	950.9
nu hat (MLE)	21.21	nu star (bias corrected)	21.3

Adjusted Level of Significance (β)	0.0453		
Approximate Chi Square Value (21.30, α)	11.81	Adjusted Chi Square Value (21.30, β)	11.61
95% Gamma Approximate UCL (use when n>=50)	358	95% Gamma Adjusted UCL (use when n<50)	364.3
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	202.4	SD (KM)	824.7
Variance (KM)	680120	SE of Mean (KM)	117
k hat (KM)	0.0602	k star (KM)	0.0698
nu hat (KM)	6.145	nu star (KM)	7.117
theta hat (KM)	3360	theta star (KM)	2901
80% gamma percentile (KM)	71.96	90% gamma percentile (KM)	435.7
95% gamma percentile (KM)	1164	99% gamma percentile (KM)	3820
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (7.12, α)	2.235	Adjusted Chi Square Value (7.12, β)	2.156
95% Gamma Approximate KM-UCL (use when n>=50)	644.6	95% Gamma Adjusted KM-UCL (use when n<50)	668.1
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.748	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.938	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.227	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.142	Detected Data Not Lognormal at 5% Significance Level	
Detected Data Not Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	199.6	Mean in Log Scale	3.26
SD in Original Scale	833.6	SD in Log Scale	1.668
95% t UCL (assumes normality of ROS data)	395.2	95% Percentile Bootstrap UCL	413
95% BCA Bootstrap UCL	551.5	95% Bootstrap t UCL	1148
95% H-UCL (Log ROS)	217.5		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	3.641	KM Geo Mean	38.12
KM SD (logged)	1.227	95% Critical H Value (KM-Log)	2.553
KM Standard Error of Mean (logged)	0.174	95% H-UCL (KM -Log)	126
KM SD (logged)	1.227	95% Critical H Value (KM-Log)	2.553
KM Standard Error of Mean (logged)	0.174		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	200.6	Mean in Log Scale	3.477
SD in Original Scale	833.3	SD in Log Scale	1.388
95% t UCL (Assumes normality)	396.2	95% H-Stat UCL	145.2
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution at 5% Significance Level			
Suggested UCL to Use			
95% KM (Chebyshev) UCL	712.5		

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Iron

General Statistics

Total Number of Observations	51	Number of Distinct Observations	15
		Number of Missing Observations	5
Number of Detects	12	Number of Non-Detects	39
Number of Distinct Detects	12	Number of Distinct Non-Detects	3
Minimum Detect	50.2	Minimum Non-Detect	42.4
Maximum Detect	4760	Maximum Non-Detect	49.1
Variance Detects	2231133	Percent Non-Detects	76.47%
Mean Detects	756.2	SD Detects	1494
Median Detects	114.5	CV Detects	1.975
Skewness Detects	2.347	Kurtosis Detects	4.834
Mean of Logged Detects	5.337	SD of Logged Detects	1.466

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.535	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.859	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.452	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.243	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	210.3	KM Standard Error of Mean	110.7
KM SD	756.9	95% KM (BCA) UCL	430.9
95% KM (t) UCL	395.9	95% KM (Percentile Bootstrap) UCL	404
95% KM (z) UCL	392.4	95% KM Bootstrap t UCL	2388
90% KM Chebyshev UCL	542.4	95% KM Chebyshev UCL	692.9
97.5% KM Chebyshev UCL	901.7	99% KM Chebyshev UCL	1312

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	1.742	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.786	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.356	**Kolmogorov-Smirnov GOF**
5% K-S Critical Value	0.259	Detected Data Not Gamma Distributed at 5% Significance Level

Detected Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	0.493	k star (bias corrected MLE)	0.425
Theta hat (MLE)	1534	Theta star (bias corrected MLE)	1778
nu hat (MLE)	11.83	nu star (bias corrected)	10.2
Mean (detects)	756.2		

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	177.9
Maximum	4760	Median	0.01
SD	771.9	CV	4.338
k hat (MLE)	0.108	k star (bias corrected MLE)	0.115
Theta hat (MLE)	1648	Theta star (bias corrected MLE)	1551
nu hat (MLE)	11.01	nu star (bias corrected)	11.7
Adjusted Level of Significance (β)	0.0453		
Approximate Chi Square Value (11.70, α)	5.03	Adjusted Chi Square Value (11.70, β)	4.902
95% Gamma Approximate UCL (use when n>=50)	413.9	95% Gamma Adjusted UCL (use when n<50)	424.6
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	210.3	SD (KM)	756.9
Variance (KM)	572891	SE of Mean (KM)	110.7
k hat (KM)	0.0772	k star (KM)	0.0858
nu hat (KM)	7.877	nu star (KM)	8.747
theta hat (KM)	2724	theta star (KM)	2453
80% gamma percentile (KM)	114	90% gamma percentile (KM)	519.7
95% gamma percentile (KM)	1226	99% gamma percentile (KM)	3603
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (8.75, α)	3.175	Adjusted Chi Square Value (8.75, β)	3.078
95% Gamma Approximate KM-UCL (use when n>=50)	579.5	95% Gamma Adjusted KM-UCL (use when n<50)	597.8
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.804	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.859	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.231	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.243	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Approximate Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	180.6	Mean in Log Scale	0.974
SD in Original Scale	771.3	SD in Log Scale	3.219
95% t UCL (assumes normality of ROS data)	361.6	95% Percentile Bootstrap UCL	374.4
95% BCA Bootstrap UCL	460.1	95% Bootstrap t UCL	2030
95% H-UCL (Log ROS)	5176		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	4.121	KM Geo Mean	61.63
KM SD (logged)	0.958	95% Critical H Value (KM-Log)	2.263
KM Standard Error of Mean (logged)	0.14	95% H-UCL (KM -Log)	132.5
KM SD (logged)	0.958	95% Critical H Value (KM-Log)	2.263
KM Standard Error of Mean (logged)	0.14		
DL/2 Statistics			

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	194.9	Mean in Log Scale	3.628
SD in Original Scale	767.9	SD in Log Scale	1.179
95% t UCL (Assumes normality)	375.2	95% H-Stat UCL	114.4
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Approximate Lognormal Distributed at 5% Significance Level			
Suggested UCL to Use			
KM H-UCL	132.5		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Manganese			
General Statistics			
Total Number of Observations	51	Number of Distinct Observations	46
		Number of Missing Observations	5
Number of Detects	48	Number of Non-Detects	3
Number of Distinct Detects	44	Number of Distinct Non-Detects	2
Minimum Detect	3	Minimum Non-Detect	2.5
Maximum Detect	3750	Maximum Non-Detect	2.7
Variance Detects	291342	Percent Non-Detects	5.882%
Mean Detects	90.8	SD Detects	539.8
Median Detects	8.55	CV Detects	5.945
Skewness Detects	6.914	Kurtosis Detects	47.86
Mean of Logged Detects	2.287	SD of Logged Detects	1.145
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.162	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.947	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.478	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.127	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	85.6	KM Standard Error of Mean	73.38
KM SD	518.6	95% KM (BCA) UCL	231.2
95% KM (t) UCL	208.6	95% KM (Percentile Bootstrap) UCL	231.1
95% KM (z) UCL	206.3	95% KM Bootstrap t UCL	4164
90% KM Chebyshev UCL	305.8	95% KM Chebyshev UCL	405.5
97.5% KM Chebyshev UCL	543.9	99% KM Chebyshev UCL	815.8
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	12.49	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.86	Detected Data Not Gamma Distributed at 5% Significance Level	

K-S Test Statistic	0.438	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.139	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.309	k star (bias corrected MLE)	0.303
Theta hat (MLE)	293.9	Theta star (bias corrected MLE)	299.2
nu hat (MLE)	29.66	nu star (bias corrected)	29.14
Mean (detects)	90.8		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	85.46
Maximum	3750	Median	8.1
SD	523.8	CV	6.129
k hat (MLE)	0.273	k star (bias corrected MLE)	0.27
Theta hat (MLE)	313.2	Theta star (bias corrected MLE)	316.6
nu hat (MLE)	27.83	nu star (bias corrected)	27.53
Adjusted Level of Significance (β)	0.0453		
Approximate Chi Square Value (27.53, α)	16.56	Adjusted Chi Square Value (27.53, β)	16.31
95% Gamma Approximate UCL (use when n>=50)	142	95% Gamma Adjusted UCL (use when n<50)	144.2
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	85.6	SD (KM)	518.6
Variance (KM)	268924	SE of Mean (KM)	73.38
k hat (KM)	0.0272	k star (KM)	0.0387
nu hat (KM)	2.779	nu star (KM)	3.949
theta hat (KM)	3141	theta star (KM)	2211
80% gamma percentile (KM)	4.03	90% gamma percentile (KM)	87.51
95% gamma percentile (KM)	402.9	99% gamma percentile (KM)	2046
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (3.95, α)	0.702	Adjusted Chi Square Value (3.95, β)	0.665
95% Gamma Approximate KM-UCL (use when n>=50)	481.8	95% Gamma Adjusted KM-UCL (use when n<50)	508.4
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.701	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.947	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.241	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.127	Detected Data Not Lognormal at 5% Significance Level	
Detected Data Not Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	85.52	Mean in Log Scale	2.155
SD in Original Scale	523.8	SD in Log Scale	1.233
95% t UCL (assumes normality of ROS data)	208.4	95% Percentile Bootstrap UCL	232.4

95% BCA Bootstrap UCL	307.8	95% Bootstrap t UCL	4241
95% H-UCL (Log ROS)	28.8		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	2.206	KM Geo Mean	9.083
KM SD (logged)	1.145	95% Critical H Value (KM-Log)	2.461
KM Standard Error of Mean (logged)	0.162	95% H-UCL (KM -Log)	26.07
KM SD (logged)	1.145	95% Critical H Value (KM-Log)	2.461
KM Standard Error of Mean (logged)	0.162		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	85.53	Mean in Log Scale	2.169
SD in Original Scale	523.7	SD in Log Scale	1.209
95% t UCL (Assumes normality)	208.4	95% H-Stat UCL	27.99
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution at 5% Significance Level			
Suggested UCL to Use			
95% KM (Chebyshev) UCL	405.5		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Antimony			
General Statistics			
Total Number of Observations	51	Number of Distinct Observations	9
		Number of Missing Observations	5
Number of Detects	7	Number of Non-Detects	44
Number of Distinct Detects	7	Number of Distinct Non-Detects	2
Minimum Detect	0.64	Minimum Non-Detect	0.62
Maximum Detect	2.9	Maximum Non-Detect	0.76
Variance Detects	1.12	Percent Non-Detects	86.27%
Mean Detects	1.547	SD Detects	1.058
Median Detects	0.78	CV Detects	0.684
Skewness Detects	0.439	Kurtosis Detects	-2.54
Mean of Logged Detects	0.22	SD of Logged Detects	0.714
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.758	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.803	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.337	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.304	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.748	KM Standard Error of Mean	0.0731
KM SD	0.483	95% KM (BCA) UCL	0.884
95% KM (t) UCL	0.87	95% KM (Percentile Bootstrap) UCL	0.869
95% KM (z) UCL	0.868	95% KM Bootstrap t UCL	0.906
90% KM Chebyshev UCL	0.967	95% KM Chebyshev UCL	1.066
97.5% KM Chebyshev UCL	1.204	99% KM Chebyshev UCL	1.475
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	0.919	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.714	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.342	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.314	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	2.46	k star (bias corrected MLE)	1.501
Theta hat (MLE)	0.629	Theta star (bias corrected MLE)	1.031
nu hat (MLE)	34.44	nu star (bias corrected)	21.01
Mean (detects)	1.547		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	0.224
Maximum	2.9	Median	0.01
SD	0.647	CV	2.895
k hat (MLE)	0.29	k star (bias corrected MLE)	0.286
Theta hat (MLE)	0.771	Theta star (bias corrected MLE)	0.782
nu hat (MLE)	29.56	nu star (bias corrected)	29.15
Adjusted Level of Significance (β)	0.0453		
Approximate Chi Square Value (29.15, α)	17.83	Adjusted Chi Square Value (29.15, β)	17.57
95% Gamma Approximate UCL (use when n>=50)	0.366	95% Gamma Adjusted UCL (use when n<50)	0.371
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.748	SD (KM)	0.483
Variance (KM)	0.233	SE of Mean (KM)	0.0731
k hat (KM)	2.393	k star (KM)	2.265
nu hat (KM)	244.1	nu star (KM)	231.1
theta hat (KM)	0.312	theta star (KM)	0.33
80% gamma percentile (KM)	1.103	90% gamma percentile (KM)	1.412
95% gamma percentile (KM)	1.705	99% gamma percentile (KM)	2.351
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (231.07, α)	196.9	Adjusted Chi Square Value (231.07, β)	196
95% Gamma Approximate KM-UCL (use when n>=50)	0.877	95% Gamma Adjusted KM-UCL (use when n<50)	0.881

Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.764	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.803	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.315	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.304	Detected Data Not Lognormal at 5% Significance Level	
Detected Data Not Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.298	Mean in Log Scale	-2.565
SD in Original Scale	0.631	SD in Log Scale	1.699
95% t UCL (assumes normality of ROS data)	0.446	95% Percentile Bootstrap UCL	0.451
95% BCA Bootstrap UCL	0.502	95% Bootstrap t UCL	0.526
95% H-UCL (Log ROS)	0.692		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-0.382	KM Geo Mean	0.683
KM SD (logged)	0.343	95% Critical H Value (KM-Log)	1.746
KM Standard Error of Mean (logged)	0.0519	95% H-UCL (KM -Log)	0.788
KM SD (logged)	0.343	95% Critical H Value (KM-Log)	1.746
KM Standard Error of Mean (logged)	0.0519		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.484	Mean in Log Scale	-0.968
SD in Original Scale	0.564	SD in Log Scale	0.541
95% t UCL (Assumes normality)	0.616	95% H-Stat UCL	0.508
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution at 5% Significance Level			
Suggested UCL to Use			
95% KM (Chebyshev) UCL	1.066		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Arsenic			
General Statistics			
Total Number of Observations	51	Number of Distinct Observations	14
		Number of Missing Observations	5
Number of Detects	12	Number of Non-Detects	39
Number of Distinct Detects	11	Number of Distinct Non-Detects	3
Minimum Detect	0.78	Minimum Non-Detect	0.64
Maximum Detect	3.7	Maximum Non-Detect	0.77
Variance Detects	0.735	Percent Non-Detects	76.47%
Mean Detects	1.378	SD Detects	0.857

Median Detects	0.95	CV Detects	0.622
Skewness Detects	2.118	Kurtosis Detects	4.739
Mean of Logged Detects	0.194	SD of Logged Detects	0.485
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.717	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.859	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.274	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.243	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.814	KM Standard Error of Mean	0.0741
KM SD	0.506	95% KM (BCA) UCL	0.944
95% KM (t) UCL	0.938	95% KM (Percentile Bootstrap) UCL	0.948
95% KM (z) UCL	0.935	95% KM Bootstrap t UCL	1.086
90% KM Chebyshev UCL	1.036	95% KM Chebyshev UCL	1.136
97.5% KM Chebyshev UCL	1.276	99% KM Chebyshev UCL	1.55
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	1.001	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.735	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.289	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.246	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	4.113	k star (bias corrected MLE)	3.14
Theta hat (MLE)	0.335	Theta star (bias corrected MLE)	0.439
nu hat (MLE)	98.71	nu star (bias corrected)	75.37
Mean (detects)	1.378		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	0.338
Maximum	3.7	Median	0.01
SD	0.708	CV	2.097
k hat (MLE)	0.302	k star (bias corrected MLE)	0.297
Theta hat (MLE)	1.119	Theta star (bias corrected MLE)	1.136
nu hat (MLE)	30.8	nu star (bias corrected)	30.32
Adjusted Level of Significance (β)	0.0453		
Approximate Chi Square Value (30.32, α)	18.75	Adjusted Chi Square Value (30.32, β)	18.48
95% Gamma Approximate UCL (use when n>=50)	0.546	95% Gamma Adjusted UCL (use when n<50)	0.554
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.814	SD (KM)	0.506

Variance (KM)	0.256	SE of Mean (KM)	0.0741
k hat (KM)	2.581	k star (KM)	2.443
nu hat (KM)	263.3	nu star (KM)	249.1
theta hat (KM)	0.315	theta star (KM)	0.333
80% gamma percentile (KM)	1.189	90% gamma percentile (KM)	1.511
95% gamma percentile (KM)	1.814	99% gamma percentile (KM)	2.479
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (249.14, α)	213.6	Adjusted Chi Square Value (249.14, β)	212.6
95% Gamma Approximate KM-UCL (use when n>=50)	0.949	95% Gamma Adjusted KM-UCL (use when n<50)	0.953
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.835	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.859	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.277	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.243	Detected Data Not Lognormal at 5% Significance Level	
Detected Data Not Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.497	Mean in Log Scale	-1.28
SD in Original Scale	0.649	SD in Log Scale	1.086
95% t UCL (assumes normality of ROS data)	0.65	95% Percentile Bootstrap UCL	0.66
95% BCA Bootstrap UCL	0.694	95% Bootstrap t UCL	0.743
95% H-UCL (Log ROS)	0.725		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-0.296	KM Geo Mean	0.744
KM SD (logged)	0.353	95% Critical H Value (KM-Log)	1.755
KM Standard Error of Mean (logged)	0.0516	95% H-UCL (KM -Log)	0.864
KM SD (logged)	0.353	95% Critical H Value (KM-Log)	1.755
KM Standard Error of Mean (logged)	0.0516		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.594	Mean in Log Scale	-0.755
SD in Original Scale	0.596	SD in Log Scale	0.584
95% t UCL (Assumes normality)	0.734	95% H-Stat UCL	0.654
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution at 5% Significance Level			
Suggested UCL to Use			
95% KM (t) UCL	0.938	KM H-UCL	0.864
95% KM (BCA) UCL	0.944		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			

Cobalt

General Statistics

Total Number of Observations	51	Number of Distinct Observations	4
		Number of Missing Observations	5
Number of Detects	2	Number of Non-Detects	49
Number of Distinct Detects	2	Number of Distinct Non-Detects	2
Minimum Detect	2	Minimum Non-Detect	1.3
Maximum Detect	2.4	Maximum Non-Detect	1.5
Variance Detects	0.08	Percent Non-Detects	96.08%
Mean Detects	2.2	SD Detects	0.283
Median Detects	2.2	CV Detects	0.129
Skewness Detects	N/A	Kurtosis Detects	N/A
Mean of Logged Detects	0.784	SD of Logged Detects	0.129

Warning: Data set has only 2 Detected Values.

This is not enough to compute meaningful or reliable statistics and estimates.

Normal GOF Test on Detects Only

Not Enough Data to Perform GOF Test

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	1.335	KM Standard Error of Mean	0.0355
KM SD	0.179	95% KM (BCA) UCL	N/A
95% KM (t) UCL	1.395	95% KM (Percentile Bootstrap) UCL	N/A
95% KM (z) UCL	1.394	95% KM Bootstrap t UCL	N/A
90% KM Chebyshev UCL	1.442	95% KM Chebyshev UCL	1.49
97.5% KM Chebyshev UCL	1.557	99% KM Chebyshev UCL	1.688

Gamma GOF Tests on Detected Observations Only

Not Enough Data to Perform GOF Test

Gamma Statistics on Detected Data Only

k hat (MLE)	120.7	k star (bias corrected MLE)	N/A
Theta hat (MLE)	0.0182	Theta star (bias corrected MLE)	N/A
nu hat (MLE)	482.7	nu star (bias corrected)	N/A
Mean (detects)	2.2		

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	1.335	SD (KM)	0.179
Variance (KM)	0.0321	SE of Mean (KM)	0.0355
k hat (KM)	55.57	k star (KM)	52.31
nu hat (KM)	5668	nu star (KM)	5336
theta hat (KM)	0.024	theta star (KM)	0.0255
80% gamma percentile (KM)	1.488	90% gamma percentile (KM)	1.577
95% gamma percentile (KM)	1.653	99% gamma percentile (KM)	1.802

Gamma Kaplan-Meier (KM) Statistics

		Adjusted Level of Significance (β)	0.0453
Approximate Chi Square Value (N/A, α)	5167	Adjusted Chi Square Value (N/A, β)	5162
95% Gamma Approximate KM-UCL (use when n>=50)	1.379	95% Gamma Adjusted KM-UCL (use when n<50)	1.38
Lognormal GOF Test on Detected Observations Only			
Not Enough Data to Perform GOF Test			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.69	Mean in Log Scale	-0.551
SD in Original Scale	0.452	SD in Log Scale	0.604
95% t UCL (assumes normality of ROS data)	0.796	95% Percentile Bootstrap UCL	0.798
95% BCA Bootstrap UCL	0.809	95% Bootstrap t UCL	0.819
95% H-UCL (Log ROS)	0.817		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	0.283	KM Geo Mean	1.327
KM SD (logged)	0.103	95% Critical H Value (KM-Log)	1.685
KM Standard Error of Mean (logged)	0.0204	95% H-UCL (KM -Log)	1.367
KM SD (logged)	0.103	95% Critical H Value (KM-Log)	1.685
KM Standard Error of Mean (logged)	0.0204		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.717	Mean in Log Scale	-0.375
SD in Original Scale	0.306	SD in Log Scale	0.24
95% t UCL (Assumes normality)	0.789	95% H-Stat UCL	0.75
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution at 5% Significance Level			
Suggested UCL to Use			
95% KM (t) UCL	1.395	KM H-UCL	1.367
95% KM (BCA) UCL	N/A		
Warning: One or more Recommended UCL(s) not available!			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			

ProUCL Output
Recreational Trespasser (Hunting) Surface Water
Columbia Falls Aluminum Facility
Columbia Falls, Montana

UCL Statistics for Data Sets with Non-Detects	
User Selected Options	
Date/Time of Computation	ProUCL 5.12/8/2019 11:02:33 AM
From File	20190207_CYANIDE_PROUCL_INPUT_RERUNS_e.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Cyanide

General Statistics			
Total Number of Observations	55	Number of Distinct Observations	8
		Number of Missing Observations	1
Number of Detects	8	Number of Non-Detects	47
Number of Distinct Detects	7	Number of Distinct Non-Detects	2
Minimum Detect	2	Minimum Non-Detect	2
Maximum Detect	15.3	Maximum Non-Detect	4
Variance Detects	24.26	Percent Non-Detects	85.45%
Mean Detects	5.325	SD Detects	4.926
Median Detects	2.85	CV Detects	0.925
Skewness Detects	1.619	Kurtosis Detects	1.531
Mean of Logged Detects	1.378	SD of Logged Detects	0.764

Normal GOF Test on Detects Only		
Shapiro Wilk Test Statistic	0.72	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.818	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.324	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.283	Detected Data Not Normal at 5% Significance Level
Detected Data Not Normal at 5% Significance Level		

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	2.486	KM Standard Error of Mean	0.305
KM SD	2.112	95% KM (BCA) UCL	3.089
95% KM (t) UCL	2.996	95% KM (Percentile Bootstrap) UCL	2.986
95% KM (z) UCL	2.987	95% KM Bootstrap t UCL	4.804
90% KM Chebyshev UCL	3.4	95% KM Chebyshev UCL	3.814
97.5% KM Chebyshev UCL	4.388	99% KM Chebyshev UCL	5.516

Gamma GOF Tests on Detected Observations Only		
A-D Test Statistic	0.873	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.725	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.3	**Kolmogorov-Smirnov GOF**
5% K-S Critical Value	0.298	Detected Data Not Gamma Distributed at 5% Significance Level
Detected Data Not Gamma Distributed at 5% Significance Level		

Gamma Statistics on Detected Data Only			
k hat (MLE)	1.845	k star (bias corrected MLE)	1.237
Theta hat (MLE)	2.886	Theta star (bias corrected MLE)	4.306
nu hat (MLE)	29.53	nu star (bias corrected)	19.79
Mean (detects)	5.325		

ProUCL Output
Recreational Trespasser (Hunting) Surface Water
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	0.783
Maximum	15.3	Median	0.01
SD	2.593	CV	3.311
k hat (MLE)	0.209	k star (bias corrected MLE)	0.21
Theta hat (MLE)	3.741	Theta star (bias corrected MLE)	3.728
nu hat (MLE)	23.03	nu star (bias corrected)	23.1
Adjusted Level of Significance (β)	0.0456		
Approximate Chi Square Value (23.10, α)	13.17	Adjusted Chi Square Value (23.10, β)	12.97
95% Gamma Approximate UCL (use when n>=50)	1.374	95% Gamma Adjusted UCL (use when n<50)	1.395
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	2.486	SD (KM)	2.112
Variance (KM)	4.461	SE of Mean (KM)	0.305
k hat (KM)	1.385	k star (KM)	1.322
nu hat (KM)	152.4	nu star (KM)	145.4
theta hat (KM)	1.794	theta star (KM)	1.881
80% gamma percentile (KM)	3.899	90% gamma percentile (KM)	5.344
95% gamma percentile (KM)	6.759	99% gamma percentile (KM)	9.981
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (145.42, α)	118.6	Adjusted Chi Square Value (145.42, β)	117.9
95% Gamma Approximate KM-UCL (use when n>=50)	3.05	95% Gamma Adjusted KM-UCL (use when n<50)	3.067
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.823	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.818	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.267	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.283	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	1.018	Mean in Log Scale	-1.531
SD in Original Scale	2.54	SD in Log Scale	1.812
95% t UCL (assumes normality of ROS data)	1.591	95% Percentile Bootstrap UCL	1.638
95% BCA Bootstrap UCL	1.841	95% Bootstrap t UCL	2.543
95% H-UCL (Log ROS)	2.601		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	0.794	KM Geo Mean	2.212
KM SD (logged)	0.364	95% Critical H Value (KM-Log)	1.76
KM Standard Error of Mean (logged)	0.0526	95% H-UCL (KM -Log)	2.579
KM SD (logged)	0.364	95% Critical H Value (KM-Log)	1.76
KM Standard Error of Mean (logged)	0.0526		

ProUCL Output
Recreational Trespasser (Hunting) Surface Water
Columbia Falls Aluminum Facility
Columbia Falls, Montana

DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	1.684	Mean in Log Scale	0.238
SD in Original Scale	2.344	SD in Log Scale	0.571
95% t UCL (Assumes normality)	2.213	95% H-Stat UCL	1.735
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Lognormal Distributed at 5% Significance Level			
Suggested UCL to Use			
KM H-UCL	2.579		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			

ProUCL Output
Recreational Trespasser (Hunting) Sediment
Columbia Falls Aluminum Facility
Columbia Falls, Montana

UCL Statistics for Data Sets with Non-Detects	
User Selected Options	
Date/Time of Computation	ProUCL 5.12/4/2019 7:00:08 PM
From File	20190204_MPAISM0-2_ATV_Hunt_ProUCL_input REv2_d.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Aluminum

General Statistics

Total Number of Observations	22	Number of Distinct Observations	21
		Number of Missing Observations	0
Minimum	6900	Mean	16255
Maximum	35400	Median	15150
SD	7756	Std. Error of Mean	1654
Coefficient of Variation	0.477	Skewness	1.389

Normal GOF Test

Shapiro Wilk Test Statistic	0.855	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.911	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.165	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.184	Data appear Normal at 5% Significance Level

Data appear Approximate Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	19100	95% Adjusted-CLT UCL (Chen-1995)	19498
		95% Modified-t UCL (Johnson-1978)	19182

Gamma GOF Test

A-D Test Statistic	0.458	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.746	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.12	**Kolmogorov-Smirnov Gamma GOF Test**
5% K-S Critical Value	0.186	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	5.502	k star (bias corrected MLE)	4.782
Theta hat (MLE)	2954	Theta star (bias corrected MLE)	3399
nu hat (MLE)	242.1	nu star (bias corrected)	210.4
MLE Mean (bias corrected)	16255	MLE Sd (bias corrected)	7433
		Approximate Chi Square Value (0.05)	177.9
Adjusted Level of Significance	0.0386	Adjusted Chi Square Value	175.6

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	19232	95% Adjusted Gamma UCL (use when n<50)	19476

Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.967	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.911	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.0999	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.184	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	8.839	Mean of logged Data	9.603
Maximum of Logged Data	10.47	SD of logged Data	0.432
Assuming Lognormal Distribution			
95% H-UCL	19509	90% Chebyshev (MVUE) UCL	20779
95% Chebyshev (MVUE) UCL	22864	97.5% Chebyshev (MVUE) UCL	25757
99% Chebyshev (MVUE) UCL	31441		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	18975	95% Jackknife UCL	19100
95% Standard Bootstrap UCL	18904	95% Bootstrap-t UCL	20221
95% Hall's Bootstrap UCL	19938	95% Percentile Bootstrap UCL	19021
95% BCA Bootstrap UCL	19449		
90% Chebyshev(Mean, Sd) UCL	21216	95% Chebyshev(Mean, Sd) UCL	23463
97.5% Chebyshev(Mean, Sd) UCL	26581	99% Chebyshev(Mean, Sd) UCL	32708
Suggested UCL to Use			
95% Student's-t UCL	19100		
When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test			
When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Iron			
General Statistics			
Total Number of Observations	22	Number of Distinct Observations	20
		Number of Missing Observations	0
Minimum	7770	Mean	13548
Maximum	25200	Median	13550
SD	4106	Std. Error of Mean	875.4
Coefficient of Variation	0.303	Skewness	0.986
Normal GOF Test			

Shapiro Wilk Test Statistic	0.923	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.911	Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.153	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.184	Data appear Normal at 5% Significance Level	
Data appear Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	15054	95% Adjusted-CLT UCL (Chen-1995)	15184
		95% Modified-t UCL (Johnson-1978)	15085
Gamma GOF Test			
A-D Test Statistic	0.351	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.743	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.127	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.185	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	12.08	k star (bias corrected MLE)	10.46
Theta hat (MLE)	1122	Theta star (bias corrected MLE)	1295
nu hat (MLE)	531.5	nu star (bias corrected)	460.3
MLE Mean (bias corrected)	13548	MLE Sd (bias corrected)	4188
		Approximate Chi Square Value (0.05)	411.6
Adjusted Level of Significance	0.0386	Adjusted Chi Square Value	408.2
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	15152	95% Adjusted Gamma UCL (use when n<50)	15280
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.961	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.911	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.125	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.184	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	8.958	Mean of logged Data	9.472
Maximum of Logged Data	10.13	SD of logged Data	0.296
Assuming Lognormal Distribution			
95% H-UCL	15285	90% Chebyshev (MVUE) UCL	16150
95% Chebyshev (MVUE) UCL	17330	97.5% Chebyshev (MVUE) UCL	18967
99% Chebyshev (MVUE) UCL	22183		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	14988	95% Jackknife UCL	15054

95% Standard Bootstrap UCL	14985	95% Bootstrap-t UCL	15330
95% Hall's Bootstrap UCL	15672	95% Percentile Bootstrap UCL	14999
95% BCA Bootstrap UCL	15014		
90% Chebyshev(Mean, Sd) UCL	16174	95% Chebyshev(Mean, Sd) UCL	17364
97.5% Chebyshev(Mean, Sd) UCL	19015	99% Chebyshev(Mean, Sd) UCL	22258
Suggested UCL to Use			
95% Student's-t UCL	15054		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Manganese			
General Statistics			
Total Number of Observations	22	Number of Distinct Observations	22
		Number of Missing Observations	0
Minimum	34.1	Mean	358.1
Maximum	1210	Median	253
SD	353.1	Std. Error of Mean	75.29
Coefficient of Variation	0.986	Skewness	1.467
Normal GOF Test			
Shapiro Wilk Test Statistic	0.79	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.911	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.259	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.184	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	487.7	95% Adjusted-CLT UCL (Chen-1995)	507.1
		95% Modified-t UCL (Johnson-1978)	491.6
Gamma GOF Test			
A-D Test Statistic	0.485	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.765	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.141	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.19	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	1.253	k star (bias corrected MLE)	1.112
Theta hat (MLE)	285.9	Theta star (bias corrected MLE)	322
nu hat (MLE)	55.12	nu star (bias corrected)	48.93
MLE Mean (bias corrected)	358.1	MLE Sd (bias corrected)	339.6
		Approximate Chi Square Value (0.05)	33.88

Adjusted Level of Significance	0.0386	Adjusted Chi Square Value	32.94
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50)	517.4	95% Adjusted Gamma UCL (use when n<50)	532
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.967	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.911	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.11	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.184	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	3.529	Mean of logged Data	5.431
Maximum of Logged Data	7.098	SD of logged Data	1
Assuming Lognormal Distribution			
95% H-UCL	661.3	90% Chebyshev (MVUE) UCL	627.2
95% Chebyshev (MVUE) UCL	746.1	97.5% Chebyshev (MVUE) UCL	911.2
99% Chebyshev (MVUE) UCL	1236		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	482	95% Jackknife UCL	487.7
95% Standard Bootstrap UCL	477.6	95% Bootstrap-t UCL	532.3
95% Hall's Bootstrap UCL	494.5	95% Percentile Bootstrap UCL	486.3
95% BCA Bootstrap UCL	505		
90% Chebyshev(Mean, Sd) UCL	584	95% Chebyshev(Mean, Sd) UCL	686.3
97.5% Chebyshev(Mean, Sd) UCL	828.3	99% Chebyshev(Mean, Sd) UCL	1107
Suggested UCL to Use			
95% Adjusted Gamma UCL	532		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Arsenic			
General Statistics			
Total Number of Observations	22	Number of Distinct Observations	20
		Number of Missing Observations	0
Minimum	1.8	Mean	5.273
Maximum	14.5	Median	4
SD	3.654	Std. Error of Mean	0.779
Coefficient of Variation	0.693	Skewness	1.435

ProUCL Output
Recreational Trespasser (Hunting) Sediment
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Normal GOF Test			
Shapiro Wilk Test Statistic	0.825	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.911	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.206	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.184	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	6.613	95% Adjusted-CLT UCL (Chen-1995)	6.809
		95% Modified-t UCL (Johnson-1978)	6.653
Gamma GOF Test			
A-D Test Statistic	0.594	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.751	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.152	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.187	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	2.71	k star (bias corrected MLE)	2.371
Theta hat (MLE)	1.946	Theta star (bias corrected MLE)	2.224
nu hat (MLE)	119.2	nu star (bias corrected)	104.3
MLE Mean (bias corrected)	5.273	MLE Sd (bias corrected)	3.424
		Approximate Chi Square Value (0.05)	81.75
Adjusted Level of Significance	0.0386	Adjusted Chi Square Value	80.26
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50)	6.728	95% Adjusted Gamma UCL (use when n<50)	6.853
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.947	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.911	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.13	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.184	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	0.588	Mean of logged Data	1.467
Maximum of Logged Data	2.674	SD of logged Data	0.623
Assuming Lognormal Distribution			
95% H-UCL	7.025	90% Chebyshev (MVUE) UCL	7.409
95% Chebyshev (MVUE) UCL	8.405	97.5% Chebyshev (MVUE) UCL	9.787
99% Chebyshev (MVUE) UCL	12.5		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			

Nonparametric Distribution Free UCLs			
95% CLT UCL	6.554	95% Jackknife UCL	6.613
95% Standard Bootstrap UCL	6.481	95% Bootstrap-t UCL	7.024
95% Hall's Bootstrap UCL	7.094	95% Percentile Bootstrap UCL	6.482
95% BCA Bootstrap UCL	6.773		
90% Chebyshev(Mean, Sd) UCL	7.61	95% Chebyshev(Mean, Sd) UCL	8.669
97.5% Chebyshev(Mean, Sd) UCL	10.14	99% Chebyshev(Mean, Sd) UCL	13.02
Suggested UCL to Use			
95% Adjusted Gamma UCL	6.853		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Cobalt			
General Statistics			
Total Number of Observations	22	Number of Distinct Observations	18
		Number of Missing Observations	0
Minimum	1.9	Mean	5.123
Maximum	9.2	Median	5.4
SD	1.661	Std. Error of Mean	0.354
Coefficient of Variation	0.324	Skewness	0.291
Normal GOF Test			
Shapiro Wilk Test Statistic	0.975	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.911	Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.113	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.184	Data appear Normal at 5% Significance Level	
Data appear Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	5.732	95% Adjusted-CLT UCL (Chen-1995)	5.729
		95% Modified-t UCL (Johnson-1978)	5.736
Gamma GOF Test			
A-D Test Statistic	0.377	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.744	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.153	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.185	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	9.099	k star (bias corrected MLE)	7.889
Theta hat (MLE)	0.563	Theta star (bias corrected MLE)	0.649
nu hat (MLE)	400.4	nu star (bias corrected)	347.1

ProUCL Output
Recreational Trespasser (Hunting) Sediment
Columbia Falls Aluminum Facility
Columbia Falls, Montana

MLE Mean (bias corrected)	5.123	MLE Sd (bias corrected)	1.824
		Approximate Chi Square Value (0.05)	304.9
Adjusted Level of Significance	0.0386	Adjusted Chi Square Value	302
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	5.831	95% Adjusted Gamma UCL (use when n<50)	5.888
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.949	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.911	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.17	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.184	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	0.642	Mean of logged Data	1.578
Maximum of Logged Data	2.219	SD of logged Data	0.357
Assuming Lognormal Distribution			
95% H-UCL	5.978	90% Chebyshev (MVUE) UCL	6.347
95% Chebyshev (MVUE) UCL	6.891	97.5% Chebyshev (MVUE) UCL	7.646
99% Chebyshev (MVUE) UCL	9.128		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	5.705	95% Jackknife UCL	5.732
95% Standard Bootstrap UCL	5.712	95% Bootstrap-t UCL	5.769
95% Hall's Bootstrap UCL	5.763	95% Percentile Bootstrap UCL	5.718
95% BCA Bootstrap UCL	5.709		
90% Chebyshev(Mean, Sd) UCL	6.185	95% Chebyshev(Mean, Sd) UCL	6.666
97.5% Chebyshev(Mean, Sd) UCL	7.334	99% Chebyshev(Mean, Sd) UCL	8.646
Suggested UCL to Use			
95% Student's-t UCL	5.732		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			

ProUCL Output
Main Plant Area ISM Soil (0-0.5 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

UCL Statistics for Data Sets with Non-Detects			
User Selected Options			
Date/Time of Computation	ProUCL 5.17/15/2019 9:53:12 AM		
From File	20190710_ProUCL_Input_ISM_c.xls		
Full Precision	ON		
Confidence Coefficient	95%		
Number of Bootstrap Operations	10000		
Aluminum_RSD_HIGH_HALF_ND			
General Statistics			
Total Number of Observations	28.000000	Number of Distinct Observations	27.000000
		Number of Missing Observations	0
Minimum	15268.017	Mean	21872.586
Maximum	37894.992	Median	20978.116
SD	6024.2279	Std. Error of Mean	1138.4721
Coefficient of Variation	0.2754237	Skewness	1.0519903
Normal GOF Test			
Shapiro Wilk Test Statistic	0.8938258	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.9240000	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.1364662	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.1641000	Data appear Normal at 5% Significance Level	
Data appear Approximate Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	23811.732	95% Adjusted-CLT UCL (Chen-1995)	23987.050
		95% Modified-t UCL (Johnson-1978)	23849.455
Gamma GOF Test			
A-D Test Statistic	0.6219304	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.7449042	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.1287846	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.1651900	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	15.219365	k star (bias corrected MLE)	13.612528
Theta hat (MLE)	1437.1549	Theta star (bias corrected MLE)	1606.7982
nu hat (MLE)	852.28444	nu star (bias corrected)	762.30158
MLE Mean (bias corrected)	21872.586	MLE Sd (bias corrected)	5928.3076
		Approximate Chi Square Value (0.05)	699.23332
Adjusted Level of Significance	0.0404000	Adjusted Chi Square Value	695.50975
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	23845.412	95% Adjusted Gamma UCL (use when n<50)	23973.074

Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.9335414	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.9240000	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.1216594	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.1641000	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	9.6335155	Mean of logged Data	9.9597768
Maximum of Logged Data	10.542574	SD of logged Data	0.2570219
Assuming Lognormal Distribution			
95% H-UCL	23878.973	90% Chebyshev (MVUE) UCL	25062.631
95% Chebyshev (MVUE) UCL	26521.444	97.5% Chebyshev (MVUE) UCL	28546.220
99% Chebyshev (MVUE) UCL	32523.500		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	23745.206	95% Jackknife UCL	23811.732
95% Standard Bootstrap UCL	23717.801	95% Bootstrap-t UCL	24110.470
95% Hall's Bootstrap UCL	24059.661	95% Percentile Bootstrap UCL	23733.631
95% BCA Bootstrap UCL	23971.840		
90% Chebyshev(Mean, Sd) UCL	25288.002	95% Chebyshev(Mean, Sd) UCL	26835.070
97.5% Chebyshev(Mean, Sd) UCL	28982.341	99% Chebyshev(Mean, Sd) UCL	33200.240
Suggested UCL to Use			
95% Student's-t UCL	23811.732		
When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test			
When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Iron_RSD_HIGH_HALF_ND			
General Statistics			
Total Number of Observations	28.000000	Number of Distinct Observations	26.000000
		Number of Missing Observations	0
Minimum	15155.300	Mean	20965.763
Maximum	68967.362	Median	17664.116
SD	10895.714	Std. Error of Mean	2059.0963
Coefficient of Variation	0.5196908	Skewness	3.6896922

Normal GOF Test			
Shapiro Wilk Test Statistic	0.4917430	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.9240000	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.3674241	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.1641000	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	24472.998	95% Adjusted-CLT UCL (Chen-1995)	25886.826
		95% Modified-t UCL (Johnson-1978)	24712.295
Gamma GOF Test			
A-D Test Statistic	4.2338924	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.7470366	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.3222553	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.1655683	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	7.2975610	k star (bias corrected MLE)	6.5394890
Theta hat (MLE)	2872.9822	Theta star (bias corrected MLE)	3206.0247
nu hat (MLE)	408.66341	nu star (bias corrected)	366.21138
MLE Mean (bias corrected)	20965.763	MLE Sd (bias corrected)	8198.5824
		Approximate Chi Square Value (0.05)	322.86188
Adjusted Level of Significance	0.0404000	Adjusted Chi Square Value	320.35082
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	23780.760	95% Adjusted Gamma UCL (use when n<50)	23967.165
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.6431238	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.9240000	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.2888387	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.1641000	Data Not Lognormal at 5% Significance Level	
Data Not Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	9.6261056	Mean of logged Data	9.8805681
Maximum of Logged Data	11.141389	SD of logged Data	0.3289167
Assuming Lognormal Distribution			
95% H-UCL	23152.072	90% Chebyshev (MVUE) UCL	24505.317
95% Chebyshev (MVUE) UCL	26278.124	97.5% Chebyshev (MVUE) UCL	28738.710
99% Chebyshev (MVUE) UCL	33572.056		
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution (0.05)			

Nonparametric Distribution Free UCLs			
95% CLT UCL	24352.675	95% Jackknife UCL	24472.998
95% Standard Bootstrap UCL	24287.694	95% Bootstrap-t UCL	31336.820
95% Hall's Bootstrap UCL	36639.416	95% Percentile Bootstrap UCL	24635.422
95% BCA Bootstrap UCL	26286.423		
90% Chebyshev(Mean, Sd) UCL	27143.052	95% Chebyshev(Mean, Sd) UCL	29941.156
97.5% Chebyshev(Mean, Sd) UCL	33824.816	99% Chebyshev(Mean, Sd) UCL	41453.513
Suggested UCL to Use			
95% Student's-t UCL	24472.998	or 95% Modified-t UCL	24712.295
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Manganese_RSD_HIGH_HALF_ND			
General Statistics			
Total Number of Observations	28.000000	Number of Distinct Observations	28.000000
		Number of Missing Observations	0
Minimum	388.96071	Mean	532.36337
Maximum	772.16982	Median	501.75194
SD	109.46560	Std. Error of Mean	20.687055
Coefficient of Variation	0.2056220	Skewness	0.7035872
Normal GOF Test			
Shapiro Wilk Test Statistic	0.9225514	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.9240000	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.1598507	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.1641000	Data appear Normal at 5% Significance Level	
Data appear Approximate Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	567.59939	95% Adjusted-CLT UCL (Chen-1995)	569.32967
		95% Modified-t UCL (Johnson-1978)	568.05783
Gamma GOF Test			
A-D Test Statistic	0.5563612	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.7442804	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.1397216	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.1651305	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			

Gamma Statistics			
k hat (MLE)	25.949524	k star (bias corrected MLE)	23.193027
Theta hat (MLE)	20.515342	Theta star (bias corrected MLE)	22.953596
nu hat (MLE)	1453.1733	nu star (bias corrected)	1298.8095
MLE Mean (bias corrected)	532.36337	MLE Sd (bias corrected)	110.54254
		Approximate Chi Square Value (0.05)	1216.1289
Adjusted Level of Significance	0.0404000	Adjusted Chi Square Value	1211.1989
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	568.55703	95% Adjusted Gamma UCL (use when n<50)	570.87121
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.9473478	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.9240000	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.1268776	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.1641000	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	5.9634783	Mean of logged Data	6.2579344
Maximum of Logged Data	6.6492045	SD of logged Data	0.1983034
Assuming Lognormal Distribution			
95% H-UCL	569.24642	90% Chebyshev (MVUE) UCL	592.37840
95% Chebyshev (MVUE) UCL	619.67033	97.5% Chebyshev (MVUE) UCL	657.55047
99% Chebyshev (MVUE) UCL	731.95867		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	566.39054	95% Jackknife UCL	567.59939
95% Standard Bootstrap UCL	566.09460	95% Bootstrap-t UCL	571.50002
95% Hall's Bootstrap UCL	569.45493	95% Percentile Bootstrap UCL	565.90743
95% BCA Bootstrap UCL	568.51074		
90% Chebyshev(Mean, Sd) UCL	594.42453	95% Chebyshev(Mean, Sd) UCL	622.53615
97.5% Chebyshev(Mean, Sd) UCL	661.55398	99% Chebyshev(Mean, Sd) UCL	738.19696
Suggested UCL to Use			
95% Student's-t UCL	567.59939		
When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test			
When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			

Nickel_RSD_HIGH_HALF_ND			
General Statistics			
Total Number of Observations	28.000000	Number of Distinct Observations	27.000000
		Number of Missing Observations	0
Minimum	15.133664	Mean	31.453743
Maximum	71.891589	Median	22.261127
SD	17.305556	Std. Error of Mean	3.2704426
Coefficient of Variation	0.5501907	Skewness	0.9613993
Normal GOF Test			
Shapiro Wilk Test Statistic	0.8222138	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.9240000	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.2583945	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.1641000	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	37.024250	95% Adjusted-CLT UCL (Chen-1995)	37.468052
		95% Modified-t UCL (Johnson-1978)	37.123283
Gamma GOF Test			
A-D Test Statistic	1.6386970	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.7497926	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.2213151	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.1661112	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	3.9766811	k star (bias corrected MLE)	3.5744176
Theta hat (MLE)	7.9095463	Theta star (bias corrected MLE)	8.7996833
nu hat (MLE)	222.69414	nu star (bias corrected)	200.16739
MLE Mean (bias corrected)	31.453743	MLE Sd (bias corrected)	16.636796
		Approximate Chi Square Value (0.05)	168.43217
Adjusted Level of Significance	0.0404000	Adjusted Chi Square Value	166.63479
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	37.380114	95% Adjusted Gamma UCL (use when n<50)	37.783307
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.8736194	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.9240000	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.1928393	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.1641000	Data Not Lognormal at 5% Significance Level	
Data Not Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	2.7169217	Mean of logged Data	3.3175478
Maximum of Logged Data	4.2751593	SD of logged Data	0.5064953

Assuming Lognormal Distribution			
95% H-UCL	37.925422	90% Chebyshev (MVUE) UCL	40.565223
95% Chebyshev (MVUE) UCL	44.803179	97.5% Chebyshev (MVUE) UCL	50.685297
99% Chebyshev (MVUE) UCL	62.239578		
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution (0.05)			
Nonparametric Distribution Free UCLs			
95% CLT UCL	36.833142	95% Jackknife UCL	37.024250
95% Standard Bootstrap UCL	36.750845	95% Bootstrap-t UCL	37.913493
95% Hall's Bootstrap UCL	37.274225	95% Percentile Bootstrap UCL	36.973628
95% BCA Bootstrap UCL	37.475164		
90% Chebyshev(Mean, Sd) UCL	41.265071	95% Chebyshev(Mean, Sd) UCL	45.709272
97.5% Chebyshev(Mean, Sd) UCL	51.877651	99% Chebyshev(Mean, Sd) UCL	63.994236
Suggested UCL to Use			
95% Chebyshev (Mean, Sd) UCL	45.709272		

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Thallium_RSD_HIGH_HALF_ND

General Statistics			
Total Number of Observations	28.000000	Number of Distinct Observations	20.000000
		Number of Missing Observations	0
Minimum	0.0841863	Mean	0.1334180
Maximum	0.2515889	Median	0.1172214
SD	0.0442207	Std. Error of Mean	0.0083569
Coefficient of Variation	0.3314450	Skewness	1.6011238
Normal GOF Test			
Shapiro Wilk Test Statistic	0.8097635	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.9240000	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.2284217	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.1641000	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	0.1476523	95% Adjusted-CLT UCL (Chen-1995)	0.1498658
		95% Modified-t UCL (Johnson-1978)	0.1480737

ProUCL Output
Main Plant Area ISM Soil (0-0.5 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Gamma GOF Test			
A-D Test Statistic	1.2284701	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.7451619	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.1966969	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.1651900	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	11.640347	k star (bias corrected MLE)	10.416976
Theta hat (MLE)	0.0114617	Theta star (bias corrected MLE)	0.0128077
nu hat (MLE)	651.85941	nu star (bias corrected)	583.35066
MLE Mean (bias corrected)	0.1334180	MLE Sd (bias corrected)	0.0413374
		Approximate Chi Square Value (0.05)	528.32717
Adjusted Level of Significance	0.0404000	Adjusted Chi Square Value	525.09835
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	0.1473130	95% Adjusted Gamma UCL (use when n<50)	0.1482188
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.9002061	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.9240000	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.1769654	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.1641000	Data Not Lognormal at 5% Significance Level	
Data Not Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	-2.474723	Mean of logged Data	-2.057837
Maximum of Logged Data	-1.379959	SD of logged Data	0.2875120
Assuming Lognormal Distribution			
95% H-UCL	0.1470189	90% Chebyshev (MVUE) UCL	0.1549028
95% Chebyshev (MVUE) UCL	0.1648619	97.5% Chebyshev (MVUE) UCL	0.1786849
99% Chebyshev (MVUE) UCL	0.2058373		
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution (0.05)			
Nonparametric Distribution Free UCLs			
95% CLT UCL	0.1471639	95% Jackknife UCL	0.1476523
95% Standard Bootstrap UCL	0.1470043	95% Bootstrap-t UCL	0.1520674
95% Hall's Bootstrap UCL	0.1505542	95% Percentile Bootstrap UCL	0.1476435
95% BCA Bootstrap UCL	0.1501800		
90% Chebyshev(Mean, Sd) UCL	0.1584888	95% Chebyshev(Mean, Sd) UCL	0.1698450
97.5% Chebyshev(Mean, Sd) UCL	0.1856070	99% Chebyshev(Mean, Sd) UCL	0.2165684

Suggested UCL to Use			
95% Student's-t UCL	0.1476523	or 95% Modified-t UCL	0.1480737

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Antimony_RSD_HIGH_HALF_ND

General Statistics			
Total Number of Observations	28.000000	Number of Distinct Observations	25.000000
		Number of Missing Observations	0
Minimum	0.1408754	Mean	1.3306867
Maximum	11.013896	Median	0.4627955
SD	2.3059424	Std. Error of Mean	0.4357821
Coefficient of Variation	1.7328965	Skewness	3.2710091

Normal GOF Test			
Shapiro Wilk Test Statistic	0.5420059	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.9240000	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.3029355	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.1641000	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			

Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	2.0729494	95% Adjusted-CLT UCL (Chen-1995)	2.3353255
		95% Modified-t UCL (Johnson-1978)	2.1178468

Gamma GOF Test			
A-D Test Statistic	2.0976927	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.7839449	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.2132938	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.1717609	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			

Gamma Statistics			
k hat (MLE)	0.7664304	k star (bias corrected MLE)	0.7081224
Theta hat (MLE)	1.7362133	Theta star (bias corrected MLE)	1.8791761
nu hat (MLE)	42.920105	nu star (bias corrected)	39.654855
MLE Mean (bias corrected)	1.3306867	MLE Sd (bias corrected)	1.5813269
		Approximate Chi Square Value (0.05)	26.228195
Adjusted Level of Significance	0.0404000	Adjusted Chi Square Value	25.552442

Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	2.0118880	95% Adjusted Gamma UCL (use when n<50)	2.0650938

Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.8975759	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.9240000	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.1563114	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.1641000	Data appear Lognormal at 5% Significance Level	
Data appear Approximate Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	-1.959879	Mean of logged Data	-0.493092
Maximum of Logged Data	2.3991578	SD of logged Data	1.1330662
Assuming Lognormal Distribution			
95% H-UCL	2.0562424	90% Chebyshev (MVUE) UCL	1.9649383
95% Chebyshev (MVUE) UCL	2.3476575	97.5% Chebyshev (MVUE) UCL	2.8788570
99% Chebyshev (MVUE) UCL	3.9222954		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	2.0474845	95% Jackknife UCL	2.0729494
95% Standard Bootstrap UCL	2.0314634	95% Bootstrap-t UCL	2.8981007
95% Hall's Bootstrap UCL	4.2726571	95% Percentile Bootstrap UCL	2.1184623
95% BCA Bootstrap UCL	2.4365915		
90% Chebyshev(Mean, Sd) UCL	2.6380331	95% Chebyshev(Mean, Sd) UCL	3.2302170
97.5% Chebyshev(Mean, Sd) UCL	4.0521453	99% Chebyshev(Mean, Sd) UCL	5.6666643
Suggested UCL to Use			
95% H-UCL	2.0562424		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
ProUCL computes and outputs H-statistic based UCLs for historical reasons only.			
H-statistic often results in unstable (both high and low) values of UCL95 as shown in examples in the Technical Guide.			
It is therefore recommended to avoid the use of H-statistic based 95% UCLs.			
Use of nonparametric methods are preferred to compute UCL95 for skewed data sets which do not follow a gamma distribution.			
Arsenic_RSD_HIGH_HALF_ND			
General Statistics			
Total Number of Observations	28.000000	Number of Distinct Observations	23.000000
		Number of Missing Observations	0
Minimum	4.4057287	Mean	8.2101774
Maximum	35.629710	Median	6.1469787
SD	6.5822188	Std. Error of Mean	1.2439224
Coefficient of Variation	0.8017146	Skewness	3.3135311

Normal GOF Test			
Shapiro Wilk Test Statistic	0.5289758	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.9240000	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.3484088	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.1641000	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	10.328936	95% Adjusted-CLT UCL (Chen-1995)	11.088559
		95% Modified-t UCL (Johnson-1978)	10.458760
Gamma GOF Test			
A-D Test Statistic	3.5104396	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.7521034	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.3095552	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.1663906	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	3.3946018	k star (bias corrected MLE)	3.0547040
Theta hat (MLE)	2.4185981	Theta star (bias corrected MLE)	2.6877162
nu hat (MLE)	190.09770	nu star (bias corrected)	171.06342
MLE Mean (bias corrected)	8.2101774	MLE Sd (bias corrected)	4.6975128
		Approximate Chi Square Value (0.05)	141.81781
Adjusted Level of Significance	0.0404000	Adjusted Chi Square Value	140.17333
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	9.9032766	95% Adjusted Gamma UCL (use when n<50)	10.019460
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.7379279	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.9240000	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.2697676	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.1641000	Data Not Lognormal at 5% Significance Level	
Data Not Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	1.4829057	Mean of logged Data	1.9509105
Maximum of Logged Data	3.5731798	SD of logged Data	0.4802263
Assuming Lognormal Distribution			
95% H-UCL	9.4333763	90% Chebyshev (MVUE) UCL	10.084036
95% Chebyshev (MVUE) UCL	11.091833	97.5% Chebyshev (MVUE) UCL	12.490617
99% Chebyshev (MVUE) UCL	15.238258		
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution (0.05)			

Nonparametric Distribution Free UCLs			
95% CLT UCL	10.256248	95% Jackknife UCL	10.328936
95% Standard Bootstrap UCL	10.225904	95% Bootstrap-t UCL	13.601484
95% Hall's Bootstrap UCL	16.768258	95% Percentile Bootstrap UCL	10.413993
95% BCA Bootstrap UCL	11.512009		
90% Chebyshev(Mean, Sd) UCL	11.941945	95% Chebyshev(Mean, Sd) UCL	13.632310
97.5% Chebyshev(Mean, Sd) UCL	15.978471	99% Chebyshev(Mean, Sd) UCL	20.587049
Suggested UCL to Use			
95% Student's-t UCL	10.328936	or 95% Modified-t UCL	10.458760
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Cobalt_RSD_HIGH_HALF_ND			
General Statistics			
Total Number of Observations	28.000000	Number of Distinct Observations	20.000000
		Number of Missing Observations	0
Minimum	5.8136316	Mean	7.0540435
Maximum	13.973712	Median	6.5760804
SD	1.6755678	Std. Error of Mean	0.3166525
Coefficient of Variation	0.2375330	Skewness	3.2274450
Normal GOF Test			
Shapiro Wilk Test Statistic	0.5929879	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.9240000	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.2893888	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.1641000	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	7.5933941	95% Adjusted-CLT UCL (Chen-1995)	7.7812590
		95% Modified-t UCL (Johnson-1978)	7.6255834
Gamma GOF Test			
A-D Test Statistic	3.1930952	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.7442904	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.2639138	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.1651326	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			

Gamma Statistics			
k hat (MLE)	25.735113	k star (bias corrected MLE)	23.001589
Theta hat (MLE)	0.2741019	Theta star (bias corrected MLE)	0.3066764
nu hat (MLE)	1441.1663	nu star (bias corrected)	1288.0890
MLE Mean (bias corrected)	7.0540435	MLE Sd (bias corrected)	1.4708189
		Approximate Chi Square Value (0.05)	1205.7551
Adjusted Level of Significance	0.0404000	Adjusted Chi Square Value	1200.8465
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	7.5357225	95% Adjusted Gamma UCL (use when n<50)	7.5665256
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.6957592	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.9240000	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.2485443	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.1641000	Data Not Lognormal at 5% Significance Level	
Data Not Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	1.7602054	Mean of logged Data	1.9340465
Maximum of Logged Data	2.6371778	SD of logged Data	0.1860993
Assuming Lognormal Distribution			
95% H-UCL	7.4914892	90% Chebyshev (MVUE) UCL	7.7806444
95% Chebyshev (MVUE) UCL	8.1189149	97.5% Chebyshev (MVUE) UCL	8.5884212
99% Chebyshev (MVUE) UCL	9.5106754		
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution (0.05)			
Nonparametric Distribution Free UCLs			
95% CLT UCL	7.5748906	95% Jackknife UCL	7.5933941
95% Standard Bootstrap UCL	7.5596364	95% Bootstrap-t UCL	8.3816681
95% Hall's Bootstrap UCL	10.009340	95% Percentile Bootstrap UCL	7.6139304
95% BCA Bootstrap UCL	7.8699967		
90% Chebyshev(Mean, Sd) UCL	8.0040011	95% Chebyshev(Mean, Sd) UCL	8.4342999
97.5% Chebyshev(Mean, Sd) UCL	9.0315380	99% Chebyshev(Mean, Sd) UCL	10.204697
Suggested UCL to Use			
95% Student's-t UCL	7.5933941	or 95% Modified-t UCL	7.6255834
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Copper_RSD_HIGH_HALF_ND			

ProUCL Output
Main Plant Area ISM Soil (0-0.5 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

General Statistics			
Total Number of Observations	28.000000	Number of Distinct Observations	25.000000
		Number of Missing Observations	0
Minimum	16.112890	Mean	101.21597
Maximum	995.88057	Median	30.204629
SD	210.11023	Std. Error of Mean	39.707101
Coefficient of Variation	2.0758604	Skewness	3.4931733
Normal GOF Test			
Shapiro Wilk Test Statistic	0.4478989	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.9240000	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.3795891	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.1641000	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	168.84862	95% Adjusted-CLT UCL (Chen-1995)	194.53683
		95% Modified-t UCL (Johnson-1978)	173.21738
Gamma GOF Test			
A-D Test Statistic	4.0363701	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.7904791	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.3209104	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.1725676	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	0.6931952	k star (bias corrected MLE)	0.6427338
Theta hat (MLE)	146.01367	Theta star (bias corrected MLE)	157.47729
nu hat (MLE)	38.818930	nu star (bias corrected)	35.993092
MLE Mean (bias corrected)	101.21597	MLE Sd (bias corrected)	126.25061
		Approximate Chi Square Value (0.05)	23.263143
Adjusted Level of Significance	0.0404000	Adjusted Chi Square Value	22.629786
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	156.60291	95% Adjusted Gamma UCL (use when n<50)	160.98587
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.7759039	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.9240000	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.2277505	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.1641000	Data Not Lognormal at 5% Significance Level	
Data Not Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	2.7796196	Mean of logged Data	3.7442411
Maximum of Logged Data	6.9036273	SD of logged Data	1.0754200

Assuming Lognormal Distribution			
95% H-UCL	127.76382	90% Chebyshev (MVUE) UCL	124.83451
95% Chebyshev (MVUE) UCL	148.27557	97.5% Chebyshev (MVUE) UCL	180.81086
99% Chebyshev (MVUE) UCL	244.72013		
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution (0.05)			
Nonparametric Distribution Free UCLs			
95% CLT UCL	166.52834	95% Jackknife UCL	168.84862
95% Standard Bootstrap UCL	164.93936	95% Bootstrap-t UCL	271.38773
95% Hall's Bootstrap UCL	210.90619	95% Percentile Bootstrap UCL	171.39359
95% BCA Bootstrap UCL	207.28483		
90% Chebyshev(Mean, Sd) UCL	220.33728	95% Chebyshev(Mean, Sd) UCL	274.29521
97.5% Chebyshev(Mean, Sd) UCL	349.18674	99% Chebyshev(Mean, Sd) UCL	496.29664
Suggested UCL to Use			
95% Chebyshev (Mean, Sd) UCL	274.29521		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Vanadium_RSD_HIGH_HALF_ND			
General Statistics			
Total Number of Observations	28.000000	Number of Distinct Observations	26.000000
		Number of Missing Observations	0
Minimum	13.017333	Mean	19.839976
Maximum	48.598152	Median	16.839883
SD	8.3952005	Std. Error of Mean	1.5865438
Coefficient of Variation	0.4231457	Skewness	2.2848224
Normal GOF Test			
Shapiro Wilk Test Statistic	0.7211621	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.9240000	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.2081997	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.1641000	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	22.542317	95% Adjusted-CLT UCL (Chen-1995)	23.181599
		95% Modified-t UCL (Johnson-1978)	22.656493

Gamma GOF Test			
A-D Test Statistic	1.6124027	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.7464534	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.1832683	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.1654427	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	8.1947378	k star (bias corrected MLE)	7.3405397
Theta hat (MLE)	2.4210629	Theta star (bias corrected MLE)	2.7027953
nu hat (MLE)	458.90531	nu star (bias corrected)	411.07022
MLE Mean (bias corrected)	19.839976	MLE Sd (bias corrected)	7.3227995
		Approximate Chi Square Value (0.05)	365.07144
Adjusted Level of Significance	0.0404000	Adjusted Chi Square Value	362.39752
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	22.339801	95% Adjusted Gamma UCL (use when n<50)	22.504633
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.8529405	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.9240000	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.1754722	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.1641000	Data Not Lognormal at 5% Significance Level	
Data Not Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	2.5662818	Mean of logged Data	2.9254450
Maximum of Logged Data	3.8835855	SD of logged Data	0.3340552
Assuming Lognormal Distribution			
95% H-UCL	22.163054	90% Chebyshev (MVUE) UCL	23.470501
95% Chebyshev (MVUE) UCL	25.191513	97.5% Chebyshev (MVUE) UCL	27.580210
99% Chebyshev (MVUE) UCL	32.272343		
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution (0.05)			
Nonparametric Distribution Free UCLs			
95% CLT UCL	22.449608	95% Jackknife UCL	22.542317
95% Standard Bootstrap UCL	22.387982	95% Bootstrap-t UCL	24.403533
95% Hall's Bootstrap UCL	33.521437	95% Percentile Bootstrap UCL	22.602345
95% BCA Bootstrap UCL	23.165022		
90% Chebyshev(Mean, Sd) UCL	24.599607	95% Chebyshev(Mean, Sd) UCL	26.755560
97.5% Chebyshev(Mean, Sd) UCL	29.747938	99% Chebyshev(Mean, Sd) UCL	35.625887

Suggested UCL to Use			
95% Student's-t UCL	22.542317	or 95% Modified-t UCL	22.656493
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Selenium_RSD_HIGH_HALF_ND			
General Statistics			
Total Number of Observations	28.000000	Number of Distinct Observations	21.000000
		Number of Missing Observations	0
Minimum	0.8756999	Mean	1.5894327
Maximum	3.1189310	Median	1.3195477
SD	0.5917808	Std. Error of Mean	0.1118361
Coefficient of Variation	0.3723220	Skewness	1.2508897
Normal GOF Test			
Shapiro Wilk Test Statistic	0.8544567	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.9240000	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.2472536	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.1641000	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	1.7799218	95% Adjusted-CLT UCL (Chen-1995)	1.8016356
		95% Modified-t UCL (Johnson-1978)	1.7843280
Gamma GOF Test			
A-D Test Statistic	1.1038917	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.7460753	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.2342734	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.1653613	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	8.7764752	k star (bias corrected MLE)	7.8599481
Theta hat (MLE)	0.1811015	Theta star (bias corrected MLE)	0.2022192
nu hat (MLE)	491.48261	nu star (bias corrected)	440.15709
MLE Mean (bias corrected)	1.5894327	MLE Sd (bias corrected)	0.5669337
		Approximate Chi Square Value (0.05)	392.51733
Adjusted Level of Significance	0.0404000	Adjusted Chi Square Value	389.74252
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	1.7823419	95% Adjusted Gamma UCL (use when n<50)	1.7950314

ProUCL Output
Main Plant Area ISM Soil (0-0.5 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.9280455	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.9240000	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.2195203	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.1641000	Data Not Lognormal at 5% Significance Level	
Data appear Approximate Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	-0.132732	Mean of logged Data	0.4053262
Maximum of Logged Data	1.1374903	SD of logged Data	0.3367860
Assuming Lognormal Distribution			
95% H-UCL	1.7865630	90% Chebyshev (MVUE) UCL	1.8924617
95% Chebyshev (MVUE) UCL	2.0322152	97.5% Chebyshev (MVUE) UCL	2.2261875
99% Chebyshev (MVUE) UCL	2.6072087		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	1.7733866	95% Jackknife UCL	1.7799218
95% Standard Bootstrap UCL	1.7671841	95% Bootstrap-t UCL	1.8185556
95% Hall's Bootstrap UCL	1.8071895	95% Percentile Bootstrap UCL	1.7792351
95% BCA Bootstrap UCL	1.8033720		
90% Chebyshev(Mean, Sd) UCL	1.9249409	95% Chebyshev(Mean, Sd) UCL	2.0769148
97.5% Chebyshev(Mean, Sd) UCL	2.2878486	99% Chebyshev(Mean, Sd) UCL	2.7021874
Suggested UCL to Use			
95% Student's-t UCL	1.7799218	or 95% Modified-t UCL	1.7843280
or 95% H-UCL	1.7865630		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
ProUCL computes and outputs H-statistic based UCLs for historical reasons only.			
H-statistic often results in unstable (both high and low) values of UCL95 as shown in examples in the Technical Guide.			
It is therefore recommended to avoid the use of H-statistic based 95% UCLs.			
Use of nonparametric methods are preferred to compute UCL95 for skewed data sets which do not follow a gamma distribution.			

Mercury_RSD_HIGH_HALF_ND			
General Statistics			
Total Number of Observations	28.000000	Number of Distinct Observations	19.000000
Number of Detects	12.000000	Number of Non-Detects	16.000000
Number of Distinct Detects	12.000000	Number of Distinct Non-Detects	7.0000000
Minimum Detect	0.0201420	Minimum Non-Detect	0.0089153
Maximum Detect	0.0759200	Maximum Non-Detect	0.0131698
Variance Detects	3.4864E-4	Percent Non-Detects	57.142857%
Mean Detects	0.0409315	SD Detects	0.0186719
Median Detects	0.0350118	CV Detects	0.4561748
Skewness Detects	0.9501283	Kurtosis Detects	0.0532795
Mean of Logged Detects	-3.286008	SD of Logged Detects	0.4405410
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.8821753	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.8590000	Detected Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.1949791	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.2426000	Detected Data appear Normal at 5% Significance Level	
Detected Data appear Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.0226365	KM Standard Error of Mean	0.0038880
KM SD	0.0196976	95% KM (BCA) UCL	0.0297560
95% KM (t) UCL	0.0292589	95% KM (Percentile Bootstrap) UCL	0.0292261
95% KM (z) UCL	0.0290318	95% KM Bootstrap t UCL	0.0307085
90% KM Chebyshev UCL	0.0343006	95% KM Chebyshev UCL	0.0395840
97.5% KM Chebyshev UCL	0.0469172	99% KM Chebyshev UCL	0.0613218
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	0.3466217	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.7317508	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.1555136	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.2458522	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	5.7076324	k star (bias corrected MLE)	4.3362798
Theta hat (MLE)	0.0071714	Theta star (bias corrected MLE)	0.0094393
nu hat (MLE)	136.98318	nu star (bias corrected)	104.07072
Mean (detects)	0.0409315		

Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.0100000	Mean	0.0232563
Maximum	0.0759200	Median	0.0100000
SD	0.0196220	CV	0.8437282
k hat (MLE)	1.9445867	k star (bias corrected MLE)	1.7600477
Theta hat (MLE)	0.0119595	Theta star (bias corrected MLE)	0.0132135
nu hat (MLE)	108.89686	nu star (bias corrected)	98.562671
Adjusted Level of Significance (β)	0.0404000		
Approximate Chi Square Value (98.56, α)	76.660310	Adjusted Chi Square Value (98.56, β)	75.466359
95% Gamma Approximate UCL (use when n>=50)	0.0299008	95% Gamma Adjusted UCL (use when n<50)	0.0303739
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.0226365	SD (KM)	0.0196976
Variance (KM)	3.8799E-4	SE of Mean (KM)	0.0038880
k hat (KM)	1.3206707	k star (KM)	1.2029798
nu hat (KM)	73.957557	nu star (KM)	67.366866
theta hat (KM)	0.0171402	theta star (KM)	0.0188171
80% gamma percentile (KM)	0.0358342	90% gamma percentile (KM)	0.0497974
95% gamma percentile (KM)	0.0635666	99% gamma percentile (KM)	0.0951207
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (67.37, α)	49.476930	Adjusted Chi Square Value (67.37, β)	48.528695
95% Gamma Approximate KM-UCL (use when n>=50)	0.0308215	95% Gamma Adjusted KM-UCL (use when n<50)	0.0314237
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.9420893	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.8590000	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.1270688	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.2426000	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.0235867	Mean in Log Scale	-4.031873
SD in Original Scale	0.0195278	SD in Log Scale	0.7507068
95% t UCL (assumes normality of ROS data)	0.0298726	95% Percentile Bootstrap UCL	0.0298006
95% BCA Bootstrap UCL	0.0305504	95% Bootstrap t UCL	0.0315958
95% H-UCL (Log ROS)	0.0321894		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-4.105422	KM Geo Mean	0.0164831
KM SD (logged)	0.7614617	95% Critical H Value (KM-Log)	2.1843581
KM Standard Error of Mean (logged)	0.1503015	95% H-UCL (KM -Log)	0.0303364
KM SD (logged)	0.7614617	95% Critical H Value (KM-Log)	2.1843581
KM Standard Error of Mean (logged)	0.1503015		

DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.0207542	Mean in Log Scale	-4.372731
SD in Original Scale	0.0214228	SD in Log Scale	1.0026978
95% t UCL (Assumes normality)	0.0276500	95% H-Stat UCL	0.0335251
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Normal Distributed at 5% Significance Level			
Suggested UCL to Use			
95% KM (t) UCL	0.0292589		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Indeno123_CDPyrene_RSD_HIGH_HALF_ND			
General Statistics			
Total Number of Observations	28.000000	Number of Distinct Observations	27.000000
		Number of Missing Observations	0
Minimum	0.1555551	Mean	12.063035
Maximum	131.12331	Median	3.2210229
SD	26.105077	Std. Error of Mean	4.9333958
Coefficient of Variation	2.1640554	Skewness	3.9111195
Normal GOF Test			
Shapiro Wilk Test Statistic	0.4801058	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.9240000	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.3316958	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.1641000	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	20.466032	95% Adjusted-CLT UCL (Chen-1995)	24.074014
		95% Modified-t UCL (Johnson-1978)	21.073770
Gamma GOF Test			
A-D Test Statistic	1.1692918	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.8112598	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.1755177	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.1750428	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			

Gamma Statistics			
k hat (MLE)	0.4955000	k star (bias corrected MLE)	0.4662203
Theta hat (MLE)	24.345177	Theta star (bias corrected MLE)	25.874113
nu hat (MLE)	27.748001	nu star (bias corrected)	26.108334
MLE Mean (bias corrected)	12.063035	MLE Sd (bias corrected)	17.666928
		Approximate Chi Square Value (0.05)	15.462791
Adjusted Level of Significance	0.0404000	Adjusted Chi Square Value	14.955893
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	20.367977	95% Adjusted Gamma UCL (use when n<50)	21.058306
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.9862461	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.9240000	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.0983646	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.1641000	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	-1.860756	Mean of logged Data	1.2064453
Maximum of Logged Data	4.8761382	SD of logged Data	1.6251414
Assuming Lognormal Distribution			
95% H-UCL	35.276692	90% Chebyshev (MVUE) UCL	24.676293
95% Chebyshev (MVUE) UCL	30.712406	97.5% Chebyshev (MVUE) UCL	39.090296
99% Chebyshev (MVUE) UCL	55.547039		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	20.177749	95% Jackknife UCL	20.466032
95% Standard Bootstrap UCL	19.938017	95% Bootstrap-t UCL	36.799410
95% Hall's Bootstrap UCL	49.495711	95% Percentile Bootstrap UCL	20.901199
95% BCA Bootstrap UCL	25.718679		
90% Chebyshev(Mean, Sd) UCL	26.863223	95% Chebyshev(Mean, Sd) UCL	33.567209
97.5% Chebyshev(Mean, Sd) UCL	42.872082	99% Chebyshev(Mean, Sd) UCL	61.149704
Suggested UCL to Use			
95% Chebyshev (Mean, Sd) UCL	33.567209		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			

BenzoBFluoranthene_RSD_HIGH_HALF_ND			
General Statistics			
Total Number of Observations	28.000000	Number of Distinct Observations	26.000000
		Number of Missing Observations	0
Minimum	0.2721008	Mean	14.705215
Maximum	168.79578	Median	3.6539939
SD	33.316417	Std. Error of Mean	6.2962110
Coefficient of Variation	2.2656192	Skewness	4.0633300
Normal GOF Test			
Shapiro Wilk Test Statistic	0.4511023	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.9240000	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.3495799	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.1641000	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	25.429478	95% Adjusted-CLT UCL (Chen-1995)	30.227660
		95% Modified-t UCL (Johnson-1978)	26.235285
Gamma GOF Test			
A-D Test Statistic	1.4662690	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.8087057	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.2154443	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.1747525	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	0.5152708	k star (bias corrected MLE)	0.4838728
Theta hat (MLE)	28.538807	Theta star (bias corrected MLE)	30.390665
nu hat (MLE)	28.855166	nu star (bias corrected)	27.096874
MLE Mean (bias corrected)	14.705215	MLE Sd (bias corrected)	21.140039
		Approximate Chi Square Value (0.05)	16.226608
Adjusted Level of Significance	0.0404000	Adjusted Chi Square Value	15.706109
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	24.556295	95% Adjusted Gamma UCL (use when n<50)	25.370087
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.9821232	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.9240000	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.0954427	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.1641000	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	-1.301583	Mean of logged Data	1.4612072
Maximum of Logged Data	5.1286896	SD of logged Data	1.5198297

Assuming Lognormal Distribution			
95% H-UCL	34.468295	90% Chebyshev (MVUE) UCL	26.283321
95% Chebyshev (MVUE) UCL	32.469561	97.5% Chebyshev (MVUE) UCL	41.055823
99% Chebyshev (MVUE) UCL	57.921873		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	25.061560	95% Jackknife UCL	25.429478
95% Standard Bootstrap UCL	24.818630	95% Bootstrap-t UCL	49.376208
95% Hall's Bootstrap UCL	61.096285	95% Percentile Bootstrap UCL	25.714106
95% BCA Bootstrap UCL	32.183753		
90% Chebyshev(Mean, Sd) UCL	33.593848	95% Chebyshev(Mean, Sd) UCL	42.149762
97.5% Chebyshev(Mean, Sd) UCL	54.025040	99% Chebyshev(Mean, Sd) UCL	77.351723
Suggested UCL to Use			
95% Chebyshev (Mean, Sd) UCL	42.149762		

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

BenzoKFluoranthene_RSD_HIGH_HALF_ND

General Statistics			
Total Number of Observations	28.000000	Number of Distinct Observations	28.000000
		Number of Missing Observations	0
Minimum	0.0937728	Mean	5.5901159
Maximum	61.702246	Median	1.5464287
SD	12.370432	Std. Error of Mean	2.3377920
Coefficient of Variation	2.2129116	Skewness	3.9192118
Normal GOF Test			
Shapiro Wilk Test Statistic	0.4600169	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.9240000	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.3555547	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.1641000	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	9.5720500	95% Adjusted-CLT UCL (Chen-1995)	11.285587
		95% Modified-t UCL (Johnson-1978)	9.8606354

Gamma GOF Test			
A-D Test Statistic	1.4119822	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.8079745	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.2270372	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.1746648	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	0.5224078	k star (bias corrected MLE)	0.4902451
Theta hat (MLE)	10.700674	Theta star (bias corrected MLE)	11.402696
nu hat (MLE)	29.254839	nu star (bias corrected)	27.453725
MLE Mean (bias corrected)	5.5901159	MLE Sd (bias corrected)	7.9838834
		Approximate Chi Square Value (0.05)	16.503360
Adjusted Level of Significance	0.0404000	Adjusted Chi Square Value	15.978013
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	9.2992882	95% Adjusted Gamma UCL (use when n<50)	9.6050435
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.9825908	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.9240000	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.1054235	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.1641000	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	-2.366880	Mean of logged Data	0.5133249
Maximum of Logged Data	4.1223203	SD of logged Data	1.5247405
Assuming Lognormal Distribution			
95% H-UCL	13.527298	90% Chebyshev (MVUE) UCL	10.276218
95% Chebyshev (MVUE) UCL	12.699504	97.5% Chebyshev (MVUE) UCL	16.062931
99% Chebyshev (MVUE) UCL	22.669732		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	9.4354415	95% Jackknife UCL	9.5720500
95% Standard Bootstrap UCL	9.2995156	95% Bootstrap-t UCL	18.788249
95% Hall's Bootstrap UCL	23.625182	95% Percentile Bootstrap UCL	9.8201148
95% BCA Bootstrap UCL	11.870129		
90% Chebyshev(Mean, Sd) UCL	12.603492	95% Chebyshev(Mean, Sd) UCL	15.780315
97.5% Chebyshev(Mean, Sd) UCL	20.189622	99% Chebyshev(Mean, Sd) UCL	28.850852

Suggested UCL to Use			
95% Chebyshev (Mean, Sd) UCL	15.780315		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Chrysene_RSD_HIGH_HALF_ND			
General Statistics			
Total Number of Observations	28.000000	Number of Distinct Observations	28.000000
		Number of Missing Observations	0
Minimum	0.2118180	Mean	12.353735
Maximum	135.87829	Median	3.3954944
SD	26.878359	Std. Error of Mean	5.0795325
Coefficient of Variation	2.1757274	Skewness	3.9915066
Normal GOF Test			
Shapiro Wilk Test Statistic	0.4671913	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.9240000	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.3478153	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.1641000	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	21.005644	95% Adjusted-CLT UCL (Chen-1995)	24.802956
		95% Modified-t UCL (Johnson-1978)	21.644246
Gamma GOF Test			
A-D Test Statistic	1.2831151	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.8071650	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.2107441	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.1745678	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	0.5303107	k star (bias corrected MLE)	0.4973012
Theta hat (MLE)	23.295278	Theta star (bias corrected MLE)	24.841554
nu hat (MLE)	29.697399	nu star (bias corrected)	27.848868
MLE Mean (bias corrected)	12.353735	MLE Sd (bias corrected)	17.518161
		Approximate Chi Square Value (0.05)	16.810424
Adjusted Level of Significance	0.0404000	Adjusted Chi Square Value	16.279742
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	20.465726	95% Adjusted Gamma UCL (use when n<50)	21.132862

Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.9863576	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.9240000	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.0921098	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.1641000	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	-1.552028	Mean of logged Data	1.3270138
Maximum of Logged Data	4.9117596	SD of logged Data	1.5240958
Assuming Lognormal Distribution			
95% H-UCL	30.470177	90% Chebyshev (MVUE) UCL	23.158633
95% Chebyshev (MVUE) UCL	28.618427	97.5% Chebyshev (MVUE) UCL	36.196409
99% Chebyshev (MVUE) UCL	51.081888		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	20.708823	95% Jackknife UCL	21.005644
95% Standard Bootstrap UCL	20.663295	95% Bootstrap-t UCL	37.870499
95% Hall's Bootstrap UCL	50.169679	95% Percentile Bootstrap UCL	21.421338
95% BCA Bootstrap UCL	26.868584		
90% Chebyshev(Mean, Sd) UCL	27.592333	95% Chebyshev(Mean, Sd) UCL	34.494904
97.5% Chebyshev(Mean, Sd) UCL	44.075405	99% Chebyshev(Mean, Sd) UCL	62.894445
Suggested UCL to Use			
95% Chebyshev (Mean, Sd) UCL	34.494904		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
BenzoAPyrene_RSD_HIGH_HALF_ND			
General Statistics			
Total Number of Observations	28.000000	Number of Distinct Observations	28.000000
		Number of Missing Observations	0
Minimum	0.2006837	Mean	12.810729
Maximum	149.76077	Median	3.0493707
SD	29.720791	Std. Error of Mean	5.6167015
Coefficient of Variation	2.3199921	Skewness	4.0388333

Normal GOF Test			
Shapiro Wilk Test Statistic	0.4468970	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.9240000	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.3567807	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.1641000	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	22.377592	95% Adjusted-CLT UCL (Chen-1995)	26.630153
		95% Modified-t UCL (Johnson-1978)	23.092100
Gamma GOF Test			
A-D Test Statistic	1.5181001	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.8133907	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.2256671	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.1752642	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	0.4858119	k star (bias corrected MLE)	0.4575702
Theta hat (MLE)	26.369731	Theta star (bias corrected MLE)	27.997301
nu hat (MLE)	27.205467	nu star (bias corrected)	25.623928
MLE Mean (bias corrected)	12.810729	MLE Sd (bias corrected)	18.938475
		Approximate Chi Square Value (0.05)	15.090081
Adjusted Level of Significance	0.0404000	Adjusted Chi Square Value	14.589939
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	21.753443	95% Adjusted Gamma UCL (use when n<50)	22.499149
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.9802312	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.9240000	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.0974566	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.1641000	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	-1.606025	Mean of logged Data	1.2369498
Maximum of Logged Data	5.0090391	SD of logged Data	1.5814404
Assuming Lognormal Distribution			
95% H-UCL	32.335031	90% Chebyshev (MVUE) UCL	23.475466
95% Chebyshev (MVUE) UCL	29.129867	97.5% Chebyshev (MVUE) UCL	36.977956
99% Chebyshev (MVUE) UCL	52.394008		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			

Nonparametric Distribution Free UCLs			
95% CLT UCL	22.049381	95% Jackknife UCL	22.377592
95% Standard Bootstrap UCL	21.943169	95% Bootstrap-t UCL	43.725619
95% Hall's Bootstrap UCL	54.424147	95% Percentile Bootstrap UCL	22.909298
95% BCA Bootstrap UCL	28.438917		
90% Chebyshev(Mean, Sd) UCL	29.660834	95% Chebyshev(Mean, Sd) UCL	37.293364
97.5% Chebyshev(Mean, Sd) UCL	47.887019	99% Chebyshev(Mean, Sd) UCL	68.696204

Suggested UCL to Use			
95% Chebyshev (Mean, Sd) UCL	37.293364		

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

DibenzAHAnthracene_RSD_HIGH_HALF_ND

General Statistics			
Total Number of Observations	28.000000	Number of Distinct Observations	27.000000
Number of Detects	27.000000	Number of Non-Detects	1.0000000
Number of Distinct Detects	26.000000	Number of Distinct Non-Detects	1.0000000
Minimum Detect	0.0458782	Minimum Non-Detect	0.0147466
Maximum Detect	36.353875	Maximum Non-Detect	0.0147466
Variance Detects	52.235256	Percent Non-Detects	3.5714286%
Mean Detects	3.2767675	SD Detects	7.2273962
Median Detects	0.9503349	CV Detects	2.2056482
Skewness Detects	4.0484415	Kurtosis Detects	18.053592
Mean of Logged Detects	-0.046250	SD of Logged Detects	1.5506984

Normal GOF Test on Detects Only		
Shapiro Wilk Test Statistic	0.4639823	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.9230000	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.3274254	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.1665000	Detected Data Not Normal at 5% Significance Level
Detected Data Not Normal at 5% Significance Level		

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	3.1602667	KM Standard Error of Mean	1.3462947
KM SD	6.9907526	95% KM (BCA) UCL	5.8360383
95% KM (t) UCL	5.4533949	95% KM (Percentile Bootstrap) UCL	5.6764976
95% KM (z) UCL	5.3747244	95% KM Bootstrap t UCL	9.8034970
90% KM Chebyshev UCL	7.1991507	95% KM Chebyshev UCL	9.0286291
97.5% KM Chebyshev UCL	11.567874	99% KM Chebyshev UCL	16.555729

Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	1.2887296	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.8061647	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.1843640	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.1777375	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.5130570	k star (bias corrected MLE)	0.4807420
Theta hat (MLE)	6.3867511	Theta star (bias corrected MLE)	6.8160618
nu hat (MLE)	27.705079	nu star (bias corrected)	25.960070
Mean (detects)	3.2767675		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.0100000	Mean	3.1600972
Maximum	36.353875	Median	0.7827772
SD	7.1191117	CV	2.2528141
k hat (MLE)	0.4714633	k star (bias corrected MLE)	0.4447589
Theta hat (MLE)	6.7027433	Theta star (bias corrected MLE)	7.1051922
nu hat (MLE)	26.401943	nu star (bias corrected)	24.906496
Adjusted Level of Significance (β)	0.0404000		
Approximate Chi Square Value (24.91, α)	14.540066	Adjusted Chi Square Value (24.91, β)	14.050045
95% Gamma Approximate UCL (use when n>=50)	5.4131083	95% Gamma Adjusted UCL (use when n<50)	5.6019001
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	3.1602667	SD (KM)	6.9907526
Variance (KM)	48.870621	SE of Mean (KM)	1.3462947
k hat (KM)	0.2043618	k star (KM)	0.2062754
nu hat (KM)	11.444258	nu star (KM)	11.551421
theta hat (KM)	15.464081	theta star (KM)	15.320621
80% gamma percentile (KM)	4.2306350	90% gamma percentile (KM)	9.5582458
95% gamma percentile (KM)	16.151720	99% gamma percentile (KM)	34.213843
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (11.55, α)	4.9330544	Adjusted Chi Square Value (11.55, β)	4.6672120
95% Gamma Approximate KM-UCL (use when n>=50)	7.4001964	95% Gamma Adjusted KM-UCL (use when n<50)	7.8217083
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.9826972	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.9230000	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.0974945	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.1665000	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			

Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	3.1604293	Mean in Log Scale	-0.185589
SD in Original Scale	7.1189595	SD in Log Scale	1.6909271
95% t UCL (assumes normality of ROS data)	5.4519602	95% Percentile Bootstrap UCL	5.6045773
95% BCA Bootstrap UCL	7.0250542	95% Bootstrap t UCL	9.9488341
95% H-UCL (Log ROS)	10.529761		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-0.195196	KM Geo Mean	0.8226734
KM SD (logged)	1.6828245	95% Critical H Value (KM-Log)	3.3993465
KM Standard Error of Mean (logged)	0.3240821	95% H-UCL (KM -Log)	10.192625
KM SD (logged)	1.6828245	95% Critical H Value (KM-Log)	3.3993465
KM Standard Error of Mean (logged)	0.3240821		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	3.1600034	Mean in Log Scale	-0.219951
SD in Original Scale	7.1191547	SD in Log Scale	1.7777586
95% t UCL (Assumes normality)	5.4515971	95% H-Stat UCL	13.097835
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Lognormal Distributed at 5% Significance Level			
Suggested UCL to Use			
95% KM (Chebyshev) UCL	9.0286291		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
BenzoAAnthracene_RSD_HIGH_HALF_ND			
General Statistics			
Total Number of Observations	28.000000	Number of Distinct Observations	27.000000
		Number of Missing Observations	0
Minimum	0.2025267	Mean	10.833437
Maximum	132.04367	Median	2.6596861
SD	25.928995	Std. Error of Mean	4.9001195
Coefficient of Variation	2.3934229	Skewness	4.1773504
Normal GOF Test			
Shapiro Wilk Test Statistic	0.4306437	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.9240000	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.3508330	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.1641000	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			

ProUCL Output
Main Plant Area ISM Soil (0-0.5 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	19.179754	95% Adjusted-CLT UCL (Chen-1995)	23.026831
		95% Modified-t UCL (Johnson-1978)	19.824483
Gamma GOF Test			
A-D Test Statistic	1.6178364	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.8135283	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.2167684	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.1752785	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	0.4851860	k star (bias corrected MLE)	0.4570113
Theta hat (MLE)	22.328419	Theta star (bias corrected MLE)	23.704963
nu hat (MLE)	27.170417	nu star (bias corrected)	25.592634
MLE Mean (bias corrected)	10.833437	MLE Sd (bias corrected)	16.025174
		Approximate Chi Square Value (0.05)	15.066040
Adjusted Level of Significance	0.0404000	Adjusted Chi Square Value	14.566336
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	18.402725	95% Adjusted Gamma UCL (use when n<50)	19.034037
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.9765530	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.9240000	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.0857636	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.1641000	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	-1.596883	Mean of logged Data	1.0673452
Maximum of Logged Data	4.8831327	SD of logged Data	1.5584129
Assuming Lognormal Distribution			
95% H-UCL	25.684074	90% Chebyshev (MVUE) UCL	19.000689
95% Chebyshev (MVUE) UCL	23.538801	97.5% Chebyshev (MVUE) UCL	29.837525
99% Chebyshev (MVUE) UCL	42.210147		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	18.893416	95% Jackknife UCL	19.179754
95% Standard Bootstrap UCL	18.699008	95% Bootstrap-t UCL	39.263788
95% Hall's Bootstrap UCL	46.808708	95% Percentile Bootstrap UCL	19.593721
95% BCA Bootstrap UCL	24.579064		
90% Chebyshev(Mean, Sd) UCL	25.533795	95% Chebyshev(Mean, Sd) UCL	32.192562
97.5% Chebyshev(Mean, Sd) UCL	41.434673	99% Chebyshev(Mean, Sd) UCL	59.589010

Suggested UCL to Use			
95% Chebyshev (Mean, Sd) UCL	32.192562		

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Naphthalene_RSD_HIGH_HALF_ND

General Statistics			
Total Number of Observations	28.000000	Number of Distinct Observations	27.000000
Number of Detects	23.000000	Number of Non-Detects	5.0000000
Number of Distinct Detects	22.000000	Number of Distinct Non-Detects	5.0000000
Minimum Detect	0.0123706	Minimum Non-Detect	0.0053477
Maximum Detect	1.8843262	Maximum Non-Detect	0.1521956
Variance Detects	0.1533585	Percent Non-Detects	17.857143%
Mean Detects	0.2011958	SD Detects	0.3916102
Median Detects	0.0863363	CV Detects	1.9464136
Skewness Detects	3.9266516	Kurtosis Detects	16.975918
Mean of Logged Detects	-2.569650	SD of Logged Detects	1.3548693

Normal GOF Test on Detects Only		
Shapiro Wilk Test Statistic	0.4859608	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.9140000	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.3148403	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.1798000	Detected Data Not Normal at 5% Significance Level
Detected Data Not Normal at 5% Significance Level		

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.1694867	KM Standard Error of Mean	0.0684346
KM SD	0.3539769	95% KM (BCA) UCL	0.3027046
95% KM (t) UCL	0.2860506	95% KM (Percentile Bootstrap) UCL	0.2947562
95% KM (z) UCL	0.2820516	95% KM Bootstrap t UCL	0.4772839
90% KM Chebyshev UCL	0.3747905	95% KM Chebyshev UCL	0.4677863
97.5% KM Chebyshev UCL	0.5968607	99% KM Chebyshev UCL	0.8504024

Gamma GOF Tests on Detected Observations Only		
A-D Test Statistic	1.0941723	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.7927939	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.1717648	**Kolmogorov-Smirnov GOF**
5% K-S Critical Value	0.1901337	Detected data appear Gamma Distributed at 5% Significance Level
Detected data follow Appr. Gamma Distribution at 5% Significance Level		

Gamma Statistics on Detected Data Only			
k hat (MLE)	0.6343282	k star (bias corrected MLE)	0.5805753
Theta hat (MLE)	0.3171793	Theta star (bias corrected MLE)	0.3465455
nu hat (MLE)	29.179098	nu star (bias corrected)	26.706462
Mean (detects)	0.2011958		

Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.0100000	Mean	0.1670537
Maximum	1.8843262	Median	0.0355958
SD	0.3612749	CV	2.1626277
k hat (MLE)	0.5476716	k star (bias corrected MLE)	0.5128020
Theta hat (MLE)	0.3050252	Theta star (bias corrected MLE)	0.3257664
nu hat (MLE)	30.669608	nu star (bias corrected)	28.716912
Adjusted Level of Significance (β)	0.0404000		
Approximate Chi Square Value (28.72, α)	17.487177	Adjusted Chi Square Value (28.72, β)	16.944905
95% Gamma Approximate UCL (use when n>=50)	0.2743305	95% Gamma Adjusted UCL (use when n<50)	0.2831096
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.1694867	SD (KM)	0.3539769
Variance (KM)	0.1252997	SE of Mean (KM)	0.0684346
k hat (KM)	0.2292565	k star (KM)	0.2285028
nu hat (KM)	12.838362	nu star (KM)	12.796157
theta hat (KM)	0.7392888	theta star (KM)	0.7417272
80% gamma percentile (KM)	0.2377599	90% gamma percentile (KM)	0.5113311
95% gamma percentile (KM)	0.8421538	99% gamma percentile (KM)	1.7342537
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (12.80, α)	5.7558954	Adjusted Chi Square Value (12.80, β)	5.4651643
95% Gamma Approximate KM-UCL (use when n>=50)	0.3767926	95% Gamma Adjusted KM-UCL (use when n<50)	0.3968369
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.9388063	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.9140000	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.1778701	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.1798000	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.1684392	Mean in Log Scale	-2.905595
SD in Original Scale	0.3607058	SD in Log Scale	1.4916047
95% t UCL (assumes normality of ROS data)	0.2845472	95% Percentile Bootstrap UCL	0.2931098
95% BCA Bootstrap UCL	0.3703422	95% Bootstrap t UCL	0.4802772
95% H-UCL (Log ROS)	0.4073142		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-2.885484	KM Geo Mean	0.0558277
KM SD (logged)	1.4431027	95% Critical H Value (KM-Log)	3.0476551
KM Standard Error of Mean (logged)	0.2846243	95% H-UCL (KM -Log)	0.3686894
KM SD (logged)	1.4431027	95% Critical H Value (KM-Log)	3.0476551
KM Standard Error of Mean (logged)	0.2846243		

DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.1709227	Mean in Log Scale	-2.874092
SD in Original Scale	0.3598737	SD in Log Scale	1.5250272
95% t UCL (Assumes normality)	0.2867629	95% H-Stat UCL	0.4575024
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Approximate Gamma Distributed at 5% Significance Level			
Suggested UCL to Use			
Adjusted KM-UCL (use when k<=1 and 15 < n < 50 but k<=1)	0.3968369		
When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test			
When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Cyanide_RSD_HIGH_HALF_ND			
General Statistics			
Total Number of Observations	28.000000	Number of Distinct Observations	28.000000
		Number of Missing Observations	0
Minimum	0.0294426	Mean	0.4736592
Maximum	1.5920121	Median	0.3617417
SD	0.3854480	Std. Error of Mean	0.0728428
Coefficient of Variation	0.8137665	Skewness	1.2165658
Normal GOF Test			
Shapiro Wilk Test Statistic	0.8902287	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.9240000	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.1626547	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.1641000	Data appear Normal at 5% Significance Level	
Data appear Approximate Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	0.5977315	95% Adjusted-CLT UCL (Chen-1995)	0.6113697
		95% Modified-t UCL (Johnson-1978)	0.6005227
Gamma GOF Test			
A-D Test Statistic	0.1249316	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.7633721	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.0592031	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.1684800	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			

Gamma Statistics			
k hat (MLE)	1.4675588	k star (bias corrected MLE)	1.3341299
Theta hat (MLE)	0.3227531	Theta star (bias corrected MLE)	0.3550323
nu hat (MLE)	82.183292	nu star (bias corrected)	74.711272
MLE Mean (bias corrected)	0.4736592	MLE Sd (bias corrected)	0.4100784
		Approximate Chi Square Value (0.05)	55.804296
Adjusted Level of Significance	0.0404000	Adjusted Chi Square Value	54.793827
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	0.6341390	95% Adjusted Gamma UCL (use when n<50)	0.6458334
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.9579936	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.9240000	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.0993371	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.1641000	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	-3.525313	Mean of logged Data	-1.125148
Maximum of Logged Data	0.4649987	SD of logged Data	0.9858844
Assuming Lognormal Distribution			
95% H-UCL	0.8382441	90% Chebyshev (MVUE) UCL	0.8433060
95% Chebyshev (MVUE) UCL	0.9920677	97.5% Chebyshev (MVUE) UCL	1.1985433
99% Chebyshev (MVUE) UCL	1.6041245		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	0.5934750	95% Jackknife UCL	0.5977315
95% Standard Bootstrap UCL	0.5924433	95% Bootstrap-t UCL	0.6267913
95% Hall's Bootstrap UCL	0.6250613	95% Percentile Bootstrap UCL	0.5950121
95% BCA Bootstrap UCL	0.6126212		
90% Chebyshev(Mean, Sd) UCL	0.6921877	95% Chebyshev(Mean, Sd) UCL	0.7911737
97.5% Chebyshev(Mean, Sd) UCL	0.9285625	99% Chebyshev(Mean, Sd) UCL	1.1984361
Suggested UCL to Use			
95% Student's-t UCL	0.5977315		
When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test			
When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			

Fluoride_RSD_HIGH_HALF_ND

General Statistics

Total Number of Observations	28.000000	Number of Distinct Observations	27.000000
		Number of Missing Observations	0
Minimum	67.861246	Mean	328.38399
Maximum	913.00857	Median	278.15212
SD	250.17570	Std. Error of Mean	47.278763
Coefficient of Variation	0.7618389	Skewness	0.7806239

Normal GOF Test

Shapiro Wilk Test Statistic	0.8700338	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.9240000	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.1815797	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.1641000	Data Not Normal at 5% Significance Level	

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	408.91336	95% Adjusted-CLT UCL (Chen-1995)	413.60326
		95% Modified-t UCL (Johnson-1978)	410.07582

Gamma GOF Test

A-D Test Statistic	0.8736578	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.7603303	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.1838901	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.1679635	Data Not Gamma Distributed at 5% Significance Level	

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	1.7478270	k star (bias corrected MLE)	1.5843693
Theta hat (MLE)	187.88129	Theta star (bias corrected MLE)	207.26480
nu hat (MLE)	97.878309	nu star (bias corrected)	88.724681
MLE Mean (bias corrected)	328.38399	MLE Sd (bias corrected)	260.88780
		Approximate Chi Square Value (0.05)	68.008035
Adjusted Level of Significance	0.0404000	Adjusted Chi Square Value	66.886744

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	428.41651	95% Adjusted Gamma UCL (use when n<50)	435.59849

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.9154680	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.9240000	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.1685164	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.1641000	Data Not Lognormal at 5% Significance Level	

Data Not Lognormal at 5% Significance Level

Lognormal Statistics			
Minimum of Logged Data	4.2174651	Mean of logged Data	5.4816210
Maximum of Logged Data	6.8167453	SD of logged Data	0.8336599
Assuming Lognormal Distribution			
95% H-UCL	488.81155	90% Chebyshev (MVUE) UCL	509.73066
95% Chebyshev (MVUE) UCL	589.05821	97.5% Chebyshev (MVUE) UCL	699.16177
99% Chebyshev (MVUE) UCL	915.43890		
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution (0.05)			
Nonparametric Distribution Free UCLs			
95% CLT UCL	406.15064	95% Jackknife UCL	408.91336
95% Standard Bootstrap UCL	404.47184	95% Bootstrap-t UCL	418.24808
95% Hall's Bootstrap UCL	410.75118	95% Percentile Bootstrap UCL	405.76905
95% BCA Bootstrap UCL	413.26694		
90% Chebyshev(Mean, Sd) UCL	470.22028	95% Chebyshev(Mean, Sd) UCL	534.46734
97.5% Chebyshev(Mean, Sd) UCL	623.63977	99% Chebyshev(Mean, Sd) UCL	798.80175
Suggested UCL to Use			
95% Chebyshev (Mean, Sd) UCL	534.46734		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
ChromiumHexavalent_Estimated_RSD_HIGH_HALF_ND			
General Statistics			
Total Number of Observations	28.000000	Number of Distinct Observations	26.000000
		Number of Missing Observations	0
Minimum	0.3817260	Mean	0.5984650
Maximum	1.0889547	Median	0.5038944
SD	0.2065438	Std. Error of Mean	0.0390331
Coefficient of Variation	0.3451225	Skewness	1.2408797
Normal GOF Test			
Shapiro Wilk Test Statistic	0.8308111	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.9240000	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.2085060	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.1641000	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	0.6649497	95% Adjusted-CLT UCL (Chen-1995)	0.6724494
		95% Modified-t UCL (Johnson-1978)	0.6664752

Gamma GOF Test			
A-D Test Statistic	1.2799768	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.7452584	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.1979016	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.1651900	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	10.299970	k star (bias corrected MLE)	9.2202109
Theta hat (MLE)	0.0581036	Theta star (bias corrected MLE)	0.0649080
nu hat (MLE)	576.79830	nu star (bias corrected)	516.33181
MLE Mean (bias corrected)	0.5984650	MLE Sd (bias corrected)	0.1970917
		Approximate Chi Square Value (0.05)	464.63551
Adjusted Level of Significance	0.0404000	Adjusted Chi Square Value	461.61128
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	0.6650515	95% Adjusted Gamma UCL (use when n<50)	0.6694086
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.8962156	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.9240000	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.1852390	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.1641000	Data Not Lognormal at 5% Significance Level	
Data Not Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	-0.963052	Mean of logged Data	-0.562716
Maximum of Logged Data	0.0852182	SD of logged Data	0.3085256
Assuming Lognormal Distribution			
95% H-UCL	0.6650950	90% Chebyshev (MVUE) UCL	0.7024578
95% Chebyshev (MVUE) UCL	0.7505120	97.5% Chebyshev (MVUE) UCL	0.8172093
99% Chebyshev (MVUE) UCL	0.9482233		
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution (0.05)			
Nonparametric Distribution Free UCLs			
95% CLT UCL	0.6626688	95% Jackknife UCL	0.6649497
95% Standard Bootstrap UCL	0.6611594	95% Bootstrap-t UCL	0.6797270
95% Hall's Bootstrap UCL	0.6701301	95% Percentile Bootstrap UCL	0.6625287
95% BCA Bootstrap UCL	0.6707528		
90% Chebyshev(Mean, Sd) UCL	0.7155644	95% Chebyshev(Mean, Sd) UCL	0.7686064
97.5% Chebyshev(Mean, Sd) UCL	0.8422267	99% Chebyshev(Mean, Sd) UCL	0.9868395

Suggested UCL to Use			
95% Student's-t UCL	0.6649497	or 95% Modified-t UCL	0.6664752
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			

ProUCL Output
Main Plant Area ISM Soil (0-2 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

UCL Statistics for Data Sets with Non-Detects	
User Selected Options	
Date/Time of Computation	ProUCL 5.17/12/2019 7:29:00 AM
From File	20190710_ProUCL_Input_ISM_c.xls
Full Precision	ON
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

Aluminum_RSD_HIGH_HALF_ND

General Statistics

Total Number of Observations	28.000000	Number of Distinct Observations	27.000000
		Number of Missing Observations	0
Minimum	15268.017	Mean	21872.586
Maximum	37894.992	Median	20978.116
SD	6024.2279	Std. Error of Mean	1138.4721
Coefficient of Variation	0.2754237	Skewness	1.0519903

Normal GOF Test

Shapiro Wilk Test Statistic	0.8938258	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.9240000	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.1364662	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.1641000	Data appear Normal at 5% Significance Level

Data appear Approximate Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	23811.732	95% Adjusted-CLT UCL (Chen-1995)	23987.050
		95% Modified-t UCL (Johnson-1978)	23849.455

Gamma GOF Test

A-D Test Statistic	0.6219304	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.7449042	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.1287846	**Kolmogorov-Smirnov Gamma GOF Test**
5% K-S Critical Value	0.1651900	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	15.219365	k star (bias corrected MLE)	13.612528
Theta hat (MLE)	1437.1549	Theta star (bias corrected MLE)	1606.7982
nu hat (MLE)	852.28444	nu star (bias corrected)	762.30158
MLE Mean (bias corrected)	21872.586	MLE Sd (bias corrected)	5928.3076
		Approximate Chi Square Value (0.05)	699.23332
Adjusted Level of Significance	0.0404000	Adjusted Chi Square Value	695.50975

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	23845.412	95% Adjusted Gamma UCL (use when n<50)	23973.074

Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.9335414	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.9240000	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.1216594	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.1641000	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	9.6335155	Mean of logged Data	9.9597768
Maximum of Logged Data	10.542574	SD of logged Data	0.2570219
Assuming Lognormal Distribution			
95% H-UCL	23878.973	90% Chebyshev (MVUE) UCL	25062.631
95% Chebyshev (MVUE) UCL	26521.444	97.5% Chebyshev (MVUE) UCL	28546.220
99% Chebyshev (MVUE) UCL	32523.500		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	23745.206	95% Jackknife UCL	23811.732
95% Standard Bootstrap UCL	23733.556	95% Bootstrap-t UCL	24169.062
95% Hall's Bootstrap UCL	24108.972	95% Percentile Bootstrap UCL	23760.415
95% BCA Bootstrap UCL	23955.741		
90% Chebyshev(Mean, Sd) UCL	25288.002	95% Chebyshev(Mean, Sd) UCL	26835.070
97.5% Chebyshev(Mean, Sd) UCL	28982.341	99% Chebyshev(Mean, Sd) UCL	33200.240
Suggested UCL to Use			
95% Student's-t UCL	23811.732		
When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test			
When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Iron_RSD_HIGH_HALF_ND			
General Statistics			
Total Number of Observations	28.000000	Number of Distinct Observations	26.000000
		Number of Missing Observations	0
Minimum	15155.300	Mean	20965.763
Maximum	68967.362	Median	17664.116
SD	10895.714	Std. Error of Mean	2059.0963
Coefficient of Variation	0.5196908	Skewness	3.6896922

Normal GOF Test			
Shapiro Wilk Test Statistic	0.4917430	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.9240000	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.3674241	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.1641000	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	24472.998	95% Adjusted-CLT UCL (Chen-1995)	25886.826
		95% Modified-t UCL (Johnson-1978)	24712.295
Gamma GOF Test			
A-D Test Statistic	4.2338924	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.7470366	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.3222553	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.1655683	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	7.2975610	k star (bias corrected MLE)	6.5394890
Theta hat (MLE)	2872.9822	Theta star (bias corrected MLE)	3206.0247
nu hat (MLE)	408.66341	nu star (bias corrected)	366.21138
MLE Mean (bias corrected)	20965.763	MLE Sd (bias corrected)	8198.5824
		Approximate Chi Square Value (0.05)	322.86188
Adjusted Level of Significance	0.0404000	Adjusted Chi Square Value	320.35082
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	23780.760	95% Adjusted Gamma UCL (use when n<50)	23967.165
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.6431238	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.9240000	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.2888387	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.1641000	Data Not Lognormal at 5% Significance Level	
Data Not Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	9.6261056	Mean of logged Data	9.8805681
Maximum of Logged Data	11.141389	SD of logged Data	0.3289167
Assuming Lognormal Distribution			
95% H-UCL	23152.072	90% Chebyshev (MVUE) UCL	24505.317
95% Chebyshev (MVUE) UCL	26278.124	97.5% Chebyshev (MVUE) UCL	28738.710
99% Chebyshev (MVUE) UCL	33572.056		
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution (0.05)			

Nonparametric Distribution Free UCLs			
95% CLT UCL	24352.675	95% Jackknife UCL	24472.998
95% Standard Bootstrap UCL	24279.186	95% Bootstrap-t UCL	31484.922
95% Hall's Bootstrap UCL	36595.771	95% Percentile Bootstrap UCL	24649.864
95% BCA Bootstrap UCL	26353.652		
90% Chebyshev(Mean, Sd) UCL	27143.052	95% Chebyshev(Mean, Sd) UCL	29941.156
97.5% Chebyshev(Mean, Sd) UCL	33824.816	99% Chebyshev(Mean, Sd) UCL	41453.513
Suggested UCL to Use			
95% Student's-t UCL	24472.998	or 95% Modified-t UCL	24712.295
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			

Manganese_RSD_HIGH_HALF_ND

General Statistics			
Total Number of Observations	28.000000	Number of Distinct Observations	28.000000
		Number of Missing Observations	0
Minimum	388.96071	Mean	532.36337
Maximum	772.16982	Median	501.75194
SD	109.46560	Std. Error of Mean	20.687055
Coefficient of Variation	0.2056220	Skewness	0.7035872
Normal GOF Test			
Shapiro Wilk Test Statistic	0.9225514	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.9240000	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.1598507	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.1641000	Data appear Normal at 5% Significance Level	
Data appear Approximate Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	567.59939	95% Adjusted-CLT UCL (Chen-1995)	569.32967
		95% Modified-t UCL (Johnson-1978)	568.05783
Gamma GOF Test			
A-D Test Statistic	0.5563612	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.7442804	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.1397216	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.1651305	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			

Gamma Statistics			
k hat (MLE)	25.949524	k star (bias corrected MLE)	23.193027
Theta hat (MLE)	20.515342	Theta star (bias corrected MLE)	22.953596
nu hat (MLE)	1453.1733	nu star (bias corrected)	1298.8095
MLE Mean (bias corrected)	532.36337	MLE Sd (bias corrected)	110.54254
		Approximate Chi Square Value (0.05)	1216.1289
Adjusted Level of Significance	0.0404000	Adjusted Chi Square Value	1211.1989
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	568.55703	95% Adjusted Gamma UCL (use when n<50)	570.87121
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.9473478	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.9240000	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.1268776	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.1641000	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	5.9634783	Mean of logged Data	6.2579344
Maximum of Logged Data	6.6492045	SD of logged Data	0.1983034
Assuming Lognormal Distribution			
95% H-UCL	569.24642	90% Chebyshev (MVUE) UCL	592.37840
95% Chebyshev (MVUE) UCL	619.67033	97.5% Chebyshev (MVUE) UCL	657.55047
99% Chebyshev (MVUE) UCL	731.95867		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	566.39054	95% Jackknife UCL	567.59939
95% Standard Bootstrap UCL	565.81282	95% Bootstrap-t UCL	571.61647
95% Hall's Bootstrap UCL	568.79120	95% Percentile Bootstrap UCL	566.38654
95% BCA Bootstrap UCL	567.97615		
90% Chebyshev(Mean, Sd) UCL	594.42453	95% Chebyshev(Mean, Sd) UCL	622.53615
97.5% Chebyshev(Mean, Sd) UCL	661.55398	99% Chebyshev(Mean, Sd) UCL	738.19696
Suggested UCL to Use			
95% Student's-t UCL	567.59939		
When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test			
When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			

Nickel_RSD_HIGH_HALF_ND			
General Statistics			
Total Number of Observations	28.000000	Number of Distinct Observations	27.000000
		Number of Missing Observations	0
Minimum	15.133664	Mean	31.453743
Maximum	71.891589	Median	22.261127
SD	17.305556	Std. Error of Mean	3.2704426
Coefficient of Variation	0.5501907	Skewness	0.9613993
Normal GOF Test			
Shapiro Wilk Test Statistic	0.8222138	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.9240000	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.2583945	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.1641000	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	37.024250	95% Adjusted-CLT UCL (Chen-1995)	37.468052
		95% Modified-t UCL (Johnson-1978)	37.123283
Gamma GOF Test			
A-D Test Statistic	1.6386970	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.7497926	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.2213151	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.1661112	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	3.9766811	k star (bias corrected MLE)	3.5744176
Theta hat (MLE)	7.9095463	Theta star (bias corrected MLE)	8.7996833
nu hat (MLE)	222.69414	nu star (bias corrected)	200.16739
MLE Mean (bias corrected)	31.453743	MLE Sd (bias corrected)	16.636796
		Approximate Chi Square Value (0.05)	168.43217
Adjusted Level of Significance	0.0404000	Adjusted Chi Square Value	166.63479
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	37.380114	95% Adjusted Gamma UCL (use when n<50)	37.783307
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.8736194	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.9240000	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.1928393	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.1641000	Data Not Lognormal at 5% Significance Level	
Data Not Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	2.7169217	Mean of logged Data	3.3175478
Maximum of Logged Data	4.2751593	SD of logged Data	0.5064953

Assuming Lognormal Distribution			
95% H-UCL	37.925422	90% Chebyshev (MVUE) UCL	40.565223
95% Chebyshev (MVUE) UCL	44.803179	97.5% Chebyshev (MVUE) UCL	50.685297
99% Chebyshev (MVUE) UCL	62.239578		
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution (0.05)			
Nonparametric Distribution Free UCLs			
95% CLT UCL	36.833142	95% Jackknife UCL	37.024250
95% Standard Bootstrap UCL	36.776473	95% Bootstrap-t UCL	38.006365
95% Hall's Bootstrap UCL	37.190578	95% Percentile Bootstrap UCL	36.910543
95% BCA Bootstrap UCL	37.392237		
90% Chebyshev(Mean, Sd) UCL	41.265071	95% Chebyshev(Mean, Sd) UCL	45.709272
97.5% Chebyshev(Mean, Sd) UCL	51.877651	99% Chebyshev(Mean, Sd) UCL	63.994236
Suggested UCL to Use			
95% Chebyshev (Mean, Sd) UCL	45.709272		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Thallium_RSD_HIGH_HALF_ND			
General Statistics			
Total Number of Observations	28.000000	Number of Distinct Observations	20.000000
		Number of Missing Observations	0
Minimum	0.0841863	Mean	0.1334180
Maximum	0.2515889	Median	0.1172214
SD	0.0442207	Std. Error of Mean	0.0083569
Coefficient of Variation	0.3314450	Skewness	1.6011238
Normal GOF Test			
Shapiro Wilk Test Statistic	0.8097635	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.9240000	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.2284217	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.1641000	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	0.1476523	95% Adjusted-CLT UCL (Chen-1995)	0.1498658
		95% Modified-t UCL (Johnson-1978)	0.1480737

Gamma GOF Test			
A-D Test Statistic	1.2284701	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.7451619	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.1966969	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.1651900	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	11.640347	k star (bias corrected MLE)	10.416976
Theta hat (MLE)	0.0114617	Theta star (bias corrected MLE)	0.0128077
nu hat (MLE)	651.85941	nu star (bias corrected)	583.35066
MLE Mean (bias corrected)	0.1334180	MLE Sd (bias corrected)	0.0413374
		Approximate Chi Square Value (0.05)	528.32717
Adjusted Level of Significance	0.0404000	Adjusted Chi Square Value	525.09835
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	0.1473130	95% Adjusted Gamma UCL (use when n<50)	0.1482188
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.9002061	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.9240000	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.1769654	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.1641000	Data Not Lognormal at 5% Significance Level	
Data Not Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	-2.474723	Mean of logged Data	-2.057837
Maximum of Logged Data	-1.379959	SD of logged Data	0.2875120
Assuming Lognormal Distribution			
95% H-UCL	0.1470189	90% Chebyshev (MVUE) UCL	0.1549028
95% Chebyshev (MVUE) UCL	0.1648619	97.5% Chebyshev (MVUE) UCL	0.1786849
99% Chebyshev (MVUE) UCL	0.2058373		
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution (0.05)			
Nonparametric Distribution Free UCLs			
95% CLT UCL	0.1471639	95% Jackknife UCL	0.1476523
95% Standard Bootstrap UCL	0.1466161	95% Bootstrap-t UCL	0.1526552
95% Hall's Bootstrap UCL	0.1511198	95% Percentile Bootstrap UCL	0.1478824
95% BCA Bootstrap UCL	0.1501398		
90% Chebyshev(Mean, Sd) UCL	0.1584888	95% Chebyshev(Mean, Sd) UCL	0.1698450
97.5% Chebyshev(Mean, Sd) UCL	0.1856070	99% Chebyshev(Mean, Sd) UCL	0.2165684

Suggested UCL to Use			
95% Student's-t UCL	0.1476523	or 95% Modified-t UCL	0.1480737

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Antimony_RSD_HIGH_HALF_ND

General Statistics			
Total Number of Observations	28.000000	Number of Distinct Observations	25.000000
		Number of Missing Observations	0
Minimum	0.1408754	Mean	1.3306867
Maximum	11.013896	Median	0.4627955
SD	2.3059424	Std. Error of Mean	0.4357821
Coefficient of Variation	1.7328965	Skewness	3.2710091

Normal GOF Test			
Shapiro Wilk Test Statistic	0.5420059	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.9240000	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.3029355	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.1641000	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			

Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	2.0729494	95% Adjusted-CLT UCL (Chen-1995)	2.3353255
		95% Modified-t UCL (Johnson-1978)	2.1178468

Gamma GOF Test			
A-D Test Statistic	2.0976927	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.7839449	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.2132938	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.1717609	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			

Gamma Statistics			
k hat (MLE)	0.7664304	k star (bias corrected MLE)	0.7081224
Theta hat (MLE)	1.7362133	Theta star (bias corrected MLE)	1.8791761
nu hat (MLE)	42.920105	nu star (bias corrected)	39.654855
MLE Mean (bias corrected)	1.3306867	MLE Sd (bias corrected)	1.5813269
		Approximate Chi Square Value (0.05)	26.228195
Adjusted Level of Significance	0.0404000	Adjusted Chi Square Value	25.552442

Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	2.0118880	95% Adjusted Gamma UCL (use when n<50)	2.0650938

Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.8975759	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.9240000	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.1563114	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.1641000	Data appear Lognormal at 5% Significance Level	
Data appear Approximate Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	-1.959879	Mean of logged Data	-0.493092
Maximum of Logged Data	2.3991578	SD of logged Data	1.1330662
Assuming Lognormal Distribution			
95% H-UCL	2.0562424	90% Chebyshev (MVUE) UCL	1.9649383
95% Chebyshev (MVUE) UCL	2.3476575	97.5% Chebyshev (MVUE) UCL	2.8788570
99% Chebyshev (MVUE) UCL	3.9222954		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	2.0474845	95% Jackknife UCL	2.0729494
95% Standard Bootstrap UCL	2.0326717	95% Bootstrap-t UCL	2.9428611
95% Hall's Bootstrap UCL	4.3058310	95% Percentile Bootstrap UCL	2.0982891
95% BCA Bootstrap UCL	2.4418560		
90% Chebyshev(Mean, Sd) UCL	2.6380331	95% Chebyshev(Mean, Sd) UCL	3.2302170
97.5% Chebyshev(Mean, Sd) UCL	4.0521453	99% Chebyshev(Mean, Sd) UCL	5.6666643
Suggested UCL to Use			
95% H-UCL	2.0562424		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
ProUCL computes and outputs H-statistic based UCLs for historical reasons only.			
H-statistic often results in unstable (both high and low) values of UCL95 as shown in examples in the Technical Guide.			
It is therefore recommended to avoid the use of H-statistic based 95% UCLs.			
Use of nonparametric methods are preferred to compute UCL95 for skewed data sets which do not follow a gamma distribution.			
Arsenic_RSD_HIGH_HALF_ND			
General Statistics			
Total Number of Observations	28.000000	Number of Distinct Observations	23.000000
		Number of Missing Observations	0
Minimum	4.4057287	Mean	8.2101774
Maximum	35.629710	Median	6.1469787
SD	6.5822188	Std. Error of Mean	1.2439224
Coefficient of Variation	0.8017146	Skewness	3.3135311

Normal GOF Test			
Shapiro Wilk Test Statistic	0.5289758	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.9240000	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.3484088	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.1641000	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	10.328936	95% Adjusted-CLT UCL (Chen-1995)	11.088559
		95% Modified-t UCL (Johnson-1978)	10.458760
Gamma GOF Test			
A-D Test Statistic	3.5104396	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.7521034	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.3095552	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.1663906	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	3.3946018	k star (bias corrected MLE)	3.0547040
Theta hat (MLE)	2.4185981	Theta star (bias corrected MLE)	2.6877162
nu hat (MLE)	190.09770	nu star (bias corrected)	171.06342
MLE Mean (bias corrected)	8.2101774	MLE Sd (bias corrected)	4.6975128
		Approximate Chi Square Value (0.05)	141.81781
Adjusted Level of Significance	0.0404000	Adjusted Chi Square Value	140.17333
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	9.9032766	95% Adjusted Gamma UCL (use when n<50)	10.019460
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.7379279	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.9240000	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.2697676	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.1641000	Data Not Lognormal at 5% Significance Level	
Data Not Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	1.4829057	Mean of logged Data	1.9509105
Maximum of Logged Data	3.5731798	SD of logged Data	0.4802263
Assuming Lognormal Distribution			
95% H-UCL	9.4333763	90% Chebyshev (MVUE) UCL	10.084036
95% Chebyshev (MVUE) UCL	11.091833	97.5% Chebyshev (MVUE) UCL	12.490617
99% Chebyshev (MVUE) UCL	15.238258		
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution (0.05)			

Nonparametric Distribution Free UCLs			
95% CLT UCL	10.256248	95% Jackknife UCL	10.328936
95% Standard Bootstrap UCL	10.201605	95% Bootstrap-t UCL	13.323492
95% Hall's Bootstrap UCL	16.358654	95% Percentile Bootstrap UCL	10.450254
95% BCA Bootstrap UCL	11.226904		
90% Chebyshev(Mean, Sd) UCL	11.941945	95% Chebyshev(Mean, Sd) UCL	13.632310
97.5% Chebyshev(Mean, Sd) UCL	15.978471	99% Chebyshev(Mean, Sd) UCL	20.587049
Suggested UCL to Use			
95% Student's-t UCL	10.328936	or 95% Modified-t UCL	10.458760
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			

Cobalt_RSD_HIGH_HALF_ND

General Statistics			
Total Number of Observations	28.000000	Number of Distinct Observations	20.000000
		Number of Missing Observations	0
Minimum	5.8136316	Mean	7.0540435
Maximum	13.973712	Median	6.5760804
SD	1.6755678	Std. Error of Mean	0.3166525
Coefficient of Variation	0.2375330	Skewness	3.2274450
Normal GOF Test			
Shapiro Wilk Test Statistic	0.5929879	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.9240000	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.2893888	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.1641000	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	7.5933941	95% Adjusted-CLT UCL (Chen-1995)	7.7812590
		95% Modified-t UCL (Johnson-1978)	7.6255834
Gamma GOF Test			
A-D Test Statistic	3.1930952	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.7442904	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.2639138	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.1651326	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			

Gamma Statistics			
k hat (MLE)	25.735113	k star (bias corrected MLE)	23.001589
Theta hat (MLE)	0.2741019	Theta star (bias corrected MLE)	0.3066764
nu hat (MLE)	1441.1663	nu star (bias corrected)	1288.0890
MLE Mean (bias corrected)	7.0540435	MLE Sd (bias corrected)	1.4708189
		Approximate Chi Square Value (0.05)	1205.7551
Adjusted Level of Significance	0.0404000	Adjusted Chi Square Value	1200.8465
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	7.5357225	95% Adjusted Gamma UCL (use when n<50)	7.5665256
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.6957592	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.9240000	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.2485443	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.1641000	Data Not Lognormal at 5% Significance Level	
Data Not Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	1.7602054	Mean of logged Data	1.9340465
Maximum of Logged Data	2.6371778	SD of logged Data	0.1860993
Assuming Lognormal Distribution			
95% H-UCL	7.4914892	90% Chebyshev (MVUE) UCL	7.7806444
95% Chebyshev (MVUE) UCL	8.1189149	97.5% Chebyshev (MVUE) UCL	8.5884212
99% Chebyshev (MVUE) UCL	9.5106754		
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution (0.05)			
Nonparametric Distribution Free UCLs			
95% CLT UCL	7.5748906	95% Jackknife UCL	7.5933941
95% Standard Bootstrap UCL	7.5692374	95% Bootstrap-t UCL	8.3908903
95% Hall's Bootstrap UCL	10.026709	95% Percentile Bootstrap UCL	7.6153868
95% BCA Bootstrap UCL	7.8161692		
90% Chebyshev(Mean, Sd) UCL	8.0040011	95% Chebyshev(Mean, Sd) UCL	8.4342999
97.5% Chebyshev(Mean, Sd) UCL	9.0315380	99% Chebyshev(Mean, Sd) UCL	10.204697
Suggested UCL to Use			
95% Student's-t UCL	7.5933941	or 95% Modified-t UCL	7.6255834
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			

Copper_RSD_HIGH_HALF_ND			
General Statistics			
Total Number of Observations	28.000000	Number of Distinct Observations	25.000000
		Number of Missing Observations	0
Minimum	16.112890	Mean	101.21597
Maximum	995.88057	Median	30.204629
SD	210.11023	Std. Error of Mean	39.707101
Coefficient of Variation	2.0758604	Skewness	3.4931733
Normal GOF Test			
Shapiro Wilk Test Statistic	0.4478989	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.9240000	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.3795891	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.1641000	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	168.84862	95% Adjusted-CLT UCL (Chen-1995)	194.53683
		95% Modified-t UCL (Johnson-1978)	173.21738
Gamma GOF Test			
A-D Test Statistic	4.0363701	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.7904791	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.3209104	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.1725676	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	0.6931952	k star (bias corrected MLE)	0.6427338
Theta hat (MLE)	146.01367	Theta star (bias corrected MLE)	157.47729
nu hat (MLE)	38.818930	nu star (bias corrected)	35.993092
MLE Mean (bias corrected)	101.21597	MLE Sd (bias corrected)	126.25061
		Approximate Chi Square Value (0.05)	23.263143
Adjusted Level of Significance	0.0404000	Adjusted Chi Square Value	22.629786
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	156.60291	95% Adjusted Gamma UCL (use when n<50)	160.98587
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.7759039	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.9240000	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.2277505	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.1641000	Data Not Lognormal at 5% Significance Level	
Data Not Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	2.7796196	Mean of logged Data	3.7442411
Maximum of Logged Data	6.9036273	SD of logged Data	1.0754200

Assuming Lognormal Distribution			
95% H-UCL	127.76382	90% Chebyshev (MVUE) UCL	124.83451
95% Chebyshev (MVUE) UCL	148.27557	97.5% Chebyshev (MVUE) UCL	180.81086
99% Chebyshev (MVUE) UCL	244.72013		
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution (0.05)			
Nonparametric Distribution Free UCLs			
95% CLT UCL	166.52834	95% Jackknife UCL	168.84862
95% Standard Bootstrap UCL	165.37993	95% Bootstrap-t UCL	270.53749
95% Hall's Bootstrap UCL	207.69952	95% Percentile Bootstrap UCL	173.08725
95% BCA Bootstrap UCL	203.28697		
90% Chebyshev(Mean, Sd) UCL	220.33728	95% Chebyshev(Mean, Sd) UCL	274.29521
97.5% Chebyshev(Mean, Sd) UCL	349.18674	99% Chebyshev(Mean, Sd) UCL	496.29664
Suggested UCL to Use			
95% Chebyshev (Mean, Sd) UCL	274.29521		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Vanadium_RSD_HIGH_HALF_ND			
General Statistics			
Total Number of Observations	28.000000	Number of Distinct Observations	26.000000
		Number of Missing Observations	0
Minimum	13.017333	Mean	19.839976
Maximum	48.598152	Median	16.839883
SD	8.3952005	Std. Error of Mean	1.5865438
Coefficient of Variation	0.4231457	Skewness	2.2848224
Normal GOF Test			
Shapiro Wilk Test Statistic	0.7211621	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.9240000	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.2081997	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.1641000	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	22.542317	95% Adjusted-CLT UCL (Chen-1995)	23.181599
		95% Modified-t UCL (Johnson-1978)	22.656493

Gamma GOF Test			
A-D Test Statistic	1.6124027	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.7464534	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.1832683	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.1654427	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	8.1947378	k star (bias corrected MLE)	7.3405397
Theta hat (MLE)	2.4210629	Theta star (bias corrected MLE)	2.7027953
nu hat (MLE)	458.90531	nu star (bias corrected)	411.07022
MLE Mean (bias corrected)	19.839976	MLE Sd (bias corrected)	7.3227995
		Approximate Chi Square Value (0.05)	365.07144
Adjusted Level of Significance	0.0404000	Adjusted Chi Square Value	362.39752
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	22.339801	95% Adjusted Gamma UCL (use when n<50)	22.504633
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.8529405	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.9240000	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.1754722	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.1641000	Data Not Lognormal at 5% Significance Level	
Data Not Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	2.5662818	Mean of logged Data	2.9254450
Maximum of Logged Data	3.8835855	SD of logged Data	0.3340552
Assuming Lognormal Distribution			
95% H-UCL	22.163054	90% Chebyshev (MVUE) UCL	23.470501
95% Chebyshev (MVUE) UCL	25.191513	97.5% Chebyshev (MVUE) UCL	27.580210
99% Chebyshev (MVUE) UCL	32.272343		
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution (0.05)			
Nonparametric Distribution Free UCLs			
95% CLT UCL	22.449608	95% Jackknife UCL	22.542317
95% Standard Bootstrap UCL	22.412020	95% Bootstrap-t UCL	24.340504
95% Hall's Bootstrap UCL	29.335941	95% Percentile Bootstrap UCL	22.473455
95% BCA Bootstrap UCL	23.197488		
90% Chebyshev(Mean, Sd) UCL	24.599607	95% Chebyshev(Mean, Sd) UCL	26.755560
97.5% Chebyshev(Mean, Sd) UCL	29.747938	99% Chebyshev(Mean, Sd) UCL	35.625887

Suggested UCL to Use			
95% Student's-t UCL	22.542317	or 95% Modified-t UCL	22.656493
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Selenium_RSD_HIGH_HALF_ND			
General Statistics			
Total Number of Observations	28.000000	Number of Distinct Observations	21.000000
		Number of Missing Observations	0
Minimum	0.8756999	Mean	1.5894327
Maximum	3.1189310	Median	1.3195477
SD	0.5917808	Std. Error of Mean	0.1118361
Coefficient of Variation	0.3723220	Skewness	1.2508897
Normal GOF Test			
Shapiro Wilk Test Statistic	0.8544567	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.9240000	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.2472536	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.1641000	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	1.7799218	95% Adjusted-CLT UCL (Chen-1995)	1.8016356
		95% Modified-t UCL (Johnson-1978)	1.7843280
Gamma GOF Test			
A-D Test Statistic	1.1038917	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.7460753	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.2342734	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.1653613	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	8.7764752	k star (bias corrected MLE)	7.8599481
Theta hat (MLE)	0.1811015	Theta star (bias corrected MLE)	0.2022192
nu hat (MLE)	491.48261	nu star (bias corrected)	440.15709
MLE Mean (bias corrected)	1.5894327	MLE Sd (bias corrected)	0.5669337
		Approximate Chi Square Value (0.05)	392.51733
Adjusted Level of Significance	0.0404000	Adjusted Chi Square Value	389.74252
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	1.7823419	95% Adjusted Gamma UCL (use when n<50)	1.7950314

Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.9280455	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.9240000	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.2195203	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.1641000	Data Not Lognormal at 5% Significance Level	
Data appear Approximate Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	-0.132732	Mean of logged Data	0.4053262
Maximum of Logged Data	1.1374903	SD of logged Data	0.3367860
Assuming Lognormal Distribution			
95% H-UCL	1.7865630	90% Chebyshev (MVUE) UCL	1.8924617
95% Chebyshev (MVUE) UCL	2.0322152	97.5% Chebyshev (MVUE) UCL	2.2261875
99% Chebyshev (MVUE) UCL	2.6072087		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	1.7733866	95% Jackknife UCL	1.7799218
95% Standard Bootstrap UCL	1.7704033	95% Bootstrap-t UCL	1.8172750
95% Hall's Bootstrap UCL	1.8056317	95% Percentile Bootstrap UCL	1.7775916
95% BCA Bootstrap UCL	1.7995763		
90% Chebyshev(Mean, Sd) UCL	1.9249409	95% Chebyshev(Mean, Sd) UCL	2.0769148
97.5% Chebyshev(Mean, Sd) UCL	2.2878486	99% Chebyshev(Mean, Sd) UCL	2.7021874
Suggested UCL to Use			
95% Student's-t UCL	1.7799218	or 95% Modified-t UCL	1.7843280
or 95% H-UCL	1.7865630		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
ProUCL computes and outputs H-statistic based UCLs for historical reasons only.			
H-statistic often results in unstable (both high and low) values of UCL95 as shown in examples in the Technical Guide.			
It is therefore recommended to avoid the use of H-statistic based 95% UCLs.			
Use of nonparametric methods are preferred to compute UCL95 for skewed data sets which do not follow a gamma distribution.			

Mercury_RSD_HIGH_HALF_ND			
General Statistics			
Total Number of Observations	28.000000	Number of Distinct Observations	19.000000
Number of Detects	12.000000	Number of Non-Detects	16.000000
Number of Distinct Detects	12.000000	Number of Distinct Non-Detects	7.0000000
Minimum Detect	0.0201420	Minimum Non-Detect	0.0089153
Maximum Detect	0.0759200	Maximum Non-Detect	0.0131698
Variance Detects	3.4864E-4	Percent Non-Detects	57.142857%
Mean Detects	0.0409315	SD Detects	0.0186719
Median Detects	0.0350118	CV Detects	0.4561748
Skewness Detects	0.9501283	Kurtosis Detects	0.0532795
Mean of Logged Detects	-3.286008	SD of Logged Detects	0.4405410
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.8821753	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.8590000	Detected Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.1949791	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.2426000	Detected Data appear Normal at 5% Significance Level	
Detected Data appear Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.0226365	KM Standard Error of Mean	0.0038880
KM SD	0.0196976	95% KM (BCA) UCL	0.0297498
95% KM (t) UCL	0.0292589	95% KM (Percentile Bootstrap) UCL	0.0291874
95% KM (z) UCL	0.0290318	95% KM Bootstrap t UCL	0.0305692
90% KM Chebyshev UCL	0.0343006	95% KM Chebyshev UCL	0.0395840
97.5% KM Chebyshev UCL	0.0469172	99% KM Chebyshev UCL	0.0613218
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	0.3466217	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.7317508	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.1555136	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.2458522	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	5.7076324	k star (bias corrected MLE)	4.3362798
Theta hat (MLE)	0.0071714	Theta star (bias corrected MLE)	0.0094393
nu hat (MLE)	136.98318	nu star (bias corrected)	104.07072
Mean (detects)	0.0409315		

Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.0100000	Mean	0.0232563
Maximum	0.0759200	Median	0.0100000
SD	0.0196220	CV	0.8437282
k hat (MLE)	1.9445867	k star (bias corrected MLE)	1.7600477
Theta hat (MLE)	0.0119595	Theta star (bias corrected MLE)	0.0132135
nu hat (MLE)	108.89686	nu star (bias corrected)	98.562671
Adjusted Level of Significance (β)	0.0404000		
Approximate Chi Square Value (98.56, α)	76.660310	Adjusted Chi Square Value (98.56, β)	75.466359
95% Gamma Approximate UCL (use when n>=50)	0.0299008	95% Gamma Adjusted UCL (use when n<50)	0.0303739
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.0226365	SD (KM)	0.0196976
Variance (KM)	3.8799E-4	SE of Mean (KM)	0.0038880
k hat (KM)	1.3206707	k star (KM)	1.2029798
nu hat (KM)	73.957557	nu star (KM)	67.366866
theta hat (KM)	0.0171402	theta star (KM)	0.0188171
80% gamma percentile (KM)	0.0358342	90% gamma percentile (KM)	0.0497974
95% gamma percentile (KM)	0.0635666	99% gamma percentile (KM)	0.0951207
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (67.37, α)	49.476930	Adjusted Chi Square Value (67.37, β)	48.528695
95% Gamma Approximate KM-UCL (use when n>=50)	0.0308215	95% Gamma Adjusted KM-UCL (use when n<50)	0.0314237
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.9420893	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.8590000	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.1270688	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.2426000	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.0235867	Mean in Log Scale	-4.031873
SD in Original Scale	0.0195278	SD in Log Scale	0.7507068
95% t UCL (assumes normality of ROS data)	0.0298726	95% Percentile Bootstrap UCL	0.0299181
95% BCA Bootstrap UCL	0.0308707	95% Bootstrap t UCL	0.0314625
95% H-UCL (Log ROS)	0.0321894		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-4.105422	KM Geo Mean	0.0164831
KM SD (logged)	0.7614617	95% Critical H Value (KM-Log)	2.1843581
KM Standard Error of Mean (logged)	0.1503015	95% H-UCL (KM -Log)	0.0303364
KM SD (logged)	0.7614617	95% Critical H Value (KM-Log)	2.1843581
KM Standard Error of Mean (logged)	0.1503015		

DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.0207542	Mean in Log Scale	-4.372731
SD in Original Scale	0.0214228	SD in Log Scale	1.0026978
95% t UCL (Assumes normality)	0.0276500	95% H-Stat UCL	0.0335251
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Normal Distributed at 5% Significance Level			
Suggested UCL to Use			
95% KM (t) UCL	0.0292589		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Indeno123_CDPyrene_RSD_HIGH_HALF_ND			
General Statistics			
Total Number of Observations	28.000000	Number of Distinct Observations	27.000000
		Number of Missing Observations	0
Minimum	0.1555551	Mean	12.063035
Maximum	131.12331	Median	3.2210229
SD	26.105077	Std. Error of Mean	4.9333958
Coefficient of Variation	2.1640554	Skewness	3.9111195
Normal GOF Test			
Shapiro Wilk Test Statistic	0.4801058	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.9240000	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.3316958	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.1641000	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	20.466032	95% Adjusted-CLT UCL (Chen-1995)	24.074014
		95% Modified-t UCL (Johnson-1978)	21.073770
Gamma GOF Test			
A-D Test Statistic	1.1692918	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.8112598	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.1755177	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.1750428	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			

Gamma Statistics			
k hat (MLE)	0.4955000	k star (bias corrected MLE)	0.4662203
Theta hat (MLE)	24.345177	Theta star (bias corrected MLE)	25.874113
nu hat (MLE)	27.748001	nu star (bias corrected)	26.108334
MLE Mean (bias corrected)	12.063035	MLE Sd (bias corrected)	17.666928
		Approximate Chi Square Value (0.05)	15.462791
Adjusted Level of Significance	0.0404000	Adjusted Chi Square Value	14.955893
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	20.367977	95% Adjusted Gamma UCL (use when n<50)	21.058306
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.9862461	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.9240000	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.0983646	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.1641000	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	-1.860756	Mean of logged Data	1.2064453
Maximum of Logged Data	4.8761382	SD of logged Data	1.6251414
Assuming Lognormal Distribution			
95% H-UCL	35.276692	90% Chebyshev (MVUE) UCL	24.676293
95% Chebyshev (MVUE) UCL	30.712406	97.5% Chebyshev (MVUE) UCL	39.090296
99% Chebyshev (MVUE) UCL	55.547039		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	20.177749	95% Jackknife UCL	20.466032
95% Standard Bootstrap UCL	20.051157	95% Bootstrap-t UCL	35.842973
95% Hall's Bootstrap UCL	49.640155	95% Percentile Bootstrap UCL	20.935496
95% BCA Bootstrap UCL	25.862367		
90% Chebyshev(Mean, Sd) UCL	26.863223	95% Chebyshev(Mean, Sd) UCL	33.567209
97.5% Chebyshev(Mean, Sd) UCL	42.872082	99% Chebyshev(Mean, Sd) UCL	61.149704
Suggested UCL to Use			
95% Chebyshev (Mean, Sd) UCL	33.567209		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			

BenzoBFluoranthene_RSD_HIGH_HALF_ND			
General Statistics			
Total Number of Observations	28.000000	Number of Distinct Observations	26.000000
		Number of Missing Observations	0
Minimum	0.2721008	Mean	14.705215
Maximum	168.79578	Median	3.6539939
SD	33.316417	Std. Error of Mean	6.2962110
Coefficient of Variation	2.2656192	Skewness	4.0633300
Normal GOF Test			
Shapiro Wilk Test Statistic	0.4511023	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.9240000	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.3495799	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.1641000	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	25.429478	95% Adjusted-CLT UCL (Chen-1995)	30.227660
		95% Modified-t UCL (Johnson-1978)	26.235285
Gamma GOF Test			
A-D Test Statistic	1.4662690	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.8087057	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.2154443	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.1747525	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	0.5152708	k star (bias corrected MLE)	0.4838728
Theta hat (MLE)	28.538807	Theta star (bias corrected MLE)	30.390665
nu hat (MLE)	28.855166	nu star (bias corrected)	27.096874
MLE Mean (bias corrected)	14.705215	MLE Sd (bias corrected)	21.140039
		Approximate Chi Square Value (0.05)	16.226608
Adjusted Level of Significance	0.0404000	Adjusted Chi Square Value	15.706109
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	24.556295	95% Adjusted Gamma UCL (use when n<50)	25.370087
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.9821232	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.9240000	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.0954427	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.1641000	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	-1.301583	Mean of logged Data	1.4612072
Maximum of Logged Data	5.1286896	SD of logged Data	1.5198297

Assuming Lognormal Distribution			
95% H-UCL	34.468295	90% Chebyshev (MVUE) UCL	26.283321
95% Chebyshev (MVUE) UCL	32.469561	97.5% Chebyshev (MVUE) UCL	41.055823
99% Chebyshev (MVUE) UCL	57.921873		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	25.061560	95% Jackknife UCL	25.429478
95% Standard Bootstrap UCL	24.944880	95% Bootstrap-t UCL	47.525235
95% Hall's Bootstrap UCL	61.040518	95% Percentile Bootstrap UCL	26.073826
95% BCA Bootstrap UCL	31.868037		
90% Chebyshev(Mean, Sd) UCL	33.593848	95% Chebyshev(Mean, Sd) UCL	42.149762
97.5% Chebyshev(Mean, Sd) UCL	54.025040	99% Chebyshev(Mean, Sd) UCL	77.351723
Suggested UCL to Use			
95% Chebyshev (Mean, Sd) UCL	42.149762		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
BenzoKFluoranthene_RSD_HIGH_HALF_ND			
General Statistics			
Total Number of Observations	28.000000	Number of Distinct Observations	28.000000
		Number of Missing Observations	0
Minimum	0.0937728	Mean	5.5901159
Maximum	61.702246	Median	1.5464287
SD	12.370432	Std. Error of Mean	2.3377920
Coefficient of Variation	2.2129116	Skewness	3.9192118
Normal GOF Test			
Shapiro Wilk Test Statistic	0.4600169	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.9240000	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.3555547	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.1641000	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	9.5720500	95% Adjusted-CLT UCL (Chen-1995)	11.285587
		95% Modified-t UCL (Johnson-1978)	9.8606354

Gamma GOF Test			
A-D Test Statistic	1.4119822	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.8079745	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.2270372	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.1746648	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	0.5224078	k star (bias corrected MLE)	0.4902451
Theta hat (MLE)	10.700674	Theta star (bias corrected MLE)	11.402696
nu hat (MLE)	29.254839	nu star (bias corrected)	27.453725
MLE Mean (bias corrected)	5.5901159	MLE Sd (bias corrected)	7.9838834
		Approximate Chi Square Value (0.05)	16.503360
Adjusted Level of Significance	0.0404000	Adjusted Chi Square Value	15.978013
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	9.2992882	95% Adjusted Gamma UCL (use when n<50)	9.6050435
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.9825908	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.9240000	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.1054235	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.1641000	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	-2.366880	Mean of logged Data	0.5133249
Maximum of Logged Data	4.1223203	SD of logged Data	1.5247405
Assuming Lognormal Distribution			
95% H-UCL	13.527298	90% Chebyshev (MVUE) UCL	10.276218
95% Chebyshev (MVUE) UCL	12.699504	97.5% Chebyshev (MVUE) UCL	16.062931
99% Chebyshev (MVUE) UCL	22.669732		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	9.4354415	95% Jackknife UCL	9.5720500
95% Standard Bootstrap UCL	9.3387716	95% Bootstrap-t UCL	18.889802
95% Hall's Bootstrap UCL	23.571099	95% Percentile Bootstrap UCL	9.7610899
95% BCA Bootstrap UCL	12.185745		
90% Chebyshev(Mean, Sd) UCL	12.603492	95% Chebyshev(Mean, Sd) UCL	15.780315
97.5% Chebyshev(Mean, Sd) UCL	20.189622	99% Chebyshev(Mean, Sd) UCL	28.850852

Suggested UCL to Use			
95% Chebyshev (Mean, Sd) UCL	15.780315		

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

BenzoAPyrene_RSD_HIGH_HALF_ND

General Statistics			
Total Number of Observations	28.000000	Number of Distinct Observations	28.000000
		Number of Missing Observations	0
Minimum	0.2006837	Mean	12.810729
Maximum	149.76077	Median	3.0493707
SD	29.720791	Std. Error of Mean	5.6167015
Coefficient of Variation	2.3199921	Skewness	4.0388333

Normal GOF Test			
Shapiro Wilk Test Statistic	0.4468970	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.9240000	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.3567807	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.1641000	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			

Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	22.377592	95% Adjusted-CLT UCL (Chen-1995)	26.630153
		95% Modified-t UCL (Johnson-1978)	23.092100

Gamma GOF Test			
A-D Test Statistic	1.5181001	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.8133907	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.2256671	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.1752642	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			

Gamma Statistics			
k hat (MLE)	0.4858119	k star (bias corrected MLE)	0.4575702
Theta hat (MLE)	26.369731	Theta star (bias corrected MLE)	27.997301
nu hat (MLE)	27.205467	nu star (bias corrected)	25.623928
MLE Mean (bias corrected)	12.810729	MLE Sd (bias corrected)	18.938475
		Approximate Chi Square Value (0.05)	15.090081
Adjusted Level of Significance	0.0404000	Adjusted Chi Square Value	14.589939

Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	21.753443	95% Adjusted Gamma UCL (use when n<50)	22.499149

Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.9802312	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.9240000	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.0974566	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.1641000	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	-1.606025	Mean of logged Data	1.2369498
Maximum of Logged Data	5.0090391	SD of logged Data	1.5814404
Assuming Lognormal Distribution			
95% H-UCL	32.335031	90% Chebyshev (MVUE) UCL	23.475466
95% Chebyshev (MVUE) UCL	29.129867	97.5% Chebyshev (MVUE) UCL	36.977956
99% Chebyshev (MVUE) UCL	52.394008		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	22.049381	95% Jackknife UCL	22.377592
95% Standard Bootstrap UCL	21.984158	95% Bootstrap-t UCL	44.586899
95% Hall's Bootstrap UCL	54.376376	95% Percentile Bootstrap UCL	23.206402
95% BCA Bootstrap UCL	28.573121		
90% Chebyshev(Mean, Sd) UCL	29.660834	95% Chebyshev(Mean, Sd) UCL	37.293364
97.5% Chebyshev(Mean, Sd) UCL	47.887019	99% Chebyshev(Mean, Sd) UCL	68.696204
Suggested UCL to Use			
95% Chebyshev (Mean, Sd) UCL	37.293364		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
DibenzAHAnthracene_RSD_HIGH_HALF_ND			
General Statistics			
Total Number of Observations	28.000000	Number of Distinct Observations	27.000000
Number of Detects	27.000000	Number of Non-Detects	1.0000000
Number of Distinct Detects	26.000000	Number of Distinct Non-Detects	1.0000000
Minimum Detect	0.0458782	Minimum Non-Detect	0.0147466
Maximum Detect	36.353875	Maximum Non-Detect	0.0147466
Variance Detects	52.235256	Percent Non-Detects	3.5714286%
Mean Detects	3.2767675	SD Detects	7.2273962
Median Detects	0.9503349	CV Detects	2.2056482
Skewness Detects	4.0484415	Kurtosis Detects	18.053592
Mean of Logged Detects	-0.046250	SD of Logged Detects	1.5506984

Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.4639823	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.9230000	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.3274254	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.1665000	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	3.1602667	KM Standard Error of Mean	1.3462947
KM SD	6.9907526	95% KM (BCA) UCL	5.6482012
95% KM (t) UCL	5.4533949	95% KM (Percentile Bootstrap) UCL	5.5794889
95% KM (z) UCL	5.3747244	95% KM Bootstrap t UCL	9.9536137
90% KM Chebyshev UCL	7.1991507	95% KM Chebyshev UCL	9.0286291
97.5% KM Chebyshev UCL	11.567874	99% KM Chebyshev UCL	16.555729
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	1.2887296	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.8061647	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.1843640	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.1777375	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.5130570	k star (bias corrected MLE)	0.4807420
Theta hat (MLE)	6.3867511	Theta star (bias corrected MLE)	6.8160618
nu hat (MLE)	27.705079	nu star (bias corrected)	25.960070
Mean (detects)	3.2767675		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.0100000	Mean	3.1600972
Maximum	36.353875	Median	0.7827772
SD	7.1191117	CV	2.2528141
k hat (MLE)	0.4714633	k star (bias corrected MLE)	0.4447589
Theta hat (MLE)	6.7027433	Theta star (bias corrected MLE)	7.1051922
nu hat (MLE)	26.401943	nu star (bias corrected)	24.906496
Adjusted Level of Significance (β)	0.0404000		
Approximate Chi Square Value (24.91, α)	14.540066	Adjusted Chi Square Value (24.91, β)	14.050045
95% Gamma Approximate UCL (use when n>=50)	5.4131083	95% Gamma Adjusted UCL (use when n<50)	5.6019001

Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	3.1602667	SD (KM)	6.9907526
Variance (KM)	48.870621	SE of Mean (KM)	1.3462947
k hat (KM)	0.2043618	k star (KM)	0.2062754
nu hat (KM)	11.444258	nu star (KM)	11.551421
theta hat (KM)	15.464081	theta star (KM)	15.320621
80% gamma percentile (KM)	4.2306350	90% gamma percentile (KM)	9.5582458
95% gamma percentile (KM)	16.151720	99% gamma percentile (KM)	34.213843
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (11.55, α)	4.9330544	Adjusted Chi Square Value (11.55, β)	4.6672120
95% Gamma Approximate KM-UCL (use when n>=50)	7.4001964	95% Gamma Adjusted KM-UCL (use when n<50)	7.8217083
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.9826972	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.9230000	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.0974945	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.1665000	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	3.1604293	Mean in Log Scale	-0.185589
SD in Original Scale	7.1189595	SD in Log Scale	1.6909271
95% t UCL (assumes normality of ROS data)	5.4519602	95% Percentile Bootstrap UCL	5.6237445
95% BCA Bootstrap UCL	7.1023364	95% Bootstrap t UCL	9.8099835
95% H-UCL (Log ROS)	10.529761		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-0.195196	KM Geo Mean	0.8226734
KM SD (logged)	1.6828245	95% Critical H Value (KM-Log)	3.3993465
KM Standard Error of Mean (logged)	0.3240821	95% H-UCL (KM -Log)	10.192625
KM SD (logged)	1.6828245	95% Critical H Value (KM-Log)	3.3993465
KM Standard Error of Mean (logged)	0.3240821		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	3.1600034	Mean in Log Scale	-0.219951
SD in Original Scale	7.1191547	SD in Log Scale	1.7777586
95% t UCL (Assumes normality)	5.4515971	95% H-Stat UCL	13.097835
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Lognormal Distributed at 5% Significance Level			

Suggested UCL to Use			
95% KM (Chebyshev) UCL	9.0286291		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
BenzoAAnthracene_RSD_HIGH_HALF_ND			
General Statistics			
Total Number of Observations	28.000000	Number of Distinct Observations	27.000000
		Number of Missing Observations	0
Minimum	0.2025267	Mean	10.833437
Maximum	132.04367	Median	2.6596861
SD	25.928995	Std. Error of Mean	4.9001195
Coefficient of Variation	2.3934229	Skewness	4.1773504
Normal GOF Test			
Shapiro Wilk Test Statistic	0.4306437	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.9240000	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.3508330	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.1641000	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	19.179754	95% Adjusted-CLT UCL (Chen-1995)	23.026831
		95% Modified-t UCL (Johnson-1978)	19.824483
Gamma GOF Test			
A-D Test Statistic	1.6178364	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.8135283	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.2167684	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.1752785	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	0.4851860	k star (bias corrected MLE)	0.4570113
Theta hat (MLE)	22.328419	Theta star (bias corrected MLE)	23.704963
nu hat (MLE)	27.170417	nu star (bias corrected)	25.592634
MLE Mean (bias corrected)	10.833437	MLE Sd (bias corrected)	16.025174
		Approximate Chi Square Value (0.05)	15.066040
Adjusted Level of Significance	0.0404000	Adjusted Chi Square Value	14.566336
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	18.402725	95% Adjusted Gamma UCL (use when n<50)	19.034037

Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.9765530	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.9240000	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.0857636	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.1641000	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	-1.596883	Mean of logged Data	1.0673452
Maximum of Logged Data	4.8831327	SD of logged Data	1.5584129
Assuming Lognormal Distribution			
95% H-UCL	25.684074	90% Chebyshev (MVUE) UCL	19.000689
95% Chebyshev (MVUE) UCL	23.538801	97.5% Chebyshev (MVUE) UCL	29.837525
99% Chebyshev (MVUE) UCL	42.210147		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	18.893416	95% Jackknife UCL	19.179754
95% Standard Bootstrap UCL	18.706524	95% Bootstrap-t UCL	40.150701
95% Hall's Bootstrap UCL	46.760148	95% Percentile Bootstrap UCL	19.670208
95% BCA Bootstrap UCL	24.694222		
90% Chebyshev(Mean, Sd) UCL	25.533795	95% Chebyshev(Mean, Sd) UCL	32.192562
97.5% Chebyshev(Mean, Sd) UCL	41.434673	99% Chebyshev(Mean, Sd) UCL	59.589010
Suggested UCL to Use			
95% Chebyshev (Mean, Sd) UCL	32.192562		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Naphthalene_RSD_HIGH_HALF_ND			
General Statistics			
Total Number of Observations	28.000000	Number of Distinct Observations	27.000000
Number of Detects	23.000000	Number of Non-Detects	5.0000000
Number of Distinct Detects	22.000000	Number of Distinct Non-Detects	5.0000000
Minimum Detect	0.0123706	Minimum Non-Detect	0.0053477
Maximum Detect	1.8843262	Maximum Non-Detect	0.1521956
Variance Detects	0.1533585	Percent Non-Detects	17.857143%
Mean Detects	0.2011958	SD Detects	0.3916102
Median Detects	0.0863363	CV Detects	1.9464136
Skewness Detects	3.9266516	Kurtosis Detects	16.975918
Mean of Logged Detects	-2.569650	SD of Logged Detects	1.3548693

Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.4859608	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.9140000	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.3148403	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.1798000	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.1694867	KM Standard Error of Mean	0.0684346
KM SD	0.3539769	95% KM (BCA) UCL	0.3000400
95% KM (t) UCL	0.2860506	95% KM (Percentile Bootstrap) UCL	0.2950074
95% KM (z) UCL	0.2820516	95% KM Bootstrap t UCL	0.4759645
90% KM Chebyshev UCL	0.3747905	95% KM Chebyshev UCL	0.4677863
97.5% KM Chebyshev UCL	0.5968607	99% KM Chebyshev UCL	0.8504024
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	1.0941723	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.7927939	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.1717648	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.1901337	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data follow Appr. Gamma Distribution at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.6343282	k star (bias corrected MLE)	0.5805753
Theta hat (MLE)	0.3171793	Theta star (bias corrected MLE)	0.3465455
nu hat (MLE)	29.179098	nu star (bias corrected)	26.706462
Mean (detects)	0.2011958		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.0100000	Mean	0.1670537
Maximum	1.8843262	Median	0.0355958
SD	0.3612749	CV	2.1626277
k hat (MLE)	0.5476716	k star (bias corrected MLE)	0.5128020
Theta hat (MLE)	0.3050252	Theta star (bias corrected MLE)	0.3257664
nu hat (MLE)	30.669608	nu star (bias corrected)	28.716912
Adjusted Level of Significance (β)	0.0404000		
Approximate Chi Square Value (28.72, α)	17.487177	Adjusted Chi Square Value (28.72, β)	16.944905
95% Gamma Approximate UCL (use when n>=50)	0.2743305	95% Gamma Adjusted UCL (use when n<50)	0.2831096

Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.1694867	SD (KM)	0.3539769
Variance (KM)	0.1252997	SE of Mean (KM)	0.0684346
k hat (KM)	0.2292565	k star (KM)	0.2285028
nu hat (KM)	12.838362	nu star (KM)	12.796157
theta hat (KM)	0.7392888	theta star (KM)	0.7417272
80% gamma percentile (KM)	0.2377599	90% gamma percentile (KM)	0.5113311
95% gamma percentile (KM)	0.8421538	99% gamma percentile (KM)	1.7342537
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (12.80, α)	5.7558954	Adjusted Chi Square Value (12.80, β)	5.4651643
95% Gamma Approximate KM-UCL (use when n>=50)	0.3767926	95% Gamma Adjusted KM-UCL (use when n<50)	0.3968369
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.9388063	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.9140000	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.1778701	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.1798000	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.1684392	Mean in Log Scale	-2.905595
SD in Original Scale	0.3607058	SD in Log Scale	1.4916047
95% t UCL (assumes normality of ROS data)	0.2845472	95% Percentile Bootstrap UCL	0.2925495
95% BCA Bootstrap UCL	0.3674619	95% Bootstrap t UCL	0.4757887
95% H-UCL (Log ROS)	0.4073142		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-2.885484	KM Geo Mean	0.0558277
KM SD (logged)	1.4431027	95% Critical H Value (KM-Log)	3.0476551
KM Standard Error of Mean (logged)	0.2846243	95% H-UCL (KM -Log)	0.3686894
KM SD (logged)	1.4431027	95% Critical H Value (KM-Log)	3.0476551
KM Standard Error of Mean (logged)	0.2846243		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.1709227	Mean in Log Scale	-2.874092
SD in Original Scale	0.3598737	SD in Log Scale	1.5250272
95% t UCL (Assumes normality)	0.2867629	95% H-Stat UCL	0.4575024
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Approximate Gamma Distributed at 5% Significance Level			

Suggested UCL to Use			
Adjusted KM-UCL (use when k<=1 and 15 < n < 50 but k<=1)	0.3968369		
When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test			
When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Cyanide_RSD_HIGH_HALF_ND			
General Statistics			
Total Number of Observations	28.000000	Number of Distinct Observations	28.000000
		Number of Missing Observations	0
Minimum	0.0294426	Mean	0.4736592
Maximum	1.5920121	Median	0.3617417
SD	0.3854480	Std. Error of Mean	0.0728428
Coefficient of Variation	0.8137665	Skewness	1.2165658
Normal GOF Test			
Shapiro Wilk Test Statistic	0.8902287	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.9240000	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.1626547	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.1641000	Data appear Normal at 5% Significance Level	
Data appear Approximate Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	0.5977315	95% Adjusted-CLT UCL (Chen-1995)	0.6113697
		95% Modified-t UCL (Johnson-1978)	0.6005227
Gamma GOF Test			
A-D Test Statistic	0.1249316	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.7633721	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.0592031	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.1684800	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	1.4675588	k star (bias corrected MLE)	1.3341299
Theta hat (MLE)	0.3227531	Theta star (bias corrected MLE)	0.3550323
nu hat (MLE)	82.183292	nu star (bias corrected)	74.711272
MLE Mean (bias corrected)	0.4736592	MLE Sd (bias corrected)	0.4100784
		Approximate Chi Square Value (0.05)	55.804296
Adjusted Level of Significance	0.0404000	Adjusted Chi Square Value	54.793827

Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	0.6341390	95% Adjusted Gamma UCL (use when n<50)	0.6458334
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.9579936	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.9240000	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.0993371	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.1641000	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	-3.525313	Mean of logged Data	-1.125148
Maximum of Logged Data	0.4649987	SD of logged Data	0.9858844
Assuming Lognormal Distribution			
95% H-UCL	0.8382441	90% Chebyshev (MVUE) UCL	0.8433060
95% Chebyshev (MVUE) UCL	0.9920677	97.5% Chebyshev (MVUE) UCL	1.1985433
99% Chebyshev (MVUE) UCL	1.6041245		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	0.5934750	95% Jackknife UCL	0.5977315
95% Standard Bootstrap UCL	0.5924672	95% Bootstrap-t UCL	0.6229547
95% Hall's Bootstrap UCL	0.6217472	95% Percentile Bootstrap UCL	0.5971445
95% BCA Bootstrap UCL	0.6101141		
90% Chebyshev(Mean, Sd) UCL	0.6921877	95% Chebyshev(Mean, Sd) UCL	0.7911737
97.5% Chebyshev(Mean, Sd) UCL	0.9285625	99% Chebyshev(Mean, Sd) UCL	1.1984361
Suggested UCL to Use			
95% Student's-t UCL	0.5977315		
When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test			
When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			

Fluoride_RSD_HIGH_HALF_ND			
General Statistics			
Total Number of Observations	28.000000	Number of Distinct Observations	27.000000
		Number of Missing Observations	0
Minimum	67.861246	Mean	328.38399
Maximum	913.00857	Median	278.15212
SD	250.17570	Std. Error of Mean	47.278763
Coefficient of Variation	0.7618389	Skewness	0.7806239
Normal GOF Test			
Shapiro Wilk Test Statistic	0.8700338	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.9240000	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.1815797	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.1641000	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	408.91336	95% Adjusted-CLT UCL (Chen-1995)	413.60326
		95% Modified-t UCL (Johnson-1978)	410.07582
Gamma GOF Test			
A-D Test Statistic	0.8736578	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.7603303	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.1838901	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.1679635	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	1.7478270	k star (bias corrected MLE)	1.5843693
Theta hat (MLE)	187.88129	Theta star (bias corrected MLE)	207.26480
nu hat (MLE)	97.878309	nu star (bias corrected)	88.724681
MLE Mean (bias corrected)	328.38399	MLE Sd (bias corrected)	260.88780
		Approximate Chi Square Value (0.05)	68.008035
Adjusted Level of Significance	0.0404000	Adjusted Chi Square Value	66.886744
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	428.41651	95% Adjusted Gamma UCL (use when n<50)	435.59849
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.9154680	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.9240000	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.1685164	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.1641000	Data Not Lognormal at 5% Significance Level	
Data Not Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	4.2174651	Mean of logged Data	5.4816210
Maximum of Logged Data	6.8167453	SD of logged Data	0.8336599

Assuming Lognormal Distribution			
95% H-UCL	488.81155	90% Chebyshev (MVUE) UCL	509.73066
95% Chebyshev (MVUE) UCL	589.05821	97.5% Chebyshev (MVUE) UCL	699.16177
99% Chebyshev (MVUE) UCL	915.43890		
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution (0.05)			
Nonparametric Distribution Free UCLs			
95% CLT UCL	406.15064	95% Jackknife UCL	408.91336
95% Standard Bootstrap UCL	405.22021	95% Bootstrap-t UCL	418.70148
95% Hall's Bootstrap UCL	411.65316	95% Percentile Bootstrap UCL	407.22129
95% BCA Bootstrap UCL	409.75235		
90% Chebyshev(Mean, Sd) UCL	470.22028	95% Chebyshev(Mean, Sd) UCL	534.46734
97.5% Chebyshev(Mean, Sd) UCL	623.63977	99% Chebyshev(Mean, Sd) UCL	798.80175
Suggested UCL to Use			
95% Chebyshev (Mean, Sd) UCL	534.46734		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
ChromiumHexavalent_Estimated_RSD_HIGH_HALF_ND			
General Statistics			
Total Number of Observations	28.000000	Number of Distinct Observations	26.000000
		Number of Missing Observations	0
Minimum	0.3817260	Mean	0.5984650
Maximum	1.0889547	Median	0.5038944
SD	0.2065438	Std. Error of Mean	0.0390331
Coefficient of Variation	0.3451225	Skewness	1.2408797
Normal GOF Test			
Shapiro Wilk Test Statistic	0.8308111	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.9240000	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.2085060	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.1641000	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	0.6649497	95% Adjusted-CLT UCL (Chen-1995)	0.6724494
		95% Modified-t UCL (Johnson-1978)	0.6664752

Gamma GOF Test			
A-D Test Statistic	1.2799768	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.7452584	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.1979016	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.1651900	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	10.299970	k star (bias corrected MLE)	9.2202109
Theta hat (MLE)	0.0581036	Theta star (bias corrected MLE)	0.0649080
nu hat (MLE)	576.79830	nu star (bias corrected)	516.33181
MLE Mean (bias corrected)	0.5984650	MLE Sd (bias corrected)	0.1970917
		Approximate Chi Square Value (0.05)	464.63551
Adjusted Level of Significance	0.0404000	Adjusted Chi Square Value	461.61128
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	0.6650515	95% Adjusted Gamma UCL (use when n<50)	0.6694086
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.8962156	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.9240000	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.1852390	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.1641000	Data Not Lognormal at 5% Significance Level	
Data Not Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	-0.963052	Mean of logged Data	-0.562716
Maximum of Logged Data	0.0852182	SD of logged Data	0.3085256
Assuming Lognormal Distribution			
95% H-UCL	0.6650950	90% Chebyshev (MVUE) UCL	0.7024578
95% Chebyshev (MVUE) UCL	0.7505120	97.5% Chebyshev (MVUE) UCL	0.8172093
99% Chebyshev (MVUE) UCL	0.9482233		
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution (0.05)			
Nonparametric Distribution Free UCLs			
95% CLT UCL	0.6626688	95% Jackknife UCL	0.6649497
95% Standard Bootstrap UCL	0.6611664	95% Bootstrap-t UCL	0.6802584
95% Hall's Bootstrap UCL	0.6674931	95% Percentile Bootstrap UCL	0.6623520
95% BCA Bootstrap UCL	0.6711225		
90% Chebyshev(Mean, Sd) UCL	0.7155644	95% Chebyshev(Mean, Sd) UCL	0.7686064
97.5% Chebyshev(Mean, Sd) UCL	0.8422267	99% Chebyshev(Mean, Sd) UCL	0.9868395
Suggested UCL to Use			
95% Student's-t UCL	0.6649497	or 95% Modified-t UCL	0.6664752
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

ProUCL Output
Central Landfill Area ISM Soil (0-0.5 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

UCL Statistics for Data Sets with Non-Detects			
User Selected Options			
Date/Time of Computation	ProUCL 5.17/12/2019 7:35:21 AM		
From File	20190710_ProUCL_Input_ISM_a.xls		
Full Precision	ON		
Confidence Coefficient	95%		
Number of Bootstrap Operations	10000		
Aluminum_RSD_HIGH_HALF_ND			
General Statistics			
Total Number of Observations	36.000000	Number of Distinct Observations	34.000000
		Number of Missing Observations	0
Minimum	11933.782	Mean	23813.438
Maximum	47002.351	Median	23710.540
SD	8310.2035	Std. Error of Mean	1385.0339
Coefficient of Variation	0.3489712	Skewness	0.7720561
Normal GOF Test			
Shapiro Wilk Test Statistic	0.9364034	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.9350000	Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.1621985	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.1454000	Data Not Normal at 5% Significance Level	
Data appear Approximate Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	26153.553	95% Adjusted-CLT UCL (Chen-1995)	26282.047
		95% Modified-t UCL (Johnson-1978)	26183.256
Gamma GOF Test			
A-D Test Statistic	0.4787769	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.7486288	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.1469723	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.1468742	Data Not Gamma Distributed at 5% Significance Level	
Detected data follow Appr. Gamma Distribution at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	8.9029119	k star (bias corrected MLE)	8.1795211
Theta hat (MLE)	2674.7920	Theta star (bias corrected MLE)	2911.3486
nu hat (MLE)	641.00966	nu star (bias corrected)	588.92552
MLE Mean (bias corrected)	23813.438	MLE Sd (bias corrected)	8326.4170
		Approximate Chi Square Value (0.05)	533.63410
Adjusted Level of Significance	0.0428000	Adjusted Chi Square Value	531.25275
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	26280.819	95% Adjusted Gamma UCL (use when n<50)	26398.623

Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.9671543	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.9350000	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.1318807	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.1454000	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	9.3871285	Mean of logged Data	10.020794
Maximum of Logged Data	10.757953	SD of logged Data	0.3423519
Assuming Lognormal Distribution			
95% H-UCL	26474.383	90% Chebyshev (MVUE) UCL	27972.331
95% Chebyshev (MVUE) UCL	29859.667	97.5% Chebyshev (MVUE) UCL	32479.217
99% Chebyshev (MVUE) UCL	37624.814		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	26091.616	95% Jackknife UCL	26153.553
95% Standard Bootstrap UCL	26090.801	95% Bootstrap-t UCL	26377.339
95% Hall's Bootstrap UCL	26415.818	95% Percentile Bootstrap UCL	26139.244
95% BCA Bootstrap UCL	26236.315		
90% Chebyshev(Mean, Sd) UCL	27968.539	95% Chebyshev(Mean, Sd) UCL	29850.661
97.5% Chebyshev(Mean, Sd) UCL	32462.972	99% Chebyshev(Mean, Sd) UCL	37594.351
Suggested UCL to Use			
95% Student's-t UCL	26153.553		
When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test			
When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Iron_RSD_HIGH_HALF_ND			
General Statistics			
Total Number of Observations	36.000000	Number of Distinct Observations	32.000000
		Number of Missing Observations	0
Minimum	12201.123	Mean	18954.474
Maximum	31536.800	Median	17422.789
SD	5002.4953	Std. Error of Mean	833.74921
Coefficient of Variation	0.2639216	Skewness	1.3174306

Normal GOF Test			
Shapiro Wilk Test Statistic	0.8169980	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.9350000	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.2626597	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.1454000	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	20363.154	95% Adjusted-CLT UCL (Chen-1995)	20521.480
		95% Modified-t UCL (Johnson-1978)	20393.665
Gamma GOF Test			
A-D Test Statistic	2.1737373	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.7471492	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.2381740	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.1466046	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	17.152290	k star (bias corrected MLE)	15.741451
Theta hat (MLE)	1105.0696	Theta star (bias corrected MLE)	1204.1123
nu hat (MLE)	1234.9648	nu star (bias corrected)	1133.3844
MLE Mean (bias corrected)	18954.474	MLE Sd (bias corrected)	4777.3754
		Approximate Chi Square Value (0.05)	1056.2254
Adjusted Level of Significance	0.0428000	Adjusted Chi Square Value	1052.8576
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	20339.131	95% Adjusted Gamma UCL (use when n<50)	20404.189
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.8823852	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.9350000	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.2228451	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.1454000	Data Not Lognormal at 5% Significance Level	
Data Not Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	9.4092832	Mean of logged Data	9.8203615
Maximum of Logged Data	10.358910	SD of logged Data	0.2382723
Assuming Lognormal Distribution			
95% H-UCL	20318.632	90% Chebyshev (MVUE) UCL	21198.196
95% Chebyshev (MVUE) UCL	22230.447	97.5% Chebyshev (MVUE) UCL	23663.171
99% Chebyshev (MVUE) UCL	26477.480		
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution (0.05)			

Nonparametric Distribution Free UCLs			
95% CLT UCL	20325.870	95% Jackknife UCL	20363.154
95% Standard Bootstrap UCL	20297.882	95% Bootstrap-t UCL	20605.696
95% Hall's Bootstrap UCL	20519.359	95% Percentile Bootstrap UCL	20368.177
95% BCA Bootstrap UCL	20497.415		
90% Chebyshev(Mean, Sd) UCL	21455.722	95% Chebyshev(Mean, Sd) UCL	22588.703
97.5% Chebyshev(Mean, Sd) UCL	24161.236	99% Chebyshev(Mean, Sd) UCL	27250.174
Suggested UCL to Use			
95% Student's-t UCL	20363.154	or 95% Modified-t UCL	20393.665
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			

Manganese_RSD_HIGH_HALF_ND

General Statistics			
Total Number of Observations	36.000000	Number of Distinct Observations	34.000000
		Number of Missing Observations	0
Minimum	360.20508	Mean	496.24723
Maximum	902.49418	Median	475.34394
SD	107.07468	Std. Error of Mean	17.845780
Coefficient of Variation	0.2157688	Skewness	1.6555902
Normal GOF Test			
Shapiro Wilk Test Statistic	0.8698568	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.9350000	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.1290075	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.1454000	Data appear Normal at 5% Significance Level	
Data appear Approximate Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	526.39897	95% Adjusted-CLT UCL (Chen-1995)	530.86252
		95% Modified-t UCL (Johnson-1978)	527.21967
Gamma GOF Test			
A-D Test Statistic	0.7051539	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.7464037	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.1320081	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.1465044	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			

ProUCL Output
Central Landfill Area ISM Soil (0-0.5 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Gamma Statistics			
k hat (MLE)	25.418704	k star (bias corrected MLE)	23.318997
Theta hat (MLE)	19.522916	Theta star (bias corrected MLE)	21.280814
nu hat (MLE)	1830.1467	nu star (bias corrected)	1678.9678
MLE Mean (bias corrected)	496.24723	MLE Sd (bias corrected)	102.76451
		Approximate Chi Square Value (0.05)	1584.8028
Adjusted Level of Significance	0.0428000	Adjusted Chi Square Value	1580.6678
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	525.73299	95% Adjusted Gamma UCL (use when n<50)	527.10828
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.9364808	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.9350000	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.1291536	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.1454000	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	5.8866735	Mean of logged Data	6.1872747
Maximum of Logged Data	6.8051622	SD of logged Data	0.1963487
Assuming Lognormal Distribution			
95% H-UCL	525.34109	90% Chebyshev (MVUE) UCL	544.75074
95% Chebyshev (MVUE) UCL	566.96115	97.5% Chebyshev (MVUE) UCL	597.78833
99% Chebyshev (MVUE) UCL	658.34237		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	525.60093	95% Jackknife UCL	526.39897
95% Standard Bootstrap UCL	525.07570	95% Bootstrap-t UCL	532.72421
95% Hall's Bootstrap UCL	539.30636	95% Percentile Bootstrap UCL	526.09869
95% BCA Bootstrap UCL	530.49763		
90% Chebyshev(Mean, Sd) UCL	549.78457	95% Chebyshev(Mean, Sd) UCL	574.03518
97.5% Chebyshev(Mean, Sd) UCL	607.69409	99% Chebyshev(Mean, Sd) UCL	673.81050
Suggested UCL to Use			
95% Student's-t UCL	526.39897		
When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test			
When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			

Nickel_RSD_HIGH_HALF_ND			
General Statistics			
Total Number of Observations	36.000000	Number of Distinct Observations	36.000000
		Number of Missing Observations	0
Minimum	20.033484	Mean	48.811858
Maximum	162.55742	Median	35.545125
SD	31.140896	Std. Error of Mean	5.1901493
Coefficient of Variation	0.6379781	Skewness	1.9976177
Normal GOF Test			
Shapiro Wilk Test Statistic	0.7610894	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.9350000	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.2401456	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.1454000	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	57.580991	95% Adjusted-CLT UCL (Chen-1995)	59.195275
		95% Modified-t UCL (Johnson-1978)	57.868989
Gamma GOF Test			
A-D Test Statistic	1.7390183	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.7530506	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.1897097	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.1476336	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	3.6436998	k star (bias corrected MLE)	3.3585767
Theta hat (MLE)	13.396235	Theta star (bias corrected MLE)	14.533495
nu hat (MLE)	262.34639	nu star (bias corrected)	241.81752
MLE Mean (bias corrected)	48.811858	MLE Sd (bias corrected)	26.634693
		Approximate Chi Square Value (0.05)	206.81658
Adjusted Level of Significance	0.0428000	Adjusted Chi Square Value	205.35001
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	57.072613	95% Adjusted Gamma UCL (use when n<50)	57.480214
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.9137862	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.9350000	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.1580893	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.1454000	Data Not Lognormal at 5% Significance Level	
Data Not Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	2.9974051	Mean of logged Data	3.7445191
Maximum of Logged Data	5.0910313	SD of logged Data	0.5076877

Assuming Lognormal Distribution			
95% H-UCL	56.700671	90% Chebyshev (MVUE) UCL	60.658870
95% Chebyshev (MVUE) UCL	66.432209	97.5% Chebyshev (MVUE) UCL	74.445380
99% Chebyshev (MVUE) UCL	90.185703		
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution (0.05)			
Nonparametric Distribution Free UCLs			
95% CLT UCL	57.348894	95% Jackknife UCL	57.580991
95% Standard Bootstrap UCL	57.333565	95% Bootstrap-t UCL	60.316168
95% Hall's Bootstrap UCL	60.269815	95% Percentile Bootstrap UCL	57.618303
95% BCA Bootstrap UCL	59.446780		
90% Chebyshev(Mean, Sd) UCL	64.382306	95% Chebyshev(Mean, Sd) UCL	71.435194
97.5% Chebyshev(Mean, Sd) UCL	81.224330	99% Chebyshev(Mean, Sd) UCL	100.45319
Suggested UCL to Use			
95% Chebyshev (Mean, Sd) UCL	71.435194		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Thallium_RSD_HIGH_HALF_ND			
General Statistics			
Total Number of Observations	36.000000	Number of Distinct Observations	25.000000
Number of Detects	33.000000	Number of Non-Detects	3.0000000
Number of Distinct Detects	22.000000	Number of Distinct Non-Detects	3.0000000
Minimum Detect	0.0709200	Minimum Non-Detect	0.0857689
Maximum Detect	0.4574344	Maximum Non-Detect	0.1029227
Variance Detects	0.0066130	Percent Non-Detects	8.3333333%
Mean Detects	0.1546541	SD Detects	0.0813201
Median Detects	0.1372303	CV Detects	0.5258194
Skewness Detects	2.4258044	Kurtosis Detects	6.6785613
Mean of Logged Detects	-1.959727	SD of Logged Detects	0.4075500
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.7350732	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.9310000	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.2211920	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.1518000	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.1484698	KM Standard Error of Mean	0.0134528
KM SD	0.0794311	95% KM (BCA) UCL	0.1738030
95% KM (t) UCL	0.1711993	95% KM (Percentile Bootstrap) UCL	0.1717016
95% KM (z) UCL	0.1705977	95% KM Bootstrap t UCL	0.1839863
90% KM Chebyshev UCL	0.1888283	95% KM Chebyshev UCL	0.2071093
97.5% KM Chebyshev UCL	0.2324827	99% KM Chebyshev UCL	0.2823238
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	1.3162638	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.7482938	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.1888209	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.1535019	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	5.5282683	k star (bias corrected MLE)	5.0459005
Theta hat (MLE)	0.0279751	Theta star (bias corrected MLE)	0.0306494
nu hat (MLE)	364.86571	nu star (bias corrected)	333.02943
Mean (detects)	0.1546541		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.0272928	Mean	0.1455089
Maximum	0.4574344	Median	0.1257945
SD	0.0837069	CV	0.5752698
k hat (MLE)	3.9594047	k star (bias corrected MLE)	3.6479728
Theta hat (MLE)	0.0367502	Theta star (bias corrected MLE)	0.0398876
nu hat (MLE)	285.07714	nu star (bias corrected)	262.65404
Adjusted Level of Significance (β)	0.0428000		
Approximate Chi Square Value (262.65, α)	226.12544	Adjusted Chi Square Value (262.65, β)	224.59003
95% Gamma Approximate UCL (use when n>=50)	0.1690146	95% Gamma Adjusted UCL (use when n<50)	0.1701701
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.1484698	SD (KM)	0.0794311
Variance (KM)	0.0063093	SE of Mean (KM)	0.0134528
k hat (KM)	3.4937752	k star (KM)	3.2211458
nu hat (KM)	251.55181	nu star (KM)	231.92250
theta hat (KM)	0.0424955	theta star (KM)	0.0460922
80% gamma percentile (KM)	0.2099811	90% gamma percentile (KM)	0.2593958
95% gamma percentile (KM)	0.3053408	99% gamma percentile (KM)	0.4045591
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (231.92, α)	197.67010	Adjusted Chi Square Value (231.92, β)	196.23726
95% Gamma Approximate KM-UCL (use when n>=50)	0.1741967	95% Gamma Adjusted KM-UCL (use when n<50)	0.1754686

Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.9196460	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.9310000	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.1621568	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.1518000	Detected Data Not Lognormal at 5% Significance Level	
Detected Data Not Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.1476743	Mean in Log Scale	-2.017546
SD in Original Scale	0.0812596	SD in Log Scale	0.4369396
95% t UCL (assumes normality of ROS data)	0.1705566	95% Percentile Bootstrap UCL	0.1704393
95% BCA Bootstrap UCL	0.1759745	95% Bootstrap t UCL	0.1833236
95% H-UCL (Log ROS)	0.1679094		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-2.007217	KM Geo Mean	0.1343621
KM SD (logged)	0.4171267	95% Critical H Value (KM-Log)	1.8520368
KM Standard Error of Mean (logged)	0.0708541	95% H-UCL (KM -Log)	0.1670207
KM SD (logged)	0.4171267	95% Critical H Value (KM-Log)	1.8520368
KM Standard Error of Mean (logged)	0.0708541		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.1457370	Mean in Log Scale	-2.050312
SD in Original Scale	0.0833479	SD in Log Scale	0.4951754
95% t UCL (Assumes normality)	0.1692074	95% H-Stat UCL	0.1706492
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution at 5% Significance Level			
Suggested UCL to Use			
95% KM (t) UCL	0.1711993	KM H-UCL	0.1670207
95% KM (BCA) UCL	0.1738030		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			

Antimony_RSD_HIGH_HALF_ND			
General Statistics			
Total Number of Observations	36.000000	Number of Distinct Observations	29.000000
Number of Detects	30.000000	Number of Non-Detects	6.0000000
Number of Distinct Detects	23.000000	Number of Distinct Non-Detects	6.0000000
Minimum Detect	0.1921028	Minimum Non-Detect	0.1088583
Maximum Detect	1.5368228	Maximum Non-Detect	0.3009611
Variance Detects	0.1296896	Percent Non-Detects	16.666667%
Mean Detects	0.4651746	SD Detects	0.3601244
Median Detects	0.3194128	CV Detects	0.7741704
Skewness Detects	2.0152764	Kurtosis Detects	3.2847707
Mean of Logged Detects	-0.961785	SD of Logged Detects	0.5830919
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.6933611	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.9270000	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.3083942	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.1590000	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.4156153	KM Standard Error of Mean	0.0581610
KM SD	0.3425488	95% KM (BCA) UCL	0.5184299
95% KM (t) UCL	0.5138825	95% KM (Percentile Bootstrap) UCL	0.5135401
95% KM (z) UCL	0.5112816	95% KM Bootstrap t UCL	0.5544745
90% KM Chebyshev UCL	0.5900983	95% KM Chebyshev UCL	0.6691332
97.5% KM Chebyshev UCL	0.7788306	99% KM Chebyshev UCL	0.9943099
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	2.1102685	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.7542539	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.2520290	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.1614467	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	2.7003408	k star (bias corrected MLE)	2.4525290
Theta hat (MLE)	0.1722652	Theta star (bias corrected MLE)	0.1896714
nu hat (MLE)	162.02045	nu star (bias corrected)	147.15174
Mean (detects)	0.4651746		

Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.0100000	Mean	0.3966929
Maximum	1.5368228	Median	0.3073646
SD	0.3630661	CV	0.9152321
k hat (MLE)	1.3187787	k star (bias corrected MLE)	1.2273990
Theta hat (MLE)	0.3008033	Theta star (bias corrected MLE)	0.3231980
nu hat (MLE)	94.952069	nu star (bias corrected)	88.372730
Adjusted Level of Significance (β)	0.0428000		
Approximate Chi Square Value (88.37, α)	67.699696	Adjusted Chi Square Value (88.37, β)	66.878077
95% Gamma Approximate UCL (use when n>=50)	0.5178286	95% Gamma Adjusted UCL (use when n<50)	0.5241903
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.4156153	SD (KM)	0.3425488
Variance (KM)	0.1173397	SE of Mean (KM)	0.0581610
k hat (KM)	1.4721032	k star (KM)	1.3679464
nu hat (KM)	105.99143	nu star (KM)	98.492142
theta hat (KM)	0.2823276	theta star (KM)	0.3038243
80% gamma percentile (KM)	0.6494337	90% gamma percentile (KM)	0.8858103
95% gamma percentile (KM)	1.1167985	99% gamma percentile (KM)	1.6415521
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (98.49, α)	76.598064	Adjusted Chi Square Value (98.49, β)	75.721565
95% Gamma Approximate KM-UCL (use when n>=50)	0.5344110	95% Gamma Adjusted KM-UCL (use when n<50)	0.5405969
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.8689040	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.9270000	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.2073545	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.1590000	Detected Data Not Lognormal at 5% Significance Level	
Detected Data Not Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.4130277	Mean in Log Scale	-1.121817
SD in Original Scale	0.3488824	SD in Log Scale	0.6542832
95% t UCL (assumes normality of ROS data)	0.5112714	95% Percentile Bootstrap UCL	0.5116998
95% BCA Bootstrap UCL	0.5335159	95% Bootstrap t UCL	0.5550692
95% H-UCL (Log ROS)	0.5051939		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-1.109661	KM Geo Mean	0.3296707
KM SD (logged)	0.6362463	95% Critical H Value (KM-Log)	2.0184944
KM Standard Error of Mean (logged)	0.1096407	95% H-UCL (KM -Log)	0.5014873
KM SD (logged)	0.6362463	95% Critical H Value (KM-Log)	2.0184944
KM Standard Error of Mean (logged)	0.1096407		

DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.4056996	Mean in Log Scale	-1.184969
SD in Original Scale	0.3548227	SD in Log Scale	0.7535031
95% t UCL (Assumes normality)	0.5056161	95% H-Stat UCL	0.5323770
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution at 5% Significance Level			
Suggested UCL to Use			
95% KM (Chebyshev) UCL	0.6691332		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Arsenic_RSD_HIGH_HALF_ND			
General Statistics			
Total Number of Observations	36.000000	Number of Distinct Observations	24.000000
		Number of Missing Observations	0
Minimum	4.7809834	Mean	6.7923470
Maximum	14.001452	Median	5.9762293
SD	2.1060293	Std. Error of Mean	0.3510049
Coefficient of Variation	0.3100591	Skewness	1.8282447
Normal GOF Test			
Shapiro Wilk Test Statistic	0.7941729	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.9350000	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.2240927	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.1454000	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	7.3853952	95% Adjusted-CLT UCL (Chen-1995)	7.4839804
		95% Modified-t UCL (Johnson-1978)	7.4032208
Gamma GOF Test			
A-D Test Statistic	1.8170077	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.7477038	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.2143099	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.1466963	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			

Gamma Statistics			
k hat (MLE)	13.454449	k star (bias corrected MLE)	12.351763
Theta hat (MLE)	0.5048402	Theta star (bias corrected MLE)	0.5499091
nu hat (MLE)	968.72031	nu star (bias corrected)	889.32695
MLE Mean (bias corrected)	6.7923470	MLE Sd (bias corrected)	1.9326597
		Approximate Chi Square Value (0.05)	821.11224
Adjusted Level of Significance	0.0428000	Adjusted Chi Square Value	818.14799
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	7.3566279	95% Adjusted Gamma UCL (use when n<50)	7.3832819
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.8767851	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.9350000	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.2033546	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.1454000	Data Not Lognormal at 5% Significance Level	
Data Not Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	1.5646463	Mean of logged Data	1.8781740
Maximum of Logged Data	2.6391610	SD of logged Data	0.2647978
Assuming Lognormal Distribution			
95% H-UCL	7.3317566	90% Chebyshev (MVUE) UCL	7.6764310
95% Chebyshev (MVUE) UCL	8.0878517	97.5% Chebyshev (MVUE) UCL	8.6588878
99% Chebyshev (MVUE) UCL	9.7805776		
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution (0.05)			
Nonparametric Distribution Free UCLs			
95% CLT UCL	7.3696987	95% Jackknife UCL	7.3853952
95% Standard Bootstrap UCL	7.3639056	95% Bootstrap-t UCL	7.5479631
95% Hall's Bootstrap UCL	7.5728696	95% Percentile Bootstrap UCL	7.3947422
95% BCA Bootstrap UCL	7.4788453		
90% Chebyshev(Mean, Sd) UCL	7.8453617	95% Chebyshev(Mean, Sd) UCL	8.3223418
97.5% Chebyshev(Mean, Sd) UCL	8.9843718	99% Chebyshev(Mean, Sd) UCL	10.284801
Suggested UCL to Use			
95% Student's-t UCL	7.3853952	or 95% Modified-t UCL	7.4032208
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			

Cobalt_RSD_HIGH_HALF_ND			
General Statistics			
Total Number of Observations	36.000000	Number of Distinct Observations	25.000000
		Number of Missing Observations	0
Minimum	4.2438680	Mean	6.5086551
Maximum	9.6263347	Median	6.3140475
SD	0.9605736	Std. Error of Mean	0.1600956
Coefficient of Variation	0.1475840	Skewness	0.7413829
Normal GOF Test			
Shapiro Wilk Test Statistic	0.9398412	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.9350000	Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.1615126	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.1454000	Data Not Normal at 5% Significance Level	
Data appear Approximate Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	6.7791482	95% Adjusted-CLT UCL (Chen-1995)	6.7931263
		95% Modified-t UCL (Johnson-1978)	6.7824452
Gamma GOF Test			
A-D Test Statistic	0.8325814	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.7450560	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.1422672	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.1463789	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data follow Appr. Gamma Distribution at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	48.365065	k star (bias corrected MLE)	44.353162
Theta hat (MLE)	0.1345735	Theta star (bias corrected MLE)	0.1467461
nu hat (MLE)	3482.2847	nu star (bias corrected)	3193.4276
MLE Mean (bias corrected)	6.5086551	MLE Sd (bias corrected)	0.9773024
		Approximate Chi Square Value (0.05)	3063.1214
Adjusted Level of Significance	0.0428000	Adjusted Chi Square Value	3057.3557
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	6.7855356	95% Adjusted Gamma UCL (use when n<50)	6.7983319
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.9549457	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.9350000	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.1331829	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.1454000	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	1.4454751	Mean of logged Data	1.8627592
Maximum of Logged Data	2.2645025	SD of logged Data	0.1461214

Assuming Lognormal Distribution			
95% H-UCL	6.7917819	90% Chebyshev (MVUE) UCL	6.9861913
95% Chebyshev (MVUE) UCL	7.2024914	97.5% Chebyshev (MVUE) UCL	7.5027076
99% Chebyshev (MVUE) UCL	8.0924242		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	6.7719889	95% Jackknife UCL	6.7791482
95% Standard Bootstrap UCL	6.7699946	95% Bootstrap-t UCL	6.7978120
95% Hall's Bootstrap UCL	6.8206821	95% Percentile Bootstrap UCL	6.7742541
95% BCA Bootstrap UCL	6.7846924		
90% Chebyshev(Mean, Sd) UCL	6.9889419	95% Chebyshev(Mean, Sd) UCL	7.2064956
97.5% Chebyshev(Mean, Sd) UCL	7.5084517	99% Chebyshev(Mean, Sd) UCL	8.1015861
Suggested UCL to Use			
95% Student's-t UCL	6.7791482		
When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test			
When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Copper_RSD_HIGH_HALF_ND			
General Statistics			
Total Number of Observations	36.000000	Number of Distinct Observations	36.000000
		Number of Missing Observations	0
Minimum	15.718521	Mean	44.341549
Maximum	427.76832	Median	25.542596
SD	67.887470	Std. Error of Mean	11.314578
Coefficient of Variation	1.5310126	Skewness	5.4336234
Normal GOF Test			
Shapiro Wilk Test Statistic	0.3611384	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.9350000	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.3366495	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.1454000	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	63.458350	95% Adjusted-CLT UCL (Chen-1995)	73.900936
		95% Modified-t UCL (Johnson-1978)	65.166104

Gamma GOF Test			
A-D Test Statistic	3.2744225	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.7635547	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.2116384	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.1492423	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	1.7091483	k star (bias corrected MLE)	1.5852378
Theta hat (MLE)	25.943652	Theta star (bias corrected MLE)	27.971544
nu hat (MLE)	123.05868	nu star (bias corrected)	114.13712
MLE Mean (bias corrected)	44.341549	MLE Sd (bias corrected)	35.217916
		Approximate Chi Square Value (0.05)	90.473279
Adjusted Level of Significance	0.0428000	Adjusted Chi Square Value	89.517197
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	55.939354	95% Adjusted Gamma UCL (use when n<50)	56.536811
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.8147264	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.9350000	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.1771934	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.1454000	Data Not Lognormal at 5% Significance Level	
Data Not Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	2.7548397	Mean of logged Data	3.4717064
Maximum of Logged Data	6.0585817	SD of logged Data	0.6342797
Assuming Lognormal Distribution			
95% H-UCL	48.866382	90% Chebyshev (MVUE) UCL	52.406692
95% Chebyshev (MVUE) UCL	58.431845	97.5% Chebyshev (MVUE) UCL	66.794524
99% Chebyshev (MVUE) UCL	83.221387		
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution (0.05)			
Nonparametric Distribution Free UCLs			
95% CLT UCL	62.952375	95% Jackknife UCL	63.458350
95% Standard Bootstrap UCL	62.795479	95% Bootstrap-t UCL	109.45197
95% Hall's Bootstrap UCL	131.12425	95% Percentile Bootstrap UCL	66.010611
95% BCA Bootstrap UCL	79.265730		
90% Chebyshev(Mean, Sd) UCL	78.285285	95% Chebyshev(Mean, Sd) UCL	93.660653
97.5% Chebyshev(Mean, Sd) UCL	115.00107	99% Chebyshev(Mean, Sd) UCL	156.92018

Suggested UCL to Use			
95% Chebyshev (Mean, Sd) UCL	93.660653		

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Vanadium_RSD_HIGH_HALF_ND

General Statistics			
Total Number of Observations	36.000000	Number of Distinct Observations	34.000000
		Number of Missing Observations	0
Minimum	12.340654	Mean	23.282372
Maximum	59.519085	Median	20.149121
SD	9.5454354	Std. Error of Mean	1.5909059
Coefficient of Variation	0.4099855	Skewness	1.8738318

Normal GOF Test			
Shapiro Wilk Test Statistic	0.8348620	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.9350000	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.1677896	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.1454000	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			

Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	25.970323	95% Adjusted-CLT UCL (Chen-1995)	26.430069
		95% Modified-t UCL (Johnson-1978)	26.053131

Gamma GOF Test			
A-D Test Statistic	0.8425198	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.7490376	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.1324617	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.1469668	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data follow Appr. Gamma Distribution at 5% Significance Level			

Gamma Statistics			
k hat (MLE)	7.8003918	k star (bias corrected MLE)	7.1688777
Theta hat (MLE)	2.9847695	Theta star (bias corrected MLE)	3.2477011
nu hat (MLE)	561.62821	nu star (bias corrected)	516.15919
MLE Mean (bias corrected)	23.282372	MLE Sd (bias corrected)	8.6956417
		Approximate Chi Square Value (0.05)	464.47173
Adjusted Level of Significance	0.0428000	Adjusted Chi Square Value	462.25291

Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50)	25.873287	95% Adjusted Gamma UCL (use when n<50)	25.997479

Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.9498182	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.9350000	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.1160489	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.1454000	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	2.5128990	Mean of logged Data	3.0822298
Maximum of Logged Data	4.0862970	SD of logged Data	0.3515916
Assuming Lognormal Distribution			
95% H-UCL	25.834559	90% Chebyshev (MVUE) UCL	27.322334
95% Chebyshev (MVUE) UCL	29.209857	97.5% Chebyshev (MVUE) UCL	31.829665
99% Chebyshev (MVUE) UCL	36.975770		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	25.899179	95% Jackknife UCL	25.970323
95% Standard Bootstrap UCL	25.851874	95% Bootstrap-t UCL	26.743991
95% Hall's Bootstrap UCL	27.235963	95% Percentile Bootstrap UCL	25.891463
95% BCA Bootstrap UCL	26.457929		
90% Chebyshev(Mean, Sd) UCL	28.055089	95% Chebyshev(Mean, Sd) UCL	30.216970
97.5% Chebyshev(Mean, Sd) UCL	33.217576	99% Chebyshev(Mean, Sd) UCL	39.111686
Suggested UCL to Use			
95% Adjusted Gamma UCL	25.997479		
When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test			
When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			

Selenium_RSD_HIGH_HALF_ND			
General Statistics			
Total Number of Observations	36.000000	Number of Distinct Observations	30.000000
Number of Detects	32.000000	Number of Non-Detects	4.0000000
Number of Distinct Detects	26.000000	Number of Distinct Non-Detects	4.0000000
Minimum Detect	0.2875260	Minimum Non-Detect	0.2099281
Maximum Detect	15.954532	Maximum Non-Detect	0.2639095
Variance Detects	9.2399163	Percent Non-Detects	11.111111%
Mean Detects	2.3853621	SD Detects	3.0397231
Median Detects	1.7394039	CV Detects	1.2743235
Skewness Detects	3.2209669	Kurtosis Detects	12.694491
Mean of Logged Detects	0.3663369	SD of Logged Detects	0.9867441
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.6329876	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.9300000	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.2951777	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.1542000	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	2.1436472	KM Standard Error of Mean	0.4914758
KM SD	2.9024134	95% KM (BCA) UCL	3.0150295
95% KM (t) UCL	2.9740312	95% KM (Percentile Bootstrap) UCL	2.9970993
95% KM (z) UCL	2.9520530	95% KM Bootstrap t UCL	3.6372403
90% KM Chebyshev UCL	3.6180746	95% KM Chebyshev UCL	4.2859406
97.5% KM Chebyshev UCL	5.2129127	99% KM Chebyshev UCL	7.0337699
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	1.0202231	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.7726413	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.1747874	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.1596128	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	1.1315747	k star (bias corrected MLE)	1.0463229
Theta hat (MLE)	2.1080023	Theta star (bias corrected MLE)	2.2797571
nu hat (MLE)	72.420782	nu star (bias corrected)	66.964667
Mean (detects)	2.3853621		

Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.0100000	Mean	2.1214330
Maximum	15.954532	Median	1.6194450
SD	2.9592426	CV	1.3949263
k hat (MLE)	0.6508615	k star (bias corrected MLE)	0.6151416
Theta hat (MLE)	3.2594230	Theta star (bias corrected MLE)	3.4486906
nu hat (MLE)	46.862029	nu star (bias corrected)	44.290193
Adjusted Level of Significance (β)	0.0428000		
Approximate Chi Square Value (44.29, α)	30.026680	Adjusted Chi Square Value (44.29, β)	29.492502
95% Gamma Approximate UCL (use when n>=50)	3.1291730	95% Gamma Adjusted UCL (use when n<50)	3.1858495
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	2.1436472	SD (KM)	2.9024134
Variance (KM)	8.4240033	SE of Mean (KM)	0.4914758
k hat (KM)	0.5454916	k star (KM)	0.5185525
nu hat (KM)	39.275397	nu star (KM)	37.335781
theta hat (KM)	3.9297527	theta star (KM)	4.1339057
80% gamma percentile (KM)	3.5256148	90% gamma percentile (KM)	5.7556781
95% gamma percentile (KM)	8.1283708	99% gamma percentile (KM)	13.943313
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (37.34, α)	24.346376	Adjusted Chi Square Value (37.34, β)	23.869123
95% Gamma Approximate KM-UCL (use when n>=50)	3.2873369	95% Gamma Adjusted KM-UCL (use when n<50)	3.3530659
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.9530363	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.9300000	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.1255773	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.1542000	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	2.1376739	Mean in Log Scale	0.1193193
SD in Original Scale	2.9476676	SD in Log Scale	1.1681082
95% t UCL (assumes normality of ROS data)	2.9677235	95% Percentile Bootstrap UCL	3.0222658
95% BCA Bootstrap UCL	3.3380912	95% Bootstrap t UCL	3.5804752
95% H-UCL (Log ROS)	3.7099738		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	0.1521894	KM Geo Mean	1.1643808
KM SD (logged)	1.0978643	95% Critical H Value (KM-Log)	2.4959620
KM Standard Error of Mean (logged)	0.1859052	95% H-UCL (KM -Log)	3.3805062
KM SD (logged)	1.0978643	95% Critical H Value (KM-Log)	2.4959620
KM Standard Error of Mean (logged)	0.1859052		

DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	2.1334007	Mean in Log Scale	0.0874685
SD in Original Scale	2.9506483	SD in Log Scale	1.2260524
95% t UCL (Assumes normality)	2.9642897	95% H-Stat UCL	4.0094215
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Lognormal Distributed at 5% Significance Level			
Suggested UCL to Use			
KM H-UCL	3.3805062		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Mercury_RSD_HIGH_HALF_ND			
General Statistics			
Total Number of Observations	36.000000	Number of Distinct Observations	24.000000
Number of Detects	28.000000	Number of Non-Detects	8.0000000
Number of Distinct Detects	18.000000	Number of Distinct Non-Detects	6.0000000
Minimum Detect	0.0247902	Minimum Non-Detect	0.0100710
Maximum Detect	0.1395379	Maximum Non-Detect	0.0486908
Variance Detects	4.6646E-4	Percent Non-Detects	22.222222%
Mean Detects	0.0404598	SD Detects	0.0215977
Median Detects	0.0364106	CV Detects	0.5338050
Skewness Detects	3.8285300	Kurtosis Detects	17.247922
Mean of Logged Detects	-3.283971	SD of Logged Detects	0.3525665
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.5789418	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.9240000	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.2499310	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.1641000	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.0344942	KM Standard Error of Mean	0.0037760
KM SD	0.0221169	95% KM (BCA) UCL	0.0417551
95% KM (t) UCL	0.0408741	95% KM (Percentile Bootstrap) UCL	0.0413598
95% KM (z) UCL	0.0407052	95% KM Bootstrap t UCL	0.0437655
90% KM Chebyshev UCL	0.0458222	95% KM Chebyshev UCL	0.0509535
97.5% KM Chebyshev UCL	0.0580754	99% KM Chebyshev UCL	0.0720651

Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	1.6838133	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.7474276	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.1984877	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.1656525	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	6.6960763	k star (bias corrected MLE)	6.0024491
Theta hat (MLE)	0.0060423	Theta star (bias corrected MLE)	0.0067406
nu hat (MLE)	374.98027	nu star (bias corrected)	336.13715
Mean (detects)	0.0404598		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.0100000	Mean	0.0344668
Maximum	0.1395379	Median	0.0309878
SD	0.0223040	CV	0.6471163
k hat (MLE)	3.2886743	k star (bias corrected MLE)	3.0331367
Theta hat (MLE)	0.0104805	Theta star (bias corrected MLE)	0.0113634
nu hat (MLE)	236.78455	nu star (bias corrected)	218.38584
Adjusted Level of Significance (β)	0.0428000		
Approximate Chi Square Value (218.39, α)	185.18390	Adjusted Chi Square Value (218.39, β)	183.79839
95% Gamma Approximate UCL (use when n>=50)	0.0406464	95% Gamma Adjusted UCL (use when n<50)	0.0409528
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.0344942	SD (KM)	0.0221169
Variance (KM)	4.8916E-4	SE of Mean (KM)	0.0037760
k hat (KM)	2.4324521	k star (KM)	2.2482663
nu hat (KM)	175.13655	nu star (KM)	161.87517
theta hat (KM)	0.0141808	theta star (KM)	0.0153426
80% gamma percentile (KM)	0.0509307	90% gamma percentile (KM)	0.0652828
95% gamma percentile (KM)	0.0788817	99% gamma percentile (KM)	0.1088369
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (161.88, α)	133.45907	Adjusted Chi Square Value (161.88, β)	132.28911
95% Gamma Approximate KM-UCL (use when n>=50)	0.0418387	95% Gamma Adjusted KM-UCL (use when n<50)	0.0422087
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.8313562	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.9240000	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.1639821	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.1641000	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Approximate Lognormal at 5% Significance Level			

Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.0359484	Mean in Log Scale	-3.425975
SD in Original Scale	0.0209080	SD in Log Scale	0.4201715
95% t UCL (assumes normality of ROS data)	0.0418360	95% Percentile Bootstrap UCL	0.0422258
95% BCA Bootstrap UCL	0.0450803	95% Bootstrap t UCL	0.0462539
95% H-UCL (Log ROS)	0.0405173		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-3.534184	KM Geo Mean	0.0291826
KM SD (logged)	0.5931784	95% Critical H Value (KM-Log)	1.9823931
KM Standard Error of Mean (logged)	0.1028499	95% H-UCL (KM -Log)	0.0424475
KM SD (logged)	0.5931784	95% Critical H Value (KM-Log)	1.9823931
KM Standard Error of Mean (logged)	0.1028499		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.0336158	Mean in Log Scale	-3.620651
SD in Original Scale	0.0231881	SD in Log Scale	0.7523227
95% t UCL (Assumes normality)	0.0401455	95% H-Stat UCL	0.0465354
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Approximate Lognormal Distributed at 5% Significance Level			
Suggested UCL to Use			
KM Student's t	0.0362504	KM H-UCL	0.0424475
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
PCB_1254Aroclor1254_RSD_HIGH_HALF_ND			
General Statistics			
Total Number of Observations	34.000000	Number of Distinct Observations	17.000000
		Number of Missing Observations	2.0000000
Number of Detects	8.0000000	Number of Non-Detects	26.000000
Number of Distinct Detects	8.0000000	Number of Distinct Non-Detects	9.0000000
Minimum Detect	0.1102051	Minimum Non-Detect	0.0106611
Maximum Detect	0.6468562	Maximum Non-Detect	0.1017354
Variance Detects	0.0483190	Percent Non-Detects	76.470588%
Mean Detects	0.2581911	SD Detects	0.2198159
Median Detects	0.1449437	CV Detects	0.8513689
Skewness Detects	1.4250298	Kurtosis Detects	0.1413811
Mean of Logged Detects	-1.606494	SD of Logged Detects	0.7055600

Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.6776830	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.8180000	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.3730729	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.2825000	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.0689035	KM Standard Error of Mean	0.0265511
KM SD	0.1448191	95% KM (BCA) UCL	0.1168623
95% KM (t) UCL	0.1138375	95% KM (Percentile Bootstrap) UCL	0.1138869
95% KM (z) UCL	0.1125762	95% KM Bootstrap t UCL	0.1660807
90% KM Chebyshev UCL	0.1485568	95% KM Chebyshev UCL	0.1846370
97.5% KM Chebyshev UCL	0.2347150	99% KM Chebyshev UCL	0.3330836
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	1.1339121	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.7236390	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.3276027	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.2973064	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	2.1323810	k star (bias corrected MLE)	1.4160715
Theta hat (MLE)	0.1210811	Theta star (bias corrected MLE)	0.1823291
nu hat (MLE)	34.118096	nu star (bias corrected)	22.657143
Mean (detects)	0.2581911		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.0100000	Mean	0.0683979
Maximum	0.6468562	Median	0.0100000
SD	0.1472035	CV	2.1521642
k hat (MLE)	0.5188675	k star (bias corrected MLE)	0.4926929
Theta hat (MLE)	0.1318215	Theta star (bias corrected MLE)	0.1388246
nu hat (MLE)	35.282991	nu star (bias corrected)	33.503119
Adjusted Level of Significance (β)	0.0422000		
Approximate Chi Square Value (33.50, α)	21.267624	Adjusted Chi Square Value (33.50, β)	20.784691
95% Gamma Approximate UCL (use when n>=50)	0.1077480	95% Gamma Adjusted UCL (use when n<50)	0.1102515

Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.0689035	SD (KM)	0.1448191
Variance (KM)	0.0209726	SE of Mean (KM)	0.0265511
k hat (KM)	0.2263760	k star (KM)	0.2260095
nu hat (KM)	15.393571	nu star (KM)	15.368648
theta hat (KM)	0.3043762	theta star (KM)	0.3048698
80% gamma percentile (KM)	0.0962130	90% gamma percentile (KM)	0.2079698
95% gamma percentile (KM)	0.3434364	99% gamma percentile (KM)	0.7093339
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (15.37, α)	7.5186795	Adjusted Chi Square Value (15.37, β)	7.2471119
95% Gamma Approximate KM-UCL (use when n>=50)	0.1408430	95% Gamma Adjusted KM-UCL (use when n<50)	0.1461207
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.7629779	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.8180000	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.2982274	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.2825000	Detected Data Not Lognormal at 5% Significance Level	
Detected Data Not Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.0736797	Mean in Log Scale	-3.697281
SD in Original Scale	0.1454131	SD in Log Scale	1.3935091
95% t UCL (assumes normality of ROS data)	0.1158840	95% Percentile Bootstrap UCL	0.1183329
95% BCA Bootstrap UCL	0.1341149	95% Bootstrap t UCL	0.1821704
95% H-UCL (Log ROS)	0.1344392		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-3.850642	KM Geo Mean	0.0212661
KM SD (logged)	1.2853371	95% Critical H Value (KM-Log)	2.8177045
KM Standard Error of Mean (logged)	0.2356533	95% H-UCL (KM -Log)	0.0912512
KM SD (logged)	1.2853371	95% Critical H Value (KM-Log)	2.8177045
KM Standard Error of Mean (logged)	0.2356533		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.0663708	Mean in Log Scale	-4.278188
SD in Original Scale	0.1482359	SD in Log Scale	1.5851537
95% t UCL (Assumes normality)	0.1093944	95% H-Stat UCL	0.1191500
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution at 5% Significance Level			

Suggested UCL to Use			
95% KM (Chebyshev) UCL	0.1846370		

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Bis2_EthylhexylPhthalate_RSD_HIGH_HALF_ND

General Statistics			
Total Number of Observations	32.000000	Number of Distinct Observations	22.000000
		Number of Missing Observations	4.0000000
Number of Detects	9.0000000	Number of Non-Detects	23.000000
Number of Distinct Detects	8.0000000	Number of Distinct Non-Detects	15.000000
Minimum Detect	0.0330000	Minimum Non-Detect	0.0060000
Maximum Detect	0.8100000	Maximum Non-Detect	1.7500000
Variance Detects	0.0749966	Percent Non-Detects	71.875000%
Mean Detects	0.2171111	SD Detects	0.2738551
Median Detects	0.0860000	CV Detects	1.2613592
Skewness Detects	1.6497084	Kurtosis Detects	1.9195562
Mean of Logged Detects	-2.190055	SD of Logged Detects	1.1924258

Normal GOF Test on Detects Only		
Shapiro Wilk Test Statistic	0.7344321	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.8290000	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.3322097	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.2744000	Detected Data Not Normal at 5% Significance Level
Detected Data Not Normal at 5% Significance Level		

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.0739257	KM Standard Error of Mean	0.0334867
KM SD	0.1712668	95% KM (BCA) UCL	0.1337982
95% KM (t) UCL	0.1307029	95% KM (Percentile Bootstrap) UCL	0.1317719
95% KM (z) UCL	0.1290063	95% KM Bootstrap t UCL	0.2121127
90% KM Chebyshev UCL	0.1743856	95% KM Chebyshev UCL	0.2198906
97.5% KM Chebyshev UCL	0.2830498	99% KM Chebyshev UCL	0.4071137

Gamma GOF Tests on Detected Observations Only		
A-D Test Statistic	0.6552114	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.7471737	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.2735727	**Kolmogorov-Smirnov GOF**
5% K-S Critical Value	0.2880032	Detected data appear Gamma Distributed at 5% Significance Level
Detected data appear Gamma Distributed at 5% Significance Level		

Gamma Statistics on Detected Data Only			
k hat (MLE)	0.8841144	k star (bias corrected MLE)	0.6634837
Theta hat (MLE)	0.2455690	Theta star (bias corrected MLE)	0.3272290
nu hat (MLE)	15.914060	nu star (bias corrected)	11.942706
Mean (detects)	0.2171111		

Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.0100000	Mean	0.0682500
Maximum	0.8100000	Median	0.0100000
SD	0.1682404	CV	2.4650611
k hat (MLE)	0.5101074	k star (bias corrected MLE)	0.4831181
Theta hat (MLE)	0.1337954	Theta star (bias corrected MLE)	0.1412698
nu hat (MLE)	32.646871	nu star (bias corrected)	30.919560
Adjusted Level of Significance (β)	0.0416000		
Approximate Chi Square Value (30.92, α)	19.217190	Adjusted Chi Square Value (30.92, β)	18.722559
95% Gamma Approximate UCL (use when n>=50)	0.1098111	95% Gamma Adjusted UCL (use when n<50)	0.1127122
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.0739257	SD (KM)	0.1712668
Variance (KM)	0.0293323	SE of Mean (KM)	0.0334867
k hat (KM)	0.1863133	k star (KM)	0.1896797
nu hat (KM)	11.924050	nu star (KM)	12.139504
theta hat (KM)	0.3967815	theta star (KM)	0.3897393
80% gamma percentile (KM)	0.0946267	90% gamma percentile (KM)	0.2233942
95% gamma percentile (KM)	0.3860969	99% gamma percentile (KM)	0.8380019
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (12.14, α)	5.3190405	Adjusted Chi Square Value (12.14, β)	5.0781286
95% Gamma Approximate KM-UCL (use when n>=50)	0.1687185	95% Gamma Adjusted KM-UCL (use when n<50)	0.1767227
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.8895695	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.8290000	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.2042592	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.2744000	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.0659848	Mean in Log Scale	-4.403339
SD in Original Scale	0.1691063	SD in Log Scale	1.6956923
95% t UCL (assumes normality of ROS data)	0.1166708	95% Percentile Bootstrap UCL	0.1190695
95% BCA Bootstrap UCL	0.1388752	95% Bootstrap t UCL	0.2240769
95% H-UCL (Log ROS)	0.1439335		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-4.081442	KM Geo Mean	0.0168831
KM SD (logged)	1.5024730	95% Critical H Value (KM-Log)	3.0942899
KM Standard Error of Mean (logged)	0.3125976	95% H-UCL (KM -Log)	0.1203046
KM SD (logged)	1.5024730	95% Critical H Value (KM-Log)	3.0942899
KM Standard Error of Mean (logged)	0.3125976		

DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.1361563	Mean in Log Scale	-3.511954
SD in Original Scale	0.2254029	SD in Log Scale	1.9707108
95% t UCL (Assumes normality)	0.2037158	95% H-Stat UCL	0.7945845
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Gamma Distributed at 5% Significance Level			
Suggested UCL to Use			
Adjusted KM-UCL (use when k<=1 and 15 < n < 50 but k<=1)	0.1767227		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Dibenzofuran_RSD_HIGH_HALF_ND			
General Statistics			
Total Number of Observations	36.000000	Number of Distinct Observations	36.000000
Number of Detects	35.000000	Number of Non-Detects	1.0000000
Number of Distinct Detects	35.000000	Number of Distinct Non-Detects	1.0000000
Minimum Detect	0.0173551	Minimum Non-Detect	0.0066751
Maximum Detect	22.695194	Maximum Non-Detect	0.0066751
Variance Detects	15.388121	Percent Non-Detects	2.7777778%
Mean Detects	1.2851895	SD Detects	3.9227696
Median Detects	0.1335011	CV Detects	3.0522888
Skewness Detects	5.1090877	Kurtosis Detects	27.939845
Mean of Logged Detects	-1.661160	SD of Logged Detects	1.8409722
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.3513777	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.9340000	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.3732724	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.1478000	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	1.2496752	KM Standard Error of Mean	0.6456288
KM SD	3.8180322	95% KM (BCA) UCL	2.5668153
95% KM (t) UCL	2.3405119	95% KM (Percentile Bootstrap) UCL	2.4674117
95% KM (z) UCL	2.3116401	95% KM Bootstrap t UCL	5.4254707
90% KM Chebyshev UCL	3.1865617	95% KM Chebyshev UCL	4.0639060
97.5% KM Chebyshev UCL	5.2816259	99% KM Chebyshev UCL	7.6736008

Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	2.8277182	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.8450781	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.2412114	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.1602448	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.3514450	k star (bias corrected MLE)	0.3403687
Theta hat (MLE)	3.6568729	Theta star (bias corrected MLE)	3.7758743
nu hat (MLE)	24.601147	nu star (bias corrected)	23.825810
Mean (detects)	1.2851895		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.0100000	Mean	1.2497676
Maximum	22.695194	Median	0.1268261
SD	3.8721610	CV	3.0983048
k hat (MLE)	0.3431540	k star (bias corrected MLE)	0.3330763
Theta hat (MLE)	3.6420023	Theta star (bias corrected MLE)	3.7521957
nu hat (MLE)	24.707087	nu star (bias corrected)	23.981496
Adjusted Level of Significance (β)	0.0428000		
Approximate Chi Square Value (23.98, α)	13.834577	Adjusted Chi Square Value (23.98, β)	13.483788
95% Gamma Approximate UCL (use when n>=50)	2.1664050	95% Gamma Adjusted UCL (use when n<50)	2.2227654
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	1.2496752	SD (KM)	3.8180322
Variance (KM)	14.577370	SE of Mean (KM)	0.6456288
k hat (KM)	0.1071310	k star (KM)	0.1167219
nu hat (KM)	7.7134317	nu star (KM)	8.4039791
theta hat (KM)	11.664927	theta star (KM)	10.706430
80% gamma percentile (KM)	1.0615935	90% gamma percentile (KM)	3.5127856
95% gamma percentile (KM)	7.1551873	99% gamma percentile (KM)	18.350672
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (8.40, α)	2.9711308	Adjusted Chi Square Value (8.40, β)	2.8258409
95% Gamma Approximate KM-UCL (use when n>=50)	3.5347634	95% Gamma Adjusted KM-UCL (use when n<50)	3.7165024
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.9269472	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.9340000	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.1368224	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.1478000	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Approximate Lognormal at 5% Significance Level			

Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	1.2495416	Mean in Log Scale	-1.789571
SD in Original Scale	3.8722356	SD in Log Scale	1.9712834
95% t UCL (assumes normality of ROS data)	2.3399454	95% Percentile Bootstrap UCL	2.4689963
95% BCA Bootstrap UCL	3.1879604	95% Bootstrap t UCL	5.4316790
95% H-UCL (Log ROS)	3.9640901		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-1.754166	KM Geo Mean	0.1730515
KM SD (logged)	1.8718027	95% Critical H Value (KM-Log)	3.5287720
KM Standard Error of Mean (logged)	0.3165216	95% H-UCL (KM -Log)	3.0469259
KM SD (logged)	1.8718027	95% Critical H Value (KM-Log)	3.5287720
KM Standard Error of Mean (logged)	0.3165216		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	1.2495825	Mean in Log Scale	-1.773420
SD in Original Scale	3.8722221	SD in Log Scale	1.9354661
95% t UCL (Assumes normality)	2.3399825	95% H-Stat UCL	3.6116343
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Approximate Lognormal Distributed at 5% Significance Level			
Suggested UCL to Use			
95% KM (Chebyshev) UCL	4.0639060		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Indeno123_CDPyrene_RSD_HIGH_HALF_ND			
General Statistics			
Total Number of Observations	36.000000	Number of Distinct Observations	30.000000
		Number of Missing Observations	0
Minimum	0.4982686	Mean	11.211899
Maximum	111.45481	Median	4.2887941
SD	21.520981	Std. Error of Mean	3.5868302
Coefficient of Variation	1.9194768	Skewness	3.6840354
Normal GOF Test			
Shapiro Wilk Test Statistic	0.5079991	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.9350000	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.3564278	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.1454000	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			

Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	17.272109	95% Adjusted-CLT UCL (Chen-1995)	19.464937
		95% Modified-t UCL (Johnson-1978)	17.639165
Gamma GOF Test			
A-D Test Statistic	1.4044566	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.8000755	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.2011856	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.1539138	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	0.6261711	k star (bias corrected MLE)	0.5925087
Theta hat (MLE)	17.905489	Theta star (bias corrected MLE)	18.922760
nu hat (MLE)	45.084318	nu star (bias corrected)	42.660625
MLE Mean (bias corrected)	11.211899	MLE Sd (bias corrected)	14.565716
		Approximate Chi Square Value (0.05)	28.686031
Adjusted Level of Significance	0.0428000	Adjusted Chi Square Value	28.164771
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	16.673852	95% Adjusted Gamma UCL (use when n<50)	16.982444
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.9601589	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.9350000	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.0997757	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.1454000	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	-0.696616	Mean of logged Data	1.4363755
Maximum of Logged Data	4.7136193	SD of logged Data	1.3834654
Assuming Lognormal Distribution			
95% H-UCL	21.337328	90% Chebyshev (MVUE) UCL	19.515305
95% Chebyshev (MVUE) UCL	23.630310	97.5% Chebyshev (MVUE) UCL	29.341777
99% Chebyshev (MVUE) UCL	40.560849		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	17.111710	95% Jackknife UCL	17.272109
95% Standard Bootstrap UCL	17.092021	95% Bootstrap-t UCL	27.163167
95% Hall's Bootstrap UCL	43.023503	95% Percentile Bootstrap UCL	17.648702
95% BCA Bootstrap UCL	20.216326		
90% Chebyshev(Mean, Sd) UCL	21.972390	95% Chebyshev(Mean, Sd) UCL	26.846530
97.5% Chebyshev(Mean, Sd) UCL	33.611647	99% Chebyshev(Mean, Sd) UCL	46.900409

Suggested UCL to Use			
95% H-UCL	21.337328		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
ProUCL computes and outputs H-statistic based UCLs for historical reasons only.			
H-statistic often results in unstable (both high and low) values of UCL95 as shown in examples in the Technical Guide.			
It is therefore recommended to avoid the use of H-statistic based 95% UCLs.			
Use of nonparametric methods are preferred to compute UCL95 for skewed data sets which do not follow a gamma distribution.			
BenzoBFluoranthene_RSD_HIGH_HALF_ND			
General Statistics			
Total Number of Observations	36.000000	Number of Distinct Observations	32.000000
		Number of Missing Observations	0
Minimum	0.6881674	Mean	19.705118
Maximum	194.76437	Median	5.7780095
SD	38.225916	Std. Error of Mean	6.3709860
Coefficient of Variation	1.9398979	Skewness	3.6142229
Normal GOF Test			
Shapiro Wilk Test Statistic	0.5149606	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.9350000	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.3094223	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.1454000	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	30.469360	95% Adjusted-CLT UCL (Chen-1995)	34.285089
		95% Modified-t UCL (Johnson-1978)	31.108976
Gamma GOF Test			
A-D Test Statistic	1.3482922	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.8040989	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.1605081	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.1543410	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	0.5850347	k star (bias corrected MLE)	0.5548003
Theta hat (MLE)	33.681963	Theta star (bias corrected MLE)	35.517493
nu hat (MLE)	42.122500	nu star (bias corrected)	39.945625
MLE Mean (bias corrected)	19.705118	MLE Sd (bias corrected)	26.455177
		Approximate Chi Square Value (0.05)	26.465062
Adjusted Level of Significance	0.0428000	Adjusted Chi Square Value	25.965878

Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	29.742354	95% Adjusted Gamma UCL (use when n<50)	30.314139
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.9604376	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.9350000	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.0766105	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.1454000	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	-0.373723	Mean of logged Data	1.9207836
Maximum of Logged Data	5.2717905	SD of logged Data	1.4490689
Assuming Lognormal Distribution			
95% H-UCL	40.070957	90% Chebyshev (MVUE) UCL	35.501215
95% Chebyshev (MVUE) UCL	43.224055	97.5% Chebyshev (MVUE) UCL	53.943056
99% Chebyshev (MVUE) UCL	74.998459		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	30.184457	95% Jackknife UCL	30.469360
95% Standard Bootstrap UCL	29.977516	95% Bootstrap-t UCL	47.614788
95% Hall's Bootstrap UCL	77.321982	95% Percentile Bootstrap UCL	30.708213
95% BCA Bootstrap UCL	35.686614		
90% Chebyshev(Mean, Sd) UCL	38.818076	95% Chebyshev(Mean, Sd) UCL	47.475602
97.5% Chebyshev(Mean, Sd) UCL	59.491913	99% Chebyshev(Mean, Sd) UCL	83.095628
Suggested UCL to Use			
95% H-UCL	40.070957		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
ProUCL computes and outputs H-statistic based UCLs for historical reasons only.			
H-statistic often results in unstable (both high and low) values of UCL95 as shown in examples in the Technical Guide.			
It is therefore recommended to avoid the use of H-statistic based 95% UCLs.			
Use of nonparametric methods are preferred to compute UCL95 for skewed data sets which do not follow a gamma distribution.			

Fluoranthene_RSD_HIGH_HALF_ND			
General Statistics			
Total Number of Observations	36.000000	Number of Distinct Observations	34.000000
		Number of Missing Observations	0
Minimum	0.5629352	Mean	26.738721
Maximum	411.90384	Median	5.5607018
SD	73.074854	Std. Error of Mean	12.179142
Coefficient of Variation	2.7329226	Skewness	4.6796419
Normal GOF Test			
Shapiro Wilk Test Statistic	0.3776835	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.9350000	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.3600949	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.1454000	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	47.316264	95% Adjusted-CLT UCL (Chen-1995)	56.921451
		95% Modified-t UCL (Johnson-1978)	48.899432
Gamma GOF Test			
A-D Test Statistic	2.8455481	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.8218660	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.2779158	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.1561033	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	0.4573171	k star (bias corrected MLE)	0.4377259
Theta hat (MLE)	58.468667	Theta star (bias corrected MLE)	61.085541
nu hat (MLE)	32.926831	nu star (bias corrected)	31.516262
MLE Mean (bias corrected)	26.738721	MLE Sd (bias corrected)	40.414716
		Approximate Chi Square Value (0.05)	19.688816
Adjusted Level of Significance	0.0428000	Adjusted Chi Square Value	19.263366
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	42.801178	95% Adjusted Gamma UCL (use when n<50)	43.746484
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.9457609	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.9350000	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.1575559	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.1454000	Data Not Lognormal at 5% Significance Level	
Data appear Approximate Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	-0.574591	Mean of logged Data	1.8776406
Maximum of Logged Data	6.0207899	SD of logged Data	1.5211242

Assuming Lognormal Distribution			
95% H-UCL	45.389815	90% Chebyshev (MVUE) UCL	38.678260
95% Chebyshev (MVUE) UCL	47.363667	97.5% Chebyshev (MVUE) UCL	59.418675
99% Chebyshev (MVUE) UCL	83.098404		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	46.771627	95% Jackknife UCL	47.316264
95% Standard Bootstrap UCL	46.527184	95% Bootstrap-t UCL	114.31032
95% Hall's Bootstrap UCL	126.33530	95% Percentile Bootstrap UCL	48.349477
95% BCA Bootstrap UCL	60.984711		
90% Chebyshev(Mean, Sd) UCL	63.276148	95% Chebyshev(Mean, Sd) UCL	79.826371
97.5% Chebyshev(Mean, Sd) UCL	102.79744	99% Chebyshev(Mean, Sd) UCL	147.91966
Suggested UCL to Use			
95% Chebyshev (Mean, Sd) UCL	79.826371		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
BenzoKFluoranthene_RSD_HIGH_HALF_ND			
General Statistics			
Total Number of Observations	36.000000	Number of Distinct Observations	35.000000
		Number of Missing Observations	0
Minimum	0.2100502	Mean	6.8176541
Maximum	66.953501	Median	2.1005020
SD	13.374773	Std. Error of Mean	2.2291288
Coefficient of Variation	1.9617852	Skewness	3.5638004
Normal GOF Test			
Shapiro Wilk Test Statistic	0.5096938	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.9350000	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.3106408	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.1454000	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	10.583929	95% Adjusted-CLT UCL (Chen-1995)	11.898988
		95% Modified-t UCL (Johnson-1978)	10.804600

Gamma GOF Test			
A-D Test Statistic	1.4867194	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.8039943	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.1731323	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.1543299	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	0.5861040	k star (bias corrected MLE)	0.5557805
Theta hat (MLE)	11.632157	Theta star (bias corrected MLE)	12.266810
nu hat (MLE)	42.199489	nu star (bias corrected)	40.016199
MLE Mean (bias corrected)	6.8176541	MLE Sd (bias corrected)	9.1449913
		Approximate Chi Square Value (0.05)	26.522583
Adjusted Level of Significance	0.0428000	Adjusted Chi Square Value	26.022816
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	10.286200	95% Adjusted Gamma UCL (use when n<50)	10.483746
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.9704113	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.9350000	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.0690087	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.1454000	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	-1.560409	Mean of logged Data	0.8616419
Maximum of Logged Data	4.2039984	SD of logged Data	1.4276614
Assuming Lognormal Distribution			
95% H-UCL	13.239491	90% Chebyshev (MVUE) UCL	11.856571
95% Chebyshev (MVUE) UCL	14.410344	97.5% Chebyshev (MVUE) UCL	17.954881
99% Chebyshev (MVUE) UCL	24.917439		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	10.484245	95% Jackknife UCL	10.583929
95% Standard Bootstrap UCL	10.435083	95% Bootstrap-t UCL	16.856553
95% Hall's Bootstrap UCL	27.322458	95% Percentile Bootstrap UCL	10.662022
95% BCA Bootstrap UCL	12.210941		
90% Chebyshev(Mean, Sd) UCL	13.505040	95% Chebyshev(Mean, Sd) UCL	16.534201
97.5% Chebyshev(Mean, Sd) UCL	20.738559	99% Chebyshev(Mean, Sd) UCL	28.997205

Suggested UCL to Use			
95% H-UCL	13.239491		

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

ProUCL computes and outputs H-statistic based UCLs for historical reasons only.

H-statistic often results in unstable (both high and low) values of UCL95 as shown in examples in the Technical Guide.

It is therefore recommended to avoid the use of H-statistic based 95% UCLs.

Use of nonparametric methods are preferred to compute UCL95 for skewed data sets which do not follow a gamma distribution.

Chrysene_RSD_HIGH_HALF_ND

General Statistics			
Total Number of Observations	36.000000	Number of Distinct Observations	33.000000
		Number of Missing Observations	0
Minimum	0.5706888	Mean	18.554476
Maximum	217.40526	Median	5.0274967
SD	40.196384	Std. Error of Mean	6.6993973
Coefficient of Variation	2.1663982	Skewness	4.1087659

Normal GOF Test			
Shapiro Wilk Test Statistic	0.4635583	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.9350000	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.3272938	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.1454000	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			

Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	29.873593	95% Adjusted-CLT UCL (Chen-1995)	34.476037
		95% Modified-t UCL (Johnson-1978)	30.638211

Gamma GOF Test			
A-D Test Statistic	1.5219238	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.8086406	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.1916176	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.1548232	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			

Gamma Statistics			
k hat (MLE)	0.5386002	k star (bias corrected MLE)	0.5122354
Theta hat (MLE)	34.449439	Theta star (bias corrected MLE)	36.222557
nu hat (MLE)	38.779216	nu star (bias corrected)	36.880948
MLE Mean (bias corrected)	18.554476	MLE Sd (bias corrected)	25.924709
		Approximate Chi Square Value (0.05)	23.978897
Adjusted Level of Significance	0.0428000	Adjusted Chi Square Value	23.505542

Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	28.537870	95% Adjusted Gamma UCL (use when n<50)	29.112567
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.9623185	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.9350000	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.0756486	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.1454000	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	-0.560911	Mean of logged Data	1.7547974
Maximum of Logged Data	5.3817632	SD of logged Data	1.5013890
Assuming Lognormal Distribution			
95% H-UCL	38.310720	90% Chebyshev (MVUE) UCL	33.008496
95% Chebyshev (MVUE) UCL	40.358356	97.5% Chebyshev (MVUE) UCL	50.559678
99% Chebyshev (MVUE) UCL	70.598198		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	29.574004	95% Jackknife UCL	29.873593
95% Standard Bootstrap UCL	29.343380	95% Bootstrap-t UCL	53.976386
95% Hall's Bootstrap UCL	79.368456	95% Percentile Bootstrap UCL	30.641947
95% BCA Bootstrap UCL	36.067795		
90% Chebyshev(Mean, Sd) UCL	38.652668	95% Chebyshev(Mean, Sd) UCL	47.756472
97.5% Chebyshev(Mean, Sd) UCL	60.392198	99% Chebyshev(Mean, Sd) UCL	85.212637
Suggested UCL to Use			
95% Chebyshev (Mean, Sd) UCL	47.756472		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
BenzoAPyrene_RSD_HIGH_HALF_ND			
General Statistics			
Total Number of Observations	36.000000	Number of Distinct Observations	30.000000
		Number of Missing Observations	0
Minimum	0.4901261	Mean	13.938842
Maximum	176.99000	Median	3.2675076
SD	33.211190	Std. Error of Mean	5.5351984
Coefficient of Variation	2.3826363	Skewness	4.1226536

Normal GOF Test			
Shapiro Wilk Test Statistic	0.4307045	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.9350000	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.3486536	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.1454000	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	23.290960	95% Adjusted-CLT UCL (Chen-1995)	27.107297
		95% Modified-t UCL (Johnson-1978)	23.924841
Gamma GOF Test			
A-D Test Statistic	2.3318273	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.8119888	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.2550981	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.1551786	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	0.5043680	k star (bias corrected MLE)	0.4808558
Theta hat (MLE)	27.636254	Theta star (bias corrected MLE)	28.987569
nu hat (MLE)	36.314495	nu star (bias corrected)	34.621620
MLE Mean (bias corrected)	13.938842	MLE Sd (bias corrected)	20.101073
		Approximate Chi Square Value (0.05)	22.161793
Adjusted Level of Significance	0.0428000	Adjusted Chi Square Value	21.708164
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	21.775552	95% Adjusted Gamma UCL (use when n<50)	22.230589
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.9466168	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.9350000	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.1447374	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.1454000	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	-0.713092	Mean of logged Data	1.3770143
Maximum of Logged Data	5.1760932	SD of logged Data	1.4753879
Assuming Lognormal Distribution			
95% H-UCL	24.711033	90% Chebyshev (MVUE) UCL	21.594122
95% Chebyshev (MVUE) UCL	26.347826	97.5% Chebyshev (MVUE) UCL	32.945783
99% Chebyshev (MVUE) UCL	45.906191		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			

Nonparametric Distribution Free UCLs			
95% CLT UCL	23.043433	95% Jackknife UCL	23.290960
95% Standard Bootstrap UCL	22.957894	95% Bootstrap-t UCL	48.114705
95% Hall's Bootstrap UCL	61.615235	95% Percentile Bootstrap UCL	23.857845
95% BCA Bootstrap UCL	28.203671		
90% Chebyshev(Mean, Sd) UCL	30.544437	95% Chebyshev(Mean, Sd) UCL	38.066212
97.5% Chebyshev(Mean, Sd) UCL	48.506144	99% Chebyshev(Mean, Sd) UCL	69.013370
Suggested UCL to Use			
95% H-UCL	24.711033		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
ProUCL computes and outputs H-statistic based UCLs for historical reasons only.			
H-statistic often results in unstable (both high and low) values of UCL95 as shown in examples in the Technical Guide.			
It is therefore recommended to avoid the use of H-statistic based 95% UCLs.			
Use of nonparametric methods are preferred to compute UCL95 for skewed data sets which do not follow a gamma distribution.			
DibenzAHAnthracene_RSD_HIGH_HALF_ND			
General Statistics			
Total Number of Observations	36.000000	Number of Distinct Observations	33.000000
Number of Detects	35.000000	Number of Non-Detects	1.0000000
Number of Distinct Detects	32.000000	Number of Distinct Non-Detects	1.0000000
Minimum Detect	0.0964776	Minimum Non-Detect	0.0132831
Maximum Detect	34.955649	Maximum Non-Detect	0.0132831
Variance Detects	42.716754	Percent Non-Detects	2.7777778%
Mean Detects	3.5783522	SD Detects	6.5358055
Median Detects	1.3982259	CV Detects	1.8264847
Skewness Detects	3.7824190	Kurtosis Detects	16.302417
Mean of Logged Detects	0.2701145	SD of Logged Detects	1.4879522
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.5357818	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.9340000	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.3224007	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.1478000	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	3.4793225	KM Standard Error of Mean	1.0786246
KM SD	6.3786238	95% KM (BCA) UCL	5.5156993
95% KM (t) UCL	5.3017368	95% KM (Percentile Bootstrap) UCL	5.3864901
95% KM (z) UCL	5.2535020	95% KM Bootstrap t UCL	7.5965748
90% KM Chebyshev UCL	6.7151961	95% KM Chebyshev UCL	8.1809379
97.5% KM Chebyshev UCL	10.215331	99% KM Chebyshev UCL	14.211501

Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	0.7977380	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.8011391	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.1543662	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.1559693	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.6129974	k star (bias corrected MLE)	0.5795024
Theta hat (MLE)	5.8374672	Theta star (bias corrected MLE)	6.1748705
nu hat (MLE)	42.909818	nu star (bias corrected)	40.565167
Mean (detects)	3.5783522		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.0100000	Mean	3.4792313
Maximum	34.955649	Median	1.3073413
SD	6.4691555	CV	1.8593635
k hat (MLE)	0.5611548	k star (bias corrected MLE)	0.5329104
Theta hat (MLE)	6.2001275	Theta star (bias corrected MLE)	6.5287358
nu hat (MLE)	40.403145	nu star (bias corrected)	38.369550
Adjusted Level of Significance (β)	0.0428000		
Approximate Chi Square Value (38.37, α)	25.183583	Adjusted Chi Square Value (38.37, β)	24.697555
95% Gamma Approximate UCL (use when n>=50)	5.3009350	95% Gamma Adjusted UCL (use when n<50)	5.4052532
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	3.4793225	SD (KM)	6.3786238
Variance (KM)	40.686841	SE of Mean (KM)	1.0786246
k hat (KM)	0.2975332	k star (KM)	0.2912573
nu hat (KM)	21.422388	nu star (KM)	20.970523
theta hat (KM)	11.693898	theta star (KM)	11.945874
80% gamma percentile (KM)	5.2958695	90% gamma percentile (KM)	10.297144
95% gamma percentile (KM)	16.067192	99% gamma percentile (KM)	31.118567
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (20.97, α)	11.569683	Adjusted Chi Square Value (20.97, β)	11.251903
95% Gamma Approximate KM-UCL (use when n>=50)	6.3064139	95% Gamma Adjusted KM-UCL (use when n<50)	6.4845215
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.9716828	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.9340000	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.0792430	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.1478000	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			

Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	3.4797710	Mean in Log Scale	0.1646723
SD in Original Scale	6.4688587	SD in Log Scale	1.5971833
95% t UCL (assumes normality of ROS data)	5.3013719	95% Percentile Bootstrap UCL	5.4059133
95% BCA Bootstrap UCL	6.2416245	95% Bootstrap t UCL	7.5850365
95% H-UCL (Log ROS)	9.8551317		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	0.1425763	KM Geo Mean	1.1532411
KM SD (logged)	1.6310460	95% Critical H Value (KM-Log)	3.1872729
KM Standard Error of Mean (logged)	0.2758097	95% H-UCL (KM -Log)	10.500824
KM SD (logged)	1.6310460	95% Critical H Value (KM-Log)	3.1872729
KM Standard Error of Mean (logged)	0.2758097		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	3.4791380	Mean in Log Scale	0.1233223
SD in Original Scale	6.4692070	SD in Log Scale	1.7106932
95% t UCL (Assumes normality)	5.3008370	95% H-Stat UCL	12.686154
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Gamma Distributed at 5% Significance Level			
Suggested UCL to Use			
Adjusted KM-UCL (use when k<=1 and 15 < n < 50 but k<=1)	6.4845215		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
BenzoAAnthracene_RSD_HIGH_HALF_ND			
General Statistics			
Total Number of Observations	36.000000	Number of Distinct Observations	31.000000
		Number of Missing Observations	0
Minimum	0.3301092	Mean	13.916647
Maximum	184.86113	Median	3.4991572
SD	34.258027	Std. Error of Mean	5.7096711
Coefficient of Variation	2.4616581	Skewness	4.2416182
Normal GOF Test			
Shapiro Wilk Test Statistic	0.4191843	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.9350000	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.3458333	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.1454000	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			

Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	23.563550	95% Adjusted-CLT UCL (Chen-1995)	27.621145
		95% Modified-t UCL (Johnson-1978)	24.236279
Gamma GOF Test			
A-D Test Statistic	2.2634742	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.8169137	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.2388745	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.1556425	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	0.4796851	k star (bias corrected MLE)	0.4582299
Theta hat (MLE)	29.012045	Theta star (bias corrected MLE)	30.370447
nu hat (MLE)	34.537331	nu star (bias corrected)	32.992553
MLE Mean (bias corrected)	13.916647	MLE Sd (bias corrected)	20.558570
		Approximate Chi Square Value (0.05)	20.860719
Adjusted Level of Significance	0.0428000	Adjusted Chi Square Value	20.421710
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	22.010062	95% Adjusted Gamma UCL (use when n<50)	22.483217
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.9551572	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.9350000	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.1302616	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.1454000	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	-1.108332	Mean of logged Data	1.3003369
Maximum of Logged Data	5.2196049	SD of logged Data	1.5405439
Assuming Lognormal Distribution			
95% H-UCL	26.696668	90% Chebyshev (MVUE) UCL	22.496230
95% Chebyshev (MVUE) UCL	27.589169	97.5% Chebyshev (MVUE) UCL	34.657970
99% Chebyshev (MVUE) UCL	48.543262		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	23.308220	95% Jackknife UCL	23.563550
95% Standard Bootstrap UCL	23.212769	95% Bootstrap-t UCL	49.646021
95% Hall's Bootstrap UCL	63.684879	95% Percentile Bootstrap UCL	24.134590
95% BCA Bootstrap UCL	29.041255		
90% Chebyshev(Mean, Sd) UCL	31.045661	95% Chebyshev(Mean, Sd) UCL	38.804527
97.5% Chebyshev(Mean, Sd) UCL	49.573532	99% Chebyshev(Mean, Sd) UCL	70.727158

Suggested UCL to Use			
95% Chebyshev (Mean, Sd) UCL	38.804527		

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Naphthalene_RSD_HIGH_HALF_ND

General Statistics			
Total Number of Observations	36.000000	Number of Distinct Observations	32.000000
Number of Detects	35.000000	Number of Non-Detects	1.0000000
Number of Distinct Detects	31.000000	Number of Distinct Non-Detects	1.0000000
Minimum Detect	0.0144230	Minimum Non-Detect	0.0061603
Maximum Detect	24.641189	Maximum Non-Detect	0.0061603
Variance Detects	17.457649	Percent Non-Detects	2.7777778%
Mean Detects	1.2666991	SD Detects	4.1782352
Median Detects	0.1014637	CV Detects	3.2985222
Skewness Detects	5.4537336	Kurtosis Detects	31.100593
Mean of Logged Detects	-1.771676	SD of Logged Detects	1.8858502

Normal GOF Test on Detects Only		
Shapiro Wilk Test Statistic	0.3155405	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.9340000	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.3821976	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.1478000	Detected Data Not Normal at 5% Significance Level
Detected Data Not Normal at 5% Significance Level		

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	1.2316842	KM Standard Error of Mean	0.6875255
KM SD	4.0657953	95% KM (BCA) UCL	2.6566018
95% KM (t) UCL	2.3933084	95% KM (Percentile Bootstrap) UCL	2.5516865
95% KM (z) UCL	2.3625630	95% KM Bootstrap t UCL	5.8200788
90% KM Chebyshev UCL	3.2942607	95% KM Chebyshev UCL	4.2285384
97.5% KM Chebyshev UCL	5.5252797	99% KM Chebyshev UCL	8.0724768

Gamma GOF Tests on Detected Observations Only		
A-D Test Statistic	2.8996100	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.8482833	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.2317926	**Kolmogorov-Smirnov GOF**
5% K-S Critical Value	0.1605478	Detected Data Not Gamma Distributed at 5% Significance Level
Detected Data Not Gamma Distributed at 5% Significance Level		

Gamma Statistics on Detected Data Only			
k hat (MLE)	0.3369452	k star (bias corrected MLE)	0.3271118
Theta hat (MLE)	3.7593628	Theta star (bias corrected MLE)	3.8723740
nu hat (MLE)	23.586162	nu star (bias corrected)	22.897824
Mean (detects)	1.2666991		

Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.0100000	Mean	1.2317908
Maximum	24.641189	Median	0.0898679
SD	4.1234365	CV	3.3475136
k hat (MLE)	0.3297904	k star (bias corrected MLE)	0.3208264
Theta hat (MLE)	3.7350721	Theta star (bias corrected MLE)	3.8394315
nu hat (MLE)	23.744907	nu star (bias corrected)	23.099498
Adjusted Level of Significance (β)	0.0428000		
Approximate Chi Square Value (23.10, α)	13.165930	Adjusted Chi Square Value (23.10, β)	12.824591
95% Gamma Approximate UCL (use when n>=50)	2.1611652	95% Gamma Adjusted UCL (use when n<50)	2.2186868
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	1.2316842	SD (KM)	4.0657953
Variance (KM)	16.530692	SE of Mean (KM)	0.6875255
k hat (KM)	0.0917715	k star (KM)	0.1026424
nu hat (KM)	6.6075459	nu star (KM)	7.3902504
theta hat (KM)	13.421210	theta star (KM)	11.999764
80% gamma percentile (KM)	0.8870409	90% gamma percentile (KM)	3.3129204
95% gamma percentile (KM)	7.1373227	99% gamma percentile (KM)	19.310646
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (7.39, α)	2.3872055	Adjusted Chi Square Value (7.39, β)	2.2599791
95% Gamma Approximate KM-UCL (use when n>=50)	3.8130167	95% Gamma Adjusted KM-UCL (use when n<50)	4.0276719
95% Gamma Adjusted KM-UCL (use when k<=1 and 15 < n < 50)			
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.9177441	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.9340000	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.1507445	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.1478000	Detected Data Not Lognormal at 5% Significance Level	
Detected Data Not Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	1.2315555	Mean in Log Scale	-1.902542
SD in Original Scale	4.1235085	SD in Log Scale	2.0177573
95% t UCL (assumes normality of ROS data)	2.3927166	95% Percentile Bootstrap UCL	2.5609726
95% BCA Bootstrap UCL	3.3793815	95% Bootstrap t UCL	5.8460068
95% H-UCL (Log ROS)	4.0919546		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-1.863842	KM Geo Mean	0.1550757
KM SD (logged)	1.9121081	95% Critical H Value (KM-Log)	3.5869539
KM Standard Error of Mean (logged)	0.3233373	95% H-UCL (KM -Log)	3.0757822
KM SD (logged)	1.9121081	95% Critical H Value (KM-Log)	3.5869539
KM Standard Error of Mean (logged)	0.3233373		

DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	1.2315986	Mean in Log Scale	-1.883096
SD in Original Scale	4.1234953	SD in Log Scale	1.9752806
95% t UCL (Assumes normality)	2.3927559	95% H-Stat UCL	3.6549015
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution at 5% Significance Level			
Suggested UCL to Use			
95% KM (Chebyshev) UCL	4.2285384		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Cyanide_RSD_HIGH_HALF_ND			
General Statistics			
Total Number of Observations	36.000000	Number of Distinct Observations	31.000000
		Number of Missing Observations	0
Minimum	0.1345946	Mean	2.8552391
Maximum	40.658798	Median	0.4135981
SD	7.8200962	Std. Error of Mean	1.3033494
Coefficient of Variation	2.7388586	Skewness	4.1321971
Normal GOF Test			
Shapiro Wilk Test Statistic	0.3825685	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.9350000	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.3813746	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.1454000	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	5.0573423	95% Adjusted-CLT UCL (Chen-1995)	5.9581738
		95% Modified-t UCL (Johnson-1978)	5.2069450
Gamma GOF Test			
A-D Test Statistic	4.5860573	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.8239337	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.3143694	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.1562957	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			

Gamma Statistics			
k hat (MLE)	0.4479778	k star (bias corrected MLE)	0.4291649
Theta hat (MLE)	6.3736169	Theta star (bias corrected MLE)	6.6530122
nu hat (MLE)	32.254404	nu star (bias corrected)	30.899871
MLE Mean (bias corrected)	2.8552391	MLE Sd (bias corrected)	4.3584333
		Approximate Chi Square Value (0.05)	19.201649
Adjusted Level of Significance	0.0428000	Adjusted Chi Square Value	18.781952
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	4.5947366	95% Adjusted Gamma UCL (use when n<50)	4.6974096
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.8492986	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.9350000	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.1783800	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.1454000	Data Not Lognormal at 5% Significance Level	
Data Not Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	-2.005488	Mean of logged Data	-0.393382
Maximum of Logged Data	3.7052153	SD of logged Data	1.4057878
Assuming Lognormal Distribution			
95% H-UCL	3.5950473	90% Chebyshev (MVUE) UCL	3.2538953
95% Chebyshev (MVUE) UCL	3.9475062	97.5% Chebyshev (MVUE) UCL	4.9102113
99% Chebyshev (MVUE) UCL	6.8012590		
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution (0.05)			
Nonparametric Distribution Free UCLs			
95% CLT UCL	4.9990581	95% Jackknife UCL	5.0573423
95% Standard Bootstrap UCL	4.9570640	95% Bootstrap-t UCL	12.569946
95% Hall's Bootstrap UCL	14.090690	95% Percentile Bootstrap UCL	5.2698681
95% BCA Bootstrap UCL	6.4117522		
90% Chebyshev(Mean, Sd) UCL	6.7652872	95% Chebyshev(Mean, Sd) UCL	8.5364073
97.5% Chebyshev(Mean, Sd) UCL	10.994653	99% Chebyshev(Mean, Sd) UCL	15.823402
Suggested UCL to Use			
95% Chebyshev (Mean, Sd) UCL	8.5364073		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			

Fluoride_RSD_HIGH_HALF_ND			
General Statistics			
Total Number of Observations	36.000000	Number of Distinct Observations	35.000000
		Number of Missing Observations	0
Minimum	22.419524	Mean	292.07011
Maximum	1176.4223	Median	96.367791
SD	315.46524	Std. Error of Mean	52.577540
Coefficient of Variation	1.0801011	Skewness	1.2963844
Normal GOF Test			
Shapiro Wilk Test Statistic	0.7706429	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.9350000	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.2599532	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.1454000	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	380.90368	95% Adjusted-CLT UCL (Chen-1995)	390.69092
		95% Modified-t UCL (Johnson-1978)	382.79703
Gamma GOF Test			
A-D Test Statistic	1.5956897	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.7768130	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.2436277	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.1512162	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	0.9891287	k star (bias corrected MLE)	0.9252198
Theta hat (MLE)	295.28020	Theta star (bias corrected MLE)	315.67646
nu hat (MLE)	71.217266	nu star (bias corrected)	66.615827
MLE Mean (bias corrected)	292.07011	MLE Sd (bias corrected)	303.64397
		Approximate Chi Square Value (0.05)	48.832974
Adjusted Level of Significance	0.0428000	Adjusted Chi Square Value	48.141131
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	398.42940	95% Adjusted Gamma UCL (use when n<50)	404.15528
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.9209950	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.9350000	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.2070976	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.1454000	Data Not Lognormal at 5% Significance Level	
Data Not Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	3.1099322	Mean of logged Data	5.0926830
Maximum of Logged Data	7.0702332	SD of logged Data	1.1193467

Assuming Lognormal Distribution			
95% H-UCL	490.89119	90% Chebyshev (MVUE) UCL	494.16346
95% Chebyshev (MVUE) UCL	583.68869	97.5% Chebyshev (MVUE) UCL	707.94625
99% Chebyshev (MVUE) UCL	952.02616		
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution (0.05)			
Nonparametric Distribution Free UCLs			
95% CLT UCL	378.55247	95% Jackknife UCL	380.90368
95% Standard Bootstrap UCL	376.60798	95% Bootstrap-t UCL	398.98642
95% Hall's Bootstrap UCL	388.20797	95% Percentile Bootstrap UCL	380.46442
95% BCA Bootstrap UCL	389.23370		
90% Chebyshev(Mean, Sd) UCL	449.80274	95% Chebyshev(Mean, Sd) UCL	521.25030
97.5% Chebyshev(Mean, Sd) UCL	620.41675	99% Chebyshev(Mean, Sd) UCL	815.21004
Suggested UCL to Use			
95% Chebyshev (Mean, Sd) UCL	521.25030		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
ChromiumHexavalent_Estimated_RSD_HIGH_HALF_ND			
General Statistics			
Total Number of Observations	32.000000	Number of Distinct Observations	28.000000
		Number of Missing Observations	4.0000000
Minimum	0.4319201	Mean	0.7011709
Maximum	2.0447491	Median	0.5503956
SD	0.3488485	Std. Error of Mean	0.0616683
Coefficient of Variation	0.4975228	Skewness	2.4109883
Normal GOF Test			
Shapiro Wilk Test Statistic	0.7066515	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.9300000	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.2703629	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.1542000	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	0.8057306	95% Adjusted-CLT UCL (Chen-1995)	0.8306904
		95% Modified-t UCL (Johnson-1978)	0.8101112

Gamma GOF Test			
A-D Test Statistic	2.3029129	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.7474939	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.2650311	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.1557077	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	6.2208673	k star (bias corrected MLE)	5.6584943
Theta hat (MLE)	0.1127127	Theta star (bias corrected MLE)	0.1239147
nu hat (MLE)	398.13551	nu star (bias corrected)	362.14363
MLE Mean (bias corrected)	0.7011709	MLE Sd (bias corrected)	0.2947633
		Approximate Chi Square Value (0.05)	319.04221
Adjusted Level of Significance	0.0416000	Adjusted Chi Square Value	316.88223
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	0.7958965	95% Adjusted Gamma UCL (use when n<50)	0.8013216
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.8407247	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.9300000	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.2516245	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.1542000	Data Not Lognormal at 5% Significance Level	
Data Not Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	-0.839515	Mean of logged Data	-0.437526
Maximum of Logged Data	0.7152751	SD of logged Data	0.3798030
Assuming Lognormal Distribution			
95% H-UCL	0.7869890	90% Chebyshev (MVUE) UCL	0.8353964
95% Chebyshev (MVUE) UCL	0.9002351	97.5% Chebyshev (MVUE) UCL	0.9902286
99% Chebyshev (MVUE) UCL	1.1670033		
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution (0.05)			
Nonparametric Distribution Free UCLs			
95% CLT UCL	0.8026062	95% Jackknife UCL	0.8057306
95% Standard Bootstrap UCL	0.8003200	95% Bootstrap-t UCL	0.8559131
95% Hall's Bootstrap UCL	0.8945206	95% Percentile Bootstrap UCL	0.8079767
95% BCA Bootstrap UCL	0.8305725		
90% Chebyshev(Mean, Sd) UCL	0.8861757	95% Chebyshev(Mean, Sd) UCL	0.9699767
97.5% Chebyshev(Mean, Sd) UCL	1.0862892	99% Chebyshev(Mean, Sd) UCL	1.3147626

ProUCL Output
Central Landfill Area ISM Soil (0-0.5 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Suggested UCL to Use			
95% Student's-t UCL	0.8057306	or 95% Modified-t UCL	0.8101112
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			

ProUCL Output
Central Landfill Area ISM Soil (0-2 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

UCL Statistics for Data Sets with Non-Detects	
User Selected Options	
Date/Time of Computation	ProUCL 5.17/12/2019 7:31:31 AM
From File	20190710_ProUCL_Input_ISM_b.xls
Full Precision	ON
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

Aluminum_RSD_HIGH_HALF_ND

General Statistics			
Total Number of Observations	68.000000	Number of Distinct Observations	62.000000
		Number of Missing Observations	0
Minimum	9014.4043	Mean	21234.905
Maximum	47002.351	Median	19241.884
SD	7517.4761	Std. Error of Mean	911.62788
Coefficient of Variation	0.3540151	Skewness	0.9673335

Normal GOF Test		
Shapiro Wilk Test Statistic	0.9352581	**Shapiro Wilk GOF Test**
5% Shapiro Wilk P Value	0.0021266	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.1192467	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.1073545	Data Not Normal at 5% Significance Level
Data Not Normal at 5% Significance Level		

Assuming Normal Distribution

95% Normal UCL		95% UCLs (Adjusted for Skewness)	
95% Student's-t UCL	22755.424	95% Adjusted-CLT UCL (Chen-1995)	22848.666
		95% Modified-t UCL (Johnson-1978)	22773.247

Gamma GOF Test		
A-D Test Statistic	0.4849231	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.7515896	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.0876043	**Kolmogorov-Smirnov Gamma GOF Test**
5% K-S Critical Value	0.1081065	Detected data appear Gamma Distributed at 5% Significance Level
Detected data appear Gamma Distributed at 5% Significance Level		

Gamma Statistics			
k hat (MLE)	8.7505855	k star (bias corrected MLE)	8.3743342
Theta hat (MLE)	2426.6839	Theta star (bias corrected MLE)	2535.7126
nu hat (MLE)	1190.0796	nu star (bias corrected)	1138.9094
MLE Mean (bias corrected)	21234.905	MLE Sd (bias corrected)	7337.9572
		Approximate Chi Square Value (0.05)	1061.5597
Adjusted Level of Significance	0.0464706	Adjusted Chi Square Value	1059.9563

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50)	22782.170	95% Adjusted Gamma UCL (use when n<50)	22816.633

Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.9820520	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk P Value	0.7295533	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.0802240	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.1073545	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	9.1065791	Mean of logged Data	9.9051756
Maximum of Logged Data	10.757953	SD of logged Data	0.3420781
Assuming Lognormal Distribution			
95% H-UCL	22878.597	90% Chebyshev (MVUE) UCL	23929.619
95% Chebyshev (MVUE) UCL	25156.250	97.5% Chebyshev (MVUE) UCL	26858.766
99% Chebyshev (MVUE) UCL	30203.029		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	22734.399	95% Jackknife UCL	22755.424
95% Standard Bootstrap UCL	22713.065	95% Bootstrap-t UCL	22895.161
95% Hall's Bootstrap UCL	22896.421	95% Percentile Bootstrap UCL	22727.884
95% BCA Bootstrap UCL	22860.938		
90% Chebyshev(Mean, Sd) UCL	23969.788	95% Chebyshev(Mean, Sd) UCL	25208.599
97.5% Chebyshev(Mean, Sd) UCL	26928.019	99% Chebyshev(Mean, Sd) UCL	30305.488
Suggested UCL to Use			
95% Approximate Gamma UCL	22782.170		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Iron_RSD_HIGH_HALF_ND			
General Statistics			
Total Number of Observations	68.000000	Number of Distinct Observations	57.000000
		Number of Missing Observations	0
Minimum	12201.123	Mean	18373.015
Maximum	31536.800	Median	17422.789
SD	4012.6397	Std. Error of Mean	486.60404
Coefficient of Variation	0.2183985	Skewness	1.8086622

ProUCL Output
Central Landfill Area ISM Soil (0-2 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Normal GOF Test			
Shapiro Wilk Test Statistic	0.7812587	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	1.128E-13	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.2203644	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.1073545	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	19184.629	95% Adjusted-CLT UCL (Chen-1995)	19287.448
		95% Modified-t UCL (Johnson-1978)	19202.417
Gamma GOF Test			
A-D Test Statistic	4.1768816	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.7489923	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.2005301	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.1077716	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	25.525158	k star (bias corrected MLE)	24.408852
Theta hat (MLE)	719.80024	Theta star (bias corrected MLE)	752.71934
nu hat (MLE)	3471.4214	nu star (bias corrected)	3319.6038
MLE Mean (bias corrected)	18373.015	MLE Sd (bias corrected)	3718.8336
		Approximate Chi Square Value (0.05)	3186.7256
Adjusted Level of Significance	0.0464706	Adjusted Chi Square Value	3183.9331
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	19139.122	95% Adjusted Gamma UCL (use when n<50)	19155.908
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.8618005	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk P Value	2.0482E-8	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.1883676	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.1073545	Data Not Lognormal at 5% Significance Level	
Data Not Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	9.4092832	Mean of logged Data	9.7989219
Maximum of Logged Data	10.358910	SD of logged Data	0.1922403
Assuming Lognormal Distribution			
95% H-UCL	19102.953	90% Chebyshev (MVUE) UCL	19638.651
95% Chebyshev (MVUE) UCL	20224.539	97.5% Chebyshev (MVUE) UCL	21037.728
99% Chebyshev (MVUE) UCL	22635.081		
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution (0.05)			

Nonparametric Distribution Free UCLs			
95% CLT UCL	19173.407	95% Jackknife UCL	19184.629
95% Standard Bootstrap UCL	19169.777	95% Bootstrap-t UCL	19337.083
95% Hall's Bootstrap UCL	19300.623	95% Percentile Bootstrap UCL	19197.653
95% BCA Bootstrap UCL	19259.118		
90% Chebyshev(Mean, Sd) UCL	19832.827	95% Chebyshev(Mean, Sd) UCL	20494.073
97.5% Chebyshev(Mean, Sd) UCL	21411.856	99% Chebyshev(Mean, Sd) UCL	23214.664
Suggested UCL to Use			
95% Student's-t UCL	19184.629	or 95% Modified-t UCL	19202.417
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			

Manganese_RSD_HIGH_HALF_ND

General Statistics			
Total Number of Observations	68.000000	Number of Distinct Observations	62.000000
		Number of Missing Observations	0
Minimum	360.20508	Mean	509.29325
Maximum	902.49418	Median	501.94322
SD	91.068320	Std. Error of Mean	11.043656
Coefficient of Variation	0.1788131	Skewness	1.2763445
Normal GOF Test			
Shapiro Wilk Test Statistic	0.9267335	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	5.6747E-4	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.0774416	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.1073545	Data appear Normal at 5% Significance Level	
Data appear Approximate Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	527.71314	95% Adjusted-CLT UCL (Chen-1995)	529.28490
		95% Modified-t UCL (Johnson-1978)	527.99803
Gamma GOF Test			
A-D Test Statistic	0.4813449	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.7487746	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.0758843	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.1077482	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			

Gamma Statistics			
k hat (MLE)	34.521077	k star (bias corrected MLE)	33.007893
Theta hat (MLE)	14.753110	Theta star (bias corrected MLE)	15.429439
nu hat (MLE)	4694.8665	nu star (bias corrected)	4489.0734
MLE Mean (bias corrected)	509.29325	MLE Sd (bias corrected)	88.645975
		Approximate Chi Square Value (0.05)	4334.3637
Adjusted Level of Significance	0.0464706	Adjusted Chi Square Value	4331.1037
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	527.47184	95% Adjusted Gamma UCL (use when n<50)	527.86887
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.9702591	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk P Value	0.2656768	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.0754687	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.1073545	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	5.8866735	Mean of logged Data	6.2184702
Maximum of Logged Data	6.8051622	SD of logged Data	0.1694396
Assuming Lognormal Distribution			
95% H-UCL	527.46617	90% Chebyshev (MVUE) UCL	540.66263
95% Chebyshev (MVUE) UCL	554.96714	97.5% Chebyshev (MVUE) UCL	574.82125
99% Chebyshev (MVUE) UCL	613.82080		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	527.45845	95% Jackknife UCL	527.71314
95% Standard Bootstrap UCL	527.32706	95% Bootstrap-t UCL	529.19127
95% Hall's Bootstrap UCL	531.34812	95% Percentile Bootstrap UCL	527.76157
95% BCA Bootstrap UCL	528.57698		
90% Chebyshev(Mean, Sd) UCL	542.42422	95% Chebyshev(Mean, Sd) UCL	557.43143
97.5% Chebyshev(Mean, Sd) UCL	578.26086	99% Chebyshev(Mean, Sd) UCL	619.17624
Suggested UCL to Use			
95% Student's-t UCL	527.71314		
When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test			
When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			

Nickel_RSD_HIGH_HALF_ND			
General Statistics			
Total Number of Observations	68.000000	Number of Distinct Observations	62.000000
		Number of Missing Observations	0
Minimum	13.002162	Mean	35.107274
Maximum	162.55742	Median	26.501438
SD	27.710770	Std. Error of Mean	3.3604245
Coefficient of Variation	0.7893171	Skewness	2.4066316
Normal GOF Test			
Shapiro Wilk Test Statistic	0.7268670	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	0	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.2125199	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.1073545	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	40.712181	95% Adjusted-CLT UCL (Chen-1995)	41.682605
		95% Modified-t UCL (Johnson-1978)	40.875635
Gamma GOF Test			
A-D Test Statistic	2.5647409	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.7600027	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.1375543	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.1090784	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	2.5757604	k star (bias corrected MLE)	2.4719279
Theta hat (MLE)	13.629868	Theta star (bias corrected MLE)	14.202386
nu hat (MLE)	350.30342	nu star (bias corrected)	336.18219
MLE Mean (bias corrected)	35.107274	MLE Sd (bias corrected)	22.329511
		Approximate Chi Square Value (0.05)	294.69807
Adjusted Level of Significance	0.0464706	Adjusted Chi Square Value	293.86243
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	40.049262	95% Adjusted Gamma UCL (use when n<50)	40.163149
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.9108938	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk P Value	4.6835E-5	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.1121926	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.1073545	Data Not Lognormal at 5% Significance Level	
Data Not Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	2.5651157	Mean of logged Data	3.3519079
Maximum of Logged Data	5.0910313	SD of logged Data	0.6014396

Assuming Lognormal Distribution			
95% H-UCL	39.458833	90% Chebyshev (MVUE) UCL	42.137322
95% Chebyshev (MVUE) UCL	45.772422	97.5% Chebyshev (MVUE) UCL	50.817801
99% Chebyshev (MVUE) UCL	60.728470		
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution (0.05)			
Nonparametric Distribution Free UCLs			
95% CLT UCL	40.634681	95% Jackknife UCL	40.712181
95% Standard Bootstrap UCL	40.611525	95% Bootstrap-t UCL	42.366503
95% Hall's Bootstrap UCL	42.246281	95% Percentile Bootstrap UCL	40.807023
95% BCA Bootstrap UCL	41.720247		
90% Chebyshev(Mean, Sd) UCL	45.188548	95% Chebyshev(Mean, Sd) UCL	49.755025
97.5% Chebyshev(Mean, Sd) UCL	56.093119	99% Chebyshev(Mean, Sd) UCL	68.543076
Suggested UCL to Use			
95% Chebyshev (Mean, Sd) UCL	49.755025		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Thallium_RSD_HIGH_HALF_ND			
General Statistics			
Total Number of Observations	68.000000	Number of Distinct Observations	48.000000
Number of Detects	63.000000	Number of Non-Detects	5.0000000
Number of Distinct Detects	43.000000	Number of Distinct Non-Detects	5.0000000
Minimum Detect	0.0639389	Minimum Non-Detect	0.0799237
Maximum Detect	0.4574344	Maximum Non-Detect	0.1029227
Variance Detects	0.0042622	Percent Non-Detects	7.3529412%
Mean Detects	0.1350741	SD Detects	0.0652853
Median Detects	0.1172214	CV Detects	0.4833292
Skewness Detects	3.0027598	Kurtosis Detects	11.760866
Mean of Logged Detects	-2.078759	SD of Logged Detects	0.3672735
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.7228386	**Normal GOF Test on Detected Observations Only**	
5% Shapiro Wilk P Value	1.332E-15	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.2090238	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.1114317	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.1309809	KM Standard Error of Mean	0.0078366
KM SD	0.0640586	95% KM (BCA) UCL	0.1450484
95% KM (t) UCL	0.1440516	95% KM (Percentile Bootstrap) UCL	0.1442004
95% KM (z) UCL	0.1438709	95% KM Bootstrap t UCL	0.1494417
90% KM Chebyshev UCL	0.1544906	95% KM Chebyshev UCL	0.1651397
97.5% KM Chebyshev UCL	0.1799203	99% KM Chebyshev UCL	0.2089539
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	1.6099679	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.7527381	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.1529206	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.1124088	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	6.6703185	k star (bias corrected MLE)	6.3632663
Theta hat (MLE)	0.0202500	Theta star (bias corrected MLE)	0.0212272
nu hat (MLE)	840.46013	nu star (bias corrected)	801.77155
Mean (detects)	0.1350741		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.0458247	Mean	0.1295525
Maximum	0.4574344	Median	0.1152823
SD	0.0658835	CV	0.5085464
k hat (MLE)	5.7120688	k star (bias corrected MLE)	5.4698697
Theta hat (MLE)	0.0226805	Theta star (bias corrected MLE)	0.0236848
nu hat (MLE)	776.84136	nu star (bias corrected)	743.90228
Adjusted Level of Significance (β)	0.0464706		
Approximate Chi Square Value (743.90, α)	681.61408	Adjusted Chi Square Value (743.90, β)	680.33315
95% Gamma Approximate UCL (use when n>=50)	0.1413915	95% Gamma Adjusted UCL (use when n<50)	0.1416577
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.1309809	SD (KM)	0.0640586
Variance (KM)	0.0041035	SE of Mean (KM)	0.0078366
k hat (KM)	4.1808177	k star (KM)	4.0061738
nu hat (KM)	568.59120	nu star (KM)	544.83963
theta hat (KM)	0.0313290	theta star (KM)	0.0326948
80% gamma percentile (KM)	0.1805591	90% gamma percentile (KM)	0.2186955
95% gamma percentile (KM)	0.2537915	99% gamma percentile (KM)	0.3287443
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (544.84, α)	491.70311	Adjusted Chi Square Value (544.84, β)	490.61809
95% Gamma Approximate KM-UCL (use when n>=50)	0.1451355	95% Gamma Adjusted KM-UCL (use when n<50)	0.1454564

ProUCL Output
Central Landfill Area ISM Soil (0-2 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Approximate Test Statistic	0.9366701	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	0.0042227	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.1206434	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.1114317	Detected Data Not Lognormal at 5% Significance Level	
Detected Data Not Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.1306840	Mean in Log Scale	-2.116285
SD in Original Scale	0.0647587	SD in Log Scale	0.3786734
95% t UCL (assumes normality of ROS data)	0.1437824	95% Percentile Bootstrap UCL	0.1441300
95% BCA Bootstrap UCL	0.1473521	95% Bootstrap t UCL	0.1489007
95% H-UCL (Log ROS)	0.1406477		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-2.112673	KM Geo Mean	0.1209143
KM SD (logged)	0.3721343	95% Critical H Value (KM-Log)	1.7926379
KM Standard Error of Mean (logged)	0.0456601	95% H-UCL (KM -Log)	0.1405866
KM SD (logged)	0.3721343	95% Critical H Value (KM-Log)	1.7926379
KM Standard Error of Mean (logged)	0.0456601		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.1284981	Mean in Log Scale	-2.153185
SD in Original Scale	0.0670696	SD in Log Scale	0.4430058
95% t UCL (Assumes normality)	0.1420639	95% H-Stat UCL	0.1414391
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution at 5% Significance Level			
Suggested UCL to Use			
95% KM (t) UCL	0.1440516	KM H-UCL	0.1405866
95% KM (BCA) UCL	0.1450484		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			

Antimony_RSD_HIGH_HALF_ND			
General Statistics			
Total Number of Observations	66.000000	Number of Distinct Observations	47.000000
		Number of Missing Observations	2.0000000
Number of Detects	50.000000	Number of Non-Detects	16.000000
Number of Distinct Detects	36.000000	Number of Distinct Non-Detects	11.000000
Minimum Detect	0.1568135	Minimum Non-Detect	0.1088583
Maximum Detect	3.2385397	Maximum Non-Detect	0.3835113
Variance Detects	0.2571846	Percent Non-Detects	24.242424%
Mean Detects	0.4676896	SD Detects	0.5071337
Median Detects	0.3009611	CV Detects	1.0843382
Skewness Detects	3.8817791	Kurtosis Detects	18.329885
Mean of Logged Detects	-1.024663	SD of Logged Detects	0.6279261
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.5497249	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.9470000	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.3154194	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.1246000	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.3917492	KM Standard Error of Mean	0.0570595
KM SD	0.4582599	95% KM (BCA) UCL	0.5022269
95% KM (t) UCL	0.4869607	95% KM (Percentile Bootstrap) UCL	0.4934320
95% KM (z) UCL	0.4856037	95% KM Bootstrap t UCL	0.5568630
90% KM Chebyshev UCL	0.5629276	95% KM Chebyshev UCL	0.6404657
97.5% KM Chebyshev UCL	0.7480855	99% KM Chebyshev UCL	0.9594838
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	4.2943577	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.7626619	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.2557832	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.1268621	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	2.0398118	k star (bias corrected MLE)	1.9307564
Theta hat (MLE)	0.2292808	Theta star (bias corrected MLE)	0.2422313
nu hat (MLE)	203.98118	nu star (bias corrected)	193.07564
Mean (detects)	0.4676896		

Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.0100000	Mean	0.3620240
Maximum	3.2385397	Median	0.2689440
SD	0.4792449	CV	1.3237933
k hat (MLE)	0.8103121	k star (bias corrected MLE)	0.7835807
Theta hat (MLE)	0.4467710	Theta star (bias corrected MLE)	0.4620123
nu hat (MLE)	106.96119	nu star (bias corrected)	103.43266
Adjusted Level of Significance (β)	0.0463636		
Approximate Chi Square Value (103.43, α)	80.965369	Adjusted Chi Square Value (103.43, β)	80.522888
95% Gamma Approximate UCL (use when n>=50)	0.4624829	95% Gamma Adjusted UCL (use when n<50)	0.4650243
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.3917492	SD (KM)	0.4582599
Variance (KM)	0.2100021	SE of Mean (KM)	0.0570595
k hat (KM)	0.7307900	k star (KM)	0.7076733
nu hat (KM)	96.464276	nu star (KM)	93.412870
theta hat (KM)	0.5360627	theta star (KM)	0.5535736
80% gamma percentile (KM)	0.6437129	90% gamma percentile (KM)	0.9808430
95% gamma percentile (KM)	1.3281803	99% gamma percentile (KM)	2.1565686
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (93.41, α)	72.123365	Adjusted Chi Square Value (93.41, β)	71.706804
95% Gamma Approximate KM-UCL (use when n>=50)	0.5073865	95% Gamma Adjusted KM-UCL (use when n<50)	0.5103340
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.8466025	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.9470000	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.1961851	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.1246000	Detected Data Not Lognormal at 5% Significance Level	
Detected Data Not Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.3879327	Mean in Log Scale	-1.272675
SD in Original Scale	0.4633535	SD in Log Scale	0.7277256
95% t UCL (assumes normality of ROS data)	0.4831032	95% Percentile Bootstrap UCL	0.4871294
95% BCA Bootstrap UCL	0.5230230	95% Bootstrap t UCL	0.5544945
95% H-UCL (Log ROS)	0.4386125		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-1.247762	KM Geo Mean	0.2871468
KM SD (logged)	0.6947246	95% Critical H Value (KM-Log)	2.0087117
KM Standard Error of Mean (logged)	0.0880322	95% H-UCL (KM -Log)	0.4345909
KM SD (logged)	0.6947246	95% Critical H Value (KM-Log)	2.0087117
KM Standard Error of Mean (logged)	0.0880322		

DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.3806007	Mean in Log Scale	-1.334816
SD in Original Scale	0.4673469	SD in Log Scale	0.8021659
95% t UCL (Assumes normality)	0.4765914	95% H-Stat UCL	0.4474246
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution at 5% Significance Level			
Suggested UCL to Use			
95% KM (Chebyshev) UCL	0.6404657		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Arsenic_RSD_HIGH_HALF_ND			
General Statistics			
Total Number of Observations	68.000000	Number of Distinct Observations	44.000000
		Number of Missing Observations	0
Minimum	4.4685854	Mean	6.4256640
Maximum	14.001452	Median	5.9147183
SD	1.7294467	Std. Error of Mean	0.2097262
Coefficient of Variation	0.2691468	Skewness	2.2415589
Normal GOF Test			
Shapiro Wilk Test Statistic	0.7803664	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	9.903E-14	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.1997347	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.1073545	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	6.7754698	95% Adjusted-CLT UCL (Chen-1995)	6.8315486
		95% Modified-t UCL (Johnson-1978)	6.7849714
Gamma GOF Test			
A-D Test Statistic	3.0037009	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.7494532	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.1766301	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.1078335	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			

Gamma Statistics			
k hat (MLE)	18.021887	k star (bias corrected MLE)	17.236607
Theta hat (MLE)	0.3565478	Theta star (bias corrected MLE)	0.3727917
nu hat (MLE)	2450.9766	nu star (bias corrected)	2344.1786
MLE Mean (bias corrected)	6.4256640	MLE Sd (bias corrected)	1.5477190
		Approximate Chi Square Value (0.05)	2232.7013
Adjusted Level of Significance	0.0464706	Adjusted Chi Square Value	2230.3671
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	6.7464931	95% Adjusted Gamma UCL (use when n<50)	6.7535537
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.8821004	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk P Value	4.9183E-7	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.1645577	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.1073545	Data Not Lognormal at 5% Significance Level	
Data Not Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	1.4970719	Mean of logged Data	1.8322994
Maximum of Logged Data	2.6391610	SD of logged Data	0.2259049
Assuming Lognormal Distribution			
95% H-UCL	6.7221846	90% Chebyshev (MVUE) UCL	6.9397328
95% Chebyshev (MVUE) UCL	7.1809255	97.5% Chebyshev (MVUE) UCL	7.5156917
99% Chebyshev (MVUE) UCL	8.1732749		
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution (0.05)			
Nonparametric Distribution Free UCLs			
95% CLT UCL	6.7706329	95% Jackknife UCL	6.7754698
95% Standard Bootstrap UCL	6.7646331	95% Bootstrap-t UCL	6.8577745
95% Hall's Bootstrap UCL	6.8677699	95% Percentile Bootstrap UCL	6.7780999
95% BCA Bootstrap UCL	6.8333377		
90% Chebyshev(Mean, Sd) UCL	7.0548427	95% Chebyshev(Mean, Sd) UCL	7.3398394
97.5% Chebyshev(Mean, Sd) UCL	7.7354038	99% Chebyshev(Mean, Sd) UCL	8.5124136
Suggested UCL to Use			
95% Student's-t UCL	6.7754698	or 95% Modified-t UCL	6.7849714
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			

Cobalt_RSD_HIGH_HALF_ND			
General Statistics			
Total Number of Observations	68.000000	Number of Distinct Observations	43.000000
		Number of Missing Observations	0
Minimum	4.2438680	Mean	6.3410373
Maximum	9.6263347	Median	6.2613324
SD	0.7911114	Std. Error of Mean	0.0959363
Coefficient of Variation	0.1247606	Skewness	1.1132479
Normal GOF Test			
Shapiro Wilk Test Statistic	0.9081708	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	3.0429E-5	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.1714974	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.1073545	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	6.5010511	95% Adjusted-CLT UCL (Chen-1995)	6.5126775
		95% Modified-t UCL (Johnson-1978)	6.5032097
Gamma GOF Test			
A-D Test Statistic	2.1945770	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.7485704	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.1539689	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.1077146	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	68.437793	k star (bias corrected MLE)	65.428283
Theta hat (MLE)	0.0926540	Theta star (bias corrected MLE)	0.0969158
nu hat (MLE)	9307.5398	nu star (bias corrected)	8898.2464
MLE Mean (bias corrected)	6.3410373	MLE Sd (bias corrected)	0.7839305
		Approximate Chi Square Value (0.05)	8679.9601
Adjusted Level of Significance	0.0464706	Adjusted Chi Square Value	8675.3384
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	6.5005037	95% Adjusted Gamma UCL (use when n<50)	6.5039668
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.9363735	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk P Value	0.0025231	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.1468690	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.1073545	Data Not Lognormal at 5% Significance Level	
Data Not Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	1.4454751	Mean of logged Data	1.8397187
Maximum of Logged Data	2.2645025	SD of logged Data	0.1211408

Assuming Lognormal Distribution			
95% H-UCL	6.5014772	90% Chebyshev (MVUE) UCL	6.6207736
95% Chebyshev (MVUE) UCL	6.7477571	97.5% Chebyshev (MVUE) UCL	6.9240051
99% Chebyshev (MVUE) UCL	7.2702103		
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution (0.05)			
Nonparametric Distribution Free UCLs			
95% CLT UCL	6.4988386	95% Jackknife UCL	6.5010511
95% Standard Bootstrap UCL	6.4964525	95% Bootstrap-t UCL	6.5214131
95% Hall's Bootstrap UCL	6.5364317	95% Percentile Bootstrap UCL	6.4988515
95% BCA Bootstrap UCL	6.5143126		
90% Chebyshev(Mean, Sd) UCL	6.6288464	95% Chebyshev(Mean, Sd) UCL	6.7592142
97.5% Chebyshev(Mean, Sd) UCL	6.9401596	99% Chebyshev(Mean, Sd) UCL	7.2955919
Suggested UCL to Use			
95% Student's-t UCL	6.5010511	or 95% Modified-t UCL	6.5032097
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Copper_RSD_HIGH_HALF_ND			
General Statistics			
Total Number of Observations	68.000000	Number of Distinct Observations	66.000000
		Number of Missing Observations	0
Minimum	11.299949	Mean	50.067675
Maximum	754.37621	Median	21.220003
SD	111.03677	Std. Error of Mean	13.465187
Coefficient of Variation	2.2177338	Skewness	5.0683909
Normal GOF Test			
Shapiro Wilk Test Statistic	0.3331484	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	0	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.3849336	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.1073545	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	72.526476	95% Adjusted-CLT UCL (Chen-1995)	81.059115
		95% Modified-t UCL (Johnson-1978)	73.905834

Gamma GOF Test			
A-D Test Statistic	11.069147	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.7810671	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.3077736	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.1112908	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	0.9825793	k star (bias corrected MLE)	0.9490342
Theta hat (MLE)	50.955352	Theta star (bias corrected MLE)	52.756452
nu hat (MLE)	133.63079	nu star (bias corrected)	129.06865
MLE Mean (bias corrected)	50.067675	MLE Sd (bias corrected)	51.394483
		Approximate Chi Square Value (0.05)	103.82623
Adjusted Level of Significance	0.0464706	Adjusted Chi Square Value	103.33787
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	62.240216	95% Adjusted Gamma UCL (use when n<50)	62.534352
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.7124186	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk P Value	0	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.2383920	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.1073545	Data Not Lognormal at 5% Significance Level	
Data Not Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	2.4247982	Mean of logged Data	3.3247076
Maximum of Logged Data	6.6258912	SD of logged Data	0.7850616
Assuming Lognormal Distribution			
95% H-UCL	46.205116	90% Chebyshev (MVUE) UCL	49.659395
95% Chebyshev (MVUE) UCL	55.121697	97.5% Chebyshev (MVUE) UCL	62.703161
99% Chebyshev (MVUE) UCL	77.595480		
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution (0.05)			
Nonparametric Distribution Free UCLs			
95% CLT UCL	72.215936	95% Jackknife UCL	72.526476
95% Standard Bootstrap UCL	72.065354	95% Bootstrap-t UCL	97.976769
95% Hall's Bootstrap UCL	73.791147	95% Percentile Bootstrap UCL	73.657429
95% BCA Bootstrap UCL	83.745316		
90% Chebyshev(Mean, Sd) UCL	90.463234	95% Chebyshev(Mean, Sd) UCL	108.76106
97.5% Chebyshev(Mean, Sd) UCL	134.15774	99% Chebyshev(Mean, Sd) UCL	184.04459

Suggested UCL to Use			
95% Chebyshev (Mean, Sd) UCL	108.76106		

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Vanadium_RSD_HIGH_HALF_ND

General Statistics			
Total Number of Observations	68.000000	Number of Distinct Observations	64.000000
		Number of Missing Observations	0
Minimum	8.8848461	Mean	19.975866
Maximum	59.519085	Median	17.226198
SD	9.6532410	Std. Error of Mean	1.1706274
Coefficient of Variation	0.4832452	Skewness	2.1457348

Normal GOF Test			
Shapiro Wilk Test Statistic	0.7887921	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	3.375E-13	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.2043239	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.1073545	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			

Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	21.928374	95% Adjusted-CLT UCL (Chen-1995)	22.226854
		95% Modified-t UCL (Johnson-1978)	21.979142

Gamma GOF Test			
A-D Test Statistic	1.8929390	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.7533699	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.1538119	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.1082834	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			

Gamma Statistics			
k hat (MLE)	6.0032337	k star (bias corrected MLE)	5.7481891
Theta hat (MLE)	3.3275176	Theta star (bias corrected MLE)	3.4751581
nu hat (MLE)	816.43978	nu star (bias corrected)	781.75371
MLE Mean (bias corrected)	19.975866	MLE Sd (bias corrected)	8.3318241
		Approximate Chi Square Value (0.05)	717.87093
Adjusted Level of Significance	0.0464706	Adjusted Chi Square Value	716.55586

Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	21.753503	95% Adjusted Gamma UCL (use when n<50)	21.793427

Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.9398620	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk P Value	0.0042913	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.1231942	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.1073545	Data Not Lognormal at 5% Significance Level	
Data Not Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	2.1843471	Mean of logged Data	2.9089304
Maximum of Logged Data	4.0862970	SD of logged Data	0.3936771
Assuming Lognormal Distribution			
95% H-UCL	21.610782	90% Chebyshev (MVUE) UCL	22.719391
95% Chebyshev (MVUE) UCL	24.046121	97.5% Chebyshev (MVUE) UCL	25.887570
99% Chebyshev (MVUE) UCL	29.504742		
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution (0.05)			
Nonparametric Distribution Free UCLs			
95% CLT UCL	21.901377	95% Jackknife UCL	21.928374
95% Standard Bootstrap UCL	21.910837	95% Bootstrap-t UCL	22.377744
95% Hall's Bootstrap UCL	22.420972	95% Percentile Bootstrap UCL	21.963162
95% BCA Bootstrap UCL	22.304066		
90% Chebyshev(Mean, Sd) UCL	23.487748	95% Chebyshev(Mean, Sd) UCL	25.078513
97.5% Chebyshev(Mean, Sd) UCL	27.286432	99% Chebyshev(Mean, Sd) UCL	31.623462
Suggested UCL to Use			
95% Student's-t UCL	21.928374	or 95% Modified-t UCL	21.979142
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Selenium_RSD_HIGH_HALF_ND			
General Statistics			
Total Number of Observations	68.000000	Number of Distinct Observations	53.000000
Number of Detects	61.000000	Number of Non-Detects	7.0000000
Number of Distinct Detects	46.000000	Number of Distinct Non-Detects	7.0000000
Minimum Detect	0.2143192	Minimum Non-Detect	0.2083658
Maximum Detect	15.954532	Maximum Non-Detect	0.2639095
Variance Detects	5.3578283	Percent Non-Detects	10.294118%
Mean Detects	1.8777050	SD Detects	2.3146983
Median Detects	1.7859929	CV Detects	1.2327274
Skewness Detects	4.2145949	Kurtosis Detects	22.987805
Mean of Logged Detects	0.1990046	SD of Logged Detects	0.9197949

Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.5906968	**Normal GOF Test on Detected Observations Only**	
5% Shapiro Wilk P Value	0	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.2999963	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.1131977	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	1.7061919	KM Standard Error of Mean	0.2729716
KM SD	2.2324531	95% KM (BCA) UCL	2.2109344
95% KM (t) UCL	2.1614856	95% KM (Percentile Bootstrap) UCL	2.1897075
95% KM (z) UCL	2.1551902	95% KM Bootstrap t UCL	2.4749068
90% KM Chebyshev UCL	2.5251066	95% KM Chebyshev UCL	2.8960475
97.5% KM Chebyshev UCL	3.4108989	99% KM Chebyshev UCL	4.4222249
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	1.7392008	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.7730194	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.1705299	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.1164493	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	1.3013975	k star (bias corrected MLE)	1.2483233
Theta hat (MLE)	1.4428374	Theta star (bias corrected MLE)	1.5041816
nu hat (MLE)	158.77049	nu star (bias corrected)	152.29544
Mean (detects)	1.8777050		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.0100000	Mean	1.6854412
Maximum	15.954532	Median	1.2857641
SD	2.2638440	CV	1.3431759
k hat (MLE)	0.7343215	k star (bias corrected MLE)	0.7117288
Theta hat (MLE)	2.2952362	Theta star (bias corrected MLE)	2.3680946
nu hat (MLE)	99.867718	nu star (bias corrected)	96.795123
Adjusted Level of Significance (β)	0.0464706		
Approximate Chi Square Value (96.80, α)	75.101256	Adjusted Chi Square Value (96.80, β)	74.688662
95% Gamma Approximate UCL (use when n>=50)	2.1723004	95% Gamma Adjusted UCL (use when n<50)	2.1843006

Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	1.7061919	SD (KM)	2.2324531
Variance (KM)	4.9838469	SE of Mean (KM)	0.2729716
k hat (KM)	0.5841052	k star (KM)	0.5681397
nu hat (KM)	79.438301	nu star (KM)	77.267003
theta hat (KM)	2.9210355	theta star (KM)	3.0031201
80% gamma percentile (KM)	2.8117196	90% gamma percentile (KM)	4.4917138
95% gamma percentile (KM)	6.2612249	99% gamma percentile (KM)	10.561808
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (77.27, α)	58.018006	Adjusted Chi Square Value (77.27, β)	57.657556
95% Gamma Approximate KM-UCL (use when n>=50)	2.2722658	95% Gamma Adjusted KM-UCL (use when n<50)	2.2864710
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Approximate Test Statistic	0.9471475	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	0.0204214	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.1768013	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.1131977	Detected Data Not Lognormal at 5% Significance Level	
Detected Data Not Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	1.7021067	Mean in Log Scale	-0.003730
SD in Original Scale	2.2518492	SD in Log Scale	1.0598045
95% t UCL (assumes normality of ROS data)	2.1575759	95% Percentile Bootstrap UCL	2.1749701
95% BCA Bootstrap UCL	2.3690177	95% Bootstrap t UCL	2.4456119
95% H-UCL (Log ROS)	2.3398255		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	0.0185782	KM Geo Mean	1.0187518
KM SD (logged)	1.0150277	95% Critical H Value (KM-Log)	2.2559856
KM Standard Error of Mean (logged)	0.1241193	95% H-UCL (KM -Log)	2.2557286
KM SD (logged)	1.0150277	95% Critical H Value (KM-Log)	2.2559856
KM Standard Error of Mean (logged)	0.1241193		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	1.6963262	Mean in Log Scale	-0.043847
SD in Original Scale	2.2558877	SD in Log Scale	1.1313762
95% t UCL (Assumes normality)	2.1526123	95% H-Stat UCL	2.4706772
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution at 5% Significance Level			

Suggested UCL to Use			
95% KM (Chebyshev) UCL	2.8960475		

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Mercury_RSD_HIGH_HALF_ND

General Statistics			
Total Number of Observations	68.000000	Number of Distinct Observations	46.000000
Number of Detects	57.000000	Number of Non-Detects	11.000000
Number of Distinct Detects	37.000000	Number of Distinct Non-Detects	9.0000000
Minimum Detect	0.0191043	Minimum Non-Detect	0.0095521
Maximum Detect	0.1395379	Maximum Non-Detect	0.0486908
Variance Detects	2.8499E-4	Percent Non-Detects	16.176471%
Mean Detects	0.0357356	SD Detects	0.0168817
Median Detects	0.0318405	CV Detects	0.4724050
Skewness Detects	4.4050002	Kurtosis Detects	25.644080
Mean of Logged Detects	-3.394478	SD of Logged Detects	0.3233255

Normal GOF Test on Detects Only		
Shapiro Wilk Test Statistic	0.6234009	**Normal GOF Test on Detected Observations Only**
5% Shapiro Wilk P Value	0	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.2076506	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.1169970	Detected Data Not Normal at 5% Significance Level
Detected Data Not Normal at 5% Significance Level		

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.0321784	KM Standard Error of Mean	0.0021702
KM SD	0.0176440	95% KM (BCA) UCL	0.0360644
95% KM (t) UCL	0.0357981	95% KM (Percentile Bootstrap) UCL	0.0359306
95% KM (z) UCL	0.0357480	95% KM Bootstrap t UCL	0.0369643
90% KM Chebyshev UCL	0.0386890	95% KM Chebyshev UCL	0.0416381
97.5% KM Chebyshev UCL	0.0457313	99% KM Chebyshev UCL	0.0537716

Gamma GOF Tests on Detected Observations Only		
A-D Test Statistic	2.0638876	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.7517302	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.1348399	**Kolmogorov-Smirnov GOF**
5% K-S Critical Value	0.1179737	Detected Data Not Gamma Distributed at 5% Significance Level
Detected Data Not Gamma Distributed at 5% Significance Level		

Gamma Statistics on Detected Data Only			
k hat (MLE)	8.1160372	k star (bias corrected MLE)	7.7005733
Theta hat (MLE)	0.0044031	Theta star (bias corrected MLE)	0.0046406
nu hat (MLE)	925.22824	nu star (bias corrected)	877.86535
Mean (detects)	0.0357356		

Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.0100000	Mean	0.0323466
Maximum	0.1395379	Median	0.0303226
SD	0.0174635	CV	0.5398883
k hat (MLE)	4.8094700	k star (bias corrected MLE)	4.6070914
Theta hat (MLE)	0.0067256	Theta star (bias corrected MLE)	0.0070210
nu hat (MLE)	654.08791	nu star (bias corrected)	626.56443
Adjusted Level of Significance (β)	0.0464706		
Approximate Chi Square Value (626.56, α)	569.49633	Adjusted Chi Square Value (626.56, β)	568.32715
95% Gamma Approximate UCL (use when n>=50)	0.0355879	95% Gamma Adjusted UCL (use when n<50)	0.0356612
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.0321784	SD (KM)	0.0176440
Variance (KM)	3.1131E-4	SE of Mean (KM)	0.0021702
k hat (KM)	3.3261042	k star (KM)	3.1891682
nu hat (KM)	452.35017	nu star (KM)	433.72688
theta hat (KM)	0.0096745	theta star (KM)	0.0100899
80% gamma percentile (KM)	0.0455640	90% gamma percentile (KM)	0.0563399
95% gamma percentile (KM)	0.0663640	99% gamma percentile (KM)	0.0880226
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (433.73, α)	386.44510	Adjusted Chi Square Value (433.73, β)	385.48539
95% Gamma Approximate KM-UCL (use when n>=50)	0.0361154	95% Gamma Adjusted KM-UCL (use when n<50)	0.0362053
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Approximate Test Statistic	0.9033022	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	1.0796E-4	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.1129196	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.1169970	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Approximate Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.0331137	Mean in Log Scale	-3.485533
SD in Original Scale	0.0166553	SD in Log Scale	0.3709345
95% t UCL (assumes normality of ROS data)	0.0364825	95% Percentile Bootstrap UCL	0.0366890
95% BCA Bootstrap UCL	0.0377413	95% Bootstrap t UCL	0.0382962
95% H-UCL (Log ROS)	0.0355957		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-3.559266	KM Geo Mean	0.0284597
KM SD (logged)	0.5102839	95% Critical H Value (KM-Log)	1.8747615
KM Standard Error of Mean (logged)	0.0635336	95% H-UCL (KM -Log)	0.0364361
KM SD (logged)	0.5102839	95% Critical H Value (KM-Log)	1.8747615
KM Standard Error of Mean (logged)	0.0635336		

DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.0314784	Mean in Log Scale	-3.626609
SD in Original Scale	0.0184304	SD in Log Scale	0.6465443
95% t UCL (Assumes normality)	0.0352062	95% H-Stat UCL	0.0383224
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Approximate Lognormal Distributed at 5% Significance Level			
Suggested UCL to Use			
KM Student's t	0.0328836	KM H-UCL	0.0364361
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
PCB_1254Aroclor1254_RSD_HIGH_HALF_ND			
General Statistics			
Total Number of Observations	63.000000	Number of Distinct Observations	34.000000
		Number of Missing Observations	5.0000000
Number of Detects	14.000000	Number of Non-Detects	49.000000
Number of Distinct Detects	14.000000	Number of Distinct Non-Detects	20.000000
Minimum Detect	0.1102051	Minimum Non-Detect	5.9427E-5
Maximum Detect	1.7287945	Maximum Non-Detect	0.1017354
Variance Detects	0.2069415	Percent Non-Detects	77.777778%
Mean Detects	0.4260500	SD Detects	0.4549083
Median Detects	0.1979840	CV Detects	1.0677345
Skewness Detects	2.0390764	Kurtosis Detects	4.6530907
Mean of Logged Detects	-1.268544	SD of Logged Detects	0.8998477
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.7199813	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.8740000	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.2866381	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.2257000	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.0947240	KM Standard Error of Mean	0.0355823
KM SD	0.2721526	95% KM (BCA) UCL	0.1689523
95% KM (t) UCL	0.1541396	95% KM (Percentile Bootstrap) UCL	0.1574851
95% KM (z) UCL	0.1532518	95% KM Bootstrap t UCL	0.1968344
90% KM Chebyshev UCL	0.2014710	95% KM Chebyshev UCL	0.2498239
97.5% KM Chebyshev UCL	0.3169357	99% KM Chebyshev UCL	0.4487639

Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	0.1106633	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.7535154	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.2434769	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.2334687	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	1.3461114	k star (bias corrected MLE)	1.1052780
Theta hat (MLE)	0.3165043	Theta star (bias corrected MLE)	0.3854686
nu hat (MLE)	37.691119	nu star (bias corrected)	30.947784
Mean (detects)	0.4260500		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.0100000	Mean	0.1024556
Maximum	1.7287945	Median	0.0100000
SD	0.2716461	CV	2.6513558
k hat (MLE)	0.4129475	k star (bias corrected MLE)	0.4038654
Theta hat (MLE)	0.2481079	Theta star (bias corrected MLE)	0.2536874
nu hat (MLE)	52.031387	nu star (bias corrected)	50.887035
Adjusted Level of Significance (β)	0.0461905		
Approximate Chi Square Value (50.89, α)	35.505433	Adjusted Chi Square Value (50.89, β)	35.204599
95% Gamma Approximate UCL (use when n>=50)	0.1468412	95% Gamma Adjusted UCL (use when n<50)	0.1480960
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.0947240	SD (KM)	0.2721526
Variance (KM)	0.0740671	SE of Mean (KM)	0.0355823
k hat (KM)	0.1211421	k star (KM)	0.1259554
nu hat (KM)	15.263900	nu star (KM)	15.870381
theta hat (KM)	0.7819249	theta star (KM)	0.7520439
80% gamma percentile (KM)	0.0875907	90% gamma percentile (KM)	0.2717626
95% gamma percentile (KM)	0.5370124	99% gamma percentile (KM)	1.3370914
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (15.87, α)	7.8708101	Adjusted Chi Square Value (15.87, β)	7.7385378
95% Gamma Approximate KM-UCL (use when n>=50)	0.1909976	95% Gamma Adjusted KM-UCL (use when n<50)	0.1942623
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.8665925	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.8740000	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.2053296	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.2257000	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Approximate Lognormal at 5% Significance Level			

Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.1043318	Mean in Log Scale	-3.994954
SD in Original Scale	0.2711573	SD in Log Scale	1.7363943
95% t UCL (assumes normality of ROS data)	0.1613767	95% Percentile Bootstrap UCL	0.1646706
95% BCA Bootstrap UCL	0.1897571	95% Bootstrap t UCL	0.2098602
95% H-UCL (Log ROS)	0.1527556		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-7.850269	KM Geo Mean	3.8965E-4
KM SD (logged)	3.5417475	95% Critical H Value (KM-Log)	4.7655440
KM Standard Error of Mean (logged)	0.4630625	95% H-UCL (KM -Log)	1.7599255
KM SD (logged)	3.5417475	95% Critical H Value (KM-Log)	4.7655440
KM Standard Error of Mean (logged)	0.4630625		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.0987591	Mean in Log Scale	-4.581158
SD in Original Scale	0.2729946	SD in Log Scale	1.9811193
95% t UCL (Assumes normality)	0.1561905	95% H-Stat UCL	0.1573714
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Approximate Lognormal Distributed at 5% Significance Level			
Suggested UCL to Use			
KM H-UCL	1.7599255		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Bis2_EthylhexylPhthalate_RSD_HIGH_HALF_ND			
General Statistics			
Total Number of Observations	60.000000	Number of Distinct Observations	37.000000
		Number of Missing Observations	8.0000000
Number of Detects	14.000000	Number of Non-Detects	46.000000
Number of Distinct Detects	13.000000	Number of Distinct Non-Detects	25.000000
Minimum Detect	0.0140000	Minimum Non-Detect	0.0060000
Maximum Detect	0.8100000	Maximum Non-Detect	3.5500000
Variance Detects	0.0537424	Percent Non-Detects	76.666667%
Mean Detects	0.1551429	SD Detects	0.2318242
Median Detects	0.0520000	CV Detects	1.4942625
Skewness Detects	2.2828838	Kurtosis Detects	4.7785550
Mean of Logged Detects	-2.573596	SD of Logged Detects	1.1310649

Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.6171698	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.8740000	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.3797214	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.2257000	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.0464546	KM Standard Error of Mean	0.0183492
KM SD	0.1302479	95% KM (BCA) UCL	0.0801676
95% KM (t) UCL	0.0771178	95% KM (Percentile Bootstrap) UCL	0.0788233
95% KM (z) UCL	0.0766363	95% KM Bootstrap t UCL	0.1357286
90% KM Chebyshev UCL	0.1015022	95% KM Chebyshev UCL	0.1264368
97.5% KM Chebyshev UCL	0.1610452	99% KM Chebyshev UCL	0.2290266
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	1.2965993	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.7671455	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.2830069	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.2367882	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.8314843	k star (bias corrected MLE)	0.7009282
Theta hat (MLE)	0.1865854	Theta star (bias corrected MLE)	0.2213392
nu hat (MLE)	23.281562	nu star (bias corrected)	19.625989
Mean (detects)	0.1551429		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.0100000	Mean	0.0438667
Maximum	0.8100000	Median	0.0100000
SD	0.1251958	CV	2.8540070
k hat (MLE)	0.6131317	k star (bias corrected MLE)	0.5935862
Theta hat (MLE)	0.0715453	Theta star (bias corrected MLE)	0.0739011
nu hat (MLE)	73.575799	nu star (bias corrected)	71.230342
Adjusted Level of Significance (β)	0.0460000		
Approximate Chi Square Value (71.23, α)	52.798811	Adjusted Chi Square Value (71.23, β)	52.408601
95% Gamma Approximate UCL (use when n>=50)	0.0591801	95% Gamma Adjusted UCL (use when n<50)	0.0596207

Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.0464546	SD (KM)	0.1302479
Variance (KM)	0.0169645	SE of Mean (KM)	0.0183492
k hat (KM)	0.1272087	k star (KM)	0.1319593
nu hat (KM)	15.265039	nu star (KM)	15.835121
theta hat (KM)	0.3651845	theta star (KM)	0.3520375
80% gamma percentile (KM)	0.0450491	90% gamma percentile (KM)	0.1346991
95% gamma percentile (KM)	0.2615270	99% gamma percentile (KM)	0.6399360
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (15.84, α)	7.8459834	Adjusted Chi Square Value (15.84, β)	7.7071613
95% Gamma Approximate KM-UCL (use when n>=50)	0.0937569	95% Gamma Adjusted KM-UCL (use when n<50)	0.0954456
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.8983697	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.8740000	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.1910318	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.2257000	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.0396408	Mean in Log Scale	-5.006005
SD in Original Scale	0.1264171	SD in Log Scale	1.6665924
95% t UCL (assumes normality of ROS data)	0.0669136	95% Percentile Bootstrap UCL	0.0695262
95% BCA Bootstrap UCL	0.0815579	95% Bootstrap t UCL	0.1280962
95% H-UCL (Log ROS)	0.0563875		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-4.365894	KM Geo Mean	0.0127033
KM SD (logged)	1.2678399	95% Critical H Value (KM-Log)	2.8838769
KM Standard Error of Mean (logged)	0.1885116	95% H-UCL (KM -Log)	0.0456763
KM SD (logged)	1.2678399	95% Critical H Value (KM-Log)	2.8838769
KM Standard Error of Mean (logged)	0.1885116		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.1350417	Mean in Log Scale	-3.796707
SD in Original Scale	0.2998110	SD in Log Scale	1.9292888
95% t UCL (Assumes normality)	0.1997221	95% H-Stat UCL	0.3738071
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Lognormal Distributed at 5% Significance Level			

Suggested UCL to Use			
KM H-UCL	0.0456763		

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Pyrene_RSD_HIGH_HALF_ND

General Statistics			
Total Number of Observations	68.000000	Number of Distinct Observations	61.000000
		Number of Missing Observations	0
Minimum	0.0293610	Mean	33.442993
Maximum	708.11757	Median	4.1104493
SD	104.65875	Std. Error of Mean	12.691738
Coefficient of Variation	3.1294672	Skewness	5.0375231

Normal GOF Test			
Shapiro Wilk Test Statistic	0.3601910	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	0	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.3747637	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.1073545	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			

Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	54.611747	95% Adjusted-CLT UCL (Chen-1995)	62.603502
		95% Modified-t UCL (Johnson-1978)	55.903955

Gamma GOF Test			
A-D Test Statistic	4.6980285	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.8600909	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.2433742	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.1170934	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			

Gamma Statistics			
k hat (MLE)	0.3210641	k star (bias corrected MLE)	0.3167035
Theta hat (MLE)	104.16296	Theta star (bias corrected MLE)	105.59718
nu hat (MLE)	43.664723	nu star (bias corrected)	43.071672
MLE Mean (bias corrected)	33.442993	MLE Sd (bias corrected)	59.426305
		Approximate Chi Square Value (0.05)	29.023682
Adjusted Level of Significance	0.0464706	Adjusted Chi Square Value	28.773898

Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	49.630010	95% Adjusted Gamma UCL (use when n<50)	50.060844

Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.9807127	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk P Value	0.6716096	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.0869190	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.1073545	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	-3.528089	Mean of logged Data	1.3857532
Maximum of Logged Data	6.5626101	SD of logged Data	2.0501887
Assuming Lognormal Distribution			
95% H-UCL	69.137800	90% Chebyshev (MVUE) UCL	64.125564
95% Chebyshev (MVUE) UCL	79.617014	97.5% Chebyshev (MVUE) UCL	101.11855
99% Chebyshev (MVUE) UCL	143.35414		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	54.319044	95% Jackknife UCL	54.611747
95% Standard Bootstrap UCL	54.253892	95% Bootstrap-t UCL	82.763077
95% Hall's Bootstrap UCL	117.09731	95% Percentile Bootstrap UCL	56.288648
95% BCA Bootstrap UCL	65.764754		
90% Chebyshev(Mean, Sd) UCL	71.518206	95% Chebyshev(Mean, Sd) UCL	88.764995
97.5% Chebyshev(Mean, Sd) UCL	112.70287	99% Chebyshev(Mean, Sd) UCL	159.72419
Suggested UCL to Use			
95% Chebyshev (Mean, Sd) UCL	88.764995		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Dibenzofuran_RSD_HIGH_HALF_ND			
General Statistics			
Total Number of Observations	68.000000	Number of Distinct Observations	65.000000
Number of Detects	61.000000	Number of Non-Detects	7.0000000
Number of Distinct Detects	60.000000	Number of Distinct Non-Detects	5.0000000
Minimum Detect	0.0063243	Minimum Non-Detect	0.0066751
Maximum Detect	93.506748	Maximum Non-Detect	0.0093507
Variance Detects	158.25767	Percent Non-Detects	10.294118%
Mean Detects	3.0368416	SD Detects	12.580050
Median Detects	0.1201510	CV Detects	4.1424784
Skewness Detects	6.5394871	Kurtosis Detects	46.337786
Mean of Logged Detects	-1.672171	SD of Logged Detects	2.1394654

Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.2692435	**Normal GOF Test on Detected Observations Only**	
5% Shapiro Wilk P Value	0	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.4048168	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.1131977	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	2.7249281	KM Standard Error of Mean	1.4492817
KM SD	11.852718	95% KM (BCA) UCL	5.6276389
95% KM (t) UCL	5.1422084	95% KM (Percentile Bootstrap) UCL	5.4323002
95% KM (z) UCL	5.1087843	95% KM Bootstrap t UCL	10.996172
90% KM Chebyshev UCL	7.0727731	95% KM Chebyshev UCL	9.0422005
97.5% KM Chebyshev UCL	11.775689	99% KM Chebyshev UCL	17.145099
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	6.6328686	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.8866336	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.2589093	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.1250360	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.2544928	k star (bias corrected MLE)	0.2529057
Theta hat (MLE)	11.932919	Theta star (bias corrected MLE)	12.007802
nu hat (MLE)	31.048118	nu star (bias corrected)	30.854495
Mean (detects)	3.0368416		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.0063243	Mean	2.7252549
Maximum	93.506748	Median	0.0853740
SD	11.940768	CV	4.3815235
k hat (MLE)	0.2401656	k star (bias corrected MLE)	0.2393740
Theta hat (MLE)	11.347397	Theta star (bias corrected MLE)	11.384924
nu hat (MLE)	32.662526	nu star (bias corrected)	32.554866
Adjusted Level of Significance (β)	0.0464706		
Approximate Chi Square Value (32.55, α)	20.512544	Adjusted Chi Square Value (32.55, β)	20.305265
95% Gamma Approximate UCL (use when n>=50)	4.3251734	95% Gamma Adjusted UCL (use when n<50)	4.3693254

Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	2.7249281	SD (KM)	11.852718
Variance (KM)	140.48693	SE of Mean (KM)	1.4492817
k hat (KM)	0.0528535	k star (KM)	0.0603257
nu hat (KM)	7.1880827	nu star (KM)	8.2042947
theta hat (KM)	51.556199	theta star (KM)	45.170271
80% gamma percentile (KM)	0.6678815	90% gamma percentile (KM)	5.1539859
95% gamma percentile (KM)	15.290232	99% gamma percentile (KM)	54.845536
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (8.20, α)	2.8538853	Adjusted Chi Square Value (8.20, β)	2.7859156
95% Gamma Approximate KM-UCL (use when n>=50)	7.8335710	95% Gamma Adjusted KM-UCL (use when n<50)	8.0246914
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Approximate Test Statistic	0.9328221	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	0.0030236	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.1237719	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.1131977	Detected Data Not Lognormal at 5% Significance Level	
Detected Data Not Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	2.7244853	Mean in Log Scale	-2.123116
SD in Original Scale	11.940946	SD in Log Scale	2.4315467
95% t UCL (assumes normality of ROS data)	5.1397153	95% Percentile Bootstrap UCL	5.3975714
95% BCA Bootstrap UCL	7.2504095	95% Bootstrap t UCL	11.071530
95% H-UCL (Log ROS)	5.7197452		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-2.014072	KM Geo Mean	0.1334442
KM SD (logged)	2.2491609	95% Critical H Value (KM-Log)	3.0796177
KM Standard Error of Mean (logged)	0.2751100	95% H-UCL (KM -Log)	3.9020582
KM SD (logged)	2.2491609	95% Critical H Value (KM-Log)	3.0796177
KM Standard Error of Mean (logged)	0.2751100		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	2.7246584	Mean in Log Scale	-2.063823
SD in Original Scale	11.940906	SD in Log Scale	2.3359960
95% t UCL (Assumes normality)	5.1398803	95% H-Stat UCL	4.6877277
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution at 5% Significance Level			

Suggested UCL to Use			
95% KM (Chebyshev) UCL	9.0422005		

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Indeno123_CDPyrene_RSD_HIGH_HALF_ND

General Statistics			
Total Number of Observations	68.000000	Number of Distinct Observations	59.000000
Number of Detects	66.000000	Number of Non-Detects	2.0000000
Number of Distinct Detects	57.000000	Number of Distinct Non-Detects	2.0000000
Minimum Detect	0.0907405	Minimum Non-Detect	0.0170138
Maximum Detect	275.46209	Maximum Non-Detect	0.0178240
Variance Detects	1448.8887	Percent Non-Detects	2.9411765%
Mean Detects	13.404559	SD Detects	38.064270
Median Detects	2.9166574	CV Detects	2.8396511
Skewness Detects	5.5950324	Kurtosis Detects	35.822828
Mean of Logged Detects	0.9565882	SD of Logged Detects	1.8402715

Normal GOF Test on Detects Only		
Shapiro Wilk Test Statistic	0.3748376	**Normal GOF Test on Detected Observations Only**
5% Shapiro Wilk P Value	0	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.3651006	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.1089311	Detected Data Not Normal at 5% Significance Level
Detected Data Not Normal at 5% Significance Level		

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	13.010807	KM Standard Error of Mean	4.5559743
KM SD	37.283823	95% KM (BCA) UCL	21.426025
95% KM (t) UCL	20.609790	95% KM (Percentile Bootstrap) UCL	21.179826
95% KM (z) UCL	20.504718	95% KM Bootstrap t UCL	31.464834
90% KM Chebyshev UCL	26.678730	95% KM Chebyshev UCL	32.869839
97.5% KM Chebyshev UCL	41.462858	99% KM Chebyshev UCL	58.342180

Gamma GOF Tests on Detected Observations Only		
A-D Test Statistic	2.8714252	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.8402712	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.1858169	**Kolmogorov-Smirnov GOF**
5% K-S Critical Value	0.1176143	Detected Data Not Gamma Distributed at 5% Significance Level
Detected Data Not Gamma Distributed at 5% Significance Level		

Gamma Statistics on Detected Data Only			
k hat (MLE)	0.4012791	k star (bias corrected MLE)	0.3931402
Theta hat (MLE)	33.404573	Theta star (bias corrected MLE)	34.096129
nu hat (MLE)	52.968847	nu star (bias corrected)	51.894506
Mean (detects)	13.404559		

Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.0100000	Mean	13.010601
Maximum	275.46209	Median	2.7957487
SD	37.561102	CV	2.8869613
k hat (MLE)	0.3750751	k star (bias corrected MLE)	0.3683316
Theta hat (MLE)	34.687993	Theta star (bias corrected MLE)	35.323069
nu hat (MLE)	51.010209	nu star (bias corrected)	50.093092
Adjusted Level of Significance (β)	0.0464706		
Approximate Chi Square Value (50.09, α)	34.842018	Adjusted Chi Square Value (50.09, β)	34.566680
95% Gamma Approximate UCL (use when n>=50)	18.705611	95% Gamma Adjusted UCL (use when n<50)	18.854609
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	13.010807	SD (KM)	37.283823
Variance (KM)	1390.0834	SE of Mean (KM)	4.5559743
k hat (KM)	0.1217777	k star (KM)	0.1262090
nu hat (KM)	16.561762	nu star (KM)	17.164429
theta hat (KM)	106.84068	theta star (KM)	103.08935
80% gamma percentile (KM)	12.056553	90% gamma percentile (KM)	37.346114
95% gamma percentile (KM)	73.740070	99% gamma percentile (KM)	183.46331
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (17.16, α)	8.7898209	Adjusted Chi Square Value (17.16, β)	8.6596952
95% Gamma Approximate KM-UCL (use when n>=50)	25.407011	95% Gamma Adjusted KM-UCL (use when n<50)	25.788792
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Approximate Test Statistic	0.9685220	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	0.2293798	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.0948352	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.1089311	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	13.011102	Mean in Log Scale	0.8222431
SD in Original Scale	37.560926	SD in Log Scale	1.9723085
95% t UCL (assumes normality of ROS data)	20.608345	95% Percentile Bootstrap UCL	21.317313
95% BCA Bootstrap UCL	26.089392	95% Bootstrap t UCL	31.602405
95% H-UCL (Log ROS)	32.120393		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	0.8086377	KM Geo Mean	2.2448478
KM SD (logged)	1.9898590	95% Critical H Value (KM-Log)	2.9363719
KM Standard Error of Mean (logged)	0.2431550	95% H-UCL (KM -Log)	33.189681
KM SD (logged)	1.9898590	95% Critical H Value (KM-Log)	2.9363719
KM Standard Error of Mean (logged)	0.2431550		

DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	13.010563	Mean in Log Scale	0.7889352
SD in Original Scale	37.561116	SD in Log Scale	2.0559464
95% t UCL (Assumes normality)	20.607845	95% H-Stat UCL	38.638585
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Lognormal Distributed at 5% Significance Level			
Suggested UCL to Use			
KM H-UCL	33.189681		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
BenzoBFluoranthene_RSD_HIGH_HALF_ND			
General Statistics			
Total Number of Observations	68.000000	Number of Distinct Observations	63.000000
		Number of Missing Observations	0
Minimum	0.0352130	Mean	22.487532
Maximum	432.16008	Median	3.7613933
SD	61.333181	Std. Error of Mean	7.4377406
Coefficient of Variation	2.7274305	Skewness	5.1637922
Normal GOF Test			
Shapiro Wilk Test Statistic	0.4035540	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	0	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.3571559	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.1073545	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	34.893059	95% Adjusted-CLT UCL (Chen-1995)	39.698161
		95% Modified-t UCL (Johnson-1978)	35.669314
Gamma GOF Test			
A-D Test Statistic	2.7162564	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.8488295	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.1709701	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.1163796	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			

Gamma Statistics			
k hat (MLE)	0.3673843	k star (bias corrected MLE)	0.3609801
Theta hat (MLE)	61.209830	Theta star (bias corrected MLE)	62.295764
nu hat (MLE)	49.964268	nu star (bias corrected)	49.093295
MLE Mean (bias corrected)	22.487532	MLE Sd (bias corrected)	37.428304
		Approximate Chi Square Value (0.05)	34.008086
Adjusted Level of Significance	0.0464706	Adjusted Chi Square Value	33.736274
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	32.462486	95% Adjusted Gamma UCL (use when n<50)	32.724036
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.9845409	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk P Value	0.8286398	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.0723874	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.1073545	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	-3.346339	Mean of logged Data	1.2969984
Maximum of Logged Data	6.0687961	SD of logged Data	2.0105022
Assuming Lognormal Distribution			
95% H-UCL	57.089815	90% Chebyshev (MVUE) UCL	53.656100
95% Chebyshev (MVUE) UCL	66.454923	97.5% Chebyshev (MVUE) UCL	84.219194
99% Chebyshev (MVUE) UCL	119.11366		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	34.721526	95% Jackknife UCL	34.893059
95% Standard Bootstrap UCL	34.713075	95% Bootstrap-t UCL	48.903706
95% Hall's Bootstrap UCL	76.422005	95% Percentile Bootstrap UCL	35.837395
95% BCA Bootstrap UCL	41.892790		
90% Chebyshev(Mean, Sd) UCL	44.800754	95% Chebyshev(Mean, Sd) UCL	54.907891
97.5% Chebyshev(Mean, Sd) UCL	68.936207	99% Chebyshev(Mean, Sd) UCL	96.492117
Suggested UCL to Use			
95% Chebyshev (Mean, Sd) UCL	54.907891		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			

Fluoranthene_RSD_HIGH_HALF_ND			
General Statistics			
Total Number of Observations	68.000000	Number of Distinct Observations	64.000000
		Number of Missing Observations	0
Minimum	0.0359993	Mean	34.807703
Maximum	754.27147	Median	4.5768509
SD	110.32480	Std. Error of Mean	13.378847
Coefficient of Variation	3.1695512	Skewness	5.1337365
Normal GOF Test			
Shapiro Wilk Test Statistic	0.3546599	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	0	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.3763141	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.1073545	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	57.122498	95% Adjusted-CLT UCL (Chen-1995)	65.713707
		95% Modified-t UCL (Johnson-1978)	58.510680
Gamma GOF Test			
A-D Test Statistic	4.5167322	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.8607086	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.2377710	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.1171326	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	0.3185234	k star (bias corrected MLE)	0.3142748
Theta hat (MLE)	109.27832	Theta star (bias corrected MLE)	110.75562
nu hat (MLE)	43.319184	nu star (bias corrected)	42.741376
MLE Mean (bias corrected)	34.807703	MLE Sd (bias corrected)	62.089844
		Approximate Chi Square Value (0.05)	28.752335
Adjusted Level of Significance	0.0464706	Adjusted Chi Square Value	28.503803
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	51.742898	95% Adjusted Gamma UCL (use when n<50)	52.194059
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.9793918	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk P Value	0.6133018	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.0846946	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.1073545	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	-3.324255	Mean of logged Data	1.4060276
Maximum of Logged Data	6.6257523	SD of logged Data	2.0698142

Assuming Lognormal Distribution			
95% H-UCL	74.251579	90% Chebyshev (MVUE) UCL	68.429866
95% Chebyshev (MVUE) UCL	85.062379	97.5% Chebyshev (MVUE) UCL	108.14766
99% Chebyshev (MVUE) UCL	153.49423		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	56.813948	95% Jackknife UCL	57.122498
95% Standard Bootstrap UCL	56.603415	95% Bootstrap-t UCL	86.151407
95% Hall's Bootstrap UCL	110.00385	95% Percentile Bootstrap UCL	58.869238
95% BCA Bootstrap UCL	69.952302		
90% Chebyshev(Mean, Sd) UCL	74.944244	95% Chebyshev(Mean, Sd) UCL	93.124745
97.5% Chebyshev(Mean, Sd) UCL	118.35858	99% Chebyshev(Mean, Sd) UCL	167.92555
Suggested UCL to Use			
95% Chebyshev (Mean, Sd) UCL	93.124745		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
BenzoKFluoranthene_RSD_HIGH_HALF_ND			
General Statistics			
Total Number of Observations	68.000000	Number of Distinct Observations	66.000000
Number of Detects	67.000000	Number of Non-Detects	1.0000000
Number of Distinct Detects	65.000000	Number of Distinct Non-Detects	1.0000000
Minimum Detect	0.0246771	Minimum Non-Detect	0.0123385
Maximum Detect	213.86780	Maximum Non-Detect	0.0123385
Variance Detects	809.26302	Percent Non-Detects	1.4705882%
Mean Detects	8.9634238	SD Detects	28.447549
Median Detects	1.5299773	CV Detects	3.1737369
Skewness Detects	6.1071050	Kurtosis Detects	42.107315
Mean of Logged Detects	0.3668000	SD of Logged Detects	1.8900032
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.3390897	**Normal GOF Test on Detected Observations Only**	
5% Shapiro Wilk P Value	0	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.3766775	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.1081342	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	8.8317902	KM Standard Error of Mean	3.4268417
KM SD	28.046784	95% KM (BCA) UCL	15.369419
95% KM (t) UCL	14.547475	95% KM (Percentile Bootstrap) UCL	14.929846
95% KM (z) UCL	14.468443	95% KM Bootstrap t UCL	24.357417
90% KM Chebyshev UCL	19.112315	95% KM Chebyshev UCL	23.769047
97.5% KM Chebyshev UCL	30.232410	99% KM Chebyshev UCL	42.928435
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	3.6084749	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.8490779	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.1812130	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.1172860	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.3655857	k star (bias corrected MLE)	0.3591664
Theta hat (MLE)	24.517985	Theta star (bias corrected MLE)	24.956187
nu hat (MLE)	48.988478	nu star (bias corrected)	48.128298
Mean (detects)	8.9634238		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.0100000	Mean	8.8317558
Maximum	213.86780	Median	1.4870362
SD	28.255324	CV	3.1992873
k hat (MLE)	0.3558339	k star (bias corrected MLE)	0.3499392
Theta hat (MLE)	24.819885	Theta star (bias corrected MLE)	25.237969
nu hat (MLE)	48.393407	nu star (bias corrected)	47.591738
Adjusted Level of Significance (β)	0.0464706		
Approximate Chi Square Value (47.59, α)	32.758869	Adjusted Chi Square Value (47.59, β)	32.492418
95% Gamma Approximate UCL (use when n>=50)	12.830681	95% Gamma Adjusted UCL (use when n<50)	12.935898
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	8.8317902	SD (KM)	28.046784
Variance (KM)	786.62210	SE of Mean (KM)	3.4268417
k hat (KM)	0.0991588	k star (KM)	0.1045881
nu hat (KM)	13.485599	nu star (KM)	14.223980
theta hat (KM)	89.067119	theta star (KM)	84.443559
80% gamma percentile (KM)	6.5278787	90% gamma percentile (KM)	23.927959
95% gamma percentile (KM)	51.108634	99% gamma percentile (KM)	137.16231
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (14.22, α)	6.7249699	Adjusted Chi Square Value (14.22, β)	6.6130574
95% Gamma Approximate KM-UCL (use when n>=50)	18.680114	95% Gamma Adjusted KM-UCL (use when n<50)	18.996237

Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Approximate Test Statistic	0.9811815	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	0.6960155	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.0708694	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.1081342	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	8.8317452	Mean in Log Scale	0.2925857
SD in Original Scale	28.255328	SD in Log Scale	1.9731509
95% t UCL (assumes normality of ROS data)	14.546796	95% Percentile Bootstrap UCL	15.116702
95% BCA Bootstrap UCL	18.648208	95% Bootstrap t UCL	23.730462
95% H-UCL (Log ROS)	18.954641		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	0.2967731	KM Geo Mean	1.3455099
KM SD (logged)	1.9482305	95% Critical H Value (KM-Log)	2.8844821
KM Standard Error of Mean (logged)	0.2380408	95% H-UCL (KM -Log)	17.834271
KM SD (logged)	1.9482305	95% Critical H Value (KM-Log)	2.8844821
KM Standard Error of Mean (logged)	0.2380408		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	8.8316994	Mean in Log Scale	0.2865797
SD in Original Scale	28.255342	SD in Log Scale	1.9890692
95% t UCL (Assumes normality)	14.546753	95% H-Stat UCL	19.650168
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Lognormal Distributed at 5% Significance Level			
Suggested UCL to Use			
KM H-UCL	17.834271		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Chrysene_RSD_HIGH_HALF_ND			
General Statistics			
Total Number of Observations	68.000000	Number of Distinct Observations	63.000000
		Number of Missing Observations	0
Minimum	0.0358461	Mean	21.369842
Maximum	407.34231	Median	3.3957870
SD	59.550398	Std. Error of Mean	7.2215465
Coefficient of Variation	2.7866560	Skewness	4.9745250

Normal GOF Test			
Shapiro Wilk Test Statistic	0.3982725	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	0	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.3600777	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.1073545	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	33.414775	95% Adjusted-CLT UCL (Chen-1995)	37.903101
		95% Modified-t UCL (Johnson-1978)	34.140841
Gamma GOF Test			
A-D Test Statistic	3.0171016	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.8524485	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.1815432	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.1166090	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	0.3524986	k star (bias corrected MLE)	0.3467511
Theta hat (MLE)	60.623898	Theta star (bias corrected MLE)	61.628755
nu hat (MLE)	47.939815	nu star (bias corrected)	47.158156
MLE Mean (bias corrected)	21.369842	MLE Sd (bias corrected)	36.290450
		Approximate Chi Square Value (0.05)	32.398897
Adjusted Level of Significance	0.0464706	Adjusted Chi Square Value	32.134010
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	31.104835	95% Adjusted Gamma UCL (use when n<50)	31.361238
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.9809567	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk P Value	0.6823015	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.0593930	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.1073545	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	-3.328520	Mean of logged Data	1.1565589
Maximum of Logged Data	6.0096539	SD of logged Data	2.0464732
Assuming Lognormal Distribution			
95% H-UCL	54.448604	90% Chebyshev (MVUE) UCL	50.563009
95% Chebyshev (MVUE) UCL	62.763757	97.5% Chebyshev (MVUE) UCL	79.697922
99% Chebyshev (MVUE) UCL	112.96181		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			

Nonparametric Distribution Free UCLs			
95% CLT UCL	33.248228	95% Jackknife UCL	33.414775
95% Standard Bootstrap UCL	33.258394	95% Bootstrap-t UCL	47.881589
95% Hall's Bootstrap UCL	72.752130	95% Percentile Bootstrap UCL	34.429620
95% BCA Bootstrap UCL	40.152454		
90% Chebyshev(Mean, Sd) UCL	43.034481	95% Chebyshev(Mean, Sd) UCL	52.847833
97.5% Chebyshev(Mean, Sd) UCL	66.468385	99% Chebyshev(Mean, Sd) UCL	93.223322
Suggested UCL to Use			
95% Chebyshev (Mean, Sd) UCL	52.847833		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
BenzoAPyrene_RSD_HIGH_HALF_ND			
General Statistics			
Total Number of Observations	68.000000	Number of Distinct Observations	60.000000
Number of Detects	67.000000	Number of Non-Detects	1.0000000
Number of Distinct Detects	59.000000	Number of Distinct Non-Detects	1.0000000
Minimum Detect	0.0301026	Minimum Non-Detect	0.0083618
Maximum Detect	401.36736	Maximum Non-Detect	0.0083618
Variance Detects	3233.2459	Percent Non-Detects	1.4705882%
Mean Detects	18.388000	SD Detects	56.861638
Median Detects	2.7229230	CV Detects	3.0923232
Skewness Detects	5.3589687	Kurtosis Detects	32.634682
Mean of Logged Detects	0.9361085	SD of Logged Detects	1.9700213
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.3597705	**Normal GOF Test on Detected Observations Only**	
5% Shapiro Wilk P Value	0	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.3746700	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.1081342	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	18.117711	KM Standard Error of Mean	6.8499324
KM SD	56.062868	95% KM (BCA) UCL	31.265411
95% KM (t) UCL	29.542824	95% KM (Percentile Bootstrap) UCL	30.165819
95% KM (z) UCL	29.384847	95% KM Bootstrap t UCL	45.548725
90% KM Chebyshev UCL	38.667508	95% KM Chebyshev UCL	47.975874
97.5% KM Chebyshev UCL	60.895525	99% KM Chebyshev UCL	86.273678

Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	4.1294288	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.8548635	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.2245029	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.1176541	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.3417057	k star (bias corrected MLE)	0.3363557
Theta hat (MLE)	53.812392	Theta star (bias corrected MLE)	54.668321
nu hat (MLE)	45.788561	nu star (bias corrected)	45.071660
Mean (detects)	18.388000		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.0100000	Mean	18.117735
Maximum	401.36736	Median	2.7229230
SD	56.479690	CV	3.1173703
k hat (MLE)	0.3320910	k star (bias corrected MLE)	0.3272439
Theta hat (MLE)	54.556535	Theta star (bias corrected MLE)	55.364629
nu hat (MLE)	45.164378	nu star (bias corrected)	44.505165
Adjusted Level of Significance (β)	0.0464706		
Approximate Chi Square Value (44.51, α)	30.203941	Adjusted Chi Square Value (44.51, β)	29.948781
95% Gamma Approximate UCL (use when n>=50)	26.696278	95% Gamma Adjusted UCL (use when n<50)	26.923726
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	18.117711	SD (KM)	56.062868
Variance (KM)	3143.0451	SE of Mean (KM)	6.8499324
k hat (KM)	0.1044374	k star (KM)	0.1096338
nu hat (KM)	14.203486	nu star (KM)	14.910195
theta hat (KM)	173.47915	theta star (KM)	165.25664
80% gamma percentile (KM)	14.252403	90% gamma percentile (KM)	49.924573
95% gamma percentile (KM)	104.42496	99% gamma percentile (KM)	274.73021
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (14.91, α)	7.1991260	Adjusted Chi Square Value (14.91, β)	7.0828137
95% Gamma Approximate KM-UCL (use when n>=50)	37.523805	95% Gamma Adjusted KM-UCL (use when n<50)	38.140012
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Approximate Test Statistic	0.9797091	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	0.6317831	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.0769764	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.1081342	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			

Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	18.117785	Mean in Log Scale	0.8588801
SD in Original Scale	56.479674	SD in Log Scale	2.0563623
95% t UCL (assumes normality of ROS data)	29.541620	95% Percentile Bootstrap UCL	30.511402
95% BCA Bootstrap UCL	36.146348	95% Bootstrap t UCL	44.565274
95% H-UCL (Log ROS)	41.482765		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	0.8519881	KM Geo Mean	2.3443029
KM SD (logged)	2.0593556	95% Critical H Value (KM-Log)	2.9957963
KM Standard Error of Mean (logged)	0.2516184	95% H-UCL (KM -Log)	41.519956
KM SD (logged)	2.0593556	95% Critical H Value (KM-Log)	2.9957963
KM Standard Error of Mean (logged)	0.2516184		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	18.117650	Mean in Log Scale	0.8417947
SD in Original Scale	56.479718	SD in Log Scale	2.1042634
95% t UCL (Assumes normality)	29.541494	95% H-Stat UCL	46.215792
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Lognormal Distributed at 5% Significance Level			
Suggested UCL to Use			
KM H-UCL	41.519956		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
DibenzAHAnthracene_RSD_HIGH_HALF_ND			
General Statistics			
Total Number of Observations	68.000000	Number of Distinct Observations	63.000000
Number of Detects	63.000000	Number of Non-Detects	5.0000000
Number of Distinct Detects	59.000000	Number of Distinct Non-Detects	4.0000000
Minimum Detect	0.0344087	Minimum Non-Detect	0.0131081
Maximum Detect	83.563935	Maximum Non-Detect	0.0155658
Variance Detects	140.33408	Percent Non-Detects	7.3529412%
Mean Detects	4.3454270	SD Detects	11.846269
Median Detects	0.8847946	CV Detects	2.7261460
Skewness Detects	5.4081341	Kurtosis Detects	33.495288
Mean of Logged Detects	-0.164545	SD of Logged Detects	1.8633880

Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.3915140	**Normal GOF Test on Detected Observations Only**	
5% Shapiro Wilk P Value	0	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.3579613	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.1114317	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	4.0268741	KM Standard Error of Mean	1.3896393
KM SD	11.367949	95% KM (BCA) UCL	6.7740580
95% KM (t) UCL	6.3446758	95% KM (Percentile Bootstrap) UCL	6.5123658
95% KM (z) UCL	6.3126273	95% KM Bootstrap t UCL	9.5015800
90% KM Chebyshev UCL	8.1957919	95% KM Chebyshev UCL	10.084171
97.5% KM Chebyshev UCL	12.705169	99% KM Chebyshev UCL	17.853610
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	2.4479352	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.8395247	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.1613344	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.1202323	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.4024081	k star (bias corrected MLE)	0.3938278
Theta hat (MLE)	10.798557	Theta star (bias corrected MLE)	11.033824
nu hat (MLE)	50.703421	nu star (bias corrected)	49.622306
Mean (detects)	4.3454270		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.0100000	Mean	4.0266456
Maximum	83.563935	Median	0.7619065
SD	11.452551	CV	2.8441915
k hat (MLE)	0.3559436	k star (bias corrected MLE)	0.3500442
Theta hat (MLE)	11.312593	Theta star (bias corrected MLE)	11.503250
nu hat (MLE)	48.408336	nu star (bias corrected)	47.606007
Adjusted Level of Significance (β)	0.0464706		
Approximate Chi Square Value (47.61, α)	32.770722	Adjusted Chi Square Value (47.61, β)	32.504219
95% Gamma Approximate UCL (use when n>=50)	5.8495055	95% Gamma Adjusted UCL (use when n<50)	5.8974657

Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	4.0268741	SD (KM)	11.367949
Variance (KM)	129.23026	SE of Mean (KM)	1.3896393
k hat (KM)	0.1254792	k star (KM)	0.1297473
nu hat (KM)	17.065178	nu star (KM)	17.645635
theta hat (KM)	32.091953	theta star (KM)	31.036280
80% gamma percentile (KM)	3.8395709	90% gamma percentile (KM)	11.633248
95% gamma percentile (KM)	22.729634	99% gamma percentile (KM)	55.966727
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (17.65, α)	9.1352700	Adjusted Chi Square Value (17.65, β)	9.0023104
95% Gamma Approximate KM-UCL (use when n>=50)	7.7782871	95% Gamma Adjusted KM-UCL (use when n<50)	7.8931685
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Approximate Test Statistic	0.9648183	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	0.1641445	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.1059740	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.1114317	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	4.0267963	Mean in Log Scale	-0.479077
SD in Original Scale	11.452498	SD in Log Scale	2.1170350
95% t UCL (assumes normality of ROS data)	6.3432305	95% Percentile Bootstrap UCL	6.5264192
95% BCA Bootstrap UCL	7.8361275	95% Bootstrap t UCL	9.7746792
95% H-UCL (Log ROS)	12.755769		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-0.471161	KM Geo Mean	0.6242768
KM SD (logged)	2.0857646	95% Critical H Value (KM-Log)	3.0134358
KM Standard Error of Mean (logged)	0.2549678	95% H-UCL (KM -Log)	11.845161
KM SD (logged)	2.0857646	95% Critical H Value (KM-Log)	3.0134358
KM Standard Error of Mean (logged)	0.2549678		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	4.0264176	Mean in Log Scale	-0.518514
SD in Original Scale	11.452632	SD in Log Scale	2.1944662
95% t UCL (Assumes normality)	6.3428790	95% H-Stat UCL	15.047780
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Lognormal Distributed at 5% Significance Level			

Suggested UCL to Use			
KM H-UCL	11.845161		

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

BenzoAAnthracene_RSD_HIGH_HALF_ND

General Statistics			
Total Number of Observations	68.000000	Number of Distinct Observations	63.000000
Number of Detects	66.000000	Number of Non-Detects	2.0000000
Number of Distinct Detects	61.000000	Number of Distinct Non-Detects	2.0000000
Minimum Detect	0.0962002	Minimum Non-Detect	0.0219404
Maximum Detect	405.05349	Maximum Non-Detect	0.0236281
Variance Detects	3358.4136	Percent Non-Detects	2.9411765%
Mean Detects	18.755810	SD Detects	57.951821
Median Detects	2.4266203	CV Detects	3.0898064
Skewness Detects	5.3044755	Kurtosis Detects	31.882450
Mean of Logged Detects	0.9377314	SD of Logged Detects	1.9471417

Normal GOF Test on Detects Only		
Shapiro Wilk Test Statistic	0.3613072	**Normal GOF Test on Detected Observations Only**
5% Shapiro Wilk P Value	0	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.3737321	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.1089311	Detected Data Not Normal at 5% Significance Level
Detected Data Not Normal at 5% Significance Level		

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	18.204814	KM Standard Error of Mean	6.9343662
KM SD	56.747396	95% KM (BCA) UCL	31.450381
95% KM (t) UCL	29.770755	95% KM (Percentile Bootstrap) UCL	30.306068
95% KM (z) UCL	29.610831	95% KM Bootstrap t UCL	45.531593
90% KM Chebyshev UCL	39.007912	95% KM Chebyshev UCL	48.431015
97.5% KM Chebyshev UCL	61.509917	99% KM Chebyshev UCL	87.200886

Gamma GOF Tests on Detected Observations Only		
A-D Test Statistic	4.3486539	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.8553019	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.2377007	**Kolmogorov-Smirnov GOF**
5% K-S Critical Value	0.1185742	Detected Data Not Gamma Distributed at 5% Significance Level
Detected Data Not Gamma Distributed at 5% Significance Level		

Gamma Statistics on Detected Data Only			
k hat (MLE)	0.3390246	k star (bias corrected MLE)	0.3337154
Theta hat (MLE)	55.322852	Theta star (bias corrected MLE)	56.203003
nu hat (MLE)	44.751252	nu star (bias corrected)	44.050438
Mean (detects)	18.755810		

Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.0100000	Mean	18.204462
Maximum	405.05349	Median	2.2831993
SD	57.169429	CV	3.1404074
k hat (MLE)	0.3206913	k star (bias corrected MLE)	0.3163471
Theta hat (MLE)	56.766308	Theta star (bias corrected MLE)	57.545849
nu hat (MLE)	43.614020	nu star (bias corrected)	43.023205
Adjusted Level of Significance (β)	0.0464706		
Approximate Chi Square Value (43.02, α)	28.983851	Adjusted Chi Square Value (43.02, β)	28.734251
95% Gamma Approximate UCL (use when n>=50)	27.022438	95% Gamma Adjusted UCL (use when n<50)	27.257169
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	18.204814	SD (KM)	56.747396
Variance (KM)	3220.2670	SE of Mean (KM)	6.9343662
k hat (KM)	0.1029155	k star (KM)	0.1081790
nu hat (KM)	13.996502	nu star (KM)	14.712342
theta hat (KM)	176.89096	theta star (KM)	168.28419
80% gamma percentile (KM)	14.075848	90% gamma percentile (KM)	49.933126
95% gamma percentile (KM)	105.05564	99% gamma percentile (KM)	277.93468
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (14.71, α)	7.0618928	Adjusted Chi Square Value (14.71, β)	6.9468390
95% Gamma Approximate KM-UCL (use when n>=50)	37.926865	95% Gamma Adjusted KM-UCL (use when n<50)	38.555010
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Approximate Test Statistic	0.9596176	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	0.0790648	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.0866509	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.1089311	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	18.204768	Mean in Log Scale	0.7956807
SD in Original Scale	57.169330	SD in Log Scale	2.0866269
95% t UCL (assumes normality of ROS data)	29.768097	95% Percentile Bootstrap UCL	30.334360
95% BCA Bootstrap UCL	36.219196	95% Bootstrap t UCL	43.683184
95% H-UCL (Log ROS)	42.140797		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	0.7978150	KM Geo Mean	2.2206835
KM SD (logged)	2.0664275	95% Critical H Value (KM-Log)	3.0007093
KM Standard Error of Mean (logged)	0.2525114	95% H-UCL (KM -Log)	40.061601
KM SD (logged)	2.0664275	95% Critical H Value (KM-Log)	3.0007093
KM Standard Error of Mean (logged)	0.2525114		

DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	18.204503	Mean in Log Scale	0.7785182
SD in Original Scale	57.169416	SD in Log Scale	2.1277275
95% t UCL (Assumes normality)	29.767849	95% H-Stat UCL	46.141171
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Lognormal Distributed at 5% Significance Level			
Suggested UCL to Use			
KM H-UCL	40.061601		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Naphthalene_RSD_HIGH_HALF_ND			
General Statistics			
Total Number of Observations	68.000000	Number of Distinct Observations	61.000000
Number of Detects	61.000000	Number of Non-Detects	7.0000000
Number of Distinct Detects	54.000000	Number of Distinct Non-Detects	7.0000000
Minimum Detect	0.0050975	Minimum Non-Detect	0.0051544
Maximum Detect	87.624856	Maximum Non-Detect	0.0061603
Variance Detects	136.76517	Percent Non-Detects	10.294118%
Mean Detects	2.6164866	SD Detects	11.694664
Median Detects	0.0773160	CV Detects	4.4696060
Skewness Detects	6.7488513	Kurtosis Detects	48.531153
Mean of Logged Detects	-1.978439	SD of Logged Detects	2.1568546
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.2475611	**Normal GOF Test on Detected Observations Only**	
5% Shapiro Wilk P Value	0	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.4116520	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.1131977	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	2.3476671	KM Standard Error of Mean	1.3467096
KM SD	11.013849	95% KM (BCA) UCL	4.9506794
95% KM (t) UCL	4.5938658	95% KM (Percentile Bootstrap) UCL	4.7896279
95% KM (z) UCL	4.5628073	95% KM Bootstrap t UCL	12.425472
90% KM Chebyshev UCL	6.3877960	95% KM Chebyshev UCL	8.2178383
97.5% KM Chebyshev UCL	10.757866	99% KM Chebyshev UCL	15.747259

Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	7.2224576	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.8926150	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.2837353	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.1254149	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.2427243	k star (bias corrected MLE)	0.2417160
Theta hat (MLE)	10.779664	Theta star (bias corrected MLE)	10.824631
nu hat (MLE)	29.612366	nu star (bias corrected)	29.489354
Mean (detects)	2.6164866		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.0050975	Mean	2.3481718
Maximum	87.624856	Median	0.0614045
SD	11.095630	CV	4.7252206
k hat (MLE)	0.2317469	k star (bias corrected MLE)	0.2313267
Theta hat (MLE)	10.132483	Theta star (bias corrected MLE)	10.150889
nu hat (MLE)	31.517581	nu star (bias corrected)	31.460433
Adjusted Level of Significance (β)	0.0464706		
Approximate Chi Square Value (31.46, α)	19.644639	Adjusted Chi Square Value (31.46, β)	19.442150
95% Gamma Approximate UCL (use when n>=50)	3.7605426	95% Gamma Adjusted UCL (use when n<50)	3.7997083
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	2.3476671	SD (KM)	11.013849
Variance (KM)	121.30488	SE of Mean (KM)	1.3467096
k hat (KM)	0.0454354	k star (KM)	0.0532349
nu hat (KM)	6.1792203	nu star (KM)	7.2399410
theta hat (KM)	51.670391	theta star (KM)	44.100184
80% gamma percentile (KM)	0.3940494	90% gamma percentile (KM)	3.8749458
95% gamma percentile (KM)	12.750426	99% gamma percentile (KM)	49.797422
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (7.24, α)	2.3031765	Adjusted Chi Square Value (7.24, β)	2.2434624
95% Gamma Approximate KM-UCL (use when n>=50)	7.3797952	95% Gamma Adjusted KM-UCL (use when n<50)	7.5762229
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Approximate Test Statistic	0.9184271	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	4.1988E-4	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.1417747	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.1131977	Detected Data Not Lognormal at 5% Significance Level	
Detected Data Not Lognormal at 5% Significance Level			

Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	2.3473011	Mean in Log Scale	-2.441286
SD in Original Scale	11.095816	SD in Log Scale	2.4618474
95% t UCL (assumes normality of ROS data)	4.5915913	95% Percentile Bootstrap UCL	4.8377425
95% BCA Bootstrap UCL	6.6590485	95% Bootstrap t UCL	12.502990
95% H-UCL (Log ROS)	4.5171535		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-2.318203	KM Geo Mean	0.0984503
KM SD (logged)	2.2606856	95% Critical H Value (KM-Log)	3.0814935
KM Standard Error of Mean (logged)	0.2764235	95% H-UCL (KM -Log)	2.9689662
KM SD (logged)	2.2606856	95% Critical H Value (KM-Log)	3.0814935
KM Standard Error of Mean (logged)	0.2764235		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	2.3474321	Mean in Log Scale	-2.379538
SD in Original Scale	11.095788	SD in Log Scale	2.3641648
95% t UCL (Assumes normality)	4.5917166	95% H-Stat UCL	3.6885265
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution at 5% Significance Level			
Suggested UCL to Use			
95% KM (Chebyshev) UCL	8.2178383		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
2_Methylnaphthalene_RSD_HIGH_HALF_ND			
General Statistics			
Total Number of Observations	67.000000	Number of Distinct Observations	61.000000
		Number of Missing Observations	1.0000000
Number of Detects	59.000000	Number of Non-Detects	8.0000000
Number of Distinct Detects	53.000000	Number of Distinct Non-Detects	8.0000000
Minimum Detect	0.0034429	Minimum Non-Detect	0.0050965
Maximum Detect	39.885668	Maximum Non-Detect	0.0594800
Variance Detects	30.087762	Percent Non-Detects	11.940299%
Mean Detects	1.2920941	SD Detects	5.4852312
Median Detects	0.0502264	CV Detects	4.2452260
Skewness Detects	6.4144394	Kurtosis Detects	44.165314
Mean of Logged Detects	-2.542658	SD of Logged Detects	2.0796631

ProUCL Output
Central Landfill Area ISM Soil (0-2 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.2627864	**Normal GOF Test on Detected Observations Only**	
5% Shapiro Wilk P Value	0	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.4071311	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.1150504	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	1.1385269	KM Standard Error of Mean	0.6309449
KM SD	5.1205519	95% KM (BCA) UCL	2.3262054
95% KM (t) UCL	2.1911136	95% KM (Percentile Bootstrap) UCL	2.2931151
95% KM (z) UCL	2.1763389	95% KM Bootstrap t UCL	6.2240484
90% KM Chebyshev UCL	3.0313615	95% KM Chebyshev UCL	3.8887518
97.5% KM Chebyshev UCL	5.0787764	99% KM Chebyshev UCL	7.4163491
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	7.1674637	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.8869686	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.2828124	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.1271440	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.2532450	k star (bias corrected MLE)	0.2516676
Theta hat (MLE)	5.1021499	Theta star (bias corrected MLE)	5.1341298
nu hat (MLE)	29.882912	nu star (bias corrected)	29.696775
Mean (detects)	1.2920941		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.0034429	Mean	1.1390082
Maximum	39.885668	Median	0.0264706
SD	5.1590904	CV	4.5294586
k hat (MLE)	0.2442411	k star (bias corrected MLE)	0.2432552
Theta hat (MLE)	4.6634578	Theta star (bias corrected MLE)	4.6823589
nu hat (MLE)	32.728311	nu star (bias corrected)	32.596198
Adjusted Level of Significance (β)	0.0464179		
Approximate Chi Square Value (32.60, α)	20.545397	Adjusted Chi Square Value (32.60, β)	20.334759
95% Gamma Approximate UCL (use when n>=50)	1.8070878	95% Gamma Adjusted UCL (use when n<50)	1.8258066

Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	1.1385269	SD (KM)	5.1205519
Variance (KM)	26.220052	SE of Mean (KM)	0.6309449
k hat (KM)	0.0494371	k star (KM)	0.0571738
nu hat (KM)	6.6245726	nu star (KM)	7.6612833
theta hat (KM)	23.029804	theta star (KM)	19.913453
80% gamma percentile (KM)	0.2389163	90% gamma percentile (KM)	2.0374060
95% gamma percentile (KM)	6.3086473	99% gamma percentile (KM)	23.445450
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (7.66, α)	2.5404724	Adjusted Chi Square Value (7.66, β)	2.4761313
95% Gamma Approximate KM-UCL (use when n>=50)	3.4334470	95% Gamma Adjusted KM-UCL (use when n<50)	3.5226635
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Approximate Test Statistic	0.9110079	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	2.0828E-4	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.1644535	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.1150504	Detected Data Not Lognormal at 5% Significance Level	
Detected Data Not Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	1.1382150	Mean in Log Scale	-2.968812
SD in Original Scale	5.1592673	SD in Log Scale	2.2855952
95% t UCL (assumes normality of ROS data)	2.1897339	95% Percentile Bootstrap UCL	2.3163838
95% BCA Bootstrap UCL	3.1352592	95% Bootstrap t UCL	6.0789363
95% H-UCL (Log ROS)	1.6858783		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-2.878258	KM Geo Mean	0.0562326
KM SD (logged)	2.1463934	95% Critical H Value (KM-Log)	3.0786569
KM Standard Error of Mean (logged)	0.2649971	95% H-UCL (KM -Log)	1.2695142
KM SD (logged)	2.1463934	95% Critical H Value (KM-Log)	3.0786569
KM Standard Error of Mean (logged)	0.2649971		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	1.1385456	Mean in Log Scale	-2.907597
SD in Original Scale	5.1591943	SD in Log Scale	2.2075592
95% t UCL (Assumes normality)	2.1900496	95% H-Stat UCL	1.4518323
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution at 5% Significance Level			

Suggested UCL to Use			
95% KM (Chebyshev) UCL	3.8887518		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
BiphenylDiphenyl_RSD_HIGH_HALF_ND			
General Statistics			
Total Number of Observations	62.000000	Number of Distinct Observations	43.000000
		Number of Missing Observations	6.0000000
Number of Detects	19.000000	Number of Non-Detects	43.000000
Number of Distinct Detects	19.000000	Number of Distinct Non-Detects	24.000000
Minimum Detect	0.0025766	Minimum Non-Detect	0.0053145
Maximum Detect	14.072215	Maximum Non-Detect	1.1976359
Variance Detects	10.513058	Percent Non-Detects	69.354839%
Mean Detects	1.2330557	SD Detects	3.2423846
Median Detects	0.0943138	CV Detects	2.6295523
Skewness Detects	3.8336147	Kurtosis Detects	15.537800
Mean of Logged Detects	-2.107896	SD of Logged Detects	2.3822064
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.4230561	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.9010000	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.3794457	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.1965000	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.3828767	KM Standard Error of Mean	0.2396069
KM SD	1.8362629	95% KM (BCA) UCL	0.8357350
95% KM (t) UCL	0.7830728	95% KM (Percentile Bootstrap) UCL	0.8157096
95% KM (z) UCL	0.7769950	95% KM Bootstrap t UCL	2.0033673
90% KM Chebyshev UCL	1.1016974	95% KM Chebyshev UCL	1.4272990
97.5% KM Chebyshev UCL	1.8792213	99% KM Chebyshev UCL	2.7669352
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	1.0694978	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.8438214	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.2138383	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.2152393	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data follow Appr. Gamma Distribution at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.2979019	k star (bias corrected MLE)	0.2859525
Theta hat (MLE)	4.1391331	Theta star (bias corrected MLE)	4.3120998
nu hat (MLE)	11.320273	nu star (bias corrected)	10.866195
Mean (detects)	1.2330557		

Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.0025766	Mean	0.3848074
Maximum	14.072215	Median	0.0100000
SD	1.8507716	CV	4.8096050
k hat (MLE)	0.2467347	k star (bias corrected MLE)	0.2455487
Theta hat (MLE)	1.5595996	Theta star (bias corrected MLE)	1.5671330
nu hat (MLE)	30.595108	nu star (bias corrected)	30.448033
Adjusted Level of Significance (β)	0.0461290		
Approximate Chi Square Value (30.45, α)	18.845369	Adjusted Chi Square Value (30.45, β)	18.627673
95% Gamma Approximate UCL (use when n>=50)	0.6217246	95% Gamma Adjusted UCL (use when n<50)	0.6289905
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.3828767	SD (KM)	1.8362629
Variance (KM)	3.3718613	SE of Mean (KM)	0.2396069
k hat (KM)	0.0434759	k star (KM)	0.0521249
nu hat (KM)	5.3910077	nu star (KM)	6.4634858
theta hat (KM)	8.8066496	theta star (KM)	7.3453732
80% gamma percentile (KM)	0.0599331	90% gamma percentile (KM)	0.6160387
95% gamma percentile (KM)	2.0656098	99% gamma percentile (KM)	8.1911299
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (6.46, α)	1.8811235	Adjusted Chi Square Value (6.46, β)	1.8231895
95% Gamma Approximate KM-UCL (use when n>=50)	1.3155533	95% Gamma Adjusted KM-UCL (use when n<50)	1.3573566
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.9690140	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.9010000	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.1029349	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.1965000	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.3819191	Mean in Log Scale	-4.571116
SD in Original Scale	1.8513740	SD in Log Scale	2.3015043
95% t UCL (assumes normality of ROS data)	0.7746290	95% Percentile Bootstrap UCL	0.8204121
95% BCA Bootstrap UCL	1.1370977	95% Bootstrap t UCL	1.9887520
95% H-UCL (Log ROS)	0.3907093		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-4.378875	KM Geo Mean	0.0125395
KM SD (logged)	2.0492369	95% Critical H Value (KM-Log)	3.1570255
KM Standard Error of Mean (logged)	0.2993514	95% H-UCL (KM -Log)	0.2343697
KM SD (logged)	2.0492369	95% Critical H Value (KM-Log)	3.1570255
KM Standard Error of Mean (logged)	0.2993514		

DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.4043857	Mean in Log Scale	-3.405015
SD in Original Scale	1.8483732	SD in Log Scale	1.7367951
95% t UCL (Assumes normality)	0.7964591	95% H-Stat UCL	0.2787982
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Approximate Gamma Distributed at 5% Significance Level			
Suggested UCL to Use			
95% KM Approximate Gamma UCL	1.3155533		
When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test			
When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Cyanide_RSD_HIGH_HALF_ND			
General Statistics			
Total Number of Observations	68.000000	Number of Distinct Observations	60.000000
Number of Detects	66.000000	Number of Non-Detects	2.0000000
Number of Distinct Detects	58.000000	Number of Distinct Non-Detects	2.0000000
Minimum Detect	0.0225535	Minimum Non-Detect	0.0444437
Maximum Detect	40.658798	Maximum Non-Detect	0.1207981
Variance Detects	37.771437	Percent Non-Detects	2.9411765%
Mean Detects	2.2524310	SD Detects	6.1458471
Median Detects	0.4135981	CV Detects	2.7285396
Skewness Detects	4.9121257	Kurtosis Detects	26.531726
Mean of Logged Detects	-0.563148	SD of Logged Detects	1.4668791
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.3850651	**Normal GOF Test on Detected Observations Only**	
5% Shapiro Wilk P Value	0	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.3583672	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.1089311	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	2.1874804	KM Standard Error of Mean	0.7356661
KM SD	6.0203234	95% KM (BCA) UCL	3.5700468
95% KM (t) UCL	3.4145099	95% KM (Percentile Bootstrap) UCL	3.5318527
95% KM (z) UCL	3.3975436	95% KM Bootstrap t UCL	5.1617077
90% KM Chebyshev UCL	4.3944789	95% KM Chebyshev UCL	5.3941748
97.5% KM Chebyshev UCL	6.7817140	99% KM Chebyshev UCL	9.5072661

Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	5.6229271	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.8244346	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.2452258	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.1166028	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.4668714	k star (bias corrected MLE)	0.4557510
Theta hat (MLE)	4.8245216	Theta star (bias corrected MLE)	4.9422409
nu hat (MLE)	61.627021	nu star (bias corrected)	60.159126
Mean (detects)	2.2524310		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.0100000	Mean	2.1864771
Maximum	40.658798	Median	0.3925677
SD	6.0654448	CV	2.7740719
k hat (MLE)	0.4422201	k star (bias corrected MLE)	0.4325144
Theta hat (MLE)	4.9443183	Theta star (bias corrected MLE)	5.0552707
nu hat (MLE)	60.141940	nu star (bias corrected)	58.821952
Adjusted Level of Significance (β)	0.0464706		
Approximate Chi Square Value (58.82, α)	42.188376	Adjusted Chi Square Value (58.82, β)	41.883635
95% Gamma Approximate UCL (use when n>=50)	3.0485377	95% Gamma Adjusted UCL (use when n<50)	3.0707186
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	2.1874804	SD (KM)	6.0203234
Variance (KM)	36.244293	SE of Mean (KM)	0.7356661
k hat (KM)	0.1320227	k star (KM)	0.1360021
nu hat (KM)	17.955092	nu star (KM)	18.496289
theta hat (KM)	16.568968	theta star (KM)	16.084164
80% gamma percentile (KM)	2.1841130	90% gamma percentile (KM)	6.3818965
95% gamma percentile (KM)	12.254838	99% gamma percentile (KM)	29.658426
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (18.50, α)	9.7504838	Adjusted Chi Square Value (18.50, β)	9.6126039
95% Gamma Approximate KM-UCL (use when n>=50)	4.1495654	95% Gamma Adjusted KM-UCL (use when n<50)	4.2090853
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Approximate Test Statistic	0.9419529	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	0.0069100	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.1236450	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.1089311	Detected Data Not Lognormal at 5% Significance Level	
Detected Data Not Lognormal at 5% Significance Level			

Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	2.1870835	Mean in Log Scale	-0.651166
SD in Original Scale	6.0652253	SD in Log Scale	1.5333686
95% t UCL (assumes normality of ROS data)	3.4138635	95% Percentile Bootstrap UCL	3.5402924
95% BCA Bootstrap UCL	4.1427978	95% Bootstrap t UCL	5.2822601
95% H-UCL (Log ROS)	2.6476983		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-0.645072	KM Geo Mean	0.5246248
KM SD (logged)	1.5133832	95% Critical H Value (KM-Log)	2.3766062
KM Standard Error of Mean (logged)	0.1852258	95% H-UCL (KM -Log)	2.5587045
KM SD (logged)	1.5133832	95% Critical H Value (KM-Log)	2.3766062
KM Standard Error of Mean (logged)	0.1852258		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	2.1873980	Mean in Log Scale	-0.643842
SD in Original Scale	6.0651127	SD in Log Scale	1.5208714
95% t UCL (Assumes normality)	3.4141553	95% H-Stat UCL	2.6006492
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution at 5% Significance Level			
Suggested UCL to Use			
95% KM (Chebyshev) UCL	5.3941748		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Fluoride_RSD_HIGH_HALF_ND			
General Statistics			
Total Number of Observations	68.000000	Number of Distinct Observations	67.000000
		Number of Missing Observations	0
Minimum	21.376505	Mean	309.03517
Maximum	1218.2033	Median	110.73226
SD	332.29051	Std. Error of Mean	40.296143
Coefficient of Variation	1.0752514	Skewness	1.2342516
Normal GOF Test			
Shapiro Wilk Test Statistic	0.7753707	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	4.807E-14	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.2386141	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.1073545	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			

ProUCL Output
Central Landfill Area ISM Soil (0-2 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	376.24576	95% Adjusted-CLT UCL (Chen-1995)	381.76099
		95% Modified-t UCL (Johnson-1978)	377.25098
Gamma GOF Test			
A-D Test Statistic	2.5356945	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.7825475	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.2031875	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.1114308	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	0.9524227	k star (bias corrected MLE)	0.9202079
Theta hat (MLE)	324.47272	Theta star (bias corrected MLE)	335.83190
nu hat (MLE)	129.52948	nu star (bias corrected)	125.14828
MLE Mean (bias corrected)	309.03517	MLE Sd (bias corrected)	322.15504
		Approximate Chi Square Value (0.05)	100.31104
Adjusted Level of Significance	0.0464706	Adjusted Chi Square Value	99.831338
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	385.55298	95% Adjusted Gamma UCL (use when n<50)	387.40561
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.9167677	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk P Value	1.1855E-4	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.1664905	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.1073545	Data Not Lognormal at 5% Significance Level	
Data Not Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	3.0622924	Mean of logged Data	5.1238811
Maximum of Logged Data	7.1051323	SD of logged Data	1.1469305
Assuming Lognormal Distribution			
95% H-UCL	442.63778	90% Chebyshev (MVUE) UCL	483.96213
95% Chebyshev (MVUE) UCL	558.56888	97.5% Chebyshev (MVUE) UCL	662.12017
99% Chebyshev (MVUE) UCL	865.52661		
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution (0.05)			
Nonparametric Distribution Free UCLs			
95% CLT UCL	375.31643	95% Jackknife UCL	376.24576
95% Standard Bootstrap UCL	374.66644	95% Bootstrap-t UCL	385.41949
95% Hall's Bootstrap UCL	381.45056	95% Percentile Bootstrap UCL	374.46857
95% BCA Bootstrap UCL	378.82470		
90% Chebyshev(Mean, Sd) UCL	429.92360	95% Chebyshev(Mean, Sd) UCL	484.68199
97.5% Chebyshev(Mean, Sd) UCL	560.68451	99% Chebyshev(Mean, Sd) UCL	709.97674

Suggested UCL to Use			
95% Chebyshev (Mean, Sd) UCL	484.68199		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
ChromiumHexavalent_Estimated_RSD_HIGH_HALF_ND			
General Statistics			
Total Number of Observations	61.000000	Number of Distinct Observations	56.000000
		Number of Missing Observations	7.0000000
Minimum	0.3921958	Mean	0.6476716
Maximum	2.0447491	Median	0.5415182
SD	0.3169609	Std. Error of Mean	0.0405827
Coefficient of Variation	0.4893851	Skewness	2.5235252
Normal GOF Test			
Shapiro Wilk Test Statistic	0.6858531	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	1.110E-16	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.2934336	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.1131977	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	0.7154710	95% Adjusted-CLT UCL (Chen-1995)	0.7284350
		95% Modified-t UCL (Johnson-1978)	0.7176565
Gamma GOF Test			
A-D Test Statistic	4.6132707	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.7527175	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.2680733	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.1140846	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	6.5413158	k star (bias corrected MLE)	6.2305407
Theta hat (MLE)	0.0990124	Theta star (bias corrected MLE)	0.1039511
nu hat (MLE)	798.04052	nu star (bias corrected)	760.12596
MLE Mean (bias corrected)	0.6476716	MLE Sd (bias corrected)	0.2594729
		Approximate Chi Square Value (0.05)	697.14944
Adjusted Level of Significance	0.0460656	Adjusted Chi Square Value	695.70021
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	0.7061786	95% Adjusted Gamma UCL (use when n<50)	0.7076497

ProUCL Output
Central Landfill Area ISM Soil (0-2 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.8274701	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk P Value	2.0252E-9	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.2460166	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.1131977	Data Not Lognormal at 5% Significance Level	
Data Not Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	-0.935994	Mean of logged Data	-0.512752
Maximum of Logged Data	0.7152751	SD of logged Data	0.3641392
Assuming Lognormal Distribution			
95% H-UCL	0.6958423	90% Chebyshev (MVUE) UCL	0.7310765
95% Chebyshev (MVUE) UCL	0.7727139	97.5% Chebyshev (MVUE) UCL	0.8305049
99% Chebyshev (MVUE) UCL	0.9440243		
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution (0.05)			
Nonparametric Distribution Free UCLs			
95% CLT UCL	0.7144242	95% Jackknife UCL	0.7154710
95% Standard Bootstrap UCL	0.7140760	95% Bootstrap-t UCL	0.7380692
95% Hall's Bootstrap UCL	0.7336962	95% Percentile Bootstrap UCL	0.7182348
95% BCA Bootstrap UCL	0.7289976		
90% Chebyshev(Mean, Sd) UCL	0.7694197	95% Chebyshev(Mean, Sd) UCL	0.8245674
97.5% Chebyshev(Mean, Sd) UCL	0.9011104	99% Chebyshev(Mean, Sd) UCL	1.0514642
Suggested UCL to Use			
95% Student's-t UCL	0.7154710	or 95% Modified-t UCL	0.7176565
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			

Appendix G Interim Deliverable

MEMORANDUM

Date: February 28, 2019

To: Mike Cirian, USEPA

From: Laura Jensen, Roux

CC: John Stroiazzo, Glencore
Steve Wright, CFAC
Dick Sloan, MDEQ
Andrew Baris, Roux
Michael Ritorto, Roux
Tom Biksey, EHS Support, LLC

Subject: **Technical Memorandum to Support the Baseline Human Health Risk Assessment at the Columbia Falls Superfund Site**
Former Columbia Falls Aluminum Company Aluminum Reduction Facility
Columbia Falls, Montana

On behalf of Columbia Falls Aluminum Company, LLC (CFAC), Roux Environmental Engineering and Geology, D.P.C. (Roux) and EHS Support, LLC prepared the attached Technical Memorandum to Support the Baseline Human Health Risk Assessment (BHHRA) for the CFAC Superfund Site in Columbia Falls, Montana. This memorandum has been prepared as part of the ongoing Remedial Investigation/Feasibility Study (RI/FS) being conducted pursuant to the Administrative Settlement Agreement and Order on Consent (AOC) dated November 30, 2015 between CFAC and the United States Environmental Protection Agency (USEPA) (CERCLA Docket No. 08-2016-0002).

Should there be any questions or comments on this submission, please do not hesitate to contact me at (631) 230-2300.

Sincerely,

Laura Jensen

Laura Jensen, P.G. (NY)
Senior Hydrogeologist

MEMO

To: Andrew Baris, Roux Environmental Engineering and Geology D.P.C.

From: Tom Biksey, EHS Support LLC

CC: Chrissy Peterson, EHS Support LLC
Gary Long, EHS Support LLC
Michael Ritorto, Roux Environmental Engineering and Geology D.P.C.
Laura Jensen, Roux Environmental Engineering and Geology D.P.C.

Date: February 28, 2019

Re: Technical Memorandum to Support the Baseline Human Health Risk Assessment at the Columbia Falls Superfund Site
Former Columbia Falls Aluminum Company Aluminum Reduction Facility
Columbia Falls, Montana

Introduction

EHS Support, LLC ("EHS Support"), on behalf of Roux Environmental Engineering and Geology D.P.C. (referred to herein as Roux) and Columbia Falls Aluminum Company LLC (CFAC), is providing this Baseline Human Health Risk Assessment (BHHRA) Interim Deliverable as part of the ongoing Remedial Investigation/Feasibility Study (RI/FS) of the Superfund Site referred to as Anaconda Aluminum Co. Columbia Falls Reduction Plant (a/k/a Columbia Falls Aluminum Plant), located in Columbia Falls, Flathead County, Montana (Site; **Figure 1**). The RI/FS is being conducted pursuant to the Administrative Settlement Agreement and Order on Consent dated November 30, 2015, between CFAC and the United States Environmental Protection Agency (USEPA) (Comprehensive Environmental Response, Compensation, and Liability Act [CERCLA] Docket No. 08-2016-0002).

The following BHHRA Interim Deliverable was prepared to supplement the general risk assessment framework provided in the *Baseline Human Health Risk Assessment Work Plan* (BHHRA WP) submitted to USEPA and Montana Department of Environmental Quality (MDEQ) in November 2017, and revised in May 2018 (EHS Support, 2018). The BHHRA Interim Deliverable was submitted to the USEPA on August 30, 2018 and the USEPA provided comments on the Interim Deliverable on November 1, 2018. EHS Support/Roux responded to the comment letter and received verbal approval of responses on February 7, 2019. As specified in the BHHRA WP, this Interim Deliverable provides additional details regarding the overall approach and methodology for the following elements of the BHHRA:

- Selection of chemicals of potential concern (COPCs) in biota

- Calculation of exposure point concentrations (EPCs) for the applicable exposure scenarios, including an example calculation for one COPC per exposure area scenario for both point samples and incremental soil samples
- Risk Assessment Guidance for Superfund (RAGS) Volume I: Part D Table 4 series (i.e., the equations used to calculate uptake of COPCs, as well as the exposure assumptions used for each receptor and exposure pathway)
- RAGS Table 5 and 6 series (i.e., the non-cancer and cancer toxicity data for the COPCs evaluated in the BHHRA)

The following provides the technical approach and references the attached tables compiled for the relevant risk assessment sections that are included in this Interim Deliverable. Further evaluation of the appropriateness of exposure assumptions and model parameters presented in this Interim Deliverable may be warranted in the BHHRA to reduce uncertainty in exposure estimates used to characterize risk to receptors.

Hazard Assessment

Data Used in the Risk Assessment

The environmental data used in the BHHRA were managed in an electronic database and were compiled by constituent, medium, sample location, and sample depth, if applicable. The environmental media data collected within the human health exposure areas defined in the BHHRA Work Plan (**Figure 2**) during the Phase I Site Characterization were included in the BHHRA preliminary database. A final BHHRA database will be based on the data from all phases of site investigation. **Attachment A, Table A-1** through **Table A-12,** present the analytical fluoride data tables for each media by exposure area that is included in the Interim Deliverable.

For groundwater, three exposure areas were defined based on the following datasets:

- Plume Area Upper Hydrogeologic Unit – groundwater wells presented in Appendix 11a
- Western Undeveloped Area Upper Hydrogeologic Unit – groundwater wells presented in Appendix 11b
- Sitewide Below Upper Hydrogeologic Unit – groundwater wells presented in Appendix 11c

Selection of COPCs for Biota

The revised BHHRA Work Plan included a preliminary selection of COPCs in soils, groundwater, surface water, and sediments based upon the results of the Phase I Site Characterization. As discussed in the Work Plan, the selection of COPCs for these media will be finalized based on the evaluation of the combined results of the Phase I and Phase II Site Characterization programs. In addition, the revised BHHRA Work Plan specified that the final selection of COPCs will include the selection of COPCs for ingestion of game and fish; and, that the technical approach for the selection of COPCs in these biotas will be presented in an Interim Deliverable. The technical approach for the selection of COPCs in biota is provided below.

Consistent with the recommendations of the USEPA RSL guidance, the selection of COPCs will be based on a target hazard quotient (THQ) equal to 0.1 to address multiple chemicals that may have non-carcinogenic effects based on the same toxic endpoint and the same mode-of-action, and a target risk equal to 1 x 10^{-6} for carcinogenic effects. To select COPCs for the ingestion of fish exposure pathway, regional screening levels (RSLs) will be calculated using the USEPA RSL Calculator for Ingestion of Fish (USEPA, 2018) for COPCs detected in surface water samples collected in the applicable exposure areas. Consistent with USEPA and MDEQ guidance (MDEQ, 2017) on derivation of water quality standards, an annually normalized fish ingestion rate of 22 grams per day (g/day), or 22,000 milligrams per day (mg/day) will be used in the calculation of screening levels for fish ingestion. A target hazard quotient (THQ) of 0.1 will also be used in the calculation to account for the potential of multiple COPCs with the same toxicological endpoint.

The concentration of a COPC in fish tissue will be determined by applying a bioconcentration factor (BCF) to the maximum surface water concentration using **Equation 1**:

$$C_{fish} = C_{sw} * BCF * CF \qquad \textbf{Equation 1}$$

Where:

- C_{fish} = concentration of COPC in fish (milligrams COPC per kilogram wet weight [mg/kg])
- C_{sw} = concentration of COPC in surface water (micrograms per liter [µ/L])
- BCF = bioconcentration factor (liter per kilogram fish tissue)
- CF = conversion factor (0.001 milligrams per micrograms [mg/µg])

The source of the BCF is the Oak Ridge National Laboratory (ORNL) Risk Assessment Information System (ORNL, 2018).

There currently are no RSLs for the selection of COPCs for the ingestion of the game tissue exposure pathway. Therefore, the residential soil RSLs will be used as a conservative method to select potential COPCs for the exposure of recreational trespasser – hunters – to game tissue affected by Site environmental media.

Exposure Assessment Exposure Point Concentrations

As specified in the revised BHHRA Work Plan, the overall approach and methodology for calculation of the EPCs for the applicable exposure scenarios, including an example calculation for one COPC per exposure area scenario, will be submitted in an Interim Deliverable for USEPA review and comment before completing the BHHRA. In addition, the approach and methodology for calculation of EPCs for Incremental Sampling Methodology (ISM) samples, and an example calculation of one COPC, will be included in the Interim Deliverable. This information is provided below and in **Tables 3-1** through **3-41**. In addition, this section provides the methodology to calculate EPCs for inhalation of fugitive dust by a recreationist/trespasser all-terrain vehicle (ATV) rider; and to calculate EPCs consumption of game tissue by recreationist/trespasser hunters.

As specified in the revised BHHRA WP, the EPC for each environmental media and exposure pathway will be the upper confidence limit (UCL) except as noted differently below. The EPCs will be calculated separately for discrete versus ISM samples for each applicable exposure area. For discrete samples, the

95 percent UCL of the arithmetic mean will be calculated using ProUCL Version 5.1 that was developed for the USEPA (2016) and will be dependent on the distribution of the data. Consistent with the Interstate Technology and Regulatory Council (ITRC) (2012), UCL_{mean} concentrations to estimate EPCs for ISM multiple decision units will be calculated using the Chebyshev UCL or Student's t UCL methods. If the 95 percent UCL of the arithmetic mean exceeds the maximum detected concentration of a COPC, the recommendation provided by the ProUCL software and guidance will be used to develop the EPC. In addition, if a sufficient number of data points (i.e., 10 or greater) are not available for the exposure scenario, the maximum detected concentration will be selected as the EPC if ProUCL software and guidance does not provide a recommendation. Recommendations provided by the ProUCL software for the evaluation of sample results qualified as below the detection level (non-detect) will be followed.

The EPCs for fluoride as the example COPC for each exposure media and receptor were calculated based upon the technical approach outlined above. **Attachment A, Table A-1** through **Table A-12,** presents the analytical fluoride data tables for each media by exposure area that was imported into ProUCL for use in the calculations of the EPCs. The ProUCL outputs are included in **Attachment B**. **Table 3-1** through **Table 3-41** present the calculated EPCs for one example COPC (fluoride) for each exposure media and receptor.

Equation 1 was used to calculate an EPC for fish tissue; however, the BCF was applied to the 95 percent UCL of the arithmetic mean of surface water data rather than the maximum concentration used for selection of COPCs.

The method for calculation of the EPC for fugitive dust generation and game tissue are provided below.

Fugitive Dust Generation

The calculation of an EPC for inhalation of fugitive dust while riding an ATV requires that a particulate emission factor (PEF) be estimated that describes the amount of respirable dust that is in the air. The amount of dust generated is dependent on a number of factors including speed, type and weight of the vehicle, and the type of soil. The PEFs used in the BHHRA were recommended by the USEPA from an ATV activity-based sampling (ABS) study at the Nelson Tunnel Superfund Site in Colorado that were representative of a mountain west soil condition. The ATV ABS study generated three chemical-specific PEF values:

- arsenic – 6.7×10^{-6} kg/m^3 ($1.49 \times 10^{+5}$ m^3/kg)
- lead – 8.5×10^{-6} kg/m^3 ($1.18 \times 10^{+5}$ m^3/kg)
- manganese – 5.2×10^{-6} kg/m^3 ($1.92 \times 10^{+5}$ m^3/kg)

As a conservative measure, for chemicals without a specific ATV ABS PEF, the largest PEF of the three chemical-specific PEFs generated through the Nelson Tunnel study was used.

The analytical data used to develop the EPC included sampling locations located in the Western Undeveloped Area and North-Central Undeveloped Area where recreational trespasser-ATV use observations (i.e., ATV trails) were noted (CFAC personal communication) (**Figure 2**), and the Central Landfill area that did not have ATV observations, but where ATV use is assumed. The 95 percent UCL of the arithmetic mean of the soil concentrations within the three areas were used for the EPCs for fugitive dust exposure because of the limited soil data, limited sampling locations along the observed trails in



the Western Undeveloped Area and North-Central Undeveloped Area, the lack of an observed trail in the Central Landfill area, and the assumption that ATVs will stray from the established ATV trails,. The calculation of an EPC for the recreational trespasser-ATV for the three exposure areas with ATV usage on the Site included the summation of the EPCs for each exposure area weighted by the area of the exposure area. **Table 3-33** provides an example calculation of the EPC with fluoride as the example COPC.

Game Tissue

The white-tailed deer was used as the example game species to estimate the EPC for a recreationist trespasser-hunter. Data specific to deer to estimate COPC concentrations in venison were not identified in the literature, but the following assumptions were used to estimate an EPC for the hunter exposure pathway:

- Deer are ruminants and, as such, are not unlike cattle; thus, it is reasonable to assume they may have similar physiological processes that could yield similar biotransfer factors. Unlike beef, however, deer meat does not undergo marbling with fat, and deer fat is quite unpalatable and likely to be trimmed rather than consumed. Therefore, the biotransfer factors for edible venison are derived by adjusting biotransfer factors for beef to account for differences in the fat content of table-ready beef. Based on data in the United States Department of Agriculture's (USDA) Food Composition Databases (USDA, 2018), a representative value for the lipid content of a strip steak was 14.6 percent, compared with 2.2 percent for ground venison (USDA, 2018).
- Transfer of COPC concentration from soil is considered; although other complete pathways may contribute to the total tissue concentration of a given contaminant in the deer (e.g., ingestion of surface water), they are likely to be negligible compared with the contributions from soil pathways.
- Bioavailability of the contaminant in soil is assumed to be 100 percent. However, estimates of site-specific bioavailability may be incorporated in the refined exposure evaluation in the BHHRA to address the potential uncertainty associated with the magnitude of exposure.

To reflect the assumptions previously noted, venison biotransfer factors were estimated by multiplying beef biotransfer factors by 2.2/14.6 (or 0.2, rounded). Thus:

$$Bv = 0.2(Bb) \qquad \textbf{Equation 2}$$

Where:

- Bv = biotransfer factor for venison (Days per kilogram tissue wet weight [D/kg tissue WW])
- 0.2 = factor to reflect differences in fat content between beef and venison (0.2, unitless, see above)
- Bb = biotransfer factor for beef (D/kg tissue WW)

For organic compounds, biotransfer to beef factors may be estimated using the following model by Research Triangle Institute (RTI) (2005) and recommended by USEPA (2005):

$$Log\ Bb = -0.099\ x \log(Kow)^2 + 1.07\ x \log(Kow) - 3.56 \qquad \textbf{Equation 3}$$



Where:

- Bb = biotransfer factor for beef (D/kg tissue WW, calculated)
- K_{ow} = octanol/water partition coefficient (unitless)

Equation 3 is appropriate for organic chemicals lacking empirical biotransfer data and having a log K_{ow} below 8.2.

Values for inorganic Bb values will be obtained from ingestion-to-beef parameters presented in Baes et al. (1984) or IAEA (1994), which are representative of the fraction of the daily elemental intake in feed that is transferred and remains in a kilogram of beef until slaughter. The Bb value for fluoride (fluorine) in this reference is 0.15 D/kg tissue WW (Baes et al., 1984).

Deer are assumed to be exposed to COPCs by ingesting browse growing on affected soil. It is estimated that deer consume approximately 1.74 kg of browse per day (Sample and Suter, 1994), which is approximately 50 percent dry matter (DM), or 0.87 kg browse DM per day (Mautz et al., 1976). The COPC concentration in browse is estimated from **Equation 4**, which was originally developed for estimating the contaminant concentration in forage to which cattle may be exposed (USEPA, 1994):

$$Cp = (Cs)(BAFplant) \qquad \textbf{Equation 4}$$

Where:

- Cp = concentration of contaminant in (plant) forage (mg/kg plant tissue dry weight [DW], calculated)
- Cs = concentration of contaminant in soil (mg/kg soil DW)
- BAFplant = soil-to-plant biotransfer factor (mg/kg plant DW per mg/kg soil DW, simplified to kg soil/kg plant)

The soil-to-plant bioaccumulation factors obtained from the literature and used to estimate plant tissue COPC concentrations was used for the BAFplant input variable in the venison model. BAFplant values for some inorganic COPCs will be obtained from Baes et al. (1984), which presents plant uptake factors for elemental constituents in both vegetative and reproductive portions of the plant. Because deer browse year-round, and the vegetative parts are more available for the greater part of the year, BAFplant values for the vegetative parts will be used. The use of the vegetative BAFplant is because the translocation of nutrients and elements tends to be greater to the vegetative portion of plants. The vegetative BAFplant for fluoride (fluorine) as presented in Baes et al. (1984) is 0.06.

The concentration of a COPC in venison can be estimated from **Equation 5** (adapted from USEPA [1994]), which includes contributions from both ingestion of browse and incidental soil ingestion by the deer. The soil ingestion rate for deer is assumed to be equal to two percent of its diet (Beyer et al., 1994):

$$Cv = [(FIRbrowse)(Cp)(Bv) + (SIR)(Cs)(Bv)] \qquad \textbf{Equation 5}$$

Where:

- Cv = contamination concentration in venison (mg/kg WW, calculated)
- FIRbrowse = browse ingestion rate (0.87 kg DW/day)

- Cp = contamination concentration in browse DW (mg/kg)
- Bv = biotransfer factor for venison (D/kg tissue WW)
- SIR = soil ingestion rate (estimated as 2 percent of the browse ingestion rate)
- Cs = concentration in soil (mg/kg soil DW)

An area use factor (AUF) was used as an additional adjustment in the calculation of the EPC concentration in venison. As opposed to cattle, which forage in a single location or area, deer are wide-ranging species that may only be exposed to soil in the affected Site for a fraction of their daily activities. The AUF is simply a ratio of the size of the Site to the size of a deer's home range. The home range of a deer is assumed to be the upper bound of the foraging range presented in Sample and Suter (1994). The example includes a hypothetical deer foraging randomly with the terrestrial exposure areas of the CFAC facility (excluding Flathead River and the Backwater Seep Sampling Area). The AUF-adjusted COPC tissue concentrations are used to calculate the Site-wide venison concentration based on the (spatially weighted) deer tissue concentrations at each individual exposure area. The spatial weighting was based on Geographic Information System (GIS) aerial mapping of the Site exposure areas versus Site vegetative habitat and was adjusted to take into account portions of the facility that do not support foraging habitat for the deer. For example, the spatial footprint of a paved parking lot would be excluded from the AUF calculations, and any soil samples from that area may be excluded from the soil exposure point concentration for the venison model, due to the lack of vegetation for browsing. **Table C-1** (**Attachment C**) presents the venison COPC uptake model and AUF EPC for assessing the hunter exposure scenario. Seasonal use may also be considered in the calculation of the AUF to estimate the exposure duration for receptors that may only be present seasonally at the Site. Seasonal use will initially be assumed to be 100 percent; however, estimates of seasonal use may be incorporated into the AUF for the refined exposure evaluation in the BHHRA to address the potential uncertainty associated with the duration of exposure for seasonal receptors at the Site.

Fish Tissue

A typical fish meal is assumed to be 8 ounces per day of uncooked fish, which is measured as wet weight (i.e., as calculated in **Equation 1**). To address intake rates based on what individuals actually consumed, USEPA (2011) estimated net cooking loss for various foods (see Table 13-69; USEPA 2011) based on dripping and volatile losses during cooking, and losses from cutting, shrinkage, excess fat, bones, scraps, and juices. The equation used to convert the C_{fish} intake rate to reflect actual consumption will be added to the exposure tables.

The following is the equation to convert the C_{fish} intake rate (see Equation. 13-3; USEPA 2011):

$$IA = 1 \times (1 - L1) \times (1 - L2) \qquad \textbf{Equation 6}$$

where:

- IA = the adjusted intake rate
- I = the wet weight intake rate
- L1 = the cooking or preparation loss (31.5 percent; USEPA 2011)
- L2 = the post-cooking loss (10.5 percent; USEPA 2011).

Exposure Equations and Assumptions

The equations that will be used to calculate uptake of COPCs, as well as the RME-based exposure assumptions for each receptor and exposure pathway, are presented in **Table 4-1** through **Table 4-6**. Site-specific exposure assumptions for the workers (i.e., industrial, stormwater, and construction), recreationists (i.e., boater, floater, hunter, ATV rider, and fisher), and trespasser will be used in place of default exposure assumptions. Where applicable (i.e., selected COPCs that are mutagenic), the equations from the USEPA (2018) RSL guidance document (e.g. See Section 4.1.1.4 for residential soil equations, USEPA 2018) will be used to address COPCs with a mutagenic mode of action. The equations used will be presented in the BHHRA with the other exposure equations. In addition, where applicable, the time-weighted average calculation methodology will be added for receptors with risk summed for the cancer risk methodology.

The site-specific assumptions are based on factors such as type of recreation anticipated (e.g., hunting, fishing, boating, floating), Site features (e.g., accessibility, vegetation), security measures (e.g., posted) in place, and proximity to residential properties. These exposure assumptions are representative of an RME scenario. In addition, the MDEQ has determined that there was no location in Montana for which climate data were available that did not have a minimum of 4 months of an average snow depth with at least 2 inches, or an average temperature at or below freezing, or both (MDEQ, 2016). However, MDEQ calculated the exposure frequencies using 75 percent of the typical exposure frequency (e.g., for residents, 75 percent of 365 days equaled 270 days of exposure to soils). Therefore, this same conservative exposure frequency assumption (i.e., 75 percent) for surface soil and dust exposure (ingestion, dermal, and inhalation) was used. Other exposure assumptions (e.g., body weight, skin surface area) are based upon the type of receptor and use and were provided in the default guidance documents referenced in the BHHRA Work Plan and listed in the reference section herein. The Montana Fish, Wildlife, and Parks website (e.g., Hunter access guide https://myfwp.mt.gov/fwpPub/hunterAccessGuide) was searched for site-specific information on hunting and fishing seasons, recreational fish and game species, breeding and foraging habitat requirements, creel and bag limits, harvest reports, and distribution and population statistics. Interviews were also conducted with the following individuals:

- Steve Wright, Health and Safety Coordinator, Columbia Falls Aluminum Company LLC – Mr. Wright provided observational information on the activities of recreational trespassers that engage in hunting and ATV riding.
- Rich Birdsell, Owner of Northern Rockies Outfitters, Kalispell, Montana – Mr. Birdsell provided local knowledge regarding recreational and fishing use of the Flathead River near the CFAC Site.
- Kristy Personett, Montana Fish, Wildlife, and Parks, Region 1 – Ms. Personett manages CFAC's Block Management Program (BMP) that provides managed hunting on their land south of the Flathead River; she provided local information on hunting in this area.

The following presents a discussion on Site-specific exposure assumptions that will be used in the BHHRA:

- A stormwater management worker is anticipated to conduct an inspection of the North Percolation Pond and Central Landfill areas once per week for approximately 1 hour per inspection (Steve Wright, personal communication). Consistent with the MDEQ exposure frequency surface soil recommendations, the stormwater management worker is assumed to be exposed to soils 8 months of the year or 38 weeks; therefore, the exposure frequency is 38 days

per year for this receptor. The same exposure frequency is assumed for surface water and sediment.

- The reasonable maximum exposure for the recreationist (i.e., boater and floater) receptor is an exposure frequency of 10 days per year for 1 hour per lunch visit to the Backwater Seep Sampling Area (Rich Birdsell, personal communication). An adolescent recreationist is considered to be 6 to 16 years old; therefore, the exposure duration for the adolescent recreationist is 10 years. An exposure duration of 20 years is assumed for the adult recreationist. For the purposes of dermal exposure, the surface area is assumed to be whole body and is based on USEPA defaults for the adolescent and adult floaters and the exposure time is assumed to be 1 hour per visit.
- The fisher has an estimated exposure frequency of 10 days per year for 20 years and an exposure time of 1 hour per lunch visit to the Backwater Seep Sampling Area (Rich Birdsell, personal communication). Additionally, a fisher is conservatively assumed to keep 2 fish per day of fishing to consume that corresponds to 2 fish meals. A typical meal is assumed to be 8 ounces per day, or 227 grams per day of fish. Therefore, the fish ingestion rate, normalized for one year, of 12,971 milligrams per day is assumed for this receptor.
- Because of the migratory nature of the fish caught by the fisher, and the lack of spawning areas along the reach of the Flathead River adjacent to the Site, the fish are not expected to be exposed to the surface waters within the Backwater Seep Sampling Area except for incidental incursions (Rich Birdsell, personal communication). Therefore, a migration ratio (MR) of 10 percent was applied to the relative percentage of time the fish would be exposed to COPCs within the Backwater Seep Sampling Area. This is a conservative migration ratio given the small surface water habitat within the Backwater Seep Sampling Area and the migratory nature of the fish species.
- The trespasser is an adolescent from 6 to 16 years of age and is assumed to access the Site 7 days per year (Steve Wright, personal communication).
- The recreationist trespasser – hunter is assumed to access the Site 14 days per hunting season (Rich Birdsell, personal communication); for deer, the hunting season is September through November, and one deer is bagged for home consumption. The average weight of dressed deer is approximately 63 kg (average buck and doe, MDEQ website), and approximately 50 percent is edible venison. Therefore, the venison ingestion rate, normalized for one year, is 0.086 kg/day.
- The recreationist trespasser – ATV rider is assumed to access the Site two days per month (Steve Wright, personal communication).

The PEF for the industrial worker, stormwater management worker, hunter, floater, fisher, resident, and trespasser have the same PEF ($1.36 \times 10^{+9}$ m^3/kg). The level of surficial soil disturbance and dust releases for the latter receptor is expected to be greater for the construction worker. Therefore, a construction worker specific PEF for unpaved road traffic of $1.3 \times 10^{+6}$ m^3/kg was calculated using the default assumptions from USEPA (2002) of 20 cars (2 tons/car) and 10 trucks (20 tons/truck), a site-specific number of days with at least 0.01 inches of rainfall (USEPA Exhibit 5-2) of 120, and the remaining default exposure assumptions in the USEPA RSL calculator (November, 2018). The ATV ABS PEF discussed above, and the other chemical-specific properties will be presented in **Table 4-7**; the data for fluoride is included as an example.

Toxicological Assessment

Table 5-1 and **Table 5-2** present the reference doses (RfDs) and reference concentrations (RfCs) selected for all the COPCs that were initially selected in the BHRRA Work Plan, and their target organs. **Table 6-1** and **Table 6-2** present the cancer slope factors (CSFs) and unit risk factors (URFs) for all the COPCs that were initially selected in the BHRRA Work Plan. These tables also include the toxicological data references. The tables will be updated to reflect additional COPCs, if any, based upon the re-screening of the entire RI data set following the completion of Phase II Site Characterization.

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Tables

Table 3-1
Exposure Point Concentration Summary (Main Plant Area - Soil 0-0.5 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Scenario Timeframe: Current
Medium: Main Plant Area Soil
Exposure Medium: Surface Soil (0 to 0.5 ft-bgs)

Exposure Point	CAS Number	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution)	Maximum Concentration (Qualifier)	Exposure Point Concentration			
							Value	Units	Statistic	Rationale
Suface Soil 0-0.5 ft-bgs	16984-48-8	Fluoride	mg/kg	76.55	129.1 NP	571	129.1	mg/kg	95% UCL	95% Chebyshev(Mean, Sd) UCL

Footnotes:
a/ mg/kg = milligrams per kilogram
b/ NA = not applicable
c/ NP = non-parametric
CAS = Chemical Abstracts Service
UCL = upper confidence limit

Table 3-2
Exposure Point Concentration Summary (Main Plant Area - Soil 0-12 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Scenario Timeframe: Future
Medium: Main Plant Area Soil
Exposure Medium: Subsurface Soil (0 to 12 ft-bgs)

Exposure Point	CAS Number	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution)	Maximum Concentration (Qualifier)	Exposure Point Concentration			
							Value	Units	Statistic	Rationale
Subsurface Soil 0-12 ft-bgs	16984-48-8	Fluoride	mg/kg	52.97	73.91 L	571	73.91	mg/kg	UCL	95% H-UCL (KM-Log)

Footnotes:
a/ mg/kg = milligrams per kilogram
b/ NA = not applicable
CAS = Chemical Abstracts Service
UCL = upper confidence limit

Table 3-3
Exposure Point Concentration Summary (North Percolation Pond Area - Soil 0-0.5 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Scenario Timeframe: Current
Medium: North Percolation Pond Area Soil
Exposure Medium: Surface Soil (0 to 0.5 ft-bgs)

Exposure Point	CAS Number	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution)	Maximum Concentration (Qualifier)	Exposure Point Concentration			
							Value	Units	Statistic	Rationale
Surface Soil 0-0.5 ft-bgs	16984-48-8	Fluoride	mg/kg	NA	NA	241	241	mg/kg	Maximum	Not enough data to perform statistics

Footnotes:
a/ mg/kg = milligrams per kilogram
b/ NA = not applicable
CAS = Chemical Abstracts Service
UCL = upper confidence limit

Table 3-4
Exposure Point Concentration Summary (North Percolation Pond Area - Soil 0-2 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Scenario Timeframe: Current
Medium: North Percolation Pond Area Soil
Exposure Medium: Surface Soil (0 to 2 ft-bgs)

Exposure Point	CAS Number	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution)	Maximum Concentration (Qualifier)	Exposure Point Concentration			
							Value	Units	Statistic	Rationale
Surface Soil 0-2 ft-bgs	16984-48-8	Fluoride	mg/kg	106.7	138.1 N	258	138.1	mg/kg	95% UCL	95% Student's-t UCL

Footnotes:
a/ mg/kg = milligrams per kilogram
b/ NA = not applicable
c/ N = normal
CAS = Chemical Abstracts Service
UCL = upper confidence limit

Table 3-5
Exposure Point Concentration Summary (North Percolation Pond Area - Soil 0-2 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Scenario Timeframe: Future
Medium: North Percolation Pond Area Soil
Exposure Medium: Subsurface Soil (0 to 12 ft-bgs)

Exposure Point	CAS Number	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution)	Maximum Concentration (Qualifier)	Exposure Point Concentration			
							Value	Units	Statistic	Rationale
Suburface Soil 0-12 ft-bgs	16984-48-8	Fluoride	mg/kg	78.85	116.2 G	258	116.2	mg/kg	95% UCL	95% Adjusted Gamma UCL (n<50)

Footnotes:
a/ mg/kg = milligrams per kilogram
b/ NA = not applicable
c/ G = gamma
CAS = Chemical Abstracts Service
UCL = upper confidence limit

Table 3-6
Exposure Point Concentration Summary (North Percolation Pond Area - Surface Water)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Scenario Timeframe: Current
Medium: North Percolation Pond Area Surface Water
Exposure Medium: Surface Water

Exposure Point	CAS Number	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution)	Maximum Concentration (Qualifier)	Exposure Point Concentration			
							Value	Units	Statistic	Rationale
Surface Water	16984-48-8	Fluoride	µg/l	NA	NA	22400	22400	µg/l	Maximum	Not enough data to perform statistics

Footnotes:
a/ µg/l = milligrams per liter
b/ NA = not applicable
CAS = Chemical Abstracts Service
UCL = upper confidence limit

Table 3-7
Exposure Point Concentration Summary (North Percolation Pond Area - Sediment)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Scenario Timeframe: Current
Medium: North Percolation Pond Area Sediment
Exposure Medium: Sediment

Exposure Point	CAS Number	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution)	Maximum Concentration (Qualifier)	Exposure Point Concentration			
							Value	Units	Statistic	Rationale
Sediment	16984-48-8	Fluoride	mg/kg	NA	NA	219	219	mg/kg	Maximum	Not enough data to perform statistics

Footnotes:
a/ mg/kg = milligrams per kilogram
b/ NA = not applicable
CAS = Chemical Abstracts Service
UCL = upper confidence limit

Table 3-8
Exposure Point Concentration Summary (Central Landfill Area - Soil 0-0.5 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Scenario Timeframe: Current
Medium: Central Landfill Area Soil
Exposure Medium: Surface Soil (0 to 0.5 ft-bgs)

Exposure Point	CAS Number	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution)	Maximum Concentration (Qualifier)	Exposure Point Concentration			
							Value	Units	Statistic	Rationale
Surface Soil 0-0.5 ft-bgs	16984-48-8	Fluoride	mg/kg	63.1	84.92 G	210	84.92	mg/kg	95% UCL	95% Adjusted Gamma UCL (n<50)

Footnotes:
a/ mg/kg = milligrams per kilogram
b/ NA = not applicable
c/ G = gamma
CAS = Chemical Abstracts Service
UCL = upper confidence limit

Table 3-9
Exposure Point Concentration Summary (Central Landfill Area - Soil 0-2 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Scenario Timeframe: Current
Medium: Central Landfill Area Soil
Exposure Medium: Surface Soil (0 to 2 ft-bgs)

Exposure Point	CAS Number	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution)	Maximum Concentration (Qualifier)	Exposure Point Concentration			
							Value	Units	Statistic	Rationale
Surface Soil 0-2 ft-bgs	16984-48-8	Fluoride	mg/kg	58.44	70.94 G	210	70.94	mg/kg	95% UCL	95% Adjusted Gamma UCL (n>50)

Footnotes:
a/ mg/kg = milligrams per kilogram
b/ NA = not applicable
c/ G = gamma
CAS = Chemical Abstracts Service
UCL = upper confidence limit

Table 3-10
Exposure Point Concentration Summary (Central Landfill Area - Soil 0-12 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Scenario Timeframe: Future
Medium: Central Landfill Area Soil
Exposure Medium: Subsurface Soil (0 to 12 ft-bgs)

Exposure Point	CAS Number	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution)	Maximum Concentration (Qualifier)	Exposure Point Concentration			
							Value	Units	Statistic	Rationale
Subsurface Soil 0-12 ft-bgs	16984-48-8	Fluoride	mg/kg	43.9	53.5 G	210	53.5	mg/kg	95% UCL	95% Adjusted Gamma UCL (n>50)

Footnotes:
a/ mg/kg = milligrams per kilogram
b/ NA = not applicable
c/ G = gamma
CAS = Chemical Abstracts Service
UCL = upper confidence limit

Table 3-11
Exposure Point Concentration Summary (Central Landfill Area - Surface Water)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Scenario Timeframe: Current
Medium: Central Landfill Area Surface Water
Exposure Medium: Surface Water

Exposure Point	CAS Number	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution)	Maximum Concentration (Qualifier)	Exposure Point Concentration			
							Value	Units	Statistic	Rationale
Surface Water	16984-48-8	Fluoride	µg/l	NA	NA	2600	2600	µg/l	Maximum	Not enough data to perform statistics

Footnotes:
a/ µg/l = milligrams per liter
b/ NA = not applicable
CAS = Chemical Abstracts Service
UCL = upper confidence limit

Table 3-12
Exposure Point Concentration Summary (Industrial Landfill Area - Soil 0-0.5 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Scenario Timeframe: Current
Medium: Industrial Landfill Area Soil
Exposure Medium: Surface Soil (0 to 0.5 ft-bgs)

Exposure Point	CAS Number	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution)	Maximum Concentration (Qualifier)	Exposure Point Concentration			
							Value	Units	Statistic	Rationale
Surface Soil 0-0.5 ft-bgs	16984-48-8	Fluoride	mg/kg	NA	NA	4.17	4.17	mg/kg	Maximum	Not enough data to perform statistics

Footnotes:
a/ mg/kg = milligrams per kilogram
b/ NA = not applicable
CAS = Chemical Abstracts Service
UCL = upper confidence limit

Table 3-13
Exposure Point Concentration Summary (Industrial Landfill Area - Soil 0-2 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Scenario Timeframe: Current
Medium: Industrial Landfill Area Soil
Exposure Medium: Surface Soil (0 to 2 ft-bgs)

Exposure Point	CAS Number	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution)	Maximum Concentration (Qualifier)	Exposure Point Concentration			
							Value	Units	Statistic	Rationale
Surface Soil 0-2 ft-bgs	16984-48-8	Fluoride	mg/kg	NA	NA	37.8	37.8	mg/kg	Maximum	Not enough data to perform statistics

Footnotes:
a/ mg/kg = milligrams per kilogram
b/ NA = not applicable
CAS = Chemical Abstracts Service
UCL = upper confidence limit

Table 3-14
Exposure Point Concentration Summary (Industrial Landfill Area - Soil 0-12 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Scenario Timeframe: Future
Medium: Industrial Landfill Area Soil
Exposure Medium: Subsurface Soil (0 to 12 ft-bgs)

Exposure Point	CAS Number	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution)	Maximum Concentration (Qualifier)	Exposure Point Concentration			
							Value	Units	Statistic	Rationale
Subsurface Soil 0-12 ft-bgs	16984-48-8	Fluoride	mg/kg	NA	NA	37.8	37.8	mg/kg	Maximum	Not enough data to perform statistics

Footnotes:
a/ mg/kg = milligrams per kilogram
b/ NA = not applicable
CAS = Chemical Abstracts Service
UCL = upper confidence limit

Table 3-15
Exposure Point Concentration Summary (Eastern Undeveloped Area - Surface Water)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Scenario Timeframe: Current
Medium: Eastern Undeveloped Area Surface Water
Exposure Medium: Surface Water

Exposure Point	CAS Number	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution)	Maximum Concentration (Qualifier)	Exposure Point Concentration			
							Value	Units	Statistic	Rationale
Surface Water	16984-48-8	Fluoride	µg/l	NA	NA	188	188	µg/l	Maximum	Not enough data to perform statistics

Footnotes:
a/ µg/l = milligrams per liter
b/ NA = not applicable
CAS = Chemical Abstracts Service
UCL = upper confidence limit

Table 3-16
Exposure Point Concentration Summary (North Central Undeveloped Area - Soil 0-0.5 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Scenario Timeframe: Current
Medium: North Central Undeveloped Area Soil
Exposure Medium: Surface Soil (0 to 0.5 ft-bgs)

Exposure Point	CAS Number	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution)	Maximum Concentration (Qualifier)	Exposure Point Concentration			
							Value	Units	Statistic	Rationale
Surface Soil 0-0.5 ft-bgs	16984-48-8	Fluoride	mg/kg	NA	NA	27.6	27.6	mg/kg	Maximum	Not enough data to perform statistics

Footnotes:
a/ mg/kg = milligrams per kilogram
b/ NA = not applicable
CAS = Chemical Abstracts Service
UCL = upper confidence limit

Table 3-17
Exposure Point Concentration Summary (North Central Undeveloped Area - Soil 0-12 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Scenario Timeframe: Future
Medium: North Central Undeveloped Area Soil
Exposure Medium: Subsurface Soil (0 to 12 ft-bgs)

Exposure Point	CAS Number	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution)	Maximum Concentration (Qualifier)	Exposure Point Concentration			
							Value	Units	Statistic	Rationale
Subsurface Soil 0-12 ft-bgs	16984-48-8	Fluoride	mg/kg	9.799	13.9 N	27.6	13.9	mg/kg	Maximum	Not enough data to perform statistics

Footnotes:
a/ mg/kg = milligrams per kilogram
b/ NA = not applicable
c/ N = normal
CAS = Chemical Abstracts Service
UCL = upper confidence limit

Table 3-18
Exposure Point Concentration Summary (North Central Undeveloped Area - Surface Water)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Scenario Timeframe: Current
Medium: North Central Undeveloped Area Surface Water
Exposure Medium: Surface Water

Exposure Point	CAS Number	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution)	Maximum Concentration (Qualifier)	Exposure Point Concentration			
							Value	Units	Statistic	Rationale
Surface Water	16984-48-8	Fluoride	µg/l	218	284.6 N	473	284.6	µg/l	95% UCL	95% Student's-t UCL

Footnotes:
a/ µg/l = milligrams per liter
b/ NA = not applicable
c/ N = non-parametric
CAS = Chemical Abstracts Service
UCL = upper confidence limit

Table 3-19
Exposure Point Concentration Summary (Western Undeveloped Area - Soil 0-0.5 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Scenario Timeframe: Current
Medium: Western Undeveloped Area Soil
Exposure Medium: Surface Soil 0 to 0.5

Exposure Point	CAS Number	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution)	Maximum Concentration (Qualifier)	Exposure Point Concentration			
							Value	Units	Statistic	Rationale
Suface Soil 0-0.5 ft-bgs	16984-48-8	Fluoride	mg/kg	8.178	10.68 N	15.4	10.68	mg/kg	UCL	95% Student's-t UCL

Footnotes:
a/ mg/kg = milligrams per kilogram
b/ NA = not applicable
c/ Note, total chromium will be evaluated as chromium III and chromium VI on a 6:1 ratio.
d/ N = normal
CAS = Chemical Abstracts Service
UCL = upper confidence limit

Table 3-20
Exposure Point Concentration Summary (Western Undeveloped Area - Surface Water)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Scenario Timeframe: Current
Medium: Western Undeveloped Area Surface Water
Exposure Medium: Surface Water

Exposure Point	CAS Number	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution)	Maximum Concentration (Qualifier)	Exposure Point Concentration			
							Value	Units	Statistic	Rationale
Surface Water	16984-48-8	Fluoride	µg/l	114.8	126.9 NP	137	126.9	µg/l	95% UCL	95% Modified-t UCL (Johnson-1978)

Footnotes:
a/ µg/l = milligrams per liter
b/ NA = not applicable
c/ NP = non-parametric
CAS = Chemical Abstracts Service
UCL = upper confidence limit

Table 3-21
Exposure Point Concentration Summary (South Percolation Pond - Soil 0-0.5 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Scenario Timeframe: Current
Medium: South Percolation Ponds Area Soil
Exposure Medium: Surface Soil 0 to 0.5

Exposure Point	CAS Number	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution)	Maximum Concentration (Qualifier)	Exposure Point Concentration			
							Value	Units	Statistic	Rationale
Suface Soil 0-0.5 ft-bgs	16984-48-8	Fluoride	mg/kg	14.19	17.95 N	44.1	17.95	mg/kg	UCL	95% Student's-t UCL

Footnotes:
a/ mg/kg = milligrams per kilogram
b/ NA = not applicable
c/ N = normal
CAS = Chemical Abstracts Service
UCL = upper confidence limit

Table 3-22
Exposure Point Concentration Summary (South Percolation Pond - Soil 0-2 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Scenario Timeframe: Current
Medium: South Percolation Ponds Area Soil
Exposure Medium: Surface Soil 0 to 2

Exposure Point	CAS Number	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution)	Maximum Concentration (Qualifier)	Exposure Point Concentration			
							Value	Units	Statistic	Rationale
Suface Soil 0-2 ft-bgs	16984-48-8	Fluoride	mg/kg	0.558	0.635 L	16.4	0.635	mg/kg	UCL	95% H-UCL (KM-Log)

Footnotes:
a/ mg/kg = milligrams per kilogram
b/ NA = not applicable
c/ L = lognormal
CAS = Chemical Abstracts Service
UCL = upper confidence limit

Table 3-23
Exposure Point Concentration Summary (South Percolation Pond - Surface Water)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Scenario Timeframe: Current
Medium: South Percolation Ponds Area Surface Water
Exposure Medium: Surface Water

xposure Poi	CAS Number	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution)	Maximum Concentration (Qualifier)	Exposure Point Concentration			
							Value	Units	Statistic	Rationale
Surface Water	16984-48-8	Fluoride	µg/l	1447	3823 NP	9240	3823	µg/l	UCL	95% Chebyshev (Mean, Sd) UCL

Footnotes:
a/ µg/l = micrograms per liter
b/ NA = not applicable
c/ NP = non-parametric
CAS = Chemical Abstracts Service
UCL = upper confidence limit

Table 3-24
Exposure Point Concentration Summary (South Percolation Pond - Sediment)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Scenario Timeframe: Current
Medium: South Percolation Ponds Area Sediment
Exposure Medium: Sediment

Exposure Point	CAS Number	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution)	Maximum Concentration (Qualifier)	Exposure Point Concentration			
							Value	Units	Statistic	Rationale
Sediment	16984-48-8	Fluoride	mg/kg	48.56	96.72 G	195	96.72	mg/kg	UCL	95% Adjusted Gamma UCL (n<50) UCL

Footnotes:
a/ mg/kg = milligrams per kilogram
b/ NA = not applicable
c/ G = gamma
CAS = Chemical Abstracts Service
UCL = upper confidence limit

Table 3-25
Exposure Point Concentration Summary (Flat Head River - Surface Water)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Scenario Timeframe: Current
Medium: Flathead River Area Surface Water
Exposure Medium: Surface Water

xposure Poi	CAS Number	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution)	Maximum Concentration (Qualifier)	Exposure Point Concentration			
							Value	Units	Statistic	Rationale
Surface Water	16984-48-8	Fluoride	µg/l	220.2	636 NP	2160	636	µg/l	UCL	95% Chebyshev (Mean, Sd) UCL

Footnotes:
a/ µg/l = micrograms per liter
b/ NA = not applicable
c/ NP = non-parametric
CAS = Chemical Abstracts Service
UCL = upper confidence limit

Table 3-26
Exposure Point Concentration Summary (Backwater Seep Area - Soil 0-0.5 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Scenario Timeframe: Current
Medium: Backwater Seep Area Soil
Exposure Medium: Surface Soil 0 to 0.5

Exposure Point	CAS Number	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution)	Maximum Concentration (Qualifier)	Exposure Point Concentration			
							Value	Units	Statistic	Rationale
Suface Soil 0-0.5 ft-bgs	16984-48-8	Fluoride	mg/kg	NA	NA	32.7	32.7	mg/kg	Maximum	Not enough data for statistics

Footnotes:
a/ mg/kg = milligrams per kilogram
b/ NA = not applicable
CAS = Chemical Abstracts Service
UCL = upper confidence limit

Table 3-27
Exposure Point Concentration Summary (Backwater Seep Area - Soil 0-2 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Scenario Timeframe: Current
Medium: Backwater Seep Area Soil
Exposure Medium: Surface Soil 0 to 2

Exposure Point	CAS Number	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution)	Maximum Concentration (Qualifier)	Exposure Point Concentration			
							Value	Units	Statistic	Rationale
Suface Soil 0-2 ft-bgs	16984-48-8	Fluoride	mg/kg	19.14	23.04 N	33.5	23.04	mg/kg	UCL	95% Student's-t UCL

Footnotes:
a/ mg/kg = milligrams per kilogram
b/ NA = not applicable
c/ N = normal
CAS = Chemical Abstracts Service
UCL = upper confidence limit

Table 3-28
Exposure Point Concentration Summary (Backwater Seep Sampling Area- Surface Water)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Scenario Timeframe: Current
Medium: Backwater Seep Area Surface Water
Exposure Medium: Surface Water

Exposure Point	CAS Number	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution)	Maximum Concentration (Qualifier)	Exposure Point Concentration			
							Value	Units	Statistic	Rationale
Surface Water	16984-48-8	Fluoride	µg/l	1141	1841 G	2,640	1841	µg/l	95% UCL	95% Gamma Adjusted UCL (n<50)

Footnotes:
a/ micrograms per liter
b/ NA = not applicable
c/ G = gamma
CAS = Chemical Abstracts Service
UCL = upper confidence limit

Table 3-29
Exposure Point Concentration Summary (Backwater Seep Sampling Area- Sediment)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Scenario Timeframe: Current
Medium: Backwater Seep Area Sediment
Exposure Medium: Sediment

Exposure Point	CAS Number	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution)	Maximum Concentration (Qualifier)	Exposure Point Concentration			
							Value	Units	Statistic	Rationale
Sediment	16984-48-8	Fluoride	mg/kg	NA	NA	24.8	24.8	mg/kg	Maximum	Not enough data for statistics

Footnotes:
a/ mg/kg = milligrams per kilogram
b/ NA = not applicable
CAS = Chemical CAS = Chemical Abstracts Service
UCL = upper con UCL = upper confidence limit

Table 3-30
Exposure Point Concentration Summary (Groundwater - Plume Area Upper Hydrogeologic Unit)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Scenario Timeframe: Current
Medium:Groundwater - Plume Area Upper Hydrogeologic Unit
Exposure Medium: Groundwater

Exposure Point	CAS Number	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution)	Maximum Concentration (Qualifier)	Exposure Point Concentration			
							Value	Units	Statistic	Rationale
Tapwater	16984-48-8	Fluoride	µg/l	4699	7708 NP	52900	7708	µg/l	UCL	95% KM Chebyshev UCL

Footnotes:
a/ µg/l = micrograms per liter
b/ NA = not applicable
c/ NP = non-parametric
CAS = Chemical CAS = Chemical Abstracts Service
UCL = upper con UCL = upper confidence limit

Table 3-31
Exposure Point Concentration Summary (Groundwater - Western Undeveloped Area Upper Hydrogeologic Unit)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Scenario Timeframe: Current
Medium: Groundwater - Western Undeveloped Area Upper Hydrogeologic Unit
Exposure Medium: Groundwater

Exposure Point	CAS Number	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution)	Maximum Concentration (Qualifier)	Exposure Point Concentration			
							Value	Units	Statistic	Rationale
Tapwater	16984-48-8	Fluoride	µg/l	NA	NA	271	271	µg/l	Maximum	Not enough data for statistics

Footnotes:
a/ µg/l = micrograms per liter
b/ NA = not applicable
CAS = Chemical Abstracts Service
UCL = upper confidence limit

Table 3-32
Exposure Point Concentration Summary (Groundwater -Sitewide Below Upper Hydrogeologic Unit)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Scenario Timeframe: Current
Medium:Groundwater - Sitewide Below Upper Hydrogeologic Unit
Exposure Medium: Groundwater

Exposure Point	CAS Number	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution)	Maximum Concentration (Qualifier)	Exposure Point Concentration			
							Value	Units	Statistic	Rationale
Tapwater	16984-48-8	Fluoride	µg/l	241.2	278.2 G	569	278.2	µg/l	UCL	95% Gamma Approximate UCL (n>= 50)

Footnotes:
a/ µg/l = micrograms per liter
b/ NA = not applicable
c/ G = gamma
CAS = Chemical Abstracts Service
UCL = upper confidence limit

Table 3-33
Exposure Point Concentration Summary (ATV Exposure Areas - Soil 0-0.5 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Scenario Timeframe: Current
Medium: ATV Exposure Areas Soil
Exposure Medium: Surface Soil 0 to 0.5

Exposure Point	CAS Number	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution)	Maximum Concentration (Qualifier)	Exposure Point Concentration						
							Central Landfills	North Central	Western Undeveloped	EPC	Units	Statistic	Rationale
Suface Soil 0-0.5 ft-bgs	16984-48-8	Fluoride	mg/kg	NA	NA	NA	84.92	27.6	10.68	29.5	mg/kg	See Footnote	Refer to text.

Footnotes:
a/ mg/kg = milligrams per kilogram
b/ NA = not applicable
c/ EPC for ATV areas is the suface soil (0 - 0.5 ft=bgs) EPC from the following areas weighted by the amount shown. Refer to text for additional discussion.

Area	Area (acres)	Area Weight (%)	EPC Table
Central Landfills Area	127.8	19.1%	Table 3.8
North Central Area	182.9	27.4%	Table 3.16
Western Undeveloped Area	357.3	53.5%	Table 3.19

CAS = Chemical Abstracts Service
UCL = upper confidence limit

Table 3-34
Exposure Point Concentration Summary (Hunter Exposure Areas - Soil 0-0.5 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Scenario Timeframe: Current
Medium: Hunter Exposure Areas Soil
Exposure Medium: Surface Soil 0 to 0.5

Exposure Point	CAS Number	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution)	Maximum Concentration (Qualifier)	Exposure Point Concentration					
							North Central	Western Undeveloped	EPC	Units	Statistic	Rationale
Suface Soil 0-0.5 ft-bgs	16984-48-8	Fluoride	mg/kg	NA	NA	NA	27.6	10.68	16.4	mg/kg	See Footnote	Refer to text.

Footnotes:
a/ mg/kg = milligrams per kilogram
b/ NA = not applicable
c/ EPC for ATV areas is the suface soil (0 - 0.5 ft=bgs) EPC from the following areas weighted by the amount shown. Refer to text for additional discussion.

Area	Area (acres)	Area Weight (%)	EPC Table
North Central Area	182.9	33.9%	Table 3.16
Western Undeveloped Area	357.3	66.1%	Table 3.19

CAS = Chemical Abstracts Service
UCL = upper confidence limit

Table 3-35
Exposure Point Concentration Summary (Backwater Seep Sampling Area- Fish)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Scenario Timeframe: Current
Medium: Backwater Seep Area Surface Water
Exposure Medium: Fish

Exposure Point	CAS Number	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution)	Maximum Concentration (Qualifier)	Exposure Point Concentration						
							Surface Water			Fish Tissue			
							Value	Units	BCF	Value	Units	Statistic	Rationale
Fish	16984-48-8	Fluoride	µg/l	1,141	1841 G	2,640	1841	µg/l	10	18.41	mg/kg	95% UCL	95% Gamma Adjusted UCL (n<50)

Footnotes:
a/ µg/l = micrograms per liter
b/ NA = not applicable
c/ G = gamma
d/ Refer to text for biocentration factor (BCF) reference(s) and equations for calculation of fish tissue EPC.
CAS = Chemical Abstracts Service
UCL = upper confidence limit

Table 3-36
Exposure Point Concentration Summary (Flathead River Area- Fish)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Scenario Timeframe: Current
Medium: Flathead River Area Surface Water
Exposure Medium: Fish

Exposure Point	CAS Number	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution)	Maximum Concentration (Qualifier)	Exposure Point Concentration						
							Surface Water			Fish Tissue			
							Value	Units	BCF	Value	Units	Statistic	Rationale
Fish	16984-48-8	Fluoride	µg/l	220	636 NP	2,160	636	µg/l	10	6.36	mg/kg	UCL	95% Chebyshev (Mean, Sd) UCL

Footnotes:
a/ µg/l = micrograms per liter
b/ NA = not applicable
c/ NP = non-parametric
d/ Refer to text for biocentration factor (BCF) reference(s) and equations for calculation of fish tissue EPC.
CAS = Chemical Abstracts Service
UCL = upper confidence limit

Table 3-37
Exposure Point Concentration Summary (Whitetail Deer)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Scenario Timeframe: Current
Medium: Vegetated Areas Surface Soil (0-0.5 ft-bgs)
Exposure Medium: Whitetail deer

Exposure Point	CAS Number	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution)	Maximum Concentration (Qualifier)	Exposure Point Concentration			
							Venison			
							Value	Units	Statistic	Rationale
Venison	16984-48-8	Fluoride	mg/kg	NA	NA	NA	0.053	mg/kg	See Footnote	Refer to text.

Footnotes:
a/ µg/l = micrograms per liter
b/ NA = not applicable
c/ Refer to text for discussion on calculation of EPC for the venison uptake by a hunter.
CAS = Chemical Abstracts Service
UCL = upper confidence limit

Table 3-38
Exposure Point Concentration Summary (ISS Samples - Main Plant Area - Surface Soil 0-0.5 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Scenario Timeframe: Current
Medium: ISS Samples - Main Plant Area - Surface Soil
Exposure Medium: Surface Soil 0-0.5 ft-bgs

Exposure Point	CAS Number	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution)	Maximum Concentration (Qualifier)	Exposure Point Concentration			
							Fish Tissue			
							Value	Units	Statistic	Rationale
Surface Soil 0-0.5 ft-bgs	16984-48-8	Fluoride	mg/kg	286	498.7 NP	632	498.7	mg/kg	UCL	95% Chebyshev (Mean, Sd) UCL

Footnotes:
a/ mg/kg = milligrams per kilogram
b/ NA = not applicable
c/ NP = non-parametric
CAS = Chemical Abstracts Service
UCL = upper confidence limit

Table 3-39
Exposure Point Concentration Summary (ISS Samples - Main Plant Area - Surface Soil 0-2 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Scenario Timeframe: Current
Medium: ISS Samples - Main Plant Area - Surface Soil
Exposure Medium: Surface Soil 0-2 ft-bgs

Exposure Point	CAS Number	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution)	Maximum Concentration (Qualifier)	Exposure Point Concentration			
							Fish Tissue			
							Value	Units	Statistic	Rationale
Surface Soil 0-2 ft-bgs	16984-48-8	Fluoride	mg/kg	298.3	464.9 NP	946	464.9	mg/kg	UCL	95% Chebyshev (Mean, Sd) UCL

Footnotes:
a/ mg/kg = milligrams per kilogram
b/ NA = not applicable
c/ NP = non-parametric
CAS = Chemical Abstracts Service
UCL = upper confidence limit

Table 3-40
Exposure Point Concentration Summary (ISS Samples - Central Landfill Area - Surface Soil 0-0.5 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Scenario Timeframe: Current
Medium: ISS Samples - Central Landfill Area - Surface Soil
Exposure Medium: Surface Soil 0-0.5 ft-bgs

Exposure Point	CAS Number	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution)	Maximum Concentration (Qualifier)	Exposure Point Concentration			
							Fish Tissue			
							Value	Units	Statistic	Rationale
Surface Soil 0-0.5 ft-bgs	16984-48-8	Fluoride	mg/kg	232	432 NP	976	432	mg/kg	UCL	95% Chebyshev (Mean, Sd) UCL

Footnotes:
a/ mg/kg = milligrams per kilogram
b/ NA = not applicable
c/ NP = non-parametric
CAS = Chemical Abstracts Service
UCL = upper confidence limit

Table 3-41
Exposure Point Concentration Summary (ISS Samples - Central Landfill Area - Surface Soil 0-2 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Scenario Timeframe: Current
Medium: ISS Samples - Central Landfill Area - Surface Soil
Exposure Medium: Surface Soil 0-2 ft-bgs

Exposure Point	CAS Number	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution)	Maximum Concentration (Qualifier)	Exposure Point Concentration			
							Fish Tissue			
							Value	Units	Statistic	Rationale
Surface Soil 0-2 ft-bgs	16984-48-8	Fluoride	mg/kg	230	370.2 NP	976	370.2	mg/kg	UCL	95% Chebyshev (Mean, Sd) UCL

Footnotes:
a/ mg/kg = milligrams per kilogram
b/ NA = not applicable
c/ NP = non-parametric
CAS = Chemical Abstracts Service
UCL = upper confidence limit

Table 4-1
Exposure Equations and Assumptions - Current/Future Scenario: Soil and Sediment
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Surface Soil/Sediment

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Parameter Value	Units (a)	Rationale/ Reference (b)	Intake Equation/ Model Name
Ingestion	Industrial Worker	Adult	Soil	CS	Chemical Concentration in Soil	See Table 3s	mg/kg	See Table 3s	
				IRsoil	Soil ingestion	100	mg/d	USEPA, 2018	Chronic Daily Intake (CDI) (mg/kg-day) =
				RBA	Relative bioavailability factor	chemical-specific	untiless	USEPA, 2018	
				EF	Exposure frequency	187	day/yr	MDEQ, 2016	$\frac{CS \times IR_{soil} \times RBA \times EF \times ED \times CF}{BW \times AT}$
				ED	Exposure duration	25	yr	USEPA, 2018	
				BW	Body weight	80	kg	USEPA, 2018	
				AT-NC	Averaging time - noncancer	9,125	days	USEPA, 2018	
				AT-C	Averaging time - cancer	25,550	days	USEPA, 2018	
				CFsoil	Conversion factor	1.0E-06	kg/mg	USEPA 1989	
	Construction Worker	Adult	Soil	CS	Chemical Concentration in Soil	See Table 3s	mg/kg	See Table 3s	
				IRsoil	Soil ingestion	330	mg/d	USEPA, 2018	Chronic Daily Intake (CDI) (mg/kg-day) =
				RBA	Relative bioavailability factor	chemical-specific	untiless	USEPA, 2018	
				EF	Exposure frequency	124	day/yr	MDEQ, 2016	$\frac{CS \times IR_{soil} \times RBA \times EF \times ED \times CF}{BW \times AT}$
				ED	Exposure duration	1	yr	USEPA, 2018	
				BW	Body weight	80	kg	USEPA, 2018	
				AT-NC	Averaging time - noncancer	365	days	USEPA, 2018	
				AT-C	Averaging time - cancer	25,550	days	USEPA, 2018	
				CFsoil	Conversion factor	1.0E-06	kg/mg	USEPA 1989	
	Stormwater Management Worker	Adult	Soil/ Sediment	CS	Chemical Concentration in Soil	See Table 3s	mg/kg	See Table 3s	
				IRsoil	Soil ingestion	100	mg/d	USEPA, 2018	Chronic Daily Intake (CDI) (mg/kg-day) =
				RBA	Relative bioavailability factor	chemical-specific	untiless	USEPA, 2018	
				EF	Exposure frequency	38	day/yr	BPJ	$\frac{CS \times IR_{soil} \times RBA \times EF \times ED \times CF}{BW \times AT}$
				ED	Exposure duration	25	yr	USEPA, 2018	
				BW	Body weight	80	kg	USEPA, 2018	
				AT-NC	Averaging time - noncancer	9,125	days	USEPA, 2018	
				AT-C	Averaging time - cancer	25,550	days	USEPA, 2018	
				CFsoil	Conversion factor	1.0E-06	kg/mg	USEPA 1989	
	Recreational Trespasser (ATV)	Adult	Soil/ Sediment	CS	Chemical Concentration in Soil	See Table 3s	mg/kg	See Table 3s	
				IRsoil	Soil ingestion	100	mg/d	USEPA, 2018	Chronic Daily Intake (CDI) (mg/kg-day) =
				RBA	Relative bioavailability factor	chemical-specific	untiless	USEPA, 2018	
				EF	Exposure frequency	9	day/yr	BPJ	$\frac{CS \times IR_{soil} \times RBA \times EF \times ED \times CF}{BW \times AT}$
				ED	Exposure duration	20	yr	BPJ	
				BW	Body weight	80	kg	USEPA, 2018	
				AT-NC	Averaging time - noncancer	7,300	days	USEPA, 2018	
				AT-C	Averaging time - cancer	25,550	days	USEPA, 2018	
				CFsoil	Conversion factor	1.0E-06	kg/mg	USEPA 1989	
	Recreational Trespasser (Hunter)	Adult	Soil/ Sediment	CS	Chemical Concentration in Soil	See Table 3s	mg/kg	See Table 3s	
				IRsoil	Soil ingestion	100	mg/d	USEPA, 2018	Chronic Daily Intake (CDI) (mg/kg-day) =
				RBA	Relative bioavailability factor	chemical-specific	untiless	USEPA, 2018	
				EF	Exposure frequency	14	day/yr	BPJ	$\frac{CS \times IR_{soil} \times RBA \times EF \times ED \times CF}{BW \times AT}$
				ED	Exposure duration	20	yr	BPJ	
				BW	Body weight	80	kg	USEPA, 2018	
				AT-NC	Averaging time - noncancer	7,300	days	USEPA, 2018	
				AT-C	Averaging time - cancer	25,550	days	USEPA, 2018	
				CFsoil	Conversion factor	1.0E-06	kg/mg	USEPA 1989	

Table 4-1
Exposure Equations and Assumptions - Current/Future Scenario: Soil and Sediment
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Surface Soil/Sediment

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Parameter Value	Units (a)	Rationale/ Reference (b)	Intake Equation/ Model Name
Ingestion	Resident	Adult	Soil	CS	Chemical Concentration in Soil	See Table 3s	mg/kg	See Table 3s	
				IRsoil	Soil ingestion	100	mg/d	USEPA, 2018	Chronic Daily Intake (CDI) (mg/kg-day) =
				RBA	Relative bioavailability factor	chemical-specific	untiless	USEPA, 2018	
				EF	Exposure frequency	270	day/yr	MDEQ, 2016	$\frac{CS \times IR_{soil} \times RBA \times EF \times ED \times CF}{BW \times AT}$
				ED	Exposure duration	20	yr	USEPA, 2018	
				BW	Body weight	80	kg	USEPA, 2018	
				AT-NC	Averaging time - noncancer	7,300	days	USEPA, 2018	
				AT-C	Averaging time - cancer	25,550	days	USEPA, 2018	
				CFsoil	Conversion factor	1.0E-06	kg/mg	USEPA 1989	
	Resident	Child	Soil	CS	Chemical Concentration in Soil	See Table 3s	mg/kg	See Table 3s	
				IRsoil	Soil ingestion	200	mg/d	USEPA, 2018	Chronic Daily Intake (CDI) (mg/kg-day) =
				$IFSM_{res\text{-}adj}$	Soil ingestion (age-adjusted mutagenic factor)	115200	mg/kg	USEPA, 2018	
				RBA	Relative bioavailability factor	chemical-specific	untiless	USEPA, 2018	$\frac{CS \times IR_{soil} \times RBA \times EF \times ED \times CF}{BW \times AT}$
				EF	Exposure frequency	270	day/yr	MDEQ, 2016	
				ED	Exposure duration	6	yr	USEPA, 2018	
				BW	Body weight	15	kg	USEPA, 2018	
				AT-NC	Averaging time - noncancer	2,190	days	USEPA, 2018	For mutagenic compounds:
				AT-C	Averaging time - cancer	25,550	days	USEPA, 2018	
				CFsoil	Conversion factor	1.00E-06	kg/mg	USEPA 1989	$\frac{CS \times IFSM_{tres\text{-}adj} \times RBA \times CF}{AT}$
				EF_{0-2}	Exposure frequency (0 to 2 years)	270	day/yr	MDEQ, 2016	
				ED_{0-2}	Exposure duration (0 to 2 years)	2	yr	USEPA, 2018	
				IRS_{0-2}	Soil ingestion (0 to 2 years)	200	mg/d	USEPA, 2018	where:
				BW_{0-2}	Body weight (0 to 2 years)	15	kg	USEPA, 2018	
				EF_{2-6}	Exposure frequency (2 to 6 years)	270	day/yr	MDEQ, 2016	$IFSM_{resc\text{-}adj} = (EF_{0-2} \times ED_{0-2} \times IRS_{0-2} \times 10) / (BW_{0-2}) +$
				ED_{2-6}	Exposure duration (2 to 6 years)	4	yr	USEPA, 2018	$(EF_{2-6} \times ED_{2-6} \times IRS_{2-6} \times 3) / (BW_{2-6})$
				IRS_{2-6}	Soil ingestion (2 to 6 years)	200	mg/d	USEPA, 2018	
				BW_{2-6}	Body weight (2-6 years)	15	kg	USEPA, 2018	
	Recreationist (Floater)	Adolescent (6-16 years)	Soil/ Sediment	CS	Chemical Concentration in Soil	See Table 3s	mg/kg	See Table 3s	
				IRsoil	Soil ingestion	100	mg/d	USEPA, 2018	Chronic Daily Intake (CDI) (mg/kg-day) =
				$IFSM_{recc\text{-}adj}$	Soil ingestion (age-adjusted mutagenic factor)	681.818	mg/kg	USEPA, 2018	
				RBA	Relative bioavailability factor	chemical-specific	untiless	USEPA, 2018	
				EF	Exposure frequency	10	day/yr	BPJ	$\frac{CS \times IR_{soil} \times RBA \times EF \times ED \times CF}{BW \times AT}$
				ED	Exposure duration	10	yr	USEPA, 2018	
				BW	Body weight	44	kg	USEPA, 2011	
				AT-NC	Averaging time - noncancer	3,650	days	USEPA, 2018	
				AT-C	Averaging time - cancer	25,550	days	USEPA, 2018	For mutagenic compounds:
				CFsoil	Conversion factor	1.00E-06	kg/mg	USEPA 1989	$\frac{CS \times IFSM_{recc\text{-}adj} \times RBA \times CF}{AT}$
									where:
									$IFSM_{recc\text{-}adj} = (EF \times ED \times IRS \times 3) / (BW)$

Table 4-1
Exposure Equations and Assumptions - Current/Future Scenario: Soil and Sediment
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Surface Soil/Sediment

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Parameter Value	Units (a)	Rationale/ Reference (b)	Intake Equation/ Model Name
Ingestion	Recreationist (Floater)	Adult	Soil/ Sediment	CS	Chemical Concentration in Soil	See Table 3s	mg/kg	See Table 3s	
				IRsoil	Soil ingestion	100	mg/d	USEPA, 2018	Chronic Daily Intake (CDI) (mg/kg-day) =
				RBA	Relative bioavailability factor	chemical-specific	unitless	USEPA, 2018	
				EF	Exposure frequency	10	day/yr	BPJ	$\frac{CS \times IR_{soil} \times RBA \times EF \times ED \times CF}{BW \times AT}$
				ED	Exposure duration	20	yr	USEPA, 2018	
				BW	Body weight	80	kg	USEPA, 2018	
				AT-NC	Averaging time - noncancer	7,300	days	USEPA, 2018	
				AT-C	Averaging time - cancer	25,550	days	USEPA, 2018	
				CFsoil	Conversion factor	1.0E-06	kg/mg	USEPA 1989	
	Recreationist (Fisher)	Adult	Soil/ Sediment	CS	Chemical Concentration in Soil	See Table 3s	mg/kg	See Table 3s	
				IRsoil	Soil ingestion	100	mg/d	USEPA, 2018	Chronic Daily Intake (CDI) (mg/kg-day) =
				RBA	Relative bioavailability factor	chemical-specific	unitless	USEPA, 2018	
				EF	Exposure frequency	10	day/yr	BPJ	$\frac{CS \times IR_{soil} \times RBA \times EF \times ED \times CF}{BW \times AT}$
				ED	Exposure duration	20	yr	USEPA, 2018	
				BW	Body weight	80	kg	USEPA, 2018	
				AT-NC	Averaging time - noncancer	7,300	days	USEPA, 2018	
				AT-C	Averaging time - cancer	25,550	days	USEPA, 2018	
				CFsoil	Conversion factor	1.0E-06	kg/mg	USEPA 1989	
	Trespasser	Adolescent (6-16 years)	Soil/ Sediment	CS	Chemical Concentration in Soil	See Table 3s	mg/kg	See Table 3s	
				IRsoil	Soil ingestion	100	mg/d	USEPA, 2018	Chronic Daily Intake (CDI) (mg/kg-day) =
				$IFSM_{tres-adj}$	Soil ingestion (age-adjusted mutagenic factor)	477.2727	mg/kg	USEPA, 2018	$\frac{CS \times IR_{soil} \times RBA \times EF \times ED \times CF}{BW \times AT}$
				RBA	Relative bioavailability factor	chemical-specific	untiless	USEPA, 2018	
				EF	Exposure frequency	7	day/yr	BPJ	
				ED	Exposure duration	10	yr	USEPA, 2018	
				BW	Body weight	44	kg	USEPA, 2018	For mutagenic compounds:
				AT-NC	Averaging time - noncancer	3,650	days	USEPA, 2018	
				AT-C	Averaging time - cancer	25,550	days	USEPA, 2018	$\frac{CS \times IFSM_{tres-adj} \times RBA \times CF}{AT}$
				CFsoil	Conversion factor	1.0E-06	kg/mg	USEPA 1989	
									where:
									$IFSM_{tres-adj} = (EF \times ED \times IRS \times 3) / (BW)$

Table 4-1
Exposure Equations and Assumptions - Current/Future Scenario: Soil and Sediment
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Surface Soil/Sediment

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Parameter Value	Units (a)	Rationale/ Reference (b)	Intake Equation/ Model Name
Dermal	Industrial Worker	Adult	Soil	CS	Chemical Concentration in Soil	See Table 3s	mg/kg	See Table 3s	
				SA	Surface area for contact	3,527	cm2/day	USEPA, 2018	Dermal Absorbed Dose (DAD) (mg/kg-day) =
				ABS-d	Dermal absorption factor-VOCs	chemical-specific	unitless	USEPA, 2018	(DA-event x EF x ED x EV x SA) / (AT x BW)
				AF	Adherence factor, adult	0.12	mg/cm2	USEPA, 2018	
				EF	Exposure frequency	187	day/yr	USEPA, 2011	where
				ED	Exposure duration	25	yr	USEPA, 2011	
				EV	Event Frequency	1	events/day	EPA, 2001	
				BW	Body weight	80	kg	USEPA, 2011	Absorbed Dose per Event (DA-event) (mg/cm2-event) =
				AT-NC	Averaging time - noncancer	9,125	days	USEPA, 2011	CS x CF x AF x ABS-d
				AT-C	Averaging time - cancer	25,550	days	USEPA, 2011	
				CFsoil	Conversion factor	1.0E-06	kg/mg	USEPA 1989	
	Construction Worker	Adult	Soil	CS	Chemical Concentration in Soil	See Table 3s	mg/kg	See Table 3s	
				SA	Surface area for contact	3,527	cm2/day	USEPA, 2018	Dermal Absorbed Dose (DAD) (mg/kg-day) =
				ABS-d	Dermal absorption factor-VOCs	chemical-specific	unitless	USEPA, 2018	(DA-event x EF x ED x EV x SA) / (AT x BW)
				AF	Adherence factor, adult	0.3	mg/cm2	USEPA, 2018	
				EF	Exposure frequency	124	day/yr	USEPA, 2011	where
				ED	Exposure duration	1	yr	USEPA, 2011	
				EV	Event Frequency	1	events/day	EPA, 2001	
				BW	Body weight	80	kg	USEPA, 2011	Absorbed Dose per Event (DA-event) (mg/cm2-event) =
				AT-NC	Averaging time - noncancer	365	days	USEPA, 2011	CS x CF x AF x ABS-d
				AT-C	Averaging time - cancer	25,550	days	USEPA, 2011	
				CFsoil	Conversion factor	1.0E-06	kg/mg	USEPA 1989	
	Stormwater Management Worker	Adult	Soil/ Sediment	CS	Chemical Concentration in Soil	See Table 3s	mg/kg	See Table 3s	
				SA	Surface area for contact	3,527	cm2/day	USEPA, 2018	Dermal Absorbed Dose (DAD) (mg/kg-day) =
				ABS-d	Dermal absorption factor-VOCs	chemical-specific	unitless	USEPA, 2018	(DA-event x EF x ED x EV x SA) / (AT x BW)
				AF	Adherence factor, adult	0.12	mg/cm2	USEPA, 2018	
				EF	Exposure frequency	38	day/yr	USEPA, 2011	where
				ED	Exposure duration	25	yr	USEPA, 2011	
				EV	Event Frequency	1	events/day	EPA, 2001	
				BW	Body weight	80	kg	USEPA, 2011	Absorbed Dose per Event (DA-event) (mg/cm2-event) =
				AT-NC	Averaging time - noncancer	9,125	days	USEPA, 2011	CS x CF x AF x ABS-d
				AT-C	Averaging time - cancer	25,550	days	USEPA, 2011	
				CFsoil	Conversion factor	1.0E-06	kg/mg	USEPA 1989	
	Recreational Trespasser (ATV)	Adult	Soil/ Sediment	CS	Chemical Concentration in Soil	See Table 3s	mg/kg	See Table 3s	
				SA	Surface area for contact	3,527	cm2/day	BPJ	Dermal Absorbed Dose (DAD) (mg/kg-day) =
				ABS-d	Dermal absorption factor-VOCs	chemical-specific	unitless	USEPA 2004	(DA-event x EF x ED x EV x SA) / (AT x BW)
				AF	Adherence factor	0.12	mg/cm2	USEPA, 2018	
				EF	Exposure frequency	9	day/yr	BPJ	where
				ED	Exposure duration	20	yr	BPJ	
				EV	Event Frequency	1	events/day	EPA, 2001	
				BW	Body weight	80	kg	USEPA, 2011	Absorbed Dose per Event (DA-event) (mg/cm2-event) =
				AT-NC	Averaging time - noncancer	7,300	days	USEPA, 2011	CS x CF x AF x ABS-d
				AT-C	Averaging time - cancer	25,550	days	USEPA, 2011	
				CFsoil	Conversion factor	1.0E-06	kg/mg	USEPA 1989	

Table 4-1
Exposure Equations and Assumptions - Current/Future Scenario: Soil and Sediment
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Surface Soil/Sediment

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Parameter Value	Units (a)	Rationale/ Reference (b)	Intake Equation/ Model Name
Dermal	Recreational Trespasser (Hunter)	Adult	Soil/ Sediment	CS	Chemical Concentration in Soil	See Table 3s	mg/kg	See Table 3s	
				SA	Surface area for contact	3,527	cm2/day	BPJ	Dermal Absorbed Dose (DAD) (mg/kg-day) =
				ABS-d	Dermal absorption factor-VOCs	chemical-specific	unitless	USEPA 2004	(DA-event x EF x ED x EV x SA) / (AT x BW)
				AF	Adherence factor	0.07	mg/cm2	USEPA, 2018	
				EF	Exposure frequency	14	day/yr	BPJ	where
				ED	Exposure duration	20	yr	BPJ	
				EV	Event Frequency	1	events/day	EPA, 2001	
				BW	Body weight	80	kg	USEPA, 2011	Absorbed Dose per Event (DA-event) (mg/cm2-event) =
				AT-NC	Averaging time - noncancer	7,300	days	USEPA, 2011	CS x CF x AF x ABS-d
				AT-C	Averaging time - cancer	25,550	days	USEPA, 2011	
				CFsoil	Conversion factor	1.0E-06	kg/mg	USEPA 1989	
	Resident	Adult	Soil	CS	Chemical Concentration in Soil	See Table 3s	mg/kg	See Table 3s	
				SA	Surface area for contact	6,032	cm2/day	USEPA, 2018	Dermal Absorbed Dose (DAD) (mg/kg-day) =
				ABS-d	Dermal absorption factor-VOCs	chemical-specific	unitless	USEPA 2004	(DA-event x EF x ED x EV x SA) / (AT x BW)
				AF	Adherence factor	0.07	mg/cm2	USEPA, 2018	
				EF	Exposure frequency	270	day/yr	MDEQ, 2016	where
				ED	Exposure duration	20	yr	USEPA, 2011	
				EV	Event Frequency	1	events/day	EPA, 2001	
				BW	Body weight	80	kg	USEPA, 2011	Absorbed Dose per Event (DA-event) (mg/cm2-event) =
				AT-NC	Averaging time - noncancer	7,300	days	USEPA, 2011	CS x CF x AF x ABS-d
				AT-C	Averaging time - cancer	25,550	days	USEPA, 2011	
				CFsoil	Conversion factor	1.0E-06	kg/mg	USEPA 1989	
	Resident	Child	Soil	CS	Chemical Concentration in Soil	See Table 3s	mg/kg	See Table 3s	
				SA	Surface area for contact	2,373	cm2/day	USEPA, 2018	Dermal Absorbed Dose (DAD) (mg/kg-day) =
				$DFSMRes_{c\text{-}adj}$	Dermal age adjusted mutagenic factor	273,370	mg/kg	USEPA, 2018	
				ABS-d	Dermal absorption factor-VOCs	chemical-specific	unitless	USEPA 2004	(DA-event x EF x ED x EV x SA) / (AT x BW)
				AF	Adherence factor	0.2	mg/cm2	USEPA, 2018	
				EF	Exposure frequency	270	day/yr	MDEQ, 2016	where
				ED	Exposure duration	6	yr	USEPA, 2011	
				EV	Event Frequency	1	events/day	EPA, 2001	
				BW	Body weight	15	kg	USEPA, 2011	Absorbed Dose per Event (DA-event) (mg/cm2-event) =
				AT-NC	Averaging time - noncancer	2190	days	USEPA, 2011	CS x CF x AF x ABS-d
				AT-C	Averaging time - cancer	25550	days	USEPA, 2011	
				CFsoil	Conversion factor	1.0E-06	kg/mg	USEPA 1989	
				$EF_{0\text{-}2}$	Exposure frequency (0 to 2 years)	270	day/yr	MDEQ, 2016	For mutagenic compounds:
				$ED_{0\text{-}2}$	Exposure duration (0 to 2 years)	2	yr	USEPA, 2018	
				$AF_{0\text{-}2}$	Adherence factor (0 to 2 years)	0.2	mg/cm2	USEPA, 2018	$\underline{CS \times DFSM_{resc\text{-}adj} \times ABSd \times CF}$
				$SA_{0\text{-}2}$	Surface area (0 to 2 years)	2,373	cm2/day	USEPA, 2018	
				$BW_{0\text{-}2}$	Body weight (0 to 2 years)	15	kg	USEPA, 2018	AT
				$EF_{2\text{-}6}$	Exposure frequency (2 to 6 years)	270	day/yr	MDEQ, 2016	
				$ED_{2\text{-}6}$	Exposure duration (2 to 6 years)	4	yr	USEPA, 2018	Where:
				$AF_{2\text{-}6}$	Adherence factor (2 to 6 years)	0.2	mg/cm2	USEPA, 2018	
				$SA_{2\text{-}6}$	Surface area (2 to 6 years)	2,373	cm2/day	USEPA, 2018	$DFSMR_{esc\text{-}adj} = (EF_{0\text{-}2} \times ED_{0\text{-}2} \times AF_{0\text{-}2} \times SA_{0\text{-}2} \times 10) / (BW_{0\text{-}2}) +$
				$BW_{2\text{-}6}$	Body weight (2-6 years)	15	kg	USEPA, 2018	$(EF_{2\text{-}6} \times ED_{2\text{-}6} \times AF_{2\text{-}6} \times SA_{2\text{-}6} \times 3) / (BW_{2\text{-}6})$

Table 4-1
Exposure Equations and Assumptions - Current/Future Scenario: Soil and Sediment
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Surface Soil/Sediment

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Parameter Value	Units (a)	Rationale/ Reference (b)	Intake Equation/ Model Name
Dermal	Recreationist (Floater)	Adolescent (6-16 years)	Soil/ Sediment	CS	Chemical Concentration in Soil	See Table 3s	mg/kg	See Table 3s	
				SA	Surface area for contact	19,652	cm2/day	USEPA, 2018	Dermal Absorbed Dose (DAD) (mg/kg-day) =
				$DFSM_{trecc-adj}$	Dermal age adjusted mutagenic factor	9,379	mg/kg	USEPA, 2018	
				ABS-d	Dermal absorption factor-VOCs	chemical-specific	unitless	USEPA 2004	(DA-event x EF x ED x EV x SA) / (AT x BW)
				AF	Adherence factor	0.07	mg/cm2	USEPA, 2018	
				EF	Exposure frequency	10	day/yr	BPJ	where
				ED	Exposure duration	10	yr	USEPA, 2011	
				EV	Event Frequency	1	events/day	EPA, 2001	
				BW	Body weight	44	kg	USEPA, 2011	Absorbed Dose per Event (DA-event) (mg/cm2-event) =
				AT-NC	Averaging time - noncancer	3,650	days	USEPA, 2011	CS x CF x AF x ABS-d
				AT-C	Averaging time - cancer	25,550	days	USEPA, 2011	
				CFsoil	Conversion factor	1.0E-06	kg/mg	USEPA 1989	
									For mutagenic compounds:
									$\frac{CS \times DFSM_{recc-adj} \times ABSd \times CF}{AT}$
									Where:
									$DFSM_{recc-adj}$ = (EF x ED x AF x SA x 3) / BW
	Recreationist (Floater)	Adult	Soil/ Sediment	CS	Chemical Concentration in Soil	See Table 3s	mg/kg	See Table 3s	
				SA	Surface area for contact	19,652	cm2/day	USEPA, 2018	Dermal Absorbed Dose (DAD) (mg/kg-day) =
				ABS-d	Dermal absorption factor-VOCs	chemical-specific	unitless	USEPA 2004	(DA-event x EF x ED x EV x SA) / (AT x BW)
				AF	Adherence factor, adult	0.07	mg/cm2	USEPA, 2018	
				EF	Exposure frequency	10	day/yr	BPJ	where
				ED	Exposure duration	20	yr	USEPA, 2011	
				EV	Event Frequency	1	events/day	EPA, 2001	
				BW	Body weight	80	kg	USEPA, 2011	Absorbed Dose per Event (DA-event) (mg/cm2-event) =
				AT-NC	Averaging time - noncancer	7300	days	USEPA, 2011	CS x CF x AF x ABS-d
				AT-C	Averaging time - cancer	25550	days	USEPA, 2011	
				CFsoil	Conversion factor	1.0E-06	kg/mg	USEPA 1989	
	Recreationist (Fisher)	Adult	Soil/ Sediment	CS	Chemical Concentration in Soil	See Table 3s	mg/kg	See Table 3s	
				SA	Surface area for contact	6,032	cm2/day	USEPA, 2018	Dermal Absorbed Dose (DAD) (mg/kg-day) =
				ABS-d	Dermal absorption factor-VOCs	chemical-specific	unitless	USEPA 2004	(DA-event x EF x ED x EV x SA) / (AT x BW)
				AF	Adherence factor, adult	0.07	mg/cm2	USEPA, 2018	
				EF	Exposure frequency	10	day/yr	BPJ	where
				ED	Exposure duration	20	yr	USEPA, 2011	
				EV	Event Frequency	1	events/day	EPA, 2001	
				BW	Body weight	80	kg	USEPA, 2011	Absorbed Dose per Event (DA-event) (mg/cm2-event) =
				AT-NC	Averaging time - noncancer	7,300	days	USEPA, 2011	CS x CF x AF x ABS-d
				AT-C	Averaging time - cancer	25,550	days	USEPA, 2011	
				CFsoil	Conversion factor	1.0E-06	kg/mg	USEPA 1989	

Table 4-1
Exposure Equations and Assumptions - Current/Future Scenario: Soil and Sediment
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Surface Soil/Sediment

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Parameter Value	Units (a)	Rationale/ Reference (b)	Intake Equation/ Model Name
Dermal	Trespasser	Adolescent (6-16 yers)	Soil/ Sediment	CS	Chemical Concentration in Soil	See Table 3s	mg/kg	See Table 3s	
				SA	Surface area for contact	6,032	cm2/day	USEPA, 2018	Dermal Absorbed Dose (DAD) (mg/kg-day) =
				$DFSM_{tres-adj}$	Dermal age adjusted mutagenic factor	2,015	mg/kg	USEPA, 2018	
				ABS-d	Dermal absorption factor-VOCs	chemical-specific	unitless	USEPA 2004	(DA-event x EF x ED x EV x SA) / (AT x BW)
				AF	Adherence factor	0.07	mg/cm2	USEPA, 2018	
				EF	Exposure frequency	7	day/yr	BPJ	where
				ED	Exposure duration	10	yr	USEPA, 2011	
				EV	Event Frequency	1	events/day	EPA, 2001	Absorbed Dose per Event (DA-event) (mg/cm2-event) = CS x CF x AF x ABS-d
				BW	Body weight	44	kg	USEPA, 2011	
				AT-NC	Averaging time - noncancer	3650	days	USEPA, 2011	
				AT-C	Averaging time - cancer	25550	days	USEPA, 2011	
				CFsoil	Conversion factor	1.0E-06	kg/mg	USEPA 1989	For mutagenic compounds: $\frac{CS \times DFSM_{tres-adj} \times ABSd \times CF}{AT}$ Where: $DFSM_{tres-adj} = (EF \times ED \times AF \times SA \times 3) / BW$

Footnotes:
a/ mg/d = milligrams per day; yr = year; kg = kilogram; cm2/day = square centimeter per day; mg/cm2 = milligrams per square centimeter; hr/day = hours per day
b/ Refer to text for complete reference citations and discussion of best professional judegment (BPJ) parameter values.

TABLE 4-2
Exposure Equations and Assumptions - Current/Future Scenario: Soil to Air
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Air and Airborne Particulate

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Parameter Value	Units (a)	Rationale/ Reference (b)	Intake Equation/ Model Name
Inhalation	Industrial Worker	Adult	Airborne Particulate and Vapors	CS	Chemical Concentration in Soil	See Table 3s	mg/kg	See Table 3s	
				ET	Exposure time	8	hr/day	USEPA, 2018	
				EF	Exposure frequency	187	day/yr	MDEQ, 2017	Intake (µg/m3) =
				ED	Exposure duration	25	yr	USEPA, 2018	CS_{soil} x (1/VF + 1/PEF) x ET x EF x ED x CFday x CFair
				AT-NC	Averaging time - noncancer	9,125	days	USEPA, 2018	AT
				AT-C	Averaging time - cancer	25,550	days	USEPA, 2018	
				PEF	Particulate Emissions Factor	1.36E+09	m3/kg	MDEQ, 2017	
				VF	Volatilization factor	chemical-specific	m3/kg		Intake (mg/m3) =
				CFair	Conversion factor for carcinogenic risk calculations	1.00E+03	ug/mg	USEPA, 2018	CSsoil x (1/VF + 1/PEF) x ET x EF x ED x CFday
				CFday	Conversion factor for time	1/24	days/hr	EPA, 2009	AT
				CFsoil	Conversion factor	1.0E-06	kg/mg	USEPA 1989	
	Construction Worker	Adult	Airborne Particulate and Vapors	CS	Chemical Concentration in Soil	See Table 3s	mg/kg	See Table 3s	
				ET	Exposure time	8	hr/day	USEPA, 2018	
				EF	Exposure frequency	124	day/yr	MDEQ, 2016	Intake (µg/m3) =
				ED	Exposure duration	1	yr	USEPA, 2018	CS_{soil} x (1/VF + 1/PEF) x ET x EF x ED x CFday x CFair
				AT-NC	Averaging time - noncancer	80	days	USEPA, 2018	AT
				AT-C	Averaging time - cancer	365	days	USEPA, 2018	
				PEF	Particulate Emissions Factor	1.30E+06	m3/kg	MDEQ, 2017	
				VF	Volatilization factor	chemical-specific	m3/kg		Intake (mg/m3) =
				CFair	Conversion factor for carcinogenic risk calculations	1.00E+03	ug/mg	USEPA, 2018	CSsoil x (1/VF + 1/PEF) x ET x EF x ED x CFday
				CFday	Conversion factor for time	1/24	days/hr	EPA, 2009	AT
				CFsoil	Conversion factor	1.0E-06	kg/mg	USEPA 1989	
	Stormwater Management Worker	Adult	Airborne Particulate and Vapors	CS	Chemical Concentration in Soil	See Table 3s	mg/kg	See Table 3s	
				ET	Exposure time	1	hr/day	BPJ	
				EF	Exposure frequency	38	day/yr	BPJ	Intake (µg/m3) =
				ED	Exposure duration	25	yr	USEPA, 2018	CS_{soil} x (1/VF + 1/PEF) x ET x EF x ED x CFday x CFair
				AT-NC	Averaging time - noncancer	9,125	days	USEPA, 2018	AT
				AT-C	Averaging time - cancer	25,550	days	USEPA, 2018	
				PEF	Particulate Emissions Factor	1.360E+09	m3/kg	MDEQ, 2017	
				VF	Volatilization factor	chemical-specific	m3/kg		Intake (mg/m3) =
				CFair	Conversion factor for carcinogenic risk calculations	1.00E+03	ug/mg	USEPA, 2018	CSsoil x (1/VF + 1/PEF) x ET x EF x ED x CFday
				CFday	Conversion factor for time	1/24	days/hr	EPA, 2009	AT
				CFsoil	Conversion factor	1.0E-06	kg/mg	USEPA 1989	
	Recreational Trespasser (ATV)	Adult	Airborne Particulate and Vapors	CS	Chemical Concentration in Soil	See Table 3s	mg/kg	See Table 3s	
				ET	Exposure time	1	hr/day	BPJ	
				EF	Exposure frequency	9	day/yr	BPJ	Intake (µg/m3) =
				ED	Exposure duration	20	yr	USEPA, 2018	CS_{soil} x (1/VF + 1/PEF) x ET x EF x ED x CFday x CFair
				AT-NC	Averaging time - noncancer	7,300	days	USEPA, 2018	AT
				AT-C	Averaging time - cancer	25,550	days	USEPA, 2018	
				PEF	Particulate Emissions Factor	chemical-specific	m3/kg	CDM SMITH, 2019	
				VF	Volatilization factor	chemical-specific	m3/kg	USEPA, 2018	Intake (mg/m3) =
				CFair	Conversion factor for carcinogenic risk calculations	1.00E+03	ug/mg	USEPA, 2018	CSsoil x (1/VF + 1/PEF) x ET x EF x ED x CFday
				CFday	Conversion factor for time	1/24	days/hr	EPA, 2009	AT
				CFsoil	Conversion factor	1.00E-06	kg/mg	USEPA 1989	

TABLE 4-2
Exposure Equations and Assumptions - Current/Future Scenario: Soil to Air
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Air and Airborne Particulate

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Parameter Value	Units (a)	Rationale/ Reference (b)	Intake Equation/ Model Name
Inhalation	Recreational Trespasser (Hunter)	Adult	Airborne Particulate and Vapors	CS	Chemical Concentration in Soil	See Table 3s	mg/kg	See Table 3s	
				ET	Exposure time	8	hr/day	BPJ	
				EF	Exposure frequency	14	day/yr	BPJ	Intake (µg/m3) =
				ED	Exposure duration	20	yr	USEPA, 2018	CS_{soil} x (1/VF + 1/PEF) x ET x EF x ED x CFday x CFair
				AT-NC	Averaging time - noncancer	7,300	days	USEPA, 2018	AT
				AT-C	Averaging time - cancer	25,550	days	USEPA, 2018	
				PEF	Particulate Emissions Factor	1.360E+09	m3/kg	MDEQ, 2017	
				VF	Volatilization factor	chemical-specific	m3/kg		Intake (mg/m3) =
				CFair	Conversion factor for carcinogenic risk calculations	1.00E+03	ug/mg	USEPA, 2018	CSsoil x (1/VF + 1/PEF) x ET x EF x ED x CFday
				CFday	Conversion factor for time	1/24	days/hr	EPA, 2009	AT
				CFsoil	Conversion factor	1.0E-06	kg/mg	USEPA 1989	
	Recreationist (Floater)	Adolescent (6-16 years)	Airborne Particulate and Vapors	CS	Chemical Concentration in Soil	See Table 3s	mg/kg	See Table 3s	
				ET	Exposure time	1	hr/day	BPJ	Intake (µg/m3) =
				EF	Exposure frequency	10	day/yr	BPJ	CS_{soil} x (1/VF + 1/PEF) x ET x EF x ED x CFday x CFair
				ED	Exposure duration	10	yr	USEPA, 2018	AT
				AT-NC	Averaging time - noncancer	3,650	days	USEPA, 2018	
				AT-C	Averaging time - cancer	25,550	days	USEPA, 2018	
				PEF	Particulate Emissions Factor	1.360E+09	m3/kg	MDEQ, 2017	Intake (mg/m3) =
				VF	Volatilization factor	chemical-specific	m3/kg		CSsoil x (1/VF + 1/PEF) x ET x EF x ED x CFday
				CFair	Conversion factor for carcinogenic risk calculations	1.00E+03	ug/mg	EPA, 2009	AT
				CFday	Conversion factor for time	1/24	days/hr	EPA, 2009	
				CFsoil	Conversion factor	1.00E-06	kg/mg	USEPA 1989	
	Recreationist (Floater)	Adult	Airborne Particulate and Vapors	CS	Chemical Concentration in Soil	See Table 3s	mg/kg	See Table 3s	
				ET	Exposure time	1	hr/day	BPJ	
				EF	Exposure frequency	10	day/yr	BPJ	Intake (µg/m3) =
				ED	Exposure duration	20	yr	USEPA, 2018	CS_{soil} x (1/VF + 1/PEF) x ET x EF x ED x CFday x CFair
				AT-NC	Averaging time - noncancer	7,300	days	USEPA, 2018	AT
				AT-C	Averaging time - cancer	25,550	days	USEPA, 2018	
				PEF	Particulate Emissions Factor	1.360E+09	m3/kg	MDEQ, 2017	
				VF	Volatilization factor	chemical-specific	m3/kg		Intake (mg/m3) =
				CFair	Conversion factor for carcinogenic risk calculations	1.00E+03	ug/mg	EPA, 2009	CSsoil x (1/VF + 1/PEF) x ET x EF x ED x CFday
				CFday	Conversion factor for time	1/24	days/hr	EPA, 2009	AT
				CFsoil	Conversion factor	1.0E-06	kg/mg	USEPA 1989	
	Recreationist (Fisher)	Adult	Airborne Particulate and Vapors	CS	Chemical Concentration in Soil	See Table 3s	mg/kg	See Table 3s	
				ET	Exposure time	1	hr/day	BPJ	
				EF	Exposure frequency	10	day/yr	BPJ	Intake (µg/m3) =
				ED	Exposure duration	20	yr	USEPA, 2018	CS_{soil} x (1/VF + 1/PEF) x ET x EF x ED x CFday x CFair
				AT-NC	Averaging time - noncancer	7,300	days	USEPA, 2018	AT
				AT-C	Averaging time - cancer	25,550	days	USEPA, 2018	
				PEF	Particulate Emissions Factor	1.360E+09	m3/kg	MDEQ, 2017	
				VF	Volatilization factor	chemical-specific	m3/kg		Intake (mg/m3) =
				CFair	Conversion factor for carcinogenic risk calculations	1.00E+03	ug/mg	EPA, 2009	CSsoil x (1/VF + 1/PEF) x ET x EF x ED x CFday
				CFday	Conversion factor for time	1/24	days/hr	EPA, 2009	AT
				CFsoil	Conversion factor	1.0E-06	kg/mg	USEPA 1989	

TABLE 4-2
Exposure Equations and Assumptions - Current/Future Scenario: Soil to Air
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Air and Airborne Particulate

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Parameter Value	Units (a)	Rationale/ Reference (b)	Intake Equation/ Model Name
Inhalation	Resident	Adult	Airborne Particulate and Vapors	CS	Chemical Concentration in Soil	See Table 3s	mg/kg	See Table 3s	
				ET	Exposure time	24	hr/day	USEPA, 2018	
				EF	Exposure frequency	270	day/yr	BPJ	Intake (µg/m3) =
				ED	Exposure duration	20	yr	USEPA, 2018	$\frac{CS_{soil} \times (1/VF + 1/PEF) \times ET \times EF \times ED \times CFday \times CFair}{AT}$
				AT-NC	Averaging time - noncancer	7,300	days	USEPA, 2018	
				AT-C	Averaging time - cancer	25,550	days	USEPA, 2018	
				PEF	Particulate Emissions Factor	1.360E+09	m3/kg	MDEQ, 2017	
				VF	Volatilization factor	chemical-specific	m3/kg		Intake (mg/m3) =
				CFair	Conversion factor for carcinogenic risk calculations	1.00E+03	ug/mg	USEPA, 2018	$\frac{CSsoil \times (1/VF + 1/PEF) \times ET \times EF \times ED \times CFday}{AT}$
				CFday	Conversion factor for time	1/24	days/hr	EPA, 2009	
				CFsoil	Conversion factor	1.00E-06	kg/mg	USEPA 1989	
	Resident	Child	Airborne Particulate and Vapors	CS	Chemical Concentration in Soil	See Table 3s	mg/kg	See Table 3s	
				ET	Exposure time	24	hr/day	USEPA, 2018	
				EF	Exposure frequency	270	day/yr	BPJ	Intake (µg/m3) =
				ED	Exposure duration	6	yr	USEPA, 2018	$\frac{CS_{soil} \times (1/VF + 1/PEF) \times ET \times EF \times ED \times CFday \times CFair}{AT}$
				AT-NC	Averaging time - noncancer	2,190	days	USEPA, 2018	
				AT-C	Averaging time - cancer	25,550	days	USEPA, 2018	
				PEF	Particulate Emissions Factor	1.360E+09	m3/kg	MDEQ, 2017	
				VF	Volatilization factor	chemical-specific	m3/kg		Intake (mg/m3) =
				CFair	Conversion factor for carcinogenic risk calculations	1.00E+03	ug/mg	USEPA, 2018	$\frac{CSsoil \times (1/VF + 1/PEF) \times ET \times EF \times ED \times CFday}{AT}$
				CFday	Conversion factor for time	1/24	days/hr	EPA, 2009	
				CFsoil	Conversion factor	1.00E-06	kg/mg	USEPA 1989	
				EF_{0-2}	Exposure frequency (0 to 2 years)	270	day/yr	MDEQ, 2016	
				ED_{0-2}	Exposure duration (0 to 2 years)	2.00	yr	USEPA, 2018	For mutagenic compounds:
				BW_{0-2}	Body weight (0 to 2 years)	15	kg	USEPA, 2018	
									$CS_{soil} \times (1/VF + 1/PEF) \times [(ET_{0-2} \times EF_{0-2} \times ED_{0-2} \times Cfday \times 10) +$
				EF_{2-6}	Exposure frequency (2 to 6 years)	270	day/yr	USEPA, 2018	$(ET_{0-2} \times EF_{0-2} \times ED_{0-2} \times Cfday \times 3)] \times Cfair$
				ED_{2-6}	Exposure duration (2 to 6 years)	4	yr	USEPA, 2018	AT
				BW_{2-6}	Body weight (2-6 years)	15	kg	USEPA, 2018	
	Trespasser	Adolescent (6-16 years)	Airborne Particulate and Vapors	CS	Chemical Concentration in Soil	See Table 3s	mg/kg	See Table 3s	
				ET	Exposure time	1	hr/day	BPJ	
				EF	Exposure frequency	7	day/yr	MDEQ, 2017	Intake (µg/m3) =
				ED	Exposure duration	10	yr	USEPA, 2018	$\frac{CS_{soil} \times (1/VF + 1/PEF) \times ET \times EF \times ED \times CFday \times CFair}{AT}$
				AT-NC	Averaging time - noncancer	3,650	days	USEPA, 2018	
				AT-C	Averaging time - cancer	25,550	days	USEPA, 2018	
				PEF	Particulate Emissions Factor	1.360E+09	m3/kg	MDEQ, 2017	
				VF	Volatilization factor	chemical-specific	m3/kg		Intake (mg/m3) =
				CFair	Conversion factor for carcinogenic risk calculations	1.00E+03	ug/mg	EPA, 2009	$\frac{CSsoil \times (1/VF + 1/PEF) \times ET \times EF \times ED \times CFday}{AT}$
				CFday	Conversion factor for time	1/24	days/hr	EPA, 2009	
				CFsoil	Conversion factor	1.00E-06	kg/mg	USEPA 1989	
									For mutagenic compounds:
									$\frac{CS_{soil} \times (1/VF + 1/PEF) \times (ET \times EF \times ED \times Cfday \times 3) \times CFair}{AT}$

Footnotes:
a/ mg/d = milligrams per day; yr = year; kg = kilogram; cm2/day = square centimeter per day; mg/cm2 = milligrams per square centimeter; hr/day = hours per day
b/ Refer to text for complete reference citations and discussion of best professional judegment (BPJ) parameter values.

TABLE 4-3
Exposure Equations and Assumptions - Current/Future Scenario: Surface Water
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Parameter Value	Units (a)	Rationale/ Reference (b)	Intake Equation/ Model Name
Ingestion	Stormwater Management Woker	Adult	Surface Water	EPCsw	Chemical Concentration in Surface water	See Table 3s	µg/l	See Table 3s	ADD_{sw} or $LADD_{sw}$ (mg/kg-day) = $\frac{EPC_{sw} \times IR_{sw} \times EF \times ED \times EV \times ET \times CF}{BW \times AT}$
				IRsw	Surface water intake rate	0.071	l/hr	USEPA, 2018	
				EF	Exposure frequency	38	day/yr	BPJ	
				ED	Exposure duration	25	yr	USEPA, 2018	
				EV	Events per day	1	events/day	BPJ	
				ET	Exposure time per event	1	hr/event	USEPA, 2018	
				CF	Conversion factor	1.0E-03	mg/µg	USEPA, 2018	
				BW	Body weight	80	kg	USEPA, 2018	
				AT-n	Averaging time (noncancer endpoint)	9125	days	USEPA, 2018	
				AT-c	Averaging time (cancer endpoint)	25550	days	USEPA, 2018	
	Recreational Trespasser (ATV)	Adult	Surface Water	EPCsw	Chemical Concentration in Surface Water	See Table 3s	µg/l	See Table 3s	ADD_{sw} or $LADD_{sw}$ (mg/kg-day) = $\frac{EPC_{sw} \times IR_{sw} \times EF \times ED \times EV \times ET \times CF}{BW \times AT}$
				IRsw	Surface water intake rate	0.071	l/hr	USEPA, 2018	
				EF	Exposure frequency	9	day/yr	BPJ	
				ED	Exposure duration	20	yr	USEPA, 2018	
				EV	Events per day	1	events/day	USEPA, 2018	
				ET	Exposure time per event	1	hr/event	BPJ	
				CF	Conversion factor	1.0E-03	mg/µg	USEPA, 2018	
				BW	Body weight	80	kg	USEPA, 2018	
				AT-n	Averaging time (noncancer endpoint)	7,300	days	USEPA, 2018	
				AT-c	Averaging time (cancer endpoint)	25,550	days	USEPA, 2018	
	Recreational Trespasser (Hunter)	Adult	Surface Water	EPCsw	Chemical Concentration in Surface Water	See Table 3s	µg/l	See Table 3s	ADD_{sw} or $LADD_{sw}$ (mg/kg-day) = $\frac{EPC_{sw} \times IR_{sw} \times EF \times ED \times EV \times ET \times CF}{BW \times AT}$
				IRsw	Surface water intake rate	0.071	l/hr	USEPA, 2018	
				EF	Exposure frequency	14	day/yr	BPJ	
				ED	Exposure duration	20	yr	USEPA, 2018	
				EV	Events per day	1	events/day	USEPA, 2018	
				ET	Exposure time per event	1	hr/event	BPJ	
				CF	Conversion factor	1.0E-03	mg/µg	USEPA, 2018	
				BW	Body weight	80	kg	USEPA, 2018	
				AT-n	Averaging time (noncancer endpoint)	7300	days	USEPA, 2018	
				AT-c	Averaging time (cancer endpoint)	25550	days	USEPA, 2018	
	Recreationist (Floater)	Adolescent (6-16 years)	Surface Water	EPCsw	Chemical Concentration in Surface Water	See Table 3s	µg/l	See Table 3s	ADD_{sw} or $LADD_{sw}$ (mg/kg-day) = $\frac{EPC_{sw} \times IR_{sw} \times EF \times ED \times EV \times ET \times CF}{BW \times AT}$ For mutagenic compounds: $\frac{EPCsw \times IFWM_{recc\text{-}adj} \times CF}{AT}$ Where: $IFWM_{recc\text{-}adj}$ = (ED x EF x IRW x EV x ET x 3) / BW
				IRsw	Surface water intake rate	0.071	l/hr	USEPA, 2018	
				$IFWM_{rec\text{-}adj}$	Ingestion of surface water mutagenic factor	0.4841	L/kg	USEPA, 2018	
				EF	Exposure frequency	10	day/yr	BPJ	
				ED	Exposure duration	10	yr	USEPA, 2018	
				EV	Events per day	1	events/day	USEPA, 2018	
				ET	Exposure time per event	1	hr/event	BPJ	
				CF	Conversion factor	1.0E-03	mg/µg	USEPA, 2018	
				BW	Body weight	44	kg	USEPA, 2018	
				AT-n	Averaging time (noncancer endpoint)	3650	days	USEPA, 2018	
				AT-c	Averaging time (cancer endpoint)	25550	days	USEPA, 2018	

TABLE 4-3
Exposure Equations and Assumptions - Current/Future Scenario: Surface Water
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Parameter Value	Units (a)	Rationale/ Reference (b)	Intake Equation/ Model Name
Ingestion	Recreationist (Floater)	Adult	Surface Water	EPCsw	Chemical Concentration in Surface Water	See Table 3s	µg/l	See Table 3s	ADD_{sw} or $LADD_{sw}$ (mg/kg-day) = $\frac{EPC_{sw} \times IR_{sw} \times EF \times ED \times EV \times ET \times CF}{BW \times AT}$
				IRsw	Surface water intake rate	0.071	l/hr	USEPA, 2018	
				EF	Exposure frequency	10	day/yr	BPJ	
				ED	Exposure duration	20	yr	USEPA, 2018	
				EV	Events per day	1	events/day	USEPA, 2018	
				ET	Exposure time per event	1	hr/event	BPJ	
				CF	Conversion factor	1.0E-03	mg/µg	USEPA, 2018	
				BW	Body weight	80	kg	USEPA, 2018	
				AT-n	Averaging time (noncancer endpoint)	7300	days	USEPA, 2018	
				AT-c	Averaging time (cancer endpoint)	25550	days	USEPA, 2018	
	Recreationist (Fisher)	Adult	Surface Water	EPCsw	Chemical Concentration in Surface Water	See Table 3s	µg/l	See Table 3s	ADD_{sw} or $LADD_{sw}$ (mg/kg-day) = $\frac{EPC_{sw} \times IR_{sw} \times EF \times ED \times EV \times ET \times CF}{BW \times AT}$
				IRsw	Surface water intake rate	0.071	l/hr	USEPA, 2018	
				EF	Exposure frequency	10	day/yr	BPJ	
				ED	Exposure duration	20	yr	USEPA, 2018	
				EV	Events per day	1	events/day	USEPA, 2018	
				ET	Exposure time per event	1	hr/event	BPJ	
				CF	Conversion factor	1.0E-03	mg/µg	USEPA, 2018	
				BW	Body weight	80	kg	USEPA, 2018	
				AT-n	Averaging time (noncancer endpoint)	7300	days	USEPA, 2018	
				AT-c	Averaging time (cancer endpoint)	25550	days	USEPA, 2018	
	Trespasser	Adolescent (6-16 years)	Surface Water	EPCsw	Chemical Concentration in Surface Water	See Table 3s	µg/l	See Table 3s	ADD_{sw} or $LADD_{sw}$ (mg/kg-day) = $\frac{EPC_{sw} \times IR_{sw} \times EF \times ED \times EV \times ET \times CF}{BW \times AT}$ For mutagenic compounds: $\frac{EPCsw \times IFWM_{tres\text{-}adj} \times CF}{AT}$ Where: $IFWM_{tres\text{-}adj}$ = (ED x EF x IRW x EV x ET x 3) / BW
				IRsw	Surface water intake rate	0.071	l/hr	USEPA, 2018	
				$IFWM_{tres\text{-}adj}$	Ingestion of surface water mutagenic factor	0.34	L/kg	USEPA, 2018	
				EF	Exposure frequency	7	day/yr	BPJ	
				ED	Exposure duration	10	yr	USEPA, 2018	
				EV	Events per day	1	events/day	USEPA, 2018	
				ET	Exposure time per event	1	hr/event	BPJ	
				CF	Conversion factor	1.0E-03	mg/µg	USEPA, 2018	
				BW	Body weight	44	kg	USEPA, 2018	
				AT-n	Averaging time (noncancer endpoint)	3650	days	USEPA, 2018	
				AT-c	Averaging time (cancer endpoint)	25550	days	USEPA, 2018	

TABLE 4-3
Exposure Equations and Assumptions - Current/Future Scenario: Surface Water
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Parameter Value	Units (a)	Rationale/ Reference (b)	Intake Equation/ Model Name
Dermal	Stormwater Management Worker	Adult	Surface Water	EPCsw	Chemical concentration in surface water	See Table 3s	µg/L	See Table 3s	DADsw or LDADsw (mg/kg-day) =
				EF	Exposure frequency	38	days/year	BPJ	For inorganics:
				ED	Exposure duration	25	years	USEPA, 2018	$\frac{EPC_{sw} \times K_p \times ET \times DFW_{rec\text{-}adj} \times CF1 \times CF2}{AT}$
				EV	Events per day	1	events/day	BPJ	AT
				ET	Exposure time per event	1	hr/event	BPJ	For organics if ET ≤ t*:
				SAsw	Skin surface area exposed to surface water	3,527	cm2	USEPA, 2018	$\frac{EPC_{sw} \times 2 \times FA \times K_p \times \sqrt{\frac{6 \times \tau_{event} \times ET}{\pi}} \times DFW_{rec-adj} \times CF1 \times CF2}{AT}$
				BW	Body weight	80	kg	USEPA, 2018	
				FA	Fraction absorbed	chemical-specific	--		
				Kp	Dermal permeability	chemical-specific	cm/hr		
				MW	Molecular weight	chemical-specific	g/mole		
				DFW-adj	Stormwater Management Worker water dermal contact factor	41883	cm²-event/kg	USEPA, 2018	For organics if ET > t*:
				τevent	Lag time per event	chemical-specific	hr/event		$\frac{EPC_{sw} \times FA \times K_p \times \left[\frac{ET}{1+B} + 2 \times \tau_{event} \times \left(\frac{1+3B+3B^2}{(1+B)^2}\right)\right] \times DFW_{rec-adj} \times CF1 \times CF2}{AT}$
				t*	Time to reach steady-state	chemical-specific	hr		
				B	Ratio of permeability through stratum corneum to permeability across viable epidermis	chemical-specific	--		
				CF1	Conversion factor	1.0E-03	mg/µg	USEPA, 2018	
				CF2	Conversion factor	1.0E-03	L/cm3	USEPA, 2018	
				AT-n	Averaging time (noncancer endpoint)	9125	days	USEPA, 2018	
				AT-c	Averaging time (cancer endpoint)	25550	days	USEPA, 2018	
	Recreational Trespasser (ATV)	Adult	Surface Water	EPCsw	Chemical concentration in surface water	See Table 3s	µg/L	See Table 3s	DADsw or LDADsw (mg/kg-day) =
				EF	Exposure frequency	9	days/year	BPJ	For inorganics:
				ED	Exposure duration	20	years	USEPA, 2018	$\frac{EPC_{sw} \times K_p \times ET \times DFW_{rec\text{-}adj} \times CF1 \times CF2}{AT}$
				EV	Events per day	1	events/day	BPJ	AT
				ET	Exposure time per event	1	hr/event	BPJ	For organics if ET ≤ t*:
				SAsw	Skin surface area exposed to surface water	3,527	cm2	USEPA, 2018	$\frac{EPC_{sw} \times 2 \times FA \times K_p \times \sqrt{\frac{6 \times \tau_{event} \times ET}{\pi}} \times DFW_{rec-adj} \times CF1 \times CF2}{AT}$
				BW	Body weight	80	kg	USEPA, 2018	
				FA	Fraction absorbed	chemical-specific	--		
				Kp	Dermal permeability	chemical-specific	cm/hr		
				MW	Molecular weight	chemical-specific	g/mole		
				DFWrec-adj	Water dermal contact factor	7936	cm²-event/kg	USEPA, 2018	For organics if ET > t*:
				τevent	Lag time per event	chemical-specific	hr/event		$\frac{EPC_{sw} \times FA \times K_p \times \left[\frac{ET}{1+B} + 2 \times \tau_{event} \times \left(\frac{1+3B+3B^2}{(1+B)^2}\right)\right] \times DFW_{rec-adj} \times CF1 \times CF2}{AT}$
				t*	Time to reach steady-state	chemical-specific	hr		
				B	Ratio of permeability through stratum corneum to permeability across viable epidermis	chemical-specific	--		
				CF1	Conversion factor	1.0E-03	mg/µg	USEPA, 2018	
				CF2	Conversion factor	1.0E-03	L/cm3	USEPA, 2018	
				AT-n	Averaging time (noncancer endpoint)	7300	days	USEPA, 2018	
				AT-c	Averaging time (cancer endpoint)	25550	days	USEPA, 2018	

TABLE 4-3
Exposure Equations and Assumptions - Current/Future Scenario: Surface Water
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Parameter Value	Units (a)	Rationale/ Reference (b)	Intake Equation/ Model Name
Dermal	Recreational Trespasser (Hunter)	Adult	Surface Water	EPCsw	Chemical concentration in surface water	See Table 3s	µg/L	See Table 3s	DADsw or LDADsw (mg/kg-day) =
				EF	Exposure frequency	14	days/year	BPJ	For inorganics:
				ED	Exposure duration	20	years	USEPA, 2018	$\frac{EPC_{sw} \times K_p \times ET \times DFW_{rec-adj} \times CF1 \times CF2}{AT}$
				EV	Events per day	1	events/day	BPJ	
				ET	Exposure time per event	1	hr/event	BPJ	For organics if ET ≤ t*:
				SAsw	Skin surface area exposed to surface water	3,527	cm2	USEPA, 2018	
				BW	Body weight	80	kg	USEPA, 2018	$\frac{EPC_{sw} \times 2 \times FA \times K_p \times \sqrt{\frac{6 \times \tau_{event} \times ET}{\pi}} \times DFW_{rec-adj} \times CF1 \times CF2}{AT}$
				FA	Fraction absorbed	chemical-specific	--		
				Kp	Dermal permeability	chemical-specific	cm/hr		
				MW	Molecular weight	chemical-specific	g/mole		
				DFWrec-adj	Water dermal contact factor	12345	cm²-event/kg	USEPA, 2018	For organics if ET > t*:
				τevent	Lag time per event	chemical-specific	hr/event		
				t*	Time to reach steady-state	chemical-specific	hr		$\frac{EPC_{sw} \times FA \times K_p \times \left[\frac{ET}{1+B} + 2 \times \tau_{event} \times \left(\frac{1+3B+3B^2}{(1+B)^2}\right)\right] \times DFW_{rec-adj} \times CF1 \times CF2}{AT}$
				B	Ratio of permeability through stratum corneum to permeability across viable epidermis	chemical-specific	--		
				CF1	Conversion factor	1.0E-03	mg/µg	USEPA, 2018	
				CF2	Conversion factor	1.0E-03	L/cm3	USEPA, 2018	
				AT-n	Averaging time (noncancer endpoint)	7300	days	USEPA, 2018	
				AT-c	Averaging time (cancer endpoint)	25550	days	USEPA, 2018	

TABLE 4-3
Exposure Equations and Assumptions - Current/Future Scenario: Surface Water
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Parameter Value	Units (a)	Rationale/ Reference (b)	Intake Equation/ Model Name
Dermal	Recreationist (Floater)	Adolescent (6-16 years)	Surface Water	EPCsw	Chemical concentration in surface water	See Table 3s	µg/L	See Table 3s	DADsw or LDADsw (mg/kg-day) =
				EF	Exposure frequency	10	days/year	BPJ	For inorganics:
				ED	Exposure duration	10	years	USEPA, 2018	$\frac{EPC_{sw} \times K_p \times ET \times DFW_{rec-adj} \times CF1 \times CF2}{AT}$
				EV	Events per day	1	events/day	BPJ	
				ET	Exposure time per event	1	hr/event	BPJ	For organics if ET ≤ t*:
				ETevent-rec-madj	Exposure time per event for mutagenic compoounds	1	hrs/event	USEPA, 2018	$\frac{EPC_{sw} \times 2 \times FA \times K_p \times \sqrt{\frac{6 \times \tau_{event} \times ET}{\pi}} \times DFW_{rec-adj} \times CF1 \times CF2}{AT}$
				SAsw	Skin surface area exposed to surface water	19652	cm2	USEPA, 2018	
				BW	Body weight	44	kg	USEPA, 2018	
				FA	Fraction absorbed	chemical-specific	--		
				Kp	Dermal permeability	chemical-specific	cm/hr		
				MW	Molecular weight	chemical-specific	g/mole		
				DFWrec-adj	Water dermal contact factor	44664	cm²-event/kg	USEPA, 2018	For organics if ET > t*:
				DFMWrec-adj	Water dermal contact factor for mutagenic compounds	133991	cm²-event/kg		$\frac{EPC_{sw} \times FA \times K_p \times \left[\frac{ET}{1+B} + 2 \times \tau_{event} \times \left(\frac{1+3B+3B^2}{(1+B)^2}\right)\right] \times DFW_{rec-adj} \times CF1 \times CF2}{AT}$
				τevent	Lag time per event	chemical-specific	hr/event		
				t*	Time to reach steady-state	chemical-specific	hr		
				B	Ratio of permeability through stratum corneum to permeability across viable epidermis	chemical-specific	--		For mutagenic compounds
				CF1	Conversion factor	1.0E-03	mg/µg	USEPA, 2018	
				CF2	Conversion factor	1.0E-03	L/cm3	USEPA, 2018	For inorganics:
				AT-n	Averaging time (noncancer endpoint)	3650	days	USEPA, 2018	DADsw = (EPCsw x Kp x ET x DFMWrec-adj x CF1 x CF2)/(AT)
				AT-c	Averaging time (cancer endpoint)	25550	days	USEPA, 2018	
									For organics if ET ≤ t*:
									$\frac{EPCsw \times Kp \times \sqrt{\frac{6 \times \tau_{event} \times ET_{event-rec-madj}}{\pi}} \times DFMWrec - adj \times CF1 \times CF2}{AT}$
									For organics if ET > t*:
									$\frac{EPCsw \times FA \times Kp \times \left[\frac{ET_{event-rec-madj}}{1+B} + 2 \times \tau_{event} \times \left(\frac{1+3B+3B^2}{(1+B)^2}\right)\right] \times DFWMrec - adj \times CF1 \times CF2}{AT}$

TABLE 4-3
Exposure Equations and Assumptions - Current/Future Scenario: Surface Water
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Parameter Value	Units (a)	Rationale/ Reference (b)	Intake Equation/ Model Name
Dermal	Recreationist (Floater)	Adult	Surface Water	EPCsw	Chemical concentration in surface water	See Table 3s	µg/L	See Table 3s	DADsw or LDADsw (mg/kg-day) =
				EF	Exposure frequency	10	days/year	BPJ	For inorganics:
				ED	Exposure duration	20	years	USEPA, 2018	$\frac{EPC_{sw} \times K_p \times ET \times DFW_{rec\text{-}adj} \times CF1 \times CF2}{AT}$
				EV	Events per day	1	events/day	BPJ	
				ET	Exposure time per event	1	hr/event	BPJ	For organics if ET ≤ t*:
				SAsw	Skin surface area exposed to surface water	19652	cm2	USEPA, 2018	$\frac{EPC_{sw} \times 2 \times FA \times K_p \times \sqrt{\frac{6 \times \tau_{event} \times ET}{\pi}} \times DFW_{rec-adj} \times CF1 \times CF2}{AT}$
				BW	Body weight	80	kg	USEPA, 2018	
				FA	Fraction absorbed	chemical-specific	--		
				Kp	Dermal permeability	chemical-specific	cm/hr		
				MW	Molecular weight	chemical-specific	g/mole		
				DFWrec-adj	Water dermal contact factor	49130	cm²-event/kg	USEPA, 2018	For organics if ET > t*:
				τevent	Lag time per event	chemical-specific	hr/event		$\frac{EPC_{sw} \times FA \times K_p \times \left[\frac{ET}{1+B} + 2 \times \tau_{event} \times \left(\frac{1+3B+3B^2}{(1+B)^2}\right)\right] \times DFW_{rec-adj} \times CF1 \times CF2}{AT}$
				t*	Time to reach steady-state	chemical-specific	hr		
				B	Ratio of permeability through stratum corneum to permeability across viable epidermis	chemical-specific	--		
				CF1	Conversion factor	1.0E-03	mg/µg	USEPA, 2018	
				CF2	Conversion factor	1.0E-03	L/cm3	USEPA, 2018	
				AT-n	Averaging time (noncancer endpoint)	7300	days	USEPA, 2018	
				AT-c	Averaging time (cancer endpoint)	25550	days	USEPA, 2018	
	Recreationist (Fisher)	Adult	Surface Water	EPCsw	Chemical concentration in surface water	See Table 3s	µg/L	See Table 3s	DADsw or LDADsw (mg/kg-day) =
				EF	Exposure frequency	10	days/year	BPJ	For inorganics:
				ED	Exposure duration	20	years	USEPA, 2018	$\frac{EPC_{sw} \times K_p \times ET \times DFW_{rec\text{-}adj} \times CF1 \times CF2}{AT}$
				EV	Events per day	1	events/day	BPJ	
				ET	Exposure time per event	1	hr/event	BPJ	For organics if ET ≤ t*:
				SAsw	Skin surface area exposed to surface water	6032	cm2	USEPA, 2018	$\frac{EPC_{sw} \times 2 \times FA \times K_p \times \sqrt{\frac{6 \times \tau_{event} \times ET}{\pi}} \times DFW_{rec-adj} \times CF1 \times CF2}{AT}$
				BW	Body weight	80	kg	USEPA, 2018	
				FA	Fraction absorbed	chemical-specific	--		
				Kp	Dermal permeability	chemical-specific	cm/hr		
				MW	Molecular weight	chemical-specific	g/mole		
				DFWrec-adj	Recreator water dermal contact factor	15080	cm²-event/kg	USEPA, 2018	For organics if ET > t*:
				τevent	Lag time per event	chemical-specific	hr/event		$\frac{EPC_{sw} \times FA \times K_p \times \left[\frac{ET}{1+B} + 2 \times \tau_{event} \times \left(\frac{1+3B+3B^2}{(1+B)^2}\right)\right] \times DFW_{rec-adj} \times CF1 \times CF2}{AT}$
				t*	Time to reach steady-state	chemical-specific	hr		
				B	Ratio of permeability through stratum corneum to permeability across viable epidermis	chemical-specific	--		
				CF1	Conversion factor	1.0E-03	mg/µg	USEPA, 2018	
				CF2	Conversion factor	1.0E-03	L/cm3	USEPA, 2018	
				AT-n	Averaging time (noncancer endpoint)	7300	days	USEPA, 2018	
				AT-c	Averaging time (cancer endpoint)	25550	days	USEPA, 2018	

TABLE 4-3
Exposure Equations and Assumptions - Current/Future Scenario: Surface Water
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Parameter Value	Units (a)	Rationale/ Reference (b)	Intake Equation/ Model Name
Dermal	Trespasser	Adolescent (6-16 yers)	Surface Water	EPCsw	Chemical concentration in surface water	See Table 3s	µg/L	See Table 3s	DADsw or LDADsw (mg/kg-day) =
				EF	Exposure frequency	7	days/year	BPJ	For inorganics:
				ED	Exposure duration	10	years	USEPA, 2018	$\frac{EPC_{sw} \times K_p \times ET \times DFW_{rec-adj} \times CF1 \times CF2}{AT}$
				EV	Events per day	1	events/day	BPJ	
				ET	Exposure time per event	1	hr/event	BPJ	For organics if ET ≤ t*:
				ETevent-tres-madj	Exposure time per event for mutagenic compoounds	1	hrs/event	USEPA, 2018	
				SAsw	Skin surface area exposed to surface water	6032	cm2	USEPA, 2018	$\frac{EPC_{sw} \times 2 \times FA \times K_p \times \sqrt{\frac{6 \times \tau_{event} \times ET}{\pi}} \times DFW_{rec-adj} \times CF1 \times CF2}{AT}$
				BW	Body weight	44	kg	USEPA, 2018	
				FA	Fraction absorbed	chemical-specific	--		
				Kp	Dermal permeability	chemical-specific	cm/hr		
				MW	Molecular weight	chemical-specific	g/mole		
				DFWrec-adj	Water dermal contact factor	9596	cm²-event/kg	USEPA, 2018	For organics if ET > t*:
				DFMWtres-adj	Water dermal contact factor for mutagenic compounds	28789	cm²-event/kg		
				τevent	Lag time per event	chemical-specific	hr/event		$\frac{EPC_{sw} \times FA \times K_p \times \left[\frac{ET}{1+B} + 2 \times \tau_{event} \times \left(\frac{1+3B+3B^2}{(1+B)^2}\right)\right] \times DFW_{rec-adj} \times CF1 \times CF2}{AT}$
				t*	Time to reach steady-state	chemical-specific	hr		
				B	Ratio of permeability through stratum corneum to permeability across viable epidermis	chemical-specific	--		
				CF1	Conversion factor	1.0E-03	mg/µg	USEPA, 2018	
				CF2	Conversion factor	1.0E-03	L/cm3	USEPA, 2018	
				AT-n	Averaging time (noncancer endpoint)	3650	days	USEPA, 2018	
				AT-c	Averaging time (cancer endpoint)	25550	days	USEPA, 2018	
									For mutagenic compounds
									For inorganics:
									DADsw = (EPCsw x Kp x ET x DFMWtres-adj x CF1 x CF2)/(AT)
									For organics if ET ≤ t*:
									$\frac{EPCsw \times Kp \times \sqrt{\frac{6 \times \tau_{event} \times ET_{event-tres-madj}}{\pi}} \times DFMWtres-adj \times CF1 \times CF}{AT}$
									For organics if ET > t*:
									$\frac{EPCsw \times FA \times Kp \times \left[\frac{ET_{event-tres-madj}}{1+B} + 2 \times \tau_{event} \times \left(\frac{1+3B+3B^2}{(1+B)^2}\right)\right] \times DFWMtres-adj \times CF1 \times CF2}{AT}$

Footnotes:
a/ mg/d = milligrams per day; yr = year; kg = kilogram; cm2/day = square centimeter per day; mg/cm2 = milligrams per square centimeter; hr/day = hours per day
b/ Refer to text for complete reference citations and discussion of best professional judegment (BPJ) parameter values.

MDEQ (2016). Memorandum Regarding Exposure Frequency. Montana Department of Environmental Quality.

TABLE 4-4
Exposure Equations and Assumptions - Future Scenario: Groundwater
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Tapwater

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Parameter Value	Units (a)	Rationale/ Reference (b)	Intake Equation/ Model Name
Ingestion	Resident	Adult	Tapwater	EPCgw	Chemical Concentration in Groundwater	See Table 3s	µg/l	See Table 3s	
				IRgw	Groundwater intake rate	2.5	l/day	USEPA, 2018	ADDgw or LADDgw (mg/kg-day) =
				EF	Exposure frequency	350	day/yr	USEPA, 2018	$\frac{EPC_{gw} \times IR_{gw} \times EF \times ED \times CF}{BW \times AT}$
				ED	Exposure duration	20	yr	USEPA, 2018	
				CF	Conversion factor	1.0E-03	mg/µg	USEPA, 2018	
				BW	Body weight	80	kg	USEPA, 2018	
				AT-n	Averaging time (noncancer endpoint)	7,300	days	USEPA, 2018	
				AT-c	Averaging time (cancer endpoint)	25,550	days	USEPA, 2018	
	Resident	Child	Tapwater	EPCgw	Chemical Concentration in Groundwater	See Table 3s	µg/l	See Table 3s	
				IRgw	Groundwater intake rate	0.78	l/day	USEPA, 2018	ADDgw or LADDgw (mg/kg-day) =
				EF	Exposure frequency	350	day/yr	USEPA, 2018	$\frac{EPC_{gw} \times IR_{gw} \times EF \times ED \times CF}{BW \times AT}$
				ED	Exposure duration	6	yr	USEPA, 2018	
				CF	Conversion factor	1.0E-03	mg/µg	USEPA, 2018	
				BW	Body weight	15	kg	USEPA, 2018	
				AT-n	Averaging time (noncancer endpoint)	2,190	days	USEPA, 2018	
				AT-c	Averaging time (cancer endpoint)	25,550	days	USEPA, 2018	
Dermal	Resident	Adult	Tapwater	EPCgw	Chemical Concentration in Groundwater	See Table 3s	µg/L	See Table 3s	DADgw or LDADgw (mg/kg-day) =
				EF	Exposure frequency	350	days/year	USEPA, 2018	For inorganics:
				ED	Exposure duration	20	years	USEPA, 2018	$\frac{EPCgw \times Kp \times ET \times DFWrec\text{-}adj \times CF1 \times CF2}{AT}$
				EV	Events per day	1	events/day	USEPA, 2018	
				ET	Exposure time per event	0.71	hr/event	USEPA, 2018	For organics if ET ≤ t*:
				SAgw	Skin surface area exposed to groundwater	19652	cm2	USEPA, 2018	$\frac{EPC_{sw} \times 2 \times FA \times K_p \times \sqrt{\frac{6 \times \tau_{event} \times ET}{\pi}} \times DFW_{rec-adj} \times CF1 \times CF2}{AT}$
				BW	Body weight	80	kg	USEPA, 2018	
				FA	Fraction absorbed	chemical-specific	--		
				Kp	Dermal permeability	chemical-specific	cm/hr		
				MW	Molecular weight	chemical-specific	g/mole		
				DFW-adj	Resident water dermal contact factor	1719550	cm²-event/kg	USEPA, 2018	For organics if ET > t*:
				τevent	Lag time per event	chemical-specific	hr/event		$\frac{EPC_{sw} \times FA \times K_p \times \left[\frac{ET}{1+B} + 2 \times \tau_{event} \times \left(\frac{1+3B+3B^2}{(1+B)^2}\right)\right] \times DFW_{rec-adj} \times CF1 \times CF2}{AT}$
				t*	Time to reach steady-state	chemical-specific	hr		
				B	Ratio of permeability through stratum corneum to permeability across viable epidermis	chemical-specific	--		
				CF1	Conversion factor	1.0E-03	mg/µg	USEPA, 2018	
				CF2	Conversion factor	1.0E-03	L/cm3	USEPA, 2018	
				AT-n	Averaging time (noncancer endpoint)	7300	days	USEPA, 2018	
				AT-c	Averaging time (cancer endpoint)	25550	days	USEPA, 2018	

TABLE 4-4
Exposure Equations and Assumptions - Future Scenario: Groundwater
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Tapwater

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Parameter Value	Units (a)	Rationale/ Reference (b)	Intake Equation/ Model Name
Dermal	Resident	Child	Tapwater	EPCgw	Chemical Concentration in Groundwater	See Table 3s	µg/L	See Table 3s	DADgw or LDADgw (mg/kg-day) =
				EF	Exposure frequency	350	days/year	USEPA, 2018	For inorganics:
				ED	Exposure duration	6	years	USEPA, 2018	$\frac{EPCgw \times Kp \times ET \times DFWrec\text{-}adj \times CF1 \times CF2}{AT}$
				EV	Events per day	1	events/day	USEPA, 2018	
				ET	Exposure time per event	0.54	hr/event	USEPA, 2018	For organics if ET ≤ t*:
				SAgw	Skin surface area exposed to groundwater	6365	cm2	USEPA, 2018	
				BW	Body weight	15	kg	USEPA, 2018	$\frac{EPC_{SW} \times 2 \times FA \times K_p \times \sqrt{\frac{6 \times \tau_{event} \times ET}{\pi}} \times DFW_{rec-adj} \times CF1 \times CF2}{AT}$
				FA	Fraction absorbed	chemical-specific	--		
				Kp	Dermal permeability	chemical-specific	cm/hr		
				MW	Molecular weight	chemical-specific	g/mole		
				DFW-adj	Water dermal contact factor	891100	cm²-event/kg	USEPA, 2018	For organics if ET > t*:
				τevent	Lag time per event	chemical-specific	hr/event		
				t*	Time to reach steady-state	chemical-specific	hr		$\frac{EPC_{SW} \times FA \times K_p \times \left[\frac{ET}{1+B} + 2 \times \tau_{event} \times \left(\frac{1+3B+3B^2}{(1+B)^2}\right)\right] \times DFW_{rec-adj} \times CF1 \times CF2}{AT}$
				B	Ratio of permeability through stratum corneum to permeability across viable epidermis	chemical-specific	--		
				CF1	Conversion factor	1.0E-03	mg/µg	USEPA, 2018	
				CF2	Conversion factor	1.0E-03	L/cm3	USEPA, 2018	
				AT-n	Averaging time (noncancer endpoint)	2190	days	USEPA, 2018	
				AT-c	Averaging time (cancer endpoint)	25550	days	USEPA, 2018	

Footnotes:
a/ mg/d = milligrams per day; yr = year; kg = kilogram; cm2/day = square centimeter per day; mg/cm2 = milligrams per square centimeter;
hr/day = hours per day
b/ Refer to text for complete reference citations and discussion of best professional judgement (BPJ) parameter values.

MDEQ (2016). Memorandum Regarding Exposure Frequency. Montana Department of Environmental Quality.

TABLE 4-5
Exposure Equations and Assumptions - Current/Future Scenario: Fish
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Fish

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Parameter Value	Units (a)	Rationale/ Reference (b)	Intake Equation/ Model Name
Ingestion	Recreationist (Fisher)	Adult	Fish	Cfish	Chemical Concentration in Fish	See Table 3s	mg/kg	See Table 3s	
				MR	Migration ratio	0.1	unitless	BPJ	
				IR_{fish}	Fish intake rate	12,971	mg/day	BPJ	ADD_{fish} or $LADD_{fish}$ (mg/kg-day) =
				EF	Exposure frequency	10	day/yr	BPJ	$\frac{Cfish \times MR \times IR_{fsh} \times IA \times EF \times ED \times EV \times ET \times CF}{BW \times AT}$
				ED	Exposure duration	20	yr	USEPA, 2018	
				EV	Events per day	1	events/day	USEPA, 2018	
				ET	Exposure time per event	1	hr/event	USEPA, 2018	where
				IA	intake rate adjustment factor	61.3%	percent	USEPA, 2011	IA = 1 x (1 – L1) x (1 – L2)
				L1	cooking or preparation loss	31.5%	percent	USEPA, 2011	
				L2	post-cooking loss	10.5%	percent	USEPA, 2011	
				CF	Conversion factor	1.0E-06	kg/mg	USEPA, 2018	
				BW	Body weight	80	kg	USEPA, 2018	
				AT-n	Averaging time (noncancer endpoint)	7300	days	USEPA, 2018	
				AT-c	Averaging time (cancer endpoint)	25550	days	USEPA, 2018	

Footnotes:
a/ mg/d = milligrams per day; yr = year; kg = kilogram; cm2/day = square centimeter per day; mg/cm2 = milligrams per square centimeter; hr/day = hours per day
b/ Refer to text for complete reference citations and discussion of best professional judgement (BPJ) parameter values.

TABLE 4-6
Exposure Equations and Assumptions - Current/Future Scenario: Hunter Uptake through Venison
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Scenario Timeframe: Current/Future
Medium: Deer
Exposure Medium: Venison

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Parameter Value	Units (a)	Rationale/ Reference (b)	Intake Equation/ Model Name
Ingestion	Hunter	Adult	Deer	Cv	Chemical Concentration in Venison	See Table 3s	mg/kg ww	Refer to text (c)	
				Irvdw	Venison intake rate (dry weight)	0.035	kg dry w/day	USEPA, 2018	$ADD_{vension}$ or $LADD_{venison}$ (mg/kg-day) =
				Irvww	Venison intake rate (wet weight)	0.086	kg wet w/day	USEPA, 2018	
				W	percent water content	59.25		USEPA, 2018	
				EF	Exposure frequency	14	day/yr	BPJ	$\frac{Cv \times Ir_{v\text{-}dw} \times EF \times ED}{BW \times AT}$
				ED	Exposure duration	20	yr	USEPA, 2018	
				CF	Conversion factor	1.0E-06	kg/mg	USEPA, 2018	
				BW	Body weight	80	kg	USEPA, 2018	$Irv\text{-}dw = Ir_{v\text{-}ww} \times ((100- W)/100)$
				AT-n	Averaging time (noncancer endpoint)	7300	days	USEPA, 2018	
				AT-c	Averaging time (cancer endpoint)	25550	days	USEPA, 2018	

Footnotes:
a/ mg/d = milligrams per day; yr = year; kg = kilogram; cm2/day = square centimeter per day; mg/cm2 = milligrams per square centimeter; hr/day = hours per day
b/ Refer to text for complete reference citations and discussion of best professional judgement (BPJ) parameter values.
c/ Refer to text for discussion of calculation of chemical concentration in deer.

Table 4-7
Chemical-Specific Parameters
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Chemical	Cas number	Dermal Absorption Factor For Soil (ABSd) (unitless) (c)	Reference (b)	Relative Bioavailability Factor for Soil (RBA) (unitless) (c)	Reference (b)	Fraction Absorbed (FA) (unitless)	Reference (b)	Volitilzation Factor (VF) (m^3/kg)	Reference (b)	ATV Rider - Activity Based PEF (m^3/kg)	Reference (b)	Dermal Permeability Factor (cm/hr)	Reference (b)	Molecular Weight (MW) (g/mole)	Reference (b)	Lag time per event steady state (τevent) (SW dermal)	Reference (b)	Time to reach steady state (t*) (SW dermal) (hr)	Reference (b)	Ratio of permeability through stratum corneum to permeability across viable epidermis (B; SW dermal)	Reference (b)	In Effective Predictive Domain (EPD)?	
Fluoride	16984-48-8	NA	USEPA, 2018	1	USEPA, 2018	1	USEPA, 2018	NA	USEPA, 2018	1.18E+05	TechLaw, 2017	0.001	USEPA, 2018	38	USEPA, 2018	0.171651953	USEPA, 2018	0.411964688	USEPA, 2018	0.002370928	USEPA, 2018	Yes	USEPA, 2018

Footnotes:
a/ USEPA = US Environmental Protection Agency.
b/ USEPA, 2018
USEPA. (2018) Regional Screening Levels, May 2018 update
TechLaw, 2017. Final 2017 Sampling and Analysis Plan/Quality Assurance Project Plan. Nelson Tunnel Superfund Site, Mineral County, Colorado. April

TABLE 5-1
Non-Cancer Toxicity Data (Oral/Dermal)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

COC	CAS No.	Chronic Oral RfD Value (a) (mg/kg-day)	Oral to Dermal Adjustment Factor	Chronic Oral to Dermal Adjustment Factor Source (b)	Adjusted Dermal RfD Value (mg/kg-day)	Chronic Primary Target Organ	Source (c)
Aluminum	7429-90-5	1.0E+00	1.0E+00	USEPA, 2018	1.0E+00	Neurological	USEPA (P)
Antimony	7440-36-0	4.0E-04	1.5E-01	USEPA, 2018	6.0E-05	hematologic (longevity, blood glucose, and cholesterol)	USEPA (I)
Arsenic	7440-38-2	3.0E-04	1.0E+00	USEPA, 2018	3.0E-04	Skin and blood	USEPA (I)
Barium	7440-39-3	2.0E-01	7.0E-02	USEPA, 2018	1.4E-02	kidney (nephropathy)	USEPA (I)
Beryllium	7440-41-7	2.0E-03	7.0E-03	USEPA, 2018	1.4E-05	Gastrointestinal	USEPA (I)
Cadmium (Diet)	7440-43-9-d	1.0E-03	2.5E-02	USEPA, 2018	2.5E-05	Urinary	USEPA (I)
Cadmium (Water)	7440-43-9	5.0E-04	5.0E-02	USEPA, 2018	2.5E-05	Urinary	USEPA (I)
Chromium, Trivalent	16065-83-1	1.5E+00	1.3E-02	USEPA, 2018	2.0E-02	NA	USEPA (I)
Chromium, Hexavalent	18540-29-9	3.0E-03	2.5E-02	USEPA, 2018	7.5E-05	NA	USEPA (I)
Cobalt	7440-48-4	3.0E-04	1.0E+00	USEPA, 2018	3.0E-04	Thyroid	USEPA (P)
Copper	7440-50-8	4.0E-02	1.0E+00	USEPA, 2018	4.0E-02	Gastrointestinal system	USEPA (H)
Iron	7439-89-6	7.0E-01	1.0E+00	USEPA, 2018	7.0E-01	GI Ttract	USEPA (P)
Manganese (Diet)	7439-96-5-d	1.4E-01	1.0E+00	USEPA, 2018	1.4E-01	Nervous	USEPA (I)
Manganese (Non-diet)	7439-96-5	2.4E-02	4.0E-02	USEPA, 2018	9.6E-04	Nervous	USEPA (S)
Mercury	7439-97-6	NA	1.0E+00	USEPA, 2018	NA	NA	NA
Nickel	7440-02-0	2.0E-02	4.0E-02	USEPA, 2018	8.0E-04	Body weight	USEPA (I)
Selenium	7782-49-2	5.0E-03	1.0E+00	USEPA, 2018	5.0E-03	nervous, hematologic, dermal	USEPA (I)
Silver	7440-22-4	5.0E-03	4.0E-02	USEPA, 2018	2.0E-04	Skin	USEPA (I)
Thallium	7440-28-0	1.0E-05	1.0E+00	USEPA, 2018	1.0E-05	Skin	USEPA (X)
Vanadium	7440-62-2	5.0E-03	2.6E-02	USEPA, 2018	1.3E-04	Dermal	USEPA (S)
Zinc	7440-66-6	3.0E-01	1.0E+00	USEPA, 2018	3.0E-01	Blood	USEPA (I)
Cyanide	57-12-5	6.0E-04	1.0E+00	USEPA, 2018	6.0E-04	Testes	USEPA (I)
Fluoride	16984-48-8	4.0E-02	1.0E+00	USEPA, 2018	4.0E-02	NA	USEPA (C)
2-Methylnaphthalene	91-57-6	4.0E-03	1.0E+00	USEPA, 2018	4.0E-03	Lungs	USEPA (I)
4-Chloroaniline	106-47-8	4.0E-03	1.0E+00	USEPA, 2018	4.0E-03	Spleen	USEPA (I)
Acenaphthene	83-32-9	6.0E-02	1.0E+00	USEPA, 2018	6.0E-02	Liver	USEPA (I)
Anthracene	120-12-7	3.0E-01	1.0E+00	USEPA, 2018	3.0E-01	NA	USEPA (I)
Benzaldehyde	100-52-7	1.0E-01	1.0E+00	USEPA, 2018	1.0E-01	Forestomach and kidney	USEPA (I)
Benzo(A)Anthracene	56-55-3	NA	1.0E+00	USEPA, 2018	NA		NA
Benzo(A)Pyrene	50-32-8	3.0E-04	1.0E+00	USEPA, 2018	3.0E-04	Developmental	USEPA (I)
Benzo(B)Fluoranthene	205-99-2	NA	1.0E+00	USEPA, 2018	NA		NA
Benzo(K)Fluoranthene	207-08-9	NA	1.0E+00	USEPA, 2018	NA		NA

TABLE 5-1
Non-Cancer Toxicity Data (Oral/Dermal)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

COC	CAS No.	Chronic Oral RfD Value (a) (mg/kg-day)	Oral to Dermal Adjustment Factor	Chronic Oral to Dermal Adjustment Factor Source (b)	Adjusted Dermal RfD Value (mg/kg-day)	Chronic Primary Target Organ	Source (c)
Chrysene	218-01-9	NA	1.0E+00	USEPA, 2018	NA		NA
Dibenz(A,H)Anthracene	53-70-3	NA	1.0E+00	USEPA, 2018	NA		NA
Dibenzofuran	132-64-9	1.0E-03	1.0E+00	USEPA, 2018	1.0E-03	NA	USEPA (X)
Fluoranthene	206-44-0	4.0E-02	1.0E+00	USEPA, 2018	4.0E-02	Whole body	USEPA (I)
Fluorene	86-73-7	4.0E-02	1.0E+00	USEPA, 2018	4.0E-02	Blood	USEPA (I)
Indeno(1,2,3-C,D)Pyrene	193-39-5	NA	1.0E+00	USEPA, 2018	NA		NA
Isophorone	78-59-1	2.0E-01	1.0E+00	USEPA, 2018	2.0E-01	Urinary	USEPA (I)
Naphthalene	91-20-3	2.0E-02	1.0E+00	USEPA, 2018	2.0E-02	Body weight	USEPA (I)
Pyrene	129-00-0	3.0E-02	1.0E+00	USEPA, 2018	3.0E-02	Kidney	USEPA (I)

Footnotes:
a/ mg/kg-day = milligrams per kilogram per day; NA = not available/not applicable
b/ Refer to text for citation
c/ OEHHA = California Office of Environmental Health Hazard Assessment -- Toxicity Criteria Database
DTSC = California Department of Toxic Substances Control -- toxicity criteria for TPH fractions
USEPA = U.S. Environmental Protection Agency
HHRA note 3 = Refer to Text for citation
PA DEP = Pennsylvania Department of Environmental Protection
Reg 9 PRG = US EPA Region 9 Preliminary Remediation Goal
A = Agency for Toxic Substance and Disease Registry
I = Integrated Risk Information System
C = Cal EPA
H = HEAST
P = PPRTV
S = USEPA (2018) for user guide Section 5
X = PPRTV Appendix
Refer to text for references.

Table 5-2
Non-Cancer Toxicity Data (Inhalation)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

COC	CAS No.	Chronic Inhalation RfC Value (a) mg/m3	Primary Target Organ	Source (b)
Aluminum	7429-90-5	5.0E-03	Neurological	USEPA (P)
Antimony	7440-36-0	NA	NA	USEPA (I)
Arsenic	7440-38-2	1.5E-05	cardiovascular, nervous, and skin	USEPA (I)
Barium	7440-39-3	5.0E-04	Fetus	USEPA (I)
Beryllium	7440-41-7	2.0E-05	Immune, Respiratory	USEPA (I)
Cadmium (Diet)	7440-43-9-d	1.0E-05	Renal	USEPA (I)
Cadmium (Water)	7440-43-9	1.0E-05	Renal	USEPA (I)
Chromium, Trivalent	16065-83-1	NA	NA	USEPA (I)
Chromium, Hexavalent	18540-29-9	1.0E-04	Lungs	USEPA (I)
Cobalt	7440-48-4	6.0E-06	Respiratory Tract; Lung	USEPA (P)
Copper	7440-50-8	NA	NA	USEPA (H)
Iron	7439-89-6	NA	NA	USEPA (P)
Manganese (Diet)	7439-96-5-d	5.0E-05	Nervous	USEPA (I)
Manganese (Non-diet)	7439-96-5	USEPA (P)	Nervous	USEPA (S)
Mercury	7439-97-6	3.0E-04	Nervous	NA
Nickel	7440-02-0	9.0E-05	Resp.	USEPA (I)
Selenium	7782-49-2	2.0E-02	NA	USEPA (I)
Silver	7440-22-4	NA	NA	USEPA (I)
Thallium	7440-28-0	NA	NA	USEPA (X)
Vanadium	7440-62-2	1.0E-04	Resp.	USEPA (S)
Zinc	7440-66-6	NA	NA	USEPA (I)
Cyanide	57-12-5	8.0E-04	Thyroid	USEPA (I)
Fluoride	16984-48-8	1.3E-02	NA	USEPA (C)
2-Methylnaphthalene	91-57-6	NA	NA	USEPA (I)
4-Chloroaniline	106-47-8	NA	NA	USEPA (I)
Acenaphthene	83-32-9	NA	NA	USEPA (I)
Anthracene	120-12-7	NA	NA	USEPA (I)
Benzaldehyde	100-52-7	NA	NA	USEPA (I)

Table 5-2
Non-Cancer Toxicity Data (Inhalation)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

COC	CAS No.	Chronic Inhalation RfC Value (a) mg/m3	Primary Target Organ	Source (b)
Benzo(A)Anthracene	56-55-3	NA	NA	NA
Benzo(A)Pyrene	50-32-8	2.0E-06	Developmental	USEPA (I)
Benzo(B)Fluoranthene	205-99-2	NA	NA	NA
Benzo(K)Fluoranthene	207-08-9	NA	NA	NA
Chrysene	218-01-9	NA	NA	NA
Dibenz(A,H)Anthracene	53-70-3	NA	NA	NA
Dibenzofuran	132-64-9	NA	NA	USEPA (X)
Fluoranthene	206-44-0	NA	NA	USEPA (I)
Fluorene	86-73-7	NA	NA	USEPA (I)
Indeno(1,2,3-C,D)Pyrene	193-39-5	NA	NA	NA
Isophorone	78-59-1	2.0E+00	NA	USEPA (I)
Naphthalene	91-20-3	3.0E-03	Nervous, Respiratory	USEPA (I)
Pyrene	129-00-0	NA	NA	USEPA (I)

Footnotes:
a/ mg/kg-day = milligrams per kilogram per day; NA = not available/not applicable
b/ Refer to text for citation
c/ OEHHA = California Office of Environmental Health Hazard Assessment -- Toxicity Criteria Database
DTSC = California Department of Toxic Substances Control -- toxicity criteria for TPH fractions
USEPA = U.S. Environmental Protection Agency
HHRA note 3 = Refer to Text for citation
PA DEP = Pennsylvania Department of Environmental Protection
Reg 9 PRG = US EPA Region 9 Preliminary Remediation Goal
A = Agency for Toxic Substance and Disease Registry
C = Cal EPA
I = Integrated Risk Information System
H = HEAST
P = PPRTV
S = USEPA (2018) for user guide Section 5
X = PPRTV Appendix
Refer to text for references.

Table 6-1
Cancer Toxicity Data (Oral/Dermal)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

COC	CAS No.	Oral Cancer Slope Factor (a) (mg/kg-day)-1	Oral to Dermal Adjustment Factor	Oral to Dermal Adjustment Factor Source (b)	Adjusted Dermal Cancer Slope Factor (mg/kg-day)-1	Weight of Evidence/ Cancer Guideline Description (c)	Source (d)	Mutagen
Aluminum	7429-90-5	NA	1.00E+00	USEPA, 2018	NA		NA	N
Antimony	7440-36-0	NA	1.50E-01	USEPA, 2018	NA		NA	N
Arsenic	7440-38-2	1.5E+00	1.00E+00	USEPA, 2018	1.5E+00	A	USEPA (I)	N
Barium	7440-39-3	NA	7.00E-02	USEPA, 2018	NA		NA	N
Beryllium	7440-41-7	NA	7.00E-03	USEPA, 2018	NA		NA	N
Cadmium (Diet)	7440-43-9-d	NA	2.50E-02	USEPA, 2018	NA		NA	N
Cadmium (Water)	7440-43-9	NA	5.00E-02	USEPA, 2018	NA		NA	N
Chromium, Trivalent	16065-83-1	NA	1.30E-02	USEPA, 2018	NA		NA	N
Chromium, Hexavalent	18540-29-9	5.0E-01	2.50E-02	USEPA, 2018	1.3E-02	Known/likely (inhalation) cannot determine (oral)	USEPA (C)	Y
Cobalt	7440-48-4	NA	1.00E+00	USEPA, 2018	NA		NA	N
Copper	7440-50-8	NA	1.00E+00	USEPA, 2018	NA		NA	N
Iron	7439-89-6	NA	1.00E+00	USEPA, 2018	NA		NA	N
Manganese (Diet)	7439-96-5-d	NA	1.00E+00	USEPA, 2018	NA		NA	N
Manganese (Non-diet)	7439-96-5	NA	4.00E-02	USEPA, 2018	NA		NA	N
Mercury	7439-97-6	NA	1.00E+00	USEPA, 2018	NA		NA	N
Nickel	7440-02-0	NA	4.00E-02	USEPA, 2018	NA		NA	N
Selenium	7782-49-2	NA	1.00E+00	USEPA, 2018	NA		NA	N
Silver	7440-22-4	NA	4.00E-02	USEPA, 2018	NA		NA	N
Thallium	7440-28-0	NA	1.00E+00	USEPA, 2018	NA		NA	N
Vanadium	7440-62-2	NA	2.60E-02	USEPA, 2018	NA		NA	N
Zinc	7440-66-6	NA	1.00E+00	USEPA, 2018	NA		NA	N
Cyanide	57-12-5	NA	1.00E+00	USEPA, 2018	NA		NA	N
Fluoride	16984-48-8	NA	1.00E+00	USEPA, 2018	NA		NA	N
2-Methylnaphthalene	91-57-6	NA	1.00E+00	USEPA, 2018	NA		NA	N
4-Chloroaniline	106-47-8	2.0E-01	1.00E+00	USEPA, 2018	2.0E-01	LI	USEPA (P)	N
Acenaphthene	83-32-9	NA	1.00E+00	USEPA, 2018	NA		NA	N
Anthracene	120-12-7	NA	1.00E+00	USEPA, 2018	NA		NA	N
Benzaldehyde	100-52-7	4.0E-03	1.00E+00	USEPA, 2018	4.0E-03	SU	USEPA (P)	N
Benzo(A)Anthracene	56-55-3	1.0E-01	1.00E+00	USEPA, 2018	1.0E-01	Carcinogenic to humans	USEPA (E)	Y
Benzo(A)Pyrene	50-32-8	1.0E+00	1.00E+00	USEPA, 2018	1.0E+00	Carcinogenic to humans	USEPA (I)	Y
Benzo(B)Fluoranthene	205-99-2	1.0E-01	1.00E+00	USEPA, 2018	1.0E-01	Carcinogenic to humans	USEPA (E)	Y
Benzo(K)Fluoranthene	207-08-9	1.0E-02	1.00E+00	USEPA, 2018	1.0E-02	Carcinogenic to humans	USEPA (E)	Y
Chrysene	218-01-9	1.0E-03	1.00E+00	USEPA, 2018	1.0E-03	Carcinogenic to humans	USEPA (E)	Y
Dibenz(A,H)Anthracene	53-70-3	1.0E+00	1.00E+00	USEPA, 2018	1.0E+00	Carcinogenic to humans	USEPA (E)	Y
Dibenzofuran	132-64-9	NA	1.00E+00	USEPA, 2018	NA		NA	N
Fluoranthene	206-44-0	NA	1.00E+00	USEPA, 2018	NA		NA	N
Fluorene	86-73-7	NA	1.00E+00	USEPA, 2018	NA		NA	N
Indeno(1,2,3-C,D)Pyrene	193-39-5	1.0E-01	1.00E+00	USEPA, 2018	1.0E-01	Carcinogenic to humans	USEPA (E)	Y
Isophorone	78-59-1	9.5E-04	1.00E+00	USEPA, 2018	9.5E-04	C	USEPA (I)	N
Naphthalene	91-20-3	NA	1.00E+00	USEPA, 2018	NA		NA	N
Pyrene	129-00-0	NA	1.00E+00	USEPA, 2018	NA		NA	N

Table 6-1
Cancer Toxicity Data (Oral/Dermal)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

COC	CAS No.	Oral Cancer Slope Factor (a) (mg/kg-day)-1	Oral to Dermal Adjustment Factor	Oral to Dermal Adjustment Factor Source (b)	Adjusted Dermal Cancer Slope Factor (mg/kg-day)-1	Weight of Evidence/ Cancer Guideline Description (c)	Source (d)	Mutagen

Footnotes:
a/ mg/kg-day = milligrams per kilogram per day; NA = not available/not applicable
b/ Refer to text for citation
c/ Weight of evidence abbreviations:
USEPA classification
A - human carcinogen
B2 - probable human carcinogen; inadequate evidence that it can cause cancer in humans but at present it is far from conclusive
C - Probable human carcinogen; There is limited evidence that it can cause cancer in animals in the absence of human data, but at present it is not conclusive.
D - Not Classifiable as to Human Carcinogenicity
IARC classification
Group 2A - Limited evidence in humans and sufficient evidence in animals
Group 2B - Limited evidence in humans and less than sufficient evidence in animals
Group 3 - Inadequate in humans and inadequate or limited in animals
d/ OEHHA = California Office of Environmental Health Hazard Assessment -- Toxicity Criteria Database
DTSC = California Department of Toxic Substances Control -- toxicity criteria for TPH fractions
CDWAL - California Drinking Water Action Level
USEPA = U.S. Environmental Protection Agency
HHRA note 3 = Refer to Text for citation
PA DEP = Pennsylvania Department of Environmental Protection
Reg 9 PRG = US EPA Region 9 Preliminary Remediation Goal
A = Agency for Toxic Substance and Disease Registry
C = Cal EPA
E = see USEPA (2018) for user guide Section 2.3.5
I = Integrated Risk Information System
H = HEAST
P = PPRTV
X = PPRTV Appendix
Refer to text for references.

Table 6-2
Cancer Toxicity Data (Inhalation)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

COC	CAS No.	Inhalation Unit Risk (µg/m3)-1	Weight of Evidence/ Cancer Guideline Description (b)	Source (c)	Mutagen
Aluminum	7429-90-5	NA		NA	N
Antimony	7440-36-0	NA		NA	N
Arsenic	7440-38-2	4.3E-03	A	USEPA (I)	N
Barium	7440-39-3	NA		NA	N
Beryllium	7440-41-7	2.4E-03	Known/likely human carcinogen	USEPA (I)	N
Cadmium (Diet)	7440-43-9-d	1.8E-03	B1	USEPA (I)	N
Cadmium (Water)	7440-43-9	1.8E-03	B1	USEPA (I)	N
Chromium, Trivalent	16065-83-1	NA		NA	N
Chromium, Hexavalent	18540-29-9	8.4E-02	Known/likely (inhalation) cannot determine (oral)	USEPA (S)	Y
Cobalt	7440-48-4	9.0E-03	LI	USEPA (P)	N
Copper	7440-50-8	NA		NA	N
Iron	7439-89-6	NA		NA	N
Manganese (Diet)	7439-96-5-d	NA		NA	N
Manganese (Non-diet)	7439-96-5	NA		NA	N
Mercury	7439-97-6	NA		NA	N
Nickel	7440-02-0	2.6E-04	A	USEPA (C)	N
Selenium	7782-49-2	NA		NA	N
Silver	7440-22-4	NA		NA	N
Thallium	7440-28-0	NA		NA	N
Vanadium	7440-62-2	NA		NA	N
Zinc	7440-66-6	NA		NA	N
Cyanide	57-12-5	NA		NA	N
Fluoride	16984-48-8	NA		NA	N
2-Methylnaphthalene	91-57-6	NA		NA	N
4-Chloroaniline	106-47-8	NA		NA	N
Acenaphthene	83-32-9	NA		NA	N
Anthracene	120-12-7	NA		NA	N
Benzaldehyde	100-52-7	NA		NA	N
Benzo(A)Anthracene	56-55-3	6.0E-05	Carcinogenic to humans	USEPA (E)	Y
Benzo(A)Pyrene	50-32-8	6.0E-04	Carcinogenic to humans	USEPA (I)	Y
Benzo(B)Fluoranthene	205-99-2	6.0E-05	Carcinogenic to humans	USEPA (E)	Y
Benzo(K)Fluoranthene	207-08-9	6.0E-06	Carcinogenic to humans	USEPA (E)	Y
Chrysene	218-01-9	6.0E-07	Carcinogenic to humans	USEPA (E)	Y
Dibenz(A,H)Anthracene	53-70-3	6.0E-04	Carcinogenic to humans	USEPA (E)	Y

Table 6-2
Cancer Toxicity Data (Inhalation)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

COC	CAS No.	Inhalation Unit Risk (µg/m3)-1	Weight of Evidence/ Cancer Guideline Description (b)	Source (c)	Mutagen
Dibenzofuran	132-64-9	NA		NA	N
Fluoranthene	206-44-0	NA		NA	N
Fluorene	86-73-7	NA		NA	N
Indeno(1,2,3-C,D)Pyrene	193-39-5	6.0E-05	Carcinogenic to humans	USEPA (E)	Y
Isophorone	78-59-1	NA		NA	N
Naphthalene	91-20-3	3.4E-05	Carcinogenic potential cannot be determined	USEPA (C)	N
Pyrene	129-00-0	NA		NA	N

Footnotes:
a/ µg/m3 = micrograms per cubic meter. NA = not available/not applicable.
b/ Weight of evidence abbreviations:
USEPA classification
A - human carcinogen
B2 - probable human carcinogen; inadequate evidence that it can cause cancer in humans but at present it is far from conclusive
C - Probable human carcinogen; There is limited evidence that it can cause cancer in animals in the absence of human data, but at present it is not conclusive.
D - Not Classifiable as to Human Carcinogenicity
IARC classification
Group 2A - Limited evidence in humans and sufficient evidence in animals
Group 2B - Limited evidence in humans and less than sufficient evidence in animals
Group 3 - Inadequate in humans and inadequate or limited in animals
c/ OEHHA = California Office of Environmental Health Hazard Assessment -- Toxicity Criteria Database
DTSC = California Department of Toxic Substances Control -- toxicity criteria for TPH fractions
CDWAL - California Drinking Water Action Level
USEPA = U.S. Environmental Protection Agency
HHRA note 3 = Refer to Text for citation
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Reg 9 PRG = US EPA Region 9 Preliminary Remediation Goal
A = Agency for Toxic Substance and Disease Registry
C = Cal EPA
E = see USEPA (2018) for user guide Section 2.3.5
I = Integrated Risk Information System
H = HEAST
P = PPRTV
X = PPRTV Appendix
Refer to text for references.

Figures

Legend

- Site Boundary
- Flathead National Forest

Scale In Feet: 2,000 1,000 0 2,000

Site Location Map

COLUMBIA FALLS ALUMINUM CO.
COLUMBIA FALLS, MT

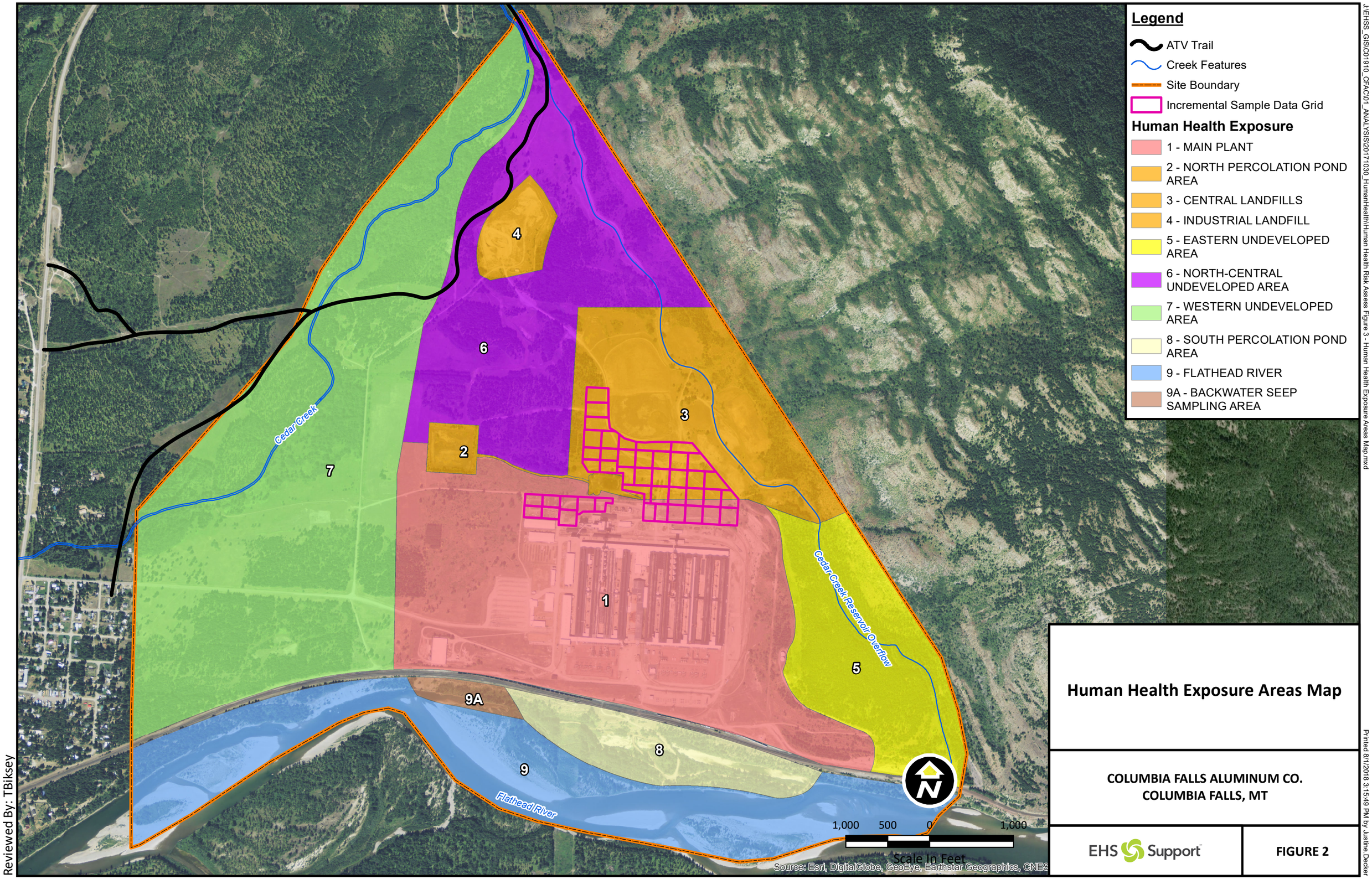
EHS Support

FIGURE 1

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Human Health Exposure Areas Map

COLUMBIA FALLS ALUMINUM CO.
COLUMBIA FALLS, MT

EHS Support

FIGURE 2

Reviewed By: TBiksey

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Attachment A Datasets

Appendix A-1a	Main Plant Area Soil (0-0.5 ft-bgs)
Appendix A-1b	Main Plant Area Soil (0-12 ft-bgs)
Appendix A-2a	North Percolation Pond Area Soil (0-2 ft-bgs)
Appendix A-2b	North Percolation Pond Area Soil (0-12 ft-bgs)
Appendix A-2c	North Percolation Pond Area (surface water)
Appendix A-2d	North Percolation Pond Area (sediment)
Appendix A-3a	Central Landfill Area Soil (0-0.5 ft-bgs)
Appendix A-3b	Central Landfill Area Soil (0-2 ft-bgs)
Appendix A-3c	Central Landfill Area Soil (0-12 ft-bgs)
Appendix A-3d	Central Landfill Area (surface water)
Appendix A-3e	Central Landfill Area (sediment)
Appendix A-4a	Industrial Landfill Area Soil (0-0.5 ft-bgs)
Appendix A-4b	Industrial Landfill Area Soil (0-2 ft-bgs)
Appendix A-4c	Industrial Landfill Area Soil (0-12 ft-bgs)
Appendix A-5a	Eastern Undeveloped Area (surface water)
Appendix A-5b	Eastern Undeveloped Area (sediment)
Appendix A-6a	North Central Undeveloped Area Soil (0-0.5 ft-bgs)
Appendix A-6b	North Central Undeveloped Area Soil (0-12 ft-bgs)
Appendix A-6c	North Central Undeveloped Area (surface water)
Appendix A-6d	North Central Undeveloped Area (sediment)
Appendix A-7a	Western Undeveloped Area Soil (0-0.5 ft-bgs)
Appendix A-7b	Western Undeveloped Area Soil (0-12 ft-bgs)
Appendix A-7c	Western Undeveloped Area (surface water)
Appendix A-7d	Western Undeveloped Area (sediment)
Appendix A-8a	South Percolation Pond Area Soil (0-0.5 ft-bgs)
Appendix A-8b	South Percolation Pond Area Soil (0-2 ft-bgs)
Appendix A-8c	South Percolation Pond Area (surface water)
Appendix A-8d	South Percolation Pond Area (sediment)
Appendix A-9a	Flathead River Area (surface water)
Appendix A-9b	Flathead River Area (sediment)
Appendix A-10a	Backwater Seep Sampling Area Soil (0-0.5 ft-bgs)
Appendix A-10b	Backwater Seep Sampling Area Soil (0-2 ft-bgs)
Appendix A-10c	Backwater Seep Sampling Area (surface water)
Appendix A-10d	Backwater Seep Sampling Area (sediment)
Appendix A-11a	Groundwater - Plume Area Upper Hydrogeologic Unit
Appendix A-11b	Groundwater - Western Undeveloped Area Upper Hydrogeologic Unit
Appendix A-11c	Groundwater - Sitewide Below Upper Hydrogeologic Unit
Appendix A-12a	Main Plant ISS Area Soil (0-0.5 ft-bgs)
Appendix A-12b	Central Landfill ISS Area Soil (0-0.5 ft-bgs)
Appendix A-12c	Central Landfill ISS Area Soil (0-2 ft-bgs)

Appendix A-1a
Main Plant Area Soil (0-0.5 ft-bgs)
Data Used in Human Health Risk Assessment
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-038	CFSB-040	CFSB-042	CFSB-044	CFSB-045	CFSB-046	CFSB-048	CFSB-050	CFSB-051	CFSB-054	CFSB-055	CFSB-057	CFSB-059	CFSB-059-DUP	CFSB-060	CFSB-062
Sample Lab IDs	460-114275-23	460-114275-10	460-114275-7	460-114141-46	460-114275-27	460-114141-44	460-114141-49	460-114275-24	460-114275-16	460-114793-20	460-114793-19	460-114793-27	460-114793-30	460-114793-29	460-114793-8	460-114828-40
Sample Name	CFSB-038-SO-0-0.5	CFSB-040-SO-0-0.5	CFSB-042-SO-0-0.5	CFSB-044-SO-0-0.5	CFSB-045-SO-0-0.5	CFSB-046-SO-0-0.5	CFSB-048-SO-0-0.5	CFSB-050-SO-0-0.5	CFSB-051-SO-0-0.5	CFSB-054-SO-0-0.5	CFSB-055-SO-0-0.5	CFSB-057-SO-0-0.5	CFSB-059-SO-0-0.5	CFSB-DUP8-SO	CFSB-060-SO-0-0.5	CFSB-062-SO-0-0.5
Sample Depth	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft
Chemical	5/21/2016	5/20/2016	5/20/2016	5/20/2016	5/21/2016	5/20/2016	5/20/2016	5/21/2016	5/21/2016	5/28/2016	5/28/2016	5/28/2016	5/28/2016	5/28/2016	5/27/2016	6/2/2016
GENERAL CHEMISTRY|ANIONS (mg/kg)																
Fluoride	87.3	203 J-	50.7 J-	330 J-	199	31.7 J-	109 J-	126	77 J-	44 J	147 J	75.7 J-	51.2 J-	52.1 J-	16.4 J	25.9 J

Footnotes:
-- = not applicable
- = Result is biased low
+ = Result is biased high
ft = feet
ft-bgs = feet below ground surface
J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
mg/kg = milligram(s) per kilogram

Appendix A-1a
Main Plant Area Soil (0-0.5 ft-bgs)
Data Used in Human Health Risk Assessment
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-064	CFSB-065	CFSB-066	CFSB-069	CFSB-071	CFSB-073	CFSB-074	CFSB-075	CFSB-079	CFSB-080	CFSB-082	CFSB-084	CFSB-086	CFSB-087	CFSB-088	CFSB-092
Sample Lab IDs	460-115008-7	460-114828-34	460-114793-12	460-114793-14	460-114793-4	320-19320-22, 460-114828-7	320-19320-31, 460-114828-17	320-19320-23, 460-114828-8	320-19320-25, 460-114828-10	320-19320-27, 460-114828-13	320-19320-26, 460-114828-11	320-19320-13, 460-114793-3	320-19320-10, 460-114529-28	320-19320-7, 460-114529-25	320-19320-4, 460-114529-22	320-19320-1, 460-114529-19
Sample Name	CFSB-064-SO-0-0.5	CFSB-065-SO-0-0.5	CFSB-066-SO-0-0.5	CFSB-069-SO-0-0.5	CFSB-071-SO-0-0.5	CFSB-073-SO-0-0.5	CFSB-074-SO-0-0.5	CFSB-075-SO-0-0.5	CFSB-079-SO-0-0.5	CFSB-080-SO-0-0.5	CFSB-082-SO-0-0.5	CFSB-084-SO-0-0.5	CFSB-086-SO-0-0.5	CFSB-087-SO-0-0.5	CFSB-088-SO-0-0.5	CFSB-092-SO-0-0.5
Sample Depth	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft
Chemical	6/3/2016	6/2/2016	5/27/2016	5/27/2016	5/27/2016	6/1/2016	6/1/2016	6/1/2016	6/1/2016	6/1/2016	6/1/2016	5/27/2016	5/26/2016	5/26/2016	5/26/2016	5/26/2016
GENERAL CHEMISTRY|ANIONS (mg/kg)																
Fluoride	33.3 J	46.8 J	571 J	36.3 J	47.3 J	28.2 J	143 J	43 J	55.4 J	35.7 J	30.4 J	59.6 J	21.1 J+	34.9 J+	23.5 J+	14.1 J

Footnotes:
-- = not applicable
- = Result is biased low
+ = Result is biased high
ft = feet
ft-bgs = feet below ground surface
J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
mg/kg = milligram(s) per kilogram

Appendix A-1a
Main Plant Area Soil (0-0.5 ft-bgs)
Data Used in Human Health Risk Assessment
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-094	CFSB-095	CFSB-097	CFSB-098	CFSB-099	CFSB-100	CFSB-121	CFSB-121-DUP	CFSB-128	CFSB-129	CFMW-025A	CFMW-026	CFMW-032A	CFMW-032A	CFMW-053A	CFMW-053A
Sample Lab IDs	460-114456-42	460-114456-37	460-114456-25	460-114456-27	460-114456-23	460-114456-26	460-114141-20	460-114141-23	460-114456-39	460-114456-44	460-117124-1	460-115528-27	460-118466-1	460-118466-2	460-118952-2	460-118952-3
Sample Name	CFSB-094-SO-0-0.5	CFSB-095-SO-0-0.5	CFSB-097-SO-0-0.5	CFSB-098-SO-0-0.5	CFSB-099-SO-0-0.5	CFSB-100-SO-0-0.5	CFSB-121-SO-0-0.5	CFSB-DUP1-SO	CFSB-128-SO-0-0.5	CFSB-129-SO-0-0.5	CFMW-025a-SO-0-0.5	CFMW-026-SO-0-0.5	CFMW-032a-SO-0-0.5	CFMW-032a-SO-0-0.5Pb	CFMW-053a-SO-0-0.5	CFMW-053a-SO-0-0.5Pb
Sample Depth	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft
Chemical	5/24/2016	5/24/2016	5/24/2016	5/24/2016	5/24/2016	5/24/2016	5/18/2016	5/18/2016	5/24/2016	5/24/2016	7/13/2016	6/14/2016	8/8/2016	8/8/2016	8/17/2016	8/17/2016
GENERAL CHEMISTRY|ANIONS (mg/kg)																
Fluoride	86.9 J-	19.5 J-	80.1 J-	93.3 J-	41.7 J+	39.2 J+	13.5 J-	9.05 J-	46.7 J-	214 J-	16.7 J	4.25 J	78.1 J	--	8.82	--

Footnotes:
-- = not applicable
- = Result is biased low
+ = Result is biased high
ft = feet
ft-bgs = feet below ground surface
J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
mg/kg = milligram(s) per kilogram

Appendix A-1a
Main Plant Area Soil (0-0.5 ft-bgs)
Data Used in Human Health Risk Assessment
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-028A	CFMW-028A	CFMW-033	CFMW-033	CFMW-034	CFMW-035	CFMW-035-DUP	CFMW-037	CFMW-038	CFMW-038	CFMW-040	CFMW-040	CFMW-042	CFMW-042	CFMW-043	CFMW-043
Sample Lab IDs	460-116402-2	460-116402-9	460-116402-16	460-116402-19	460-114793-41	460-114828-22	460-114828-23	460-116119-2	320-19945-1, 460-116119-6	460-116119-9	320-19945-4, 460-116283-1	460-116283-6	460-115648-15	460-115648-19	460-115648-3	460-115648-10
Sample Name	CFMW-028a-SO-0-0.5	CFMW-028a-SO-0-0.5Pb	CFMW-033-SO-0-0.5	CFMW-033-SO-0-0.5Pb	CFMW-034-SO-0-0.5	CFMW-035-SO-0-0.5	CFMW-DUP11-SO	CFMW-037-SO-0-0.5	CFMW-038-SO-0-0.5	CFMW-038-SO-0-0.5 Pb	CFMW-040-SO-0-0.5	CFMW-040-SO-0-0.5Pb	CFMW-042-SO-0-0.5	CFMW-042-SO-0-0.5-Pb	CFMW-043-SO-0-0.5	CFMW-043-SO-0-0.5-Pb
Sample Depth	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft
Chemical	6/30/2016	6/30/2016	7/1/2016	7/1/2016	5/31/2016	6/1/2016	6/1/2016	6/24/2016	6/25/2016	6/25/2016	6/28/2016	6/28/2016	6/16/2016	6/16/2016	6/15/2016	6/15/2016
GENERAL CHEMISTRY|ANIONS (mg/kg)																
Fluoride	6.47 J+	--	8.12 J+	--	42.8 J	98.3 J	123 J	192 J	22.3 J+	--	27.6 J+	--	47.5 J-	--	84.9 J-	--

Footnotes:
-- = not applicable
- = Result is biased low
+ = Result is biased high
ft = feet
ft-bgs = feet below ground surface
J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
mg/kg = milligram(s) per kilogram

Appendix A-1a
Main Plant Area Soil (0-0.5 ft-bgs)
Data Used in Human Health Risk Assessment
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-044A	CFMW-044A	CFMW-045A	CFMW-047	CFMW-047	CFMW-049	CFMW-049A	CFMW-050	CFMW-050	CFMW-054
Sample Lab IDs	460-117381-5	460-117506-7	460-118613-2	460-115886-20	460-116014-1	460-119134-1	460-119134-7	460-116014-7	460-116014-13	460-115886-3
Sample Name	CFMW-044a-SO-0-0.5	CFMW-044a-SO-0-0.5Pb	CFMW-045a-SO-0-0.5	CFMW-047-SO-0-0.5	CFMW-047-SO-0-0.5-Pb	CFMW-049-SO-0-0.5	CFMW-049a-SO-0-0.5 Pb	CFMW-050-SO-0-0.5	CFMW-050-SO-0-0.5-Pb	CFMW-054-SO-0-0.5
Sample Depth	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft
Chemical	7/20/2016	7/20/2016	8/12/2016	6/21/2016	6/21/2016	8/20/2016	8/20/2016	6/22/2016	6/22/2016	6/20/2016
GENERAL CHEMISTRY|ANIONS (mg/kg)										
Fluoride	59.8 J+	--	74.8 J	22.2 J	--	11.4 J+	--	21.2 J+	--	231 J

Footnotes:
-- = not applicable
- = Result is biased low
+ = Result is biased high
ft = feet
ft-bgs = feet below ground surface
J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
mg/kg = milligram(s) per kilogram

Appendix A-1b
Main Plant Area Soil (0-12 ft-bgs)
Data Used in Human Health Risk Assessment
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-010	CFSB-010	CFSB-012	CFSB-012	CFSB-038	CFSB-038	CFSB-038	CFSB-040	CFSB-040	CFSB-040	CFSB-042	CFSB-042	CFSB-042	CFSB-044	CFSB-044	CFSB-044
Sample Lab IDs	460-114275-19	460-114275-20	460-114793-22	460-114793-23	460-114275-23	460-114275-21	460-114275-22	460-114275-10	460-114275-11	460-114275-12	460-114275-7	460-114275-8	460-114275-9	460-114141-46	460-114141-47	460-114141-48
Sample Name	CFSB-010-SO-0.5-2	CFSB-010-SO-10-12	CFSB-012-SO-0.5-2	CFSB-012-SO-10-12	CFSB-038-SO-0-0.5	CFSB-038-SO-0.5-2	CFSB-038-SO-10-12	CFSB-040-SO-0-0.5	CFSB-040-SO-0.5-2	CFSB-040-SO-10-12	CFSB-042-SO-0-0.5	CFSB-042-SO-0.5-2	CFSB-042-SO-10-12	CFSB-044-SO-0-0.5	CFSB-044-SO-0.5-2.0	CFSB-044-SO-10-12
Sample Depth	0.5-2 ft	10-12 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft
Chemical	5/21/2016	5/21/2016	5/28/2016	5/28/2016	5/21/2016	5/21/2016	5/21/2016	5/20/2016	5/20/2016	5/20/2016	5/20/2016	5/20/2016	5/20/2016	5/20/2016	5/20/2016	5/20/2016
GENERAL CHEMISTRY|ANIONS (mg/kg)																
Fluoride	37.9 J-	16.1 J-	42.4 J	7.44 J	87.3	54.4 J-	8.5	203 J-	66.8 J-	37.1 J-	50.7 J-	33.1 J-	12.8 J-	330 J-	310 J-	9.64 J-

Footnotes:
-- = not applicable
- = Result is biased low
+ = Result is biased high
ft = feet
ft-bgs = feet below ground surface
J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
mg/kg = milligram(s) per kilogram

Appendix A-1b
Main Plant Area Soil (0-12 ft-bgs)
Data Used in Human Health Risk Assessment
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-045	CFSB-045	CFSB-045	CFSB-046	CFSB-046	CFSB-046	CFSB-048	CFSB-048	CFSB-048	CFSB-049	CFSB-049	CFSB-050	CFSB-050	CFSB-050	CFSB-051	CFSB-051
Sample Lab IDs	460-114275-27	460-114275-28	460-114275-29	460-114141-44	460-114141-45	460-114275-15	460-114141-49	460-114141-50	460-114141-51	460-114793-34	460-114793-32	460-114275-24	460-114275-25	460-114275-26	460-114275-16	460-114275-17
Sample Name	CFSB-045-SO-0-0.5	CFSB-045-SO-0.5-2	CFSB-045-SO-10-12	CFSB-046-SO-0-0.5	CFSB-046-SO-0.5-2.0	CFSB-046-SO-10-12	CFSB-048-SO-0-0.5	CFSB-048-SO-0.5-2.0	CFSB-048-SO-10-12	CFSB-049-SO-0.5-2	CFSB-049-SO-10-12	CFSB-050-SO-0-0.5	CFSB-050-SO-0.5-2	CFSB-050-SO-10-12	CFSB-051-SO-0-0.5	CFSB-051-SO-0.5-2
Sample Depth	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft
Chemical	5/21/2016	5/21/2016	5/21/2016	5/20/2016	5/20/2016	5/20/2016	5/20/2016	5/20/2016	5/20/2016	5/28/2016	5/28/2016	5/21/2016	5/21/2016	5/21/2016	5/21/2016	5/21/2016
GENERAL CHEMISTRY|ANIONS (mg/kg)																
Fluoride	199	140	164	31.7 J-	13.7 J-	10.7 J-	109 J-	57.7 J-	18.6 J-	23.3 J	4.48 J	126	165	23.4	77 J-	73 J-

Footnotes:
-- = not applicable
- = Result is biased low
+ = Result is biased high
ft = feet
ft-bgs = feet below ground surface
J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
mg/kg = milligram(s) per kilogram

Appendix A-1b
Main Plant Area Soil (0-12 ft-bgs)
Data Used in Human Health Risk Assessment
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-051	CFSB-052	CFSB-052	CFSB-053	CFSB-053	CFSB-054	CFSB-054	CFSB-054	CFSB-055	CFSB-055	CFSB-055	CFSB-057	CFSB-057	CFSB-057	CFSB-059	CFSB-059-DUP
Sample Lab IDs	460-114275-18	460-114275-13	460-114275-14	460-114793-56	460-114793-58	460-114793-20	460-114793-25	460-114793-24	460-114793-19	460-114793-21	460-114793-26	460-114793-27	460-114793-35	460-114793-31	460-114793-30	460-114793-29
Sample Name	CFSB-051-SO-10-12	CFSB-052-SO-0.5-2	CFSB-052-SO-10-12	CFSB-053-SO-0.5-2	CFSB-053-SO-10-12	CFSB-054-SO-0-0.5	CFSB-054-SO-0.5-2	CFSB-054-SO-10-12	CFSB-055-SO-0-0.5	CFSB-055-SO-0.5-2	CFSB-055-SO-10-12	CFSB-057-SO-0-0.5	CFSB-057-SO-0.5-2	CFSB-057-SO-10-12	CFSB-059-SO-0-0.5	CFSB-DUP8-SO
Sample Depth	10-12 ft	0.5-2 ft	10-12 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0-0.5 ft
Chemical	5/21/2016	5/20/2016	5/20/2016	5/31/2016	5/31/2016	5/28/2016	5/28/2016	5/28/2016	5/28/2016	5/28/2016	5/28/2016	5/28/2016	5/28/2016	5/28/2016	5/28/2016	5/28/2016
GENERAL CHEMISTRY|ANIONS (mg/kg)																
Fluoride	81.1 J-	1.55 J-	4.16 J-	25.8 J	2 J+	44 J	58.1 J-	13.1 J	147 J	129 J	95.4 J	75.7 J-	76.2 J	13.5 J	51.2 J-	52.1 J-

Footnotes:
-- = not applicable
- = Result is biased low
+ = Result is biased high
ft = feet
ft-bgs = feet below ground surface
J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
mg/kg = milligram(s) per kilogram

Appendix A-1b
Main Plant Area Soil (0-12 ft-bgs)
Data Used in Human Health Risk Assessment
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-059	CFSB-059	CFSB-060	CFSB-060	CFSB-060	CFSB-062	CFSB-062	CFSB-062	CFSB-064	CFSB-064	CFSB-064	CFSB-065	CFSB-065	CFSB-065	CFSB-066	CFSB-066
Sample Lab IDs	460-114793-33	460-114793-28	460-114793-8	460-114793-2	460-114793-10	460-114828-40	460-114828-39	460-114828-41	460-115008-7	460-115008-8	460-115008-9	460-114828-34	460-114828-36	460-114828-32	460-114793-12	460-114793-1
Sample Name	CFSB-059-SO-0.5-2	CFSB-059-SO-10-12	CFSB-060-SO-0-0.5	CFSB-060-SO-0.5-2	CFSB-060-SO-10-12	CFSB-062-SO-0-0.5	CFSB-062-SO-0.5-2	CFSB-062-SO-10-12	CFSB-064-SO-0-0.5	CFSB-064-SO-0.5-2	CFSB-064-SO-10-12	CFSB-065-SO-0-0.5	CFSB-065-SO-0.5-2	CFSB-065-SO-10-12	CFSB-066-SO-0-0.5	CFSB-066-SO-0.5-2
Sample Depth	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft
Chemical	5/28/2016	5/28/2016	5/27/2016	5/27/2016	5/27/2016	6/2/2016	6/2/2016	6/2/2016	6/3/2016	6/3/2016	6/3/2016	6/2/2016	6/2/2016	6/2/2016	5/27/2016	5/27/2016
GENERAL CHEMISTRY|ANIONS (mg/kg)																
Fluoride	42.5 J-	21.6 J-	16.4 J	11.3 J	6.74 J	25.9 J	27.5 J	17.3 J	33.3 J	71.2 J	0.19 UJ	46.8 J	57.1 J	9.92 J	571 J	367 J

Footnotes:
-- = not applicable
- = Result is biased low
+ = Result is biased high
ft = feet
ft-bgs = feet below ground surface
J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
mg/kg = milligram(s) per kilogram

Appendix A-1b
Main Plant Area Soil (0-12 ft-bgs)
Data Used in Human Health Risk Assessment
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-066	CFSB-068	CFSB-068	CFSB-069	CFSB-069	CFSB-069	CFSB-071	CFSB-071	CFSB-071	CFSB-071-DUP	CFSB-073	CFSB-073	CFSB-073	CFSB-074	CFSB-074	CFSB-074
Sample Lab IDs	460-114793-16	460-114793-18	460-114793-11	460-114793-14	460-114793-15	460-114793-17	460-114793-4	460-114793-9	460-114793-13	460-114793-7	320-19320-22, 460-114828-7	320-19320-17, 460-114828-2	320-19320-18, 460-114828-3	320-19320-31, 460-114828-17	320-19320-16, 460-114828-1	320-19320-30, 460-114828-16
Sample Name	CFSB-066-SO-10-12	CFSB-068-SO-0.5-2	CFSB-068-SO-10-12	CFSB-069-SO-0-0.5	CFSB-069-SO-0.5-2	CFSB-069-SO-10-12	CFSB-071-SO-0-0.5	CFSB-071-SO-0.5-2	CFSB-071-SO-10-12	CFSB-DUP7-SO	CFSB-073-SO-0-0.5	CFSB-073-SO-0.5-2	CFSB-073-SO-10-12	CFSB-074-SO-0-0.5	CFSB-074-SO-0.5-2	CFSB-074-SO-10-12
Sample Depth	10-12 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft
Chemical	5/27/2016	5/27/2016	5/27/2016	5/27/2016	5/27/2016	5/27/2016	5/27/2016	5/27/2016	5/27/2016	5/27/2016	6/1/2016	6/1/2016	6/1/2016	6/1/2016	6/1/2016	6/1/2016
GENERAL CHEMISTRY|ANIONS (mg/kg)																
Fluoride	25.2 J	19 J	28.1 J+	36.3 J	39.8 J	6.42 J	47.3 J	54 J	3.16 J	4.28 J	28.2 J	24.3 J	10.3 J	143 J	8.98 J	28.3 J

Footnotes:
-- = not applicable
- = Result is biased low
+ = Result is biased high
ft = feet
ft-bgs = feet below ground surface
J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
mg/kg = milligram(s) per kilogram

Appendix A-1b
Main Plant Area Soil (0-12 ft-bgs)
Data Used in Human Health Risk Assessment
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-075	CFSB-075	CFSB-075	CFSB-079	CFSB-079	CFSB-079	CFSB-080	CFSB-080	CFSB-080	CFSB-082	CFSB-082	CFSB-082	CFSB-084	CFSB-084	CFSB-084	CFSB-086
Sample Lab IDs	320-19320-23, 460-114828-8	320-19320-19, 460-114828-4	320-19320-21, 460-114828-6	320-19320-25, 460-114828-10	320-19320-24, 460-114828-9	320-19320-20, 460-114828-5	320-19320-27, 460-114828-13	320-19320-28, 460-114828-14	320-19320-33, 460-114828-12	320-19320-26, 460-114828-11	320-19320-32, 460-114828-18	320-19320-29, 460-114828-15	320-19320-13, 460-114793-3	320-19320-14, 460-114793-6	320-19320-15, 460-114793-5	320-19320-10, 460-114529-28
Sample Name	CFSB-075-SO-0-0.5	CFSB-075-SO-0.5-2	CFSB-075-SO-10-12	CFSB-079-SO-0-0.5	CFSB-079-SO-0.5-2	CFSB-079-SO-10-12	CFSB-080-SO-0-0.5	CFSB-080-SO-0.5-2	CFSB-080-SO-10-12	CFSB-082-SO-0-0.5	CFSB-082-SO-0.5-2	CFSB-082-SO-10-12	CFSB-084-SO-0-0.5	CFSB-084-SO-0.5-2	CFSB-084-SO-10-12	CFSB-086-SO-0-0.5
Sample Depth	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft
Chemical	6/1/2016	6/1/2016	6/1/2016	6/1/2016	6/1/2016	6/1/2016	6/1/2016	6/1/2016	6/1/2016	6/1/2016	6/1/2016	6/1/2016	5/27/2016	5/27/2016	5/27/2016	5/26/2016
GENERAL CHEMISTRY|ANIONS (mg/kg)																
Fluoride	43 J	33.7 J	26.8 J	55.4 J	20.3 J	21.5 J	35.7 J	8.79 J	10.2 J	30.4 J	18.2 J	5.35 J	59.6 J	24.1 J	7.15 J	21.1 J+

Footnotes:
-- = not applicable
- = Result is biased low
+ = Result is biased high
ft = feet
ft-bgs = feet below ground surface
J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
mg/kg = milligram(s) per kilogram

Appendix A-1b
Main Plant Area Soil (0-12 ft-bgs)
Data Used in Human Health Risk Assessment
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-086	CFSB-086	CFSB-087	CFSB-087	CFSB-087	CFSB-088	CFSB-088	CFSB-088	CFSB-092	CFSB-092	CFSB-092	CFSB-094	CFSB-094	CFSB-094	CFSB-095	CFSB-095
Sample Lab IDs	320-19320-11, 460-114529-29	320-19320-12, 460-114529-30	320-19320-7, 460-114529-25	320-19320-8, 460-114529-26	320-19320-9, 460-114529-27	320-19320-4, 460-114529-22	320-19320-5, 460-114529-23	320-19320-6, 460-114529-24	320-19320-1, 460-114529-19	320-19320-2, 460-114529-20	320-19320-3, 460-114529-21	460-114456-42	460-114456-43	460-114456-41	460-114456-37	460-114456-38
Sample Name	CFSB-086-SO-0.5-2	CFSB-086-SO-10-12	CFSB-087-SO-0-0.5	CFSB-087-SO-0.5-2	CFSB-087-SO-10-12	CFSB-088-SO-0-0.5	CFSB-088-SO-0.5-2	CFSB-088-SO-10-12	CFSB-092-SO-0-0.5	CFSB-092-SO-0.5-2	CFSB-092-SO-10-12	CFSB-094-SO-0-0.5	CFSB-094-SO-0.5-2.0	CFSB-094-SO-10-12	CFSB-095-SO-0-0.5	CFSB-095-SO-0.5-2.0
Sample Depth	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft
Chemical	5/26/2016	5/26/2016	5/26/2016	5/26/2016	5/26/2016	5/26/2016	5/26/2016	5/26/2016	5/26/2016	5/26/2016	5/26/2016	5/24/2016	5/24/2016	5/24/2016	5/24/2016	5/24/2016
GENERAL CHEMISTRY|ANIONS (mg/kg)																
Fluoride	12.9 J+	18.6 J+	34.9 J+	29.3 J+	17.2 J+	23.5 J+	25.8 J+	5.88 J+	14.1 J	29.9 J	2.35 J+	86.9 J-	63.2 J-	1.49 J-	19.5 J-	16.9 J-

Footnotes:
-- = not applicable
- = Result is biased low
+ = Result is biased high
ft = feet
ft-bgs = feet below ground surface
J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
mg/kg = milligram(s) per kilogram

Appendix A-1b
Main Plant Area Soil (0-12 ft-bgs)
Data Used in Human Health Risk Assessment
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-095	CFSB-097	CFSB-097	CFSB-097	CFSB-098	CFSB-098	CFSB-098	CFSB-099	CFSB-099	CFSB-099	CFSB-100	CFSB-100	CFSB-100	CFSB-121	CFSB-121-DUP	CFSB-121
Sample Lab IDs	460-114456-36	460-114456-25	460-114456-34	460-114456-31	460-114456-27	460-114456-32	460-114456-35	460-114456-23	460-114456-28	460-114456-30	460-114456-26	460-114456-33	460-114456-29	460-114141-20	460-114141-23	460-114141-21
Sample Name	CFSB-095-SO-10-12	CFSB-097-SO-0-0.5	CFSB-097-SO-0.5-2	CFSB-097-SO-10-12	CFSB-098-SO-0-0.5	CFSB-098-SO-0.5-2	CFSB-098-SO-10-12	CFSB-099-SO-0-0.5	CFSB-099-SO-0.5-2	CFSB-099-SO-10-12	CFSB-100-SO-0-0.5	CFSB-100-SO-0.5-2	CFSB-100-SO-10-12	CFSB-121-SO-0-0.5	CFSB-DUP1-SO	CFSB-121-SO-0.5-2.0
Sample Depth	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0-0.5 ft	0.5-2 ft
Chemical	5/24/2016	5/24/2016	5/24/2016	5/24/2016	5/24/2016	5/24/2016	5/24/2016	5/24/2016	5/24/2016	5/24/2016	5/24/2016	5/24/2016	5/24/2016	5/18/2016	5/18/2016	5/18/2016
GENERAL CHEMISTRY|ANIONS (mg/kg)																
Fluoride	10.4 J-	80.1 J-	47.6 J-	1.29 J-	93.3 J-	79.9 J-	141 J-	41.7 J+	3.18 J+	2.87 J+	39.2 J+	90.9 J-	16.6 J+	13.5 J-	9.05 J-	10.1 J-

Footnotes:
-- = not applicable
- = Result is biased low
+ = Result is biased high
ft = feet
ft-bgs = feet below ground surface
J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
mg/kg = milligram(s) per kilogram

Appendix A-1b
Main Plant Area Soil (0-12 ft-bgs)
Data Used in Human Health Risk Assessment
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-121	CFSB-128	CFSB-128	CFSB-128	CFSB-129	CFSB-129	CFSB-129	CFSB-130	CFSB-130	CFSB-131	CFSB-131	CFMW-025A	CFMW-025A	CFMW-025A	CFMW-026	CFMW-026
Sample Lab IDs	460-114141-22	460-114456-39	460-114456-40	460-114456-47	460-114456-44	460-114456-46	460-114456-45	460-115731-5	460-115731-6	460-115731-1	460-115731-2	460-117124-1	460-117124-3	460-117124-4	460-115528-27	460-115528-26
Sample Name	CFSB-121-SO-10-12	CFSB-128-SO-0-0.5	CFSB-128-SO-0.5-2.0	CFSB-128-SO-10-12	CFSB-129-SO-0-0.5	CFSB-129-SO-0.5-2.0	CFSB-129-SO-10-12	CFSB-130-SO-0.5-2	CFSB-130-SO-10-12	CFSB-131-SO-0.5-2	CFSB-131-SO-10-12	CFMW-025a-SO-0-0.5	CFMW-025a-SO-0.5-2	CFMW-025a-SO-10-12	CFMW-026-SO-0-0.5	CFMW-026-SO-0.5-2
Sample Depth	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0.5-2 ft	10-12 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft
Chemical	5/18/2016	5/24/2016	5/24/2016	5/24/2016	5/24/2016	5/24/2016	5/24/2016	6/17/2016	6/17/2016	6/17/2016	6/17/2016	7/13/2016	7/13/2016	7/13/2016	6/14/2016	6/14/2016
GENERAL CHEMISTRY|ANIONS (mg/kg)																
Fluoride	1.38 J-	46.7 J-	63.4 J-	10.6 J-	214 J-	203 J-	123 J-	2.46	232 J-	3.82	86.7 J-	16.7 J	7.99 J	2.06 J	4.25 J	4.09 J

Footnotes:
-- = not applicable
- = Result is biased low
+ = Result is biased high
ft = feet
ft-bgs = feet below ground surface
J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
mg/kg = milligram(s) per kilogram

Appendix A-1b
Main Plant Area Soil (0-12 ft-bgs)
Data Used in Human Health Risk Assessment
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-026-DUP	CFMW-026	CFMW-028A	CFMW-028A	CFMW-028A	CFMW-028A	CFMW-028A	CFMW-028A-DUP	CFMW-032A	CFMW-032A	CFMW-032A	CFMW-032A	CFMW-032A-DUP	CFMW-033	CFMW-033	CFMW-033
Sample Lab IDs	460-115528-25	460-115528-28	460-116402-2	460-116402-9	460-116402-3	460-116402-10	460-116402-4	460-116402-6	460-118466-1	460-118466-2	460-118466-3	460-118466-4	460-118466-6	460-116402-16	460-116402-19	460-116402-17
Sample Name	CFMW-DUP15-SO	CFMW-026-SO-10-12	CFMW-028a-SO-0-0.5	CFMW-028a-SO-0-0.5Pb	CFMW-028a-SO-0.5-2	CFMW-028a-SO-4.5-6	CFMW-028a-SO-10-12	CFMW-DUP19-SO	CFMW-032a-SO-0-0.5	CFMW-032a-SO-0-0.5Pb	CFMW-032a-SO-0.5-2	CFMW-032a-SO-10-12	CFMW-Dup21-SO	CFMW-033-SO-0-0.5	CFMW-033-SO-0-0.5Pb	CFMW-033-SO-0.5-2
Sample Depth	0.5-2 ft	10-12 ft	0-0.5 ft	0-0.5 ft	0.5-2 ft	4.5-6 ft	10-12 ft	10-12 ft	0-0.5 ft	0-0.5 ft	0.5-2 ft	10-12 ft	10-12 ft	0-0.5 ft	0-0.5 ft	0.5-2 ft
Chemical	6/14/2016	6/14/2016	6/30/2016	6/30/2016	6/30/2016	6/30/2016	6/30/2016	6/30/2016	8/8/2016	8/8/2016	8/8/2016	8/8/2016	8/8/2016	7/1/2016	7/1/2016	7/1/2016
GENERAL CHEMISTRY|ANIONS (mg/kg)																
Fluoride	84.1 J	51.7 J	6.47 J+	--	20.1 J+	293 J+	13.8 J+	14.9 J+	78.1 J	--	61.6 J	1.57 J	1.59 J	8.12 J+	--	36.8 J+

Footnotes:
-- = not applicable
- = Result is biased low
+ = Result is biased high
ft = feet
ft-bgs = feet below ground surface
J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
mg/kg = milligram(s) per kilogram

Appendix A-1b
Main Plant Area Soil (0-12 ft-bgs)
Data Used in Human Health Risk Assessment
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-033	CFMW-034	CFMW-034	CFMW-034-DUP	CFMW-034	CFMW-035	CFMW-035-DUP	CFMW-035	CFMW-035	CFMW-037	CFMW-037	CFMW-037	CFMW-038	CFMW-038	CFMW-038	CFMW-038
Sample Lab IDs	460-116402-18	460-114793-41	460-114793-42	460-114793-44	460-114793-43	460-114828-22	460-114828-23	460-114828-20	460-114828-21	460-116119-2	460-116119-3	460-116119-4	320-19945-1, 460-116119-6	460-116119-9	320-19945-2, 460-116119-7	320-19945-3, 460-116119-8
Sample Name	CFMW-033-SO-10-12	CFMW-034-SO-0-0.5	CFMW-034-SO-0.5-2	CFMW-DUP10-SO	CFMW-034-SO-10-12	CFMW-035-SO-0-0.5	CFMW-DUP11-SO	CFMW-035-SO-0.5-2	CFMW-035-SO-10-12	CFMW-037-SO-0-0.5	CFMW-037-SO-0.5-2	CFMW-037-SO-10-12	CFMW-038-SO-0-0.5	CFMW-038-SO-0-0.5 Pb	CFMW-038-SO-0.5-2	CFMW-038-SO-10-12
Sample Depth	10-12 ft	0-0.5 ft	0.5-2 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0-0.5 ft	0.5-2 ft	10-12 ft
Chemical	7/1/2016	5/31/2016	5/31/2016	5/31/2016	5/31/2016	6/1/2016	6/1/2016	6/1/2016	6/1/2016	6/24/2016	6/24/2016	6/24/2016	6/25/2016	6/25/2016	6/25/2016	6/25/2016
GENERAL CHEMISTRY|ANIONS (mg/kg)																
Fluoride	11.3 J+	42.8 J	42.4 J	21.6 J-	7.39 J-	98.3 J	123 J	11.1 J	8.7 J	192 J	39.2 J+	12.3 J+	22.3 J+	--	25.8 J+	21.5 J+

Footnotes:
-- = not applicable
- = Result is biased low
+ = Result is biased high
ft = feet
ft-bgs = feet below ground surface
J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
mg/kg = milligram(s) per kilogram

Appendix A-1b
Main Plant Area Soil (0-12 ft-bgs)
Data Used in Human Health Risk Assessment
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-040	CFMW-040	CFMW-040	CFMW-040	CFMW-042	CFMW-042	CFMW-042	CFMW-042-DUP	CFMW-042	CFMW-043	CFMW-043	CFMW-043	CFMW-043	CFMW-044A	CFMW-044A	CFMW-044A
Sample Lab IDs	320-19945-4, 460-116283-1	460-116283-6	320-19945-5, 460-116283-2	320-19945-6, 460-116283-3	460-115648-15	460-115648-19	460-115648-16	460-115648-18	460-115648-17	460-115648-3	460-115648-10	460-115648-4	460-115648-5	460-117381-5	460-117506-7	460-117381-6
Sample Name	CFMW-040-SO-0-0.5	CFMW-040-SO-0-0.5Pb	CFMW-040-SO-0.5-2	CFMW-040-SO-10-12	CFMW-042-SO-0-0.5	CFMW-042-SO-0-0.5-Pb	CFMW-042-SO-0.5-2	CFMW-DUP16-SO	CFMW-042-SO-10-12	CFMW-043-SO-0-0.5	CFMW-043-SO-0-0.5-Pb	CFMW-043-SO-0.5-2	CFMW-043-SO-10-12	CFMW-044a-SO-0-0.5	CFMW-044a-SO-0-0.5Pb	CFMW-044a-SO-0.5-2
Sample Depth	0-0.5 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0-0.5 ft	0.5-2 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0-0.5 ft	0.5-2 ft
Chemical	6/28/2016	6/28/2016	6/28/2016	6/28/2016	6/16/2016	6/16/2016	6/16/2016	6/16/2016	6/16/2016	6/15/2016	6/15/2016	6/15/2016	6/15/2016	7/20/2016	7/20/2016	7/20/2016
GENERAL CHEMISTRY|ANIONS (mg/kg)																
Fluoride	27.6 J+	--	22.1 J+	14 J+	47.5 J-	--	22.9 J	41.5 J	5.29 J	84.9 J-	--	86.2 J-	4.91 J-	59.8 J+	--	34 J+

Footnotes:
-- = not applicable
- = Result is biased low
+ = Result is biased high
ft = feet
ft-bgs = feet below ground surface
J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
mg/kg = milligram(s) per kilogram

Appendix A-1b
Main Plant Area Soil (0-12 ft-bgs)
Data Used in Human Health Risk Assessment
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-044A	CFMW-045A	CFMW-045A	CFMW-045A	CFMW-047	CFMW-047	CFMW-047	CFMW-047	CFMW-049	CFMW-049A	CFMW-049A	CFMW-049A	CFMW-050	CFMW-050	CFMW-050	CFMW-050-DUP
Sample Lab IDs	460-117381-7	460-118613-2	460-118613-3	460-118613-4	460-115886-20	460-116014-1	460-115886-21	460-115886-22	460-119134-1	460-119134-7	460-119134-2	460-119134-3	460-116014-7	460-116014-13	460-116014-8	460-116014-10
Sample Name	CFMW-044a-SO-10-12	CFMW-045a-SO-0.5	CFMW-045a-SO-0.5-2	CFMW-045a-SO-10-12	CFMW-047-SO-0.5	CFMW-047-SO-0-0.5-Pb	CFMW-047-SO-0.5-2	CFMW-047-SO-10-12	CFMW-049-SO-0.5	CFMW-049a-SO-0.5 Pb	CFMW-049a-SO-0.5-2	CFMW-049a-SO-10-12	CFMW-050-SO-0.5	CFMW-050-SO-0-0.5-Pb	CFMW-050-SO-0.5-2	CFMW-DUP17-SO
Sample Depth	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0-0.5 ft	0.5-2 ft	0.5-2 ft
Chemical	7/20/2016	8/12/2016	8/12/2016	8/12/2016	6/21/2016	6/21/2016	6/21/2016	6/21/2016	8/20/2016	8/20/2016	8/20/2016	8/20/2016	6/22/2016	6/22/2016	6/22/2016	6/22/2016
GENERAL CHEMISTRY|ANIONS (mg/kg)																
Fluoride	4.02 J+	74.8 J	65.3 J	16.7 J	22.2 J	--	36.2 J	3.73 J	11.4 J+	--	10.9 J+	2.91 J+	21.2 J+	--	26 J+	33 J+

Footnotes:
-- = not applicable
- = Result is biased low
+ = Result is biased high
ft = feet
ft-bgs = feet below ground surface
J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
mg/kg = milligram(s) per kilogram

Appendix A-1b
Main Plant Area Soil (0-12 ft-bgs)
Data Used in Human Health Risk Assessment
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-050	CFMW-053A	CFMW-053A	CFMW-053A	CFMW-053A-DUP	CFMW-053A	CFMW-054	CFMW-054	CFMW-054
Sample Lab IDs	460-116014-9	460-118952-2	460-118952-3	460-118952-4	460-118952-6	460-118952-5	460-115886-3	460-115886-4	460-115886-5
Sample Name	CFMW-050-SO-10-12	CFMW-053a-SO-0-0.5	CFMW-053a-SO-0-0.5Pb	CFMW-053a-SO-0.5-2	CFMW-DUP22-SO	CFMW-053a-SO-10-12	CFMW-054-SO-0-0.5	CFMW-054-SO-0.5-2	CFMW-054-SO-10-12
Sample Depth	10-12 ft	0-0.5 ft	0-0.5 ft	0.5-2 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft
Chemical	6/22/2016	8/17/2016	8/17/2016	8/17/2016	8/17/2016	8/17/2016	6/20/2016	6/20/2016	6/20/2016
GENERAL CHEMISTRY|ANIONS (mg/kg)									
Fluoride	2.7 J+	8.82	--	8.47 J	3.85 J	3.87	231 J	355 J	14 J

Footnotes:
-- = not applicable
- = Result is biased low
+ = Result is biased high
ft = feet
ft-bgs = feet below ground surface
J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
mg/kg = milligram(s) per kilogram

Appendix A-2a
North Percolation Pond Area Soil (0-2 ft-bgs)
Data Used in Human Health Risk Assessment
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-027	CFMW-027	CFSB-014	CFSB-014	CFSB-016	CFSB-016	CFSB-019	CFSB-019	CFSB-019-DUP	CFSB-025	CFSB-025	CFSB-026	CFSB-026	CFSB-027	CFSB-027	CFSB-028
Sample Lab IDs	460-116402-11	460-116402-12	460-114828-33	460-114828-37	460-114828-25	460-114828-35	460-115008-10	460-115008-11	460-115008-12	460-115528-18	460-115528-15	460-115528-16	460-115528-11	460-115528-22	460-115528-19	460-117381-1
Sample Name	CFMW-027-SO-0-0.5	CFMW-027-SO-0.5-2	CFSB-014-SO-0-0.5	CFSB-014-SO-0.5-2	CFSB-016-SO-0-0.5	CFSB-016-SO-0.5-2	CFSB-019-SO-0-0.5	CFSB-019-SO-0.5-2	CFSB-DUP13-SO	CFSB-025-SO-0-0.5	CFSB-025-SO-0.5-2	CFSB-026-SO-0-0.5	CFSB-026-SO-0.5-2	CFSB-027-SO-0-0.5	CFSB-027-SO-0.5-2	CFSB-028-SO-0-0.5
Sample Depth	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft
Chemical	6/30/2016	6/30/2016	6/2/2016	6/2/2016	6/2/2016	6/2/2016	6/4/2016	6/4/2016	6/4/2016	6/13/2016	6/13/2016	6/13/2016	6/13/2016	6/13/2016	6/13/2016	7/18/2016
GENERAL CHEMISTRY|ANIONS (mg/kg)																
Fluoride	149 J+	58.8 J+	33.6 J	7.98 J	241 J	54.3 J	50 J	48.2 J	50.2 J	138 J-	154 J-	167 J-	258 J+	52.8 J-	81.5 J-	94.8 J+

Footnotes:
-- = not applicable
- = Result is biased low
+ = Result is biased high
ft = feet
ft-bgs = feet below ground surface
J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
mg/kg = milligram(s) per kilogram

Appendix A-2a
North Percolation Pond Area Soil (0-2 ft-bgs)
Data Used in Human Health Risk Assessment
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-028	CFSB-030	CFSB-030
Sample Lab IDs	460-117381-2	460-115528-20	460-115528-23
Sample Name	CFSB-028-SO-0.5-2	CFSB-030-SO-0-0.5	CFSB-030-SO-0.5-2
Sample Depth	0.5-2 ft	0-0.5 ft	0.5-2 ft
Chemical	7/18/2016	6/13/2016	6/13/2016
GENERAL CHEMISTRY|ANIONS (mg/kg)			
Fluoride	23.8 J+	221 J+	84 J-

Footnotes:
-- = not applicable
- = Result is biased low
+ = Result is biased high
ft = feet
ft-bgs = feet below ground surface
J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
mg/kg = milligram(s) per kilogram

Appendix A-2b
North Percolation Pond Area Soil (0-12 ft-bgs)
Data Used in Human Health Risk Assessment
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-027	CFMW-027	CFMW-027	CFSB-014	CFSB-014	CFSB-014	CFSB-016	CFSB-016	CFSB-016	CFSB-019	CFSB-019	CFSB-019-DUP	CFSB-019	CFSB-025	CFSB-025	CFSB-025
Sample Lab IDs	460-116402-11	460-116402-12	460-116402-13	460-114828-33	460-114828-37	460-114828-38	460-114828-25	460-114828-35	460-114828-26	460-115008-10	460-115008-11	460-115008-12	460-115528-13	460-115528-18	460-115528-15	460-115528-12
Sample Name	CFMW-027-SO-0-0.5	CFMW-027-SO-0.5-2	CFMW-027-SO-10-12	CFSB-014-SO-0-0.5	CFSB-014-SO-0.5-2	CFSB-014-SO-10-12	CFSB-016-SO-0-0.5	CFSB-016-SO-0.5-2	CFSB-016-SO-10-12	CFSB-019-SO-0-0.5	CFSB-019-SO-0.5-2	CFSB-DUP13-SO	CFSB-019-SO-10-12	CFSB-025-SO-0-0.5	CFSB-025-SO-0.5-2	CFSB-025-SO-10-12
Sample Depth	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft
Chemical	6/30/2016	6/30/2016	6/30/2016	6/2/2016	6/2/2016	6/2/2016	6/2/2016	6/2/2016	6/2/2016	6/4/2016	6/4/2016	6/4/2016	6/13/2016	6/13/2016	6/13/2016	6/13/2016
GENERAL CHEMISTRY|ANIONS (mg/kg)																
Fluoride	149 J+	58.8 J+	44.7 J+	33.6 J	7.98 J	0.87 J	241 J	54.3 J	3.9 J	50 J	48.2 J	50.2 J	20.9 J-	138 J-	154 J-	34.4 J-

Footnotes:
-- = not applicable
- = Result is biased low
+ = Result is biased high
ft = feet
ft-bgs = feet below ground surface
J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
mg/kg = milligram(s) per kilogram

Appendix A-2b
North Percolation Pond Area Soil (0-12 ft-bgs)
Data Used in Human Health Risk Assessment
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-026	CFSB-026	CFSB-026	CFSB-027	CFSB-027	CFSB-027	CFSB-028	CFSB-028	CFSB-028	CFSB-030	CFSB-030	CFSB-030
Sample Lab IDs	460-115528-16	460-115528-11	460-115528-14	460-115528-22	460-115528-19	460-115528-17	460-117381-1	460-117381-2	460-117381-3	460-115528-20	460-115528-23	460-115528-21
Sample Name	CFSB-026-SO-0-0.5	CFSB-026-SO-0.5-2	CFSB-026-SO-10-12	CFSB-027-SO-0-0.5	CFSB-027-SO-0.5-2	CFSB-027-SO-10-12	CFSB-028-SO-0-0.5	CFSB-028-SO-0.5-2	CFSB-028-SO-10-12	CFSB-030-SO-0-0.5	CFSB-030-SO-0.5-2	CFSB-030-SO-10-12
Sample Depth	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft
Chemical	6/13/2016	6/13/2016	6/13/2016	6/13/2016	6/13/2016	6/13/2016	7/18/2016	7/18/2016	7/18/2016	6/13/2016	6/13/2016	6/13/2016
GENERAL CHEMISTRY|ANIONS (mg/kg)												
Fluoride	167 J-	258 J+	26.1 J-	52.8 J-	81.5 J-	49.1 J-	94.8 J+	23.8 J+	19 J+	221 J+	84 J-	10.3 J-

Footnotes:
-- = not applicable
- = Result is biased low
+ = Result is biased high
ft = feet
ft-bgs = feet below ground surface
J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
mg/kg = milligram(s) per kilogram

Appendix A-2c
North Percolation Pond Area (surface water)
Data Used in Human Health Risk Assessment
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Chemical	CFSWP-023 460-130874-1 CFSWP-023-SW 4/3/2017	CFSWP-024 460-135444-5 CFSWP-024-SW 6/15/2017
GENERAL CHEMISTRY|ANIONS (µg/L)		
Fluoride	2150	22400 J+

Footnotes:
+ = Result is biased high
J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
µg/L = microgram(s) per liter

Appendix A-2d
North Percolation Pond Area (sediment)
Data Used in Human Health Risk Assessment
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSDP-023	CFSDP-023-DUP	CFSDP-024
Sample Lab IDs	200-35201-11, 460-119830-1	460-119830-6	200-35201-12, 460-119830-2
Sample Name	CFSDP-023-SD	CFSDP-DUP2-SD	CFSDP-024-SD
Chemical	9/7/2016	9/7/2016	9/7/2016
GENERAL CHEMISTRY|ANIONS (mg/kg)			
Fluoride	56.6 J	59.3 J	219

Footnotes:
J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
mg/kg = milligram(s) per kilogram

Appendix A-3a
Central Landfill Area Soil (0-0.5 ft-bgs)
Data Used in Human Health Risk Assessment
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-023A	CFSB-001	CFSB-002	CFSB-003	CFSB-004	CFSB-005	CFSB-006	CFSB-007	CFSB-008	CFSB-009	CFSB-009-DUP	CFSB-021	CFSB-022	CFSB-029	CFSB-033	CFSB-034
Sample Lab IDs	460-115731-9	460-114529-4	460-114529-7	460-114529-10	460-114529-1	460-114529-15	460-114456-18	460-114529-14	460-114456-20	460-114456-15	460-114456-24	460-114456-12	460-114456-6	460-114456-4	460-114456-5	460-114793-52
	CFMW-023a-SO-0-	CFSB-001-SO-0-	CFSB-002-SO-0-	CFSB-003-SO-0-	CFSB-004-SO-0-	CFSB-005-SO-0-	CFSB-006-SO-0-	CFSB-007-SO-0-	CFSB-008-SO-0-	CFSB-009-SO-0-		CFSB-021-SO-0-	CFSB-022-SO-0-	CFSB-029-SO-0-	CFSB-033-SO-0-	CFSB-034-SO-0-
Sample Name	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	CFSB-DUP6-SO	0.5	0.5	0.5	0.5	0.5
Sample Depth	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft
Chemical	6/17/2016	5/25/2016	5/25/2016	5/25/2016	5/25/2016	5/25/2016	5/23/2016	5/25/2016	5/23/2016	5/23/2016	5/24/2016	5/23/2016	5/23/2016	5/23/2016	5/23/2016	5/31/2016
GENERAL CHEMISTRY|ANIONS (mg/kg)																
Fluoride	109 J-	56.5 J	22.4 J	26.9 J	34.1 J	11.6 J	14.6 J	11.8 J	30.6 J	37.6 J	37.9 J+	89.9 J	28.9 J	62 J	95.8 J	210 J-

Footnotes:
- = Result is biased low
+ = Result is biased high
ft = feet
ft-bgs = feet below ground surface
J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
mg/kg = milligram(s) per kilogram

Appendix A-3a
Central Landfill Area Soil (0-0.5 ft-bgs)
Data Used in Human Health Risk Assessment
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-035	CFSB-036	CFSB-037	CFMW-012A	CFMW-019A	CFMW-002	CFMW-008A	CFMW-010	CFMW-016A	CFMW-018	CFMW-022	CFMW-029
Sample Lab IDs	460-114793-45	460-114793-48	460-114793-49	460-114275-1	460-114456-49	460-115528-7	460-115528-1	460-114141-16	460-115886-11	460-114141-34	460-114828-29	460-114141-13
	CFSB-035-SO-0-	CFSB-036-SO-0-	CFSB-037-SO-0-	CFMW-012A-SO-0	CFMW-019a-SO-0-	CFMW-002-SO-0-	CFMW-008a-SO-0-	CFMW-010-SO-0-	CFMW-016a-SO-0-	CFMW-018-SO-0-	CFMW-022-SO-0-	CFMW-029-SO-0-
Sample Name	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Sample Depth	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft
Chemical	5/31/2016	5/31/2016	5/31/2016	5/20/2016	5/25/2016	6/13/2016	6/13/2016	5/18/2016	6/21/2016	5/19/2016	6/2/2016	5/18/2016
GENERAL CHEMISTRY|ANIONS (mg/kg)												
Fluoride	180 J	86.8 J	19.4 J	91.9 J-	37 J-	56.7 J-	84.9 J-	114 J-	59.4 J	9.33 J-	17.5 J	105 J-

Footnotes:
- = Result is biased low
+ = Result is biased high
ft = feet
ft-bgs = feet below ground surface
J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
mg/kg = milligram(s) per kilogram

Appendix A-3b
Central Landfill Area Soil (0-2 ft-bgs)
Data Used in Human Health Risk Assessment
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-023A	CFMW-023A	CFSB-001	CFSB-001	CFSB-002	CFSB-002	CFSB-003	CFSB-003	CFSB-004	CFSB-004	CFSB-005	CFSB-005	CFSB-006	CFSB-006	CFSB-007	CFSB-007
Sample Lab IDs	460-115731-9	460-115731-10	460-114529-4	460-114529-5	460-114529-7	460-114529-8	460-114529-10	460-114529-11	460-114529-1	460-114529-2	460-114529-15	460-114529-17	460-114456-18	460-114456-22	460-114529-14	460-114529-16
Sample Name	CFMW-023a-SO-0-0.5	CFMW-023a-SO-0.5-2	CFSB-001-SO-0-0.5	CFSB-001-SO-0.5-2	CFSB-002-SO-0-0.5	CFSB-002-SO-0.5-2	CFSB-003-SO-0-0.5	CFSB-003-SO-0.5-2	CFSB-004-SO-0-0.5	CFSB-004-SO-0.5-2	CFSB-005-SO-0-0.5	CFSB-005-SO-0.5-2	CFSB-006-SO-0-0.5	CFSB-006-SO-0.5-2	CFSB-007-SO-0-0.5	CFSB-007-SO-0.5-2
Sample Depth	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft
Chemical	6/17/2016	6/17/2016	5/25/2016	5/25/2016	5/25/2016	5/25/2016	5/25/2016	5/25/2016	5/25/2016	5/25/2016	5/25/2016	5/25/2016	5/23/2016	5/23/2016	5/25/2016	5/25/2016
GENERAL CHEMISTRY|ANIONS (mg/kg)																
Fluoride	109 J-	58.5	56.5 J	53.7 J	22.4 J	28 J	26.9 J	16.3 J	34.1 J	39 J	11.6 J	20.4 J	14.6 J	5.6 J+	11.8 J	25 J

Footnotes:
- = Result is biased low
+ = Result is biased high
ft = feet
ft-bgs = feet below ground surface
J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
mg/kg = milligram(s) per kilogram

Appendix A-3b
Central Landfill Area Soil (0-2 ft-bgs)
Data Used in Human Health Risk Assessment
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-008	CFSB-008	CFSB-008-DUP	CFSB-009	CFSB-009	CFSB-009-DUP	CFSB-021	CFSB-021	CFSB-022	CFSB-022	CFSB-029	CFSB-029	CFSB-033	CFSB-033	CFSB-034	CFSB-034
Sample Lab IDs	460-114456-20	460-114456-17	460-114456-19	460-114456-15	460-114456-13	460-114456-24	460-114456-12	460-114456-9	460-114456-6	460-114456-7	460-114456-4	460-114456-3	460-114456-5	460-114456-10	460-114793-52	460-114793-51
Sample Name	CFSB-008-SO-0-0.5	CFSB-008-SO-0.5-2	CFSB-DUP4-SO	CFSB-009-SO-0-0.5	CFSB-009-SO-0.5-2	CFSB-DUP6-SO	CFSB-021-SO-0-0.5	CFSB-021-SO-0.5-2	CFSB-022-SO-0-0.5	CFSB-022-SO-0.5-2	CFSB-029-SO-0-0.5	CFSB-029-SO-0.5-2	CFSB-033-SO-0-0.5	CFSB-033-SO-0.5-2	CFSB-034-SO-0-0.5	CFSB-034-SO-0.5-2
Sample Depth	0-0.5 ft	0.5-2 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft
Chemical	5/23/2016	5/23/2016	5/23/2016	5/23/2016	5/23/2016	5/24/2016	5/23/2016	5/23/2016	5/23/2016	5/23/2016	5/23/2016	5/23/2016	5/23/2016	5/23/2016	5/31/2016	5/31/2016
GENERAL CHEMISTRY|ANIONS (mg/kg)																
Fluoride	30.6 J	16.2 J	45.4 J	37.6 J	17.9 J	37.9 J+	89.9 J	81.1 J	28.9 J	24.7 J	62 J	21.7 J	95.8 J	75.3 J	210 J-	20.4 J

Footnotes:
- = Result is biased low
+ = Result is biased high
ft = feet
ft-bgs = feet below ground surface
J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
mg/kg = milligram(s) per kilogram

Appendix A-3b
Central Landfill Area Soil (0-2 ft-bgs)
Data Used in Human Health Risk Assessment
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-035	CFSB-035	CFSB-036	CFSB-036	CFSB-037	CFSB-037	CFMW-012A	CFMW-012A	CFMW-012A-DUP	CFMW-019A	CFMW-019A	CFMW-019A-DUP	CFMW-002	CFMW-002	CFMW-008A	CFMW-008A
Sample Lab IDs	460-114793-45	460-114793-46	460-114793-48	460-114793-53	460-114793-49	460-114793-54	460-114275-1	460-114275-3	460-114275-5	460-114456-49	460-114456-50	460-114456-52	460-115528-7	460-115528-8	460-115528-1	460-115528-3
Sample Name	CFSB-035-SO-0-0.5	CFSB-035-SO-0.5-2	CFSB-036-SO-0-0.5	CFSB-036-SO-0.5-2	CFSB-037-SO-0-0.5	CFSB-037-SO-0.5-2	CFMW-012A-SO-0-0.5	CFMW-012A-SO-0.5-2	CFMW-DUP3-SO	CFMW-019a-SO-0-0.5	CFMW-019a-SO-0.5-2	CFMW-DUP5-SO	CFMW-002-SO-0-0.5	CFMW-002-SO-0.5-2	CFMW-008a-SO-0-0.5	CFMW-008a-SO-0.5-2
Sample Depth	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft
Chemical	5/31/2016	5/31/2016	5/31/2016	5/31/2016	5/31/2016	5/31/2016	5/20/2016	5/20/2016	5/20/2016	5/25/2016	5/25/2016	5/25/2016	6/13/2016	6/13/2016	6/13/2016	6/13/2016
GENERAL CHEMISTRY|ANIONS (mg/kg)																
Fluoride	180 J	116 J	86.8 J	104 J-	19.4 J	15.5 J	91.9 J-	59.3 J-	80.8 J-	37 J-	62.2 J-	44.2 J-	56.7 J-	166 J+	84.9 J-	180 J+

Footnotes:
- = Result is biased low
+ = Result is biased high
ft = feet
ft-bgs = feet below ground surface
J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
mg/kg = milligram(s) per kilogram

Appendix A-3b
Central Landfill Area Soil (0-2 ft-bgs)
Data Used in Human Health Risk Assessment
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-010	CFMW-010	CFMW-016A	CFMW-016A	CFMW-018	CFMW-018	CFMW-022	CFMW-022	CFMW-022-DUP	CFMW-029	CFMW-029
Sample Lab IDs	460-114141-16	460-114141-17	460-115886-11	460-115886-12	460-114141-34	460-114141-35	460-114828-29	460-114828-28	460-114828-30	460-114141-13	460-114141-14
Sample Name	CFMW-010-SO-0-0.5	CFMW-010-SO-0.5-2.0	CFMW-016a-SO-0-0.5	CFMW-016a-SO-0.5-2	CFMW-018-SO-0-0.5	CFMW-018-SO-0.5-2.0	CFMW-022-SO-0-0.5	CFMW-022-SO-0.5-2	CFMW-DUP12-SO	CFMW-029-SO-0-0.5	CFMW-029-SO-0.5-2.0
Sample Depth	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft
Chemical	5/18/2016	5/18/2016	6/21/2016	6/21/2016	5/19/2016	5/19/2016	6/2/2016	6/2/2016	6/2/2016	5/18/2016	5/18/2016
GENERAL CHEMISTRY|ANIONS (mg/kg)											
Fluoride	114 J-	101 J-	59.4 J	25.4 J	9.33 J-	7.71 J-	17.5 J	9.45 J	10.1 J	105 J-	50.3 J-

Footnotes:
- = Result is biased low
+ = Result is biased high
ft = feet
ft-bgs = feet below ground surface
J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
mg/kg = milligram(s) per kilogram

Appendix A-3c
Central Landfill Area Soil (0-12 ft-bgs)
Data Used in Human Health Risk Assessment
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-023A	CFMW-023A	CFMW-023A	CFSB-001	CFSB-001	CFSB-001	CFSB-002	CFSB-002	CFSB-002	CFSB-003	CFSB-003	CFSB-003	CFSB-004	CFSB-004	CFSB-004	CFSB-005
Sample Lab IDs	460-115731-9	460-115731-10	460-115731-11	460-114529-4	460-114529-5	460-114529-6	460-114529-7	460-114529-8	460-114529-9	460-114529-10	460-114529-11	460-114529-13	460-114529-1	460-114529-2	460-114529-3	460-114529-15
Sample Name	CFMW-023a-SO-0-0.5	CFMW-023a-SO-0.5-2	CFMW-023a-SO-10-12	CFSB-001-SO-0-0.5	CFSB-001-SO-0.5-2	CFSB-001-SO-10-12	CFSB-002-SO-0-0.5	CFSB-002-SO-0.5-2	CFSB-002-SO-10-12	CFSB-003-SO-0-0.5	CFSB-003-SO-0.5-2	CFSB-003-SO-10-12	CFSB-004-SO-0-0.5	CFSB-004-SO-0.5-2	CFSB-004-SO-10-12	CFSB-005-SO-0-0.5
Sample Depth	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft
Chemical	6/17/2016	6/17/2016	6/17/2016	5/25/2016	5/25/2016	5/25/2016	5/25/2016	5/25/2016	5/25/2016	5/25/2016	5/25/2016	5/25/2016	5/25/2016	5/25/2016	5/25/2016	5/25/2016
GENERAL CHEMISTRY|ANIONS (mg/kg)																
Fluoride	109 J-	58.5	3.69	56.5 J	53.7 J	11.6 J	22.4 J	28 J	4.27 J	26.9 J	16.3 J	0.35 J	34.1 J	39 J	10.3 J	11.6 J

Footnotes:
- = Result is biased low
+ = Result is biased high
ft = feet
ft-bgs = feet below ground surface
J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
mg/kg = milligram(s) per kilogram

Appendix A-3c
Central Landfill Area Soil (0-12 ft-bgs)
Data Used in Human Health Risk Assessment
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Sample Depth Chemical	CFSB-005 460-114529-17 CFSB-005-SO-0.5-2 0.5-2 ft 5/25/2016	CFSB-005 460-114529-12 CFSB-005-SO-10-12 10-12 ft 5/25/2016	CFSB-006 460-114456-18 CFSB-006-SO-0-0.5 0-0.5 ft 5/23/2016	CFSB-006 460-114456-22 CFSB-006-SO-0.5-2 0.5-2 ft 5/23/2016	CFSB-006 460-114456-16 CFSB-006-SO-10-12 10-12 ft 5/23/2016	CFSB-007 460-114529-14 CFSB-007-SO-0-0.5 0-0.5 ft 5/25/2016	CFSB-007 460-114529-16 CFSB-007-SO-0.5-2 0.5-2 ft 5/25/2016	CFSB-007 460-114529-18 CFSB-007-SO-10-12 10-12 ft 5/25/2016	CFSB-008 460-114456-20 CFSB-008-SO-0-0.5 0-0.5 ft 5/23/2016	CFSB-008 460-114456-17 CFSB-008-SO-0.5-2 0.5-2 ft 5/23/2016	CFSB-008-DUP 460-114456-19 CFSB-DUP4-SO 0.5-2 ft 5/23/2016	CFSB-008 460-114456-21 CFSB-008-SO-10-12 10-12 ft 5/23/2016	CFSB-009 460-114456-15 CFSB-009-SO-0-0.5 0-0.5 ft 5/23/2016	CFSB-009 460-114456-13 CFSB-009-SO-0.5-2 0.5-2 ft 5/23/2016	CFSB-009 460-114456-14 CFSB-009-SO-10-12 10-12 ft 5/23/2016	CFSB-009-DUP 460-114456-24 CFSB-DUP6-SO 0-0.5 ft 5/24/2016
GENERAL CHEMISTRY|ANIONS (mg/kg)																
Fluoride	20.4 J	4.23 J	14.6 J	5.6 J+	12.5 J	11.8 J	25 J	1.52 J	30.6 J	16.2 J	45.4 J	8.58 J+	37.6 J	17.9 J	4.63 J	37.9 J+

Footnotes:
- = Result is biased low
+ = Result is biased high
ft = feet
ft-bgs = feet below ground surface
J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
mg/kg = milligram(s) per kilogram

Appendix A-3c
Central Landfill Area Soil (0-12 ft-bgs)
Data Used in Human Health Risk Assessment
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-021	CFSB-021	CFSB-021	CFSB-022	CFSB-022	CFSB-022	CFSB-029	CFSB-029	CFSB-029	CFSB-033	CFSB-033	CFSB-033	CFSB-034	CFSB-034	CFSB-034	CFSB-035
Sample Lab IDs	460-114456-12	460-114456-9	460-114456-1	460-114456-6	460-114456-7	460-114456-11	460-114456-4	460-114456-3	460-114456-8	460-114456-5	460-114456-10	460-114456-2	460-114793-52	460-114793-51	460-114793-55	460-114793-45
Sample Name	CFSB-021-SO-0-0.5	CFSB-021-SO-0.5-2	CFSB-021-SO-10-12	CFSB-022-SO-0-0.5	CFSB-022-SO-0.5-2	CFSB-022-SO-10-12	CFSB-029-SO-0-0.5	CFSB-029-SO-0.5-2	CFSB-029-SO-10-12	CFSB-033-SO-0-0.5	CFSB-033-SO-0.5-2	CFSB-033-SO-10-12	CFSB-034-SO-0-0.5	CFSB-034-SO-0.5-2	CFSB-034-SO-10-12	CFSB-035-SO-0-0.5
Sample Depth	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft
Chemical	5/23/2016	5/23/2016	5/23/2016	5/23/2016	5/23/2016	5/23/2016	5/23/2016	5/23/2016	5/23/2016	5/23/2016	5/23/2016	5/23/2016	5/31/2016	5/31/2016	5/31/2016	5/31/2016
GENERAL CHEMISTRY|ANIONS (mg/kg)																
Fluoride	89.9 J	81.1 J	16.8 J	28.9 J	24.7 J	25.9 J	62 J	21.7 J	57.1 J	95.8 J	75.3 J	12.4 J	210 J-	20.4 J	32.9 J	180 J

Footnotes:
- = Result is biased low
+ = Result is biased high
ft = feet
ft-bgs = feet below ground surface
J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
mg/kg = milligram(s) per kilogram

Appendix A-3c
Central Landfill Area Soil (0-12 ft-bgs)
Data Used in Human Health Risk Assessment
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-035	CFSB-035	CFSB-036	CFSB-036	CFSB-036	CFSB-037	CFSB-037	CFSB-037	CFMW-012A	CFMW-012A	CFMW-012A-DUP	CFMW-012A	CFMW-019A	CFMW-019A	CFMW-019A-DUP	CFMW-019A
Sample Lab IDs	460-114793-46	460-114793-57	460-114793-48	460-114793-53	460-114793-50	460-114793-49	460-114793-54	460-114793-47	460-114275-1	460-114275-3	460-114275-5	460-114275-4	460-114456-49	460-114456-50	460-114456-52	460-114456-51
Sample Name	CFSB-035-SO-0.5-2	CFSB-035-SO-10-12	CFSB-036-SO-0-0.5	CFSB-036-SO-0.5-2	CFSB-036-SO-10-12	CFSB-037-SO-0-0.5	CFSB-037-SO-0.5-2	CFSB-037-SO-10-12	CFMW-012A-SO-0-0.5	CFMW-012A-SO-0.5-2	CFMW-DUP3-SO	CFMW-012A-SO-10-12	CFMW-019a-SO-0-0.5	CFMW-019a-SO-0.5-2	CFMW-DUP5-SO	CFMW-019a-SO-10-12
Sample Depth	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	0.5-2 ft	10-12 ft
Chemical	5/31/2016	5/31/2016	5/31/2016	5/31/2016	5/31/2016	5/31/2016	5/31/2016	5/31/2016	5/20/2016	5/20/2016	5/20/2016	5/20/2016	5/25/2016	5/25/2016	5/25/2016	5/25/2016
GENERAL CHEMISTRY|ANIONS (mg/kg)																
Fluoride	116 J	35.2 J	86.8 J	104 J-	28.3 J	19.4 J	15.5 J	5.64 J	91.9 J-	59.3 J-	80.8 J-	13.7 J-	37 J-	62.2 J-	44.2 J-	1.3 J-

Footnotes:
- = Result is biased low
+ = Result is biased high
ft = feet
ft-bgs = feet below ground surface
J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
mg/kg = milligram(s) per kilogram

Appendix A-3c
Central Landfill Area Soil (0-12 ft-bgs)
Data Used in Human Health Risk Assessment
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-002	CFMW-002	CFMW-002	CFMW-008A	CFMW-008A	CFMW-008A	CFMW-008A-DUP	CFMW-010	CFMW-010	CFMW-010	CFMW-016A	CFMW-016A	CFMW-016A	CFMW-018	CFMW-018	CFMW-018
Sample Lab IDs	460-115528-7	460-115528-8	460-115528-9	460-115528-1	460-115528-3	460-115528-4	460-115528-5	460-114141-16	460-114141-17	460-114141-18	460-115886-11	460-115886-12	460-115886-13	460-114141-34	460-114141-35	460-114141-36
Sample Name	CFMW-002-SO-0-0.5	CFMW-002-SO-0.5-2	CFMW-002-SO-10-12	CFMW-008a-SO-0-0.5	CFMW-008a-SO-0.5-2	CFMW-008a-SO-10-12	CFMW-DUP14-SO	CFMW-010-SO-0-0.5	CFMW-010-SO-0.5-2.0	CFMW-010-SO-10-12	CFMW-016a-SO-0-0.5	CFMW-016a-SO-0.5-2	CFMW-016a-SO-10-12	CFMW-018-SO-0-0.5	CFMW-018-SO-0.5-2.0	CFMW-018-SO-10-12
Sample Depth	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft
Chemical	6/13/2016	6/13/2016	6/13/2016	6/13/2016	6/13/2016	6/13/2016	6/13/2016	5/18/2016	5/18/2016	5/18/2016	6/21/2016	6/21/2016	6/21/2016	5/19/2016	5/19/2016	5/19/2016
GENERAL CHEMISTRY|ANIONS (mg/kg)																
Fluoride	56.7 J-	166 J+	10.2 J-	84.9 J-	180 J+	3.98 J-	3.25 J-	114 J-	101 J-	11.6 J-	59.4 J	25.4 J	6.29 J	9.33 J-	7.71 J-	4.07 J-

Footnotes:
- = Result is biased low
+ = Result is biased high
ft = feet
ft-bgs = feet below ground surface
J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
mg/kg = milligram(s) per kilogram

Appendix A-3c
Central Landfill Area Soil (0-12 ft-bgs)
Data Used in Human Health Risk Assessment
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Sample Depth Chemical	CFMW-018-DUP 460-114141-37 CFMW-DUP2-SO 10-12 ft 5/19/2016	CFMW-022 460-114828-29 CFMW-022-SO-0- 0.5 0-0.5 ft 6/2/2016	CFMW-022 460-114828-28 CFMW-022-SO- 0.5-2 0.5-2 ft 6/2/2016	CFMW-022-DUP 460-114828-30 CFMW-DUP12-SO 0.5-2 ft 6/2/2016	CFMW-022 460-114828-27 CFMW-022-SO-10- 12 10-12 ft 6/2/2016	CFMW-029 460-114141-13 CFMW-029-SO-0- 0.5 0-0.5 ft 5/18/2016	CFMW-029 460-114141-14 CFMW-029-SO- 0.5-2.0 0.5-2 ft 5/18/2016	CFMW-029 460-114141- CFMW-029- SO-10-12 10-12 ft 5/18/2016
GENERAL CHEMISTRY|ANIONS (mg/kg)								
Fluoride	4.03 J-	17.5 J	9.45 J	10.1 J	63.3 J	105 J-	50.3 J-	9.6 J-

Footnotes:
- = Result is biased low
+ = Result is biased high
ft = feet
ft-bgs = feet below ground surface
J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
mg/kg = milligram(s) per kilogram

Appendix A-3d
Central Landfill Area (surface water)
Data Used in Human Health Risk Assessment
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSWP-010	CFSWP-010	CFSWP-010	CFSWP-011	CFSWP-011	CFSWP-011	CFSWP-012	CFSWP-012	CFSWP-012-DUP	CFSWP-012
Sample Lab IDs	460-114997-2	460-129899-2	460-135182-2	460-114997-3	460-130874-6	460-135182-3	460-114997-4	460-130874-7	460-130874-8	460-135182-4
Sample Name	CFSWP-010-SW	CFSWP-010-SW	CFSWP-010-SW	CFSWP-011-SW	CFSWP-011-SW	CFSWP-011-SW	CFSWP-012-SW	CFSWP-012-SW	CFSWP-DUP5-SW	CFSWP-012-SW
Chemical	6/7/2016	3/15/2017	6/12/2017	6/7/2016	4/3/2017	6/12/2017	6/7/2016	4/3/2017	4/3/2017	6/12/2017
GENERAL CHEMISTRY|ANIONS (µg/L)										
Fluoride	39.4 J	2600	181	38.7 J	103	131	39.5 J	101	89.6	131

Footnotes:
J = The analyte was positively identified; the associated numerical value
µg/L = microgram(s) per liter

Appendix A-3e
Central Landfill Area (sediment)
Data Used in Human Health Risk Assessment
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSDP-010	CFSDP-011	CFSDP-012	CFSDP-012-DUP
Sample Lab IDs	200-35201-5, 460-119741-2	200-35201-6, 460-119741-3	200-35201-7, 460-119741-4	460-119741-6
Sample Name	CFSDP-010-SO	CFSDP-011-SO	CFSDP-012-SO	CFSDP-DUP1-SO
Sample Depth	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft
Chemical	9/6/2016	9/6/2016	9/6/2016	9/6/2016
GENERAL CHEMISTRY|ANIONS (mg/kg)				
Fluoride	4.27	1.62	1.3	1.57

Footnotes:
ft = feet
mg/kg = milligram(s) per kilogram

Appendix A-4a
Industrial Landfill Area Soil (0-0.5 ft-bgs)
Data Used in Human Health Risk Assessment
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-003A
Sample Lab IDs	460-114793-37
Sample Name	CFMW-003a-SO-0-0.5
Sample Depth	0-0.5 ft
Chemical	5/31/2016
GENERAL CHEMISTRY|ANIONS (mg/kg)	
Fluoride	4.17 J

Footnotes:
ft = feet
ft-bgs = feet below ground surface
J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
mg/kg = milligram(s) per kilogram

Appendix A-4b
Industrial Landfill Area Soil (0-2 ft-bgs)
Data Used in Human Health Risk Assessment
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-003A	CFMW-003A
Sample Lab IDs	460-114793-37	460-114793-39
Sample Name	CFMW-003a-SO-0-0.5	CFMW-003a-SO-0.5-2
Sample Depth	0-0.5 ft	0.5-2 ft
Chemical	5/31/2016	5/31/2016
GENERAL CHEMISTRY|ANIONS (mg/kg)		
Fluoride	4.17 J	37.8 J-

Footnotes:
- = Result is biased low
ft = feet
ft-bgs = feet below ground surface
J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
mg/kg = milligram(s) per kilogram

Appendix A-4c
Industrial Landfill Area Soil (0-12 ft-bgs)
Data Used in Human Health Risk Assessment
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Sample Depth Chemical	CFMW-003A 460-114793-37 CFMW-003a-SO-0-0.5 0-0.5 ft 5/31/2016	CFMW-003A 460-114793-39 CFMW-003a-SO-0.5-2 0.5-2 ft 5/31/2016	CFMW-003A 460-114793-40 CFMW-003a-SO-10-12 10-12 ft 5/31/2016	CFMW-003A-DUP 460-114793-38 CFMW-DUP9-SO 10-12 ft 5/31/2016
GENERAL CHEMISTRY|ANIONS mg/kg)				
Fluoride	4.17 J	37.8 J-	2.76 J	3.31 J-

Footnotes:
- = Result is biased low
ft = feet
ft-bgs = feet below ground surface
J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
mg/kg = milligram(s) per kilogram

Appendix A-5a
Eastern Undeveloped Area (surface water)
Data Used in Human Health Risk Assessment
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Chemical	CFSWP-009 460-114997-1 CFSWP-009-SW 6/7/2016	CFSWP-009 460-130874-5 CFSWP-009-SW 4/3/2017	CFSWP-009 460-135182-1 CFSWP-009-SW 6/12/2017
GENERAL CHEMISTRY|ANIONS (µg/L)			
Fluoride	80.3	105	188

Footnotes:
µg/L = microgram(s) per liter

Appendix A-5b
Eastern Undeveloped Area (sediment)
Data Used in Human Health Risk Assessment
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSDP-009
Sample Lab IDs	200-35201-4, 460-119741-1
Sample Name	CFSDP-009-SO
Sample Depth	0-0.5 ft
Chemical	9/6/2016
GENERAL CHEMISTRY|ANIONS	
Fluoride	1.62

Footnotes:
ft = feet
mg/kg = milligram(s) per kilogram

Appendix A-6a
North Central Undeveloped Area Soil (0-0.5 ft-bgs)
Data Used in Human Health Risk Assessment
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-011	CFMW-011A	CFSB-013	CFSB-122
Sample Lab IDs	460-114141-41	460-116119-10	460-114141-	460-114141-28
Sample Name	CFSB-011-SO-0-0.5	CFMW-011a-SO-0-0.5	CFSB-013-SO-0-0.5	CFSB-122-SO-0-0.5
Sample Depth	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft
Chemical	5/19/2016	6/25/2016	5/19/2016	5/19/2016
GENERAL CHEMISTRY|ANIONS (mg/kg)				
Fluoride	8.33 J-	27.6 J+	15.8 J-	12.2 J-

Footnotes:
- = Result is biased low
+ = Result is biased high
ft = feet
ft-bgs = feet below ground surface
J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
mg/kg = milligram(s) per kilogram

Appendix A-6b
North Central Undeveloped Area Soil (0-12 ft-bgs)
Data Used in Human Health Risk Assessment
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Sample Depth Chemical	CFSB-011 460-114141-41 CFSB-011-SO-0-0.5 0-0.5 ft 5/19/2016	CFSB-011 460-114141-42 CFSB-011-SO-0.5-2.0 0.5-2 ft 5/19/2016	CFSB-011 460-114141-43 CFSB-011-SO-10-12 10-12 ft 5/19/2016	CFMW-011A 460-116119-10 CFMW-011a-SO-0-0.5 0-0.5 ft 6/25/2016	CFMW-011A 460-116119-11 CFMW-011a-SO-0.5-2 0.5-2 ft 6/25/2016	CFMW-011A-DUP 460-116119-13 CFMW-Dup18-SO 0.5-2 ft 6/25/2016	CFMW-011A 460-116119-12 CFMW-011a-SO-10-12 10-12 ft 6/25/2016	CFSB-013 460-114141- CFSB-013-SO-0-0.5 0-0.5 ft 5/19/2016	CFSB-013 460-114141- CFSB-013-SO-0.5-2.0 0.5-2 ft 5/19/2016	CFSB-013 460-114141- CFSB-013-SO-10-12 10-12 ft 5/19/2016	CFSB-122 460-114141-28 CFSB-122-SO-0-0.5 0-0.5 ft 5/19/2016	CFSB-122 460-114141-29 CFSB-122-SO-0.5-2.0 0.5-2 ft 5/19/2016	CFSB-122 460-114141-30 CFSB-122-SO-10-12 10-12 ft 5/19/2016
GENERAL CHEMISTRY|ANIONS (mg/kg)													
Fluoride	8.33 J-	11.2 J-	7.87 J-	27.6 J+	12 J+	10.1 J+	5.08 J+	15.8 J-	8 J-	1.57 J-	12.2 J-	5.57 J-	0.57 J-

Footnotes:
- = Result is biased low
+ = Result is biased high
ft = feet
ft-bgs = feet below ground surface
J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
mg/kg = milligram(s) per kilogram

Appendix A-6c
North Central Undeveloped Area (surface water)
Data Used in Human Health Risk Assessment
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSWP-013	CFSWP-013-DUP	CFSWP-013	CFSWP-013	CFSWP-013	CFSWP-021	CFSWP-021	CFSWP-021	CFSWP-021	CFSWP-022	CFSWP-022
Sample Lab IDs	460-114997-5	460-114997-6	460-124553-1	460-129899-3	460-135182-5	460-114944-4	460-124553-7	460-129899-1	460-135444-4	460-114944-5	460-130874-2
Sample Name	CFSWP-013-SW	CFSWP-DUP1-SW	CFSWP-013-SW	CFSWP-013-SW	CFSWP-013-SW	CFSWP-021-SW	CFSWP-021-SW	CFSWP-021-SW	CFSWP-021-SW	CFSWP-022-SW	CFSWP-022-SW
Chemical	6/7/2016	6/7/2016	11/30/2016	3/15/2017	6/12/2017	6/6/2016	11/30/2016	3/15/2017	6/15/2017	6/6/2016	4/3/2017
GENERAL CHEMISTRY|ANIONS (µg/L)											
Fluoride	39.2 J	38.3 J	473 J-	308	131	166	189 J-	231	243	177	223

Footnotes:

- = Result is biased low

J = The analyte was positively identified; the associated numerical value

µg/L = microgram(s) per liter

Appendix A-6d
North Central Undeveloped Area (sediment)
Data Used in Human Health Risk Assessment
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSDP-013	CFSDP-021	CFSDP-022
Sample Lab IDs	200-35201-8, 460-119741-5	200-35201-9, 460-119741-7	200-35201-10, 460-119741-8
Sample Name	CFSDP-013-SO	CFSDP-021-SO	CFSDP-022-SO
Sample Depth	0-0.5 ft	0-0.5 ft	0-0.5 ft
Chemical	9/6/2016	9/6/2016	9/6/2016
GENERAL CHEMISTRY|ANIONS (mg/kg)			
Fluoride	1.81	2.6	3.79

Footnotes:
J = The analyte was positively identified; the associated numerical value is the approximate
mg/kg = milligram(s) per kilogram

Appendix A-7a
Western Undeveloped Area Soil (0-0.5 ft-bgs)
Data Used in Human Health Risk Assessment
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Sample Depth Chemical	CFMW-056A 460-117203-2 CFMW-056a-SO-0- 0.5 0-0.5 ft 7/15/2016	CFMW-056A-DUP 460-117203-7 CFMW-DUP20-SO 0-0.5 ft 7/15/2016	CFMW-057A 460-117886-1 CFMW-057a-SO-0- 0.5 0-0.5 ft 7/27/2016	CFMW-059A 460-117573-6 CFMW-059a-SO-0- 0.5 0-0.5 ft 7/22/2016	CFSB-120 460-114141-10 CFSB-120-SO-0- 0.5 0-0.5 ft 5/18/2016	CFSB-123 460-114141-31 CFSB-123-SO-0- 0.5 0-0.5 ft 5/19/2016	CFSB-124 460-114141-25 CFSB-124-SO-0- 0.5 0-0.5 ft 5/19/2016	CFSB-125 460-114141-4 CFSB-125-SO-0- 0.5 0-0.5 ft 5/18/2016	CFSB-126 460-114141-7 CFSB-126-SO-0- 0.5 0-0.5 ft 5/18/2016	CFSB-127 460-114141-1 CFSB-127-SO-0- 0.5 0-0.5 ft 5/18/2016	CFSB-132 460-115008-1 CFSB-132-SO-0- 0.5 0-0.5 ft 6/3/2016	CFSB-133 460-115008-4 CFSB-133-SO-0- 0.5 0-0.5 ft 6/3/2016
GENERAL CHEMISTRY|ANIONS (mg/kg)												
Fluoride	3.15 J	10.7 J	15.4	14.2	5.63 J	10.5 J-	10.8 J-	8.31 J-	6.31 J-	3.93 J-	1.78 J	2.4 J

Footnotes:
- = Result is biased low
ft = feet
ft-bgs = feet below ground surface
J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
mg/kg = milligram(s) per kilogram

Appendix A-7b
Western Undeveloped Area Soil (0-12 ft-bgs)
Data Used in Human Health Risk Assessment
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFMW-056A	CFMW-056A-DUP	CFMW-056A	CFMW-056A	CFMW-057A	CFMW-057A	CFMW-057A	CFMW-059A	CFMW-059A	CFMW-059A	CFSB-120	CFSB-120	CFSB-120	CFSB-123	CFSB-123	CFSB-123
Sample Lab IDs	460-117203-2	460-117203-7	460-117203-4	460-117203-5	460-117886-1	460-117886-2	460-117886-3	460-117573-6	460-117573-7	460-117573-8	460-114141-10	460-114141-11	460-114141-12	460-114141-31	460-114141-32	460-114141-33
Sample Name	CFMW-056a-SO-0.5	CFMW-DUP20-SO	CFMW-056a-SO-0.5-2	CFMW-056a-SO-10-12	CFMW-057a-SO-0-0.5	CFMW-057a-SO-0.5-2	CFMW-057a-SO-10-12	CFMW-059a-SO-0-0.5	CFMW-059a-SO-0.5-2	CFMW-059a-SO-10-12	CFSB-120-SO-0-0.5	CFSB-120-SO-0.5-2.0	CFSB-120-SO-10-12	CFSB-123-SO-0-0.5	CFSB-123-SO-0.5-2.0	CFSB-123-SO-10-12
Sample Depth	0-0.5 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft
Chemical	7/15/2016	7/15/2016	7/15/2016	7/15/2016	7/27/2016	7/27/2016	7/27/2016	7/22/2016	7/22/2016	7/22/2016	5/18/2016	5/18/2016	5/18/2016	5/19/2016	5/19/2016	5/19/2016
GENERAL CHEMISTRY|ANIONS (mg/kg)																
Fluoride	3.15 J	10.7 J	3.64 J+	2.27 J+	15.4	1.41	1.34	14.2	2.87	3.17	5.63 J	2.43 J-	0.43 J-	10.5 J-	9.29 J-	0.58 J-

Footnotes:
-- = not applicable
- = Result is biased low
+ = Result is biased high
ft = feet
ft-bgs = feet below ground surface
J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
mg/kg = milligram(s) per kilogram
UJ = The analyte was not deemed above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.

Appendix A-7b
Western Undeveloped Area Soil (0-12 ft-bgs)
Data Used in Human Health Risk Assessment
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-124	CFSB-124	CFSB-124	CFSB-125	CFSB-125	CFSB-125	CFSB-126	CFSB-126	CFSB-126	CFSB-127	CFSB-127	CFSB-127	CFSB-132	CFSB-132	CFSB-132	CFSB-133	CFSB-133	CFSB-133
Sample Lab IDs	460-114141-25	460-114141-26	460-114141-27	460-114141-4	460-114141-5	460-114141-6	460-114141-7	460-114141-8	460-114141-9	460-114141-1	460-114141-2	460-114141-3	460-115008-1	460-115008-2	460-115008-3	460-115008-4	460-115008-5	460-115008-6
Sample Name	CFSB-124-SO-0-0.5	CFSB-124-SO-0.5-2.0	CFSB-124-SO-10-12	CFSB-125-SO-0-0.5	CFSB-125-SO-0.5-2.0	CFSB-125-SO-10-12	CFSB-126-SO-0-0.5	CFSB-126-SO-0.5-2.0	CFSB-126-SO-10-12	CFSB-127-SO-0-0.5	CFSB-127-SO-0.5-2.0	CFSB-127-SO-10-12	CFSB-132-SO-0-0.5	CFSB-132-SO-0.5-2	CFSB-132-SO-10-12	CFSB-133-SO-0-0.5	CFSB-133-SO-0.5-2	CFSB-133-SO-10-12
Sample Depth	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft	0-0.5 ft	0.5-2 ft	10-12 ft
Chemical	5/19/2016	5/19/2016	5/19/2016	5/18/2016	5/18/2016	5/18/2016	5/18/2016	5/18/2016	5/18/2016	5/18/2016	5/18/2016	5/18/2016	6/3/2016	6/3/2016	6/3/2016	6/3/2016	6/3/2016	6/3/2016
GENERAL CHEMISTRY|ANIONS (mg/kg)																		
Fluoride	10.8 J-	6.61 J-	0.92 J-	8.31 J-	8.91 J-	0.97 J-	6.31 J-	5.3 J-	0.75 J-	3.93 J-	1.54 J-	2.61 J-	1.78 J	0.31 J	0.24 UJ	2.4 J	0.92 J	0.21 UJ

Footnotes:
-- = not applicable
- = Result is biased low
+ = Result is biased high
ft = feet
ft-bgs = feet below ground surface
J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
mg/kg = milligram(s) per kilogram
UJ = The analyte was not deemed above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.

Appendix A-7c
Western Undeveloped Area (surface water)
Data Used in Human Health Risk Assessment
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Chemical	CFSWP-014 460-119361-1 CFSWP-014-SW 8/29/2016	CFSWP-014 460-124553-2 CFSWP-014-SW 11/30/2016	CFSWP-014-DUP 460-124553-5 CFSWP-DUP3-SW 11/30/2016	CFSWP-014 460-129850-1 CFSWP-014-SW 3/13/2017	CFSWP-014-DUP 460-129850-5 CFSWP-Dup4-SW 3/13/2017	CFSWP-014 460-135255-1 CFSWP-014-SW 6/13/2017	CFSWP-015 460-119361-2 CFSWP-015-SW 8/29/2016	CFSWP-015-DUP 460-119361-4 CFSWP-DUP2-SW 8/29/2016	CFSWP-015 460-124553-3 CFSWP-015-SW 11/30/2016	CFSWP-015 460-125810-1 CFSWP-015-SW 12/20/2016	CFSWP-015 460-129850-2 CFSWP-015-SW 3/13/2017	CFSWP-015 460-135255-2 CFSWP-015-SW 6/13/2017
GENERAL CHEMISTRY|ANIONS (µg/L)												
Fluoride	55.8 J	117 J-	123 J-	126	134	137	62.4 J	62.3 J	119 J-	112 J-	129	135

Footnotes:
-- = not applicable
- = Result is biased low
+ = Result is biased high
J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
µg/L = microgram(s) per liter

Appendix A-7c
Western Undeveloped Area (surface water)
Data Used in Human Health Risk Assessment
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Chemical	CFSWP-015-DUP 460-135255-4 CFSWP-DUP7-SW 6/13/2017	CFSWP-016 460-119361-3 CFSWP-016-SW 8/29/2016	CFSWP-016 460-124553-4 CFSWP-016-SW 11/30/2016	CFSWP-016 460-129850-4 CFSWP-016-SW 3/13/2017	CFSWP-016 460-135182-6 CFSWP-016-SW 6/12/2017	CFSWP-016-DUP 460-135182-7 CFSWP-DUP6-SW 6/12/2017	CFSWP-025 460-125810-2 CFSWP-025-SW 12/20/2016	CFSWP-025 460-129850-3 CFSWP-025-SW 3/13/2017	CFSWP-025 460-135255-3 CFSWP-025-SW 6/13/2017
GENERAL CHEMISTRY|ANIONS (µg/L)									
Fluoride	136	58.8 J	123 J-	132	135	137	115 J-	128	134

Footnotes:
-- = not applicable
- = Result is biased low
+ = Result is biased high
J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
µg/L = microgram(s) per liter

Appendix A-7d
Western Undeveloped Area (sediment)
Data Used in Human Health Risk Assessment
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSDP-014	CFSDP-015	CFSDP-016
Sample Lab IDs	200-35201-1, 460-119363-1	200-35201-2, 460-119363-2	200-35201-3, 460-119363-3
Sample Name	CFSDP-014-SD	CFSDP-015-SD	CFSDP-016-SD
Chemical	8/29/2016	8/29/2016	8/29/2016
GENERAL CHEMISTRY|ANIONS (mg/kg)			
Fluoride	1.63 J+	1.41 J+	1.71 J+

Footnotes:
+ = Result is biased high
J = The analyte was positively identified; the associated numerical value is the approximate
mg/kg = milligram(s) per kilogram

Appendix A-8a
South Percolation Pond Area Soil (0-0.5 ft-bgs)
Data Used in Human Health Risk Assessment
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-101	CFSB-102	CFSB-104	CFSB-109	CFSB-110	CFSB-113	CFSB-113	CFSB-115	CFSB-116	CFSB-118	CFSB-151	CFSB-152	CFSB-153	CFSB-114	CFSB-119	CFSB-142	CFSB-143	CFSB-144
Sample Lab IDs	460-117506-1	460-117124-10	460-117124-7	460-117124-14	460-117124-17	460-119512-1	460-119512-9	460-119512-4	460-117573-1	460-117506-4	200-40872-1, 460-144726-8	200-40872-4, 460-144726-6	200-40872-7, 460-144478-14	460-116987-10	460-116987-7	460-144400-5	460-144400-8	460-144400-17
Sample Name	CFSB-101-SO-0-0.5	CFSB-102-SO-0-0.5	CFSB-104-SO-0-0.5	CFSB-109-SO-0-0.5	CFSB-110-SO-0-0.5	CFSB-113-SO-0-0.5	CFSB-113-SO-0-0.5Pb	CFSB-115-SO-0-0.5	CFSB-116-SO-0-0.5	CFSB-118-SO-0-0.5	CFSB-151-SO-0-0.5	CFSB-152-SO-0-0.5	CFSB-153-SO-0-0.5	CFSB-114-SO-0-0.5	CFSB-119-SO-0-0.5	CFSB-142-SO-0-0.5	CFSB-143-SO-0-0.5	CFSB-144-SO-0-0.5
Sample Depth	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft
Chemical	7/21/2016	7/13/2016	7/13/2016	7/13/2016	7/14/2016	8/31/2016	8/31/2016	8/31/2016	7/22/2016	7/21/2016	11/7/2017	11/7/2017	11/6/2017	7/12/2016	7/12/2016	11/2/2017	11/2/2017	11/3/2017
GENERAL CHEMISTRY (mg/kg)																		
Fluoride	18.5 J+	7.21 J	12.6 J	17.4 J	28.4 J	2.97 J+	--	2.4 J+	3.81	1.8 J+	18.3 J+	44.1 J+	30.4 J+	3.18 J	4.81 J	22.1 J+	17.1 J+	19.5 J+

Footnotes:
-- = not applicable
- = Result is biased low
+ = Result is biased high
ft = feet
ft-bgs = feet below ground surface
J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
mg/kg = milligram(s) per kilogram

Appendix A-8a
South Percolation Pond Area Soil (0-0.5 ft-bgs)
Data Used in Human Health Risk Assessment
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-145	CFSB-146	CFSB-147	CFSB-147-DUP	CFSB-148	CFMW-061	CFMW-061	CFMW-064	CFMW-064
Sample Lab IDs	460-144478-1	460-144478-4	460-144478-8	460-144478-7	460-144478-11	460-116987-13	460-116987-17	460-116987-2	460-116987-6
Sample Name	CFSB-145-SO-0-0.5	CFSB-146-SO-0-0.5	CFSB-147-SO-0-0.5	CFSB-DUP16-SO	CFSB-148-SO-0-0.5	CFMW-061-SO-0-0.5	CFMW-061-SO-0-0.5Pb	CFMW-064-SO-0-0.5	CFMW-064-SO-0-0.5Pb
Sample Depth	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft
Chemical	11/6/2017	11/6/2017	11/6/2017	11/6/2017	11/6/2017	7/12/2016	7/12/2016	7/11/2016	7/11/2016
GENERAL CHEMISTRY (mg/kg)									
Fluoride	14.4 J+	14.7 J+	12.4 J+	10.6 J+	12.3 J+	3.06 J	--	15 J	--

Footnotes:
-- = not applicable
- = Result is biased low
+ = Result is biased high
ft = feet
ft-bgs = feet below ground surface
J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
mg/kg = milligram(s) per kilogram

Attachment A-8b
South Percolation Pond Area Soil (0-2 ft-bgs)
Data Used in Human Health Risk Assessment
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-101	CFSB-101	CFSB-102	CFSB-102	CFSB-104	CFSB-104	CFSB-109	CFSB-109	CFSB-110	CFSB-110	CFSB-113	CFSB-113	CFSB-113	CFSB-115	CFSB-115	CFSB-116	CFSB-116
Sample Lab IDs	460-117506-1	460-117506-2	460-117124-10	460-117124-11	460-117124-7	460-117124-8	460-117124-14	460-117124-15	460-117124-17	460-117124-18	460-119512-1	460-119512-9	460-119512-2	460-119512-4	460-119512-5	460-117573-1	460-117573-2
Sample Name	CFSB-101-SO-0-0.5	CFSB-101-SO-0.5-2	CFSB-102-SO-0-0.5	CFSB-102-SO-0.5-2	CFSB-104-SO-0-0.5	CFSB-104-SO-0.5-2	CFSB-109-SO-0-0.5	CFSB-109-SO-0.5-2	CFSB-110-SO-0-0.5	CFSB-110-SO-0.5-2	CFSB-113-SO-0-0.5	CFSB-113-SO-0-0.5Pb	CFSB-113-SO-0.5-2	CFSB-115-SO-0-0.5	CFSB-115-SO-0.5-2	CFSB-116-SO-0-0.5	CFSB-116-SO-0.5-2
Sample Depth	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft
Chemical	7/21/2016	7/21/2016	7/13/2016	7/13/2016	7/13/2016	7/13/2016	7/13/2016	7/13/2016	7/14/2016	7/14/2016	8/31/2016	8/31/2016	8/31/2016	8/31/2016	8/31/2016	7/22/2016	7/22/2016
GENERAL CHEMISTRY (mg/kg)																	
Fluoride	18.5 J+	10.2 J+	7.21 J	8.74 J	12.6 J	11.4 J	17.4 J	17.7 J	28.4 J	11.2 J	2.97 J+	--	1.26 J+	2.4 J+	1.58 J+	3.81	1.96 J

Footnotes:
-- = not applicable
- = Result is biased low
+ = Result is biased high
ft = feet
ft-bgs = feet below ground surface
J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
mg/kg = milligram(s) per kilogram

Attachment A-8b
South Percolation Pond Area Soil (0-2 ft-bgs)
Data Used in Human Health Risk Assessment
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-118	CFSB-118	CFSB-151	CFSB-151	CFSB-152	CFSB-152	CFSB-153	CFSB-153	CFSB-114	CFSB-114	CFSB-119	CFSB-119	CFSB-142	CFSB-142	CFSB-143	CFSB-143	CFSB-143-DUP
Sample Lab IDs	460-117506-4	460-117506-5	200-40872-1, 460-144726-8	200-40872-2, 460-144726-9	200-40872-4, 460-144726-6	200-40872-5, 460-144726-7	200-40872-7, 460-144478-14	200-40872-8, 460-144478-15	460-116987-10	460-116987-11	460-116987-7	460-116987-8	460-144400-5	460-144400-6	460-144400-8	460-144400-9	460-144400-11
Sample Name	CFSB-118-SO-0.5	CFSB-118-SO-0.5-2	CFSB-151-SO-0-0.5	CFSB-151-SO-0.5-2	CFSB-152-SO-0-0.5	CFSB-152-SO-0.5-2	CFSB-153-SO-0-0.5	CFSB-153-SO-0.5-2	CFSB-114-SO-0-0.5	CFSB-114-SO-0.5-2	CFSB-119-SO-0-0.5	CFSB-119-SO-0.5-2	CFSB-142-SO-0-0.5	CFSB-142-SO-0.5-2	CFSB-143-SO-0-0.5	CFSB-143-SO-0.5-2	CFSB-DUP15-SO
Sample Depth	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0.5-2 ft
Chemical	7/21/2016	7/21/2016	11/7/2017	11/7/2017	11/7/2017	11/7/2017	11/6/2017	11/6/2017	7/12/2016	7/12/2016	7/12/2016	7/12/2016	11/2/2017	11/2/2017	11/2/2017	11/2/2017	11/2/2017
GENERAL CHEMISTRY (mg/kg)																	
Fluoride	1.8 J+	1.85 J+	18.3 J+	12.4 J+	44.1 J+	24.7 J+	30.4 J+	31.4 J+	3.18 J	10.1 J	4.81 J	14.6 J	22.1 J+	17.8 J+	17.1 J+	15.5 J+	14.3 J+

Footnotes:
-- = not applicable
- = Result is biased low
+ = Result is biased high
ft = feet
ft-bgs = feet below ground surface
J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
mg/kg = milligram(s) per kilogram

Attachment A-8b
South Percolation Pond Area Soil (0-2 ft-bgs)
Data Used in Human Health Risk Assessment
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-144	CFSB-144	CFSB-145	CFSB-145	CFSB-146	CFSB-146	CFSB-147	CFSB-147-DUP	CFSB-147	CFSB-148	CFSB-148	CFMW-061	CFMW-061	CFMW-061	CFMW-064	CFMW-064	CFMW-064
Sample Lab IDs	460-144400-17	460-144400-18	460-144478-1	460-144478-2	460-144478-4	460-144478-5	460-144478-8	460-144478-7	460-144478-9	460-144478-11	460-144478-12	460-116987-13	460-116987-17	460-116987-14	460-116987-2	460-116987-6	460-116987-3
Sample Name	CFSB-144-SO-0-0.5	CFSB-144-SO-0.5-2	CFSB-145-SO-0-0.5	CFSB-145-SO-0.5-2	CFSB-146-SO-0-0.5	CFSB-146-SO-0.5-2	CFSB-147-SO-0-0.5	CFSB-DUP16-SO	CFSB-147-SO-0.5-2	CFSB-148-SO-0-0.5	CFSB-148-SO-0.5-2	CFMW-061-SO-0-0.5	CFMW-061-SO-0-0.5Pb	CFMW-061-SO-0.5-2	CFMW-064-SO-0.5	CFMW-064-SO-0.5Pb	CFMW-064-SO-0.5-2
Sample Depth	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0-0.5 ft	0.5-2 ft
Chemical	11/3/2017	11/3/2017	11/6/2017	11/6/2017	11/6/2017	11/6/2017	11/6/2017	11/6/2017	11/6/2017	11/6/2017	11/6/2017	7/12/2016	7/12/2016	7/12/2016	7/11/2016	7/11/2016	7/11/2016
GENERAL CHEMISTRY (mg/kg)																	
Fluoride	19.5 J+	18.6 J+	14.4 J+	16.9 J+	14.7 J+	18.9 J+	12.4 J+	10.6 J+	12.4 J+	12.3 J+	18.6 J+	3.06 J	--	4.88 J	15 J	--	15.2 J

Footnotes:
-- = not applicable
- = Result is biased low
+ = Result is biased high
ft = feet
ft-bgs = feet below ground surface
J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
mg/kg = milligram(s) per kilogram

Appendix A-8c
South Percolation Pond Area (surface water)
Data Used in Human Health Risk Assessment
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSWP-018	CFSWP-018	CFSWP-018	CFSWP-018	CFSWP-019	CFSWP-019	CFSWP-019	CFSWP-019	CFSWP-019	CFSWP-020	CFSWP-020	CFSWP-020	CFSWP-020	CFSWP-020	CFSWP-030	CFSWP-031	CFSWP-032
Sample Lab IDs	460-114944-1	460-124639-5	460-130874-3	460-135444-1	460-114944-2	460-124639-6	460-130874-4	460-135444-2	460-144576-1	460-114944-3	460-124639-7	460-129875-6	460-135444-3	460-144576-2	460-144395-1	460-144395-2	460-144395-4
Sample Name	CFSWP-018-6/6/2016	CFSWP-018-12/1/2016	CFSWP-018-4/3/2017	CFSWP-018-6/15/2017	CFSWP-019-6/6/2016	CFSWP-019-12/1/2016	CFSWP-019-4/3/2017	CFSWP-019-6/15/2017	CFSWP-019-11/7/2017	CFSWP-020-6/6/2016	CFSWP-020-12/1/2016	CFSWP-020-3/16/2017	CFSWP-020-6/15/2017	CFSWP-020-11/7/2017	CFSWP-030-11/3/2017	CFSWP-031-11/3/2017	CFSWP-032-11/3/2017
Chemical																	
GENERAL CHEMISTRY (µg/l)																	
Fluoride	353	828 J-	365	1700	379	785 J-	350	305	9240 J-	250	265 J-	330 J	308	418 J-	2580	3420	2720

Footnotes:
- = Result is biased low
J = The analyte was positively identified; the associated numerical value is the
µg/L = microgram(s) per liter

Appendix A-8d
South Percolation Pond Area (sediment)
Data Used in Human Health Risk Assessment
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-149	CFSB-150	CFSDP-018	CFSDP-018	CFSDP-019	CFSDP-019	CFSDP-020	CFSDP-020	CFSDP-030	CFSDP-031	CFSDP-032
Sample Lab IDs	460-144726-2	460-144726-1	200-35201-13, 460-119830-3	460-144726-3	200-35201-14, 460-119830-4	460-144726-4	200-35201-15, 460-119830-5	460-144726-5	460-144400-13	460-144400-14	460-144400-15
Sample Name	CFSB-149-SD-0-0.5	CFSB-150-SD-0-0.5	CFSDP-018-SD	CFSDP-018-SD	CFSDP-019-SD	CFSDP-019-SD	CFSDP-020-SD	CFSDP-020-SD	CFSDP-030-SD	CFSDP-031-SD	CFSDP-032-SD
Chemical	11/7/2017	11/7/2017	9/7/2016	11/7/2017	9/7/2016	11/7/2017	9/7/2016	11/7/2017	11/3/2017	11/3/2017	11/3/2017
GENERAL CHEMISTRY (mg/kg)											
Fluoride	19.5 J+	22.6 J+	19.1	74 J+	29.4	93.7 J+	5.3	34.9 J+	20.8 J+	22.2 J+	17.2 J+

Footnotes:
+ = Result is biased high
J = The analyte was positively identified; the associated numerical value is the approximate concentration
mg/kg = milligram(s) per kilogram

Appendix A-9a
Flathead River Area (surface water)
Data Used in Human Health Risk Assessment
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Chemical	CFSWP-001 460-120379-1 CFSWP-001-SW 9/16/2016	CFSWP-001 460-124726-1 CFSWP-001-SW 12/2/2016	CFSWP-001 460-130969-1 CFSWP-001-SW 4/4/2017	CFSWP-001 460-135338-1 CFSWP-001-SW 6/14/2017	CFSWP-002 460-120379-2 CFSWP-002-SW 9/16/2016	CFSWP-002 460-124726-2 CFSWP-002-SW 12/2/2016	CFSWP-002 460-130969-2 CFSWP-002-SW 4/4/2017	CFSWP-002 460-135338-2 CFSWP-002-SW 6/14/2017	CFSWP-006 460-119967-4 CFSWP-006-SW 9/9/2016	CFSWP-006 460-124639-4 CFSWP-006-SW 12/1/2016	CFSWP-006 460-129875-4 CFSWP-006-SW 3/16/2017	CFSWP-006 460-135338-6 CFSWP-006-SW 6/14/2017	CFSWP-007 460-120379-3 CFSWP-007-SW 9/16/2016	CFSWP-007 460-124726-3 CFSWP-007-SW 12/2/2016	CFSWP-007 460-129875-5 CFSWP-007-SW 3/16/2017	CFSWP-007 460-135338-7 CFSWP-007-SW 6/14/2017
GENERAL CHEMISTRY|ANIONS (µg/L)																
Fluoride	35.8 J-	211 J-	84.2	118	35.9 J-	547 J-	95	119	37.3 J	106 J-	122 J	122	33.8 J-	110 J-	114 J	123

Footnotes:
-- = not applicable
- = Result is biased low
J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
µg/L = microgram(s) per liter

Appendix A-9a
Flathead River Area (surface water)
Data Used in Human Health Risk Assessment
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID Sample Lab IDs Sample Name Chemical	CFSWP-008 460-120379-4 CFSWP-008-SW 9/16/2016	CFSWP-008 460-124726-4 CFSWP-008-SW 12/2/2016	CFSWP-008 460-130969-3 CFSWP-008-SW 4/4/2017	CFSWP-008 460-135338-8 CFSWP-008-SW 6/14/2017	CFSWP-026 460-144086-4 CFSWP-026-SW 10/31/2017	CFSWP-033 460-144395-3 CFSWP-033-SW 11/3/2017
GENERAL CHEMISTRY|ANIONS (µg/L)						
Fluoride	33.5 J-	107 J-	96.8	124	308	2160

Footnotes:
-- = not applicable
- = Result is biased low
J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
µg/L = microgram(s) per liter

Appendix A-9b
Flathead River Area (sediment)
Data Used in Human Health Risk Assessment
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSDP-001	CFSDP-002	CFSDP-006	CFSDP-007	CFSDP-008	CFSDP-026	CFSDP-033
Sample Lab IDs	200-35201-16, 460-119897-1	460-119897-2	460-119996-4	200-35201-17, 460-119897-3	200-35201-18, 460-119897-4	460-144087-8	460-144400-16
Sample Name	CFSDP-001-SO	CFSDP-002-SO	CFSDP-006-SD	CFSDP-007-SO	CFSDP-008-SO	CFSDP-026-SD	CFSDP-033-SD
Sample Depth	0-0.5 ft	0-0.5 ft	?-? ?	0-0.5 ft	0-0.5 ft	?-? ?	?-? ?
Chemical	9/8/2016	9/8/2016	9/9/2016	9/8/2016	9/8/2016	10/31/2017	11/3/2017
GENERAL CHEMISTRY|ANIONS (mg/kg)							
Fluoride	0.78 J	0.36 J	1.23 J+	1.69	0.65 J	69.2 J+	19.2 J+

Footnotes:
+ = Result is biased high
J = The analyte was positively identified; the associated numerical value is the approximate
mg/kg = milligram(s) per kilogram

Attachment A-10a
Backwater Seep Sampling Area Soil (0-0.5 ft-bgs)
Data Used in Human Health Risk Assessment
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-137	CFSB-138	CFSB-140	CFSB-141	CFSB-134	CFSB-135	CFSB-136
Sample Lab IDs	460-144170-9	460-144170-4	460-144087-3	460-144170-7	460-144087-11	460-144087-13	460-144087-15
Sample Name	CFSB-137-SO-0-0.5	CFSB-138-SO-0-0.5	CFSB-140-SO-0-0.5	CFSB-141-SO-0-0.5	CFSB-134-SO-0-0.5	CFSB-135-SO-0-0.5	CFSB-136-SO-0-0.5
Sample Depth	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 2
Chemical	11/1/2017	11/1/2017	10/31/2017	11/1/2017	10/31/2017	10/31/2017	10/31/2017
GENERAL CHEMISTRY (mg/kg)							
Fluoride	17 J+	32.7 J+	12.8 J+	16.4 J+	25.7 J+	22.2 J+	14.5 J+

Footnotes:
+ = Result is biased high
ft = feet
ft-bgs = feet below ground surface
J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
mg/kg = milligram(s) per kilogram

Attachment A-10b
Backwater Seep Sampling Area Soil (0-2 ft-bgs)
Data Used in Human Health Risk Assessment
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSB-137	CFSB-137	CFSB-137	CFSB-138	CFSB-138	CFSB-138-DUP	CFSB-140	CFSB-140	CFSB-141	CFSB-141	CFSB-141	CFSB-134	CFSB-134	CFSB-135	CFSB-135	CFSB-136	CFSB-136
Sample Lab IDs	460-144170-9	460-144170-10	460-144400-1	460-144170-4	460-144170-5	460-144170-6	460-144087-3	460-144087-4	460-144170-7	460-144170-8	460-144400-4	460-144087-11	460-144087-12	460-144087-13	460-144087-14	460-144087-15	460-144087-16
Sample Name	CFSB-137-SO-0-0.5	CFSB-137-SO-0.5-2	CFSB-137-SO-0.5-2	CFSB-138-SO-0-0.5	CFSB-138-SO-0.5-2	CFSB-DUP14-SO	CFSB-140-SO-0-0.5	CFSB-140-SO-0.5-2	CFSB-141-SO-0-0.5	CFSB-141-SO-0.5-2	CFSB-141-SO-0.5-2	CFSB-134-SO-0-0.5	CFSB-134-SO-0.5-2	CFSB-135-SO-0-0.5	CFSB-135-SO-0.5-2	CFSB-136-SO-0-0.5 2	CFSB-136-SO-0.5-2
Sample Depth	0-0.5 ft	0.5-2 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 2	0.5-2 ft
Chemical	11/1/2017	11/1/2017	11/2/2017	11/1/2017	11/1/2017	11/1/2017	10/31/2017	10/31/2017	11/1/2017	11/1/2017	11/2/2017	10/31/2017	10/31/2017	10/31/2017	10/31/2017	10/31/2017	10/31/2017
GENERAL CHEMISTRY (mg/kg)																	
Fluoride	17 J+	16.7 J+	--	32.7 J+	19.3 J	33.5 J	12.8 J+	14.9 J+	16.4 J+	1.58 J+	--	25.7 J+	21.7 J+	22.2 J+	22.9 J+	14.5 J+	15.4 J+

Footnotes:
-- = not applicable
+ = Result is biased high
ft = feet
ft-bgs = feet below ground surface
J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
mg/kg = milligram(s) per kilogram

Attachment A-10c
Backwater Seep Sampling Area (surface water)
Data Used in Human Health Risk Assessment
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSWP-027	CFSWP-029	CFSWP-003	CFSWP-003	CFSWP-003	CFSWP-003	CFSWP-003	CFSWP-004	CFSWP-004	CFSWP-004	CFSWP-004	CFSWP-004	CFSWP-005	CFSWP-005	CFSWP-005	CFSWP-005	CFSWP-005	CFSWP-005-DUP	CFSWP-028
Sample Lab IDs	460-144086-5	460-144175-3	460-119967-1	460-124639-1	460-129875-1	460-135338-3	460-144086-1	460-119967-2	460-124639-2	460-129875-2	460-135338-4	460-144086-2	460-119967-3	460-124639-3	460-129875-3	460-135338-5	460-144175-1	460-144175-2	460-144086-3
Sample Name	CFSWP-027-SW	CFSWP-029-SW	CFSWP-003-SW	CFSWP-003-SW	CFSWP-003-SW	CFSWP-003-SW	CFSWP-003-SW	CFSWP-004-SW	CFSWP-004-SW	CFSWP-004-SW	CFSWP-004-SW	CFSWP-004-SW	CFSWP-005-SW	CFSWP-005-SW	CFSWP-005-SW	CFSWP-005-SW	CFSWP-005-SW	CFSWP-DUP8-SW	CFSWP-028-SW
Chemical	10/31/2017	11/1/2017	9/9/2016	12/1/2016	3/16/2017	6/14/2017	10/31/2017	9/9/2016	12/1/2016	3/16/2017	6/14/2017	10/31/2017	9/9/2016	12/1/2016	3/16/2017	6/14/2017	11/1/2017	11/1/2017	10/31/2017
GENERAL CHEMISTRY (µg/l)																			
Fluoride	320	2400 J+	181	615 J-	198 J	192	646	2560	1810 J-	342 J	175	2470	2570	2100 J-	457 J	555	2440 J+	2640 J+	311

Footnotes:
-- = not applicable
- = Result is biased low
+ = Result is biased high
J = The analyte was positively identified; the associated
µg/L = microgram(s) per liter

Attachment A-10d
Backwater Seep Sampling Area (sediment)
Data Used in Human Health Risk Assessment
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFSDP-027	CFSDP-029	CFSDP-003	CFSDP-003	CFSDP-004	CFSDP-004	CFSDP-005	CFSDP-005	CFSDP-005-DUP	CFSDP-005	CFSDP-005-DUP	CFSDP-028
Sample Lab IDs	460-144087-9	460-144170-1	200-35201-20, 460-119996-1	460-144087-6	200-35201-21, 460-119996-2	460-144087-7	200-35201-22, 460-119996-3	460-144170-2	460-144170-3	460-144400-2	460-144400-3	460-144087-10
Sample Name	CFSDP-027-SD	CFSDP-029-SD	CFSDP-003-SD	CFSDP-003-SD	CFSDP-004-SD	CFSDP-004-SD	CFSDP-005-SD	CFSDP-005-SD	CFSDP-DUP3-SD	CFSDP-005-SD	CFSDP-DUP3-SD	CFSDP-028-SD
Chemical	10/31/2017	11/1/2017	9/9/2016	10/31/2017	9/9/2016	10/31/2017	9/9/2016	11/1/2017	11/1/2017	11/2/2017	11/2/2017	10/31/2017
GENERAL CHEMISTRY (mg/kg)												
Fluoride	21.8 J+	22.2 J+	10.4 J+	24.8 J+	8.57 J+	22.7 J+	13.7 J+	20.5 J+	16.7 J+	--	--	22.9 J+

Footnotes:
-- = not applicable
+ = Result is biased high
J = The analyte was positively identified; the associated numerical value is the approximate concentration
mg/kg = milligram(s) per kilogram

Appendix A-11a
Groundwater - Plume Area Upper Hydrogeologic Unit
Data Used in Human Health Risk Assessment
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site
Sample Facility	CFAC Ecological	CFAC Ecological	CFAC Ecological	CFAC Ecological	CFAC Ecological	CFAC Ecological	CFAC Ecological	CFAC Ecological	CFAC Ecological	CFAC Ecological	CFAC Ecological	CFAC Ecological	CFAC Ecological	CFAC Ecological	CFAC Ecological	CFAC Ecological
Sample Investigation Area	ECO EXP AREA 3 CENTRAL LANDFILLS AREA	ECO EXP AREA 3 CENTRAL LANDFILLS AREA	ECO EXP AREA 3 CENTRAL LANDFILLS AREA	ECO EXP AREA 3 CENTRAL LANDFILLS AREA	ECO EXP AREA 3 CENTRAL LANDFILLS AREA	ECO EXP AREA 3 CENTRAL LANDFILLS AREA	ECO EXP AREA 3 CENTRAL LANDFILLS AREA	ECO EXP AREA 6 NORTH-CENTRAL UNDEVELOPED AREA	ECO EXP AREA 6 NORTH-CENTRAL UNDEVELOPED AREA	ECO EXP AREA 6 NORTH-CENTRAL UNDEVELOPED AREA	ECO EXP AREA 6 NORTH-CENTRAL UNDEVELOPED AREA	ECO EXP AREA 6 NORTH-CENTRAL UNDEVELOPED AREA	ECO EXP AREA 3 CENTRAL LANDFILLS AREA	ECO EXP AREA 3 CENTRAL LANDFILLS AREA	ECO EXP AREA 3 CENTRAL LANDFILLS AREA	ECO EXP AREA 3 CENTRAL LANDFILLS AREA
Sample Water Bearing Zone	Upper Hydrogeologic Unit	Upper Hydrogeologic Unit	Upper Hydrogeologic Unit	Upper Hydrogeologic Unit	Upper Hydrogeologic Unit	Upper Hydrogeologic Unit	Upper Hydrogeologic Unit	Upper Hydrogeologic Unit	Upper Hydrogeologic Unit	Upper Hydrogeologic Unit	Upper Hydrogeologic Unit	Upper Hydrogeologic Unit	Upper Hydrogeologic Unit	Upper Hydrogeologic Unit	Upper Hydrogeologic Unit	Upper Hydrogeologic Unit
Sample Location ID	CFMW-002	CFMW-002	CFMW-002	CFMW-010	CFMW-010	CFMW-010	CFMW-010	CFMW-011	CFMW-011	CFMW-011	CFMW-011	CFMW-011-DUP	CFMW-012	CFMW-012	CFMW-012	CFMW-012
Sample Lab IDs	460-120053-1	460-130333-4	460-136178-9	460-120053-2	460-125567-2	460-130333-5	460-136178-8	460-120143-13	460-125105-2	460-130410-7	460-136263-7	460-136263-11	460-120053-5	460-125477-4	460-130225-3	460-135989-9
Sample Name	CFMW-002-GW	CFMW-002-GW	CFMW-002-GW	CFMW-010-GW	CFMW-010-GW	CFMW-010-GW	CFMW-010-GW	CFMW-011-GW	CFMW-011-GW	CFMW-011-GW	CFMW-011-GW	CFMW-DUP15-GW	CFMW-012-GW	CFMW-012-GW	CFMW-012-GW	CFMW-012-GW
Chemical	9/12/2016	3/24/2017	6/27/2017	9/12/2016	12/15/2016	3/24/2017	6/27/2017	9/13/2016	12/8/2016	3/27/2017	6/28/2017	6/28/2017	9/12/2016	12/14/2016	3/22/2017	6/23/2017
GENERAL CHEMISTRY|ANIONS (µg/L)																
Fluoride	18900	8900	4930	30900	3190	17200	6810	207	241 J	298 J+	297 J-	289 J-	12400	5750 J	12600 J+	30600

Footnotes:
- = Result is biased low
+ = Result is biased high
J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
µg/L = microgram(s) per liter

Appendix A-11a
Groundwater - Plume Area Upper Hydrogeologic Unit
Data Used in Human Health Risk Assessment
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Site Sample Facility Sample Investigation Area Sample Water Bearing Zone Sample Location ID Sample Lab IDs Sample Name Chemical	Columbia Falls Alumnium Company Site CFAC Ecological ECO EXP AREA 3 CENTRAL LANDFILLS AREA Upper Hydrogeologic Unit CFMW-014 460-120053-7 CFMW-014-GW 9/12/2016	Columbia Falls Alumnium Company Site CFAC Ecological ECO EXP AREA 3 CENTRAL LANDFILLS AREA Upper Hydrogeologic Unit CFMW-014 460-125567-4 CFMW-014-GW 12/15/2016	Columbia Falls Alumnium Company Site CFAC Ecological ECO EXP AREA 3 CENTRAL LANDFILLS AREA Upper Hydrogeologic Unit CFMW-014 460-130620-1 CFMW-014-GW 3/29/2017	Columbia Falls Alumnium Company Site CFAC Ecological ECO EXP AREA 3 CENTRAL LANDFILLS AREA Upper Hydrogeologic Unit CFMW-014 460-136178-11 CFMW-014-GW 6/27/2017	Columbia Falls Alumnium Company Site CFAC Ecological ECO EXP AREA 3 CENTRAL LANDFILLS AREA Upper Hydrogeologic Unit CFMW-015 460-120053-8 CFMW-015-GW 9/12/2016	Columbia Falls Alumnium Company Site CFAC Ecological ECO EXP AREA 3 CENTRAL LANDFILLS AREA Upper Hydrogeologic Unit CFMW-015 460-125567-3 CFMW-015-GW 12/15/2016	Columbia Falls Alumnium Company Site CFAC Ecological ECO EXP AREA 3 CENTRAL LANDFILLS AREA Upper Hydrogeologic Unit CFMW-015 460-130620-2 CFMW-015-GW 3/29/2017	Columbia Falls Alumnium Company Site CFAC Ecological ECO EXP AREA 3 CENTRAL LANDFILLS AREA Upper Hydrogeologic Unit CFMW-015 460-136178-10 CFMW-015-GW 6/27/2017	Columbia Falls Alumnium Company Site CFAC Ecological ECO EXP AREA 3 CENTRAL LANDFILLS AREA Upper Hydrogeologic Unit CFMW-016 460-130507-5 CFMW-016-GW 3/28/2017	Columbia Falls Alumnium Company Site CFAC Ecological ECO EXP AREA 3 CENTRAL LANDFILLS AREA Upper Hydrogeologic Unit CFMW-016-DUP 460-130507-4 CFMW-DUP10-GW 3/28/2017	Columbia Falls Alumnium Company Site CFAC Ecological ECO EXP AREA 3 CENTRAL LANDFILLS AREA Upper Hydrogeologic Unit CFMW-016 460-136351-4 CFMW-016-GW 6/29/2017	Columbia Falls Alumnium Company Site CFAC Ecological ECO EXP AREA 3 CENTRAL LANDFILLS AREA Upper Hydrogeologic Unit CFMW-016A 460-120664-3 CFMW-016a-GW 9/21/2016	Columbia Falls Alumnium Company Site CFAC Ecological ECO EXP AREA 3 CENTRAL LANDFILLS AREA Upper Hydrogeologic Unit CFMW-016A 460-125477-9 CFMW-016a-GW 12/14/2016	Columbia Falls Alumnium Company Site CFAC Ecological ECO EXP AREA 3 CENTRAL LANDFILLS AREA Upper Hydrogeologic Unit CFMW-016A 460-130410-3 CFMW-016a-GW 3/27/2017	Columbia Falls Alumnium Company Site CFAC Ecological ECO EXP AREA 3 CENTRAL LANDFILLS AREA Upper Hydrogeologic Unit CFMW-016A 460-136063-4 CFMW-016a-GW 6/26/2017	Columbia Falls Alumnium Company Site CFAC Ecological ECO EXP AREA 3 CENTRAL LANDFILLS AREA Upper Hydrogeologic Unit CFMW-017 460-130507-9 CFMW-017-GW 3/28/2017
GENERAL CHEMISTRY|ANIONS (µg/L)																
Fluoride	8300	17300 J-	13000	3960	38400	16800 J-	4740	52900	428	438	338	304	293 J-	358 J+	293 J+	13400

Footnotes:
- = Result is biased low
+ = Result is biased high
J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
µg/L = microgram(s) per liter

Appendix A-11a
Groundwater - Plume Area Upper Hydrogeologic Unit
Data Used in Human Health Risk Assessment
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site
Sample Facility	CFAC Ecological	CFAC Ecological	CFAC Ecological	CFAC Ecological	CFAC Ecological	CFAC Ecological	CFAC Ecological	CFAC Ecological	CFAC Ecological	CFAC Ecological	CFAC Ecological	CFAC Ecological	CFAC Ecological	CFAC Ecological	CFAC Ecological	CFAC Ecological
Sample Investigation Area	ECO EXP AREA 3 CENTRAL LANDFILLS AREA	ECO EXP AREA 3 CENTRAL LANDFILLS AREA	ECO EXP AREA 3 CENTRAL LANDFILLS AREA	ECO EXP AREA 3 CENTRAL LANDFILLS AREA	ECO EXP AREA 3 CENTRAL LANDFILLS AREA	ECO EXP AREA 3 CENTRAL LANDFILLS AREA	ECO EXP AREA 3 CENTRAL LANDFILLS AREA	ECO EXP AREA 3 CENTRAL LANDFILLS AREA	ECO EXP AREA 3 CENTRAL LANDFILLS AREA	ECO EXP AREA 3 CENTRAL LANDFILLS AREA	ECO EXP AREA 3 CENTRAL LANDFILLS AREA	ECO EXP AREA 3 CENTRAL LANDFILLS AREA	ECO EXP AREA 3 CENTRAL LANDFILLS AREA	ECO EXP AREA 2 NORTH PERCOLATION POND AREA	ECO EXP AREA 2 NORTH PERCOLATION POND AREA	ECO EXP AREA 2 NORTH PERCOLATION POND AREA
Sample Water Bearing Zone	Upper Hydrogeologic Unit	Upper Hydrogeologic Unit	Upper Hydrogeologic Unit	Upper Hydrogeologic Unit	Upper Hydrogeologic Unit	Upper Hydrogeologic Unit	Upper Hydrogeologic Unit	Upper Hydrogeologic Unit	Upper Hydrogeologic Unit	Upper Hydrogeologic Unit	Upper Hydrogeologic Unit	Upper Hydrogeologic Unit	Upper Hydrogeologic Unit	Upper Hydrogeologic Unit	Upper Hydrogeologic Unit	Upper Hydrogeologic Unit
Sample Location ID	CFMW-017	CFMW-019	CFMW-019	CFMW-019	CFMW-019	CFMW-021	CFMW-021	CFMW-021	CFMW-021	CFMW-022	CFMW-022	CFMW-022	CFMW-022	CFMW-027	CFMW-027	CFMW-027
Sample Lab IDs	460-136063-6	460-120053-3	460-125567-5	460-130620-3	460-136351-5	460-120053-9	460-125477-1	460-130620-4	460-136063-11	460-120143-12	460-125196-7	460-130507-6	460-136063-10	460-120143-11	460-125477-3	460-130410-6
Sample Name	CFMW-017-GW	CFMW-019-GW	CFMW-019-GW	CFMW-019-GW	CFMW-019-GW	CFMW-021-GW	CFMW-021-GW	CFMW-021-GW	CFMW-021-GW	CFMW-022-GW	CFMW-022-GW	CFMW-022-GW	CFMW-022-GW	CFMW-027-GW	CFMW-027-GW	CFMW-027-GW
Chemical	6/26/2017	9/12/2016	12/15/2016	3/29/2017	6/29/2017	9/12/2016	12/14/2016	3/29/2017	6/26/2017	9/13/2016	12/9/2016	3/28/2017	6/26/2017	9/13/2016	12/14/2016	3/27/2017
GENERAL CHEMISTRY|ANIONS (µg/L)																
Fluoride	1160 J+	2860	2890	2950	3720	1950	3120 J-	4500	1930 J+	432	558 J-	971	573 J+	2390	1970 J-	2560 J+

Footnotes:
- = Result is biased low
+ = Result is biased high
J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
µg/L = microgram(s) per liter

Appendix A-11a
Groundwater - Plume Area Upper Hydrogeologic Unit
Data Used in Human Health Risk Assessment
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site
Sample Facility	CFAC Ecological	CFAC Ecological	CFAC Ecological	CFAC Ecological	CFAC Ecological	CFAC Ecological	CFAC Ecological	CFAC Ecological	CFAC Ecological	CFAC Ecological	CFAC Ecological	CFAC Ecological	CFAC Ecological	CFAC Ecological	CFAC Ecological	CFAC Ecological
Sample Investigation Area	ECO EXP AREA 2 NORTH PERCOLATION POND AREA	ECO EXP AREA 1 MAIN PLANT AREA	ECO EXP AREA 1 MAIN PLANT AREA	ECO EXP AREA 1 MAIN PLANT AREA	ECO EXP AREA 1 MAIN PLANT AREA	ECO EXP AREA 1 MAIN PLANT AREA	ECO EXP AREA 1 MAIN PLANT AREA	ECO EXP AREA 1 MAIN PLANT AREA	ECO EXP AREA 1 MAIN PLANT AREA	ECO EXP AREA 3 CENTRAL LANDFILLS AREA	ECO EXP AREA 3 CENTRAL LANDFILLS AREA	ECO EXP AREA 3 CENTRAL LANDFILLS AREA	ECO EXP AREA 3 CENTRAL LANDFILLS AREA	ECO EXP AREA 3 CENTRAL LANDFILLS AREA	ECO EXP AREA 1 MAIN PLANT AREA	ECO EXP AREA 1 MAIN PLANT AREA
Sample Water Bearing Zone	Upper Hydrogeologic Unit	Upper Hydrogeologic Unit	Upper Hydrogeologic Unit	Upper Hydrogeologic Unit	Upper Hydrogeologic Unit	Upper Hydrogeologic Unit	Upper Hydrogeologic Unit	Upper Hydrogeologic Unit	Upper Hydrogeologic Unit	Upper Hydrogeologic Unit	Upper Hydrogeologic Unit	Upper Hydrogeologic Unit	Upper Hydrogeologic Unit	Upper Hydrogeologic Unit	Upper Hydrogeologic Unit	Upper Hydrogeologic Unit
Sample Location ID	CFMW-027	CFMW-028	CFMW-028	CFMW-028	CFMW-028	CFMW-028A	CFMW-028A	CFMW-028A	CFMW-028A	CFMW-029	CFMW-029-DUP	CFMW-029	CFMW-029	CFMW-029	CFMW-031	CFMW-031
Sample Lab IDs	460-136063-9	460-120143-10	460-124783-2	460-130032-7	460-136063-7	460-120581-8	460-125196-5	460-130088-11	460-136178-4	460-120143-8	460-120143-9	460-125477-2	460-130333-6	460-136063-8	460-120318-2	460-125196-4
Sample Name	CFMW-027-GW	CFMW-028-GW	CFMW-028-GW	CFMW-028-GW	CFMW-028-GW	CFMW-028a-GW	CFMW-028a-GW	CFMW-028a-GW	CFMW-028a-GW	CFMW-029-GW	CFMW-DUP1-GW	CFMW-029-GW	CFMW-029-GW	CFMW-029-GW	CFMW-031-GW	CFMW-031-GW
Chemical	6/26/2017	9/13/2016	12/5/2016	3/20/2017	6/26/2017	9/20/2016	12/9/2016	3/21/2017	6/27/2017	9/13/2016	9/13/2016	12/14/2016	3/24/2017	6/26/2017	9/15/2016	12/9/2016
GENERAL CHEMISTRY|ANIONS (µg/L)																
Fluoride	5190	3170 J+	3130 J-	4400	3800 J+	1020	557 J-	408	286	3370 J+	3370 J+	4180 J	1810 J+	2570 J+	2440	2100 J-

Footnotes:
- = Result is biased low
+ = Result is biased high
J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
µg/L = microgram(s) per liter

Appendix A-11a
Groundwater - Plume Area Upper Hydrogeologic Unit
Data Used in Human Health Risk Assessment
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site
Sample Facility	CFAC Ecological	CFAC Ecological	CFAC Ecological	CFAC Ecological	CFAC Ecological	CFAC Ecological	CFAC Ecological	CFAC Ecological	CFAC Ecological	CFAC Ecological	CFAC Ecological	CFAC Ecological	CFAC Ecological	CFAC Ecological	CFAC Ecological	CFAC Ecological
Sample Investigation Area	ECO EXP AREA 1 MAIN PLANT AREA	ECO EXP AREA 1 MAIN PLANT AREA	ECO EXP AREA 1 MAIN PLANT AREA	ECO EXP AREA 1 MAIN PLANT AREA	ECO EXP AREA 1 MAIN PLANT AREA	ECO EXP AREA 1 MAIN PLANT AREA	ECO EXP AREA 1 MAIN PLANT AREA	ECO EXP AREA 1 MAIN PLANT AREA	ECO EXP AREA 1 MAIN PLANT AREA	ECO EXP AREA 1 MAIN PLANT AREA	ECO EXP AREA 1 MAIN PLANT AREA	ECO EXP AREA 1 MAIN PLANT AREA	ECO EXP AREA 1 MAIN PLANT AREA	ECO EXP AREA 1 MAIN PLANT AREA	ECO EXP AREA 1 MAIN PLANT AREA	ECO EXP AREA 1 MAIN PLANT AREA
Sample Water Bearing Zone	Upper Hydrogeologic Unit	Upper Hydrogeologic Unit	Upper Hydrogeologic Unit	Upper Hydrogeologic Unit	Upper Hydrogeologic Unit	Upper Hydrogeologic Unit	Upper Hydrogeologic Unit	Upper Hydrogeologic Unit	Upper Hydrogeologic Unit	Upper Hydrogeologic Unit	Upper Hydrogeologic Unit	Upper Hydrogeologic Unit	Upper Hydrogeologic Unit	Upper Hydrogeologic Unit	Upper Hydrogeologic Unit	Upper Hydrogeologic Unit
Sample Location ID	CFMW-031	CFMW-031	CFMW-031-DUP	CFMW-032	CFMW-032	CFMW-032	CFMW-032	CFMW-032-DUP	CFMW-033	CFMW-033	CFMW-033	CFMW-033	CFMW-034	CFMW-034	CFMW-034	CFMW-034
Sample Lab IDs	460-130088-6	460-135818-7	460-135818-8	460-120318-1	460-125356-1	460-130410-8	460-135701-7	460-135701-9	460-120318-3	460-124871-1	460-130088-3	460-135619-2	460-120223-1	460-125356-2	460-130088-5	460-135619-4
Sample Name	CFMW-031-GW	CFMW-031-GW	CFMW-DUP13-GW	CFMW-032-GW	CFMW-032-GW	CFMW-032-GW	CFMW-032-GW	CFMW-DUP12-GW	CFMW-033-GW	CFMW-033-GW	CFMW-033-GW	CFMW-033-GW	CFMW-034-GW	CFMW-034-GW	CFMW-034-GW	CFMW-034-GW
Chemical	3/21/2017	6/21/2017	6/21/2017	9/15/2016	12/13/2016	3/27/2017	6/20/2017	6/20/2017	9/15/2016	12/6/2016	3/21/2017	6/19/2017	9/14/2016	12/13/2016	3/21/2017	6/19/2017
GENERAL CHEMISTRY|ANIONS (µg/L)																
Fluoride	2700	2770 J-	2800 J-	5210 J-	2490	3060 J+	8570	8460	2340	2040 J-	2620	3250	4530 J-	60 U	3200	6590

Footnotes:
- = Result is biased low
+ = Result is biased high
J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
µg/L = microgram(s) per liter

Appendix A-11a
Groundwater - Plume Area Upper Hydrogeologic Unit
Data Used in Human Health Risk Assessment
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site
Sample Facility	CFAC Ecological	CFAC Ecological	CFAC Ecological	CFAC Ecological	CFAC Ecological	CFAC Ecological	CFAC Ecological	CFAC Ecological	CFAC Ecological	CFAC Ecological	CFAC Ecological	CFAC Ecological	CFAC Ecological	CFAC Ecological	CFAC Ecological	CFAC Ecological
Sample Investigation Area	ECO EXP AREA 1 MAIN PLANT AREA	ECO EXP AREA 1 MAIN PLANT AREA	ECO EXP AREA 1 MAIN PLANT AREA	ECO EXP AREA 1 MAIN PLANT AREA	ECO EXP AREA 1 MAIN PLANT AREA	ECO EXP AREA 1 MAIN PLANT AREA	ECO EXP AREA 1 MAIN PLANT AREA	ECO EXP AREA 1 MAIN PLANT AREA	ECO EXP AREA 1 MAIN PLANT AREA	ECO EXP AREA 1 MAIN PLANT AREA	ECO EXP AREA 1 MAIN PLANT AREA	ECO EXP AREA 1 MAIN PLANT AREA	ECO EXP AREA 1 MAIN PLANT AREA	ECO EXP AREA 1 MAIN PLANT AREA	ECO EXP AREA 1 MAIN PLANT AREA	ECO EXP AREA 1 MAIN PLANT AREA
Sample Water Bearing Zone	Upper Hydrogeologic Unit	Upper Hydrogeologic Unit	Upper Hydrogeologic Unit	Upper Hydrogeologic Unit	Upper Hydrogeologic Unit	Upper Hydrogeologic Unit	Upper Hydrogeologic Unit	Upper Hydrogeologic Unit	Upper Hydrogeologic Unit	Upper Hydrogeologic Unit	Upper Hydrogeologic Unit	Upper Hydrogeologic Unit	Upper Hydrogeologic Unit	Upper Hydrogeologic Unit	Upper Hydrogeologic Unit	Upper Hydrogeologic Unit
Sample Location ID	CFMW-038	CFMW-038	CFMW-038	CFMW-038	CFMW-040	CFMW-040	CFMW-040	CFMW-040	CFMW-042	CFMW-042	CFMW-043	CFMW-043	CFMW-043	CFMW-043	CFMW-044	CFMW-044
Sample Lab IDs	460-120223-10	460-125196-8	460-130333-7	460-136178-6	460-120223-11	460-125356-4	460-130691-3	460-135701-10	460-120223-3	460-135701-8	460-120143-6	460-125477-5	460-130032-8	460-135818-9	460-120318-4	460-125196-2
Sample Name	CFMW-038-GW	CFMW-038-GW	CFMW-038-GW	CFMW-038-GW	CFMW-040-GW	CFMW-040-GW	CFMW-040-GW	CFMW-040-GW	CFMW-042-GW	CFMW-042-GW	CFMW-043-GW	CFMW-043-GW	CFMW-043-GW	CFMW-043-GW	CFMW-044-GW	CFMW-044-GW
Chemical	9/14/2016	12/9/2016	3/24/2017	6/27/2017	9/14/2016	12/13/2016	3/30/2017	6/20/2017	9/14/2016	6/20/2017	9/13/2016	12/14/2016	3/20/2017	6/21/2017	9/15/2016	12/9/2016
GENERAL CHEMISTRY|ANIONS (µg/L)																
Fluoride	2590	2400 J-	2830 J+	2810	2650	2360	3090	2830	2410	2780	2280	2050 J-	2730	2020 J-	2150	1670 J-

Footnotes:
- = Result is biased low
+ = Result is biased high
J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
µg/L = microgram(s) per liter

Appendix A-11a
Groundwater - Plume Area Upper Hydrogeologic Unit
Data Used in Human Health Risk Assessment
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site
Sample Facility	CFAC Ecological	CFAC Ecological	CFAC Ecological	CFAC Ecological	CFAC Ecological	CFAC Ecological	CFAC Ecological	CFAC Ecological	CFAC Ecological	CFAC Ecological	CFAC Ecological	CFAC Ecological	CFAC Ecological	CFAC Ecological	CFAC Ecological	CFAC Ecological
Sample Investigation Area	ECO EXP AREA 1 MAIN PLANT AREA	ECO EXP AREA 1 MAIN PLANT AREA	ECO EXP AREA 1 MAIN PLANT AREA	ECO EXP AREA 1 MAIN PLANT AREA	ECO EXP AREA 1 MAIN PLANT AREA	ECO EXP AREA 1 MAIN PLANT AREA	ECO EXP AREA 1 MAIN PLANT AREA	ECO EXP AREA 1 MAIN PLANT AREA	ECO EXP AREA 1 MAIN PLANT AREA	ECO EXP AREA 1 MAIN PLANT AREA	ECO EXP AREA 1 MAIN PLANT AREA	ECO EXP AREA 1 MAIN PLANT AREA	ECO EXP AREA 1 MAIN PLANT AREA	ECO EXP AREA 1 MAIN PLANT AREA	ECO EXP AREA 1 MAIN PLANT AREA	ECO EXP AREA 1 MAIN PLANT AREA
Sample Water Bearing Zone	Upper Hydrogeologic Unit	Upper Hydrogeologic Unit	Upper Hydrogeologic Unit	Upper Hydrogeologic Unit	Upper Hydrogeologic Unit	Upper Hydrogeologic Unit	Upper Hydrogeologic Unit	Upper Hydrogeologic Unit	Upper Hydrogeologic Unit	Upper Hydrogeologic Unit	Upper Hydrogeologic Unit	Upper Hydrogeologic Unit	Upper Hydrogeologic Unit	Upper Hydrogeologic Unit	Upper Hydrogeologic Unit	Upper Hydrogeologic Unit
Sample Location ID	CFMW-044	CFMW-044	CFMW-044A	CFMW-044A	CFMW-044A	CFMW-044A	CFMW-045	CFMW-045	CFMW-045	CFMW-045	CFMW-045A	CFMW-045A	CFMW-045A	CFMW-045A	CFMW-047	CFMW-047
Sample Lab IDs	460-130507-2	460-135818-10	460-120477-7	460-125747-3	460-130088-13	460-135989-3	460-120318-5	460-125477-11	460-130226-7	460-136263-8	460-120477-2	460-125196-9	460-130333-8	460-135989-5	460-120223-7	460-125567-10
Sample Name	CFMW-044-GW	CFMW-044-GW	CFMW-044a-GW	CFMW-044a-GW	CFMW-044a-GW	CFMW-044a-GW	CFMW-045-GW	CFMW-045-GW	CFMW-045-GW	CFMW-045-GW	CFMW-045a-GW	CFMW-045a-GW	CFMW-045a-GW	CFMW-045a-GW	CFMW-047-GW	CFMW-047-GW
Chemical	3/28/2017	6/21/2017	9/19/2016	12/19/2016	3/21/2017	6/23/2017	9/15/2016	12/14/2016	3/23/2017	6/28/2017	9/19/2016	12/9/2016	3/24/2017	6/23/2017	9/14/2016	12/15/2016
GENERAL CHEMISTRY|ANIONS (µg/L)																
Fluoride	2050	1400 J-	1720	2280	2720	2250 J+	2300	1920 J-	2550	2150 J-	2980	1650 J-	3520 J+	3400 J+	2160	1960

Footnotes:
- = Result is biased low
+ = Result is biased high
J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
µg/L = microgram(s) per liter

Appendix A-11a
Groundwater - Plume Area Upper Hydrogeologic Unit
Data Used in Human Health Risk Assessment
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site
Sample Facility	CFAC Ecological	CFAC Ecological	CFAC Ecological	CFAC Ecological	CFAC Ecological	CFAC Ecological	CFAC Ecological	CFAC Ecological	CFAC Ecological
Sample Investigation Area	ECO EXP AREA 1 MAIN PLANT AREA	ECO EXP AREA 1 MAIN PLANT AREA	ECO EXP AREA 1 MAIN PLANT AREA	ECO EXP AREA 1 MAIN PLANT AREA	ECO EXP AREA 1 MAIN PLANT AREA	ECO EXP AREA 1 MAIN PLANT AREA	ECO EXP AREA 1 MAIN PLANT AREA	ECO EXP AREA 1 MAIN PLANT AREA	ECO EXP AREA 1 MAIN PLANT AREA
Sample Water Bearing Zone	Upper Hydrogeologic Unit	Upper Hydrogeologic Unit	Upper Hydrogeologic Unit	Upper Hydrogeologic Unit	Upper Hydrogeologic Unit	Upper Hydrogeologic Unit	Upper Hydrogeologic Unit	Upper Hydrogeologic Unit	Upper Hydrogeologic Unit
Sample Location ID	CFMW-047	CFMW-047	CFMW-053	CFMW-053	CFMW-053	CFMW-054	CFMW-054	CFMW-054	CFMW-054
Sample Lab IDs	460-130226-5	460-135818-6	460-120223-5	460-125342-3	460-136263-10	460-120223-6	460-125342-4	460-130225-5	460-135818-12
Sample Name	CFMW-047-GW	CFMW-047-GW	CFMW-053-GW	CFMW-053-GW	CFMW-053-GW	CFMW-054-GW	CFMW-054-GW	CFMW-054-GW	CFMW-054-GW
Chemical	3/23/2017	6/21/2017	9/14/2016	12/12/2016	6/28/2017	9/14/2016	12/12/2016	3/22/2017	6/21/2017
GENERAL CHEMISTRY|ANIONS (µg/L)									
Fluoride	2470	1920	1990	1870	1610 J-	1920	1610	2070	1880

Footnotes:
- = Result is biased low
+ = Result is biased high
J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
µg/L = microgram(s) per liter

Appendix A-11b
Groundwater - Western Undeveloped Area Upper Hydrogeologic Unit
Data Used in Human Health Risk Assessment
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site
Sample Facility	CFAC Ecological	CFAC Ecological	CFAC Ecological	CFAC Ecological	CFAC Ecological	CFAC Ecological	CFAC Ecological	CFAC Ecological	CFAC Ecological
Sample Investigation Area	ECO EXP AREA 7 WESTERN UNDEVELOPED AREA	ECO EXP AREA 7 WESTERN UNDEVELOPED AREA	ECO EXP AREA 7 WESTERN UNDEVELOPED AREA	ECO EXP AREA 7 WESTERN UNDEVELOPED AREA	ECO EXP AREA 7 WESTERN UNDEVELOPED AREA	ECO EXP AREA 7 WESTERN UNDEVELOPED AREA	ECO EXP AREA 7 WESTERN UNDEVELOPED AREA	ECO EXP AREA 7 WESTERN UNDEVELOPED AREA	ECO EXP AREA 7 WESTERN UNDEVELOPED AREA
Sample Water Bearing Zone	Upper Hydrogeologic Unit	Upper Hydrogeologic Unit	Upper Hydrogeologic Unit	Upper Hydrogeologic Unit	Upper Hydrogeologic Unit	Upper Hydrogeologic Unit	Upper Hydrogeologic Unit	Upper Hydrogeologic Unit	Upper Hydrogeologic Unit
Sample Location ID	CFMW-056B	CFMW-056B	CFMW-056B	CFMW-056B-DUP	CFMW-056B	CFMW-059	CFMW-059	CFMW-059	CFMW-059
Sample Lab IDs	460-120143-5	460-125342-2	460-130088-1	460-130088-2	460-135884-10	460-120318-8	460-125342-1	460-130226-10	460-135818-11
Sample Name	CFMW-056b-GW	CFMW-056b-GW	CFMW-0566-GW	CFMW-Dup7-GW	CFMW-056b-GW	CFMW-059-GW	CFMW-059-GW	CFMW-059-GW	CFMW-059-GW
Chemical	9/13/2016	12/12/2016	3/21/2017	3/21/2017	6/22/2017	9/15/2016	12/12/2016	3/23/2017	6/21/2017
GENERAL CHEMISTRY|ANIONS (µg/L)									
Fluoride	156	194	271	266	188	59.5 J	114	120	124

Footnotes:
J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
µg/L = microgram(s) per liter

Appendix A-11c
Groundwater - Sitewide Below Upper Hydrogeologic Unit
Data Used in Human Health Risk Assessment
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site
Sample Facility	CFAC Ecological	CFAC Ecological	CFAC Ecological	CFAC Ecological	CFAC Ecological	CFAC Ecological	CFAC Ecological	CFAC Ecological	CFAC Ecological	CFAC Ecological	CFAC Ecological	CFAC Ecological	CFAC Ecological	CFAC Ecological	CFAC Ecological	CFAC Ecological
Sample Investigation Area	ECO EXP AREA 6 NORTH-CENTRAL UNDEVELOPED AREA	ECO EXP AREA 6 NORTH-CENTRAL UNDEVELOPED AREA	ECO EXP AREA 6 NORTH-CENTRAL UNDEVELOPED AREA	ECO EXP AREA 6 NORTH-CENTRAL UNDEVELOPED AREA	ECO EXP AREA 6 NORTH-CENTRAL UNDEVELOPED AREA	ECO EXP AREA 6 NORTH-CENTRAL UNDEVELOPED AREA	ECO EXP AREA 6 NORTH-CENTRAL UNDEVELOPED AREA	ECO EXP AREA 6 NORTH-CENTRAL UNDEVELOPED AREA	ECO EXP AREA 3 CENTRAL LANDFILLS AREA	ECO EXP AREA 3 CENTRAL LANDFILLS AREA	ECO EXP AREA 3 CENTRAL LANDFILLS AREA	ECO EXP AREA 3 CENTRAL LANDFILLS AREA	ECO EXP AREA 3 CENTRAL LANDFILLS AREA	ECO EXP AREA 3 CENTRAL LANDFILLS AREA	ECO EXP AREA 3 CENTRAL LANDFILLS AREA	ECO EXP AREA 3 CENTRAL LANDFILLS AREA
Sample Water Bearing Zone	Below Upper Hydrogeologic Unit	Below Upper Hydrogeologic Unit	Below Upper Hydrogeologic Unit	Below Upper Hydrogeologic Unit	Below Upper Hydrogeologic Unit	Below Upper Hydrogeologic Unit	Below Upper Hydrogeologic Unit	Below Upper Hydrogeologic Unit	Below Upper Hydrogeologic Unit	Below Upper Hydrogeologic Unit	Below Upper Hydrogeologic Unit	Below Upper Hydrogeologic Unit	Below Upper Hydrogeologic Unit	Below Upper Hydrogeologic Unit	Below Upper Hydrogeologic Unit	Below Upper Hydrogeologic Unit
Sample Location ID	CFMW-003A	CFMW-003A	CFMW-003A	CFMW-003A	CFMW-011A	CFMW-011A	CFMW-011A	CFMW-011A	CFMW-012A	CFMW-012A-DUP	CFMW-012A	CFMW-012A	CFMW-012A	CFMW-019A	CFMW-019A	CFMW-019A
Sample Lab IDs	460-120581-1	460-125342-7	460-130032-3	460-135619-3	460-120581-2	460-125477-8	460-130088-12	460-136351-3	460-120318-7	460-120318-12	460-125356-7	460-130032-1	460-135701-3	460-120581-3	460-125477-10	460-130410-2
Sample Name	CFMW-003a-GW	CFMW-003a-GW	CFMW-003a-GW	CFMW-003a-GW	CFMW-011a-GW	CFMW-011a-GW	CFMW-011a-GW	CFMW-011a-GW	CFMW-012a-GW	CFMW-DUP2-GW	CFMW-012a-GW	CFMW-012a-GW	CFMW-012a-GW	CFMW-019a-GW	CFMW-019a-GW	CFMW-019a-GW
Chemical	9/20/2016	12/12/2016	3/20/2017	6/19/2017	9/20/2016	12/14/2016	3/21/2017	6/29/2017	9/15/2016	9/15/2016	12/13/2016	3/20/2017	6/20/2017	9/20/2016	12/14/2016	3/27/2017
GENERAL CHEMISTRY|ANIONS (µg/L)																
Fluoride	312	337	373	276	200	194 J-	246	197	54.6 J	55.8 J	119	135	139	361	182 J-	214 J+

Footnotes:
-- = not applicable
- = Result is biased low
+ = Result is biased high
J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
U = The analyte was analyzed for, but was not detected above the reported sample quantitation limit. The associated value is the quantitation limit or the estimated detection limit for dioxins or PCB congeners.
µg/L = microgram(s) per liter

Appendix A-11c
Groundwater - Sitewide Below Upper Hydrogeologic Unit
Data Used in Human Health Risk Assessment
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site
Sample Facility	CFAC Ecological	CFAC Ecological	CFAC Ecological	CFAC Ecological	CFAC Ecological	CFAC Ecological	CFAC Ecological	CFAC Ecological	CFAC Ecological	CFAC Ecological	CFAC Ecological	CFAC Ecological	CFAC Ecological	CFAC Ecological	CFAC Ecological	CFAC Ecological
Sample Investigation Area	ECO EXP AREA 3 CENTRAL LANDFILLS AREA	ECO EXP AREA 3 CENTRAL LANDFILLS AREA	ECO EXP AREA 7 WESTERN UNDEVELOPED AREA	ECO EXP AREA 7 WESTERN UNDEVELOPED AREA	ECO EXP AREA 7 WESTERN UNDEVELOPED AREA	ECO EXP AREA 7 WESTERN UNDEVELOPED AREA	ECO EXP AREA 1 MAIN PLANT AREA	ECO EXP AREA 1 MAIN PLANT AREA	ECO EXP AREA 1 MAIN PLANT AREA	ECO EXP AREA 1 MAIN PLANT AREA	ECO EXP AREA 1 MAIN PLANT AREA	ECO EXP AREA 1 MAIN PLANT AREA	ECO EXP AREA 1 MAIN PLANT AREA	ECO EXP AREA 1 MAIN PLANT AREA	ECO EXP AREA 1 MAIN PLANT AREA	ECO EXP AREA 1 MAIN PLANT AREA
Sample Water Bearing Zone	Below Upper Hydrogeologic Unit	Below Upper Hydrogeologic Unit	Below Upper Hydrogeologic Unit	Below Upper Hydrogeologic Unit	Below Upper Hydrogeologic Unit	Below Upper Hydrogeologic Unit	Below Upper Hydrogeologic Unit	Below Upper Hydrogeologic Unit	Below Upper Hydrogeologic Unit	Below Upper Hydrogeologic Unit	Below Upper Hydrogeologic Unit	Below Upper Hydrogeologic Unit	Below Upper Hydrogeologic Unit	Below Upper Hydrogeologic Unit	Below Upper Hydrogeologic Unit	Below Upper Hydrogeologic Unit
Sample Location ID	CFMW-019A-DUP	CFMW-019A	CFMW-025A	CFMW-025A	CFMW-025A	CFMW-025A	CFMW-032A	CFMW-032A	CFMW-032A	CFMW-032A	CFMW-044B	CFMW-044B	CFMW-044B	CFMW-044B	CFMW-053A	CFMW-053A
Sample Lab IDs	460-130410-5	460-136063-3	460-120143-1	460-124783-5	460-130333-2	460-135884-7	460-120382-3	460-125644-3	460-130620-6	460-136178-5	460-120477-8	460-125747-2	460-130333-9	460-135989-4	460-120477-1	460-125747-5
Sample Name	CFMW-DUP9-GW	CFMW-019a-GW	CFMW-025a-GW	CFMW-025a-GW	CFMW-025a-GW	CFMW-025a-GW	CFMW-032a-GW	CFMW-032a-GW	CFMW-032a-GW	CFMW-032a-GW	CFMW-044b-GW	CFMW-044b-GW	CFMW-044b-GW	CFMW-044b-GW	CFMW-053a-GW	CFMW-053a-GW
Chemical	3/27/2017	6/26/2017	9/13/2016	12/5/2016	3/24/2017	6/22/2017	9/16/2016	12/16/2016	3/29/2017	6/27/2017	9/19/2016	12/19/2016	3/24/2017	6/23/2017	9/19/2016	12/19/2016
GENERAL CHEMISTRY|ANIONS (µg/L)																
Fluoride	201 J+	179 J+	399	334 J-	524	413	49 J-	225 J	171	241	153	142	176	138 J+	15 U	537

Footnotes:
-- = not applicable
- = Result is biased low
+ = Result is biased high
J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
U = The analyte was analyzed for, but was not detected above the reported sample quantitation limit. The associated value is the quantitation limit or the estimated detection limit for dioxins or PCB congeners.
µg/L = microgram(s) per liter

Appendix A-11c
Groundwater - Sitewide Below Upper Hydrogeologic Unit
Data Used in Human Health Risk Assessment
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site
Sample Facility	CFAC Ecological	CFAC Ecological	CFAC Ecological	CFAC Ecological	CFAC Ecological	CFAC Ecological	CFAC Ecological	CFAC Ecological	CFAC Ecological	CFAC Ecological	CFAC Ecological	CFAC Ecological	CFAC Ecological	CFAC Ecological	CFAC Ecological	CFAC Ecological
Sample Investigation Area	ECO EXP AREA 1 MAIN PLANT AREA	ECO EXP AREA 1 MAIN PLANT AREA	ECO EXP AREA 7 WESTERN UNDEVELOPED AREA	ECO EXP AREA 7 WESTERN UNDEVELOPED AREA	ECO EXP AREA 7 WESTERN UNDEVELOPED AREA	ECO EXP AREA 7 WESTERN UNDEVELOPED AREA	ECO EXP AREA 7 WESTERN UNDEVELOPED AREA	ECO EXP AREA 7 WESTERN UNDEVELOPED AREA	ECO EXP AREA 7 WESTERN UNDEVELOPED AREA	ECO EXP AREA 7 WESTERN UNDEVELOPED AREA	ECO EXP AREA 7 WESTERN UNDEVELOPED AREA	ECO EXP AREA 7 WESTERN UNDEVELOPED AREA	ECO EXP AREA 7 WESTERN UNDEVELOPED AREA	ECO EXP AREA 7 WESTERN UNDEVELOPED AREA	ECO EXP AREA 7 WESTERN UNDEVELOPED AREA	ECO EXP AREA 7 WESTERN UNDEVELOPED AREA
Sample Water Bearing Zone	Below Upper Hydrogeologic Unit	Below Upper Hydrogeologic Unit	Below Upper Hydrogeologic Unit	Below Upper Hydrogeologic Unit	Below Upper Hydrogeologic Unit	Below Upper Hydrogeologic Unit	Below Upper Hydrogeologic Unit	Below Upper Hydrogeologic Unit	Below Upper Hydrogeologic Unit	Below Upper Hydrogeologic Unit	Below Upper Hydrogeologic Unit	Below Upper Hydrogeologic Unit	Below Upper Hydrogeologic Unit	Below Upper Hydrogeologic Unit	Below Upper Hydrogeologic Unit	Below Upper Hydrogeologic Unit
Sample Location ID	CFMW-053A	CFMW-053A	CFMW-056	CFMW-056-DUP	CFMW-056	CFMW-056	CFMW-056	CFMW-056A	CFMW-056A	CFMW-056A-DUP	CFMW-056A	CFMW-056A	CFMW-057	CFMW-057	CFMW-057	CFMW-057-DUP
Sample Lab IDs	460-130410-4	460-136263-6	460-120581-6	460-120581-7	460-125356-8	460-130225-11	460-135884-5	460-120581-4	460-124871-2	460-124871-4	460-130691-2	460-135884-6	460-120477-9	460-124783-6	460-130620-7	460-130620-10
Sample Name	CFMW-053a-GW	CFMW-053a-GW	CFMW-056-GW	CFMW-DUP3-GW	CFMW-056-GW	CFMW-056-GW	CFMW-056-GW	CFMW-056a-GW	CFMW-056a-GW	CFMW-DUP4-GW	CFMW-056a-GW	CFMW-056a-GW	CFMW-057-GW	CFMW-057-GW	CFMW-057-GW	CFMW-DUP11-GW
Chemical	3/27/2017	6/28/2017	9/20/2016	9/20/2016	12/13/2016	3/22/2017	6/22/2017	9/20/2016	12/6/2016	12/6/2016	3/30/2017	6/22/2017	9/19/2016	12/5/2016	3/29/2017	3/29/2017
GENERAL CHEMISTRY|ANIONS (µg/L)																
Fluoride	428 J+	487 J-	138	131	107	242	194	405	400 J-	394 J-	258	569	66.6 J	127 J-	137	136

Footnotes:
-- = not applicable
- = Result is biased low
+ = Result is biased high
J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
U = The analyte was analyzed for, but was not detected above the reported sample quantitation limit. The associated value is the quantitation limit or the estimated detection limit for dioxins or PCB congeners.
µg/L = microgram(s) per liter

Appendix A-11c
Groundwater - Sitewide Below Upper Hydrogeologic Unit
Data Used in Human Health Risk Assessment
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site	Columbia Falls Alumnium Company Site
Sample Facility	CFAC Ecological	CFAC Ecological	CFAC Ecological	CFAC Ecological	CFAC Ecological	CFAC Ecological	CFAC Ecological	CFAC Ecological	CFAC Ecological
Sample Investigation Area	ECO EXP AREA 7 WESTERN UNDEVELOPED AREA	ECO EXP AREA 7 WESTERN UNDEVELOPED AREA	ECO EXP AREA 7 WESTERN UNDEVELOPED AREA	ECO EXP AREA 7 WESTERN UNDEVELOPED AREA	ECO EXP AREA 7 WESTERN UNDEVELOPED AREA	ECO EXP AREA 7 WESTERN UNDEVELOPED AREA	ECO EXP AREA 7 WESTERN UNDEVELOPED AREA	ECO EXP AREA 7 WESTERN UNDEVELOPED AREA	ECO EXP AREA 7 WESTERN UNDEVELOPED AREA
Sample Water Bearing Zone	Below Upper Hydrogeologic Unit	Below Upper Hydrogeologic Unit	Below Upper Hydrogeologic Unit	Below Upper Hydrogeologic Unit	Below Upper Hydrogeologic Unit	Below Upper Hydrogeologic Unit	Below Upper Hydrogeologic Unit	Below Upper Hydrogeologic Unit	Below Upper Hydrogeologic Unit
Sample Location ID	CFMW-057	CFMW-057A	CFMW-057A	CFMW-057A	CFMW-057A	CFMW-059A	CFMW-059A	CFMW-059A	CFMW-059A
Sample Lab IDs	460-136263-3	460-120477-10	460-125644-7	460-130225-7	460-136263-4	460-120477-6	460-125644-2	460-130620-8	460-136263-5
Sample Name	CFMW-057-GW	CFMW-057a-GW	CFMW-057a-GW	CFMW-057a-GW	CFMW-057a-GW	CFMW-059a-GW	CFMW-059a-GW	CFMW-059a-GW	CFMW-059a-GW
Chemical	6/28/2017	9/19/2016	12/16/2016	3/22/2017	6/28/2017	9/19/2016	12/16/2016	3/29/2017	6/28/2017
GENERAL CHEMISTRY|ANIONS (µg/L)									
Fluoride	204 J-	15 U	180 J	425	322 J-	147	198 J	233	185 J-

Footnotes:
-- = not applicable
- = Result is biased low
+ = Result is biased high
J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
U = The analyte was analyzed for, but was not detected above the reported sample quantitation limit. The associated value is the quantitation limit or the estimated detection limit for dioxins or PCB congeners
µg/L = microgram(s) per liter

Appendix A-12a
Main Plant ISS Area Soil (0-0.5 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFISS-024	CFISS-025	CFISS-026	CFISS-027	CFISS-027-	CFISS-028	CFISS-029	CFISS-030	CFISS-031	CFISS-032	CFISS-033	CFISS-034	CFISS-035	CFISS-036	CFISS-037	CFISS-038	CFISS-039	CFISS-040	CFISS-041	CFISS-042	CFISS-043
Sample Lab IDs	240-66695-2	240-66695-5	240-66695-7	240-66695-9	240-66695-10	240-66695-12	240-66588-5	240-67693-1	240-67287-1	240-67138-5	240-67138-7	240-67138-1	240-67138-3	240-67353-1	240-67353-3	240-67287-5	240-67287-7	240-67287-3	240-67353-6	240-67463-3	240-67463-1
Sample Name	CFISS-024-SO-0-0.5	CFISS-025-SO-0-0.5	CFISS-026-SO-0-0.5	CFISS-027-SO-0-0.5	CFISS-DUP3-SO	CFISS-028-SO-0-0.5	CFISS-029-SO-0-0.5	CFISS-030-SO-0-0.5	CFISS-031-S0-0-0.5	CFISS-032-SO-0-0.5	CFISS-033-SO-0-0.5	CFISS-034-SO-0-0.5	CFISS-035-SO-0-0.5	CFISS-036-SO-0-0.5	CFISS-037-SO-0-0.5	CFISS-038-S0-0-0.5	CFISS-039-S0-0-0.5	CFISS-040-S0-0-0.5	CFISS-41-SO-0-0.5	CFISS-042-SO-0-0.5	CFISS-043-SO-0-0.5
Sample Depth	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft
Chemical	6/29/2016	6/30/2016	6/30/2016	7/1/2016	7/1/2016	7/1/2016	6/27/2016	7/25/2016	7/13/2016	7/12/2016	7/12/2016	7/11/2016	7/11/2016	7/15/2016	7/15/2016	7/14/2016	7/14/2016	7/13/2016	7/16/2016	7/18/2016	7/18/2016
GENERAL CHEMISTRY|ANIONS (mg/kg)																					
Fluoride	592 J+	69.8	617 J+	244 J+	239 J+	183 J+	39.9 J	270 J-	391	59.3	544	301	92.8	56.3	83.4	507	60.9	349	84.3	632	534

Footnotes:
- = Result is biased low
+ = Result is biased high
ft = feet
ft-bgs = feet below ground surface
J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
mg/kg = milligram(s) per kilogram

Appendix A-12b
Central Landfill ISS Area Soil (0-0.5 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFISS-001	CFISS-002	CFISS-002	CFISS-003	CFISS-004	CFISS-005	CFISS-006	CFISS-006-DUP	CFISS-006	CFISS-006-DUP	CFISS-007	CFISS-008	CFISS-008	CFISS-009	CFISS-010	CFISS-011	CFISS-012
Sample Lab IDs	460-115528-29	460-115528-32	240-67463-7	460-115648-6	460-115648-8	460-115648-12	460-115731-13	460-115731-17	240-67463-5	240-67463-9	460-115731-15	460-115731-18	240-67693-3	460-116014-3	460-116014-5	460-115886-15	460-115886-18
Sample Name	CFISS-001-SO-0-0.5	CFISS-002-SO-0-0.5	CFISS-002-SO-0-0.5	CFISS-003-SO-0-0.5	CFISS-004-SO-0-0.5	CFISS-005-SO-0-0.5	CFISS-006-SO-0-0.5	CFISS-DUP1-SO	CFISS-006-SO-0-0.5	CFISS-DUP1-SO	CFISS-007-SO-0-0.5	CFISS-008-SO-0-0.5	CFISS-008-SO-0-0.5	CFISS-009-SO-0-0.5	CFISS-010-SO-0-0.5	CFISS-011-SO-0-0.5	CFISS-012-SO-0-0.5
Sample Depth	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft
Chemical	6/14/2016	6/14/2016	7/19/2016	6/15/2016	6/15/2016	6/16/2016	6/17/2016	6/17/2016	7/19/2016	7/19/2016	6/17/2016	6/18/2016	7/26/2016	6/22/2016	6/22/2016	6/21/2016	6/21/2016
GENERAL CHEMISTRY|ANIONS (mg/kg)																	
Fluoride	10.4 J	18.6 J	976	680 J-	86.7 J-	54.9 J-	59	78.1 J-	70.2	73.2	189 J-	328 J-	662 J-	21.8 J+	33.8 J+	41.2 J	45.5 J

Footnotes:
-- = not applicable
- = Result is biased low
+ = Result is biased high
ft = feet
ft-bgs = feet below ground surface
J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
mg/kg = milligram(s) per kilogram

Appendix A-12b
Central Landfill ISS Area Soil (0-0.5 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFISS-013	CFISS-014	CFISS-015	CFISS-016	CFISS-017	CFISS-018	CFISS-019	CFISS-020	CFISS-020-	CFISS-021	CFISS-022	CFISS-023	CFISS-024	CFISS-025	CFISS-026	CFISS-027	CFISS-027-DUP	CFISS-028	CFISS-029
Sample Lab IDs	460-115886-6	460-115886-8	460-115731-20	240-66446-1	240-66695-1	240-66516-1	240-66516-3	240-66516-5	240-66516-6	240-66516-8	240-66588-1	240-66588-3	240-66695-2	240-66695-5	240-66695-7	240-66695-9	240-66695-10	240-66695-12	240-66588-5
Sample Name	CFISS-013-SO-0-0.5	CFISS-014-SO-0-0.5	CFISS-015-SO-0-0.5	CFISS-016-SO-0-0.5	CFISS-017-SO-0-0.5	CFISS-018-SO-0-0.5	CFISS-019-SO-0-0.5	CFISS-020-SO-0-0.5	CFISS-DUP2-SO	CFISS-021-SO-0-0.5	CFISS-022-SO-0-0.5	CFISS-023-SO-0-0.5	CFISS-024-SO-0-0.5	CFISS-025-SO-0-0.5	CFISS-026-SO-0-0.5	CFISS-027-SO-0-0.5	CFISS-DUP3-SO	CFISS-028-SO-0-0.5	CFISS-029-SO-0-0.5
Sample Depth	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft
Chemical	6/20/2016	6/20/2016	6/18/2016	6/23/2016	6/29/2016	6/24/2016	6/24/2016	6/25/2016	6/25/2016	6/25/2016	6/27/2016	6/27/2016	6/29/2016	6/30/2016	6/30/2016	7/1/2016	7/1/2016	7/1/2016	6/27/2016
GENERAL CHEMISTRY|ANIONS (mg/kg)																			
Fluoride	254 J	318 J	372 J-	27.6	36.7	72.9 J-	215 J-	61.2 J-	60.4 J-	251 J-	732 J+	39.3 J	592 J+	69.8	617 J+	244 J+	239 J+	183 J+	39.9 J

Footnotes:
-- = not applicable
- = Result is biased low
+ = Result is biased high
ft = feet
ft-bgs = feet below ground surface
J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
mg/kg = milligram(s) per kilogram

Appendix A-12c
Central Landfill ISS Area Soil (0-2 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFISS-001	CFISS-001	CFISS-002	CFISS-002	CFISS-002	CFISS-002	CFISS-003	CFISS-003	CFISS-004	CFISS-004	CFISS-005	CFISS-005	CFISS-006	CFISS-006-DUP	CFISS-006	CFISS-006	CFISS-006-DUP	CFISS-006	CFISS-007
Sample Lab IDs	460-115528-29	460-115528-30	460-115528-32	460-115528-33	240-67463-7	240-67463-8	460-115648-6	460-115648-7	460-115648-8	460-115648-9	460-115648-12	460-115648-13	460-115731-13	460-115731-17	460-115731-14	240-67463-5	240-67463-9	240-67463-6	460-115731-15
Sample Name	CFISS-001-SO-0.5	CFISS-001-SO-0.5-2	CFISS-002-SO-0.5	CFISS-002-SO-0.5-2	CFISS-002-SO-0-0.5	CFISS-002-SO-0.5-2	CFISS-003-SO-0-0.5	CFISS-003-SO-0.5-2	CFISS-004-SO-0.5	CFISS-004-SO-0.5-2	CFISS-005-SO-0.5	CFISS-005-SO-0.5-2	CFISS-006-SO-0.5	CFISS-DUP1-SO	CFISS-006-SO-0.5-2	CFISS-006-SO-0-0.5	CFISS-DUP1-SO	CFISS-006-SO-0.5-2	CFISS-007-SO-0.5
Sample Depth	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft
Chemical	6/14/2016	6/14/2016	6/14/2016	6/14/2016	7/19/2016	7/19/2016	6/15/2016	6/15/2016	6/15/2016	6/15/2016	6/16/2016	6/16/2016	6/17/2016	6/17/2016	6/17/2016	7/19/2016	7/19/2016	7/19/2016	6/17/2016
GENERAL CHEMISTRY|ANIONS (mg/kg)																			
Fluoride	10.4 J	35.5 J	18.6 J	53.3 J	976	647	680 J-	270 J-	86.7 J-	81.4 J-	54.9 J-	61.8 J-	59	78.1 J-	76 J-	70.2	73.2	85.4	189 J-

Footnotes:
-- = not applicable
- = Result is biased low
+ = Result is biased high
ft = feet
ft-bgs = feet below ground surface
J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
mg/kg = milligram(s) per kilogram

Appendix A-12c
Central Landfill ISS Area Soil (0-2 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFISS-007	CFISS-008	CFISS-008	CFISS-008	CFISS-008	CFISS-009	CFISS-009	CFISS-010	CFISS-010	CFISS-011	CFISS-011	CFISS-012	CFISS-012	CFISS-013	CFISS-013	CFISS-014	CFISS-014	CFISS-015	CFISS-015
Sample Lab IDs	460-115731-16	460-115731-18	460-115731-19	240-67693-3	240-67693-4	460-116014-3	460-116014-4	460-116014-5	460-116014-6	460-115886-15	460-115886-16	460-115886-18	460-115886-19	460-115886-6	460-115886-7	460-115886-8	460-115886-9	460-115731-20	460-115731-21
Sample Name	CFISS-007-SO-0.5-2	CFISS-008-SO-0.5	CFISS-008-SO-0.5-2	CFISS-008-SO-0-0.5	CFISS-008-SO-0.5-2	CFISS-009-SO-0.5	CFISS-009-SO-0.5-2	CFISS-010-SO-0-0.5	CFISS-010-SO-0.5-2	CFISS-011-SO-0.5	CFISS-011-SO-0.5-2	CFISS-012-SO-0.5	CFISS-012-SO-0.5-2	CFISS-013-SO-0.5	CFISS-013-SO-0.5-2	CFISS-014-SO-0.5	CFISS-014-SO-0.5-2	CFISS-015-SO-0.5	CFISS-015-SO-0.5-2
Sample Depth	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft
Chemical	6/17/2016	6/18/2016	6/18/2016	7/26/2016	7/26/2016	6/22/2016	6/22/2016	6/22/2016	6/22/2016	6/21/2016	6/21/2016	6/21/2016	6/21/2016	6/20/2016	6/20/2016	6/20/2016	6/20/2016	6/18/2016	6/18/2016
GENERAL CHEMISTRY|ANIONS (mg/kg)																			
Fluoride	141 J-	328 J-	320 J-	662 J-	508 J-	21.8 J+	53.8 J+	33.8 J+	28.3 J+	41.2 J	60.9 J	45.5 J	52.9 J	254 J	337 J	318 J	598 J	372 J-	379 J-

Footnotes:
-- = not applicable
- = Result is biased low
+ = Result is biased high
ft = feet
ft-bgs = feet below ground surface
J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
mg/kg = milligram(s) per kilogram

Appendix A-12c
Central Landfill ISS Area Soil (0-2 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFISS-016	CFISS-016	CFISS-017	CFISS-017	CFISS-018	CFISS-018	CFISS-019	CFISS-019	CFISS-020	CFISS-020-DUP	CFISS-020	CFISS-021	CFISS-021	CFISS-022	CFISS-022	CFISS-023	CFISS-023	CFISS-024	CFISS-024
Sample Lab IDs	240-66446-1	240-66588-7	240-66446-4	240-66695-1	240-66516-1	240-66516-2	240-66516-3	240-66516-4	240-66516-5	240-66516-6	240-66516-7	240-66516-8	240-66516-10	240-66588-1	240-66588-2	240-66588-3	240-66588-4	240-66695-2	240-66695-4
Sample Name	CFISS-016-SO-0-0.5	CFISS-016-SO-0.5-2	CFISS-017-SO-0.5-2	CFISS-017-SO-0-0.5	CFISS-018-SO-0-0.5	CFISS-018-SO-0.5-2	CFISS-019-SO-0-0.5	CFISS-019-SO-0.5-2	CFISS-020-SO-0.5	CFISS-DUP2-SO	CFISS-020-SO-0.5-2	CFISS-021-SO-0-0.5	CFISS-021-SO-0.5-2	CFISS-022-SO-0-0.5	CFISS-022-SO-0.5-2	CFISS-023-SO-0-0.5	CFISS-023-SO-0.5-2	CFISS-024-SO-0-0.5	CFISS-024-SO-0.5-2
Sample Depth	0-0.5 ft	0.5-2 ft	0.5-2 ft	0-0.5 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft
Chemical	6/23/2016	6/28/2016	6/23/2016	6/29/2016	6/24/2016	6/24/2016	6/24/2016	6/24/2016	6/25/2016	6/25/2016	6/25/2016	6/25/2016	6/25/2016	6/27/2016	6/27/2016	6/27/2016	6/27/2016	6/29/2016	6/29/2016
GENERAL CHEMISTRY|ANIONS (mg/kg)																			
Fluoride	27.6	36.8 J	28.6	36.7	72.9 J-	16.6 J-	215 J-	70.5 J-	61.2 J-	60.4 J-	36.7 J-	251 J-	136 J-	732 J+	282 J+	39.3 J	44.6 J	592 J+	204 J+

Footnotes:
-- = not applicable
- = Result is biased low
+ = Result is biased high
ft = feet
ft-bgs = feet below ground surface
J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
mg/kg = milligram(s) per kilogram

Appendix A-12c
Central Landfill ISS Area Soil (0-2 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Sample Location ID	CFISS-025	CFISS-025	CFISS-026	CFISS-026	CFISS-027	CFISS-027-DUP	CFISS-027	CFISS-028	CFISS-028	CFISS-029	CFISS-029
Sample Lab IDs	240-66695-5	240-66695-6	240-66695-7	240-66695-8	240-66695-9	240-66695-10	240-66695-11	240-66695-12	240-66695-14	240-66588-5	240-66588-6
Sample Name	CFISS-025-SO-0-0.5	CFISS-025-SO-0.5-2	CFISS-026-SO-0-0.5	CFISS-026-SO-0.5-2	CFISS-027-SO-0-0.5	CFISS-DUP3-SO	CFISS-027-SO-0.5-2	CFISS-028-SO-0-0.5	CFISS-028-SO-0.5-2	CFISS-029-SO-0-0.5	CFISS-029-SO-0.5-2
Sample Depth	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft	0-0.5 ft	0.5-2 ft
Chemical	6/30/2016	6/30/2016	6/30/2016	6/30/2016	7/1/2016	7/1/2016	7/1/2016	7/1/2016	7/1/2016	6/27/2016	6/27/2016
GENERAL CHEMISTRY|ANIONS (mg/kg)											
Fluoride	69.8	157 J+	617 J+	632 J+	244 J+	239 J+	946	183 J+	861 J+	39.9 J	53 J

Footnotes:
-- = not applicable
- = Result is biased low
+ = Result is biased high
ft = feet
ft-bgs = feet below ground surface
J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
mg/kg = milligram(s) per kilogram

Attachment B ProUCL Outputs

ProUCL Output
Main Plant Area Soil (0-0.5 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

1	**UCL Statistics for Data Sets with Non-Detects**											
2												
3				User Selected Options								
4				Date/Time of Computation	ProUCL 5.17/17/2018 4:56:19 PM							
5				From File	20180717_fluoride_for_proucl.xls							
6				Full Precision	OFF							
7				Confidence Coefficient	95%							
8				Number of Bootstrap Operations	2000							
9												
10												
11	**Fluoride**											
12												
13	**General Statistics**											
14					Total Number of Observations	60			Number of Distinct Observations	60		
15									Number of Missing Observations	0		
16					Minimum	4.25			Mean	75.53		
17					Maximum	571			Median	45.35		
18					SD	92.23			Std. Error of Mean	11.91		
19					Coefficient of Variation	1.221			Skewness	3.27		
20												
21	**Normal GOF Test**											
22					Shapiro Wilk Test Statistic	0.668			**Shapiro Wilk GOF Test**			
23					5% Shapiro Wilk P Value	0			Data Not Normal at 5% Significance Level			
24					Lilliefors Test Statistic	0.233			**Lilliefors GOF Test**			
25					5% Lilliefors Critical Value	0.114			Data Not Normal at 5% Significance Level			
26	Data Not Normal at 5% Significance Level											
27												
28	**Assuming Normal Distribution**											
29					**95% Normal UCL**				**95% UCLs (Adjusted for Skewness)**			
30					95% Student's-t UCL	95.43			95% Adjusted-CLT UCL (Chen-1995)	100.5		
31									95% Modified-t UCL (Johnson-1978)	96.27		
32												
33	**Gamma GOF Test**											
34					A-D Test Statistic	0.999			**Anderson-Darling Gamma GOF Test**			
35					5% A-D Critical Value	0.776			Data Not Gamma Distributed at 5% Significance Level			
36					K-S Test Statistic	0.122			**Kolmogorov-Smirnov Gamma GOF Test**			
37					5% K-S Critical Value	0.118			Data Not Gamma Distributed at 5% Significance Level			
38	Data Not Gamma Distributed at 5% Significance Level											
39												
40	**Gamma Statistics**											
41					k hat (MLE)	1.156			k star (bias corrected MLE)	1.11		
42					Theta hat (MLE)	65.31			Theta star (bias corrected MLE)	68.06		
43					nu hat (MLE)	138.8			nu star (bias corrected)	133.2		
44					MLE Mean (bias corrected)	75.53			MLE Sd (bias corrected)	71.7		
45									Approximate Chi Square Value (0.05)	107.5		
46					Adjusted Level of Significance	0.046			Adjusted Chi Square Value	106.9		
47												
48	**Assuming Gamma Distribution**											
49					95% Approximate Gamma UCL (use when n>=50))	93.56			95% Adjusted Gamma UCL (use when n<50)	94.06		
50												

ProUCL Output
Main Plant Area Soil (0-0.5 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

	A	B	C	D	E	F	G	H	I	J	K	L
51	**Lognormal GOF Test**											
52					Shapiro Wilk Test Statistic	0.992	**Shapiro Wilk Lognormal GOF Test**					
53					5% Shapiro Wilk P Value	0.992	Data appear Lognormal at 5% Significance Level					
54					Lilliefors Test Statistic	0.0558	**Lilliefors Lognormal GOF Test**					
55					5% Lilliefors Critical Value	0.114	Data appear Lognormal at 5% Significance Level					
56	Data appear Lognormal at 5% Significance Level											
57												
58	**Lognormal Statistics**											
59					Minimum of Logged Data	1.447				Mean of logged Data	3.834	
60					Maximum of Logged Data	6.347				SD of logged Data	0.995	
61												
62	**Assuming Lognormal Distribution**											
63					95% H-UCL	102.8				90% Chebyshev (MVUE) UCL	109.1	
64					95% Chebyshev (MVUE) UCL	124.6				97.5% Chebyshev (MVUE) UCL	146	
65					99% Chebyshev (MVUE) UCL	188.2						
66												
67	**Nonparametric Distribution Free UCL Statistics**											
68	Data appear to follow a Discernible Distribution at 5% Significance Level											
69												
70	**Nonparametric Distribution Free UCLs**											
71					95% CLT UCL	95.12				95% Jackknife UCL	95.43	
72					95% Standard Bootstrap UCL	95.1				95% Bootstrap-t UCL	105.4	
73					95% Hall's Bootstrap UCL	114.8				95% Percentile Bootstrap UCL	96.46	
74					95% BCA Bootstrap UCL	101.2						
75					90% Chebyshev(Mean, Sd) UCL	111.3				95% Chebyshev(Mean, Sd) UCL	127.4	
76					97.5% Chebyshev(Mean, Sd) UCL	149.9				99% Chebyshev(Mean, Sd) UCL	194	
77												
78	**Suggested UCL to Use**											
79					95% H-UCL	102.8						
80												
81	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
82	Recommendations are based upon data size, data distribution, and skewness.											
83	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
84	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
85												
86	ProUCL computes and outputs H-statistic based UCLs for historical reasons only.											
87	H-statistic often results in unstable (both high and low) values of UCL95 as shown in examples in the Technical Guide.											
88	It is therefore recommended to avoid the use of H-statistic based 95% UCLs.											
89	Use of nonparametric methods are preferred to compute UCL95 for skewed data sets which do not follow a gamma distribution.											

ProUCL Output
Main Plant Area Soil (0-12 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

1	**UCL Statistics for Data Sets with Non-Detects**											
2												
3				User Selected Options								
4				Date/Time of Computation	ProUCL 5.17/17/2018 4:55:14 PM							
5				From File	20180717_fluoride_for_proucl_a.xls							
6				Full Precision	OFF							
7				Confidence Coefficient	95%							
8				Number of Bootstrap Operations	2000							
9												
10	**Fluoride**											
11												
12	**General Statistics**											
13					Total Number of Observations	197			Number of Distinct Observations	184		
14					Number of Detects	196			Number of Non-Detects	1		
15					Number of Distinct Detects	183			Number of Distinct Non-Detects	1		
16					Minimum Detect	1.29			Minimum Non-Detect	0.19		
17					Maximum Detect	571			Maximum Non-Detect	0.19		
18					Variance Detects	5721			Percent Non-Detects	0.508%		
19					Mean Detects	52.55			SD Detects	75.63		
20					Median Detects	25.85			CV Detects	1.439		
21					Skewness Detects	3.345			Kurtosis Detects	14.68		
22					Mean of Logged Detects	3.228			SD of Logged Detects	1.269		
23												
24	**Normal GOF Test on Detects Only**											
25					Shapiro Wilk Test Statistic	0.64			**Normal GOF Test on Detected Observations Only**			
26					5% Shapiro Wilk P Value	0			Detected Data Not Normal at 5% Significance Level			
27					Lilliefors Test Statistic	0.249			**Lilliefors GOF Test**			
28					5% Lilliefors Critical Value	0.0637			Detected Data Not Normal at 5% Significance Level			
29	**Detected Data Not Normal at 5% Significance Level**											
30												
31	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
32					KM Mean	52.29			KM Standard Error of Mean	5.382		
33					KM SD	75.34			95% KM (BCA) UCL	61.09		
34					95% KM (t) UCL	61.18			95% KM (Percentile Bootstrap) UCL	61.95		
35					95% KM (z) UCL	61.14			95% KM Bootstrap t UCL	62.74		
36					90% KM Chebyshev UCL	68.43			95% KM Chebyshev UCL	75.75		
37					97.5% KM Chebyshev UCL	85.9			99% KM Chebyshev UCL	105.8		
38												
39	**Gamma GOF Tests on Detected Observations Only**											
40					A-D Test Statistic	2.426			**Anderson-Darling GOF Test**			
41					5% A-D Critical Value	0.793			Detected Data Not Gamma Distributed at 5% Significance Level			
42					K-S Test Statistic	0.0868			**Kolmogorov-Smirnov GOF**			
43					5% K-S Critical Value	0.0671			Detected Data Not Gamma Distributed at 5% Significance Level			
44	**Detected Data Not Gamma Distributed at 5% Significance Level**											
45												
46	**Gamma Statistics on Detected Data Only**											
47					k hat (MLE)	0.807			k star (bias corrected MLE)	0.798		
48					Theta hat (MLE)	65.1			Theta star (bias corrected MLE)	65.83		
49					nu hat (MLE)	316.5			nu star (bias corrected)	313		
50					Mean (detects)	52.55						
51												

ProUCL Output
Main Plant Area Soil (0-12 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

52	**Gamma ROS Statistics using Imputed Non-Detects**											
53	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
54	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
55	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
56	This is especially true when the sample size is small.											
57	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
58						Minimum	0.01				Mean	52.29
59						Maximum	571				Median	25.8
60						SD	75.53				CV	1.445
61						k hat (MLE)	0.775				k star (bias corrected MLE)	0.767
62						Theta hat (MLE)	67.46				Theta star (bias corrected MLE)	68.2
63						nu hat (MLE)	305.4				nu star (bias corrected)	302.1
64						Adjusted Level of Significance (β)	0.0488					
65						Approximate Chi Square Value (302.07, α)	262.8				Adjusted Chi Square Value (302.07, β)	262.5
66						95% Gamma Approximate UCL (use when n>=50)	60.1				95% Gamma Adjusted UCL (use when n<50)	60.16
67												
68	**Estimates of Gamma Parameters using KM Estimates**											
69						Mean (KM)	52.29				SD (KM)	75.34
70						Variance (KM)	5676				SE of Mean (KM)	5.382
71						k hat (KM)	0.482				k star (KM)	0.478
72						nu hat (KM)	189.8				nu star (KM)	188.2
73						theta hat (KM)	108.6				theta star (KM)	109.5
74						80% gamma percentile (KM)	85.68				90% gamma percentile (KM)	142.8
75						95% gamma percentile (KM)	204.1				99% gamma percentile (KM)	355.7
76												
77	**Gamma Kaplan-Meier (KM) Statistics**											
78						Approximate Chi Square Value (188.21, α)	157.5				Adjusted Chi Square Value (188.21, β)	157.3
79						95% Gamma Approximate KM-UCL (use when n>=50)	62.49				95% Gamma Adjusted KM-UCL (use when n<50)	62.58
80												
81	**Lognormal GOF Test on Detected Observations Only**											
82						Shapiro Wilk Approximate Test Statistic	0.976				**Shapiro Wilk GOF Test**	
83						5% Shapiro Wilk P Value	0.137				Detected Data appear Lognormal at 5% Significance Level	
84						Lilliefors Test Statistic	0.0309				**Lilliefors GOF Test**	
85						5% Lilliefors Critical Value	0.0637				Detected Data appear Lognormal at 5% Significance Level	
86	Detected Data appear Lognormal at 5% Significance Level											
87												
88	**Lognormal ROS Statistics Using Imputed Non-Detects**											
89						Mean in Original Scale	52.29				Mean in Log Scale	3.209
90						SD in Original Scale	75.53				SD in Log Scale	1.293
91						95% t UCL (assumes normality of ROS data)	61.18				95% Percentile Bootstrap UCL	61.33
92						95% BCA Bootstrap UCL	62.66				95% Bootstrap t UCL	63.04
93						95% H-UCL (Log ROS)	71.62					
94												
95	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
96						KM Mean (logged)	3.203				KM Geo Mean	24.6
97						KM SD (logged)	1.31				95% Critical H Value (KM-Log)	2.467
98						KM Standard Error of Mean (logged)	0.0936				95% H-UCL (KM -Log)	73.06
99						KM SD (logged)	1.31				95% Critical H Value (KM-Log)	2.467
100						KM Standard Error of Mean (logged)	0.0936					
101												
102	**DL/2 Statistics**											

ProUCL Output
Main Plant Area Soil (0-12 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

	A	B	C	D	E	F	G	H	I	J	K	L
103	**DL/2 Normal**						**DL/2 Log-Transformed**					
104					Mean in Original Scale	52.29				Mean in Log Scale		3.199
105					SD in Original Scale	75.53				SD in Log Scale		1.327
106					95% t UCL (Assumes normality)	61.18				95% H-Stat UCL		74.83
107	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
108												
109	**Nonparametric Distribution Free UCL Statistics**											
110	**Detected Data appear Lognormal Distributed at 5% Significance Level**											
111												
112	**Suggested UCL to Use**											
113					KM H-UCL	73.06						
114												
115	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
116	Recommendations are based upon data size, data distribution, and skewness.											
117	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
118	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
119												

ProUCL Output
North Percolation Pond Area Soil (0-2 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

1	**UCL Statistics for Data Sets with Non-Detects**											
2												
3				User Selected Options								
4				Date/Time of Computation	ProUCL 5.17/17/2018 4:54:06 PM							
5				From File	20180717_fluoride_for_proucl_b.xls							
6				Full Precision	OFF							
7				Confidence Coefficient	95%							
8				Number of Bootstrap Operations	2000							
9												
10												
11	**Fluoride**											
12												
13	**General Statistics**											
14						Total Number of Observations	18			Number of Distinct Observations	18		
15										Number of Missing Observations	0	
16						Minimum	7.98			Mean	106.7	
17						Maximum	258			Median	82.75	
18						SD	76.79			Std. Error of Mean	18.1	
19						Coefficient of Variation	0.72			Skewness	0.745	
20												
21	**Normal GOF Test**											
22						Shapiro Wilk Test Statistic	0.905			**Shapiro Wilk GOF Test**		
23						5% Shapiro Wilk Critical Value	0.897			Data appear Normal at 5% Significance Level		
24						Lilliefors Test Statistic	0.178			**Lilliefors GOF Test**		
25						5% Lilliefors Critical Value	0.202			Data appear Normal at 5% Significance Level		
26	**Data appear Normal at 5% Significance Level**											
27												
28	**Assuming Normal Distribution**											
29						**95% Normal UCL**				**95% UCLs (Adjusted for Skewness)**		
30						95% Student's-t UCL	138.1			95% Adjusted-CLT UCL (Chen-1995)	139.8	
31										95% Modified-t UCL (Johnson-1978)	138.7	
32												
33	**Gamma GOF Test**											
34						A-D Test Statistic	0.278			**Anderson-Darling Gamma GOF Test**		
35						5% A-D Critical Value	0.754			Detected data appear Gamma Distributed at 5% Significance Level		
36						K-S Test Statistic	0.122			**Kolmogorov-Smirnov Gamma GOF Test**		
37						5% K-S Critical Value	0.207			Detected data appear Gamma Distributed at 5% Significance Level		
38	**Detected data appear Gamma Distributed at 5% Significance Level**											
39												
40	**Gamma Statistics**											
41						k hat (MLE)	1.778			k star (bias corrected MLE)	1.519	
42						Theta hat (MLE)	59.99			Theta star (bias corrected MLE)	70.23	
43						nu hat (MLE)	64.01			nu star (bias corrected)	54.67	
44						MLE Mean (bias corrected)	106.7			MLE Sd (bias corrected)	86.54	
45										Approximate Chi Square Value (0.05)	38.68	
46						Adjusted Level of Significance	0.0357			Adjusted Chi Square Value	37.39	
47												
48	**Assuming Gamma Distribution**											
49						95% Approximate Gamma UCL (use when n>=50))	150.7			95% Adjusted Gamma UCL (use when n<50)	155.9	
50												
51	**Lognormal GOF Test**											

ProUCL Output
North Percolation Pond Area Soil (0-2 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

	A	B	C	D	E	F	G	H	I	J	K	L
52					Shapiro Wilk Test Statistic	0.937	**Shapiro Wilk Lognormal GOF Test**					
53					5% Shapiro Wilk Critical Value	0.897	Data appear Lognormal at 5% Significance Level					
54					Lilliefors Test Statistic	0.141	**Lilliefors Lognormal GOF Test**					
55					5% Lilliefors Critical Value	0.202	Data appear Lognormal at 5% Significance Level					
56					Data appear Lognormal at 5% Significance Level							
57												
58					**Lognormal Statistics**							
59					Minimum of Logged Data	2.077	Mean of logged Data	4.363				
60					Maximum of Logged Data	5.553	SD of logged Data	0.897				
61												
62					**Assuming Lognormal Distribution**							
63					95% H-UCL	201.9	90% Chebyshev (MVUE) UCL	193				
64					95% Chebyshev (MVUE) UCL	228.8	97.5% Chebyshev (MVUE) UCL	278.6				
65					99% Chebyshev (MVUE) UCL	376.2						
66												
67					**Nonparametric Distribution Free UCL Statistics**							
68					Data appear to follow a Discernible Distribution at 5% Significance Level							
69												
70					**Nonparametric Distribution Free UCLs**							
71					95% CLT UCL	136.4	95% Jackknife UCL	138.1				
72					95% Standard Bootstrap UCL	136	95% Bootstrap-t UCL	143.7				
73					95% Hall's Bootstrap UCL	138.8	95% Percentile Bootstrap UCL	135.8				
74					95% BCA Bootstrap UCL	135.7						
75					90% Chebyshev(Mean, Sd) UCL	161	95% Chebyshev(Mean, Sd) UCL	185.5				
76					97.5% Chebyshev(Mean, Sd) UCL	219.7	99% Chebyshev(Mean, Sd) UCL	286.7				
77												
78					**Suggested UCL to Use**							
79					95% Student's-t UCL	138.1						
80												
81					Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.							
82					Recommendations are based upon data size, data distribution, and skewness.							
83					These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).							
84					However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.							
85												

ProUCL Output
North Percolation Pond Area Soil (0-12 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

1	**UCL Statistics for Data Sets with Non-Detects**											
2												
3				User Selected Options								
4				Date/Time of Computation	ProUCL 5.17/17/2018 4:53:01 PM							
5				From File	20180717_fluoride_for_proucl_c.xls							
6				Full Precision	OFF							
7				Confidence Coefficient	95%							
8				Number of Bootstrap Operations	2000							
9												
10												
11	**Fluoride**											
12												
13	**General Statistics**											
14						Total Number of Observations	27			Number of Distinct Observations		27	
15										Number of Missing Observations		0
16						Minimum	0.87			Mean		78.85
17						Maximum	258			Median		50.2
18						SD	74.5			Std. Error of Mean		14.34
19						Coefficient of Variation	0.945			Skewness		1.197
20												
21	**Normal GOF Test**											
22						Shapiro Wilk Test Statistic	0.843			**Shapiro Wilk GOF Test**		
23						5% Shapiro Wilk Critical Value	0.923			Data Not Normal at 5% Significance Level		
24						Lilliefors Test Statistic	0.236			**Lilliefors GOF Test**		
25						5% Lilliefors Critical Value	0.167			Data Not Normal at 5% Significance Level		
26	**Data Not Normal at 5% Significance Level**											
27												
28	**Assuming Normal Distribution**											
29						**95% Normal UCL**				**95% UCLs (Adjusted for Skewness)**		
30						95% Student's-t UCL	103.3			95% Adjusted-CLT UCL (Chen-1995)		106
31										95% Modified-t UCL (Johnson-1978)		103.9
32												
33	**Gamma GOF Test**											
34						A-D Test Statistic	0.238			**Anderson-Darling Gamma GOF Test**		
35						5% A-D Critical Value	0.773			Detected data appear Gamma Distributed at 5% Significance Level		
36						K-S Test Statistic	0.106			**Kolmogorov-Smirnov Gamma GOF Test**		
37						5% K-S Critical Value	0.173			Detected data appear Gamma Distributed at 5% Significance Level		
38	**Detected data appear Gamma Distributed at 5% Significance Level**											
39												
40	**Gamma Statistics**											
41						k hat (MLE)	1.013			k star (bias corrected MLE)		0.925
42						Theta hat (MLE)	77.85			Theta star (bias corrected MLE)		85.24
43						nu hat (MLE)	54.7			nu star (bias corrected)		49.95
44						MLE Mean (bias corrected)	78.85			MLE Sd (bias corrected)		81.99
45										Approximate Chi Square Value (0.05)		34.72
46						Adjusted Level of Significance	0.0401			Adjusted Chi Square Value		33.91
47												
48	**Assuming Gamma Distribution**											
49						95% Approximate Gamma UCL (use when n>=50)	113.4			95% Adjusted Gamma UCL (use when n<50)		116.2
50												

ProUCL Output
North Percolation Pond Area Soil (0-12 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

51	**Lognormal GOF Test**											
52					Shapiro Wilk Test Statistic	0.92	**Shapiro Wilk Lognormal GOF Test**					
53					5% Shapiro Wilk Critical Value	0.923	Data Not Lognormal at 5% Significance Level					
54					Lilliefors Test Statistic	0.13	**Lilliefors Lognormal GOF Test**					
55					5% Lilliefors Critical Value	0.167	Data appear Lognormal at 5% Significance Level					
56	Data appear Approximate Lognormal at 5% Significance Level											
57												
58	**Lognormal Statistics**											
59					Minimum of Logged Data	-0.139				Mean of logged Data		3.799
60					Maximum of Logged Data	5.553				SD of logged Data		1.311
61												
62	**Assuming Lognormal Distribution**											
63					95% H-UCL	225.2				90% Chebyshev (MVUE) UCL		191.2
64					95% Chebyshev (MVUE) UCL	232.5				97.5% Chebyshev (MVUE) UCL		290
65					99% Chebyshev (MVUE) UCL	402.8						
66												
67	**Nonparametric Distribution Free UCL Statistics**											
68	Data appear to follow a Discernible Distribution at 5% Significance Level											
69												
70	**Nonparametric Distribution Free UCLs**											
71					95% CLT UCL	102.4				95% Jackknife UCL		103.3
72					95% Standard Bootstrap UCL	102.6				95% Bootstrap-t UCL		109.3
73					95% Hall's Bootstrap UCL	104.8				95% Percentile Bootstrap UCL		103.7
74					95% BCA Bootstrap UCL	106.6						
75					90% Chebyshev(Mean, Sd) UCL	121.9				95% Chebyshev(Mean, Sd) UCL		141.3
76					97.5% Chebyshev(Mean, Sd) UCL	168.4				99% Chebyshev(Mean, Sd) UCL		221.5
77												
78	**Suggested UCL to Use**											
79					95% Adjusted Gamma UCL	116.2						
80												
81	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
82	Recommendations are based upon data size, data distribution, and skewness.											
83	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
84	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
85												

ProUCL Output
Central Landfills Area Soil (0-0.5 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

1	**UCL Statistics for Data Sets with Non-Detects**											
2												
3				User Selected Options								
4				Date/Time of Computation	ProUCL 5.17/17/2018 4:52:07 PM							
5				From File	20180717_fluoride_for_proucl_d.xls							
6				Full Precision	OFF							
7				Confidence Coefficient	95%							
8				Number of Bootstrap Operations	2000							
9												
10												
11	**Fluoride**											
12												
13	**General Statistics**											
14					Total Number of Observations	27			Number of Distinct Observations	27		
15									Number of Missing Observations	0		
16					Minimum	9.33			Mean	63.1		
17					Maximum	210			Median	56.5		
18					SD	50.89			Std. Error of Mean	9.794		
19					Coefficient of Variation	0.807			Skewness	1.325		
20												
21	**Normal GOF Test**											
22					Shapiro Wilk Test Statistic	0.864			**Shapiro Wilk GOF Test**			
23					5% Shapiro Wilk Critical Value	0.923			Data Not Normal at 5% Significance Level			
24					Lilliefors Test Statistic	0.173			**Lilliefors GOF Test**			
25					5% Lilliefors Critical Value	0.167			Data Not Normal at 5% Significance Level			
26	Data Not Normal at 5% Significance Level											
27												
28	**Assuming Normal Distribution**											
29					**95% Normal UCL**				**95% UCLs (Adjusted for Skewness)**			
30					95% Student's-t UCL	79.8			95% Adjusted-CLT UCL (Chen-1995)	81.88		
31									95% Modified-t UCL (Johnson-1978)	80.22		
32												
33	**Gamma GOF Test**											
34					A-D Test Statistic	0.365			**Anderson-Darling Gamma GOF Test**			
35					5% A-D Critical Value	0.761			Detected data appear Gamma Distributed at 5% Significance Level			
36					K-S Test Statistic	0.116			**Kolmogorov-Smirnov Gamma GOF Test**			
37					5% K-S Critical Value	0.171			Detected data appear Gamma Distributed at 5% Significance Level			
38	Detected data appear Gamma Distributed at 5% Significance Level											
39												
40	**Gamma Statistics**											
41					k hat (MLE)	1.664			k star (bias corrected MLE)	1.504		
42					Theta hat (MLE)	37.92			Theta star (bias corrected MLE)	41.96		
43					nu hat (MLE)	89.85			nu star (bias corrected)	81.2		
44					MLE Mean (bias corrected)	63.1			MLE Sd (bias corrected)	51.45		
45									Approximate Chi Square Value (0.05)	61.44		
46					Adjusted Level of Significance	0.0401			Adjusted Chi Square Value	60.34		
47												
48	**Assuming Gamma Distribution**											
49					95% Approximate Gamma UCL (use when n>=50)	83.4			95% Adjusted Gamma UCL (use when n<50)	84.92		
50												

ProUCL Output
Central Landfills Area Soil (0-0.5 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

	A	B	C	D	E	F	G	H	I	J	K	L
51	**Lognormal GOF Test**											
52					Shapiro Wilk Test Statistic	0.961	**Shapiro Wilk Lognormal GOF Test**					
53					5% Shapiro Wilk Critical Value	0.923	Data appear Lognormal at 5% Significance Level					
54					Lilliefors Test Statistic	0.135	**Lilliefors Lognormal GOF Test**					
55					5% Lilliefors Critical Value	0.167	Data appear Lognormal at 5% Significance Level					
56	Data appear Lognormal at 5% Significance Level											
57												
58	**Lognormal Statistics**											
59					Minimum of Logged Data	2.233				Mean of logged Data		3.815
60					Maximum of Logged Data	5.347				SD of logged Data		0.867
61												
62	**Assuming Lognormal Distribution**											
63					95% H-UCL	98.64				90% Chebyshev (MVUE) UCL		101
64					95% Chebyshev (MVUE) UCL	117.4				97.5% Chebyshev (MVUE) UCL		140.1
65					99% Chebyshev (MVUE) UCL	184.8						
66												
67	**Nonparametric Distribution Free UCL Statistics**											
68	Data appear to follow a Discernible Distribution at 5% Significance Level											
69												
70	**Nonparametric Distribution Free UCLs**											
71					95% CLT UCL	79.21				95% Jackknife UCL		79.8
72					95% Standard Bootstrap UCL	78.63				95% Bootstrap-t UCL		83.08
73					95% Hall's Bootstrap UCL	86.66				95% Percentile Bootstrap UCL		79.12
74					95% BCA Bootstrap UCL	81.31						
75					90% Chebyshev(Mean, Sd) UCL	92.48				95% Chebyshev(Mean, Sd) UCL		105.8
76					97.5% Chebyshev(Mean, Sd) UCL	124.3				99% Chebyshev(Mean, Sd) UCL		160.5
77												
78	**Suggested UCL to Use**											
79					95% Adjusted Gamma UCL	84.92						
80												
81	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
82	Recommendations are based upon data size, data distribution, and skewness.											
83	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
84	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
85												

ProUCL Output
Central Landfills Area Soil (0-2 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

1	**UCL Statistics for Data Sets with Non-Detects**											
2												
3				User Selected Options								
4				Date/Time of Computation	ProUCL 5.17/17/2018 4:51:14 PM							
5				From File	20180717_fluoride_for_proucl_e.xls							
6				Full Precision	OFF							
7				Confidence Coefficient	95%							
8				Number of Bootstrap Operations	2000							
9												
10												
11	**Fluoride**											
12												
13	**General Statistics**											
14					Total Number of Observations	54			Number of Distinct Observations	52		
15									Number of Missing Observations	0		
16					Minimum	5.6			Mean	58.44		
17					Maximum	210			Median	42.2		
18					SD	48.54			Std. Error of Mean	6.606		
19					Coefficient of Variation	0.831			Skewness	1.311		
20												
21	**Normal GOF Test**											
22					Shapiro Wilk Test Statistic	0.856			**Shapiro Wilk GOF Test**			
23					5% Shapiro Wilk P Value	7.3516E-7			Data Not Normal at 5% Significance Level			
24					Lilliefors Test Statistic	0.156			**Lilliefors GOF Test**			
25					5% Lilliefors Critical Value	0.12			Data Not Normal at 5% Significance Level			
26	Data Not Normal at 5% Significance Level											
27												
28	**Assuming Normal Distribution**											
29	**95% Normal UCL**								**95% UCLs (Adjusted for Skewness)**			
30					95% Student's-t UCL	69.5			95% Adjusted-CLT UCL (Chen-1995)	70.57		
31									95% Modified-t UCL (Johnson-1978)	69.7		
32												
33	**Gamma GOF Test**											
34					A-D Test Statistic	0.536			**Anderson-Darling Gamma GOF Test**			
35					5% A-D Critical Value	0.767			Detected data appear Gamma Distributed at 5% Significance Level			
36					K-S Test Statistic	0.101			**Kolmogorov-Smirnov Gamma GOF Test**			
37					5% K-S Critical Value	0.123			Detected data appear Gamma Distributed at 5% Significance Level			
38	Detected data appear Gamma Distributed at 5% Significance Level											
39												
40	**Gamma Statistics**											
41					k hat (MLE)	1.562			k star (bias corrected MLE)	1.488		
42					Theta hat (MLE)	37.4			Theta star (bias corrected MLE)	39.28		
43					nu hat (MLE)	168.7			nu star (bias corrected)	160.7		
44					MLE Mean (bias corrected)	58.44			MLE Sd (bias corrected)	47.91		
45									Approximate Chi Square Value (0.05)	132.4		
46					Adjusted Level of Significance	0.0456			Adjusted Chi Square Value	131.7		
47												
48	**Assuming Gamma Distribution**											
49					95% Approximate Gamma UCL (use when n>=50)	70.94			95% Adjusted Gamma UCL (use when n<50)	71.32		
50												

ProUCL Output
Central Landfills Area Soil (0-2 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

	A	B	C	D	E	F	G	H	I	J	K	L
51	**Lognormal GOF Test**											
52					Shapiro Wilk Test Statistic	0.967	**Shapiro Wilk Lognormal GOF Test**					
53					5% Shapiro Wilk P Value	0.258	Data appear Lognormal at 5% Significance Level					
54					Lilliefors Test Statistic	0.0915	**Lilliefors Lognormal GOF Test**					
55					5% Lilliefors Critical Value	0.12	Data appear Lognormal at 5% Significance Level					
56	Data appear Lognormal at 5% Significance Level											
57												
58	**Lognormal Statistics**											
59					Minimum of Logged Data	1.723	Mean of logged Data	3.715				
60					Maximum of Logged Data	5.347	SD of logged Data	0.889				
61												
62	**Assuming Lognormal Distribution**											
63					95% H-UCL	79.82	90% Chebyshev (MVUE) UCL	85.51				
64					95% Chebyshev (MVUE) UCL	96.9	97.5% Chebyshev (MVUE) UCL	112.7				
65					99% Chebyshev (MVUE) UCL	143.7						
66												
67	**Nonparametric Distribution Free UCL Statistics**											
68	Data appear to follow a Discernible Distribution at 5% Significance Level											
69												
70	**Nonparametric Distribution Free UCLs**											
71					95% CLT UCL	69.31	95% Jackknife UCL	69.5				
72					95% Standard Bootstrap UCL	69.03	95% Bootstrap-t UCL	70.89				
73					95% Hall's Bootstrap UCL	71.05	95% Percentile Bootstrap UCL	69.96				
74					95% BCA Bootstrap UCL	71.75						
75					90% Chebyshev(Mean, Sd) UCL	78.26	95% Chebyshev(Mean, Sd) UCL	87.24				
76					97.5% Chebyshev(Mean, Sd) UCL	99.7	99% Chebyshev(Mean, Sd) UCL	124.2				
77												
78	**Suggested UCL to Use**											
79					95% Approximate Gamma UCL	70.94						
80												
81	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
82	Recommendations are based upon data size, data distribution, and skewness.											
83	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
84	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
85												

ProUCL Output
Central Landfills Area Soil (0-12 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

1	**UCL Statistics for Data Sets with Non-Detects**											
2												
3				User Selected Options								
4				Date/Time of Computation	ProUCL 5.17/17/2018 4:50:13 PM							
5				From File	20180717_fluoride_for_proucl_f.xls							
6				Full Precision	OFF							
7				Confidence Coefficient	95%							
8				Number of Bootstrap Operations	2000							
9												
10												
11	**Fluoride**											
12												
13	**General Statistics**											
14						Total Number of Observations	81			Number of Distinct Observations	77		
15										Number of Missing Observations	0	
16						Minimum	0.35			Mean	43.9	
17						Maximum	210			Median	25.9	
18						SD	45.54			Std. Error of Mean	5.06	
19						Coefficient of Variation	1.037			Skewness	1.657	
20												
21	**Normal GOF Test**											
22						Shapiro Wilk Test Statistic	0.805			**Shapiro Wilk GOF Test**		
23						5% Shapiro Wilk P Value	3.331E-15			Data Not Normal at 5% Significance Level		
24						Lilliefors Test Statistic	0.185			**Lilliefors GOF Test**		
25						5% Lilliefors Critical Value	0.0985			Data Not Normal at 5% Significance Level		
26	**Data Not Normal at 5% Significance Level**											
27												
28	**Assuming Normal Distribution**											
29						**95% Normal UCL**				**95% UCLs (Adjusted for Skewness)**		
30						95% Student's-t UCL	52.32			95% Adjusted-CLT UCL (Chen-1995)	53.22	
31										95% Modified-t UCL (Johnson-1978)	52.48	
32												
33	**Gamma GOF Test**											
34						A-D Test Statistic	0.465			**Anderson-Darling Gamma GOF Test**		
35						5% A-D Critical Value	0.783			Detected data appear Gamma Distributed at 5% Significance Level		
36						K-S Test Statistic	0.0706			**Kolmogorov-Smirnov Gamma GOF Test**		
37						5% K-S Critical Value	0.102			Detected data appear Gamma Distributed at 5% Significance Level		
38	**Detected data appear Gamma Distributed at 5% Significance Level**											
39												
40	**Gamma Statistics**											
41						k hat (MLE)	0.982			k star (bias corrected MLE)	0.954	
42						Theta hat (MLE)	44.7			Theta star (bias corrected MLE)	46.02	
43						nu hat (MLE)	159.1			nu star (bias corrected)	154.5	
44						MLE Mean (bias corrected)	43.9			MLE Sd (bias corrected)	44.95	
45										Approximate Chi Square Value (0.05)	126.8	
46						Adjusted Level of Significance	0.047			Adjusted Chi Square Value	126.4	
47												
48	**Assuming Gamma Distribution**											
49						95% Approximate Gamma UCL (use when n>=50)	53.5			95% Adjusted Gamma UCL (use when n<50)	53.69	
50												

ProUCL Output
Central Landfills Area Soil (0-12 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

	A	B	C	D	E	F	G	H	I	J	K	L
51	**Lognormal GOF Test**											
52					Shapiro Wilk Test Statistic	0.963	**Shapiro Wilk Lognormal GOF Test**					
53					5% Shapiro Wilk P Value	0.0786	Data appear Lognormal at 5% Significance Level					
54					Lilliefors Test Statistic	0.0735	**Lilliefors Lognormal GOF Test**					
55					5% Lilliefors Critical Value	0.0985	Data appear Lognormal at 5% Significance Level					
56	Data appear Lognormal at 5% Significance Level											
57												
58	**Lognormal Statistics**											
59					Minimum of Logged Data	-1.05				Mean of logged Data		3.193
60					Maximum of Logged Data	5.347				SD of logged Data		1.233
61												
62	**Assuming Lognormal Distribution**											
63					95% H-UCL	73.17				90% Chebyshev (MVUE) UCL		78.11
64					95% Chebyshev (MVUE) UCL	90.27				97.5% Chebyshev (MVUE) UCL		107.2
65					99% Chebyshev (MVUE) UCL	140.3						
66												
67	**Nonparametric Distribution Free UCL Statistics**											
68	Data appear to follow a Discernible Distribution at 5% Significance Level											
69												
70	**Nonparametric Distribution Free UCLs**											
71					95% CLT UCL	52.22				95% Jackknife UCL		52.32
72					95% Standard Bootstrap UCL	52.16				95% Bootstrap-t UCL		54.17
73					95% Hall's Bootstrap UCL	53.15				95% Percentile Bootstrap UCL		52.21
74					95% BCA Bootstrap UCL	53.71						
75					90% Chebyshev(Mean, Sd) UCL	59.08				95% Chebyshev(Mean, Sd) UCL		65.95
76					97.5% Chebyshev(Mean, Sd) UCL	75.5				99% Chebyshev(Mean, Sd) UCL		94.24
77												
78	**Suggested UCL to Use**											
79					95% Approximate Gamma UCL	53.5						
80												
81	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
82	Recommendations are based upon data size, data distribution, and skewness.											
83	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
84	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
85												

ProUCL Output
North-Central Undeveloped Area (surface water)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

1	**UCL Statistics for Data Sets with Non-Detects**											
2												
3				User Selected Options								
4				Date/Time of Computation	ProUCL 5.17/17/2018 4:48:27 PM							
5				From File	20180717_fluoride_for_proucl_g.xls							
6				Full Precision	OFF							
7				Confidence Coefficient	95%							
8				Number of Bootstrap Operations	2000							
9												
10												
11	**Fluoride**											
12												
13	**General Statistics**											
14					Total Number of Observations	10			Number of Distinct Observations	10		
15									Number of Missing Observations	0		
16					Minimum	39.2			Mean	218		
17					Maximum	473			Median	206		
18					SD	114.8			Std. Error of Mean	36.32		
19					Coefficient of Variation	0.527			Skewness	0.982		
20												
21	**Normal GOF Test**											
22					Shapiro Wilk Test Statistic	0.927			**Shapiro Wilk GOF Test**			
23					5% Shapiro Wilk Critical Value	0.842			Data appear Normal at 5% Significance Level			
24					Lilliefors Test Statistic	0.214			**Lilliefors GOF Test**			
25					5% Lilliefors Critical Value	0.262			Data appear Normal at 5% Significance Level			
26	**Data appear Normal at 5% Significance Level**											
27												
28	**Assuming Normal Distribution**											
29					**95% Normal UCL**				**95% UCLs (Adjusted for Skewness)**			
30					95% Student's-t UCL	284.6			95% Adjusted-CLT UCL (Chen-1995)	289.8		
31									95% Modified-t UCL (Johnson-1978)	286.5		
32												
33	**Gamma GOF Test**											
34					A-D Test Statistic	0.391			**Anderson-Darling Gamma GOF Test**			
35					5% A-D Critical Value	0.731			Detected data appear Gamma Distributed at 5% Significance Level			
36					K-S Test Statistic	0.184			**Kolmogorov-Smirnov Gamma GOF Test**			
37					5% K-S Critical Value	0.268			Detected data appear Gamma Distributed at 5% Significance Level			
38	**Detected data appear Gamma Distributed at 5% Significance Level**											
39												
40	**Gamma Statistics**											
41					k hat (MLE)	3.404			k star (bias corrected MLE)	2.449		
42					Theta hat (MLE)	64.05			Theta star (bias corrected MLE)	89.01		
43					nu hat (MLE)	68.08			nu star (bias corrected)	48.99		
44					MLE Mean (bias corrected)	218			MLE Sd (bias corrected)	139.3		
45									Approximate Chi Square Value (0.05)	33.92		
46					Adjusted Level of Significance	0.0267			Adjusted Chi Square Value	31.75		
47												
48	**Assuming Gamma Distribution**											
49					95% Approximate Gamma UCL (use when n>=50))	314.9			95% Adjusted Gamma UCL (use when n<50)	336.4		
50												

ProUCL Output
North-Central Undeveloped Area (surface water)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

	A	B	C	D	E	F	G	H	I	J	K	L
51	**Lognormal GOF Test**											
52					Shapiro Wilk Test Statistic	0.874	**Shapiro Wilk Lognormal GOF Test**					
53					5% Shapiro Wilk Critical Value	0.842	Data appear Lognormal at 5% Significance Level					
54					Lilliefors Test Statistic	0.228	**Lilliefors Lognormal GOF Test**					
55					5% Lilliefors Critical Value	0.262	Data appear Lognormal at 5% Significance Level					
56	Data appear Lognormal at 5% Significance Level											
57												
58	**Lognormal Statistics**											
59					Minimum of Logged Data	3.669				Mean of logged Data		5.231
60					Maximum of Logged Data	6.159				SD of logged Data		0.653
61												
62	**Assuming Lognormal Distribution**											
63					95% H-UCL	394.6				90% Chebyshev (MVUE) UCL		369.5
64					95% Chebyshev (MVUE) UCL	434.6				97.5% Chebyshev (MVUE) UCL		525
65					99% Chebyshev (MVUE) UCL	702.5						
66												
67	**Nonparametric Distribution Free UCL Statistics**											
68	Data appear to follow a Discernible Distribution at 5% Significance Level											
69												
70	**Nonparametric Distribution Free UCLs**											
71					95% CLT UCL	277.8				95% Jackknife UCL		284.6
72					95% Standard Bootstrap UCL	275.1				95% Bootstrap-t UCL		304.6
73					95% Hall's Bootstrap UCL	395.3				95% Percentile Bootstrap UCL		279.1
74					95% BCA Bootstrap UCL	282.9						
75					90% Chebyshev(Mean, Sd) UCL	327				95% Chebyshev(Mean, Sd) UCL		376.3
76					97.5% Chebyshev(Mean, Sd) UCL	444.8				99% Chebyshev(Mean, Sd) UCL		579.4
77												
78	**Suggested UCL to Use**											
79					95% Student's-t UCL	284.6						
80												
81	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
82	Recommendations are based upon data size, data distribution, and skewness.											
83	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
84	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
85												

ProUCL Output
Western Undeveloped Area Soil (0-0.5 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

1	**UCL Statistics for Data Sets with Non-Detects**											
2												
3				User Selected Options								
4				Date/Time of Computation	ProUCL 5.17/17/2018 4:47:36 PM							
5				From File	20180717_fluoride_for_proucl_h.xls							
6				Full Precision	OFF							
7				Confidence Coefficient	95%							
8				Number of Bootstrap Operations	2000							
9												
10												
11	**Fluoride**											
12												
13	**General Statistics**											
14						Total Number of Observations	11			Number of Distinct Observations	11		
15										Number of Missing Observations	0	
16						Minimum	1.78			Mean	8.178	
17						Maximum	15.4			Median	8.31	
18						SD	4.576			Std. Error of Mean	1.38	
19						Coefficient of Variation	0.56			Skewness	0.111	
20												
21	**Normal GOF Test**											
22						Shapiro Wilk Test Statistic	0.951			**Shapiro Wilk GOF Test**		
23						5% Shapiro Wilk Critical Value	0.85			Data appear Normal at 5% Significance Level		
24						Lilliefors Test Statistic	0.149			**Lilliefors GOF Test**		
25						5% Lilliefors Critical Value	0.251			Data appear Normal at 5% Significance Level		
26	**Data appear Normal at 5% Significance Level**											
27												
28	**Assuming Normal Distribution**											
29						**95% Normal UCL**				**95% UCLs (Adjusted for Skewness)**		
30						95% Student's-t UCL	10.68			95% Adjusted-CLT UCL (Chen-1995)	10.5	
31										95% Modified-t UCL (Johnson-1978)	10.69	
32												
33	**Gamma GOF Test**											
34						A-D Test Statistic	0.326			**Anderson-Darling Gamma GOF Test**		
35						5% A-D Critical Value	0.735			Detected data appear Gamma Distributed at 5% Significance Level		
36						K-S Test Statistic	0.19			**Kolmogorov-Smirnov Gamma GOF Test**		
37						5% K-S Critical Value	0.257			Detected data appear Gamma Distributed at 5% Significance Level		
38	**Detected data appear Gamma Distributed at 5% Significance Level**											
39												
40	**Gamma Statistics**											
41						k hat (MLE)	2.751			k star (bias corrected MLE)	2.061	
42						Theta hat (MLE)	2.973			Theta star (bias corrected MLE)	3.968	
43						nu hat (MLE)	60.52			nu star (bias corrected)	45.35	
44						MLE Mean (bias corrected)	8.178			MLE Sd (bias corrected)	5.696	
45										Approximate Chi Square Value (0.05)	30.9	
46						Adjusted Level of Significance	0.0278			Adjusted Chi Square Value	28.97	
47												
48	**Assuming Gamma Distribution**											
49						95% Approximate Gamma UCL (use when n>=50))	12			95% Adjusted Gamma UCL (use when n<50)	12.8	
50												

ProUCL Output
Western Undeveloped Area Soil (0-0.5 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

	A	B	C	D	E	F	G	H	I	J	K	L
51	**Lognormal GOF Test**											
52					Shapiro Wilk Test Statistic	0.913	**Shapiro Wilk Lognormal GOF Test**					
53					5% Shapiro Wilk Critical Value	0.85	Data appear Lognormal at 5% Significance Level					
54					Lilliefors Test Statistic	0.187	**Lilliefors Lognormal GOF Test**					
55					5% Lilliefors Critical Value	0.251	Data appear Lognormal at 5% Significance Level					
56	Data appear Lognormal at 5% Significance Level											
57												
58	**Lognormal Statistics**											
59					Minimum of Logged Data	0.577				Mean of logged Data		1.909
60					Maximum of Logged Data	2.734				SD of logged Data		0.713
61												
62	**Assuming Lognormal Distribution**											
63					95% H-UCL	15.23				90% Chebyshev (MVUE) UCL		14.12
64					95% Chebyshev (MVUE) UCL	16.69				97.5% Chebyshev (MVUE) UCL		20.25
65					99% Chebyshev (MVUE) UCL	27.24						
66												
67	**Nonparametric Distribution Free UCL Statistics**											
68	Data appear to follow a Discernible Distribution at 5% Significance Level											
69												
70	**Nonparametric Distribution Free UCLs**											
71					95% CLT UCL	10.45				95% Jackknife UCL		10.68
72					95% Standard Bootstrap UCL	10.36				95% Bootstrap-t UCL		10.66
73					95% Hall's Bootstrap UCL	10.56				95% Percentile Bootstrap UCL		10.49
74					95% BCA Bootstrap UCL	10.38						
75					90% Chebyshev(Mean, Sd) UCL	12.32				95% Chebyshev(Mean, Sd) UCL		14.19
76					97.5% Chebyshev(Mean, Sd) UCL	16.79				99% Chebyshev(Mean, Sd) UCL		21.91
77												
78	**Suggested UCL to Use**											
79					95% Student's-t UCL	10.68						
80												
81	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
82	Recommendations are based upon data size, data distribution, and skewness.											
83	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
84	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
85												

ProUCL Output
Western Undeveloped Area (surface water)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

1	**UCL Statistics for Data Sets with Non-Detects**											
2												
3				User Selected Options								
4				Date/Time of Computation	ProUCL 5.17/17/2018 4:45:28 PM							
5				From File	20180717_fluoride_for_proucl_j.xls							
6				Full Precision	OFF							
7				Confidence Coefficient	95%							
8				Number of Bootstrap Operations	2000							
9												
10												
11	**Fluoride**											
12												
13	**General Statistics**											
14					Total Number of Observations	16			Number of Distinct Observations	13		
15									Number of Missing Observations	0		
16					Minimum	55.8			Mean	114.8		
17					Maximum	137			Median	125.5		
18					SD	28.71			Std. Error of Mean	7.178		
19					Coefficient of Variation	0.25			Skewness	-1.5		
20												
21	**Normal GOF Test**											
22					Shapiro Wilk Test Statistic	0.716			**Shapiro Wilk GOF Test**			
23					5% Shapiro Wilk Critical Value	0.887			Data Not Normal at 5% Significance Level			
24					Lilliefors Test Statistic	0.274			**Lilliefors GOF Test**			
25					5% Lilliefors Critical Value	0.213			Data Not Normal at 5% Significance Level			
26	**Data Not Normal at 5% Significance Level**											
27												
28	**Assuming Normal Distribution**											
29					**95% Normal UCL**				**95% UCLs (Adjusted for Skewness)**			
30					95% Student's-t UCL	127.3			95% Adjusted-CLT UCL (Chen-1995)	123.7		
31									95% Modified-t UCL (Johnson-1978)	126.9		
32												
33	**Gamma GOF Test**											
34					A-D Test Statistic	2.341			**Anderson-Darling Gamma GOF Test**			
35					5% A-D Critical Value	0.738			Data Not Gamma Distributed at 5% Significance Level			
36					K-S Test Statistic	0.316			**Kolmogorov-Smirnov Gamma GOF Test**			
37					5% K-S Critical Value	0.215			Data Not Gamma Distributed at 5% Significance Level			
38	**Data Not Gamma Distributed at 5% Significance Level**											
39												
40	**Gamma Statistics**											
41					k hat (MLE)	12.57			k star (bias corrected MLE)	10.26		
42					Theta hat (MLE)	9.127			Theta star (bias corrected MLE)	11.19		
43					nu hat (MLE)	402.3			nu star (bias corrected)	328.2		
44					MLE Mean (bias corrected)	114.8			MLE Sd (bias corrected)	35.83		
45									Approximate Chi Square Value (0.05)	287.2		
46					Adjusted Level of Significance	0.0335			Adjusted Chi Square Value	282.9		
47												
48	**Assuming Gamma Distribution**											
49					95% Approximate Gamma UCL (use when n>=50))	131.1			95% Adjusted Gamma UCL (use when n<50)	133.1		
50												

ProUCL Output
Western Undeveloped Area (surface water)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

	A	B	C	D	E	F	G	H	I	J	K	L
51	**Lognormal GOF Test**											
52					Shapiro Wilk Test Statistic	0.663	**Shapiro Wilk Lognormal GOF Test**					
53					5% Shapiro Wilk Critical Value	0.887	Data Not Lognormal at 5% Significance Level					
54					Lilliefors Test Statistic	0.333	**Lilliefors Lognormal GOF Test**					
55					5% Lilliefors Critical Value	0.213	Data Not Lognormal at 5% Significance Level					
56	Data Not Lognormal at 5% Significance Level											
57												
58	**Lognormal Statistics**											
59					Minimum of Logged Data	4.022				Mean of logged Data	4.702	
60					Maximum of Logged Data	4.92				SD of logged Data	0.317	
61												
62	**Assuming Lognormal Distribution**											
63					95% H-UCL	135.2				90% Chebyshev (MVUE) UCL	143.4	
64					95% Chebyshev (MVUE) UCL	156				97.5% Chebyshev (MVUE) UCL	173.5	
65					99% Chebyshev (MVUE) UCL	207.9						
66												
67	**Nonparametric Distribution Free UCL Statistics**											
68	Data do not follow a Discernible Distribution (0.05)											
69												
70	**Nonparametric Distribution Free UCLs**											
71					95% CLT UCL	126.6				95% Jackknife UCL	127.3	
72					95% Standard Bootstrap UCL	126.2				95% Bootstrap-t UCL	124.7	
73					95% Hall's Bootstrap UCL	123.7				95% Percentile Bootstrap UCL	125.2	
74					95% BCA Bootstrap UCL	124.4						
75					90% Chebyshev(Mean, Sd) UCL	136.3				95% Chebyshev(Mean, Sd) UCL	146	
76					97.5% Chebyshev(Mean, Sd) UCL	159.6				99% Chebyshev(Mean, Sd) UCL	186.2	
77												
78	**Suggested UCL to Use**											
79					95% Student's-t UCL	127.3				or 95% Modified-t UCL	126.9	
80												
81	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
82	Recommendations are based upon data size, data distribution, and skewness.											
83	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
84	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
85												
86	**Note: For highly negatively-skewed data, confidence limits (e.g., Chen, Johnson, Lognormal, and Gamma) may not be**											
87	**reliable. Chen's and Johnson's methods provide adjustments for positvely skewed data sets.**											
88												

ProUCL Output
South Percolation Pond Area Soil (0-0.5 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

1	**UCL Statistics for Data Sets with Non-Detects**											
2												
3				User Selected Options								
4				Date/Time of Computation	ProUCL 5.17/30/2018 10:04:57 AM							
5				From File	20180727_fluoride_MISC_for_proucl.xls							
6				Full Precision	OFF							
7				Confidence Coefficient	95%							
8				Number of Bootstrap Operations	2000							
9												
10												
11	**Fluoride**											
12												
13	**General Statistics**											
14					Total Number of Observations	23			Number of Distinct Observations	23		
15									Number of Missing Observations	0		
16					Minimum	1.8			Mean	14.19		
17					Maximum	44.1			Median	14.4		
18					SD	10.49			Std. Error of Mean	2.188		
19					Coefficient of Variation	0.739			Skewness	1.066		
20												
21	**Normal GOF Test**											
22					Shapiro Wilk Test Statistic	0.901			**Shapiro Wilk GOF Test**			
23					5% Shapiro Wilk Critical Value	0.914			Data Not Normal at 5% Significance Level			
24					Lilliefors Test Statistic	0.133			**Lilliefors GOF Test**			
25					5% Lilliefors Critical Value	0.18			Data appear Normal at 5% Significance Level			
26	**Data appear Approximate Normal at 5% Significance Level**											
27												
28	**Assuming Normal Distribution**											
29					**95% Normal UCL**				**95% UCLs (Adjusted for Skewness)**			
30					95% Student's-t UCL	17.95			95% Adjusted-CLT UCL (Chen-1995)	18.31		
31									95% Modified-t UCL (Johnson-1978)	18.03		
32												
33	**Gamma GOF Test**											
34					A-D Test Statistic	0.652			**Anderson-Darling Gamma GOF Test**			
35					5% A-D Critical Value	0.758			Detected data appear Gamma Distributed at 5% Significance Level			
36					K-S Test Statistic	0.185			**Kolmogorov-Smirnov Gamma GOF Test**			
37					5% K-S Critical Value	0.185			Data Not Gamma Distributed at 5% Significance Level			
38	**Detected data follow Appr. Gamma Distribution at 5% Significance Level**											
39												
40	**Gamma Statistics**											
41					k hat (MLE)	1.671			k star (bias corrected MLE)	1.482		
42					Theta hat (MLE)	8.491			Theta star (bias corrected MLE)	9.574		
43					nu hat (MLE)	76.89			nu star (bias corrected)	68.19		
44					MLE Mean (bias corrected)	14.19			MLE Sd (bias corrected)	11.66		
45									Approximate Chi Square Value (0.05)	50.19		
46					Adjusted Level of Significance	0.0389			Adjusted Chi Square Value	49.07		
47												
48	**Assuming Gamma Distribution**											
49					95% Approximate Gamma UCL (use when n>=50))	19.29			95% Adjusted Gamma UCL (use when n<50)	19.73		
50												

ProUCL Output
South Percolation Pond Area Soil (0-0.5 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

	A	B	C	D	E	F	G	H	I	J	K	L
51	**Lognormal GOF Test**											
52					Shapiro Wilk Test Statistic	0.914	**Shapiro Wilk Lognormal GOF Test**					
53					5% Shapiro Wilk Critical Value	0.914	Data Not Lognormal at 5% Significance Level					
54					Lilliefors Test Statistic	0.233	**Lilliefors Lognormal GOF Test**					
55					5% Lilliefors Critical Value	0.18	Data Not Lognormal at 5% Significance Level					
56	Data Not Lognormal at 5% Significance Level											
57												
58	**Lognormal Statistics**											
59					Minimum of Logged Data	0.588				Mean of logged Data		2.325
60					Maximum of Logged Data	3.786				SD of logged Data		0.911
61												
62	**Assuming Lognormal Distribution**											
63					95% H-UCL	24.74				90% Chebyshev (MVUE) UCL		24.69
64					95% Chebyshev (MVUE) UCL	29.03				97.5% Chebyshev (MVUE) UCL		35.05
65					99% Chebyshev (MVUE) UCL	46.88						
66												
67	**Nonparametric Distribution Free UCL Statistics**											
68	Data appear to follow a Discernible Distribution at 5% Significance Level											
69												
70	**Nonparametric Distribution Free UCLs**											
71					95% CLT UCL	17.79				95% Jackknife UCL		17.95
72					95% Standard Bootstrap UCL	17.67				95% Bootstrap-t UCL		18.53
73					95% Hall's Bootstrap UCL	19.17				95% Percentile Bootstrap UCL		17.77
74					95% BCA Bootstrap UCL	18.08						
75					90% Chebyshev(Mean, Sd) UCL	20.76				95% Chebyshev(Mean, Sd) UCL		23.73
76					97.5% Chebyshev(Mean, Sd) UCL	27.86				99% Chebyshev(Mean, Sd) UCL		35.96
77												
78	**Suggested UCL to Use**											
79					95% Student's-t UCL	17.95						
80												
81	When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test											
82	When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL											
83												
84	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
85	Recommendations are based upon data size, data distribution, and skewness.											
86	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
87	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
88												

ProUCL Output
South Percolation Pond Area Soil (0-2 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

1	**UCL Statistics for Data Sets with Non-Detects**											
2												
3				User Selected Options								
4				Date/Time of Computation	ProUCL 5.17/30/2018 10:04:11 AM							
5				From File	20180727_fluoride_MISC_for_proucl_a.xls							
6				Full Precision	OFF							
7				Confidence Coefficient	95%							
8				Number of Bootstrap Operations	2000							
9												
10												
11	**Fluoride**											
12												
13	**General Statistics**											
14				Total Number of Observations	47		Number of Distinct Observations	44				
15							Number of Missing Observations	0				
16				Minimum	1.26		Mean	13.59				
17				Maximum	44.1		Median	14.3				
18				SD	8.979		Std. Error of Mean	1.31				
19				Coefficient of Variation	0.661		Skewness	0.913				
20												
21	**Normal GOF Test**											
22				Shapiro Wilk Test Statistic	0.922		**Shapiro Wilk GOF Test**					
23				5% Shapiro Wilk Critical Value	0.946		Data Not Normal at 5% Significance Level					
24				Lilliefors Test Statistic	0.128		**Lilliefors GOF Test**					
25				5% Lilliefors Critical Value	0.128		Data appear Normal at 5% Significance Level					
26	**Data appear Approximate Normal at 5% Significance Level**											
27												
28	**Assuming Normal Distribution**											
29				**95% Normal UCL**			**95% UCLs (Adjusted for Skewness)**					
30				95% Student's-t UCL	15.79		95% Adjusted-CLT UCL (Chen-1995)	15.93				
31							95% Modified-t UCL (Johnson-1978)	15.82				
32												
33	**Gamma GOF Test**											
34				A-D Test Statistic	1.456		**Anderson-Darling Gamma GOF Test**					
35				5% A-D Critical Value	0.764		Data Not Gamma Distributed at 5% Significance Level					
36				K-S Test Statistic	0.165		**Kolmogorov-Smirnov Gamma GOF Test**					
37				5% K-S Critical Value	0.131		Data Not Gamma Distributed at 5% Significance Level					
38	**Data Not Gamma Distributed at 5% Significance Level**											
39												
40	**Gamma Statistics**											
41				k hat (MLE)	1.817		k star (bias corrected MLE)	1.715				
42				Theta hat (MLE)	7.479		Theta star (bias corrected MLE)	7.922				
43				nu hat (MLE)	170.8		nu star (bias corrected)	161.2				
44				MLE Mean (bias corrected)	13.59		MLE Sd (bias corrected)	10.38				
45							Approximate Chi Square Value (0.05)	132.9				
46				Adjusted Level of Significance	0.0449		Adjusted Chi Square Value	132				
47												
48	**Assuming Gamma Distribution**											
49				95% Approximate Gamma UCL (use when n>=50))	16.49		95% Adjusted Gamma UCL (use when n<50)	16.59				
50												

ProUCL Output
South Percolation Pond Area Soil (0-2 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

	A	B	C	D	E	F	G	H	I	J	K	L
51	**Lognormal GOF Test**											
52					Shapiro Wilk Test Statistic	0.879	**Shapiro Wilk Lognormal GOF Test**					
53					5% Shapiro Wilk Critical Value	0.946	Data Not Lognormal at 5% Significance Level					
54					Lilliefors Test Statistic	0.207	**Lilliefors Lognormal GOF Test**					
55					5% Lilliefors Critical Value	0.128	Data Not Lognormal at 5% Significance Level					
56	Data Not Lognormal at 5% Significance Level											
57												
58	**Lognormal Statistics**											
59					Minimum of Logged Data	0.231				Mean of logged Data		2.309
60					Maximum of Logged Data	3.786				SD of logged Data		0.897
61												
62	**Assuming Lognormal Distribution**											
63					95% H-UCL	20.2				90% Chebyshev (MVUE) UCL		21.56
64					95% Chebyshev (MVUE) UCL	24.58				97.5% Chebyshev (MVUE) UCL		28.78
65					99% Chebyshev (MVUE) UCL	37.03						
66												
67	**Nonparametric Distribution Free UCL Statistics**											
68	Data appear to follow a Discernible Distribution at 5% Significance Level											
69												
70	**Nonparametric Distribution Free UCLs**											
71					95% CLT UCL	15.74				95% Jackknife UCL		15.79
72					95% Standard Bootstrap UCL	15.79				95% Bootstrap-t UCL		15.96
73					95% Hall's Bootstrap UCL	16				95% Percentile Bootstrap UCL		15.79
74					95% BCA Bootstrap UCL	16.11						
75					90% Chebyshev(Mean, Sd) UCL	17.52				95% Chebyshev(Mean, Sd) UCL		19.3
76					97.5% Chebyshev(Mean, Sd) UCL	21.77				99% Chebyshev(Mean, Sd) UCL		26.62
77												
78	**Suggested UCL to Use**											
79					95% Student's-t UCL	15.79						
80												
81	When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test											
82	When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL											
83												
84	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
85	Recommendations are based upon data size, data distribution, and skewness.											
86	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
87	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
88												

ProUCL Output
South Percolation Pond Area (surface water)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

1	**UCL Statistics for Data Sets with Non-Detects**											
2												
3			User Selected Options									
4			Date/Time of Computation	ProUCL 5.13/20/2018 9:01:56 AM								
5			From File	20180319_ProUCL_inputRev_2_a.xls								
6			Full Precision	OFF								
7			Confidence Coefficient	95%								
8			Number of Bootstrap Operations	2000								
9												
10	**Fluoride**											
11												
12	**General Statistics**											
13				Total Number of Observations	17			Number of Distinct Observations	17			
14								Number of Missing Observations	0			
15				Minimum	250			Mean	1447			
16				Maximum	9240			Median	379			
17				SD	2248			Std. Error of Mean	545.2			
18				Coefficient of Variation	1.554			Skewness	2.931			
19												
20	**Normal GOF Test**											
21				Shapiro Wilk Test Statistic	0.582			**Shapiro Wilk GOF Test**				
22				5% Shapiro Wilk Critical Value	0.892			Data Not Normal at 5% Significance Level				
23				Lilliefors Test Statistic	0.314			**Lilliefors GOF Test**				
24				5% Lilliefors Critical Value	0.207			Data Not Normal at 5% Significance Level				
25	**Data Not Normal at 5% Significance Level**											
26												
27	**Assuming Normal Distribution**											
28				**95% Normal UCL**				**95% UCLs (Adjusted for Skewness)**				
29				95% Student's-t UCL	2399			95% Adjusted-CLT UCL (Chen-1995)	2758			
30								95% Modified-t UCL (Johnson-1978)	2463			
31												
32	**Gamma GOF Test**											
33				A-D Test Statistic	1.655			**Anderson-Darling Gamma GOF Test**				
34				5% A-D Critical Value	0.773			Data Not Gamma Distributed at 5% Significance Level				
35				K-S Test Statistic	0.299			**Kolmogorov-Smirnov Gamma GOF Test**				
36				5% K-S Critical Value	0.216			Data Not Gamma Distributed at 5% Significance Level				
37	**Data Not Gamma Distributed at 5% Significance Level**											
38												
39	**Gamma Statistics**											
40				k hat (MLE)	0.842			k star (bias corrected MLE)	0.732			
41				Theta hat (MLE)	1719			Theta star (bias corrected MLE)	1975			
42				nu hat (MLE)	28.62			nu star (bias corrected)	24.9			
43				MLE Mean (bias corrected)	1447			MLE Sd (bias corrected)	1691			
44								Approximate Chi Square Value (0.05)	14.54			
45				Adjusted Level of Significance	0.0346			Adjusted Chi Square Value	13.71			
46												
47	**Assuming Gamma Distribution**											
48				95% Approximate Gamma UCL (use when n>=50))	2478			95% Adjusted Gamma UCL (use when n<50)	2628			
49												

ProUCL Output
South Percolation Pond Area (surface water)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

	A	B	C	D	E	F	G	H	I	J	K	L
50	**Lognormal GOF Test**											
51					Shapiro Wilk Test Statistic	0.828	**Shapiro Wilk Lognormal GOF Test**					
52					5% Shapiro Wilk Critical Value	0.892	Data Not Lognormal at 5% Significance Level					
53					Lilliefors Test Statistic	0.276	**Lilliefors Lognormal GOF Test**					
54					5% Lilliefors Critical Value	0.207	Data Not Lognormal at 5% Significance Level					
55	Data Not Lognormal at 5% Significance Level											
56												
57	**Lognormal Statistics**											
58					Minimum of Logged Data	5.521			Mean of logged Data			6.577
59					Maximum of Logged Data	9.131			SD of logged Data			1.104
60												
61	**Assuming Lognormal Distribution**											
62					95% H-UCL	2880			90% Chebyshev (MVUE) UCL			2378
63					95% Chebyshev (MVUE) UCL	2888			97.5% Chebyshev (MVUE) UCL			3596
64					99% Chebyshev (MVUE) UCL	4986						
65												
66	**Nonparametric Distribution Free UCL Statistics**											
67	Data do not follow a Discernible Distribution (0.05)											
68												
69	**Nonparametric Distribution Free UCLs**											
70					95% CLT UCL	2344			95% Jackknife UCL			2399
71					95% Standard Bootstrap UCL	2305			95% Bootstrap-t UCL			3732
72					95% Hall's Bootstrap UCL	5431			95% Percentile Bootstrap UCL			2409
73					95% BCA Bootstrap UCL	2852						
74					90% Chebyshev(Mean, Sd) UCL	3083			95% Chebyshev(Mean, Sd) UCL			3823
75					97.5% Chebyshev(Mean, Sd) UCL	4852			99% Chebyshev(Mean, Sd) UCL			6872
76												
77	**Suggested UCL to Use**											
78					95% Chebyshev (Mean, Sd) UCL	3823						
79												
80	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
81	Recommendations are based upon data size, data distribution, and skewness.											
82	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
83	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
84												

ProUCL Output
South Percolation Pond Area (sediment)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

1	**UCL Statistics for Data Sets with Non-Detects**											
2												
3				User Selected Options								
4				Date/Time of Computation	ProUCL 5.17/26/2018 2:34:48 PM							
5				From File	WorkSheet.xls							
6				Full Precision	OFF							
7				Confidence Coefficient	95%							
8				Number of Bootstrap Operations	2000							
9												
10												
11	**Fluoride**											
12												
13	**General Statistics**											
14				Total Number of Observations	11			Number of Distinct Observations	11			
15								Number of Missing Observations	0			
16				Minimum	5.3			Mean	48.56			
17				Maximum	195			Median	22.6			
18				SD	55.27			Std. Error of Mean	16.66			
19				Coefficient of Variation	1.138			Skewness	2.204			
20												
21	**Normal GOF Test**											
22				Shapiro Wilk Test Statistic	0.703			**Shapiro Wilk GOF Test**				
23				5% Shapiro Wilk Critical Value	0.85			Data Not Normal at 5% Significance Level				
24				Lilliefors Test Statistic	0.325			**Lilliefors GOF Test**				
25				5% Lilliefors Critical Value	0.251			Data Not Normal at 5% Significance Level				
26	Data Not Normal at 5% Significance Level											
27												
28	**Assuming Normal Distribution**											
29				**95% Normal UCL**				**95% UCLs (Adjusted for Skewness)**				
30				95% Student's-t UCL	78.77			95% Adjusted-CLT UCL (Chen-1995)	87.81			
31								95% Modified-t UCL (Johnson-1978)	80.61			
32												
33	**Gamma GOF Test**											
34				A-D Test Statistic	0.674			**Anderson-Darling Gamma GOF Test**				
35				5% A-D Critical Value	0.747			Detected data appear Gamma Distributed at 5% Significance Level				
36				K-S Test Statistic	0.244			**Kolmogorov-Smirnov Gamma GOF Test**				
37				5% K-S Critical Value	0.261			Detected data appear Gamma Distributed at 5% Significance Level				
38	Detected data appear Gamma Distributed at 5% Significance Level											
39												
40	**Gamma Statistics**											
41				k hat (MLE)	1.252			k star (bias corrected MLE)	0.972			
42				Theta hat (MLE)	38.77			Theta star (bias corrected MLE)	49.99			
43				nu hat (MLE)	27.55			nu star (bias corrected)	21.37			
44				MLE Mean (bias corrected)	48.56			MLE Sd (bias corrected)	49.27			
45								Approximate Chi Square Value (0.05)	11.87			
46				Adjusted Level of Significance	0.0278			Adjusted Chi Square Value	10.73			
47												
48	**Assuming Gamma Distribution**											
49				95% Approximate Gamma UCL (use when n>=50)	87.45			95% Adjusted Gamma UCL (use when n<50)	96.72			
50												

ProUCL Output
South Percolation Pond Area (sediment)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

	A	B	C	D	E	F	G	H	I	J	K	L
51	**Lognormal GOF Test**											
52	Shapiro Wilk Test Statistic					0.94	**Shapiro Wilk Lognormal GOF Test**					
53	5% Shapiro Wilk Critical Value					0.85	Data appear Lognormal at 5% Significance Level					
54	Lilliefors Test Statistic					0.182	**Lilliefors Lognormal GOF Test**					
55	5% Lilliefors Critical Value					0.251	Data appear Lognormal at 5% Significance Level					
56	Data appear Lognormal at 5% Significance Level											
57												
58	**Lognormal Statistics**											
59	Minimum of Logged Data					1.668	Mean of logged Data					3.433
60	Maximum of Logged Data					5.273	SD of logged Data					0.972
61												
62	**Assuming Lognormal Distribution**											
63	95% H-UCL					122.9	90% Chebyshev (MVUE) UCL					90.58
64	95% Chebyshev (MVUE) UCL					110.4	97.5% Chebyshev (MVUE) UCL					137.8
65	99% Chebyshev (MVUE) UCL					191.7						
66												
67	**Nonparametric Distribution Free UCL Statistics**											
68	Data appear to follow a Discernible Distribution at 5% Significance Level											
69												
70	**Nonparametric Distribution Free UCLs**											
71	95% CLT UCL					75.97	95% Jackknife UCL					78.77
72	95% Standard Bootstrap UCL					74.26	95% Bootstrap-t UCL					118.5
73	95% Hall's Bootstrap UCL					164.2	95% Percentile Bootstrap UCL					76.29
74	95% BCA Bootstrap UCL					89.78						
75	90% Chebyshev(Mean, Sd) UCL					98.56	95% Chebyshev(Mean, Sd) UCL					121.2
76	97.5% Chebyshev(Mean, Sd) UCL					152.6	99% Chebyshev(Mean, Sd) UCL					214.4
77												
78	**Suggested UCL to Use**											
79	95% Adjusted Gamma UCL					96.72						
80												
81	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
82	Recommendations are based upon data size, data distribution, and skewness.											
83	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
84	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
85												

ProUCL Output
Flathead River Area (surface water)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

1	**UCL Statistics for Data Sets with Non-Detects**											
2												
3				User Selected Options								
4				Date/Time of Computation	ProUCL 5.17/17/2018 4:43:39 PM							
5				From File	20180717_fluoride_for_proucl_k.xls							
6				Full Precision	OFF							
7				Confidence Coefficient	95%							
8				Number of Bootstrap Operations	2000							
9												
10												
11	**Fluoride**											
12												
13	**General Statistics**											
14					Total Number of Observations	22			Number of Distinct Observations	21		
15									Number of Missing Observations	0		
16					Minimum	33.5			Mean	220.2		
17					Maximum	2160			Median	112		
18					SD	447.5			Std. Error of Mean	95.41		
19					Coefficient of Variation	2.033			Skewness	4.258		
20												
21	**Normal GOF Test**											
22					Shapiro Wilk Test Statistic	0.385			**Shapiro Wilk GOF Test**			
23					5% Shapiro Wilk Critical Value	0.911			Data Not Normal at 5% Significance Level			
24					Lilliefors Test Statistic	0.403			**Lilliefors GOF Test**			
25					5% Lilliefors Critical Value	0.184			Data Not Normal at 5% Significance Level			
26	**Data Not Normal at 5% Significance Level**											
27												
28	**Assuming Normal Distribution**											
29					**95% Normal UCL**				**95% UCLs (Adjusted for Skewness)**			
30					95% Student's-t UCL	384.3			95% Adjusted-CLT UCL (Chen-1995)	469.6		
31									95% Modified-t UCL (Johnson-1978)	398.8		
32												
33	**Gamma GOF Test**											
34					A-D Test Statistic	2.564			**Anderson-Darling Gamma GOF Test**			
35					5% A-D Critical Value	0.777			Data Not Gamma Distributed at 5% Significance Level			
36					K-S Test Statistic	0.366			**Kolmogorov-Smirnov Gamma GOF Test**			
37					5% K-S Critical Value	0.192			Data Not Gamma Distributed at 5% Significance Level			
38	**Data Not Gamma Distributed at 5% Significance Level**											
39												
40	**Gamma Statistics**											
41					k hat (MLE)	0.879			k star (bias corrected MLE)	0.789		
42					Theta hat (MLE)	250.5			Theta star (bias corrected MLE)	278.9		
43					nu hat (MLE)	38.67			nu star (bias corrected)	34.73		
44					MLE Mean (bias corrected)	220.2			MLE Sd (bias corrected)	247.8		
45									Approximate Chi Square Value (0.05)	22.25		
46					Adjusted Level of Significance	0.0386			Adjusted Chi Square Value	21.5		
47												
48	**Assuming Gamma Distribution**											
49					95% Approximate Gamma UCL (use when n>=50))	343.7			95% Adjusted Gamma UCL (use when n<50)	355.6		
50												
51	**Lognormal GOF Test**											

ProUCL Output
Flathead River Area (surface water)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

	A	B	C	D	E	F	G	H	I	J	K	L
52					Shapiro Wilk Test Statistic	0.838	**Shapiro Wilk Lognormal GOF Test**					
53					5% Shapiro Wilk Critical Value	0.911	Data Not Lognormal at 5% Significance Level					
54					Lilliefors Test Statistic	0.28	**Lilliefors Lognormal GOF Test**					
55					5% Lilliefors Critical Value	0.184	Data Not Lognormal at 5% Significance Level					
56	Data Not Lognormal at 5% Significance Level											
57												
58	**Lognormal Statistics**											
59					Minimum of Logged Data	3.512	Mean of logged Data	4.727				
60					Maximum of Logged Data	7.678	SD of logged Data	0.965				
61												
62	**Assuming Lognormal Distribution**											
63					95% H-UCL	307.1	90% Chebyshev (MVUE) UCL	295.7				
64					95% Chebyshev (MVUE) UCL	350.4	97.5% Chebyshev (MVUE) UCL	426.4				
65					99% Chebyshev (MVUE) UCL	575.7						
66												
67	**Nonparametric Distribution Free UCL Statistics**											
68	Data do not follow a Discernible Distribution (0.05)											
69												
70	**Nonparametric Distribution Free UCLs**											
71					95% CLT UCL	377.1	95% Jackknife UCL	384.3				
72					95% Standard Bootstrap UCL	373.5	95% Bootstrap-t UCL	1055				
73					95% Hall's Bootstrap UCL	943.7	95% Percentile Bootstrap UCL	399.8				
74					95% BCA Bootstrap UCL	527						
75					90% Chebyshev(Mean, Sd) UCL	506.4	95% Chebyshev(Mean, Sd) UCL	636				
76					97.5% Chebyshev(Mean, Sd) UCL	816	99% Chebyshev(Mean, Sd) UCL	1169				
77												
78	**Suggested UCL to Use**											
79					95% Chebyshev (Mean, Sd) UCL	636						
80												
81	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
82	Recommendations are based upon data size, data distribution, and skewness.											
83	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
84	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
85												

ProUCL Output
Backwater Seep Area Soil (0-2 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

1	**UCL Statistics for Data Sets with Non-Detects**											
2												
3				User Selected Options								
4				Date/Time of Computation	ProUCL 5.17/30/2018 9:57:04 AM							
5				From File	20180727_fluoride_MISC_for_proucl_b.xls							
6				Full Precision	OFF							
7				Confidence Coefficient	95%							
8				Number of Bootstrap Operations	2000							
9												
10												
11	**Fluoride**											
12												
13	**General Statistics**											
14				Total Number of Observations	14		Number of Distinct Observations	14				
15							Number of Missing Observations	0				
16				Minimum	1.58		Mean	19.14				
17				Maximum	33.5		Median	16.85				
18				SD	8.243		Std. Error of Mean	2.203				
19				Coefficient of Variation	0.431		Skewness	-0.0178				
20												
21	**Normal GOF Test**											
22				Shapiro Wilk Test Statistic	0.939		**Shapiro Wilk GOF Test**					
23				5% Shapiro Wilk Critical Value	0.874		Data appear Normal at 5% Significance Level					
24				Lilliefors Test Statistic	0.174		**Lilliefors GOF Test**					
25				5% Lilliefors Critical Value	0.226		Data appear Normal at 5% Significance Level					
26	**Data appear Normal at 5% Significance Level**											
27												
28	**Assuming Normal Distribution**											
29				**95% Normal UCL**			**95% UCLs (Adjusted for Skewness)**					
30				95% Student's-t UCL	23.04		95% Adjusted-CLT UCL (Chen-1995)	22.75				
31							95% Modified-t UCL (Johnson-1978)	23.04				
32												
33	**Gamma GOF Test**											
34				A-D Test Statistic	0.932		**Anderson-Darling Gamma GOF Test**					
35				5% A-D Critical Value	0.742		Data Not Gamma Distributed at 5% Significance Level					
36				K-S Test Statistic	0.241		**Kolmogorov-Smirnov Gamma GOF Test**					
37				5% K-S Critical Value	0.23		Data Not Gamma Distributed at 5% Significance Level					
38	**Data Not Gamma Distributed at 5% Significance Level**											
39												
40	**Gamma Statistics**											
41				k hat (MLE)	3.326		k star (bias corrected MLE)	2.661				
42				Theta hat (MLE)	5.756		Theta star (bias corrected MLE)	7.194				
43				nu hat (MLE)	93.12		nu star (bias corrected)	74.5				
44				MLE Mean (bias corrected)	19.14		MLE Sd (bias corrected)	11.73				
45							Approximate Chi Square Value (0.05)	55.62				
46				Adjusted Level of Significance	0.0312		Adjusted Chi Square Value	53.46				
47												
48	**Assuming Gamma Distribution**											
49				95% Approximate Gamma UCL (use when n>=50))	25.64		95% Adjusted Gamma UCL (use when n<50)	26.67				
50												

ProUCL Output
Backwater Seep Area Soil (0-2 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

51	**Lognormal GOF Test**											
52					Shapiro Wilk Test Statistic	0.687	**Shapiro Wilk Lognormal GOF Test**					
53					5% Shapiro Wilk Critical Value	0.874	Data Not Lognormal at 5% Significance Level					
54					Lilliefors Test Statistic	0.298	**Lilliefors Lognormal GOF Test**					
55					5% Lilliefors Critical Value	0.226	Data Not Lognormal at 5% Significance Level					
56	**Data Not Lognormal at 5% Significance Level**											
57												
58	**Lognormal Statistics**											
59					Minimum of Logged Data	0.457			Mean of logged Data	2.794		
60					Maximum of Logged Data	3.512			SD of logged Data	0.736		
61												
62	**Assuming Lognormal Distribution**											
63					95% H-UCL	34.86			90% Chebyshev (MVUE) UCL	33.95		
64					95% Chebyshev (MVUE) UCL	39.85			97.5% Chebyshev (MVUE) UCL	48.04		
65					99% Chebyshev (MVUE) UCL	64.12						
66												
67	**Nonparametric Distribution Free UCL Statistics**											
68	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
69												
70	**Nonparametric Distribution Free UCLs**											
71					95% CLT UCL	22.76			95% Jackknife UCL	23.04		
72					95% Standard Bootstrap UCL	22.67			95% Bootstrap-t UCL	23.21		
73					95% Hall's Bootstrap UCL	23.26			95% Percentile Bootstrap UCL	22.81		
74					95% BCA Bootstrap UCL	22.83						
75					90% Chebyshev(Mean, Sd) UCL	25.75			95% Chebyshev(Mean, Sd) UCL	28.74		
76					97.5% Chebyshev(Mean, Sd) UCL	32.9			99% Chebyshev(Mean, Sd) UCL	41.06		
77												
78	**Suggested UCL to Use**											
79					95% Student's-t UCL	23.04						
80												
81	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
82	Recommendations are based upon data size, data distribution, and skewness.											
83	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
84	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
85												
86	**Note: For highly negatively-skewed data, confidence limits (e.g., Chen, Johnson, Lognormal, and Gamma) may not be**											
87	**reliable. Chen's and Johnson's methods provide adjustments for positvely skewed data sets.**											
88												

ProUCL Output
Backwater Seep Area (surface water)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

1	**UCL Statistics for Data Sets with Non-Detects**											
2												
3				User Selected Options								
4				Date/Time of Computation	ProUCL 5.13/20/2018 6:37:58 AM							
5				From File	20180319_ProUCL_inputRev_2_d.xls							
6				Full Precision	OFF							
7				Confidence Coefficient	95%							
8				Number of Bootstrap Operations	2000							
9												
10	**Fluoride**											
11												
12	**General Statistics**											
13				Total Number of Observations	18		Number of Distinct Observations	18				
14							Number of Missing Observations	0				
15				Minimum	175		Mean	1141				
16				Maximum	2640		Median	585				
17				SD	1029		Std. Error of Mean	242.5				
18				Coefficient of Variation	0.902		Skewness	0.532				
19												
20	**Normal GOF Test**											
21				Shapiro Wilk Test Statistic	0.771		**Shapiro Wilk GOF Test**					
22				5% Shapiro Wilk Critical Value	0.897		Data Not Normal at 5% Significance Level					
23				Lilliefors Test Statistic	0.296		**Lilliefors GOF Test**					
24				5% Lilliefors Critical Value	0.202		Data Not Normal at 5% Significance Level					
25	**Data Not Normal at 5% Significance Level**											
26												
27	**Assuming Normal Distribution**											
28				**95% Normal UCL**			**95% UCLs (Adjusted for Skewness)**					
29				95% Student's-t UCL	1563		95% Adjusted-CLT UCL (Chen-1995)	1573				
30							95% Modified-t UCL (Johnson-1978)	1568				
31												
32	**Gamma GOF Test**											
33				A-D Test Statistic	1.25		**Anderson-Darling Gamma GOF Test**					
34				5% A-D Critical Value	0.763		Data Not Gamma Distributed at 5% Significance Level					
35				K-S Test Statistic	0.204		**Kolmogorov-Smirnov Gamma GOF Test**					
36				5% K-S Critical Value	0.209		Detected data appear Gamma Distributed at 5% Significance Level					
37	**Detected data follow Appr. Gamma Distribution at 5% Significance Level**											
38												
39	**Gamma Statistics**											
40				k hat (MLE)	1.16		k star (bias corrected MLE)	1.004				
41				Theta hat (MLE)	983.5		Theta star (bias corrected MLE)	1137				
42				nu hat (MLE)	41.77		nu star (bias corrected)	36.15				
43				MLE Mean (bias corrected)	1141		MLE Sd (bias corrected)	1139				
44							Approximate Chi Square Value (0.05)	23.39				
45				Adjusted Level of Significance	0.0357		Adjusted Chi Square Value	22.4				
46												
47	**Assuming Gamma Distribution**											
48				95% Approximate Gamma UCL (use when n>=50)	1764		95% Adjusted Gamma UCL (use when n<50)	1841				
49												

ProUCL Output
Backwater Seep Area (surface water)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

	A	B	C	D	E	F	G	H	I	J	K	L
50	**Lognormal GOF Test**											
51					Shapiro Wilk Test Statistic	0.853	**Shapiro Wilk Lognormal GOF Test**					
52					5% Shapiro Wilk Critical Value	0.897	Data Not Lognormal at 5% Significance Level					
53					Lilliefors Test Statistic	0.202	**Lilliefors Lognormal GOF Test**					
54					5% Lilliefors Critical Value	0.202	Data Not Lognormal at 5% Significance Level					
55	Data Not Lognormal at 5% Significance Level											
56												
57	**Lognormal Statistics**											
58					Minimum of Logged Data	5.165				Mean of logged Data		6.551
59					Maximum of Logged Data	7.879				SD of logged Data		1.069
60												
61	**Assuming Lognormal Distribution**											
62					95% H-UCL	2519				90% Chebyshev (MVUE) UCL		2184
63					95% Chebyshev (MVUE) UCL	2638				97.5% Chebyshev (MVUE) UCL		3267
64					99% Chebyshev (MVUE) UCL	4504						
65												
66	**Nonparametric Distribution Free UCL Statistics**											
67	Data appear to follow a Discernible Distribution at 5% Significance Level											
68												
69	**Nonparametric Distribution Free UCLs**											
70					95% CLT UCL	1540				95% Jackknife UCL		1563
71					95% Standard Bootstrap UCL	1526				95% Bootstrap-t UCL		1617
72					95% Hall's Bootstrap UCL	1512				95% Percentile Bootstrap UCL		1529
73					95% BCA Bootstrap UCL	1558						
74					90% Chebyshev(Mean, Sd) UCL	1869				95% Chebyshev(Mean, Sd) UCL		2198
75					97.5% Chebyshev(Mean, Sd) UCL	2656				99% Chebyshev(Mean, Sd) UCL		3554
76												
77	**Suggested UCL to Use**											
78					95% Adjusted Gamma UCL	1841						
79												
80	When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test											
81	When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL											
82												
83	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
84	Recommendations are based upon data size, data distribution, and skewness.											
85	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
86	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											

ProUCL Output
Groundwater - Plume Area Upper Hydrogeologic Unit
Columbia Falls Aluminum Facility
Columbia Falls, Montana

1	**UCL Statistics for Data Sets with Non-Detects**											
2												
3			User Selected Options									
4			Date/Time of Computation	ProUCL 5.17/27/2018 1:58:02 PM								
5			From File	20180727_fluoride_GW_for_proucl.xls								
6			Full Precision	OFF								
7			Confidence Coefficient	95%								
8			Number of Bootstrap Operations	2000								
9												
10	**Fluoride**											
11												
12	**General Statistics**											
13						Total Number of Observations	116			Number of Distinct Observations	108		
14						Number of Detects	115			Number of Non-Detects	1	
15						Number of Distinct Detects	107			Number of Distinct Non-Detects	1	
16						Minimum Detect	207			Minimum Non-Detect	60	
17						Maximum Detect	52900			Maximum Non-Detect	60	
18						Variance Detects	57073768			Percent Non-Detects	0.862%	
19						Mean Detects	4699			SD Detects	7555	
20						Median Detects	2550			CV Detects	1.608	
21						Skewness Detects	4.022			Kurtosis Detects	18.91	
22						Mean of Logged Detects	7.829			SD of Logged Detects	1.088	
23												
24	**Normal GOF Test on Detects Only**											
25						Shapiro Wilk Test Statistic	0.519		**Normal GOF Test on Detected Observations Only**			
26						5% Shapiro Wilk P Value	0		Detected Data Not Normal at 5% Significance Level			
27						Lilliefors Test Statistic	0.318		**Lilliefors GOF Test**			
28						5% Lilliefors Critical Value	0.0829		Detected Data Not Normal at 5% Significance Level			
29	**Detected Data Not Normal at 5% Significance Level**											
30												
31	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
32						KM Mean	4659			KM Standard Error of Mean	699.6	
33						KM SD	7502			95% KM (BCA) UCL	5789	
34						95% KM (t) UCL	5819			95% KM (Percentile Bootstrap) UCL	5851	
35						95% KM (z) UCL	5810			95% KM Bootstrap t UCL	6306	
36						90% KM Chebyshev UCL	6758			95% KM Chebyshev UCL	7708	
37						97.5% KM Chebyshev UCL	9028			99% KM Chebyshev UCL	11620	
38												
39	**Gamma GOF Tests on Detected Observations Only**											
40						A-D Test Statistic	6.351		**Anderson-Darling GOF Test**			
41						5% A-D Critical Value	0.786		Detected Data Not Gamma Distributed at 5% Significance Level			
42						K-S Test Statistic	0.215		**Kolmogorov-Smirnov GOF**			
43						5% K-S Critical Value	0.0884		Detected Data Not Gamma Distributed at 5% Significance Level			
44	**Detected Data Not Gamma Distributed at 5% Significance Level**											
45												
46	**Gamma Statistics on Detected Data Only**											
47						k hat (MLE)	0.93			k star (bias corrected MLE)	0.911	
48						Theta hat (MLE)	5053			Theta star (bias corrected MLE)	5156	
49						nu hat (MLE)	213.9			nu star (bias corrected)	209.6	
50						Mean (detects)	4699					
51												

ProUCL Output
Groundwater - Plume Area Upper Hydrogeologic Unit
Columbia Falls Aluminum Facility
Columbia Falls, Montana

	A	B	C	D	E	F	G	H	I	J	K	L
52	**Gamma ROS Statistics using Imputed Non-Detects**											
53	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
54	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
55	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
56	This is especially true when the sample size is small.											
57	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
58					Minimum	0.01				Mean	4659	
59					Maximum	52900				Median	2520	
60					SD	7534				CV	1.617	
61					k hat (MLE)	0.817				k star (bias corrected MLE)	0.801	
62					Theta hat (MLE)	5704				Theta star (bias corrected MLE)	5813	
63					nu hat (MLE)	189.5				nu star (bias corrected)	185.9	
64					Adjusted Level of Significance (β)	0.0479						
65					Approximate Chi Square Value (185.92, α)	155.4				Adjusted Chi Square Value (185.92, β)	155	
66					95% Gamma Approximate UCL (use when n>=50)	5574				95% Gamma Adjusted UCL (use when n<50)	5587	
67												
68	**Estimates of Gamma Parameters using KM Estimates**											
69					Mean (KM)	4659				SD (KM)	7502	
70					Variance (KM)	56273672				SE of Mean (KM)	699.6	
71					k hat (KM)	0.386				k star (KM)	0.382	
72					nu hat (KM)	89.5				nu star (KM)	88.51	
73					theta hat (KM)	12078				theta star (KM)	12212	
74					80% gamma percentile (KM)	7475				90% gamma percentile (KM)	13268	
75					95% gamma percentile (KM)	19676				99% gamma percentile (KM)	35871	
76												
77	**Gamma Kaplan-Meier (KM) Statistics**											
78					Approximate Chi Square Value (88.51, α)	67.82				Adjusted Chi Square Value (88.51, β)	67.6	
79					95% Gamma Approximate KM-UCL (use when n>=50)	6081				95% Gamma Adjusted KM-UCL (use when n<50)	6101	
80												
81	**Lognormal GOF Test on Detected Observations Only**											
82					Shapiro Wilk Approximate Test Statistic	0.922				**Shapiro Wilk GOF Test**		
83					5% Shapiro Wilk P Value	2.3520E-7				Detected Data Not Lognormal at 5% Significance Level		
84					Lilliefors Test Statistic	0.167				**Lilliefors GOF Test**		
85					5% Lilliefors Critical Value	0.0829				Detected Data Not Lognormal at 5% Significance Level		
86	**Detected Data Not Lognormal at 5% Significance Level**											
87												
88	**Lognormal ROS Statistics Using Imputed Non-Detects**											
89					Mean in Original Scale	4660				Mean in Log Scale	7.804	
90					SD in Original Scale	7534				SD in Log Scale	1.116	
91					95% t UCL (assumes normality of ROS data)	5820				95% Percentile Bootstrap UCL	5834	
92					95% BCA Bootstrap UCL	6147				95% Bootstrap t UCL	6497	
93					95% H-UCL (Log ROS)	5822						
94												
95	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
96					KM Mean (logged)	7.797				KM Geo Mean	2433	
97					KM SD (logged)	1.132				95% Critical H Value (KM-Log)	2.346	
98					KM Standard Error of Mean (logged)	0.106				95% H-UCL (KM -Log)	5915	
99					KM SD (logged)	1.132				95% Critical H Value (KM-Log)	2.346	
100					KM Standard Error of Mean (logged)	0.106						
101												

ProUCL Output
Groundwater - Plume Area Upper Hydrogeologic Unit
Columbia Falls Aluminum Facility
Columbia Falls, Montana

	A	B	C	D	E	F	G	H	I	J	K	L
102	**DL/2 Statistics**											
103	**DL/2 Normal**						**DL/2 Log-Transformed**					
104					Mean in Original Scale	4659				Mean in Log Scale		7.791
105					SD in Original Scale	7534				SD in Log Scale		1.158
106					95% t UCL (Assumes normality)	5819				95% H-Stat UCL		6110
107	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
108												
109	**Nonparametric Distribution Free UCL Statistics**											
110	**Data do not follow a Discernible Distribution at 5% Significance Level**											
111												
112	**Suggested UCL to Use**											
113					95% KM (Chebyshev) UCL	7708						
114												
115	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
116	Recommendations are based upon data size, data distribution, and skewness.											
117	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
118	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
119												

ProUCL Output
Groundwater - Sitewide Below Upper Hydrogeologic Unit
Columbia Falls Aluminum Facility
Columbia Falls, Montana

1	**UCL Statistics for Data Sets with Non-Detects**											
2												
3			User Selected Options									
4			Date/Time of Computation	ProUCL 5.17/27/2018 1:59:17 PM								
5			From File	20180727_fluoride_GW_for_proucl_a.xls								
6			Full Precision	OFF								
7			Confidence Coefficient	95%								
8			Number of Bootstrap Operations	2000								
9												
10	**Fluoride**											
11												
12	**General Statistics**											
13						Total Number of Observations	52			Number of Distinct Observations	49		
14						Number of Detects	50			Number of Non-Detects	2	
15						Number of Distinct Detects	48			Number of Distinct Non-Detects	1	
16						Minimum Detect	49			Minimum Non-Detect	15	
17						Maximum Detect	569			Maximum Non-Detect	15	
18						Variance Detects	17014			Percent Non-Detects	3.846%	
19						Mean Detects	249.5			SD Detects	130.4	
20						Median Detects	202			CV Detects	0.523	
21						Skewness Detects	0.766			Kurtosis Detects	-0.219	
22						Mean of Logged Detects	5.378			SD of Logged Detects	0.56	
23												
24	**Normal GOF Test on Detects Only**											
25						Shapiro Wilk Test Statistic	0.919			**Shapiro Wilk GOF Test**		
26						5% Shapiro Wilk Critical Value	0.947			Detected Data Not Normal at 5% Significance Level		
27						Lilliefors Test Statistic	0.156			**Lilliefors GOF Test**		
28						5% Lilliefors Critical Value	0.125			Detected Data Not Normal at 5% Significance Level		
29	**Detected Data Not Normal at 5% Significance Level**											
30												
31	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
32						KM Mean	240.5			KM Standard Error of Mean	18.83	
33						KM SD	134.4			95% KM (BCA) UCL	270.2	
34						95% KM (t) UCL	272			95% KM (Percentile Bootstrap) UCL	271.8	
35						95% KM (z) UCL	271.4			95% KM Bootstrap t UCL	275.3	
36						90% KM Chebyshev UCL	297			95% KM Chebyshev UCL	322.5	
37						97.5% KM Chebyshev UCL	358.1			99% KM Chebyshev UCL	427.8	
38												
39	**Gamma GOF Tests on Detected Observations Only**											
40						A-D Test Statistic	0.525			**Anderson-Darling GOF Test**		
41						5% A-D Critical Value	0.755			Detected data appear Gamma Distributed at 5% Significance Level		
42						K-S Test Statistic	0.0979			**Kolmogorov-Smirnov GOF**		
43						5% K-S Critical Value	0.126			Detected data appear Gamma Distributed at 5% Significance Level		
44	**Detected data appear Gamma Distributed at 5% Significance Level**											
45												
46	**Gamma Statistics on Detected Data Only**											
47						k hat (MLE)	3.686			k star (bias corrected MLE)	3.478	
48						Theta hat (MLE)	67.69			Theta star (bias corrected MLE)	71.73	
49						nu hat (MLE)	368.6			nu star (bias corrected)	347.8	
50						Mean (detects)	249.5					
51												

ProUCL Output
Groundwater - Sitewide Below Upper Hydrogeologic Unit
Columbia Falls Aluminum Facility
Columbia Falls, Montana

	A	B	C	D	E	F	G	H	I	J	K	L
52	**Gamma ROS Statistics using Imputed Non-Detects**											
53	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
54	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
55	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
56	This is especially true when the sample size is small.											
57	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
58					Minimum	25.56				Mean		241.2
59					Maximum	569				Median		199
60					SD	134.6				CV		0.558
61					k hat (MLE)	2.912				k star (bias corrected MLE)		2.757
62					Theta hat (MLE)	82.8				Theta star (bias corrected MLE)		87.46
63					nu hat (MLE)	302.9				nu star (bias corrected)		286.7
64					Adjusted Level of Significance (β)	0.0454						
65					Approximate Chi Square Value (286.75, α)	248.5				Adjusted Chi Square Value (286.75, β)		247.5
66					95% Gamma Approximate UCL (use when n>=50)	278.2				95% Gamma Adjusted UCL (use when n<50)		279.4
67												
68	**Estimates of Gamma Parameters using KM Estimates**											
69					Mean (KM)	240.5				SD (KM)		134.4
70					Variance (KM)	18065				SE of Mean (KM)		18.83
71					k hat (KM)	3.201				k star (KM)		3.029
72					nu hat (KM)	332.9				nu star (KM)		315
73					theta hat (KM)	75.13				theta star (KM)		79.39
74					80% gamma percentile (KM)	342.6				90% gamma percentile (KM)		425.7
75					95% gamma percentile (KM)	503.3				99% gamma percentile (KM)		671.2
76												
77	**Gamma Kaplan-Meier (KM) Statistics**											
78					Approximate Chi Square Value (315.02, α)	274.9				Adjusted Chi Square Value (315.02, β)		273.8
79					95% Gamma Approximate KM-UCL (use when n>=50)	275.6				95% Gamma Adjusted KM-UCL (use when n<50)		276.6
80												
81	**Lognormal GOF Test on Detected Observations Only**											
82					Shapiro Wilk Test Statistic	0.956				**Shapiro Wilk GOF Test**		
83					5% Shapiro Wilk Critical Value	0.947				Detected Data appear Lognormal at 5% Significance Level		
84					Lilliefors Test Statistic	0.0795				**Lilliefors GOF Test**		
85					5% Lilliefors Critical Value	0.125				Detected Data appear Lognormal at 5% Significance Level		
86	**Detected Data appear Lognormal at 5% Significance Level**											
87												
88	**Lognormal ROS Statistics Using Imputed Non-Detects**											
89					Mean in Original Scale	242.1				Mean in Log Scale		5.326
90					SD in Original Scale	133.2				SD in Log Scale		0.609
91					95% t UCL (assumes normality of ROS data)	273				95% Percentile Bootstrap UCL		273.5
92					95% BCA Bootstrap UCL	272.8				95% Bootstrap t UCL		275.4
93					95% H-UCL (Log ROS)	292.2						
94												
95	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
96					KM Mean (logged)	5.275				KM Geo Mean		195.4
97					KM SD (logged)	0.748				95% Critical H Value (KM-Log)		2.068
98					KM Standard Error of Mean (logged)	0.105				95% H-UCL (KM -Log)		320.9
99					KM SD (logged)	0.748				95% Critical H Value (KM-Log)		2.068
100					KM Standard Error of Mean (logged)	0.105						
101												

ProUCL Output
Groundwater - Sitewide Below Upper Hydrogeologic Unit
Columbia Falls Aluminum Facility
Columbia Falls, Montana

	A	B	C	D	E	F	G	H	I	J	K	L
102	**DL/2 Statistics**											
103	**DL/2 Normal**						**DL/2 Log-Transformed**					
104					Mean in Original Scale	240.2				Mean in Log Scale		5.248
105					SD in Original Scale	136.2				SD in Log Scale		0.853
106					95% t UCL (Assumes normality)	271.8				95% H-Stat UCL		354.5
107	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
108												
109	**Nonparametric Distribution Free UCL Statistics**											
110	**Detected Data appear Gamma Distributed at 5% Significance Level**											
111												
112	**Suggested UCL to Use**											
113					95% KM Approximate Gamma UCL	275.6				95% GROS Approximate Gamma UCL		278.2
114												
115	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
116	Recommendations are based upon data size, data distribution, and skewness.											
117	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
118	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
119												

ProUCL Output
Main Plant Area Soil (0-0.5 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

1	**UCL Statistics for Data Sets with Non-Detects**											
2												
3				User Selected Options								
4				Date/Time of Computation	ProUCL 5.17/30/2018 8:30:09 AM							
5				From File	20180727_fluoride_vegetated_MPA_NPerc_for_proucl_e.xls							
6				Full Precision	OFF							
7				Confidence Coefficient	95%							
8				Number of Bootstrap Operations	2000							
9												
10												
11	**Fluoride**											
12												
13	**General Statistics**											
14						Total Number of Observations	19			Number of Distinct Observations	19		
15										Number of Missing Observations	0	
16						Minimum	4.25			Mean	33.25	
17						Maximum	93.3			Median	22.2	
18						SD	26.73			Std. Error of Mean	6.133	
19						Coefficient of Variation	0.804			Skewness	0.98	
20												
21	**Normal GOF Test**											
22						Shapiro Wilk Test Statistic	0.883			**Shapiro Wilk GOF Test**		
23						5% Shapiro Wilk Critical Value	0.901			Data Not Normal at 5% Significance Level		
24						Lilliefors Test Statistic	0.187			**Lilliefors GOF Test**		
25						5% Lilliefors Critical Value	0.197			Data appear Normal at 5% Significance Level		
26	**Data appear Approximate Normal at 5% Significance Level**											
27												
28	**Assuming Normal Distribution**											
29						**95% Normal UCL**				**95% UCLs (Adjusted for Skewness)**		
30						95% Student's-t UCL	43.89			95% Adjusted-CLT UCL (Chen-1995)	44.81	
31										95% Modified-t UCL (Johnson-1978)	44.12	
32												
33	**Gamma GOF Test**											
34						A-D Test Statistic	0.242			**Anderson-Darling Gamma GOF Test**		
35						5% A-D Critical Value	0.756			Detected data appear Gamma Distributed at 5% Significance Level		
36						K-S Test Statistic	0.109			**Kolmogorov-Smirnov Gamma GOF Test**		
37						5% K-S Critical Value	0.202			Detected data appear Gamma Distributed at 5% Significance Level		
38	**Detected data appear Gamma Distributed at 5% Significance Level**											
39												
40	**Gamma Statistics**											
41						k hat (MLE)	1.614			k star (bias corrected MLE)	1.394	
42						Theta hat (MLE)	20.6			Theta star (bias corrected MLE)	23.85	
43						nu hat (MLE)	61.33			nu star (bias corrected)	52.98	
44						MLE Mean (bias corrected)	33.25			MLE Sd (bias corrected)	28.16	
45										Approximate Chi Square Value (0.05)	37.26	
46						Adjusted Level of Significance	0.0369			Adjusted Chi Square Value	36.11	
47												
48	**Assuming Gamma Distribution**											
49						95% Approximate Gamma UCL (use when n>=50))	47.28			95% Adjusted Gamma UCL (use when n<50)	48.79	
50												

ProUCL Output
Main Plant Area Soil (0-0.5 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

	A	B	C	D	E	F	G	H	I	J	K	L
51	**Lognormal GOF Test**											
52					Shapiro Wilk Test Statistic	0.972	**Shapiro Wilk Lognormal GOF Test**					
53					5% Shapiro Wilk Critical Value	0.901	Data appear Lognormal at 5% Significance Level					
54					Lilliefors Test Statistic	0.0933	**Lilliefors Lognormal GOF Test**					
55					5% Lilliefors Critical Value	0.197	Data appear Lognormal at 5% Significance Level					
56	Data appear Lognormal at 5% Significance Level											
57												
58	**Lognormal Statistics**											
59					Minimum of Logged Data	1.447				Mean of logged Data		3.163
60					Maximum of Logged Data	4.536				SD of logged Data		0.894
61												
62	**Assuming Lognormal Distribution**											
63					95% H-UCL	59.23				90% Chebyshev (MVUE) UCL		57.42
64					95% Chebyshev (MVUE) UCL	67.89				97.5% Chebyshev (MVUE) UCL		82.43
65					99% Chebyshev (MVUE) UCL	111						
66												
67	**Nonparametric Distribution Free UCL Statistics**											
68	Data appear to follow a Discernible Distribution at 5% Significance Level											
69												
70	**Nonparametric Distribution Free UCLs**											
71					95% CLT UCL	43.34				95% Jackknife UCL		43.89
72					95% Standard Bootstrap UCL	42.86				95% Bootstrap-t UCL		45.56
73					95% Hall's Bootstrap UCL	44.08				95% Percentile Bootstrap UCL		43.2
74					95% BCA Bootstrap UCL	44.14						
75					90% Chebyshev(Mean, Sd) UCL	51.65				95% Chebyshev(Mean, Sd) UCL		59.98
76					97.5% Chebyshev(Mean, Sd) UCL	71.55				99% Chebyshev(Mean, Sd) UCL		94.27
77												
78	**Suggested UCL to Use**											
79					95% Student's-t UCL	43.89						
80												
81	When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test											
82	When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL											
83												
84	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
85	Recommendations are based upon data size, data distribution, and skewness.											
86	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
87	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
88												

ProUCL Output
Main Plant ISS Area Soil (0-0.5 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

1	**UCL Statistics for Data Sets with Non-Detects**											
2												
3				User Selected Options								
4				Date/Time of Computation	ProUCL 5.17/30/2018 9:43:05 AM							
5				From File	20180727_fluoride_ISS_for_proucl.xls							
6				Full Precision	OFF							
7				Confidence Coefficient	95%							
8				Number of Bootstrap Operations	2000							
9												
10												
11	**Fluoride**											
12												
13	**General Statistics**											
14					Total Number of Observations	20			Number of Distinct Observations	20		
15									Number of Missing Observations	0		
16					Minimum	39.9			Mean	285.5		
17					Maximum	632			Median	257		
18					SD	218.7			Std. Error of Mean	48.91		
19					Coefficient of Variation	0.766			Skewness	0.375		
20												
21	**Normal GOF Test**											
22					Shapiro Wilk Test Statistic	0.866			**Shapiro Wilk GOF Test**			
23					5% Shapiro Wilk Critical Value	0.905			Data Not Normal at 5% Significance Level			
24					Lilliefors Test Statistic	0.211			**Lilliefors GOF Test**			
25					5% Lilliefors Critical Value	0.192			Data Not Normal at 5% Significance Level			
26	**Data Not Normal at 5% Significance Level**											
27												
28	**Assuming Normal Distribution**											
29					**95% Normal UCL**				**95% UCLs (Adjusted for Skewness)**			
30					95% Student's-t UCL	370.1			95% Adjusted-CLT UCL (Chen-1995)	370.4		
31									95% Modified-t UCL (Johnson-1978)	370.8		
32												
33	**Gamma GOF Test**											
34					A-D Test Statistic	0.878			**Anderson-Darling Gamma GOF Test**			
35					5% A-D Critical Value	0.759			Data Not Gamma Distributed at 5% Significance Level			
36					K-S Test Statistic	0.201			**Kolmogorov-Smirnov Gamma GOF Test**			
37					5% K-S Critical Value	0.198			Data Not Gamma Distributed at 5% Significance Level			
38	**Data Not Gamma Distributed at 5% Significance Level**											
39												
40	**Gamma Statistics**											
41					k hat (MLE)	1.453			k star (bias corrected MLE)	1.268		
42					Theta hat (MLE)	196.6			Theta star (bias corrected MLE)	225.2		
43					nu hat (MLE)	58.1			nu star (bias corrected)	50.72		
44					MLE Mean (bias corrected)	285.5			MLE Sd (bias corrected)	253.6		
45									Approximate Chi Square Value (0.05)	35.36		
46					Adjusted Level of Significance	0.038			Adjusted Chi Square Value	34.35		
47												
48	**Assuming Gamma Distribution**											
49					95% Approximate Gamma UCL (use when n>=50))	409.5			95% Adjusted Gamma UCL (use when n<50)	421.6		
50												

ProUCL Output
Main Plant ISS Area Soil (0-0.5 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

	A	B	C	D	E	F	G	H	I	J	K	L
51	**Lognormal GOF Test**											
52					Shapiro Wilk Test Statistic	0.882	**Shapiro Wilk Lognormal GOF Test**					
53					5% Shapiro Wilk Critical Value	0.905	Data Not Lognormal at 5% Significance Level					
54					Lilliefors Test Statistic	0.177	**Lilliefors Lognormal GOF Test**					
55					5% Lilliefors Critical Value	0.192	Data appear Lognormal at 5% Significance Level					
56	Data appear Approximate Lognormal at 5% Significance Level											
57												
58	**Lognormal Statistics**											
59					Minimum of Logged Data	3.686				Mean of logged Data		5.272
60					Maximum of Logged Data	6.449				SD of logged Data		0.972
61												
62	**Assuming Lognormal Distribution**											
63					95% H-UCL	557.4				90% Chebyshev (MVUE) UCL		522.3
64					95% Chebyshev (MVUE) UCL	621.8				97.5% Chebyshev (MVUE) UCL		760
65					99% Chebyshev (MVUE) UCL	1031						
66												
67	**Nonparametric Distribution Free UCL Statistics**											
68	Data appear to follow a Discernible Distribution at 5% Significance Level											
69												
70	**Nonparametric Distribution Free UCLs**											
71					95% CLT UCL	366				95% Jackknife UCL		370.1
72					95% Standard Bootstrap UCL	364.5				95% Bootstrap-t UCL		377.1
73					95% Hall's Bootstrap UCL	365.7				95% Percentile Bootstrap UCL		364.6
74					95% BCA Bootstrap UCL	368						
75					90% Chebyshev(Mean, Sd) UCL	432.3				95% Chebyshev(Mean, Sd) UCL		498.7
76					97.5% Chebyshev(Mean, Sd) UCL	590.9				99% Chebyshev(Mean, Sd) UCL		772.1
77												
78	**Suggested UCL to Use**											
79					95% H-UCL	557.4						
80												
81	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
82	Recommendations are based upon data size, data distribution, and skewness.											
83	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
84	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
85												
86	ProUCL computes and outputs H-statistic based UCLs for historical reasons only.											
87	H-statistic often results in unstable (both high and low) values of UCL95 as shown in examples in the Technical Guide.											
88	It is therefore recommended to avoid the use of H-statistic based 95% UCLs.											
89	Use of nonparametric methods are preferred to compute UCL95 for skewed data sets which do not follow a gamma distribution.											
90												

ProUCL Output
Main Plant ISS Area Soil (0-2 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

1	**UCL Statistics for Data Sets with Non-Detects**										
2											
3	User Selected Options										
4	Date/Time of Computation	ProUCL 5.18/21/2018 10:30:10 AM									
5	From File	WorkSheet.xls									
6	Full Precision	OFF									
7	Confidence Coefficient	95%									
8	Number of Bootstrap Operations	2000									
9											
10											
11	**Fluoride**										
12											
13	**General Statistics**										
14	Total Number of Observations			41			Number of Distinct Observations			39	
15							Number of Missing Observations			1	
16	Minimum			39.9			Mean			298.3	
17	Maximum			946			Median			225	
18	SD			244.7			Std. Error of Mean			38.21	
19	Coefficient of Variation			0.82			Skewness			0.959	
20											
21	**Normal GOF Test**										
22	Shapiro Wilk Test Statistic			0.865			**Shapiro Wilk GOF Test**				
23	5% Shapiro Wilk Critical Value			0.941			Data Not Normal at 5% Significance Level				
24	Lilliefors Test Statistic			0.173			**Lilliefors GOF Test**				
25	5% Lilliefors Critical Value			0.137			Data Not Normal at 5% Significance Level				
26	**Data Not Normal at 5% Significance Level**										
27											
28	**Assuming Normal Distribution**										
29	**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**				
30	95% Student's-t UCL			362.7			95% Adjusted-CLT UCL (Chen-1995)			367.3	
31							95% Modified-t UCL (Johnson-1978)			363.6	
32											
33	**Gamma GOF Test**										
34	A-D Test Statistic			0.84			**Anderson-Darling Gamma GOF Test**				
35	5% A-D Critical Value			0.766			Data Not Gamma Distributed at 5% Significance Level				
36	K-S Test Statistic			0.145			**Kolmogorov-Smirnov Gamma GOF Test**				
37	5% K-S Critical Value			0.14			Data Not Gamma Distributed at 5% Significance Level				
38	**Data Not Gamma Distributed at 5% Significance Level**										
39											
40	**Gamma Statistics**										
41	k hat (MLE)			1.515			k star (bias corrected MLE)			1.42	
42	Theta hat (MLE)			197			Theta star (bias corrected MLE)			210.1	
43	nu hat (MLE)			124.2			nu star (bias corrected)			116.4	
44	MLE Mean (bias corrected)			298.3			MLE Sd (bias corrected)			250.3	
45							Approximate Chi Square Value (0.05)			92.53	
46	Adjusted Level of Significance			0.0441			Adjusted Chi Square Value			91.75	
47											
48	**Assuming Gamma Distribution**										
49	95% Approximate Gamma UCL (use when n>=50))			375.4			95% Adjusted Gamma UCL (use when n<50)			378.6	

ProUCL Output
Main Plant ISS Area Soil (0-2 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

50											
51	**Lognormal GOF Test**										
52				Shapiro Wilk Test Statistic	0.938	**Shapiro Wilk Lognormal GOF Test**					
53				5% Shapiro Wilk Critical Value	0.941	Data Not Lognormal at 5% Significance Level					
54				Lilliefors Test Statistic	0.134	**Lilliefors Lognormal GOF Test**					
55				5% Lilliefors Critical Value	0.137	Data appear Lognormal at 5% Significance Level					
56	**Data appear Approximate Lognormal at 5% Significance Level**										
57											
58	**Lognormal Statistics**										
59				Minimum of Logged Data	3.686	Mean of logged Data	5.333				
60				Maximum of Logged Data	6.852	SD of logged Data	0.904				
61											
62	**Assuming Lognormal Distribution**										
63				95% H-UCL	429.8	90% Chebyshev (MVUE) UCL	455.9				
64				95% Chebyshev (MVUE) UCL	523.2	97.5% Chebyshev (MVUE) UCL	616.6				
65				99% Chebyshev (MVUE) UCL	800.1						
66											
67	**Nonparametric Distribution Free UCL Statistics**										
68	**Data appear to follow a Discernible Distribution at 5% Significance Level**										
69											
70	**Nonparametric Distribution Free UCLs**										
71				95% CLT UCL	361.2	95% Jackknife UCL	362.7				
72				95% Standard Bootstrap UCL	359.8	95% Bootstrap-t UCL	369.2				
73				95% Hall's Bootstrap UCL	364.5	95% Percentile Bootstrap UCL	361.3				
74				95% BCA Bootstrap UCL	366.8						
75				90% Chebyshev(Mean, Sd) UCL	413	95% Chebyshev(Mean, Sd) UCL	464.9				
76				97.5% Chebyshev(Mean, Sd) UCL	537	99% Chebyshev(Mean, Sd) UCL	678.6				
77											
78	**Suggested UCL to Use**										
79				95% H-UCL	429.8						
80											
81	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.										
82	Recommendations are based upon data size, data distribution, and skewness.										
83	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).										
84	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.										
85											
86	**ProUCL computes and outputs H-statistic based UCLs for historical reasons only.**										
87	**H-statistic often results in unstable (both high and low) values of UCL95 as shown in examples in the Technical Guide.**										
88	**It is therefore recommended to avoid the use of H-statistic based 95% UCLs.**										
89	**Use of nonparametric methods are preferred to compute UCL95 for skewed data sets which do not follow a gamma distribution.**										
90											

ProUCL Output
Central Landfill ISS Area Soil (0-0.5 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

1	**UCL Statistics for Data Sets with Non-Detects**											
2												
3				User Selected Options								
4				Date/Time of Computation	ProUCL 5.17/30/2018 9:42:29 AM							
5				From File	20180727_fluoride_ISS_for_proucl_a.xls							
6				Full Precision	OFF							
7				Confidence Coefficient	95%							
8				Number of Bootstrap Operations	2000							
9												
10												
11	**Fluoride**											
12												
13	**General Statistics**											
14					Total Number of Observations	32			Number of Distinct Observations	32		
15									Number of Missing Observations	0		
16					Minimum	10.4			Mean	232		
17					Maximum	976			Median	82.4		
18					SD	259.9			Std. Error of Mean	45.95		
19					Coefficient of Variation	1.12			Skewness	1.378		
20												
21	**Normal GOF Test**											
22					Shapiro Wilk Test Statistic	0.788			**Shapiro Wilk GOF Test**			
23					5% Shapiro Wilk Critical Value	0.93			Data Not Normal at 5% Significance Level			
24					Lilliefors Test Statistic	0.243			**Lilliefors GOF Test**			
25					5% Lilliefors Critical Value	0.154			Data Not Normal at 5% Significance Level			
26	**Data Not Normal at 5% Significance Level**											
27												
28	**Assuming Normal Distribution**											
29					**95% Normal UCL**				**95% UCLs (Adjusted for Skewness)**			
30					95% Student's-t UCL	309.9			95% Adjusted-CLT UCL (Chen-1995)	319.6		
31									95% Modified-t UCL (Johnson-1978)	311.8		
32												
33	**Gamma GOF Test**											
34					A-D Test Statistic	0.936			**Anderson-Darling Gamma GOF Test**			
35					5% A-D Critical Value	0.782			Data Not Gamma Distributed at 5% Significance Level			
36					K-S Test Statistic	0.189			**Kolmogorov-Smirnov Gamma GOF Test**			
37					5% K-S Critical Value	0.161			Data Not Gamma Distributed at 5% Significance Level			
38	**Data Not Gamma Distributed at 5% Significance Level**											
39												
40	**Gamma Statistics**											
41					k hat (MLE)	0.867			k star (bias corrected MLE)	0.806		
42					Theta hat (MLE)	267.7			Theta star (bias corrected MLE)	287.8		
43					nu hat (MLE)	55.47			nu star (bias corrected)	51.6		
44					MLE Mean (bias corrected)	232			MLE Sd (bias corrected)	258.4		
45									Approximate Chi Square Value (0.05)	36.1		
46					Adjusted Level of Significance	0.0416			Adjusted Chi Square Value	35.41		
47												
48	**Assuming Gamma Distribution**											
49					95% Approximate Gamma UCL (use when n>=50))	331.6			95% Adjusted Gamma UCL (use when n<50)	338.1		
50												

ProUCL Output
Central Landfill ISS Area Soil (0-0.5 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

	A	B	C	D	E	F	G	H	I	J	K	L
51	**Lognormal GOF Test**											
52					Shapiro Wilk Test Statistic	0.947	**Shapiro Wilk Lognormal GOF Test**					
53					5% Shapiro Wilk Critical Value	0.93	Data appear Lognormal at 5% Significance Level					
54					Lilliefors Test Statistic	0.129	**Lilliefors Lognormal GOF Test**					
55					5% Lilliefors Critical Value	0.154	Data appear Lognormal at 5% Significance Level					
56	Data appear Lognormal at 5% Significance Level											
57												
58	**Lognormal Statistics**											
59					Minimum of Logged Data	2.342				Mean of logged Data		4.769
60					Maximum of Logged Data	6.883				SD of logged Data		1.252
61												
62	**Assuming Lognormal Distribution**											
63					95% H-UCL	478.9				90% Chebyshev (MVUE) UCL		447.3
64					95% Chebyshev (MVUE) UCL	537.8				97.5% Chebyshev (MVUE) UCL		663.3
65					99% Chebyshev (MVUE) UCL	909.9						
66												
67	**Nonparametric Distribution Free UCL Statistics**											
68	Data appear to follow a Discernible Distribution at 5% Significance Level											
69												
70	**Nonparametric Distribution Free UCLs**											
71					95% CLT UCL	307.6				95% Jackknife UCL		309.9
72					95% Standard Bootstrap UCL	306				95% Bootstrap-t UCL		321.4
73					95% Hall's Bootstrap UCL	317.5				95% Percentile Bootstrap UCL		309
74					95% BCA Bootstrap UCL	317.6						
75					90% Chebyshev(Mean, Sd) UCL	369.9				95% Chebyshev(Mean, Sd) UCL		432.3
76					97.5% Chebyshev(Mean, Sd) UCL	519				99% Chebyshev(Mean, Sd) UCL		689.2
77												
78	**Suggested UCL to Use**											
79					95% H-UCL	478.9						
80												
81	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
82	Recommendations are based upon data size, data distribution, and skewness.											
83	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
84	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
85												
86	ProUCL computes and outputs H-statistic based UCLs for historical reasons only.											
87	H-statistic often results in unstable (both high and low) values of UCL95 as shown in examples in the Technical Guide.											
88	It is therefore recommended to avoid the use of H-statistic based 95% UCLs.											
89	Use of nonparametric methods are preferred to compute UCL95 for skewed data sets which do not follow a gamma distribution.											
90												

ProUCL Output
Central Landfill ISS Area Soil (0-2 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

1	**UCL Statistics for Data Sets with Non-Detects**											
2												
3				User Selected Options								
4				Date/Time of Computation	ProUCL 5.17/30/2018 8:44:15 AM							
5				From File	20180727_fluoride_ISS_for_proucl_b.xls							
6				Full Precision	OFF							
7				Confidence Coefficient	95%							
8				Number of Bootstrap Operations	2000							
9												
10												
11	**Fluoride**											
12												
13	**General Statistics**											
14				Total Number of Observations	64			Number of Distinct Observations	63			
15								Number of Missing Observations	0			
16				Minimum	10.4			Mean	230			
17				Maximum	976			Median	83.4			
18				SD	257.3			Std. Error of Mean	32.16			
19				Coefficient of Variation	1.119			Skewness	1.392			
20												
21	**Normal GOF Test**											
22				Shapiro Wilk Test Statistic	0.772			**Shapiro Wilk GOF Test**				
23				5% Shapiro Wilk P Value	3.341E-13			Data Not Normal at 5% Significance Level				
24				Lilliefors Test Statistic	0.242			**Lilliefors GOF Test**				
25				5% Lilliefors Critical Value	0.111			Data Not Normal at 5% Significance Level				
26	Data Not Normal at 5% Significance Level											
27												
28	**Assuming Normal Distribution**											
29	**95% Normal UCL**							**95% UCLs (Adjusted for Skewness)**				
30				95% Student's-t UCL	283.7			95% Adjusted-CLT UCL (Chen-1995)	288.9			
31								95% Modified-t UCL (Johnson-1978)	284.6			
32												
33	**Gamma GOF Test**											
34				A-D Test Statistic	2.002			**Anderson-Darling Gamma GOF Test**				
35				5% A-D Critical Value	0.785			Data Not Gamma Distributed at 5% Significance Level				
36				K-S Test Statistic	0.195			**Kolmogorov-Smirnov Gamma GOF Test**				
37				5% K-S Critical Value	0.115			Data Not Gamma Distributed at 5% Significance Level				
38	Data Not Gamma Distributed at 5% Significance Level											
39												
40	**Gamma Statistics**											
41				k hat (MLE)	0.899			k star (bias corrected MLE)	0.867			
42				Theta hat (MLE)	255.8			Theta star (bias corrected MLE)	265.1			
43				nu hat (MLE)	115.1			nu star (bias corrected)	111			
44				MLE Mean (bias corrected)	230			MLE Sd (bias corrected)	246.9			
45								Approximate Chi Square Value (0.05)	87.71			
46				Adjusted Level of Significance	0.0463			Adjusted Chi Square Value	87.23			
47												
48	**Assuming Gamma Distribution**											
49				95% Approximate Gamma UCL (use when n>=50))	291.1			95% Adjusted Gamma UCL (use when n<50)	292.7			
50												

ProUCL Output
Central Landfill ISS Area Soil (0-2 ft-bgs)
Columbia Falls Aluminum Facility
Columbia Falls, Montana

	A	B	C	D	E	F	G	H	I	J	K	L
51	**Lognormal GOF Test**											
52					Shapiro Wilk Test Statistic	0.937	**Shapiro Wilk Lognormal GOF Test**					
53					5% Shapiro Wilk P Value	0.00387	Data Not Lognormal at 5% Significance Level					
54					Lilliefors Test Statistic	0.139	**Lilliefors Lognormal GOF Test**					
55					5% Lilliefors Critical Value	0.111	Data Not Lognormal at 5% Significance Level					
56	Data Not Lognormal at 5% Significance Level											
57												
58	**Lognormal Statistics**											
59					Minimum of Logged Data	2.342				Mean of logged Data	4.788	
60					Maximum of Logged Data	6.883				SD of logged Data	1.194	
61												
62	**Assuming Lognormal Distribution**											
63					95% H-UCL	342.9				90% Chebyshev (MVUE) UCL	374.6	
64					95% Chebyshev (MVUE) UCL	435.4				97.5% Chebyshev (MVUE) UCL	519.9	
65					99% Chebyshev (MVUE) UCL	685.8						
66												
67	**Nonparametric Distribution Free UCL Statistics**											
68	Data do not follow a Discernible Distribution (0.05)											
69												
70	**Nonparametric Distribution Free UCLs**											
71					95% CLT UCL	282.9				95% Jackknife UCL	283.7	
72					95% Standard Bootstrap UCL	282.3				95% Bootstrap-t UCL	291.4	
73					95% Hall's Bootstrap UCL	292.2				95% Percentile Bootstrap UCL	286	
74					95% BCA Bootstrap UCL	288.6						
75					90% Chebyshev(Mean, Sd) UCL	326.5				95% Chebyshev(Mean, Sd) UCL	370.2	
76					97.5% Chebyshev(Mean, Sd) UCL	430.8				99% Chebyshev(Mean, Sd) UCL	550	
77												
78	**Suggested UCL to Use**											
79					95% Chebyshev (Mean, Sd) UCL	370.2						
80												
81	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
82	Recommendations are based upon data size, data distribution, and skewness.											
83	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
84	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
85												

Attachment C Venison COPC Uptake Model

Table C-1
Example Calculation for the Ingested Dose of Fluoride in Venison Tissue by the Hunter

Human Health Exposure Area	*Soil Concentration*	*Biotransfer Factor for Venison (Bv) (Bv = 0.2 x Bb)*		*Forage Tissue Concentration, Dry Matter (Cp) ($Cp = Cs \times BAF_{plant}$)*		*Venison Concentration (Cv) ($Cv = (Cp \times FIR_{browse} \times Bv) + (Cs \times FIR_{browse} \times f_{SI} \times Bv)$)*			*AUF (unitless) ($AUF = Area_{Site} \times Area_{Foraging\ Range}$)*			*AUF-Adjusted Venison Concentration (mg/kg ww) ($Cv_{Adjusted} = Cv \times AUF$)*
	Cs (mg/kg dw)[a]	Bb (D/kg tissue ww)	Bv (D/kg tissue ww)	BAF_{plant} (kg soil dw/kg plant tissue dw)	Cp (mg/kg plant tissue dw)	FIR_{browse} (kg DM/d)	f_{SI}	Cv (mg/kg ww)	Area of Site (acres)[b]	Area of Deer Foraging Range (acres)[b]	AUF (unitless)	
Main Plant Area	43.89	0.15	0.03	0.06	2.6334	0.87	0.02	0.09	150.2	997.7	0.151	0.014
North Percolation Pond Area	221	0.15	0.03	0.06	13.26	0.87	0.02	0.5	3.2	997.7	0.003	0.001
Central Landfills Area	84.92	0.15	0.03	0.06	5.0952	0.87	0.02	0.2	127.8	997.7	0.128	0.023
Industrial Landfill Area	4.17	0.15	0.03	0.06	0.2502	0.87	0.02	0.01	18.3	997.7	0.018	0.000
Eastern Undeveloped Area	0	0.15	0.03	0.06	0	0.87	0.02	0.0	99.9	997.7	0.100	0.000
North-Central Undeveloped Area	12.2	0.15	0.03	0.06	0.732	0.87	0.02	0.0	182.9	997.7	0.183	0.005
Western Undeveloped Area	10.68	0.15	0.03	0.06	0.6408	0.87	0.02	0.0	357.3	997.7	0.358	0.008
South Percolation Pond Area	17.95	0.15	0.03	0.06	1.077	0.87	0.02	0	49.1	997.7	0.049	0.002
Backwater Seep Sampling Area	32.7	0.15	0.03	0.06	1.962	0.87	0.02	0	8.8	997.7	0.009	0.001
											$EPC_{venison}$	0.053

Notes:

C_s = concentration in soil (mg/kg dry weight)

B_b = biotransfer factor for beef (d/kg tissue wet weight)

AUF = aereal ratio of exposure area to receptor foraging range (unitless)

B_v = biotransfer factor for venison; Bb adjusted to Bv multiplying Bb by 0.2 based on the ratio of % fatvenison/% fatbeef (2.9 / 14.4 = 0.2)

BAF_{plant} = soil-to-plant forage bioaccumulation factor (kg soil dry weight / kg plant forage tissue dry weight)

C_p = Concentration in plant forage tissue (mg/kg plant dry weight)

FIR_{browse} = browse ingestion rate (kg dry plant tissue/day)

C_v = concentration in venison tissue (mg/kg venison wet weight)

f_{SI} = Fraction of FIR_{browse} associated with incidental soil ingestion

Ir_v = ingestion rate of venison (kg venison wet weight/day)

EF = exposure frequency (days/year)

ED = exposure duration (years)

BW = body weight (kg)

AT = averaging time (noncancer) (days)

mg/kg = milligrams per kilogram

mg DM/d = milligrams dry matter per day

kg/d = kilograms per day

d/yr = days per year

yr = year

kg = kilograms

d = days

mg/kg-d = milligrams per kilogram per day

mg/kg ww = milligrams per kilogram wet weight

[a] Soil concentrations based on exposure point concentrations (EPCs) calculated for surface soil (0 - 0.5 ft bgs) for each exposure area. Refer to text for discussion on development of soil EPCs. If soil data not available for an exposure area, the soil concentration set to 0 for the purposes of calculation.

[b] Values presented are the vegetated portions of the exopsure area and Site. See table below for non-vegetated and vegetated areas for each human health exposure area.

Human Health Exposure Area	AOC	Area		
		Non-Vegetated (Acres)	Vegetated (Acres)	Total (Acres)
Main Plant Area	1	140.0	150.2	290.1
North Percolation Pond Area	2	8.0	3.2	11.3
Central Landfills Area	3	0.0	127.8	127.8
Industrial Landfill Area	4	0.0	18.3	18.3
Eastern Undeveloped Area	5	0.0	99.9	99.9
North-Central Undeveloped Area	6	0.0	182.9	182.9
Western Undeveloped Area	7	0.0	357.3	357.3
South Percolation Pond Area	8	0.0	49.1	49.1
Backwater Seep Sampling Area	9A	0.0	8.8	8.8
Total		148.0	997.7	1145.7

Appendix H Venison Uptake Models

Table H-1
Estimated Concentrations in Dietary Items of Terrestrial Receptors
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	log Kow	Estimated Bioaccumulation Factors in Plants of Terrestrial Receptors (mg/kg, dry weight)		
		Plants		
		Bioaccumulation Factor (BAF)	Estimated Concentration	BAF Reference
Inorganics - Metals				
Aluminum	NA	8.00E-04	2.1E+01	Baes et al. (1984)
Arsenic	NA	3.75E-02	2.8E-01	Bechtel-Jacobs (1998a)g
Barium	NA	1.56E-01	5.4E+01	Bechtel-Jacobs (1998a)g
Chromium[b]	NA	4.10E-02	1.1E-02	Bechtel-Jacobs (1998a)g
Cobalt	NA	7.50E-03	4.3E-02	Bechtel-Jacobs (1998a)g
Copper	NA	Regression[a]	5.78E+00	Bechtel-Jacobs (1998a)
Iron	NA	8.00E-04	1.3E+01	Bechtel-Jacobs (1998a)
Manganese	NA	7.90E-02	7.6E+01	Bechtel-Jacobs (1998a)g
Mercury	NA	Regression[a]	5.98E+01	Bechtel-Jacobs (1998a)
Nickel	NA	Regression[a]	8.02E-01	Bechtel-Jacobs (1998a)
Selenium	NA	Regression[a]	1.47E-01	Bechtel-Jacobs (1998a)
Thallium	NA	4.00E-03	7.6E-04	Baes et al. (1984)
Vanadium	NA	4.85E-03	6.5E-02	Bechtel-Jacobs (1998a)g
Zinc	NA	Regression[a]	4.93E+01	Bechtel-Jacobs (1998a)
Inorganics - Other Inorganics				
Cyanide[b]	NA	0.00E+00	0.0E+00	Lanno and Menzie (2005)
Fluoride	NA	6.00E-02	6.0E-01	Baes et al. (1984)
Semi-volatile Organic Compounds (SVOCs) - Polycyclic Aromatic Hydrocarbons (PAHs)				
Low Molecular Weight (LMW) PAHs:				
Naphthalene	3.36	1.22E+01	1.2E+02	USEPA (2007a)
High Molecular Weight (HMW) PAHs:				
Benzo(a)anthracene	5.7	Regression[a]	1.3E-02	USEPA (2007a)
Benzo[A]Pyrene	6.11	Regression[a]	1.2E-02	USEPA (2007a)
Benzo(b)fluoranthene	6.2	3.10E-01	5.7E-02	USEPA (2007a)

Table H-1
Estimated Concentrations in Dietary Items of Terrestrial Receptors
Columbia Falls Aluminum Company
Columbia Falls, Montana

Notes:

a, Plant tissue concentrations (mg/kg dry weight) calculated based on regression models, where ln([tissue]) = B0 + B1(ln[soil]).
Slopes (B1) and intercepts (B0) are as follows:

Analyte	B0	Data Source
Antimony	-3.233	USEPA (2007)
Beryllium	-0.5361	USEPA (2007)
Cadmium	-0.475	Bechtel-Jacobs (1998)
Copper	0.668	Bechtel-Jacobs (1998)
Lead	-1.328	Bechtel-Jacobs (1998)
Mercury	0.544	Bechtel-Jacobs (1998)
Nickel	-2.223	Bechtel-Jacobs (1998)
Selenium	-0.677	Bechtel-Jacobs (1998)
Zinc	1.575	Bechtel-Jacobs (1998)
Acenaphthene	-5.562	USEPA (2007)
Acenaphthylene	-1.144	USEPA (2007)
Anthracene	-0.9887	USEPA (2007)
Benzo(a)anthracene	-2.7078	USEPA (2007)
Benzo(a)pyrene	-2.0615	USEPA (2007)
Benzo(g,h,i)perylene	-0.9313	USEPA (2007)
Benzo(k)fluoranthene	-2.1579	USEPA (2007)
Chrysene	-2.7078	USEPA (2007)
Fluorene	-5.562	USEPA (2007)
Phenanthrene	-0.1665	USEPA (2007)

b, Chromium values used for hexavalent chromium; cyanide value used for free cyanide.

c, Soil-to-plant BAF based on Kow model for non-ionic organic compounds (rinsed foliage data) provided in USEPA (2005), where: log BAF = -0.4057(log Kow) + 1.781;
log Kow values obtained from EPA EpiSuite V. 1.69, KOWWIN module.

d, Soil-invertebrate bioaccumulation factor could not be identified; therefore, a conservative default accumulation factor of 1.0 was assummed.

e, Soil invertebrate tissue concentrations (mg/kg dry weight) calculated based on regression models, where ln([tissue]) = B0 + B1(ln[soil])
and slopes (B1) and intercepts (B0) are as follows:

Analyte	B0	Data Source
Arsenic	-1.421	Sample et al. (1999)
Cadmium	2.114	Sample et al. (1999)
Lead	-0.218	Sample et al. (1999)
Manganese	-0.809	Sample et al. (1999)
Selenium	-0.075	Sample et al. (1999)
Zinc	4.449	Sample et al. (1999)
2,3,7,8-TCDD	3.533	Sample et al. (1998a)

f, Bioaccumulation factor estimated as the product of the soil-plant and ingestion-beef factors reported in Baes et al. (1984)

f, Median soil-to-plant uptake factors reported in Bechtel (1998a) were used as bioaccumulation factors.

g, Small mammal tissue concentrations (mg/kg dry weight) calculated based on regression models, where ln([tissue]) = B0 + B1(ln[soil])
and slopes (B1) and intercepts (B0) are as follows:

Table H-1
Estimated Concentrations in Dietary Items of Terrestrial Receptors
Columbia Falls Aluminum Company
Columbia Falls, Montana

Analyte	B0	Data Source
Arsenic	-4.8471	Sample et al. (1998b)
Cadmium	-1.2571	Sample et al. (1998b)
Chromium	-1.4599	Sample et al. (1998b)
Cobalt	-4.4669	Sample et al. (1998b)
Copper	2.042	Sample et al. (1998b)
Lead	0.0761	Sample et al. (1998b)
Nickel	-0.2462	Sample et al. (1998b)
Selenium	-0.4158	Sample et al. (1998b)
Zinc	4.3632	Sample et al. (1998b)
2,3,7,8-TCDD	0.8113	Sample et al. (1998b)

h, Pentachlorophenol concentration in small mammal tissue (mg/kg dry weight) calculated based on regression models, where [tissue] = 0.198 + 0.00452([dietinvertebrate])

h, USEPA (2005) assumes bioaccumulation of PAHs by birds and mammals is minimal due to rapid metabolism of these compounds after ingestion.

i, Small mammal tissue estimated based on the medial BAF for the general model presented in Sample et al. (1998b)

j, No value was identified in the literature. Soil-to-small mammal BF estimated based on the approach presented in Table 5, consistent with LANL (2017).

Table H-2
Calculation for the Ingested Dose of Cyanide in Venison Tissue by the Hunter

Human Health Exposure Area	*Soil Concentration*	*Biotransfer Factor for Venison (Bv) (Bv = 0.2 x Bb)*		*Forage Tissue Concentration, Dry Matter (Cp) ($Cp = Cs \times BAF_{plant}$)*		*Venison Concentration (Cv) ($Cv = (Cp \times FIR_{browse} \times Bv) + (Cs \times FIR_{browse} \times f_{SI} \times Bv)$)*			*AUF (unitless) ($AUF = Area_{Site} \times Area_{Foraging\ Range}$)*			*AUF-Adjusted Venison Concentration (mg/kg ww) ($Cv_{Adjusted} = Cv \times AUF$)*
	Cs (mg/kg dw)[a]	Bb (D/kg tissue ww)	Bv (D/kg tissue ww)	BAF_{plant} (kg soil dw/kg plant tissue dw)	Cp (mg/kg plant tissue dw)	FIR_{browse} (kg DM/d)	f_{SI}	Cv (mg/kg ww)	Area of Site (acres)[b]	Area of Deer Foraging Range (acres)[b]	AUF (unitless)	
Main Plant Area	0.172	0.15	0.03	0	0E+00	0.87	0.02	0.000090	147.6	997.7	0.148	0.000013
North Percolation Pond Area	44.8	0.15	0.03	0	0E+00	0.87	0.02	0.023	3.2	997.7	0.003	0.000076
Central Landfills Area	0.433	0.15	0.03	0	0E+00	0.87	0.02	0.00023	129.5	997.7	0.130	0.000029
Industrial Landfill Area	0.157	0.15	0.03	0	0E+00	0.87	0.02	0.00008	19.2	997.7	0.019	0.0000016
Eastern Undeveloped Area	0.304	0.15	0.03	0	0E+00	0.87	0.02	0.00016	99.9	997.7	0.100	0.000016
North-Central Undeveloped Area	0.141	0.15	0.03	0	0E+00	0.87	0.02	0.00007	182.9	997.7	0.183	0.000013
Western Undeveloped Area	0.32	0.15	0.03	0	0E+00	0.87	0.02	0.00017	357.3	997.7	0.358	0.000060
South Percolation Pond Area	4.117	0.15	0.03	0	0E+00	0.87	0.02	0.0021	49.1	997.7	0.049	0.000106
Backwater Seep Sampling Area	1.9	0.15	0.03	0	0E+00	0.87	0.02	0.0010	8.9	997.7	0.009	0.0000088
											EPC venison	3.2E-04

Notes:

C_s = concentration in soil (mg/kg dry weight)

B_b = biotransfer factor for beef (d/kg tissue wet weight)

AUF = aereal ratio of exposure area to receptor foraging range (unitless)

B_v = biotransfer factor for venison; Bb adjusted to Bv multiplying Bb by 0.2 based on the ratio of % fatvenison/% fatbeef (2.9 / 14.4 = 0.2)

BAF_{plant} = soil-to-plant forage bioaccumulation factor (kg soil dry weight / kg plant forage tissue dry weight)

C_p = Concentration in plant forage tissue (mg/kg plant dry weight)

FIR_{browse} = browse ingestion rate (kg dry plant tissue/day)

C_v = concentration in venison tissue (mg/kg venison wet weight)

f_{SI} = Fraction of FIR_{browse} associated with incidental soil ingestion

Ir_v = ingestion rate of venison (kg venison wet weight/day)

EF = exposure frequency (days/year)

ED = exposure duration (years)

BW = body weight (kg)

AT = averaging time (noncancer) (days)

mg/kg = milligrams per kilogram

mg DM/d = milligrams dry matter per day

kg/d = kilograms per day

d/yr = days per year

yr = year

kg = kilograms

d = days

mg/kg-d = milligrams per kilogram per day

mg/kg ww = milligrams per kilogram wet weight

[a] Soil concentrations based on exposure point concentrations (EPCs) calculated for surface soil (0 - 0.5 ft bgs) for each exposure area. Refer to text for discussion on development of soil EPCs. If soil data not available for an exposure area, the soil concentration set to 0 for the purposes of calculation.

[b] Values presented are the vegetated portions of the exopsure area and Site. See table below for non-vegetated and vegetated areas for each human health exposure area.

		Area		
		Non-Vegetated	Vegetated	Total
Human Health Exposure Area	**AOC**	**(Acres)**	**(Acres)**	**(Acres)**
HHRA Exp Area	AOC	Non-Veg_Area	Veg_Area	Total_Area
Main Plant Area	1	139.8	147.6	287.4
North Percolation Pond Area	2	8.0	3.2	11.3
Central Landfills Area	3	0.13	129.5	129.7
Industrial Landfill Area	4	0.0	19.2	19.2
Eastern Undeveloped Area	5	0.0	99.9	99.9
North-Central Undeveloped Area	6	0.0	182.9	182.9
Western Undeveloped Area	7	0.0	357.3	357.3
South Percolation Pond Area	8	0.0	49.1	49.1
Backwater Seep Sampling Area	9A	0.0	8.9	8.9
Total		148.0	997.7	1145.7

Table H-3
Calculation for the Ingested Dose of Fluoride in Venison Tissue by the Hunter

Human Health Exposure Area	*Soil Concentration*	*Biotransfer Factor for Venison (Bv) (Bv = 0.2 x Bb)*		*Forage Tissue Concentration, Dry Matter (Cp) (Cp = Cs x BAF_{plant})*		*Venison Concentration (Cv) (Cv= (Cp x FIR_{browse} x Bv) + (Cs x FIR_{browse} x f_{SI} x Bv))*			*AUF (unitless) (AUF= $Area_{Site}$ x $Area_{Foraging\ Range}$)*			*AUF-Adjusted Venison Concentration (mg/kg ww)*
	Cs (mg/kg dw)[a]	Bb (D/kg tissue ww)	Bv (D/kg tissue ww)	BAF_{plant} (kg soil dw/kg plant tissue dw)	Cp (mg/kg plant tissue dw)	FIR_{browse} (kg DM/d)	f_{SI}	Cv (mg/kg ww)	Area of Site (acres)[b]	Area of Deer Foraging Range (acres)[b]	AUF (unitless)	*($Cv_{Adjusted}$ = Cv x AUF)*
Main Plant Area	96.61	0.15	0.03	0.06	6.0E-01	0.87	0.02	0.07	147.6	997.7	0.148	0.010
North Percolation Pond Area	145.6	0.15	0.03	0.06	6.0E-01	0.87	0.02	0.1	3.2	997.7	0.003	0.000
Central Landfills Area	82.9	0.15	0.03	0.06	6.0E-01	0.87	0.02	0.1	129.5	997.7	0.130	0.008
Industrial Landfill Area	471.3	0.15	0.03	0.06	6.0E-01	0.87	0.02	0.26	19.2	997.7	0.019	0.005
Eastern Undeveloped Area	21.05	0.15	0.03	0.06	6.0E-01	0.87	0.02	0.0	99.9	997.7	0.100	0.003
North-Central Undeveloped Area	11.25	0.15	0.03	0.06	6.0E-01	0.87	0.02	0.0	182.9	997.7	0.183	0.004
Western Undeveloped Area	6.88	0.15	0.03	0.06	6.0E-01	0.87	0.02	0.0	357.3	997.7	0.358	0.007
South Percolation Pond Area	17.95	0.15	0.03	0.06	6.0E-01	0.87	0.02	0	49.1	997.7	0.049	0.001
Backwater Seep Sampling Area	32.7	0.15	0.03	0.06	6.0E-01	0.87	0.02	0	8.9	997.7	0.009	0.000
											$EPC_{venison}$	0.038

Notes:

C_s = concentration in soil (mg/kg dry weight)

B_b = biotransfer factor for beef (d/kg tissue wet weight)

AUF = aereal ratio of exposure area to receptor foraging range (unitless)

B_v = biotransfer factor for venison; Bb adjusted to Bv multiplying Bb by 0.2 based on the ratio of % fatvenison/% fatbeef (2.9 / 14.4 = 0.2)

BAF_{plant} = soil-to-plant forage bioaccumulation factor (kg soil dry weight / kg plant forage tissue dry weight)

C_p = Concentration in plant forage tissue (mg/kg plant dry weight)

FIR_{browse} = browse ingestion rate (kg dry plant tissue/day)

C_v = concentration in venison tissue (mg/kg venison wet weight)

f_{SI} = Fraction of FIR_{browse} associated with incidental soil ingestion

Ir_v = ingestion rate of venison (kg venison wet weight/day)

EF = exposure frequency (days/year)

ED = exposure duration (years)

BW = body weight (kg)

AT = averaging time (noncancer) (days)

mg/kg = milligrams per kilogram

mg DM/d = milligrams dry matter per day

kg/d = kilograms per day

d/yr = days per year

yr = year

kg = kilograms

d = days

mg/kg-d = milligrams per kilogram per day

mg/kg ww = milligrams per kilogram wet weight

[a] Soil concentrations based on exposure point concentrations (EPCs) calculated for surface soil (0 - 0.5 ft bgs) for each exposure area. Refer to text for discussion on development of soil EPCs. If soil data not available for an exposure area, the soil concentration set to 0 for the purposes of calculation.

[b] Values presented are the vegetated portions of the exopsure area and Site. See table below for non-vegetated and vegetated areas for each human health exposure area.

Human Health Exposure Area	AOC	Area		
		Non-Vegetated (Acres)	Vegetated (Acres)	Total (Acres)
Main Plant Area	1	139.8	147.6	287.4
North Percolation Pond Area	2	8.0	3.2	11.3
Central Landfills Area	3	0.13	129.5	129.7
Industrial Landfill Area	4	0.0	19.2	19.2
Eastern Undeveloped Area	5	0.0	99.9	99.9
North-Central Undeveloped Area	6	0.0	182.9	182.9
Western Undeveloped Area	7	0.0	357.3	357.3
South Percolation Pond Area	8	0.0	49.1	49.1
Backwater Seep Sampling Area	9A	0.0	8.9	8.9
Total		148.0	997.7	1145.7

Table H-4
Calculation for the Ingested Dose of Hexavalent Chromium in Venison Tissue by the Hunter

Human Health Exposure Area	*Soil Concentration*	*Biotransfer Factor for Venison (Bv) (Bv = 0.2 x Bb)*		*Forage Tissue Concentration, Dry Matter (Cp) ($Cp = Cs \times BAF_{plant}$)*		*Venison Concentration (Cv) ($Cv = (Cp \times FIR_{browse} \times Bv) + (Cs \times FIR_{browse} \times f_{SI} \times Bv)$)*			*AUF (unitless) ($AUF = Area_{Site} \times Area_{Foraging\ Range}$)*			*AUF-Adjusted Venison Concentration (mg/kg ww) ($Cv_{Adjusted} = Cv \times AUF$)*
	Cs (mg/kg dw)[a]	Bb (D/kg tissue ww)	Bv (D/kg tissue ww)	BAF_{plant} (kg soil dw/kg plant tissue dw)	Cp (mg/kg plant tissue dw)	FIR_{browse} (kg DM/d)	f_{SI}	Cv (mg/kg ww)	Area of Site (acres)[b]	Area of Deer Foraging Range (acres)[b]	AUF (unitless)	
Main Plant Area	0.409	0.15	0.03	0.041	1.1E-02	0.87	0.02	0.00049	147.6	997.7	0.148	7.3E-05
North Percolation Pond Area	0.724	0.15	0.03	0.041	1.1E-02	0.87	0.02	0.00066	3.2	997.7	0.003	2.1E-06
Central Landfills Area	0.385	0.15	0.03	0.041	1.1E-02	0.87	0.02	0.00048	129.5	997.7	0.130	6.2E-05
Industrial Landfill Area	0.431	0.15	0.03	0.041	1.1E-02	0.87	0.02	0.00050	19.2	997.7	0.019	9.7E-06
Eastern Undeveloped Area	0.238	0.15	0.03	0.041	1.1E-02	0.87	0.02	0.00040	99.9	997.7	0.100	4.0E-05
North-Central Undeveloped Area	0.261	0.15	0.03	0.041	1.1E-02	0.87	0.02	0.00042	182.9	997.7	0.183	7.6E-05
Western Undeveloped Area	0.338	0.15	0.03	0.041	1.1E-02	0.87	0.02	0.00046	357.3	997.7	0.358	1.6E-04
South Percolation Pond Area	0.317	0.15	0.03	0.041	1.1E-02	0.87	0.02	0.00044	49.1	997.7	0.049	2.2E-05
Backwater Seep Sampling Area	0.331873	0.15	0.03	0.041	1.1E-02	0.87	0.02	0.00045	8.9	997.7	0.009	4.0E-06
											$EPC_{venison}$	4.5E-04

Notes:

C_s = concentration in soil (mg/kg dry weight)

B_b = biotransfer factor for beef (d/kg tissue wet weight)

AUF = aereal ratio of exposure area to receptor foraging range (unitless)

B_v = biotransfer factor for venison; Bb adjusted to Bv multiplying Bb by 0.2 based on the ratio of % fatvenison/% fatbeef (2.9 / 14.4 = 0.2)

BAF_{plant} = soil-to-plant forage bioaccumulation factor (kg soil dry weight / kg plant forage tissue dry weight)

C_p = Concentration in plant forage tissue (mg/kg plant dry weight)

FIR_{browse} = browse ingestion rate (kg dry plant tissue/day)

C_v = concentration in venison tissue (mg/kg venison wet weight)

f_{SI} = Fraction of FIR_{browse} associated with incidental soil ingestion

Ir_v = ingestion rate of venison (kg venison wet weight/day)

EF = exposure frequency (days/year)

ED = exposure duration (years)

BW = body weight (kg)

AT = averaging time (noncancer) (days)

mg/kg = milligrams per kilogram

mg DM/d = milligrams dry matter per day

kg/d = kilograms per day

d/yr = days per year

yr = year

kg = kilograms

d = days

mg/kg-d = milligrams per kilogram per day

mg/kg ww = milligrams per kilogram wet weight

[a] Soil concentrations based on exposure point concentrations (EPCs) calculated for surface soil (0 - 0.5 ft bgs) for each exposure area. Refer to text for discussion on development of soil EPCs. If soil data not available for an exposure area, the soil concentration set to 0 for the purposes of calculation.

[b] Values presented are the vegetated portions of the exopsure area and Site. See table below for non-vegetated and vegetated areas for each human health exposure area.

Human Health Exposure Area	AOC	Area		
		Non-Vegetated (Acres)	Vegetated (Acres)	Total (Acres)
Main Plant Area	1	139.8	147.6	287.4
North Percolation Pond Area	2	8.0	3.2	11.3
Central Landfills Area	3	0.13	129.5	129.7
Industrial Landfill Area	4	0.0	19.2	19.2
Eastern Undeveloped Area	5	0.0	99.9	99.9
North-Central Undeveloped Area	6	0.0	182.9	182.9
Western Undeveloped Area	7	0.0	357.3	357.3
South Percolation Pond Area	8	0.0	49.1	49.1
Backwater Seep Sampling Area	9A	0.0	8.9	8.9
Total		148.0	997.7	1145.7

Table H-5
Calculation for the Ingested Dose of Aluminum in Venison Tissue by the Hunter

Human Health Exposure Area	*Soil Concentration*	*Biotransfer Factor for Venison (Bv) (Bv = 0.2 x Bb)*		*Forage Tissue Concentration, Dry Matter (Cp) ($Cp = Cs \times BAF_{plant}$)*		*Venison Concentration (Cv) ($Cv = (Cp \times FIR_{browse} \times Bv) + (Cs \times FIR_{browse} \times f_{SI} \times Bv)$)*			*AUF (unitless) ($AUF = Area_{Site} \times Area_{Foraging\ Range}$)*			*AUF-Adjusted Venison Concentration (mg/kg ww) ($Cv_{Adjusted} = Cv \times AUF$)*
	Cs (mg/kg dw)[a]	Bb (D/kg tissue ww)	Bv (D/kg tissue ww)	BAF_{plant} (kg soil dw/kg plant tissue dw)	Cp (mg/kg plant tissue dw)	FIR_{browse} (kg DM/d)	f_{SI}	Cv (mg/kg ww)	Area of Site (acres)[b]	Area of Deer Foraging Range (acres)[b]	AUF (unitless)	
Main Plant Area	15811	0.15	0.03	0.0008	2.1E+01	0.87	0.02	8.79	147.6	997.7	0.148	1.301
North Percolation Pond Area	46518	0.15	0.03	0.0008	2.1E+01	0.87	0.02	24.8	3.2	997.7	0.003	0.080
Central Landfills Area	15808	0.15	0.03	0.0008	2.1E+01	0.87	0.02	8.8	129.5	997.7	0.130	1.142
Industrial Landfill Area	21418	0.15	0.03	0.0008	2.1E+01	0.87	0.02	11.72	19.2	997.7	0.019	0.226
Eastern Undeveloped Area	19578	0.15	0.03	0.0008	2.1E+01	0.87	0.02	10.8	99.9	997.7	0.100	1.077
North-Central Undeveloped Area	19264	0.15	0.03	0.0008	2.1E+01	0.87	0.02	10.6	182.9	997.7	0.183	1.942
Western Undeveloped Area	19193	0.15	0.03	0.0008	2.1E+01	0.87	0.02	10.6	357.3	997.7	0.358	3.782
South Percolation Pond Area	2570	0.15	0.03	0.0008	2.1E+01	0.87	0.02	2	49.1	997.7	0.049	0.093
Backwater Seep Sampling Area	10800	0.15	0.03	0.0008	2.1E+01	0.87	0.02	6	8.9	997.7	0.009	0.055
											$EPC_{venison}$	9.697

Notes:

C_s = concentration in soil (mg/kg dry weight)

B_b = biotransfer factor for beef (d/kg tissue wet weight)

AUF = aereal ratio of exposure area to receptor foraging range (unitless)

B_v = biotransfer factor for venison; Bb adjusted to Bv multiplying Bb by 0.2 based on the ratio of % fatvenison/% fatbeef (2.9 / 14.4 = 0.2)

BAF_{plant} = soil-to-plant forage bioaccumulation factor (kg soil dry weight / kg plant forage tissue dry weight)

C_p = Concentration in plant forage tissue (mg/kg plant dry weight)

FIR_{browse} = browse ingestion rate (kg dry plant tissue/day)

C_v = concentration in venison tissue (mg/kg venison wet weight)

f_{SI} = Fraction of FIR_{browse} associated with incidental soil ingestion

Ir_v = ingestion rate of venison (kg venison wet weight/day)

EF = exposure frequency (days/year)

ED = exposure duration (years)

BW = body weight (kg)

AT = averaging time (noncancer) (days)

mg/kg = milligrams per kilogram

mg DM/d = milligrams dry matter per day

kg/d = kilograms per day

d/yr = days per year

yr = year

kg = kilograms

d = days

mg/kg-d = milligrams per kilogram per day

mg/kg ww = milligrams per kilogram wet weight

[a] Soil concentrations based on exposure point concentrations (EPCs) calculated for surface soil (0 - 0.5 ft bgs) for each exposure area. Refer to text for discussion on development of soil EPCs. If soil data not available for an exposure area, the soil concentration set to 0 for the purposes of calculation.

[b] Values presented are the vegetated portions of the exopsure area and Site. See table below for non-vegetated and vegetated areas for each human health exposure area.

Human Health Exposure Area	AOC	Area		
		Non-Vegetated (Acres)	Vegetated (Acres)	Total (Acres)
Main Plant Area	1	139.8	147.6	287.4
North Percolation Pond Area	2	8.0	3.2	11.3
Central Landfills Area	3	0.13	129.5	129.7
Industrial Landfill Area	4	0.0	19.2	19.2
Eastern Undeveloped Area	5	0.0	99.9	99.9
North-Central Undeveloped Area	6	0.0	182.9	182.9
Western Undeveloped Area	7	0.0	357.3	357.3
South Percolation Pond Area	8	0.0	49.1	49.1
Backwater Seep Sampling Area	9A	0.0	8.9	8.9
Total		148.0	997.7	1145.7

Table H-6
Calculation for the Ingested Dose of Antimony in Venison Tissue by the Hunter

Human Health Exposure Area	*Soil Concentration*	*Biotransfer Factor for Venison (Bv) (Bv = 0.2 x Bb)*		*Forage Tissue Concentration, Dry Matter (Cp) ($Cp = Cs \times BAF_{plant}$)*		*Venison Concentration (Cv) ($Cv = (Cp \times FIR_{browse} \times Bv) + (Cs \times FIR_{browse} \times f_{SI} \times Bv)$)*			*AUF (unitless) ($AUF = Area_{Site} \times Area_{Foraging\ Range}$)*			*AUF-Adjusted Venison Concentration (mg/kg ww) ($Cv_{Adjusted} = Cv \times AUF$)*
	Cs (mg/kg dw)[a]	Bb (D/kg tissue ww)	Bv (D/kg tissue ww)	BAF_{plant} (kg soil dw/kg plant tissue dw)	Cp (mg/kg plant tissue dw)	FIR_{browse} (kg DM/d)	f_{SI}	Cv (mg/kg ww)	Area of Site (acres)[b]	Area of Deer Foraging Range (acres)[b]	AUF (unitless)	
Main Plant Area	0.269	0.15	0.03	Regression	3.4E-01	0.87	0.02	0.01	147.6	997.7	0.148	0.001
North Percolation Pond Area	0.825	0.15	0.03	Regression	3.4E-01	0.87	0.02	0.01	3.2	997.7	0.003	0.000
Central Landfills Area	0.265	0.15	0.03	Regression	3.4E-01	0.87	0.02	0.01	129.5	997.7	0.130	0.001
Industrial Landfill Area	0.794	0.15	0.03	Regression	3.4E-01	0.87	0.02	0.01	19.2	997.7	0.019	0.000
Eastern Undeveloped Area	NA	0.15	0.03	Regression	3.4E-01	0.87	0.02	NA	99.9	997.7	0.100	NA
North-Central Undeveloped Area	NA	0.15	0.03	Regression	3.4E-01	0.87	0.02	NA	182.9	997.7	0.183	NA
Western Undeveloped Area	NA	0.15	0.03	Regression	3.4E-01	0.87	0.02	NA	357.3	997.7	0.358	NA
South Percolation Pond Area	0.67	0.15	0.03	Regression	3.4E-01	0.87	0.02	0.01	49.1	997.7	0.049	0.000
Backwater Seep Sampling Area	NA	0.15	0.03	Regression	3.4E-01	0.87	0.02	NA	8.9	997.7	0.009	NA
											$EPC_{venison}$	0.0032

Notes:

C_s = concentration in soil (mg/kg dry weight)

B_b = biotransfer factor for beef (d/kg tissue wet weight)

AUF = aereal ratio of exposure area to receptor foraging range (unitless)

B_v = biotransfer factor for venison; Bb adjusted to Bv multiplying Bb by 0.2 based on the ratio of % fatvenison/% fatbeef (2.9 / 14.4 = 0.2)

BAF_{plant} = soil-to-plant forage bioaccumulation factor (kg soil dry weight / kg plant forage tissue dry weight)

C_p = Concentration in plant forage tissue (mg/kg plant dry weight)

FIR_{browse} = browse ingestion rate (kg dry plant tissue/day)

C_v = concentration in venison tissue (mg/kg venison wet weight)

f_{SI} = Fraction of FIR_{browse} associated with incidental soil ingestion

Ir_v = ingestion rate of venison (kg venison wet weight/day)

EF = exposure frequency (days/year)

ED = exposure duration (years)

BW = body weight (kg)

AT = averaging time (noncancer) (days)

mg/kg = milligrams per kilogram

mg DM/d = milligrams dry matter per day

kg/d = kilograms per day

d/yr = days per year

yr = year

kg = kilograms

d = days

mg/kg-d = milligrams per kilogram per day

mg/kg ww = milligrams per kilogram wet weight

[a] Soil concentrations based on exposure point concentrations (EPCs) calculated for surface soil (0 - 0.5 ft bgs) for each exposure area. Refer to text for discussion on development of soil EPCs. If soil data not available for an exposure area, the soil concentration set to 0 for the purposes of calculation.

[b] Values presented are the vegetated portions of the exopsure area and Site. See table below for non-vegetated and vegetated areas for each human health exposure area.

Human Health Exposure Area	AOC	Area		
		Non-Vegetated (Acres)	Vegetated (Acres)	Total (Acres)
Main Plant Area	1	139.8	147.6	287.4
North Percolation Pond Area	2	8.0	3.2	11.3
Central Landfills Area	3	0.13	129.5	129.7
Industrial Landfill Area	4	0.0	19.2	19.2
Eastern Undeveloped Area	5	0.0	99.9	99.9
North-Central Undeveloped Area	6	0.0	182.9	182.9
Western Undeveloped Area	7	0.0	357.3	357.3
South Percolation Pond Area	8	0.0	49.1	49.1
Backwater Seep Sampling Area	9A	0.0	8.9	8.9
Total		148.0	997.7	1145.7

Table H-7
Calculation for the Ingested Dose of Arsenic in Venison Tissue by the Hunter

Human Health Exposure Area	*Soil Concentration*	*Biotransfer Factor for Venison (Bv) (Bv = 0.2 x Bb)*		*Forage Tissue Concentration, Dry Matter (Cp) ($Cp = Cs \times BAF_{plant}$)*		*Venison Concentration (Cv) ($Cv = (Cp \times FIR_{browse} \times Bv) + (Cs \times FIR_{browse} \times f_{SI} \times Bv)$)*			*AUF (unitless) ($AUF = Area_{Site} \times Area_{Foraging\ Range}$)*			*AUF-Adjusted Venison Concentration (mg/kg ww) ($Cv_{Adjusted} = Cv \times AUF$)*
	Cs (mg/kg dw)[a]	Bb (D/kg tissue ww)	Bv (D/kg tissue ww)	BAF_{plant} (kg soil dw/kg plant tissue dw)	Cp (mg/kg plant tissue dw)	FIR_{browse} (kg DM/d)	f_{SI}	Cv (mg/kg ww)	Area of Site (acres)[b]	Area of Deer Foraging Range (acres)[b]	AUF (unitless)	
Main Plant Area	4.841	0.15	0.03	0.03752	2.8E-01	0.87	0.02	0.0097	147.6	997.7	0.148	0.00144
North Percolation Pond Area	12.06	0.15	0.03	0.03752	2.8E-01	0.87	0.02	0.0135	3.2	997.7	0.003	0.000044
Central Landfills Area	6.583	0.15	0.03	0.03752	2.8E-01	0.87	0.02	0.0106	129.5	997.7	0.130	0.00138
Industrial Landfill Area	9.302	0.15	0.03	0.03752	2.8E-01	0.87	0.02	0.0120	19.2	997.7	0.019	0.00023
Eastern Undeveloped Area	7.18	0.15	0.03	0.03752	2.8E-01	0.87	0.02	0.0109	99.9	997.7	0.100	0.00110
North-Central Undeveloped Area	7.345	0.15	0.03	0.03752	2.8E-01	0.87	0.02	0.0110	182.9	997.7	0.183	0.00202
Western Undeveloped Area	5.526	0.15	0.03	0.03752	2.8E-01	0.87	0.02	0.0101	357.3	997.7	0.358	0.00361
South Percolation Pond Area	3.53	0.15	0.03	0.03752	2.8E-01	0.87	0.02	0.0090	49.1	997.7	0.049	0.00044
Backwater Seep Sampling Area	5.4	0.15	0.03	0.03752	2.8E-01	0.87	0.02	0.0100	8.9	997.7	0.009	0.00009
											$EPC_{venison}$	0.0104

Notes:

C_s = concentration in soil (mg/kg dry weight)

B_b = biotransfer factor for beef (d/kg tissue wet weight)

AUF = aereal ratio of exposure area to receptor foraging range (unitless)

B_v = biotransfer factor for venison; Bb adjusted to Bv multiplying Bb by 0.2 based on the ratio of % fatvenison/% fatbeef (2.9 / 14.4 = 0.2)

BAF_{plant} = soil-to-plant forage bioaccumulation factor (kg soil dry weight / kg plant forage tissue dry weight)

C_p = Concentration in plant forage tissue (mg/kg plant dry weight)

FIR_{browse} = browse ingestion rate (kg dry plant tissue/day)

C_v = concentration in venison tissue (mg/kg venison wet weight)

f_{SI} = Fraction of FIR_{browse} associated with incidental soil ingestion

Ir_v = ingestion rate of venison (kg venison wet weight/day)

EF = exposure frequency (days/year)

ED = exposure duration (years)

BW = body weight (kg)

AT = averaging time (noncancer) (days)

mg/kg = milligrams per kilogram

mg DM/d = milligrams dry matter per day

kg/d = kilograms per day

d/yr = days per year

yr = year

kg = kilograms

d = days

mg/kg-d = milligrams per kilogram per day

mg/kg ww = milligrams per kilogram wet weight

[a] Soil concentrations based on exposure point concentrations (EPCs) calculated for surface soil (0 - 0.5 ft bgs) for each exposure area. Refer to text for discussion on development of soil EPCs. If soil data not available for an exposure area, the soil concentration set to 0 for the purposes of calculation.

[b] Values presented are the vegetated portions of the exopsure area and Site. See table below for non-vegetated and vegetated areas for each human health exposure area.

Human Health Exposure Area	AOC	Area		
		Non-Vegetated (Acres)	Vegetated (Acres)	Total (Acres)
Main Plant Area	1	139.8	147.6	287.4
North Percolation Pond Area	2	8.0	3.2	11.3
Central Landfills Area	3	0.13	129.5	129.7
Industrial Landfill Area	4	0.0	19.2	19.2
Eastern Undeveloped Area	5	0.0	99.9	99.9
North-Central Undeveloped Area	6	0.0	182.9	182.9
Western Undeveloped Area	7	0.0	357.3	357.3
South Percolation Pond Area	8	0.0	49.1	49.1
Backwater Seep Sampling Area	9A	0.0	8.9	8.9
Total		148.0	997.7	1145.7

Table H-8
Calculation for the Ingested Dose of Cobalt in Venison Tissue by the Hunter

Human Health Exposure Area	*Soil Concentration*	*Biotransfer Factor for Venison (Bv) (Bv = 0.2 x Bb)*		*Forage Tissue Concentration, Dry Matter (Cp) ($Cp = Cs \times BAF_{plant}$)*		*Venison Concentration (Cv) ($Cv = (Cp \times FIR_{browse} \times Bv) + (Cs \times FIR_{browse} \times f_{SI} \times Bv)$)*			*AUF (unitless) ($AUF = Area_{Site} \times Area_{Foraging\ Range}$)*			*AUF-Adjusted Venison Concentration (mg/kg ww) ($Cv_{Adjusted} = Cv \times AUF$)*
	Cs (mg/kg dw)[a]	Bb (D/kg tissue ww)	Bv (D/kg tissue ww)	BAF_{plant} (kg soil dw/kg plant tissue dw)	Cp (mg/kg plant tissue dw)	FIR_{browse} (kg DM/d)	f_{SI}	Cv (mg/kg ww)	Area of Site (acres)[b]	Area of Deer Foraging Range (acres)[b]	AUF (unitless)	
Main Plant Area	5.306	0.15	0.03	0.0075	4.3E-02	0.87	0.02	0.0039	147.6	997.7	0.148	0.00058
North Percolation Pond Area	8.925	0.15	0.03	0.0075	4.3E-02	0.87	0.02	0.0058	3.2	997.7	0.003	0.000019
Central Landfills Area	5.867	0.15	0.03	0.0075	4.3E-02	0.87	0.02	0.0042	129.5	997.7	0.130	0.00054
Industrial Landfill Area	7.454	0.15	0.03	0.0075	4.3E-02	0.87	0.02	0.0050	19.2	997.7	0.019	0.00010
Eastern Undeveloped Area	5.594	0.15	0.03	0.0075	4.3E-02	0.87	0.02	0.0040	99.9	997.7	0.100	0.00041
North-Central Undeveloped Area	5.759	0.15	0.03	0.0075	4.3E-02	0.87	0.02	0.0041	182.9	997.7	0.183	0.00076
Western Undeveloped Area	5.994	0.15	0.03	0.0075	4.3E-02	0.87	0.02	0.0043	357.3	997.7	0.358	0.00152
South Percolation Pond Area	4.98	0.15	0.03	0.0075	4.3E-02	0.87	0.02	0.0037	49.1	997.7	0.049	0.00018
Backwater Seep Sampling Area	7.6	0.15	0.03	0.0075	4.3E-02	0.87	0.02	0.0051	8.9	997.7	0.009	0.000045
											EPC venison	0.0042

Notes:

C_s = concentration in soil (mg/kg dry weight)

B_b = biotransfer factor for beef (d/kg tissue wet weight)

AUF = aereal ratio of exposure area to receptor foraging range (unitless)

B_v = biotransfer factor for venison; Bb adjusted to Bv multiplying Bb by 0.2 based on the ratio of % fatvenison/% fatbeef (2.9 / 14.4 = 0.2)

BAF_{plant} = soil-to-plant forage bioaccumulation factor (kg soil dry weight / kg plant forage tissue dry weight)

C_p = Concentration in plant forage tissue (mg/kg plant dry weight)

FIR_{browse} = browse ingestion rate (kg dry plant tissue/day)

C_v = concentration in venison tissue (mg/kg venison wet weight)

f_{SI} = Fraction of FIR_{browse} associated with incidental soil ingestion

Ir_v = ingestion rate of venison (kg venison wet weight/day)

EF = exposure frequency (days/year)

ED = exposure duration (years)

BW = body weight (kg)

AT = averaging time (noncancer) (days)

mg/kg = milligrams per kilogram

mg DM/d = milligrams dry matter per day

kg/d = kilograms per day

d/yr = days per year

yr = year

kg = kilograms

d = days

mg/kg-d = milligrams per kilogram per day

mg/kg ww = milligrams per kilogram wet weight

[a] Soil concentrations based on exposure point concentrations (EPCs) calculated for surface soil (0 - 0.5 ft bgs) for each exposure area. Refer to text for discussion on development of soil EPCs. If soil data not available for an exposure area, the soil concentration set to 0 for the purposes of calculation.

[b] Values presented are the vegetated portions of the exopsure area and Site. See table below for non-vegetated and vegetated areas for each human health exposure area.

Human Health Exposure Area	AOC	Area		
		Non-Vegetated (Acres)	Vegetated (Acres)	Total (Acres)
Main Plant Area	1	139.8	147.6	287.4
North Percolation Pond Area	2	8.0	3.2	11.3
Central Landfills Area	3	0.13	129.5	129.7
Industrial Landfill Area	4	0.0	19.2	19.2
Eastern Undeveloped Area	5	0.0	99.9	99.9
North-Central Undeveloped Area	6	0.0	182.9	182.9
Western Undeveloped Area	7	0.0	357.3	357.3
South Percolation Pond Area	8	0.0	49.1	49.1
Backwater Seep Sampling Area	9A	0.0	8.9	8.9
Total		148.0	997.7	1145.7

Table H-9
Calculation for the Ingested Dose of Copper in Venison Tissue by the Hunter

Human Health Exposure Area	*Soil Concentration*	*Biotransfer Factor for Venison (Bv) (Bv = 0.2 x Bb)*		*Forage Tissue Concentration, Dry Matter (Cp) ($Cp = Cs \times BAF_{plant}$)*		*Venison Concentration (Cv) ($Cv = (Cp \times FIR_{browse} \times Bv) + (Cs \times FIR_{browse} \times f_{SI} \times Bv)$)*			*AUF (unitless) ($AUF = Area_{Site} \times Area_{Foraging\ Range}$)*			*AUF-Adjusted Venison Concentration (mg/kg ww) ($Cv_{Adjusted} = Cv \times AUF$)*
	Cs (mg/kg dw)[a]	Bb (D/kg tissue ww)	Bv (D/kg tissue ww)	BAF_{plant} (kg soil dw/kg plant tissue dw)	Cp (mg/kg plant tissue dw)	FIR_{browse} (kg DM/d)	f_{SI}	Cv (mg/kg ww)	Area of Site (acres)[b]	Area of Deer Foraging Range (acres)[b]	AUF (unitless)	
Main Plant Area	16.37	0.15	0.03	Regression	5.9E+00	0.87	0.02	0.16	147.6	997.7	0.148	0.024
North Percolation Pond Area	40.45	0.15	0.03	Regression	8.4E+00	0.87	0.02	0.2	3.2	997.7	0.003	0.001
Central Landfills Area	696.5	0.15	0.03	Regression	2.6E+01	0.87	0.02	1.0	129.5	997.7	0.130	0.134
Industrial Landfill Area	21.84	0.15	0.03	Regression	6.6E+00	0.87	0.02	0.18	19.2	997.7	0.019	0.004
Eastern Undeveloped Area	14.3	0.15	0.03	Regression	5.6E+00	0.87	0.02	0.2	99.9	997.7	0.100	0.015
North-Central Undeveloped Area	15.75	0.15	0.03	Regression	5.8E+00	0.87	0.02	0.2	182.9	997.7	0.183	0.029
Western Undeveloped Area	17.9	0.15	0.03	Regression	6.1E+00	0.87	0.02	0.2	357.3	997.7	0.358	0.060
South Percolation Pond Area	204.4	0.15	0.03	Regression	1.6E+01	0.87	0.02	1	49.1	997.7	0.049	0.026
Backwater Seep Sampling Area	22.7	0.15	0.03	Regression	6.7E+00	0.87	0.02	0	8.9	997.7	0.009	0.002
											$EPC_{venison}$	0.294

Notes:

C_s = concentration in soil (mg/kg dry weight)

B_b = biotransfer factor for beef (d/kg tissue wet weight)

AUF = aereal ratio of exposure area to receptor foraging range (unitless)

B_v = biotransfer factor for venison; Bb adjusted to Bv multiplying Bb by 0.2 based on the ratio of % fatvenison/% fatbeef (2.9 / 14.4 = 0.2)

BAF_{plant} = soil-to-plant forage bioaccumulation factor (kg soil dry weight / kg plant forage tissue dry weight)

C_p = Concentration in plant forage tissue (mg/kg plant dry weight)

FIR_{browse} = browse ingestion rate (kg dry plant tissue/day)

C_v = concentration in venison tissue (mg/kg venison wet weight)

f_{SI} = Fraction of FIR_{browse} associated with incidental soil ingestion

Ir_v = ingestion rate of venison (kg venison wet weight/day)

EF = exposure frequency (days/year)

ED = exposure duration (years)

BW = body weight (kg)

AT = averaging time (noncancer) (days)

mg/kg = milligrams per kilogram

mg DM/d = milligrams dry matter per day

kg/d = kilograms per day

d/yr = days per year

yr = year

kg = kilograms

d = days

mg/kg-d = milligrams per kilogram per day

mg/kg ww = milligrams per kilogram wet weight

[a] Soil concentrations based on exposure point concentrations (EPCs) calculated for surface soil (0 - 0.5 ft bgs) for each exposure area. Refer to text for discussion on development of soil EPCs. If soil data not available for an exposure area, the soil concentration set to 0 for the purposes of calculation.

[b] Values presented are the vegetated portions of the exopsure area and Site. See table below for non-vegetated and vegetated areas for each human health exposure area.

Human Health Exposure Area	AOC	Area		
		Non-Vegetated (Acres)	Vegetated (Acres)	Total (Acres)
Main Plant Area	1	139.8	147.6	287.4
North Percolation Pond Area	2	8.0	3.2	11.3
Central Landfills Area	3	0.13	129.5	129.7
Industrial Landfill Area	4	0.0	19.2	19.2
Eastern Undeveloped Area	5	0.0	99.9	99.9
North-Central Undeveloped Area	6	0.0	182.9	182.9
Western Undeveloped Area	7	0.0	357.3	357.3
South Percolation Pond Area	8	0.0	49.1	49.1
Backwater Seep Sampling Area	9A	0.0	8.9	8.9
Total		148.0	997.7	1145.7

Table H-10
Calculation for the Ingested Dose of Iron in Venison Tissue by the Hunter

Human Health Exposure Area	*Soil Concentration*	*Biotransfer Factor for Venison (Bv) (Bv = 0.2 x Bb)*		*Forage Tissue Concentration, Dry Matter (Cp) ($Cp = Cs \times BAF_{plant}$)*		*Venison Concentration (Cv) ($Cv = (Cp \times FIR_{browse} \times Bv) + (Cs \times FIR_{browse} \times f_{SI} \times Bv)$)*			*AUF (unitless) ($AUF = Area_{Site} \times Area_{Foraging\ Range}$)*			*AUF-Adjusted Venison Concentration (mg/kg ww) ($Cv_{Adjusted} = Cv \times AUF$)*
	Cs (mg/kg dw)[a]	Bb (D/kg tissue ww)	Bv (D/kg tissue ww)	BAF_{plant} (kg soil dw/kg plant tissue dw)	Cp (mg/kg plant tissue dw)	FIR_{browse} (kg DM/d)	f_{SI}	Cv (mg/kg ww)	Area of Site (acres)[b]	Area of Deer Foraging Range (acres)[b]	AUF (unitless)	
Main Plant Area	13957	0.15	0.03	0.0008	1.3E+01	0.87	0.02	7.61	147.6	997.7	0.148	1.126
North Percolation Pond Area	9657	0.15	0.03	0.0008	1.3E+01	0.87	0.02	5.4	3.2	997.7	0.003	0.017
Central Landfills Area	16479	0.15	0.03	0.0008	1.3E+01	0.87	0.02	8.9	129.5	997.7	0.130	1.159
Industrial Landfill Area	16810	0.15	0.03	0.0008	1.3E+01	0.87	0.02	9.10	19.2	997.7	0.019	0.175
Eastern Undeveloped Area	12863	0.15	0.03	0.0008	1.3E+01	0.87	0.02	7.0	99.9	997.7	0.100	0.705
North-Central Undeveloped Area	15638	0.15	0.03	0.0008	1.3E+01	0.87	0.02	8.5	182.9	997.7	0.183	1.556
Western Undeveloped Area	15873	0.15	0.03	0.0008	1.3E+01	0.87	0.02	8.6	357.3	997.7	0.358	3.085
South Percolation Pond Area	11759	0.15	0.03	0.0008	1.3E+01	0.87	0.02	6	49.1	997.7	0.049	0.318
Backwater Seep Sampling Area	17600	0.15	0.03	0.0008	1.3E+01	0.87	0.02	10	8.9	997.7	0.009	0.085
											$EPC_{venison}$	8.227

Notes:

C_s = concentration in soil (mg/kg dry weight)

B_b = biotransfer factor for beef (d/kg tissue wet weight)

AUF = aereal ratio of exposure area to receptor foraging range (unitless)

B_v = biotransfer factor for venison; Bb adjusted to Bv multiplying Bb by 0.2 based on the ratio of % fatvenison/% fatbeef (2.9 / 14.4 = 0.2)

BAF_{plant} = soil-to-plant forage bioaccumulation factor (kg soil dry weight / kg plant forage tissue dry weight)

C_p = Concentration in plant forage tissue (mg/kg plant dry weight)

FIR_{browse} = browse ingestion rate (kg dry plant tissue/day)

C_v = concentration in venison tissue (mg/kg venison wet weight)

f_{SI} = Fraction of FIR_{browse} associated with incidental soil ingestion

Ir_v = ingestion rate of venison (kg venison wet weight/day)

EF = exposure frequency (days/year)

ED = exposure duration (years)

BW = body weight (kg)

AT = averaging time (noncancer) (days)

mg/kg = milligrams per kilogram

mg DM/d = milligrams dry matter per day

kg/d = kilograms per day

d/yr = days per year

yr = year

kg = kilograms

d = days

mg/kg-d = milligrams per kilogram per day

mg/kg ww = milligrams per kilogram wet weight

[a] Soil concentrations based on exposure point concentrations (EPCs) calculated for surface soil (0 - 0.5 ft bgs) for each exposure area. Refer to text for discussion on development of soil EPCs. If soil data not available for an exposure area, the soil concentration set to 0 for the purposes of calculation.

[b] Values presented are the vegetated portions of the exopsure area and Site. See table below for non-vegetated and vegetated areas for each human health exposure area.

Human Health Exposure Area	AOC	Area		
		Non-Vegetated (Acres)	Vegetated (Acres)	Total (Acres)
Main Plant Area	1	139.8	147.6	287.4
North Percolation Pond Area	2	8.0	3.2	11.3
Central Landfills Area	3	0.13	129.5	129.7
Industrial Landfill Area	4	0.0	19.2	19.2
Eastern Undeveloped Area	5	0.0	99.9	99.9
North-Central Undeveloped Area	6	0.0	182.9	182.9
Western Undeveloped Area	7	0.0	357.3	357.3
South Percolation Pond Area	8	0.0	49.1	49.1
Backwater Seep Sampling Area	9A	0.0	8.9	8.9
Total		148.0	997.7	1145.7

Table H-11
Calculation for the Ingested Dose of Manganese in Venison Tissue by the Hunter

Human Health Exposure Area	*Soil Concentration*	*Biotransfer Factor for Venison (Bv) (Bv = 0.2 x Bb)*		*Forage Tissue Concentration, Dry Matter (Cp) ($Cp = Cs \times BAF_{plant}$)*		*Venison Concentration (Cv) ($Cv = (Cp \times FIR_{browse} \times Bv) + (Cs \times FIR_{browse} \times f_{SI} \times Bv)$)*			*AUF (unitless) ($AUF = Area_{Site} \times Area_{Foraging\ Range}$)*			*AUF-Adjusted Venison Concentration (mg/kg ww) ($Cv_{Adjusted} = Cv \times AUF$)*
	Cs (mg/kg dw)[a]	Bb (D/kg tissue ww)	Bv (D/kg tissue ww)	BAF_{plant} (kg soil dw/kg plant tissue dw)	Cp (mg/kg plant tissue dw)	FIR_{browse} (kg DM/d)	f_{SI}	Cv (mg/kg ww)	Area of Site (acres)[b]	Area of Deer Foraging Range (acres)[b]	AUF (unitless)	
Main Plant Area	456.8	0.15	0.03	0.079	7.6E+01	0.87	0.02	2.22	147.6	997.7	0.148	0.328
North Percolation Pond Area	230.4	0.15	0.03	0.079	7.6E+01	0.87	0.02	2.1	3.2	997.7	0.003	0.007
Central Landfills Area	547.2	0.15	0.03	0.079	7.6E+01	0.87	0.02	2.3	129.5	997.7	0.130	0.294
Industrial Landfill Area	1280	0.15	0.03	0.079	7.6E+01	0.87	0.02	2.65	19.2	997.7	0.019	0.051
Eastern Undeveloped Area	210	0.15	0.03	0.079	7.6E+01	0.87	0.02	2.1	99.9	997.7	0.100	0.209
North-Central Undeveloped Area	959.1	0.15	0.03	0.079	7.6E+01	0.87	0.02	2.5	182.9	997.7	0.183	0.454
Western Undeveloped Area	643.4	0.15	0.03	0.079	7.6E+01	0.87	0.02	2.3	357.3	997.7	0.358	0.829
South Percolation Pond Area	385.8	0.15	0.03	0.079	7.6E+01	0.87	0.02	2	49.1	997.7	0.049	0.107
Backwater Seep Sampling Area	467	0.15	0.03	0.079	7.6E+01	0.87	0.02	2	8.9	997.7	0.009	0.020
											$EPC_{venison}$	2.298

Notes:

C_s = concentration in soil (mg/kg dry weight)

B_b = biotransfer factor for beef (d/kg tissue wet weight)

AUF = aereal ratio of exposure area to receptor foraging range (unitless)

B_v = biotransfer factor for venison; Bb adjusted to Bv multiplying Bb by 0.2 based on the ratio of % fatvenison/% fatbeef (2.9 / 14.4 = 0.2)

BAF_{plant} = soil-to-plant forage bioaccumulation factor (kg soil dry weight / kg plant forage tissue dry weight)

C_p = Concentration in plant forage tissue (mg/kg plant dry weight)

FIR_{browse} = browse ingestion rate (kg dry plant tissue/day)

C_v = concentration in venison tissue (mg/kg venison wet weight)

f_{SI} = Fraction of FIR_{browse} associated with incidental soil ingestion

Ir_v = ingestion rate of venison (kg venison wet weight/day)

EF = exposure frequency (days/year)

ED = exposure duration (years)

BW = body weight (kg)

AT = averaging time (noncancer) (days)

mg/kg = milligrams per kilogram

mg DM/d = milligrams dry matter per day

kg/d = kilograms per day

d/yr = days per year

yr = year

kg = kilograms

d = days

mg/kg-d = milligrams per kilogram per day

mg/kg ww = milligrams per kilogram wet weight

[a] Soil concentrations based on exposure point concentrations (EPCs) calculated for surface soil (0 - 0.5 ft bgs) for each exposure area. Refer to text for discussion on development of soil EPCs. If soil data not available for an exposure area, the soil concentration set to 0 for the purposes of calculation.

[b] Values presented are the vegetated portions of the exopsure area and Site. See table below for non-vegetated and vegetated areas for each human health exposure area.

Human Health Exposure Area	AOC	Area		
		Non-Vegetated (Acres)	Vegetated (Acres)	Total (Acres)
Main Plant Area	1	139.8	147.6	287.4
North Percolation Pond Area	2	8.0	3.2	11.3
Central Landfills Area	3	0.13	129.5	129.7
Industrial Landfill Area	4	0.0	19.2	19.2
Eastern Undeveloped Area	5	0.0	99.9	99.9
North-Central Undeveloped Area	6	0.0	182.9	182.9
Western Undeveloped Area	7	0.0	357.3	357.3
South Percolation Pond Area	8	0.0	49.1	49.1
Backwater Seep Sampling Area	9A	0.0	8.9	8.9
Total		148.0	997.7	1145.7

Table H-12
Calculation for the Ingested Dose of Manganese in Venison Tissue by the Hunter

Human Health Exposure Area	*Soil Concentration*	*Biotransfer Factor for Venison (Bv) (Bv = 0.2 x Bb)*		*Forage Tissue Concentration, Dry Matter (Cp) ($Cp = Cs \times BAF_{plant}$)*		*Venison Concentration (Cv) ($Cv = (Cp \times FIR_{browse} \times Bv) + (Cs \times FIR_{browse} \times f_{SI} \times Bv)$)*			*AUF (unitless) ($AUF = Area_{Site} \times Area_{Foraging\ Range}$)*			*AUF-Adjusted Venison Concentration (mg/kg ww) ($Cv_{Adjusted} = Cv \times AUF$)*
	Cs (mg/kg dw)[a]	Bb (D/kg tissue ww)	Bv (D/kg tissue ww)	BAF_{plant} (kg soil dw/kg plant tissue dw)	Cp (mg/kg plant tissue dw)	FIR_{browse} (kg DM/d)	f_{SI}	Cv (mg/kg ww)	Area of Site (acres)[b]	Area of Deer Foraging Range (acres)[b]	AUF (unitless)	
Main Plant Area	0.0218	0.15	0.03	Regression	7.8E+01	0.87	0.02	2.03	147.6	997.7	0.148	0.300
North Percolation Pond Area	0.0436	0.15	0.03	Regression	3.9E+01	0.87	0.02	1.0	3.2	997.7	0.003	0.003
Central Landfills Area	0.0217	0.15	0.03	Regression	7.8E+01	0.87	0.02	2.0	129.5	997.7	0.130	0.265
Industrial Landfill Area	0.0295	0.15	0.03	Regression	5.8E+01	0.87	0.02	1.50	19.2	997.7	0.019	0.029
Eastern Undeveloped Area	0.0498	0.15	0.03	Regression	3.4E+01	0.87	0.02	0.9	99.9	997.7	0.100	0.089
North-Central Undeveloped Area	0.0284	0.15	0.03	Regression	6.0E+01	0.87	0.02	1.6	182.9	997.7	0.183	0.286
Western Undeveloped Area	0.0274	0.15	0.03	Regression	6.2E+01	0.87	0.02	1.6	357.3	997.7	0.358	0.579
South Percolation Pond Area	0.369	0.15	0.03	Regression	4.7E+00	0.87	0.02	0	49.1	997.7	0.049	0.006
Backwater Seep Sampling Area	0.024	0.15	0.03	Regression	7.1E+01	0.87	0.02	2	8.9	997.7	0.009	0.016
											$EPC_{venison}$	1.575

Notes:

C_s = concentration in soil (mg/kg dry weight)

B_b = biotransfer factor for beef (d/kg tissue wet weight)

AUF = aereal ratio of exposure area to receptor foraging range (unitless)

B_v = biotransfer factor for venison; Bb adjusted to Bv multiplying Bb by 0.2 based on the ratio of % fatvenison/% fatbeef (2.9 / 14.4 = 0.2)

BAF_{plant} = soil-to-plant forage bioaccumulation factor (kg soil dry weight / kg plant forage tissue dry weight)

C_p = Concentration in plant forage tissue (mg/kg plant dry weight)

FIR_{browse} = browse ingestion rate (kg dry plant tissue/day)

C_v = concentration in venison tissue (mg/kg venison wet weight)

f_{SI} = Fraction of FIR_{browse} associated with incidental soil ingestion

Ir_v = ingestion rate of venison (kg venison wet weight/day)

EF = exposure frequency (days/year)

ED = exposure duration (years)

BW = body weight (kg)

AT = averaging time (noncancer) (days)

mg/kg = milligrams per kilogram

mg DM/d = milligrams dry matter per day

kg/d = kilograms per day

d/yr = days per year

yr = year

kg = kilograms

d = days

mg/kg-d = milligrams per kilogram per day

mg/kg ww = milligrams per kilogram wet weight

[a] Soil concentrations based on exposure point concentrations (EPCs) calculated for surface soil (0 - 0.5 ft bgs) for each exposure area. Refer to text for discussion on development of soil EPCs. If soil data not available for an exposure area, the soil concentration set to 0 for the purposes of calculation.

[b] Values presented are the vegetated portions of the exopsure area and Site. See table below for non-vegetated and vegetated areas for each human health exposure area.

Human Health Exposure Area	AOC	Area		
		Non-Vegetated (Acres)	Vegetated (Acres)	Total (Acres)
Main Plant Area	1	139.8	147.6	287.4
North Percolation Pond Area	2	8.0	3.2	11.3
Central Landfills Area	3	0.13	129.5	129.7
Industrial Landfill Area	4	0.0	19.2	19.2
Eastern Undeveloped Area	5	0.0	99.9	99.9
North-Central Undeveloped Area	6	0.0	182.9	182.9
Western Undeveloped Area	7	0.0	357.3	357.3
South Percolation Pond Area	8	0.0	49.1	49.1
Backwater Seep Sampling Area	9A	0.0	8.9	8.9
Total		148.0	997.7	1145.7

Table H-13
Calculation for the Ingested Dose of Manganese in Venison Tissue by the Hunter

Human Health Exposure Area	*Soil Concentration*	*Biotransfer Factor for Venison (Bv) (Bv = 0.2 x Bb)*		*Forage Tissue Concentration, Dry Matter (Cp) ($Cp = Cs \times BAF_{plant}$)*		*Venison Concentration (Cv) ($Cv = (Cp \times FIR_{browse} \times Bv) + (Cs \times FIR_{browse} \times f_{SI} \times Bv)$)*			*AUF (unitless) ($AUF = Area_{Site} \times Area_{Foraging\ Range}$)*			*AUF-Adjusted Venison Concentration (mg/kg ww) ($Cv_{Adjusted} = Cv \times AUF$)*
	Cs (mg/kg dw)[a]	Bb (D/kg tissue ww)	Bv (D/kg tissue ww)	BAF_{plant} (kg soil dw/kg plant tissue dw)	Cp (mg/kg plant tissue dw)	FIR_{browse} (kg DM/d)	f_{SI}	Cv (mg/kg ww)	Area of Site (acres)[b]	Area of Deer Foraging Range (acres)[b]	AUF (unitless)	
Main Plant Area	30.6	0.15	0.03	Regression	1.4E+00	0.87	0.02	0.05	147.6	997.7	0.148	0.008
North Percolation Pond Area	329.5	0.15	0.03	Regression	8.3E+00	0.87	0.02	0.4	3.2	997.7	0.003	0.001
Central Landfills Area	23.98	0.15	0.03	Regression	1.2E+00	0.87	0.02	0.0	129.5	997.7	0.130	0.006
Industrial Landfill Area	177.6	0.15	0.03	Regression	5.2E+00	0.87	0.02	0.23	19.2	997.7	0.019	0.004
Eastern Undeveloped Area	40.24	0.15	0.03	Regression	1.7E+00	0.87	0.02	0.1	99.9	997.7	0.100	0.007
North-Central Undeveloped Area	14.55	0.15	0.03	Regression	8.0E-01	0.87	0.02	0.0	182.9	997.7	0.183	0.005
Western Undeveloped Area	12.08	0.15	0.03	Regression	7.0E-01	0.87	0.02	0.0	357.3	997.7	0.358	0.009
South Percolation Pond Area	18.75	0.15	0.03	Regression	9.7E-01	0.87	0.02	0	49.1	997.7	0.049	0.002
Backwater Seep Sampling Area	16.4	0.15	0.03	Regression	8.8E-01	0.87	0.02	0	8.9	997.7	0.009	0.000
											$EPC_{venison}$	0.042

Notes:

C_s = concentration in soil (mg/kg dry weight)

B_b = biotransfer factor for beef (d/kg tissue wet weight)

AUF = aereal ratio of exposure area to receptor foraging range (unitless)

B_v = biotransfer factor for venison; Bb adjusted to Bv multiplying Bb by 0.2 based on the ratio of % fatvenison/% fatbeef (2.9 / 14.4 = 0.2)

BAF_{plant} = soil-to-plant forage bioaccumulation factor (kg soil dry weight / kg plant forage tissue dry weight)

C_p = Concentration in plant forage tissue (mg/kg plant dry weight)

FIR_{browse} = browse ingestion rate (kg dry plant tissue/day)

C_v = concentration in venison tissue (mg/kg venison wet weight)

f_{SI} = Fraction of FIR_{browse} associated with incidental soil ingestion

Ir_v = ingestion rate of venison (kg venison wet weight/day)

EF = exposure frequency (days/year)

ED = exposure duration (years)

BW = body weight (kg)

AT = averaging time (noncancer) (days)

mg/kg = milligrams per kilogram

mg DM/d = milligrams dry matter per day

kg/d = kilograms per day

d/yr = days per year

yr = year

kg = kilograms

d = days

mg/kg-d = milligrams per kilogram per day

mg/kg ww = milligrams per kilogram wet weight

[a] Soil concentrations based on exposure point concentrations (EPCs) calculated for surface soil (0 - 0.5 ft bgs) for each exposure area. Refer to text for discussion on development of soil EPCs. If soil data not available for an exposure area, the soil concentration set to 0 for the purposes of calculation.

[b] Values presented are the vegetated portions of the exopsure area and Site. See table below for non-vegetated and vegetated areas for each human health exposure area.

Human Health Exposure Area	AOC	Area		
		Non-Vegetated (Acres)	Vegetated (Acres)	Total (Acres)
Main Plant Area	1	139.8	147.6	287.4
North Percolation Pond Area	2	8.0	3.2	11.3
Central Landfills Area	3	0.13	129.5	129.7
Industrial Landfill Area	4	0.0	19.2	19.2
Eastern Undeveloped Area	5	0.0	99.9	99.9
North-Central Undeveloped Area	6	0.0	182.9	182.9
Western Undeveloped Area	7	0.0	357.3	357.3
South Percolation Pond Area	8	0.0	49.1	49.1
Backwater Seep Sampling Area	9A	0.0	8.9	8.9
Total		148.0	997.7	1145.7

Table H-14
Calculation for the Ingested Dose of Manganese in Venison Tissue by the Hunter

Human Health Exposure Area	*Soil Concentration*	*Biotransfer Factor for Venison (Bv) (Bv = 0.2 x Bb)*		*Forage Tissue Concentration, Dry Matter (Cp) ($Cp = Cs \times BAF_{plant}$)*		*Venison Concentration (Cv) ($Cv = (Cp \times FIR_{browse} \times Bv) + (Cs \times FIR_{browse} \times f_{SI} \times Bv)$)*			*AUF (unitless) ($AUF = Area_{Site} \times Area_{Foraging\ Range}$)*			*AUF-Adjusted Venison Concentration (mg/kg ww) ($Cv_{Adjusted} = Cv \times AUF$)*
	Cs (mg/kg dw)[a]	Bb (D/kg tissue ww)	Bv (D/kg tissue ww)	BAF_{plant} (kg soil dw/kg plant tissue dw)	Cp (mg/kg plant tissue dw)	FIR_{browse} (kg DM/d)	f_{SI}	Cv (mg/kg ww)	Area of Site (acres)[b]	Area of Deer Foraging Range (acres)[b]	AUF (unitless)	
Main Plant Area	0.263	0.15	0.03	Regression	1.2E-01	0.87	0.02	0.0032	147.6	997.7	0.148	0.000469
North Percolation Pond Area	1.517	0.15	0.03	Regression	8.0E-01	0.87	0.02	0.0218	3.2	997.7	0.003	0.000070
Central Landfills Area	0.388	0.15	0.03	Regression	1.8E-01	0.87	0.02	0.0049	129.5	997.7	0.130	0.00063
Industrial Landfill Area	0.379	0.15	0.03	Regression	1.7E-01	0.87	0.02	0.0047	19.2	997.7	0.019	0.000091
Eastern Undeveloped Area	0.354	0.15	0.03	Regression	1.6E-01	0.87	0.02	0.0044	99.9	997.7	0.100	0.00044
North-Central Undeveloped Area	0.325	0.15	0.03	Regression	1.5E-01	0.87	0.02	0.0040	182.9	997.7	0.183	0.00073
Western Undeveloped Area	0.93	0.15	0.03	Regression	4.7E-01	0.87	0.02	0.0127	357.3	997.7	0.358	0.00456
South Percolation Pond Area	0.477	0.15	0.03	Regression	2.2E-01	0.87	0.02	0.0061	49.1	997.7	0.049	0.00030
Backwater Seep Sampling Area	NA	0.15	0.03	Regression	NA	0.87	0.02	NA	8.9	997.7	0.009	NA
											$EPC_{venison}$	0.0073

Notes:

C_s = concentration in soil (mg/kg dry weight)

B_b = biotransfer factor for beef (d/kg tissue wet weight)

AUF = aereal ratio of exposure area to receptor foraging range (unitless)

B_v = biotransfer factor for venison; Bb adjusted to Bv multiplying Bb by 0.2 based on the ratio of % fatvenison/% fatbeef (2.9 / 14.4 = 0.2)

BAF_{plant} = soil-to-plant forage bioaccumulation factor (kg soil dry weight / kg plant forage tissue dry weight)

C_p = Concentration in plant forage tissue (mg/kg plant dry weight)

FIR_{browse} = browse ingestion rate (kg dry plant tissue/day)

C_v = concentration in venison tissue (mg/kg venison wet weight)

f_{SI} = Fraction of FIR_{browse} associated with incidental soil ingestion

Ir_v = ingestion rate of venison (kg venison wet weight/day)

EF = exposure frequency (days/year)

ED = exposure duration (years)

BW = body weight (kg)

AT = averaging time (noncancer) (days)

mg/kg = milligrams per kilogram

mg DM/d = milligrams dry matter per day

kg/d = kilograms per day

d/yr = days per year

yr = year

kg = kilograms

d = days

mg/kg-d = milligrams per kilogram per day

mg/kg ww = milligrams per kilogram wet weight

[a] Soil concentrations based on exposure point concentrations (EPCs) calculated for surface soil (0 - 0.5 ft bgs) for each exposure area. Refer to text for discussion on development of soil EPCs. If soil data not available for an exposure area, the soil concentration set to 0 for the purposes of calculation.

[b] Values presented are the vegetated portions of the exopsure area and Site. See table below for non-vegetated and vegetated areas for each human health exposure area.

Human Health Exposure Area	AOC	Area		
		Non-Vegetated (Acres)	Vegetated (Acres)	Total (Acres)
Main Plant Area	1	139.8	147.6	287.4
North Percolation Pond Area	2	8.0	3.2	11.3
Central Landfills Area	3	0.13	129.5	129.7
Industrial Landfill Area	4	0.0	19.2	19.2
Eastern Undeveloped Area	5	0.0	99.9	99.9
North-Central Undeveloped Area	6	0.0	182.9	182.9
Western Undeveloped Area	7	0.0	357.3	357.3
South Percolation Pond Area	8	0.0	49.1	49.1
Backwater Seep Sampling Area	9A	0.0	8.9	8.9
Total		148.0	997.7	1145.7

Table H-15
Calculation for the Ingested Dose of Manganese in Venison Tissue by the Hunter

Human Health Exposure Area	*Soil Concentration*	*Biotransfer Factor for Venison (Bv) (Bv = 0.2 x Bb)*		*Forage Tissue Concentration, Dry Matter (Cp) ($Cp = Cs \times BAF_{plant}$)*		*Venison Concentration (Cv) ($Cv = (Cp \times FIR_{browse} \times Bv) + (Cs \times FIR_{browse} \times f_{SI} \times Bv)$)*			*AUF (unitless) ($AUF = Area_{Site} \times Area_{Foraging\ Range}$)*			*AUF-Adjusted Venison Concentration (mg/kg ww) ($Cv_{Adjusted} = Cv \times AUF$)*
	Cs (mg/kg dw)[a]	Bb (D/kg tissue ww)	Bv (D/kg tissue ww)	BAF_{plant} (kg soil dw/kg plant tissue dw)	Cp (mg/kg plant tissue dw)	FIR_{browse} (kg DM/d)	f_{SI}	Cv (mg/kg ww)	Area of Site (acres)[b]	Area of Deer Foraging Range (acres)[b]	AUF (unitless)	
Main Plant Area	NA	0.15	0.03	0.004	7.6E-04	0.87	0.02	NA	147.6	997.7	0.148	NA
North Percolation Pond Area	2.002	0.15	0.03	0.004	7.6E-04	0.87	0.02	0.00	3.2	997.7	0.003	3.43827E-06
Central Landfills Area	0.111	0.15	0.03	0.004	7.6E-04	0.87	0.02	0.00	129.5	997.7	0.130	1.00993E-05
Industrial Landfill Area	0.17	0.15	0.03	0.004	7.6E-04	0.87	0.02	0.00	19.2	997.7	0.019	2.09286E-06
Eastern Undeveloped Area	0.123	0.15	0.03	0.004	7.6E-04	0.87	0.02	0.00	99.9	997.7	0.100	8.41591E-06
North-Central Undeveloped Area	0.19	0.15	0.03	0.004	7.6E-04	0.87	0.02	0.00	182.9	997.7	0.183	2.18171E-05
Western Undeveloped Area	NA	0.15	0.03	0.004	7.6E-04	0.87	0.02	NA	357.3	997.7	0.358	NA
South Percolation Pond Area	0.2	0.15	0.03	0.004	7.6E-04	0.87	0.02	0.00	49.1	997.7	0.049	6.11531E-06
Backwater Seep Sampling Area	NA	0.15	0.03	0.004	7.6E-04	0.87	0.02	NA	8.9	997.7	0.009	NA
											EPC venison	5.19787E-05

Notes:

C_s = concentration in soil (mg/kg dry weight)

B_b = biotransfer factor for beef (d/kg tissue wet weight)

AUF = aereal ratio of exposure area to receptor foraging range (unitless)

B_v = biotransfer factor for venison; Bb adjusted to Bv multiplying Bb by 0.2 based on the ratio of % fatvenison/% fatbeef (2.9 / 14.4 = 0.2)

BAF_{plant} = soil-to-plant forage bioaccumulation factor (kg soil dry weight / kg plant forage tissue dry weight)

C_p = Concentration in plant forage tissue (mg/kg plant dry weight)

FIR_{browse} = browse ingestion rate (kg dry plant tissue/day)

C_v = concentration in venison tissue (mg/kg venison wet weight)

f_{SI} = Fraction of FIR_{browse} associated with incidental soil ingestion

Ir_v = ingestion rate of venison (kg venison wet weight/day)

EF = exposure frequency (days/year)

ED = exposure duration (years)

BW = body weight (kg)

AT = averaging time (noncancer) (days)

mg/kg = milligrams per kilogram

mg DM/d = milligrams dry matter per day

kg/d = kilograms per day

d/yr = days per year

yr = year

kg = kilograms

d = days

mg/kg-d = milligrams per kilogram per day

mg/kg ww = milligrams per kilogram wet weight

[a] Soil concentrations based on exposure point concentrations (EPCs) calculated for surface soil (0 - 0.5 ft bgs) for each exposure area. Refer to text for discussion on development of soil EPCs. If soil data not available for an exposure area, the soil concentration set to 0 for the purposes of calculation.

[b] Values presented are the vegetated portions of the exopsure area and Site. See table below for non-vegetated and vegetated areas for each human health exposure area.

Human Health Exposure Area	AOC	Area		
		Non-Vegetated (Acres)	Vegetated (Acres)	Total (Acres)
Main Plant Area	1	139.8	147.6	287.4
North Percolation Pond Area	2	8.0	3.2	11.3
Central Landfills Area	3	0.13	129.5	129.7
Industrial Landfill Area	4	0.0	19.2	19.2
Eastern Undeveloped Area	5	0.0	99.9	99.9
North-Central Undeveloped Area	6	0.0	182.9	182.9
Western Undeveloped Area	7	0.0	357.3	357.3
South Percolation Pond Area	8	0.0	49.1	49.1
Backwater Seep Sampling Area	9A	0.0	8.9	8.9
Total		148.0	997.7	1145.7

Table H-16
Calculation for the Ingested Dose of Manganese in Venison Tissue by the Hunter

Human Health Exposure Area	*Soil Concentration*	*Biotransfer Factor for Venison (Bv) (Bv = 0.2 x Bb)*		*Forage Tissue Concentration, Dry Matter (Cp) ($Cp = Cs \times BAF_{plant}$)*		*Venison Concentration (Cv) ($Cv = (Cp \times FIR_{browse} \times Bv) + (Cs \times FIR_{browse} \times f_{SI} \times Bv)$)*			*AUF (unitless) ($AUF = Area_{Site} \times Area_{Foraging\ Range}$)*			*AUF-Adjusted Venison Concentration (mg/kg ww) ($Cv_{Adjusted} = Cv \times AUF$)*
	Cs (mg/kg dw)[a]	Bb (D/kg tissue ww)	Bv (D/kg tissue ww)	BAF_{plant} (kg soil dw/kg plant tissue dw)	Cp (mg/kg plant tissue dw)	FIR_{browse} (kg DM/d)	f_{SI}	Cv (mg/kg ww)	Area of Site (acres)[b]	Area of Deer Foraging Range (acres)[b]	AUF (unitless)	
Main Plant Area	13.67	0.15	0.03	0.00485	6.5E-02	0.87	0.02	0.01	147.6	997.7	0.148	0.0013
North Percolation Pond Area	101.6	0.15	0.03	0.00485	6.5E-02	0.87	0.02	0.1	3.2	997.7	0.003	0.0002
Central Landfills Area	14.67	0.15	0.03	0.00485	6.5E-02	0.87	0.02	0.0	129.5	997.7	0.130	0.0012
Industrial Landfill Area	68.99	0.15	0.03	0.00485	6.5E-02	0.87	0.02	0.04	19.2	997.7	0.019	0.0007
Eastern Undeveloped Area	17.48	0.15	0.03	0.00485	6.5E-02	0.87	0.02	0.0	99.9	997.7	0.100	0.0011
North-Central Undeveloped Area	13.33	0.15	0.03	0.00485	6.5E-02	0.87	0.02	0.0	182.9	997.7	0.183	0.0016
Western Undeveloped Area	13.09	0.15	0.03	0.00485	6.5E-02	0.87	0.02	0.0	357.3	997.7	0.358	0.0031
South Percolation Pond Area	13.2	0.15	0.03	0.00485	6.5E-02	0.87	0.02	0	49.1	997.7	0.049	0.0004
Backwater Seep Sampling Area	16.6	0.15	0.03	0.00485	6.5E-02	0.87	0.02	0	8.9	997.7	0.009	0.0001
											$EPC_{venison}$	0.0097

Notes:

C_s = concentration in soil (mg/kg dry weight)

B_b = biotransfer factor for beef (d/kg tissue wet weight)

AUF = aereal ratio of exposure area to receptor foraging range (unitless)

B_v = biotransfer factor for venison; Bb adjusted to Bv multiplying Bb by 0.2 based on the ratio of % fatvenison/% fatbeef (2.9 / 14.4 = 0.2)

BAF_{plant} = soil-to-plant forage bioaccumulation factor (kg soil dry weight / kg plant forage tissue dry weight)

C_p = Concentration in plant forage tissue (mg/kg plant dry weight)

FIR_{browse} = browse ingestion rate (kg dry plant tissue/day)

C_v = concentration in venison tissue (mg/kg venison wet weight)

f_{SI} = Fraction of FIR_{browse} associated with incidental soil ingestion

Ir_v = ingestion rate of venison (kg venison wet weight/day)

EF = exposure frequency (days/year)

ED = exposure duration (years)

BW = body weight (kg)

AT = averaging time (noncancer) (days)

mg/kg = milligrams per kilogram

mg DM/d = milligrams dry matter per day

kg/d = kilograms per day

d/yr = days per year

yr = year

kg = kilograms

d = days

mg/kg-d = milligrams per kilogram per day

mg/kg ww = milligrams per kilogram wet weight

[a] Soil concentrations based on exposure point concentrations (EPCs) calculated for surface soil (0 - 0.5 ft bgs) for each exposure area. Refer to text for discussion on development of soil EPCs. If soil data not available for an exposure area, the soil concentration set to 0 for the purposes of calculation.

[b] Values presented are the vegetated portions of the exopsure area and Site. See table below for non-vegetated and vegetated areas for each human health exposure area.

Human Health Exposure Area	AOC	Area		
		Non-Vegetated (Acres)	Vegetated (Acres)	Total (Acres)
Main Plant Area	1	139.8	147.6	287.4
North Percolation Pond Area	2	8.0	3.2	11.3
Central Landfills Area	3	0.13	129.5	129.7
Industrial Landfill Area	4	0.0	19.2	19.2
Eastern Undeveloped Area	5	0.0	99.9	99.9
North-Central Undeveloped Area	6	0.0	182.9	182.9
Western Undeveloped Area	7	0.0	357.3	357.3
South Percolation Pond Area	8	0.0	49.1	49.1
Backwater Seep Sampling Area	9A	0.0	8.9	8.9
Total		148.0	997.7	1145.7

Table H-17
Calculation for the Ingested Dose of Manganese in Venison Tissue by the Hunter

Human Health Exposure Area	*Soil Concentration*	*Biotransfer Factor for Venison (Bv) (Bv = 0.2 x Bb)*		*Forage Tissue Concentration, Dry Matter (Cp) (Cp = Cs x BAF_{plant})*		*Venison Concentration (Cv) (Cv= (Cp x FIR_{browse} x Bv) + (Cs x FIR_{browse} x f_{SI} x Bv))*			*AUF (unitless) (AUF= $Area_{Site}$ x $Area_{Foraging\ Range}$)*			*AUF-Adjusted Venison Concentration (mg/kg ww)*
	Cs (mg/kg dw)[a]	Bb (D/kg tissue ww)	Bv (D/kg tissue ww)	BAF_{plant} (kg soil dw/kg plant tissue dw)	Cp (mg/kg plant tissue dw)	FIR_{browse} (kg DM/d)	f_{SI}	Cv (mg/kg ww)	Area of Site (acres)[b]	Area of Deer Foraging Range (acres)[b]	AUF (unitless)	*($Cv_{Adjusted}$ = Cv x AUF)*
Main Plant Area	NA	0.15	0.03	0.089	8.9E-01	0.87	0.02	NA	147.6	997.7	0.148	NA
North Percolation Pond Area	NA	0.15	0.03	0.089	8.9E-01	0.87	0.02	NA	3.2	997.7	0.003	NA
Central Landfills Area	0.341	0.15	0.03	0.089	8.9E-01	0.87	0.02	0.02	129.5	997.7	0.130	0.003
Industrial Landfill Area	NA	0.15	0.03	0.089	8.9E-01	0.87	0.02	NA	19.2	997.7	0.019	NA
Eastern Undeveloped Area	NA	0.15	0.03	0.089	8.9E-01	0.87	0.02	NA	99.9	997.7	0.100	NA
North-Central Undeveloped Area	NA	0.15	0.03	0.089	8.9E-01	0.87	0.02	NA	182.9	997.7	0.183	NA
Western Undeveloped Area	NA	0.15	0.03	0.089	8.9E-01	0.87	0.02	NA	357.3	997.7	0.358	NA
South Percolation Pond Area	NA	0.15	0.03	0.089	8.9E-01	0.87	0.02	NA	49.1	997.7	0.049	NA
Backwater Seep Sampling Area	NA	0.15	0.03	0.089	8.9E-01	0.87	0.02	NA	8.9	997.7	0.009	NA
											$EPC_{venison}$	0.003

Notes:

C_s = concentration in soil (mg/kg dry weight)

B_b = biotransfer factor for beef (d/kg tissue wet weight)

AUF = aereal ratio of exposure area to receptor foraging range (unitless)

B_v = biotransfer factor for venison; Bb adjusted to Bv multiplying Bb by 0.2 based on the ratio of % fatvenison/% fatbeef (2.9 / 14.4 = 0.2)

BAF_{plant} = soil-to-plant forage bioaccumulation factor (kg soil dry weight / kg plant forage tissue dry weight)

C_p = Concentration in plant forage tissue (mg/kg plant dry weight)

FIR_{browse} = browse ingestion rate (kg dry plant tissue/day)

C_v = concentration in venison tissue (mg/kg venison wet weight)

f_{SI} = Fraction of FIR_{browse} associated with incidental soil ingestion

Ir_v = ingestion rate of venison (kg venison wet weight/day)

EF = exposure frequency (days/year)

ED = exposure duration (years)

BW = body weight (kg)

AT = averaging time (noncancer) (days)

mg/kg = milligrams per kilogram

mg DM/d = milligrams dry matter per day

kg/d = kilograms per day

d/yr = days per year

yr = year

kg = kilograms

d = days

mg/kg-d = milligrams per kilogram per day

mg/kg ww = milligrams per kilogram wet weight

[a] Soil concentrations based on exposure point concentrations (EPCs) calculated for surface soil (0 - 0.5 ft bgs) for each exposure area. Refer to text for discussion on development of soil EPCs. If soil data not available for an exposure area, the soil concentration set to 0 for the purposes of calculation.

[b] Values presented are the vegetated portions of the exopsure area and Site. See table below for non-vegetated and vegetated areas for each human health exposure area.

Human Health Exposure Area	AOC	Area		
		Non-Vegetated (Acres)	Vegetated (Acres)	Total (Acres)
Main Plant Area	1	139.8	147.6	287.4
North Percolation Pond Area	2	8.0	3.2	11.3
Central Landfills Area	3	0.13	129.5	129.7
Industrial Landfill Area	4	0.0	19.2	19.2
Eastern Undeveloped Area	5	0.0	99.9	99.9
North-Central Undeveloped Area	6	0.0	182.9	182.9
Western Undeveloped Area	7	0.0	357.3	357.3
South Percolation Pond Area	8	0.0	49.1	49.1
Backwater Seep Sampling Area	9A	0.0	8.9	8.9
Total		148.0	997.7	1145.7

Table H-18
Calculation for the Ingested Dose of Indeno(1,2,3-c,d) in Venison Tissue by the Hunter

Human Health Exposure Area	*Soil Concentration*	*Biotransfer Factor for Venison (Bv) (Bv = 0.2 x Bb)*		*Forage Tissue Concentration, Dry Matter (Cp) ($Cp = Cs \times BAF_{plant}$)*		*Venison Concentration (Cv) ($Cv = (Cp \times FIR_{browse} \times Bv) + (Cs \times FIR_{browse} \times f_{SI} \times Bv)$)*			*AUF (unitless) ($AUF = Area_{Site} \times Area_{Foraging\ Range}$)*			*AUF-Adjusted Venison Concentration (mg/kg ww) ($Cv_{Adjusted} = Cv \times AUF$)*
	Cs (mg/kg dw)[a]	Bb (D/kg tissue ww)	Bv (D/kg tissue ww)	BAF_{plant} (kg soil dw/kg plant tissue dw)	Cp (mg/kg plant tissue dw)	FIR_{browse} (kg DM/d)	f_{SI}	Cv (mg/kg ww)	Area of Site (acres)[b]	Area of Deer Foraging Range (acres)[b]	AUF (unitless)	
Main Plant Area	10.62	0.15	0.03	0.110	1.1E+00	0.87	0.02	0.03	147.6	997.7	0.148	0.005
North Percolation Pond Area	584.3	0.15	0.03	0.110	1.1E+00	0.87	0.02	0.3	3.2	997.7	0.003	0.001
Central Landfills Area	8.41	0.15	0.03	0.110	1.1E+00	0.87	0.02	0.0	129.5	997.7	0.130	0.004
Industrial Landfill Area	39.56	0.15	0.03	0.110	1.1E+00	0.87	0.02	0.05	19.2	997.7	0.019	0.001
Eastern Undeveloped Area	1.047	0.15	0.03	0.110	1.1E+00	0.87	0.02	0.0	99.9	997.7	0.100	0.003
North-Central Undeveloped Area	NA	0.15	0.03	0.110	1.1E+00	0.87	0.02	NA	182.9	997.7	0.183	NA
Western Undeveloped Area	NA	0.15	0.03	0.110	1.1E+00	0.87	0.02	NA	357.3	997.7	0.358	NA
South Percolation Pond Area	0.47	0.15	0.03	0.110	1.1E+00	0.87	0.02	0	49.1	997.7	0.049	0.001
Backwater Seep Sampling Area	NA	0.15	0.03	0.110	1.1E+00	0.87	0.02	NA	8.9	997.7	0.009	NA
											$EPC_{venison}$	0.0157

Notes:

C_s = concentration in soil (mg/kg dry weight)

B_b = biotransfer factor for beef (d/kg tissue wet weight)

AUF = aereal ratio of exposure area to receptor foraging range (unitless)

B_v = biotransfer factor for venison; Bb adjusted to Bv multiplying Bb by 0.2 based on the ratio of % fatvenison/% fatbeef (2.9 / 14.4 = 0.2)

BAF_{plant} = soil-to-plant forage bioaccumulation factor (kg soil dry weight / kg plant forage tissue dry weight)

C_p = Concentration in plant forage tissue (mg/kg plant dry weight)

FIR_{browse} = browse ingestion rate (kg dry plant tissue/day)

C_v = concentration in venison tissue (mg/kg venison wet weight)

f_{SI} = Fraction of FIR_{browse} associated with incidental soil ingestion

Ir_v = ingestion rate of venison (kg venison wet weight/day)

EF = exposure frequency (days/year)

ED = exposure duration (years)

BW = body weight (kg)

AT = averaging time (noncancer) (days)

mg/kg = milligrams per kilogram

mg DM/d = milligrams dry matter per day

kg/d = kilograms per day

d/yr = days per year

yr = year

kg = kilograms

d = days

mg/kg-d = milligrams per kilogram per day

mg/kg ww = milligrams per kilogram wet weight

[a] Soil concentrations based on exposure point concentrations (EPCs) calculated for surface soil (0 - 0.5 ft bgs) for each exposure area. Refer to text for discussion on development of soil EPCs.
If soil data not available for an exposure area, the soil concentration set to 0 for the purposes of calculation.

[b] Values presented are the vegetated portions of the exopsure area and Site. See table below for non-vegetated and vegetated areas for each human health exposure area.

Human Health Exposure Area	AOC	Area		
		Non-Vegetated (Acres)	Vegetated (Acres)	Total (Acres)
Main Plant Area	1	139.8	147.6	287.4
North Percolation Pond Area	2	8.0	3.2	11.3
Central Landfills Area	3	0.13	129.5	129.7
Industrial Landfill Area	4	0.0	19.2	19.2
Eastern Undeveloped Area	5	0.0	99.9	99.9
North-Central Undeveloped Area	6	0.0	182.9	182.9
Western Undeveloped Area	7	0.0	357.3	357.3
South Percolation Pond Area	8	0.0	49.1	49.1
Backwater Seep Sampling Area	9A	0.0	8.9	8.9
Total		148.0	997.7	1145.7

Table H-19
Calculation for the Ingested Dose of Benzo(a)anthracene in Venison Tissue by the Hunter

Human Health Exposure Area	*Soil Concentration*	*Biotransfer Factor for Venison (Bv) (Bv = 0.2 x Bb)*		*Forage Tissue Concentration, Dry Matter (Cp) ($Cp = Cs \times BAF_{plant}$)*		*Venison Concentration (Cv) ($Cv = (Cp \times FIR_{browse} \times Bv) + (Cs \times FIR_{browse} \times f_{SI} \times Bv)$)*			*AUF (unitless) ($AUF = Area_{Site} \times Area_{Foraging\ Range}$)*			*AUF-Adjusted Venison Concentration (mg/kg ww) ($Cv_{Adjusted} = Cv \times AUF$)*
	Cs (mg/kg dw)[a]	Bb (D/kg tissue ww)	Bv (D/kg tissue ww)	BAF_{plant} (kg soil dw/kg plant tissue dw)	Cp (mg/kg plant tissue dw)	FIR_{browse} (kg DM/d)	f_{SI}	Cv (mg/kg ww)	Area of Site (acres)[b]	Area of Deer Foraging Range (acres)[b]	AUF (unitless)	
Main Plant Area	12.04	0.15	0.03	Regression	2.9E-01	0.87	0.02	0.01	147.6	997.7	0.148	2.1E-03
North Percolation Pond Area	1013	0.15	0.03	Regression	4.1E+00	0.87	0.02	0.6	3.2	997.7	0.003	2.1E-03
Central Landfills Area	10.32	0.15	0.03	Regression	2.7E-01	0.87	0.02	0.0	129.5	997.7	0.130	1.6E-03
Industrial Landfill Area	43	0.15	0.03	Regression	6.2E-01	0.87	0.02	0.04	19.2	997.7	0.019	7.5E-04
Eastern Undeveloped Area	0.618	0.15	0.03	Regression	5.0E-02	0.87	0.02	0.0	99.9	997.7	0.100	1.6E-04
North-Central Undeveloped Area	0.0679	0.15	0.03	Regression	1.3E-02	0.87	0.02	0.0	182.9	997.7	0.183	7.1E-05
Western Undeveloped Area	0.0528	0.15	0.03	Regression	1.2E-02	0.87	0.02	0.0	357.3	997.7	0.358	1.2E-04
South Percolation Pond Area	0.14	0.15	0.03	Regression	2.1E-02	0.87	0.02	0	49.1	997.7	0.049	3.0E-05
Backwater Seep Sampling Area	0.091	0.15	0.03	Regression	1.6E-02	0.87	0.02	0	8.9	997.7	0.009	4.1E-06
											$EPC_{venison}$	6.8E-03

Notes:

C_s = concentration in soil (mg/kg dry weight)

B_b = biotransfer factor for beef (d/kg tissue wet weight)

AUF = aereal ratio of exposure area to receptor foraging range (unitless)

B_v = biotransfer factor for venison; Bb adjusted to Bv multiplying Bb by 0.2 based on the ratio of % fatvenison/% fatbeef (2.9 / 14.4 = 0.2)

BAF_{plant} = soil-to-plant forage bioaccumulation factor (kg soil dry weight / kg plant forage tissue dry weight)

C_p = Concentration in plant forage tissue (mg/kg plant dry weight)

FIR_{browse} = browse ingestion rate (kg dry plant tissue/day)

C_v = concentration in venison tissue (mg/kg venison wet weight)

f_{SI} = Fraction of FIR_{browse} associated with incidental soil ingestion

Ir_v = ingestion rate of venison (kg venison wet weight/day)

EF = exposure frequency (days/year)

ED = exposure duration (years)

BW = body weight (kg)

AT = averaging time (noncancer) (days)

mg/kg = milligrams per kilogram

mg DM/d = milligrams dry matter per day

kg/d = kilograms per day

d/yr = days per year

yr = year

kg = kilograms

d = days

mg/kg-d = milligrams per kilogram per day

mg/kg ww = milligrams per kilogram wet weight

[a] Soil concentrations based on exposure point concentrations (EPCs) calculated for surface soil (0 - 0.5 ft bgs) for each exposure area. Refer to text for discussion on development of soil EPCs.
If soil data not available for an exposure area, the soil concentration set to 0 for the purposes of calculation.

[b] Values presented are the vegetated portions of the exopsure area and Site. See table below for non-vegetated and vegetated areas for each human health exposure area.

Human Health Exposure Area	AOC	Area		
		Non-Vegetated (Acres)	Vegetated (Acres)	Total (Acres)
Main Plant Area	1	139.8	147.6	287.4
North Percolation Pond Area	2	8.0	3.2	11.3
Central Landfills Area	3	0.13	129.5	129.7
Industrial Landfill Area	4	0.0	19.2	19.2
Eastern Undeveloped Area	5	0.0	99.9	99.9
North-Central Undeveloped Area	6	0.0	182.9	182.9
Western Undeveloped Area	7	0.0	357.3	357.3
South Percolation Pond Area	8	0.0	49.1	49.1
Backwater Seep Sampling Area	9A	0.0	8.9	8.9
Total		148.0	997.7	1145.7

Table H-20
Calculation for the Ingested Dose of Benzo(a)pyrene in Venison Tissue by the Hunter

Human Health Exposure Area	*Soil Concentration*	*Biotransfer Factor for Venison (Bv) (Bv = 0.2 x Bb)*		*Forage Tissue Concentration, Dry Matter (Cp) (Cp = Cs x BAF_{plant})*		*Venison Concentration (Cv) (Cv= (Cp x FIR_{browse} x Bv) + (Cs x FIR_{browse} x f_{SI} x Bv))*			*AUF (unitless) (AUF= Area $_{Site}$ x Area $_{Foraging\ Range}$)*			*AUF-Adjusted Venison Concentration (mg/kg ww)*
	Cs (mg/kg dw)[a]	Bb (D/kg tissue ww)	Bv (D/kg tissue ww)	BAF_{plant} (kg soil dw/kg plant tissue dw)	Cp (mg/kg plant tissue dw)	FIR_{browse} (kg DM/d)	f_{SI}	Cv (mg/kg ww)	Area of Site (acres)[b]	Area of Deer Foraging Range (acres)[b]	AUF (unitless)	*($Cv_{Adjusted}$ = Cv x AUF)*
Main Plant Area	13.98	0.15	0.03	Regression	1.7E+00	0.87	0.02	0.05	147.6	997.7	0.148	7.5E-03
North Percolation Pond Area	1145	0.15	0.03	Regression	1.2E+02	0.87	0.02	3.8	3.2	997.7	0.003	1.2E-02
Central Landfills Area	10.57	0.15	0.03	Regression	1.3E+00	0.87	0.02	0.0	129.5	997.7	0.130	5.0E-03
Industrial Landfill Area	52.45	0.15	0.03	Regression	6.0E+00	0.87	0.02	0.19	19.2	997.7	0.019	3.6E-03
Eastern Undeveloped Area	0.891	0.15	0.03	Regression	1.1E-01	0.87	0.02	0.0	99.9	997.7	0.100	3.4E-04
North-Central Undeveloped Area	0.0901	0.15	0.03	Regression	1.2E-02	0.87	0.02	0.0	182.9	997.7	0.183	6.7E-05
Western Undeveloped Area	0.0672	0.15	0.03	Regression	9.1E-03	0.87	0.02	0.0	357.3	997.7	0.358	9.8E-05
South Percolation Pond Area	0.459	0.15	0.03	Regression	6.0E-02	0.87	0.02	0	49.1	997.7	0.049	8.8E-05
Backwater Seep Sampling Area	0.036	0.15	0.03	Regression	5.0E-03	0.87	0.02	0	8.9	997.7	0.009	1.3E-06
											$EPC_{venison}$	2.9E-02

Notes:

C_s = concentration in soil (mg/kg dry weight)

B_b = biotransfer factor for beef (d/kg tissue wet weight)

AUF = aereal ratio of exposure area to receptor foraging range (unitless)

B_v = biotransfer factor for venison; Bb adjusted to Bv multiplying Bb by 0.2 based on the ratio of % fatvenison/% fatbeef (2.9 / 14.4 = 0.2)

BAF_{plant} = soil-to-plant forage bioaccumulation factor (kg soil dry weight / kg plant forage tissue dry weight)

C_p = Concentration in plant forage tissue (mg/kg plant dry weight)

FIR_{browse} = browse ingestion rate (kg dry plant tissue/day)

C_v = concentration in venison tissue (mg/kg venison wet weight)

f_{SI} = Fraction of FIR_{browse} associated with incidental soil ingestion

Ir_v = ingestion rate of venison (kg venison wet weight/day)

EF = exposure frequency (days/year)

ED = exposure duration (years)

BW = body weight (kg)

AT = averaging time (noncancer) (days)

mg/kg = milligrams per kilogram

mg DM/d = milligrams dry matter per day

kg/d = kilograms per day

d/yr = days per year

yr = year

kg = kilograms

d = days

mg/kg-d = milligrams per kilogram per day

mg/kg ww = milligrams per kilogram wet weight

[a] Soil concentrations based on exposure point concentrations (EPCs) calculated for surface soil (0 - 0.5 ft bgs) for each exposure area. Refer to text for discussion on development of soil EPCs.
If soil data not available for an exposure area, the soil concentration set to 0 for the purposes of calculation.

[b] Values presented are the vegetated portions of the exopsure area and Site. See table below for non-vegetated and vegetated areas for each human health exposure area.

Human Health Exposure Area	AOC	Area		
		Non-Vegetated (Acres)	Vegetated (Acres)	Total (Acres)
Main Plant Area	1	139.8	147.6	287.4
North Percolation Pond Area	2	8.0	3.2	11.3
Central Landfills Area	3	0.13	129.5	129.7
Industrial Landfill Area	4	0.0	19.2	19.2
Eastern Undeveloped Area	5	0.0	99.9	99.9
North-Central Undeveloped Area	6	0.0	182.9	182.9
Western Undeveloped Area	7	0.0	357.3	357.3
South Percolation Pond Area	8	0.0	49.1	49.1
Backwater Seep Sampling Area	9A	0.0	8.9	8.9
Total		148.0	997.7	1145.7

Table H-21
Calculation for the Ingested Dose of Benzo(b)fluoranthene in Venison Tissue by the Hunter

Human Health Exposure Area	*Soil Concentration*	*Biotransfer Factor for Venison (Bv) (Bv = 0.2 x Bb)*		*Forage Tissue Concentration, Dry Matter (Cp) ($Cp = Cs \times BAF_{plant}$)*		*Venison Concentration (Cv) ($Cv = (Cp \times FIR_{browse} \times Bv) + (Cs \times FIR_{browse} \times f_{SI} \times Bv)$)*			*AUF (unitless) ($AUF = Area_{Site} \times Area_{Foraging\ Range}$)*			*AUF-Adjusted Venison Concentration (mg/kg ww) ($Cv_{Adjusted} = Cv \times AUF$)*
	Cs (mg/kg dw)[a]	Bb (D/kg tissue ww)	Bv (D/kg tissue ww)	BAF_{plant} (kg soil dw/kg plant tissue dw)	Cp (mg/kg plant tissue dw)	FIR_{browse} (kg DM/d)	f_{SI}	Cv (mg/kg ww)	Area of Site (acres)[b]	Area of Deer Foraging Range (acres)[b]	AUF (unitless)	
Main Plant Area	15.23	0.15	0.03	0.31	5.7E-02	0.87	0.02	0.01	147.6	997.7	0.148	1.4E-03
North Percolation Pond Area	925.9	0.15	0.03	0.31	5.7E-02	0.87	0.02	0.5	3.2	997.7	0.003	1.6E-03
Central Landfills Area	12.99	0.15	0.03	0.31	5.7E-02	0.87	0.02	0.0	129.5	997.7	0.130	1.1E-03
Industrial Landfill Area	58.72	0.15	0.03	0.31	5.7E-02	0.87	0.02	0.03	19.2	997.7	0.019	6.2E-04
Eastern Undeveloped Area	2.049	0.15	0.03	0.31	5.7E-02	0.87	0.02	0.0	99.9	997.7	0.100	2.6E-04
North-Central Undeveloped Area	0.183	0.15	0.03	0.31	5.7E-02	0.87	0.02	0.0	182.9	997.7	0.183	2.9E-04
Western Undeveloped Area	0.1	0.15	0.03	0.31	5.7E-02	0.87	0.02	0.0	357.3	997.7	0.358	5.5E-04
South Percolation Pond Area	1.711	0.15	0.03	0.31	5.7E-02	0.87	0.02	0	49.1	997.7	0.049	1.2E-04
Backwater Seep Sampling Area	0.4	0.15	0.03	0.31	5.7E-02	0.87	0.02	0	8.9	997.7	0.009	1.5E-05
											$EPC_{venison}$	0.006

Notes:

C_s = concentration in soil (mg/kg dry weight)

B_b = biotransfer factor for beef (d/kg tissue wet weight)

AUF = aereal ratio of exposure area to receptor foraging range (unitless)

B_v = biotransfer factor for venison; Bb adjusted to Bv multiplying Bb by 0.2 based on the ratio of % fatvenison/% fatbeef (2.9 / 14.4 = 0.2)

BAF_{plant} = soil-to-plant forage bioaccumulation factor (kg soil dry weight / kg plant forage tissue dry weight)

C_p = Concentration in plant forage tissue (mg/kg plant dry weight)

FIR_{browse} = browse ingestion rate (kg dry plant tissue/day)

C_v = concentration in venison tissue (mg/kg venison wet weight)

f_{SI} = Fraction of FIR_{browse} associated with incidental soil ingestion

Ir_v = ingestion rate of venison (kg venison wet weight/day)

EF = exposure frequency (days/year)

ED = exposure duration (years)

BW = body weight (kg)

AT = averaging time (noncancer) (days)

mg/kg = milligrams per kilogram

mg DM/d = milligrams dry matter per day

kg/d = kilograms per day

d/yr = days per year

yr = year

kg = kilograms

d = days

mg/kg-d = milligrams per kilogram per day

mg/kg ww = milligrams per kilogram wet weight

[a] Soil concentrations based on exposure point concentrations (EPCs) calculated for surface soil (0 - 0.5 ft bgs) for each exposure area. Refer to text for discussion on development of soil EPCs.
If soil data not available for an exposure area, the soil concentration set to 0 for the purposes of calculation.

[b] Values presented are the vegetated portions of the exopsure area and Site. See table below for non-vegetated and vegetated areas for each human health exposure area.

Human Health Exposure Area	AOC	Area		
		Non-Vegetated (Acres)	Vegetated (Acres)	Total (Acres)
Main Plant Area	1	139.8	147.6	287.4
North Percolation Pond Area	2	8.0	3.2	11.3
Central Landfills Area	3	0.13	129.5	129.7
Industrial Landfill Area	4	0.0	19.2	19.2
Eastern Undeveloped Area	5	0.0	99.9	99.9
North-Central Undeveloped Area	6	0.0	182.9	182.9
Western Undeveloped Area	7	0.0	357.3	357.3
South Percolation Pond Area	8	0.0	49.1	49.1
Backwater Seep Sampling Area	9A	0.0	8.9	8.9
Total		148.0	997.7	1145.7

Table H-22
Calculation for the Ingested Dose of Benzo(k)fluoranthene in Venison Tissue by the Hunter

Human Health Exposure Area	*Soil Concentration*	*Biotransfer Factor for Venison (Bv) (Bv = 0.2 x Bb)*		*Forage Tissue Concentration, Dry Matter (Cp) ($Cp = Cs \times BAF_{plant}$)*		*Venison Concentration (Cv) ($Cv = (Cp \times FIR_{browse} \times Bv) + (Cs \times FIR_{browse} \times f_{SI} \times Bv)$)*			*AUF (unitless) ($AUF = Area_{Site} \times Area_{Foraging\ Range}$)*			*AUF-Adjusted Venison Concentration (mg/kg ww) ($Cv_{Adjusted} = Cv \times AUF$)*
	Cs (mg/kg dw)[a]	Bb (D/kg tissue ww)	Bv (D/kg tissue ww)	BAF_{plant} (kg soil dw/kg plant tissue dw)	Cp (mg/kg plant tissue dw)	FIR_{browse} (kg DM/d)	f_{SI}	Cv (mg/kg ww)	Area of Site (acres)[b]	Area of Deer Foraging Range (acres)[b]	AUF (unitless)	
Main Plant Area	6.33	0.15	0.03	Regression	8.4E-01	0.87	0.02	0.03	147.6	997.7	0.148	0.004
North Percolation Pond Area	645.5	0.15	0.03	Regression	8.4E-01	0.87	0.02	0.4	3.2	997.7	0.003	0.001
Central Landfills Area	5.383	0.15	0.03	Regression	8.4E-01	0.87	0.02	0.0	129.5	997.7	0.130	0.003
Industrial Landfill Area	23.44	0.15	0.03	Regression	8.4E-01	0.87	0.02	0.03	19.2	997.7	0.019	0.001
Eastern Undeveloped Area	NA	0.15	0.03	Regression	8.4E-01	0.87	0.02	NA	99.9	997.7	0.100	NA
North-Central Undeveloped Area	NA	0.15	0.03	Regression	8.4E-01	0.87	0.02	NA	182.9	997.7	0.183	NA
Western Undeveloped Area	NA	0.15	0.03	Regression	8.4E-01	0.87	0.02	NA	357.3	997.7	0.358	NA
South Percolation Pond Area	NA	0.15	0.03	Regression	8.4E-01	0.87	0.02	NA	49.1	997.7	0.049	NA
Backwater Seep Sampling Area	NA	0.15	0.03	Regression	8.4E-01	0.87	0.02	NA	8.9	997.7	0.009	NA
											$EPC_{venison}$	0.009

Notes:

C_s = concentration in soil (mg/kg dry weight)

B_b = biotransfer factor for beef (d/kg tissue wet weight)

AUF = aereal ratio of exposure area to receptor foraging range (unitless)

B_v = biotransfer factor for venison; Bb adjusted to Bv multiplying Bb by 0.2 based on the ratio of % fatvenison/% fatbeef (2.9 / 14.4 = 0.2)

BAF_{plant} = soil-to-plant forage bioaccumulation factor (kg soil dry weight / kg plant forage tissue dry weight)

C_p = Concentration in plant forage tissue (mg/kg plant dry weight)

FIR_{browse} = browse ingestion rate (kg dry plant tissue/day)

C_v = concentration in venison tissue (mg/kg venison wet weight)

f_{SI} = Fraction of FIR_{browse} associated with incidental soil ingestion

Ir_v = ingestion rate of venison (kg venison wet weight/day)

EF = exposure frequency (days/year)

ED = exposure duration (years)

BW = body weight (kg)

AT = averaging time (noncancer) (days)

mg/kg = milligrams per kilogram

mg DM/d = milligrams dry matter per day

kg/d = kilograms per day

d/yr = days per year

yr = year

kg = kilograms

d = days

mg/kg-d = milligrams per kilogram per day

mg/kg ww = milligrams per kilogram wet weight

[a] Soil concentrations based on exposure point concentrations (EPCs) calculated for surface soil (0 - 0.5 ft bgs) for each exposure area. Refer to text for discussion on development of soil EPCs. If soil data not available for an exposure area, the soil concentration set to 0 for the purposes of calculation.

[b] Values presented are the vegetated portions of the exopsure area and Site. See table below for non-vegetated and vegetated areas for each human health exposure area.

Human Health Exposure Area	AOC	Area		
		Non-Vegetated (Acres)	Vegetated (Acres)	Total (Acres)
Main Plant Area	1	139.8	147.6	287.4
North Percolation Pond Area	2	8.0	3.2	11.3
Central Landfills Area	3	0.13	129.5	129.7
Industrial Landfill Area	4	0.0	19.2	19.2
Eastern Undeveloped Area	5	0.0	99.9	99.9
North-Central Undeveloped Area	6	0.0	182.9	182.9
Western Undeveloped Area	7	0.0	357.3	357.3
South Percolation Pond Area	8	0.0	49.1	49.1
Backwater Seep Sampling Area	9A	0.0	8.9	8.9
Total		148.0	997.7	1145.7

Table H-23
Calculation for the Ingested Dose of Bis(2-ethylhexyl)phthalate in Venison Tissue by the Hunter

Human Health Exposure Area	*Soil Concentration*	*Biotransfer Factor for Venison (Bv) (Bv = 0.2 x Bb)*		*Forage Tissue Concentration, Dry Matter (Cp) ($Cp = Cs \times BAF_{plant}$)*		*Venison Concentration (Cv) ($Cv = (Cp \times FIR_{browse} \times Bv) + (Cs \times FIR_{browse} \times f_{SI} \times Bv)$)*			*AUF (unitless) ($AUF = Area_{Site} \times Area_{Foraging\ Range}$)*			*AUF-Adjusted Venison Concentration (mg/kg ww) ($Cv_{Adjusted} = Cv \times AUF$)*
	Cs (mg/kg dw)[a]	Bb (D/kg tissue ww)	Bv (D/kg tissue ww)	BAF_{plant} (kg soil dw/kg plant tissue dw)	Cp (mg/kg plant tissue dw)	FIR_{browse} (kg DM/d)	f_{SI}	Cv (mg/kg ww)	Area of Site (acres)[b]	Area of Deer Foraging Range (acres)[b]	AUF (unitless)	
Main Plant Area	0.114	0.15	0.03	0.024	2.4E-01	0.87	0.02	0.01	147.6	997.7	0.148	0.001
North Percolation Pond Area	0.17	0.15	0.03	0.024	8.4E-01	0.87	0.02	0.0	3.2	997.7	0.003	0.000
Central Landfills Area	0.246	0.15	0.03	0.024	8.4E-01	0.87	0.02	0.0	129.5	997.7	0.130	0.003
Industrial Landfill Area	0.0639	0.15	0.03	0.024	8.4E-01	0.87	0.02	0.02	19.2	997.7	0.019	0.000
Eastern Undeveloped Area	0.093	0.15	0.03	0.024	8.4E-01	0.87	0.02	0.0	99.9	997.7	0.100	0.002
North-Central Undeveloped Area	NA	0.15	0.03	0.024	8.4E-01	0.87	0.02	NA	182.9	997.7	0.183	NA
Western Undeveloped Area	NA	0.15	0.03	0.024	8.4E-01	0.87	0.02	NA	357.3	997.7	0.358	NA
South Percolation Pond Area	NA	0.15	0.03	0.024	8.4E-01	0.87	0.02	NA	49.1	997.7	0.049	NA
Backwater Seep Sampling Area	NA	0.15	0.03	0.024	8.4E-01	0.87	0.02	NA	8.9	997.7	0.009	NA
											$EPC_{venison}$	0.0065

Notes:

C_s = concentration in soil (mg/kg dry weight)

B_b = biotransfer factor for beef (d/kg tissue wet weight)

AUF = aereal ratio of exposure area to receptor foraging range (unitless)

B_v = biotransfer factor for venison; Bb adjusted to Bv multiplying Bb by 0.2 based on the ratio of % fatvenison/% fatbeef (2.9 / 14.4 = 0.2)

BAF_{plant} = soil-to-plant forage bioaccumulation factor (kg soil dry weight / kg plant forage tissue dry weight)

C_p = Concentration in plant forage tissue (mg/kg plant dry weight)

FIR_{browse} = browse ingestion rate (kg dry plant tissue/day)

C_v = concentration in venison tissue (mg/kg venison wet weight)

f_{SI} = Fraction of FIR_{browse} associated with incidental soil ingestion

Ir_v = ingestion rate of venison (kg venison wet weight/day)

EF = exposure frequency (days/year)

ED = exposure duration (years)

BW = body weight (kg)

AT = averaging time (noncancer) (days)

mg/kg = milligrams per kilogram

mg DM/d = milligrams dry matter per day

kg/d = kilograms per day

d/yr = days per year

yr = year

kg = kilograms

d = days

mg/kg-d = milligrams per kilogram per day

mg/kg ww = milligrams per kilogram wet weight

[a] Soil concentrations based on exposure point concentrations (EPCs) calculated for surface soil (0 - 0.5 ft bgs) for each exposure area. Refer to text for discussion on development of soil EPCs.
If soil data not available for an exposure area, the soil concentration set to 0 for the purposes of calculation.

[b] Values presented are the vegetated portions of the exopsure area and Site. See table below for non-vegetated and vegetated areas for each human health exposure area.

Human Health Exposure Area	AOC	Area		
		Non-Vegetated (Acres)	Vegetated (Acres)	Total (Acres)
Main Plant Area	1	139.8	147.6	287.4
North Percolation Pond Area	2	8.0	3.2	11.3
Central Landfills Area	3	0.13	129.5	129.7
Industrial Landfill Area	4	0.0	19.2	19.2
Eastern Undeveloped Area	5	0.0	99.9	99.9
North-Central Undeveloped Area	6	0.0	182.9	182.9
Western Undeveloped Area	7	0.0	357.3	357.3
South Percolation Pond Area	8	0.0	49.1	49.1
Backwater Seep Sampling Area	9A	0.0	8.9	8.9
Total		148.0	997.7	1145.7

Table H-24
Calculation for the Ingested Dose of Chrysene in Venison Tissue by the Hunter

Human Health Exposure Area	*Soil Concentration*	*Biotransfer Factor for Venison (Bv) (Bv = 0.2 x Bb)*		*Forage Tissue Concentration, Dry Matter (Cp) (Cp = Cs x BAF_{plant})*		*Venison Concentration (Cv) (Cv= (Cp x FIR_{browse} x Bv) + (Cs x FIR_{browse} x f_{SI} x Bv))*			*AUF (unitless) (AUF= Area $_{Site}$ x Area $_{Foraging\ Range}$)*			*AUF-Adjusted Venison Concentration (mg/kg ww)*
	Cs (mg/kg dw)[a]	Bb (D/kg tissue ww)	Bv (D/kg tissue ww)	BAF_{plant} (kg soil dw/kg plant tissue dw)	Cp (mg/kg plant tissue dw)	FIR_{browse} (kg DM/d)	f_{SI}	Cv (mg/kg ww)	Area of Site (acres)[b]	Area of Deer Foraging Range (acres)[b]	AUF (unitless)	*($Cv_{Adjusted}$ = Cv x AUF)*
Main Plant Area	12.93	0.15	0.03	Regression	2.6E-01	0.87	0.02	0.01	147.6	997.7	0.148	0.002
North Percolation Pond Area	1055	0.15	0.03	Regression	2.6E-01	0.87	0.02	0.6	3.2	997.7	0.003	0.002
Central Landfills Area	11.7	0.15	0.03	Regression	2.6E-01	0.87	0.02	0.0	129.5	997.7	0.130	0.002
Industrial Landfill Area	51	0.15	0.03	Regression	2.6E-01	0.87	0.02	0.03	19.2	997.7	0.019	0.001
Eastern Undeveloped Area	NA	0.15	0.03	Regression	2.6E-01	0.87	0.02	NA	99.9	997.7	0.100	NA
North-Central Undeveloped Area	NA	0.15	0.03	Regression	2.6E-01	0.87	0.02	NA	182.9	997.7	0.183	NA
Western Undeveloped Area	NA	0.15	0.03	Regression	2.6E-01	0.87	0.02	NA	357.3	997.7	0.358	NA
South Percolation Pond Area	NA	0.15	0.03	Regression	2.6E-01	0.87	0.02	NA	49.1	997.7	0.049	NA
Backwater Seep Sampling Area	NA	0.15	0.03	Regression	2.6E-01	0.87	0.02	NA	8.9	997.7	0.009	NA
											$EPC_{venison}$	0.006

Notes:

C_s = concentration in soil (mg/kg dry weight)

B_b = biotransfer factor for beef (d/kg tissue wet weight)

AUF = aereal ratio of exposure area to receptor foraging range (unitless)

B_v = biotransfer factor for venison; Bb adjusted to Bv multiplying Bb by 0.2 based on the ratio of % fatvenison/% fatbeef (2.9 / 14.4 = 0.2)

BAF_{plant} = soil-to-plant forage bioaccumulation factor (kg soil dry weight / kg plant forage tissue dry weight)

C_p = Concentration in plant forage tissue (mg/kg plant dry weight)

FIR_{browse} = browse ingestion rate (kg dry plant tissue/day)

C_v = concentration in venison tissue (mg/kg venison wet weight)

f_{SI} = Fraction of FIR_{browse} associated with incidental soil ingestion

Ir_v = ingestion rate of venison (kg venison wet weight/day)

EF = exposure frequency (days/year)

ED = exposure duration (years)

BW = body weight (kg)

AT = averaging time (noncancer) (days)

mg/kg = milligrams per kilogram

mg DM/d = milligrams dry matter per day

kg/d = kilograms per day

d/yr = days per year

yr = year

kg = kilograms

d = days

mg/kg-d = milligrams per kilogram per day

mg/kg ww = milligrams per kilogram wet weight

[a] Soil concentrations based on exposure point concentrations (EPCs) calculated for surface soil (0 - 0.5 ft bgs) for each exposure area. Refer to text for discussion on development of soil EPCs.
If soil data not available for an exposure area, the soil concentration set to 0 for the purposes of calculation.

[b] Values presented are the vegetated portions of the exopsure area and Site. See table below for non-vegetated and vegetated areas for each human health exposure area.

Human Health Exposure Area	AOC	Area		
		Non-Vegetated (Acres)	Vegetated (Acres)	Total (Acres)
Main Plant Area	1	139.8	147.6	287.4
North Percolation Pond Area	2	8.0	3.2	11.3
Central Landfills Area	3	0.13	129.5	129.7
Industrial Landfill Area	4	0.0	19.2	19.2
Eastern Undeveloped Area	5	0.0	99.9	99.9
North-Central Undeveloped Area	6	0.0	182.9	182.9
Western Undeveloped Area	7	0.0	357.3	357.3
South Percolation Pond Area	8	0.0	49.1	49.1
Backwater Seep Sampling Area	9A	0.0	8.9	8.9
Total		148.0	997.7	1145.7

Table H-25
Calculation for the Ingested Dose of Dibenzo(a,h)anthracene in Venison Tissue by the Hunter

Human Health Exposure Area	*Soil Concentration*	*Biotransfer Factor for Venison (Bv) (Bv = 0.2 x Bb)*		*Forage Tissue Concentration, Dry Matter (Cp) ($Cp = Cs \times BAF_{plant}$)*		*Venison Concentration (Cv) ($Cv = (Cp \times FIR_{browse} \times Bv) + (Cs \times FIR_{browse} \times f_{SI} \times Bv)$)*			*AUF (unitless) ($AUF = Area_{Site} \times Area_{Foraging\ Range}$)*			*AUF-Adjusted Venison Concentration (mg/kg ww) ($Cv_{Adjusted} = Cv \times AUF$)*
	Cs (mg/kg dw)[a]	Bb (D/kg tissue ww)	Bv (D/kg tissue ww)	BAF_{plant} (kg soil dw/kg plant tissue dw)	Cp (mg/kg plant tissue dw)	FIR_{browse} (kg DM/d)	f_{SI}	Cv (mg/kg ww)	Area of Site (acres)[b]	Area of Deer Foraging Range (acres)[b]	AUF (unitless)	
Main Plant Area	3.053	0.15	0.03	0.13	1.3E+00	0.87	0.02	0.04	147.6	997.7	0.148	0.005
North Percolation Pond Area	279.1	0.15	0.03	0.13	1.3E+00	0.87	0.02	0.2	3.2	997.7	0.003	0.001
Central Landfills Area	2.267	0.15	0.03	0.13	1.3E+00	0.87	0.02	0.0	129.5	997.7	0.130	0.005
Industrial Landfill Area	10.96	0.15	0.03	0.13	1.3E+00	0.87	0.02	0.04	19.2	997.7	0.019	0.001
Eastern Undeveloped Area	0.267	0.15	0.03	0.13	1.3E+00	0.87	0.02	0.0	99.9	997.7	0.100	0.003
North-Central Undeveloped Area	NA	0.15	0.03	0.13	1.3E+00	0.87	0.02	NA	182.9	997.7	0.183	NA
Western Undeveloped Area	NA	0.15	0.03	0.13	1.3E+00	0.87	0.02	NA	357.3	997.7	0.358	NA
South Percolation Pond Area	0.0447	0.15	0.03	0.13	1.3E+00	0.87	0.02	0	49.1	997.7	0.049	0.002
Backwater Seep Sampling Area	NA	0.15	0.03	0.13	1.3E+00	0.87	0.02	NA	8.9	997.7	0.009	NA
											$EPC_{venison}$	0.016

Notes:

C_s = concentration in soil (mg/kg dry weight)

B_b = biotransfer factor for beef (d/kg tissue wet weight)

AUF = aereal ratio of exposure area to receptor foraging range (unitless)

B_v = biotransfer factor for venison; Bb adjusted to Bv multiplying Bb by 0.2 based on the ratio of % fatvenison/% fatbeef (2.9 / 14.4 = 0.2)

BAF_{plant} = soil-to-plant forage bioaccumulation factor (kg soil dry weight / kg plant forage tissue dry weight)

C_p = Concentration in plant forage tissue (mg/kg plant dry weight)

FIR_{browse} = browse ingestion rate (kg dry plant tissue/day)

C_v = concentration in venison tissue (mg/kg venison wet weight)

f_{SI} = Fraction of FIR_{browse} associated with incidental soil ingestion

Ir_v = ingestion rate of venison (kg venison wet weight/day)

EF = exposure frequency (days/year)

ED = exposure duration (years)

BW = body weight (kg)

AT = averaging time (noncancer) (days)

mg/kg = milligrams per kilogram

mg DM/d = milligrams dry matter per day

kg/d = kilograms per day

d/yr = days per year

yr = year

kg = kilograms

d = days

mg/kg-d = milligrams per kilogram per day

mg/kg ww = milligrams per kilogram wet weight

[a] Soil concentrations based on exposure point concentrations (EPCs) calculated for surface soil (0 - 0.5 ft bgs) for each exposure area. Refer to text for discussion on development of soil EPCs.
If soil data not available for an exposure area, the soil concentration set to 0 for the purposes of calculation.

[b] Values presented are the vegetated portions of the exopsure area and Site. See table below for non-vegetated and vegetated areas for each human health exposure area.

Human Health Exposure Area	AOC	Area		
		Non-Vegetated (Acres)	Vegetated (Acres)	Total (Acres)
Main Plant Area	1	139.8	147.6	287.4
North Percolation Pond Area	2	8.0	3.2	11.3
Central Landfills Area	3	0.13	129.5	129.7
Industrial Landfill Area	4	0.0	19.2	19.2
Eastern Undeveloped Area	5	0.0	99.9	99.9
North-Central Undeveloped Area	6	0.0	182.9	182.9
Western Undeveloped Area	7	0.0	357.3	357.3
South Percolation Pond Area	8	0.0	49.1	49.1
Backwater Seep Sampling Area	9A	0.0	8.9	8.9
Total		148.0	997.7	1145.7

Table H-26
Calculation for the Ingested Dose of Dibenzofuran in Venison Tissue by the Hunter

Human Health Exposure Area	*Soil Concentration*	*Biotransfer Factor for Venison (Bv) (Bv = 0.2 x Bb)*		*Forage Tissue Concentration, Dry Matter (Cp) ($Cp = Cs \times BAF_{plant}$)*		*Venison Concentration (Cv) ($Cv = (Cp \times FIR_{browse} \times Bv) + (Cs \times FIR_{browse} \times f_{SI} \times Bv)$)*			*AUF (unitless) ($AUF = Area_{Site} \times Area_{Foraging\ Range}$)*			*AUF-Adjusted Venison Concentration (mg/kg ww) ($Cv_{Adjusted} = Cv \times AUF$)*
	Cs (mg/kg dw)[a]	Bb (D/kg tissue ww)	Bv (D/kg tissue ww)	BAF_{plant} (kg soil dw/kg plant tissue dw)	Cp (mg/kg plant tissue dw)	FIR_{browse} (kg DM/d)	f_{SI}	Cv (mg/kg ww)	Area of Site (acres)[b]	Area of Deer Foraging Range (acres)[b]	AUF (unitless)	
Main Plant Area	NA	0.15	0.03	1.879	1.9E+01	0.87	0.02	NA	147.6	997.7	0.148	NA
North Percolation Pond Area	8.616	0.15	0.03	1.879	1.9E+01	0.87	0.02	0.5	3.2	997.7	0.003	0.002
Central Landfills Area	0.977	0.15	0.03	1.879	1.9E+01	0.87	0.02	0.5	129.5	997.7	0.130	0.064
Industrial Landfill Area	NA	0.15	0.03	1.879	1.9E+01	0.87	0.02	NA	19.2	997.7	0.019	NA
Eastern Undeveloped Area	NA	0.15	0.03	1.879	1.9E+01	0.87	0.02	NA	99.9	997.7	0.100	NA
North-Central Undeveloped Area	NA	0.15	0.03	1.879	1.9E+01	0.87	0.02	NA	182.9	997.7	0.183	NA
Western Undeveloped Area	NA	0.15	0.03	1.879	1.9E+01	0.87	0.02	NA	357.3	997.7	0.358	NA
South Percolation Pond Area	NA	0.15	0.03	1.879	1.9E+01	0.87	0.02	NA	49.1	997.7	0.049	NA
Backwater Seep Sampling Area	NA	0.15	0.03	1.879	1.9E+01	0.87	0.02	NA	8.9	997.7	0.009	NA
											$EPC_{venison}$	0.065

Notes:

C_s = concentration in soil (mg/kg dry weight)

B_b = biotransfer factor for beef (d/kg tissue wet weight)

AUF = aereal ratio of exposure area to receptor foraging range (unitless)

B_v = biotransfer factor for venison; Bb adjusted to Bv multiplying Bb by 0.2 based on the ratio of % fatvenison/% fatbeef (2.9 / 14.4 = 0.2)

BAF_{plant} = soil-to-plant forage bioaccumulation factor (kg soil dry weight / kg plant forage tissue dry weight)

C_p = Concentration in plant forage tissue (mg/kg plant dry weight)

FIR_{browse} = browse ingestion rate (kg dry plant tissue/day)

C_v = concentration in venison tissue (mg/kg venison wet weight)

f_{SI} = Fraction of FIR_{browse} associated with incidental soil ingestion

Ir_v = ingestion rate of venison (kg venison wet weight/day)

EF = exposure frequency (days/year)

ED = exposure duration (years)

BW = body weight (kg)

AT = averaging time (noncancer) (days)

mg/kg = milligrams per kilogram

mg DM/d = milligrams dry matter per day

kg/d = kilograms per day

d/yr = days per year

yr = year

kg = kilograms

d = days

mg/kg-d = milligrams per kilogram per day

mg/kg ww = milligrams per kilogram wet weight

[a] Soil concentrations based on exposure point concentrations (EPCs) calculated for surface soil (0 - 0.5 ft bgs) for each exposure area. Refer to text for discussion on development of soil EPCs. If soil data not available for an exposure area, the soil concentration set to 0 for the purposes of calculation.

[b] Values presented are the vegetated portions of the exopsure area and Site. See table below for non-vegetated and vegetated areas for each human health exposure area.

Human Health Exposure Area	AOC	Area		
		Non-Vegetated (Acres)	Vegetated (Acres)	Total (Acres)
Main Plant Area	1	139.8	147.6	287.4
North Percolation Pond Area	2	8.0	3.2	11.3
Central Landfills Area	3	0.13	129.5	129.7
Industrial Landfill Area	4	0.0	19.2	19.2
Eastern Undeveloped Area	5	0.0	99.9	99.9
North-Central Undeveloped Area	6	0.0	182.9	182.9
Western Undeveloped Area	7	0.0	357.3	357.3
South Percolation Pond Area	8	0.0	49.1	49.1
Backwater Seep Sampling Area	9A	0.0	8.9	8.9
Total		148.0	997.7	1145.7

Table H-27
Calculation for the Ingested Dose of Naphthalene in Venison Tissue by the Hunter

Human Health Exposure Area	*Soil Concentration*	*Biotransfer Factor for Venison (Bv) (Bv = 0.2 x Bb)*		*Forage Tissue Concentration, Dry Matter (Cp) ($Cp = Cs \times BAF_{plant}$)*		*Venison Concentration (Cv) ($Cv = (Cp \times FIR_{browse} \times Bv) + (Cs \times FIR_{browse} \times f_{SI} \times Bv)$)*			*AUF (unitless) ($AUF = Area_{Site} \times Area_{Foraging\ Range}$)*			*AUF-Adjusted Venison Concentration (mg/kg ww) ($Cv_{Adjusted} = Cv \times AUF$)*
	Cs (mg/kg dw)[a]	Bb (D/kg tissue ww)	Bv (D/kg tissue ww)	BAF_{plant} (kg soil dw/kg plant tissue dw)	Cp (mg/kg plant tissue dw)	FIR_{browse} (kg DM/d)	f_{SI}	Cv (mg/kg ww)	Area of Site (acres)[b]	Area of Deer Foraging Range (acres)[b]	AUF (unitless)	
Main Plant Area	0.491	0.15	0.03	12.200	1.2E+02	0.87	0.02	3.18	147.6	997.7	0.148	4.7E-01
North Percolation Pond Area	3.215	0.15	0.03	12.200	1.2E+02	0.87	0.02	3.2	3.2	997.7	0.003	1.0E-02
Central Landfills Area	0.0686	0.15	0.03	12.200	1.2E+02	0.87	0.02	3.2	129.5	997.7	0.130	4.1E-01
Industrial Landfill Area	1.349	0.15	0.03	12.200	1.2E+02	0.87	0.02	3.18	19.2	997.7	0.019	6.1E-02
Eastern Undeveloped Area	0.00835	0.15	0.03	12.200	1.2E+02	0.87	0.02	3.2	99.9	997.7	0.100	3.2E-01
North-Central Undeveloped Area	0.0122	0.15	0.03	12.200	1.2E+02	0.87	0.02	3.2	182.9	997.7	0.183	5.8E-01
Western Undeveloped Area	0.00447	0.15	0.03	12.200	1.2E+02	0.87	0.02	3.2	357.3	997.7	0.358	1.1E+00
South Percolation Pond Area	0.015	0.15	0.03	12.200	1.2E+02	0.87	0.02	3	49.1	997.7	0.049	1.6E-01
Backwater Seep Sampling Area	0.81	0.15	0.03	12.200	1.2E+02	0.87	0.02	3	8.9	997.7	0.009	2.8E-02
											$EPC_{venison}$	3.184

Notes:

C_s = concentration in soil (mg/kg dry weight)

B_b = biotransfer factor for beef (d/kg tissue wet weight)

AUF = aereal ratio of exposure area to receptor foraging range (unitless)

B_v = biotransfer factor for venison; Bb adjusted to Bv multiplying Bb by 0.2 based on the ratio of % fatvenison/% fatbeef (2.9 / 14.4 = 0.2)

BAF_{plant} = soil-to-plant forage bioaccumulation factor (kg soil dry weight / kg plant forage tissue dry weight)

C_p = Concentration in plant forage tissue (mg/kg plant dry weight)

FIR_{browse} = browse ingestion rate (kg dry plant tissue/day)

C_v = concentration in venison tissue (mg/kg venison wet weight)

f_{SI} = Fraction of FIR_{browse} associated with incidental soil ingestion

Ir_v = ingestion rate of venison (kg venison wet weight/day)

EF = exposure frequency (days/year)

ED = exposure duration (years)

BW = body weight (kg)

AT = averaging time (noncancer) (days)

mg/kg = milligrams per kilogram

mg DM/d = milligrams dry matter per day

kg/d = kilograms per day

d/yr = days per year

yr = year

kg = kilograms

d = days

mg/kg-d = milligrams per kilogram per day

mg/kg ww = milligrams per kilogram wet weight

[a] Soil concentrations based on exposure point concentrations (EPCs) calculated for surface soil (0 - 0.5 ft bgs) for each exposure area. Refer to text for discussion on development of soil EPCs.
If soil data not available for an exposure area, the soil concentration set to 0 for the purposes of calculation.

[b] Values presented are the vegetated portions of the exopsure area and Site. See table below for non-vegetated and vegetated areas for each human health exposure area.

Human Health Exposure Area	AOC	Area		
		Non-Vegetated (Acres)	Vegetated (Acres)	Total (Acres)
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Central Landfills Area	3	0.13	129.5	129.7
Industrial Landfill Area	4	0.0	19.2	19.2
Eastern Undeveloped Area	5	0.0	99.9	99.9
North-Central Undeveloped Area	6	0.0	182.9	182.9
Western Undeveloped Area	7	0.0	357.3	357.3
South Percolation Pond Area	8	0.0	49.1	49.1
Backwater Seep Sampling Area	9A	0.0	8.9	8.9
Total		148.0	997.7	1145.7

Appendix I Incremental Sampling Risk Characterization

Table I-1
Calculation of Chemical Cancer Risks and Non-Cancer Hazards
(Main Plant Area - ISM - Trespasser - Current)
Reasonable Maximum Exposure
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Scenario Timeframe:	Current
Receptor Population:	Trespasser
Receptor Age:	Adolescent

Medium	Exposure Medium	Exposure point	Exposure route	Cas Number	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
								Intake/Exposure Concentration		CSF/Unit Risk		Cancer	Intake/Exposure Concentration		RfD/RfC		Hazard
						Value	Units	Value	Units	Value	Units	Risk	Value	Units	Value	Units	Quotient
Soil	Soil	Surface Soil 0-0.5 ft-bgs	Ingestion	57-12-5	Cyanide	1.0037157	mg/kg	6.2E-09	(mg/kg-day)	NA	1/(mg/kg-day)	NA	4.4E-08	(mg/kg-day)	6.0E-04	(mg/kg-day)	7E-05
				16984-48-8	Fluoride	638.2707	mg/kg	4.0E-06	(mg/kg-day)	NA	1/(mg/kg-day)	NA	2.8E-05	(mg/kg-day)	4.0E-02	(mg/kg-day)	7E-04
				7429-90-5	Aluminum	33418.72	mg/kg	2.1E-04	(mg/kg-day)	NA	1/(mg/kg-day)	NA	1.5E-03	(mg/kg-day)	1.0E+00	(mg/kg-day)	1E-03
				7440-36-0	Antimony	2.8606302	mg/kg	1.8E-08	(mg/kg-day)	NA	1/(mg/kg-day)	NA	1.2E-07	(mg/kg-day)	4.0E-04	(mg/kg-day)	3E-04
				7440-38-2	Arsenic	12.009131	mg/kg	4.5E-08	(mg/kg-day)	1.5E+00	1/(mg/kg-day)	7E-08	3.1E-07	(mg/kg-day)	3.0E-04	(mg/kg-day)	1E-03
				7440-47-3_EST	Chromium, Hexavalent - Estimated	0.8816094	mg/kg	1.6E-08	(mg/kg-day)	5.0E-01	1/(mg/kg-day)	8E-09	3.8E-08	(mg/kg-day)	3.0E-03	(mg/kg-day)	1E-05
				7440-48-4	Cobalt	7.925533	mg/kg	4.9E-08	(mg/kg-day)	NA	1/(mg/kg-day)	NA	3.5E-07	(mg/kg-day)	3.0E-04	(mg/kg-day)	1E-03
				7440-50-8	Copper	211.87315	mg/kg	1.3E-06	(mg/kg-day)	NA	1/(mg/kg-day)	NA	9.2E-06	(mg/kg-day)	4.0E-02	(mg/kg-day)	2E-04
				7439-89-6	Iron	25480.537	mg/kg	1.6E-04	(mg/kg-day)	NA	1/(mg/kg-day)	NA	1.1E-03	(mg/kg-day)	7.0E-01	(mg/kg-day)	2E-03
				7439-96-5	Manganese	568.83732	mg/kg	3.5E-06	(mg/kg-day)	NA	1/(mg/kg-day)	NA	2.5E-05	(mg/kg-day)	2.4E-02	(mg/kg-day)	1E-03
				7439-97-6	Mercury	0.0557745	mg/kg	3.5E-10	(mg/kg-day)	NA	1/(mg/kg-day)	NA	2.4E-09	(mg/kg-day)	NA	(mg/kg-day)	NA
				7440-02-0	Nickel	64.322329	mg/kg	4.0E-07	(mg/kg-day)	NA	1/(mg/kg-day)	NA	2.8E-06	(mg/kg-day)	2.0E-02	(mg/kg-day)	1E-04
				7782-49-2	Selenium	2.809854	mg/kg	1.7E-08	(mg/kg-day)	NA	1/(mg/kg-day)	NA	1.2E-07	(mg/kg-day)	5.0E-03	(mg/kg-day)	2E-05
				7440-28-0	Thallium	0.2054599	mg/kg	1.3E-09	(mg/kg-day)	NA	1/(mg/kg-day)	NA	9.0E-09	(mg/kg-day)	1.0E-05	(mg/kg-day)	9E-04
				7440-62-2	Vanadium	34.727203	mg/kg	2.2E-07	(mg/kg-day)	NA	1/(mg/kg-day)	NA	1.5E-06	(mg/kg-day)	5.0E-03	(mg/kg-day)	3E-04
				56-55-3	Benzo(A)Anthracene	74.291891	mg/kg	1.4E-06	(mg/kg-day)	1.0E-01	1/(mg/kg-day)	1E-07	3.2E-06	(mg/kg-day)	NA	(mg/kg-day)	NA
				50-32-8	Benzo(A)Pyrene	85.599373	mg/kg	1.6E-06	(mg/kg-day)	1.0E+00	1/(mg/kg-day)	2E-06	3.7E-06	(mg/kg-day)	3.0E-04	(mg/kg-day)	1E-02
				205-99-2	Benzo(B)Fluoranthene	96.228262	mg/kg	1.8E-06	(mg/kg-day)	1.0E-01	1/(mg/kg-day)	2E-07	4.2E-06	(mg/kg-day)	NA	(mg/kg-day)	NA
				207-08-9	Benzo(K)Fluoranthene	35.879012	mg/kg	6.7E-07	(mg/kg-day)	1.0E-02	1/(mg/kg-day)	7E-09	1.6E-06	(mg/kg-day)	NA	(mg/kg-day)	NA
				218-01-9	Chrysene	78.030709	mg/kg	1.5E-06	(mg/kg-day)	1.0E-03	1/(mg/kg-day)	1E-09	3.4E-06	(mg/kg-day)	NA	(mg/kg-day)	NA
				53-70-3	Dibenz(A,H)Anthracene	20.539913	mg/kg	3.8E-07	(mg/kg-day)	1.0E+00	1/(mg/kg-day)	4E-07	9.0E-07	(mg/kg-day)	NA	(mg/kg-day)	NA
				193-39-5	Indeno(1,2,3-C,D)Pyrene	75.724508	mg/kg	1.4E-06	(mg/kg-day)	1.0E-01	1/(mg/kg-day)	1E-07	3.3E-06	(mg/kg-day)	NA	(mg/kg-day)	NA
				91-20-3	Naphthalene	1.0333641	mg/kg	6.4E-09	(mg/kg-day)	NA	1/(mg/kg-day)	NA	4.5E-08	(mg/kg-day)	2.0E-02	(mg/kg-day)	2E-06
			Total Ingestion									3E-06					2E-02
			Dermal	57-12-5	Cyanide	1.0037157	mg/kg	NA	(mg/kg-day)	NA	1/(mg/kg-day)	NA	NA	(mg/kg-day)	6.0E-04	(mg/kg-day)	NA
				16984-48-8	Fluoride	638.2707	mg/kg	NA	(mg/kg-day)	NA	1/(mg/kg-day)	NA	NA	(mg/kg-day)	4.0E-02	(mg/kg-day)	NA
				7429-90-5	Aluminum	33418.72	mg/kg	NA	(mg/kg-day)	NA	1/(mg/kg-day)	NA	NA	(mg/kg-day)	1.0E+00	(mg/kg-day)	NA
				7440-36-0	Antimony	2.8606302	mg/kg	NA	(mg/kg-day)	NA	1/(mg/kg-day)	NA	NA	(mg/kg-day)	6.0E-05	(mg/kg-day)	NA
				7440-38-2	Arsenic	12.009131	mg/kg	9.5E-09	(mg/kg-day)	1.5E+00	1/(mg/kg-day)	1E-08	6.6E-08	(mg/kg-day)	3.0E-04	(mg/kg-day)	2E-04
				7440-47-3_EST	Chromium, Hexavalent - Estimated	0.8816094	mg/kg	NA	(mg/kg-day)	1.3E-02	1/(mg/kg-day)	NA	NA	(mg/kg-day)	7.5E-05	(mg/kg-day)	NA
				7440-48-4	Cobalt	7.925533	mg/kg	NA	(mg/kg-day)	NA	1/(mg/kg-day)	NA	NA	(mg/kg-day)	3.0E-04	(mg/kg-day)	NA
				7440-50-8	Copper	211.87315	mg/kg	NA	(mg/kg-day)	NA	1/(mg/kg-day)	NA	NA	(mg/kg-day)	4.0E-02	(mg/kg-day)	NA
				7439-89-6	Iron	25480.537	mg/kg	NA	(mg/kg-day)	NA	1/(mg/kg-day)	NA	NA	(mg/kg-day)	7.0E-01	(mg/kg-day)	NA
				7439-96-5	Manganese	568.83732	mg/kg	NA	(mg/kg-day)	NA	1/(mg/kg-day)	NA	NA	(mg/kg-day)	9.6E-04	(mg/kg-day)	NA
				7439-97-6	Mercury	0.0557745	mg/kg	NA	(mg/kg-day)	NA	1/(mg/kg-day)	NA	NA	(mg/kg-day)	NA	(mg/kg-day)	NA
				7440-02-0	Nickel	64.322329	mg/kg	NA	(mg/kg-day)	NA	1/(mg/kg-day)	NA	NA	(mg/kg-day)	8.0E-04	(mg/kg-day)	NA
				7782-49-2	Selenium	2.809854	mg/kg	NA	(mg/kg-day)	NA	1/(mg/kg-day)	NA	NA	(mg/kg-day)	5.0E-03	(mg/kg-day)	NA
				7440-28-0	Thallium	0.2054599	mg/kg	NA	(mg/kg-day)	NA	1/(mg/kg-day)	NA	NA	(mg/kg-day)	1.0E-05	(mg/kg-day)	NA
				7440-62-2	Vanadium	34.727203	mg/kg	NA	(mg/kg-day)	NA	1/(mg/kg-day)	NA	NA	(mg/kg-day)	1.3E-04	(mg/kg-day)	NA
				56-55-3	Benzo(A)Anthracene	74.291891	mg/kg	7.6E-07	(mg/kg-day)	1.0E-01	1/(mg/kg-day)	8E-08	1.8E-06	(mg/kg-day)	NA	(mg/kg-day)	NA
				50-32-8	Benzo(A)Pyrene	85.599373	mg/kg	8.8E-07	(mg/kg-day)	1.0E+00	1/(mg/kg-day)	9E-07	2.0E-06	(mg/kg-day)	3.0E-04	(mg/kg-day)	7E-03
				205-99-2	Benzo(B)Fluoranthene	96.228262	mg/kg	9.9E-07	(mg/kg-day)	1.0E-01	1/(mg/kg-day)	1E-07	2.3E-06	(mg/kg-day)	NA	(mg/kg-day)	NA
				207-08-9	Benzo(K)Fluoranthene	35.879012	mg/kg	3.7E-07	(mg/kg-day)	1.0E-02	1/(mg/kg-day)	4E-09	8.6E-07	(mg/kg-day)	NA	(mg/kg-day)	NA
				218-01-9	Chrysene	78.030709	mg/kg	8.0E-07	(mg/kg-day)	1.0E-03	1/(mg/kg-day)	8E-10	1.9E-06	(mg/kg-day)	NA	(mg/kg-day)	NA
				53-70-3	Dibenz(A,H)Anthracene	20.539913	mg/kg	2.1E-07	(mg/kg-day)	1.0E+00	1/(mg/kg-day)	2E-07	4.9E-07	(mg/kg-day)	NA	(mg/kg-day)	NA
				193-39-5	Indeno(1,2,3-C,D)Pyrene	75.724508	mg/kg	7.8E-07	(mg/kg-day)	1.0E-01	1/(mg/kg-day)	8E-08	1.8E-06	(mg/kg-day)	NA	(mg/kg-day)	NA
				91-20-3	Naphthalene	1.0333641	mg/kg	3.5E-09	(mg/kg-day)	NA	1/(mg/kg-day)	NA	2.5E-08	(mg/kg-day)	2.0E-02	(mg/kg-day)	1E-06
			Total Dermal									1E-06					7E-03
		Total Soil Direct Contact										4E-06					3E-02

Table I-1
Calculation of Chemical Cancer Risks and Non-Cancer Hazards
(Main Plant Area - ISM - Trespasser - Current)
Reasonable Maximum Exposure
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Scenario Timeframe:	Current
Receptor Population:	Trespasser
Receptor Age:	Adolescent

Medium	Exposure Medium	Exposure point	Exposure route	Cas Number	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
								Intake/Exposure Concentration		CSF/Unit Risk		Cancer	Intake/Exposure Concentration		RfD/RfC		Hazard
						Value	Units	Value	Units	Value	Units	Risk	Value	Units	Value	Units	Quotient
	Air	Airborne vapors /dust	Inhalation	57-12-5	Cyanide	1.0037157	mg/kg	2.1E-06	(µg/m3)	NA	1/(µg/m3)	NA	1.5E-08	mg/m3	8.0E-04	mg/m3	2E-05
				16984-48-8	Fluoride	638.2707	mg/kg	5.4E-08	(µg/m3)	NA	1/(µg/m3)	NA	3.8E-10	mg/m3	1.3E-02	mg/m3	3E-08
				7429-90-5	Aluminum	33418.72	mg/kg	2.8E-06	(µg/m3)	NA	1/(µg/m3)	NA	2.0E-08	mg/m3	5.0E-03	mg/m3	4E-06
				7440-36-0	Antimony	2.8606302	mg/kg	2.4E-10	(µg/m3)	NA	1/(µg/m3)	NA	1.7E-12	mg/m3	NA	mg/m3	NA
				7440-38-2	Arsenic	12.009131	mg/kg	1.0E-09	(µg/m3)	4.3E-03	1/(µg/m3)	4E-12	7.1E-12	mg/m3	1.5E-05	mg/m3	5E-07
				7440-47-3_EST	Chromium, Hexavalent - Estimated	0.8816094	mg/kg	2.2E-10	(µg/m3)	8.4E-02	1/(µg/m3)	2E-11	5.2E-13	mg/m3	1.0E-04	mg/m3	5E-09
				7440-48-4	Cobalt	7.925533	mg/kg	6.7E-10	(µg/m3)	9.0E-03	1/(µg/m3)	6E-12	4.7E-12	mg/m3	6.0E-06	mg/m3	8E-07
				7440-50-8	Copper	211.87315	mg/kg	1.8E-08	(µg/m3)	NA	1/(µg/m3)	NA	1.2E-10	mg/m3	NA	mg/m3	NA
				7439-89-6	Iron	25480.537	mg/kg	2.1E-06	(µg/m3)	NA	1/(µg/m3)	NA	1.5E-08	mg/m3	NA	mg/m3	NA
				7439-96-5	Manganese	568.83732	mg/kg	4.8E-08	(µg/m3)	NA	1/(µg/m3)	NA	3.3E-10	mg/m3	5.0E-05	mg/m3	7E-06
				7439-97-6	Mercury	0.0557745	mg/kg	1.8E-07	(µg/m3)	NA	1/(µg/m3)	NA	1.3E-09	mg/m3	3.0E-04	mg/m3	4E-06
				7440-02-0	Nickel	64.322329	mg/kg	5.4E-09	(µg/m3)	2.6E-04	1/(µg/m3)	1E-12	3.8E-11	mg/m3	9.0E-05	mg/m3	4E-07
				7782-49-2	Selenium	2.809854	mg/kg	2.4E-10	(µg/m3)	NA	1/(µg/m3)	NA	1.7E-12	mg/m3	2.0E-02	mg/m3	8E-11
				7440-28-0	Thallium	0.2054599	mg/kg	1.7E-11	(µg/m3)	NA	1/(µg/m3)	NA	1.2E-13	mg/m3	NA	mg/m3	NA
				7440-62-2	Vanadium	34.727203	mg/kg	2.9E-09	(µg/m3)	NA	1/(µg/m3)	NA	2.0E-11	mg/m3	1.0E-04	mg/m3	2E-07
				56-55-3	Benzo(A)Anthracene	74.291891	mg/kg	5.8E-06	(µg/m3)	6.0E-05	1/(µg/m3)	3E-10	1.4E-08	mg/m3	NA	mg/m3	NA
				50-32-8	Benzo(A)Pyrene	85.599373	mg/kg	2.2E-08	(µg/m3)	6.0E-04	1/(µg/m3)	1E-11	5.0E-11	mg/m3	2.0E-06	mg/m3	3E-05
				205-99-2	Benzo(B)Fluoranthene	96.228262	mg/kg	2.4E-08	(µg/m3)	6.0E-05	1/(µg/m3)	1E-12	5.7E-11	mg/m3	NA	mg/m3	NA
				207-08-9	Benzo(K)Fluoranthene	35.879012	mg/kg	9.0E-09	(µg/m3)	6.0E-06	1/(µg/m3)	5E-14	2.1E-11	mg/m4	NA	mg/m3	NA
				218-01-9	Chrysene	78.030709	mg/kg	2.0E-08	(µg/m3)	6.0E-07	1/(µg/m3)	1E-14	4.6E-11	mg/m5	NA	mg/m3	NA
				53-70-3	Dibenz(A,H)Anthracene	20.539913	mg/kg	5.2E-09	(µg/m3)	6.0E-04	1/(µg/m3)	3E-12	1.2E-11	mg/m3	NA	mg/m3	NA
				193-39-5	Indeno(1,2,3-C,D)Pyrene	75.724508	mg/kg	1.9E-08	(µg/m3)	6.0E-05	1/(µg/m3)	1E-12	4.4E-11	mg/m3	NA	mg/m3	NA
				91-20-3	Naphthalene	1.0333641	mg/kg	2.5E-06	(µg/m3)	3.4E-05	1/(µg/m3)	9E-11	1.8E-08	mg/m3	3.0E-03	mg/m3	6E-06
			Total Inhalation									5E-10					7E-05
		Total Dust Inhalation										5E-10					7E-05
	Total Soil Direct Contact and Dust Inhalation											4E-06					3E-02
Medium Total												4E-06					3E-02
												Total of Receptor Risks Across All Media 4E-06				Total of Receptor Hazards Across All Media	3E-02

Table I-2
Summary of Receptor Risks and Hazards for COPCs
(Main Plant Area - Trespasser - Current)
Reasonable Maximum Exposure
Columbia Falls Aluminum Facility

Scenario Timeframe:	Current
Receptor Population:	Trespasser
Receptor Age:	Adolescent

Medium	Exposure Medium	Exposure Point	Cas Number	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
					Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Surface Soil	57-12-5	Cyanide	NA	NA	NA	NA	Testes (RfDo)	7E-05	NA	NA	7E-05
Main Plant Area		0-2 ft bgs	16984-48-8	Fluoride	NA	NA	NA	NA	NA (RfDo)	7E-04	NA	NA	7E-04
ISM Dus			7429-90-5	Aluminum	NA	NA	NA	NA	Neurological (RfDo)	1E-03	NA	NA	1E-03
			7440-36-0	Antimony	NA	NA	NA	NA	hematologic (longevity, blood glucose, and cholesterol) (RfDo)	3E-04	NA	NA	3E-04
			7440-38-2	Arsenic	7E-08	NA	1E-08	8E-08	Skin and blood (RfDo)	1E-03	NA	2E-04	1E-03
			7440-47-3_EST	Chromium, Hexavalent - Estimated	8E-09	NA	NA	8E-09	NA (RfDo)	1E-05	NA	NA	1E-05
			7440-48-4	Cobalt	NA	NA	NA	NA	Thyroid (RfDo)	1E-03	NA	NA	1E-03
			7440-50-8	Copper	NA	NA	NA	NA	Gastrointestinal system (RfDo)	2E-04	NA	NA	2E-04
			7439-89-6	Iron	NA	NA	NA	NA	GI Ttract (RfDo)	2E-03	NA	NA	2E-03
			7439-96-5	Manganese	NA	NA	NA	NA	Nervous (RfDo)	1E-03	NA	NA	1E-03
			7439-97-6	Mercury	NA	NA	NA	NA	NA (RfDo)	NA	NA	NA	NA
			7440-02-0	Nickel	NA	NA	NA	NA	Body weight (RfDo)	1E-04	NA	NA	1E-04
			7782-49-2	Selenium	NA	NA	NA	NA	nervous, hematologic, dermal (RfDo)	2E-05	NA	NA	2E-05
			7440-28-0	Thallium	NA	NA	NA	NA	Skin (RfDo)	9E-04	NA	NA	9E-04
			7440-62-2	Vanadium	NA	NA	NA	NA	Dermal (RfDo)	3E-04	NA	NA	3E-04
			56-55-3	Benzo(A)Anthracene	1E-07	NA	8E-08	2E-07	NA (RfDo)	NA	NA	NA	NA
			50-32-8	Benzo(A)Pyrene	***2E-06***	NA	9E-07	***2E-06***	Developmental (RfDo)	1E-02	NA	7E-03	2E-02
			205-99-2	Benzo(B)Fluoranthene	2E-07	NA	1E-07	3E-07	NA (RfDo)	NA	NA	NA	NA
			207-08-9	Benzo(K)Fluoranthene	7E-09	NA	4E-09	1E-08	NA (RfDo)	NA	NA	NA	NA
			218-01-9	Chrysene	1E-09	NA	8E-10	2E-09	NA (RfDo)	NA	NA	NA	NA
			53-70-3	Dibenz(A,H)Anthracene	4E-07	NA	2E-07	6E-07	NA (RfDo)	NA	NA	NA	NA
			193-39-5	Indeno(1,2,3-C,D)Pyrene	1E-07	NA	8E-08	2E-07	NA (RfDo)	NA	NA	NA	NA
			91-20-3	Naphthalene	NA	NA	NA	NA	Body weight (RfDo)	2E-06	NA	1E-06	3E-06
				Chemical Total	***3E-06***	NA	***1E-06***	***4E-06***		2E-02	NA	7E-03	3E-02
		Exposure Point Total						***4E-06***					3E-02
	Exposure Medium Total							***4E-06***					3E-02
	Air	Airborne	57-12-5	Cyanide	NA	NA	NA	NA	Thyroid (RfC)	NA	2E-05	NA	2E-05
		vapors	16984-48-8	Fluoride	NA	NA	NA	NA	NA (RfC)	NA	3E-08	NA	3E-08
		/dust	7429-90-5	Aluminum	NA	NA	NA	NA	Neurological (RfC)	NA	4E-06	NA	4E-06
			7440-36-0	Antimony	NA	NA	NA	NA	NA (RfC)	NA	NA	NA	NA
			7440-38-2	Arsenic	NA	4E-12	NA	4E-12	cardiovascular, nervous, and skin (RfC)	NA	5E-07	NA	5E-07
			7440-47-3_EST	Chromium, Hexavalent - Estimated	NA	2E-11	NA	2E-11	Lungs (RfC)	NA	5E-09	NA	5E-09
			7440-48-4	Cobalt	NA	6E-12	NA	6E-12	Respiratory Tract; Lung (RfC)	NA	8E-07	NA	8E-07
			7440-50-8	Copper	NA	NA	NA	NA	NA (RfC)	NA	NA	NA	NA
			7439-89-6	Iron	NA	NA	NA	NA	NA (RfC)	NA	NA	NA	NA
			7439-96-5	Manganese	NA	NA	NA	NA	Nervous (RfC)	NA	7E-06	NA	7E-06
			7439-97-6	Mercury	NA	NA	NA	NA	Nervous (RfC)	NA	4E-06	NA	4E-06
			7440-02-0	Nickel	NA	1E-12	NA	1E-12	Resp. (RfC)	NA	4E-07	NA	4E-07
			7782-49-2	Selenium	NA	NA	NA	NA	NA (RfC)	NA	8E-11	NA	8E-11
			7440-28-0	Thallium	NA	NA	NA	NA	NA (RfC)	NA	NA	NA	NA
			7440-62-2	Vanadium	NA	NA	NA	NA	Resp. (RfC)	NA	2E-07	NA	2E-07
			56-55-3	Benzo(A)Anthracene	NA	3E-10	NA	3E-10	NA (RfC)	NA	NA	NA	NA
			50-32-8	Benzo(A)Pyrene	NA	1E-11	NA	1E-11	Developmental (RfC)	NA	3E-05	NA	3E-05
			205-99-2	Benzo(B)Fluoranthene	NA	1E-12	NA	1E-12	NA (RfC)	NA	NA	NA	NA
			207-08-9	Benzo(K)Fluoranthene	NA	5E-14	NA	5E-14	NA (RfC)	NA	NA	NA	NA
			218-01-9	Chrysene	NA	1E-14	NA	1E-14	NA (RfC)	NA	NA	NA	NA
			53-70-3	Dibenz(A,H)Anthracene	NA	3E-12	NA	3E-12	NA (RfC)	NA	NA	NA	NA
			193-39-5	Indeno(1,2,3-C,D)Pyrene	NA	1E-12	NA	1E-12	NA (RfC)	NA	NA	NA	NA
			91-20-3	Naphthalene	NA	9E-11	NA	9E-11	Nervous, Respiratory (RfC)	NA	6E-06	NA	6E-06
				Chemical Total	NA	5E-10	NA	5E-10		NA	7E-05	NA	7E-05

Table I-2
Summary of Receptor Risks and Hazards for COPCs
(Main Plant Area - Trespasser - Current)
Reasonable Maximum Exposure
Columbia Falls Aluminum Facility

Scenario Timeframe:	Current
Receptor Population:	Trespasser
Receptor Age:	Adolescent

Medium	Exposure Medium	Exposure Point	Cas Number	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
					Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
		Exposure Point Total						5E-10					7E-05
	Exposure Medium Total							5E-10					7E-05
Medium Total								***4E-06***					3E-02
Receptor Total							Receptor Risk Total	***4E-06***				Receptor HI Total	3E-02

Table I-3
Calculation of Chemical Cancer Risks and Non-Cancer Hazards
(Main Plant Area - ISM - Industrial Worker - Future)
Reasonable Maximum Exposure
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Scenario Timeframe:	Future
Receptor Population:	Industrial Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure point	Exposure route	Cas Number	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
								Intake/Exposure Concentration		CSF/Unit Risk		Cancer	Intake/Exposure Concentration		RfD/RfC		Hazard
						Value	Units	Value	Units	Value	Units	Risk	Value	Units	Value	Units	Quotient
Soil	Soil	Surface soil 0-2 ft-bgs	Ingestion	57-12-5	Cyanide	0.7911737	mg/kg	1.8E-07	(mg/kg-day)	NA	1/(mg/kg-day)	NA	5.1E-07	(mg/kg-day)	6.0E-04	(mg/kg-day)	8E-04
				16984-48-8	Fluoride	534.46734	mg/kg	1.2E-04	(mg/kg-day)	NA	1/(mg/kg-day)	NA	3.4E-04	(mg/kg-day)	4.0E-02	(mg/kg-day)	9E-03
				7440-47-3_EST	Chromium, Hexavalent - Estimated	0.7686064	mg/kg	1.8E-07	(mg/kg-day)	5.0E-01	1/(mg/kg-day)	9E-08	4.9E-07	(mg/kg-day)	3.0E-03	(mg/kg-day)	2E-04
				7429-90-5	Aluminum	26835.07	mg/kg	6.1E-03	(mg/kg-day)	NA	1/(mg/kg-day)	NA	1.7E-02	(mg/kg-day)	1.0E+00	(mg/kg-day)	2E-02
				7440-36-0	Antimony	3.230217	mg/kg	7.4E-07	(mg/kg-day)	NA	1/(mg/kg-day)	NA	2.1E-06	(mg/kg-day)	4.0E-04	(mg/kg-day)	5E-03
				7440-38-2	Arsenic	13.63231	mg/kg	1.9E-06	(mg/kg-day)	1.5E+00	1/(mg/kg-day)	3E-06	5.2E-06	(mg/kg-day)	3.0E-04	(mg/kg-day)	2E-02
				7440-48-4	Cobalt	8.4342999	mg/kg	1.9E-06	(mg/kg-day)	NA	1/(mg/kg-day)	NA	5.4E-06	(mg/kg-day)	3.0E-04	(mg/kg-day)	2E-02
				7440-50-8	Copper	274.29521	mg/kg	6.3E-05	(mg/kg-day)	NA	1/(mg/kg-day)	NA	1.8E-04	(mg/kg-day)	4.0E-02	(mg/kg-day)	4E-03
				7439-89-6	Iron	29941.156	mg/kg	6.8E-03	(mg/kg-day)	NA	1/(mg/kg-day)	NA	1.9E-02	(mg/kg-day)	7.0E-01	(mg/kg-day)	3E-02
				7439-96-5	Manganese	622.53615	mg/kg	1.4E-04	(mg/kg-day)	NA	1/(mg/kg-day)	NA	4.0E-04	(mg/kg-day)	2.4E-02	(mg/kg-day)	2E-02
				7439-97-6	Mercury	0.039584	mg/kg	9.1E-09	(mg/kg-day)	NA	1/(mg/kg-day)	NA	2.5E-08	(mg/kg-day)	NA	(mg/kg-day)	NA
				7440-02-0	Nickel	45.709272	mg/kg	1.0E-05	(mg/kg-day)	NA	1/(mg/kg-day)	NA	2.9E-05	(mg/kg-day)	2.0E-02	(mg/kg-day)	1E-03
				7782-49-2	Selenium	2.0769148	mg/kg	4.8E-07	(mg/kg-day)	NA	1/(mg/kg-day)	NA	1.3E-06	(mg/kg-day)	5.0E-03	(mg/kg-day)	3E-04
				7440-28-0	Thallium	0.169845	mg/kg	3.9E-08	(mg/kg-day)	NA	1/(mg/kg-day)	NA	1.1E-07	(mg/kg-day)	1.0E-05	(mg/kg-day)	1E-02
				7440-62-2	Vanadium	26.75556	mg/kg	6.1E-06	(mg/kg-day)	NA	1/(mg/kg-day)	NA	1.7E-05	(mg/kg-day)	5.0E-03	(mg/kg-day)	3E-03
				56-55-3	Benzo(A)Anthracene	32.192562	mg/kg	7.4E-06	(mg/kg-day)	1.0E-01	1/(mg/kg-day)	7E-07	2.1E-05	(mg/kg-day)	NA	(mg/kg-day)	NA
				50-32-8	Benzo(A)Pyrene	37.293364	mg/kg	8.5E-06	(mg/kg-day)	1.0E+00	1/(mg/kg-day)	9E-06	2.4E-05	(mg/kg-day)	3.0E-04	(mg/kg-day)	8E-02
				205-99-2	Benzo(B)Fluoranthene	42.149762	mg/kg	9.6E-06	(mg/kg-day)	1.0E-01	1/(mg/kg-day)	1E-06	2.7E-05	(mg/kg-day)	NA	(mg/kg-day)	NA
				207-08-9	Benzo(K)Fluoranthene	15.780315	mg/kg	3.6E-06	(mg/kg-day)	1.0E-02	1/(mg/kg-day)	4E-08	1.0E-05	(mg/kg-day)	NA	(mg/kg-day)	NA
				218-01-9	Chrysene	34.494904	mg/kg	7.9E-06	(mg/kg-day)	1.0E-03	1/(mg/kg-day)	8E-09	2.2E-05	(mg/kg-day)	NA	(mg/kg-day)	NA
				53-70-3	Dibenz(A,H)Anthracene	9.0286291	mg/kg	2.1E-06	(mg/kg-day)	1.0E+00	1/(mg/kg-day)	2E-06	5.8E-06	(mg/kg-day)	NA	(mg/kg-day)	NA
				193-39-5	Indeno(1,2,3-C,D)Pyrene	33.567209	mg/kg	7.7E-06	(mg/kg-day)	1.0E-01	1/(mg/kg-day)	8E-07	2.1E-05	(mg/kg-day)	NA	(mg/kg-day)	NA
				91-20-3	Naphthalene	0.4677863	mg/kg	1.1E-07	(mg/kg-day)	NA	1/(mg/kg-day)	NA	3.0E-07	(mg/kg-day)	2.0E-02	(mg/kg-day)	1E-05
			Total Ingestion									2E-05					2E-01
			Dermal	57-12-5	Cyanide	0.7911737	mg/kg	NA	(mg/kg-day)	NA	1/(mg/kg-day)	NA	NA	(mg/kg-day)	6.0E-04	(mg/kg-day)	NA
				16984-48-8	Fluoride	534.46734	mg/kg	NA	(mg/kg-day)	NA	1/(mg/kg-day)	NA	NA	(mg/kg-day)	4.0E-02	(mg/kg-day)	NA
				7440-47-3_EST	Chromium, Hexavalent - Estimated	0.7686064	mg/kg	NA	(mg/kg-day)	1.3E-02	1/(mg/kg-day)	NA	NA	(mg/kg-day)	7.5E-05	(mg/kg-day)	NA
				7429-90-5	Aluminum	26835.07	mg/kg	NA	(mg/kg-day)	NA	1/(mg/kg-day)	NA	NA	(mg/kg-day)	1.0E+00	(mg/kg-day)	NA
				7440-36-0	Antimony	3.230217	mg/kg	NA	(mg/kg-day)	NA	1/(mg/kg-day)	NA	NA	(mg/kg-day)	6.0E-05	(mg/kg-day)	NA
				7440-38-2	Arsenic	13.63231	mg/kg	4.0E-07	(mg/kg-day)	1.5E+00	1/(mg/kg-day)	6E-07	1.1E-06	(mg/kg-day)	3.0E-04	(mg/kg-day)	4E-03
				7440-48-4	Cobalt	8.4342999	mg/kg	NA	(mg/kg-day)	NA	1/(mg/kg-day)	NA	NA	(mg/kg-day)	3.0E-04	(mg/kg-day)	NA
				7440-50-8	Copper	274.29521	mg/kg	NA	(mg/kg-day)	NA	1/(mg/kg-day)	NA	NA	(mg/kg-day)	4.0E-02	(mg/kg-day)	NA
				7439-89-6	Iron	29941.156	mg/kg	NA	(mg/kg-day)	NA	1/(mg/kg-day)	NA	NA	(mg/kg-day)	7.0E-01	(mg/kg-day)	NA
				7439-96-5	Manganese	622.53615	mg/kg	NA	(mg/kg-day)	NA	1/(mg/kg-day)	NA	NA	(mg/kg-day)	9.6E-04	(mg/kg-day)	NA
				7439-97-6	Mercury	0.039584	mg/kg	NA	(mg/kg-day)	NA	1/(mg/kg-day)	NA	NA	(mg/kg-day)	NA	(mg/kg-day)	NA
				7440-02-0	Nickel	45.709272	mg/kg	NA	(mg/kg-day)	NA	1/(mg/kg-day)	NA	NA	(mg/kg-day)	8.0E-04	(mg/kg-day)	NA
				7782-49-2	Selenium	2.0769148	mg/kg	NA	(mg/kg-day)	NA	1/(mg/kg-day)	NA	NA	(mg/kg-day)	5.0E-03	(mg/kg-day)	NA
				7440-28-0	Thallium	0.169845	mg/kg	NA	(mg/kg-day)	NA	1/(mg/kg-day)	NA	NA	(mg/kg-day)	1.0E-05	(mg/kg-day)	NA
				7440-62-2	Vanadium	26.75556	mg/kg	NA	(mg/kg-day)	NA	1/(mg/kg-day)	NA	NA	(mg/kg-day)	1.3E-04	(mg/kg-day)	NA
				56-55-3	Benzo(A)Anthracene	32.192562	mg/kg	4.1E-06	(mg/kg-day)	1.0E-01	1/(mg/kg-day)	4E-07	1.1E-05	(mg/kg-day)	NA	(mg/kg-day)	NA
				50-32-8	Benzo(A)Pyrene	37.293364	mg/kg	4.7E-06	(mg/kg-day)	1.0E+00	1/(mg/kg-day)	5E-06	1.3E-05	(mg/kg-day)	3.0E-04	(mg/kg-day)	4E-02
				205-99-2	Benzo(B)Fluoranthene	42.149762	mg/kg	5.3E-06	(mg/kg-day)	1.0E-01	1/(mg/kg-day)	5E-07	1.5E-05	(mg/kg-day)	NA	(mg/kg-day)	NA
				207-08-9	Benzo(K)Fluoranthene	15.780315	mg/kg	2.0E-06	(mg/kg-day)	1.0E-02	1/(mg/kg-day)	2E-08	5.6E-06	(mg/kg-day)	NA	(mg/kg-day)	NA
				218-01-9	Chrysene	34.494904	mg/kg	4.3E-06	(mg/kg-day)	1.0E-03	1/(mg/kg-day)	4E-09	1.2E-05	(mg/kg-day)	NA	(mg/kg-day)	NA
				53-70-3	Dibenz(A,H)Anthracene	9.0286291	mg/kg	1.1E-06	(mg/kg-day)	1.0E+00	1/(mg/kg-day)	1E-06	3.2E-06	(mg/kg-day)	NA	(mg/kg-day)	NA
				193-39-5	Indeno(1,2,3-C,D)Pyrene	33.567209	mg/kg	4.2E-06	(mg/kg-day)	1.0E-01	1/(mg/kg-day)	4E-07	1.2E-05	(mg/kg-day)	NA	(mg/kg-day)	NA
				91-20-3	Naphthalene	0.4677863	mg/kg	5.9E-08	(mg/kg-day)	NA	1/(mg/kg-day)	NA	1.6E-07	(mg/kg-day)	2.0E-02	(mg/kg-day)	8E-06
			Total Dermal									8E-06					5E-02
		Total Soil Direct Contact										2E-05					3E-01

Table I-3
Calculation of Chemical Cancer Risks and Non-Cancer Hazards
(Main Plant Area - ISM - Industrial Worker - Future)
Reasonable Maximum Exposure
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Scenario Timeframe:	Future
Receptor Population:	Industrial Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure point	Exposure route	Cas Number	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
								Intake/Exposure Concentration		CSF/Unit Risk		Cancer	Intake/Exposure Concentration		RfD/RfC		Hazard
						Value	Units	Value	Units	Value	Units	Risk	Value	Units	Value	Units	Quotient
	Air	Airborne vapors /dust	Inhalation	57-12-5	Cyanide	0.7911737	mg/kg	9.1E-04	(µg/m3)	NA	1/(µg/m3)	NA	9.1E-04	mg/m3	8.0E-04	mg/m3	1E+00
				16984-48-8	Fluoride	534.46734	mg/kg	2.4E-05	(µg/m3)	NA	1/(µg/m3)	NA	2.4E-05	mg/m3	1.3E-02	mg/m3	2E-03
				7440-47-3_EST	Chromium, Hexavalent - Estimated	0.7686064	mg/kg	3.4E-08	(µg/m3)	8.4E-02	1/(µg/m3)	3E-09	3.4E-08	mg/m3	1.0E-04	mg/m3	3E-04
				7429-90-5	Aluminum	26835.07	mg/kg	1.2E-03	(µg/m3)	NA	1/(µg/m3)	NA	1.2E-03	mg/m3	5.0E-03	mg/m3	2E-01
				7440-36-0	Antimony	3.230217	mg/kg	1.4E-07	(µg/m3)	NA	1/(µg/m3)	NA	1.4E-07	mg/m3	NA	mg/m4	NA
				7440-38-2	Arsenic	13.63231	mg/kg	6.1E-07	(µg/m3)	4.3E-03	1/(µg/m3)	3E-09	6.1E-07	mg/m3	1.5E-05	mg/m5	4E-02
				7440-48-4	Cobalt	8.4342999	mg/kg	3.8E-07	(µg/m3)	9.0E-03	1/(µg/m3)	3E-09	3.8E-07	mg/m3	6.0E-06	mg/m6	6E-02
				7440-50-8	Copper	274.29521	mg/kg	1.2E-05	(µg/m3)	NA	1/(µg/m3)	NA	1.2E-05	mg/m3	NA	mg/m7	NA
				7439-89-6	Iron	29941.156	mg/kg	1.3E-03	(µg/m3)	NA	1/(µg/m3)	NA	1.3E-03	mg/m3	NA	mg/m8	NA
				7439-96-5	Manganese	622.53615	mg/kg	2.8E-05	(µg/m3)	NA	1/(µg/m3)	NA	2.8E-05	mg/m3	5.0E-05	mg/m9	6E-01
				7439-97-6	Mercury	0.039584	mg/kg	7.0E-05	(µg/m3)	NA	1/(µg/m3)	NA	7.0E-05	mg/m3	3.0E-04	mg/m10	2E-01
				7440-02-0	Nickel	45.709272	mg/kg	2.0E-06	(µg/m3)	2.6E-04	1/(µg/m3)	5E-10	2.0E-06	mg/m3	9.0E-05	mg/m11	2E-02
				7782-49-2	Selenium	2.0769148	mg/kg	9.3E-08	(µg/m3)	NA	1/(µg/m3)	NA	9.3E-08	mg/m3	2.0E-02	mg/m12	5E-06
				7440-28-0	Thallium	0.169845	mg/kg	7.6E-09	(µg/m3)	NA	1/(µg/m3)	NA	7.6E-09	mg/m3	NA	mg/m13	NA
				7440-62-2	Vanadium	26.75556	mg/kg	1.2E-06	(µg/m3)	NA	1/(µg/m3)	NA	1.2E-06	mg/m3	1.0E-04	mg/m14	1E-02
				56-55-3	Benzo(A)Anthracene	32.192562	mg/kg	4.5E-04	(µg/m3)	6.0E-05	1/(µg/m3)	3E-08	4.5E-04	mg/m3	NA	mg/m15	NA
				50-32-8	Benzo(A)Pyrene	37.293364	mg/kg	1.7E-06	(µg/m3)	6.0E-04	1/(µg/m3)	1E-09	1.7E-06	mg/m3	2.0E-06	mg/m16	8E-01
				205-99-2	Benzo(B)Fluoranthene	42.149762	mg/kg	1.9E-06	(µg/m3)	6.0E-05	1/(µg/m3)	1E-10	1.9E-06	mg/m3	NA	mg/m17	NA
				207-08-9	Benzo(K)Fluoranthene	15.780315	mg/kg	7.1E-07	(µg/m3)	6.0E-06	1/(µg/m3)	4E-12	7.1E-07	mg/m4	NA	mg/m18	NA
				218-01-9	Chrysene	34.494904	mg/kg	1.5E-06	(µg/m3)	6.0E-07	1/(µg/m3)	9E-13	1.5E-06	mg/m3	NA	mg/m19	NA
				53-70-3	Dibenz(A,H)Anthracene	9.0286291	mg/kg	4.0E-07	(µg/m3)	6.0E-04	1/(µg/m3)	2E-10	4.0E-07	mg/m3	NA	mg/m20	NA
				193-39-5	Indeno(1,2,3-C,D)Pyrene	33.567209	mg/kg	1.5E-06	(µg/m3)	6.0E-05	1/(µg/m3)	9E-11	1.5E-06	mg/m3	NA	mg/m21	NA
				91-20-3	Naphthalene	0.4677863	mg/kg	6.2E-04	(µg/m3)	3.4E-05	1/(µg/m3)	2E-08	6.2E-04	mg/m3	3.0E-03	mg/m22	2E-01
			Total Inhalation									6E-08					3E+00
		Total Dust Inhalation										6E-08					3E+00
	Total Soil Direct Contact and Dust Inhalation											2E-05					4E+00
Medium Total												2E-05					4E+00
												Total of Receptor Risks Across All Media 2E-05					Total of Receptor Hazards Across All Media 4E+00

Table I-4
Summary of Receptor Risks and Hazards for COPCs
(Main Plant Area - ISM - Industrial Worker - Future)
Reasonable Maximum Exposure
Columbia Falls Aluminum Facility

Scenario Timeframe:	Future
Receptor Population:	Industrial Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Cas Number	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
					Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Surface Soil	57-12-5	Cyanide	NA	NA	NA	NA	Testes (RfDo)	8E-04	NA	NA	8E-04
Main Plant Area		0-2 ft bgs	16984-48-8	Fluoride	NA	NA	NA	NA	NA (RfDo)	9E-03	NA	NA	9E-03
ISM Dus			7440-47-3_EST	Chromium, Hexavalent - Estimated	9E-08	NA	NA	9E-08	NA (RfDo)	2E-04	NA	NA	2E-04
			7429-90-5	Aluminum	NA	NA	NA	NA	Neurological (RfDo)	2E-02	NA	NA	2E-02
			7440-36-0	Antimony	NA	NA	NA	NA	hematologic (longevity, blood glucose, and cholesterol) (RfDo)	5E-03	NA	NA	5E-03
			7440-38-2	Arsenic	***3E-06***	NA	6E-07	***3E-06***	Skin and blood (RfDo)	2E-02	NA	4E-03	2E-02
			7440-48-4	Cobalt	NA	NA	NA	NA	Thyroid (RfDo)	2E-02	NA	NA	2E-02
			7440-50-8	Copper	NA	NA	NA	NA	Gastrointestinal system (RfDo)	4E-03	NA	NA	4E-03
			7439-89-6	Iron	NA	NA	NA	NA	GI Ttract (RfDo)	3E-02	NA	NA	3E-02
			7439-96-5	Manganese	NA	NA	NA	NA	Nervous (RfDo)	2E-02	NA	NA	2E-02
			7439-97-6	Mercury	NA	NA	NA	NA	NA (RfDo)	NA	NA	NA	NA
			7440-02-0	Nickel	NA	NA	NA	NA	Body weight (RfDo)	1E-03	NA	NA	1E-03
			7782-49-2	Selenium	NA	NA	NA	NA	nervous, hematologic, dermal (RfDo)	3E-04	NA	NA	3E-04
			7440-28-0	Thallium	NA	NA	NA	NA	Skin (RfDo)	1E-02	NA	NA	1E-02
			7440-62-2	Vanadium	NA	NA	NA	NA	Dermal (RfDo)	3E-03	NA	NA	3E-03
			56-55-3	Benzo(A)Anthracene	7E-07	NA	4E-07	1E-06	NA (RfDo)	NA	NA	NA	NA
			50-32-8	Benzo(A)Pyrene	***9E-06***	NA	***5E-06***	***1E-05***	Developmental (RfDo)	8E-02	NA	4E-02	1E-01
			205-99-2	Benzo(B)Fluoranthene	1E-06	NA	5E-07	1E-06	NA (RfDo)	NA	NA	NA	NA
			207-08-9	Benzo(K)Fluoranthene	4E-08	NA	2E-08	6E-08	NA (RfDo)	NA	NA	NA	NA
			218-01-9	Chrysene	8E-09	NA	4E-09	1E-08	NA (RfDo)	NA	NA	NA	NA
			53-70-3	Dibenz(A,H)Anthracene	***2E-06***	NA	1E-06	***3E-06***	NA (RfDo)	NA	NA	NA	NA
			193-39-5	Indeno(1,2,3-C,D)Pyrene	8E-07	NA	4E-07	1E-06	NA (RfDo)	NA	NA	NA	NA
			91-20-3	Naphthalene	NA	NA	NA	NA	Body weight (RfDo)	1E-05	NA	8E-06	2E-05
				Chemical Total	***2E-05***	NA	***8E-06***	***2E-05***		2E-01	NA	5E-02	3E-01
		Exposure Point Total						***2E-05***					3E-01
	Exposure Medium Total							***2E-05***					3E-01
	Air	Airborne	57-12-5	Cyanide	NA	NA	NA	NA	Thyroid (RfC)	NA	1E+00	NA	1E+00
		vapors	16984-48-8	Fluoride	NA	NA	NA	NA	NA (RfC)	NA	2E-03	NA	2E-03
		/dust	7440-47-3_EST	Chromium, Hexavalent - Estimated	NA	3E-09	NA	3E-09	Lungs (RfC)	NA	3E-04	NA	3E-04
			7429-90-5	Aluminum	NA	NA	NA	NA	Neurological (RfC)	NA	2E-01	NA	2E-01
			7440-36-0	Antimony	NA	NA	NA	NA	NA (RfC)	NA	NA	NA	NA
			7440-38-2	Arsenic	NA	3E-09	NA	3E-09	cardiovascular, nervous, and skin (RfC)	NA	4E-02	NA	4E-02
			7440-48-4	Cobalt	NA	3E-09	NA	3E-09	Respiratory Tract; Lung (RfC)	NA	6E-02	NA	6E-02
			7440-50-8	Copper	NA	NA	NA	NA	NA (RfC)	NA	NA	NA	NA
			7439-89-6	Iron	NA	NA	NA	NA	NA (RfC)	NA	NA	NA	NA
			7439-96-5	Manganese	NA	NA	NA	NA	Nervous (RfC)	NA	6E-01	NA	6E-01
			7439-97-6	Mercury	NA	NA	NA	NA	Nervous (RfC)	NA	2E-01	NA	2E-01
			7440-02-0	Nickel	NA	5E-10	NA	5E-10	Resp. (RfC)	NA	2E-02	NA	2E-02
			7782-49-2	Selenium	NA	NA	NA	NA	NA (RfC)	NA	5E-06	NA	5E-06
			7440-28-0	Thallium	NA	NA	NA	NA	NA (RfC)	NA	NA	NA	NA
			7440-62-2	Vanadium	NA	NA	NA	NA	Resp. (RfC)	NA	1E-02	NA	1E-02
			56-55-3	Benzo(A)Anthracene	NA	3E-08	NA	3E-08	NA (RfC)	NA	NA	NA	NA
			50-32-8	Benzo(A)Pyrene	NA	1E-09	NA	1E-09	Developmental (RfC)	NA	8E-01	NA	8E-01
			205-99-2	Benzo(B)Fluoranthene	NA	1E-10	NA	1E-10	NA (RfC)	NA	NA	NA	NA
			207-08-9	Benzo(K)Fluoranthene	NA	4E-12	NA	4E-12	NA (RfC)	NA	NA	NA	NA
			218-01-9	Chrysene	NA	9E-13	NA	9E-13	NA (RfC)	NA	NA	NA	NA

Table I-4
Summary of Receptor Risks and Hazards for COPCs
(Main Plant Area - ISM - Industrial Worker - Future)
Reasonable Maximum Exposure
Columbia Falls Aluminum Facility

Scenario Timeframe:	Future
Receptor Population:	Industrial Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Cas Number	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
					Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
	Air	Airborne vapors /dust	53-70-3	Dibenz(A,H)Anthracene	NA	2E-10	NA	2E-10	NA (RfC)	NA	NA	NA	NA
			193-39-5	Indeno(1,2,3-C,D)Pyrene	NA	9E-11	NA	9E-11	NA (RfC)	NA	NA	NA	NA
			91-20-3	Naphthalene	NA	2E-08	NA	2E-08	Nervous, Respiratory (RfC)	NA	2E-01	NA	2E-01
				Chemical Total	NA	6E-08	NA	6E-08		NA	***3E+00***	NA	***3E+00***
		Exposure Point Total						6E-08					***3E+00***
	Exposure Medium Total							6E-08					***3E+00***
Medium Total								***2E-05***					***4E+00***
Receptor Total							Receptor Risk Total	***2E-05***				Receptor HI Total	***4E+00***

Blood/Cardiovascular/Hematologic	6E-02
Body weight	1E-03
Dermal/Skin	8E-02
Developmental	1E+00
Gastrointestinal	3E-02
Lungs/Respiratory	3E-01
Nervous	1E+00
Neurological	2E-01
Testes	8E-04
Thyroid	1E+00

Table I-5
Calculation of Chemical Cancer Risks and Non-Cancer Hazards
(Main Plant Area - ISM - Construction Worker - Future)
Reasonable Maximum Exposure
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Scenario Timeframe:	Future
Receptor Population:	Construction
Receptor Age:	Adult

Medium	Exposure Medium	Exposure point	Exposure route	Cas Number	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
								Intake/Exposure Concentration		CSF/Unit Risk		Cancer	Intake/Exposure Concentration		RfD/RfC		Hazard
						Value	Units	Value	Units	Value	Units	Risk	Value	Units	Value	Units	Quotient
Soil	Soil	Surface soil 0-2 ft-bgs	Ingestion	57-12-5	Cyanide	0.7911737	mg/kg	1.6E-08	(mg/kg-day)	NA	1/(mg/kg-day)	NA	1.1E-06	(mg/kg-day)	6.0E-04	(mg/kg-day)	2E-03
				16984-48-8	Fluoride	534.46734	mg/kg	1.1E-05	(mg/kg-day)	NA	1/(mg/kg-day)	NA	7.5E-04	(mg/kg-day)	4.0E-02	(mg/kg-day)	2E-02
				7440-47-3_EST	Chromium, Hexavalent - Estimated	0.7686064	mg/kg	1.5E-08	(mg/kg-day)	5.0E-01	1/(mg/kg-day)	8E-09	1.1E-06	(mg/kg-day)	3.0E-03	(mg/kg-day)	4E-04
				7429-90-5	Aluminum	26835.07	mg/kg	5.4E-04	(mg/kg-day)	NA	1/(mg/kg-day)	NA	3.8E-02	(mg/kg-day)	1.0E+00	(mg/kg-day)	4E-02
				7440-36-0	Antimony	3.230217	mg/kg	6.5E-08	(mg/kg-day)	NA	1/(mg/kg-day)	NA	4.5E-06	(mg/kg-day)	4.0E-04	(mg/kg-day)	1E-02
				7440-38-2	Arsenic	13.63231	mg/kg	1.6E-07	(mg/kg-day)	1.5E+00	1/(mg/kg-day)	2E-07	1.1E-05	(mg/kg-day)	3.0E-04	(mg/kg-day)	4E-02
				7440-48-4	Cobalt	8.4342999	mg/kg	1.7E-07	(mg/kg-day)	NA	1/(mg/kg-day)	NA	1.2E-05	(mg/kg-day)	3.0E-04	(mg/kg-day)	4E-02
				7440-50-8	Copper	274.29521	mg/kg	5.5E-06	(mg/kg-day)	NA	1/(mg/kg-day)	NA	3.8E-04	(mg/kg-day)	4.0E-02	(mg/kg-day)	1E-02
				7439-89-6	Iron	29941.156	mg/kg	6.0E-04	(mg/kg-day)	NA	1/(mg/kg-day)	NA	4.2E-02	(mg/kg-day)	7.0E-01	(mg/kg-day)	6E-02
				7439-96-5	Manganese	622.53615	mg/kg	1.2E-05	(mg/kg-day)	NA	1/(mg/kg-day)	NA	8.7E-04	(mg/kg-day)	2.4E-02	(mg/kg-day)	4E-02
				7439-97-6	Mercury	0.039584	mg/kg	7.9E-10	(mg/kg-day)	NA	1/(mg/kg-day)	NA	5.5E-08	(mg/kg-day)	NA	(mg/kg-day)	NA
				7440-02-0	Nickel	45.709272	mg/kg	9.2E-07	(mg/kg-day)	NA	1/(mg/kg-day)	NA	6.4E-05	(mg/kg-day)	2.0E-02	(mg/kg-day)	3E-03
				7782-49-2	Selenium	2.0769148	mg/kg	4.2E-08	(mg/kg-day)	NA	1/(mg/kg-day)	NA	2.9E-06	(mg/kg-day)	5.0E-03	(mg/kg-day)	6E-04
				7440-28-0	Thallium	0.169845	mg/kg	3.4E-09	(mg/kg-day)	NA	1/(mg/kg-day)	NA	2.4E-07	(mg/kg-day)	1.0E-05	(mg/kg-day)	2E-02
				7440-62-2	Vanadium	26.75556	mg/kg	5.4E-07	(mg/kg-day)	NA	1/(mg/kg-day)	NA	3.7E-05	(mg/kg-day)	5.0E-03	(mg/kg-day)	7E-03
				56-55-3	Benzo(A)Anthracene	32.192562	mg/kg	6.4E-07	(mg/kg-day)	1.0E-01	1/(mg/kg-day)	6E-08	4.5E-05	(mg/kg-day)	NA	(mg/kg-day)	NA
				50-32-8	Benzo(A)Pyrene	37.293364	mg/kg	7.5E-07	(mg/kg-day)	1.0E+00	1/(mg/kg-day)	7E-07	5.2E-05	(mg/kg-day)	3.0E-04	(mg/kg-day)	2E-01
				205-99-2	Benzo(B)Fluoranthene	42.149762	mg/kg	8.4E-07	(mg/kg-day)	1.0E-01	1/(mg/kg-day)	8E-08	5.9E-05	(mg/kg-day)	NA	(mg/kg-day)	NA
				207-08-9	Benzo(K)Fluoranthene	15.780315	mg/kg	3.2E-07	(mg/kg-day)	1.0E-02	1/(mg/kg-day)	3E-09	2.2E-05	(mg/kg-day)	NA	(mg/kg-day)	NA
				218-01-9	Chrysene	34.494904	mg/kg	6.9E-07	(mg/kg-day)	1.0E-03	1/(mg/kg-day)	7E-10	4.8E-05	(mg/kg-day)	NA	(mg/kg-day)	NA
				53-70-3	Dibenz(A,H)Anthracene	9.0286291	mg/kg	1.8E-07	(mg/kg-day)	1.0E+00	1/(mg/kg-day)	2E-07	1.3E-05	(mg/kg-day)	NA	(mg/kg-day)	NA
				193-39-5	Indeno(1,2,3-C,D)Pyrene	33.567209	mg/kg	6.7E-07	(mg/kg-day)	1.0E-01	1/(mg/kg-day)	7E-08	4.7E-05	(mg/kg-day)	NA	(mg/kg-day)	NA
				91-20-3	Naphthalene	0.4677863	mg/kg	9.4E-09	(mg/kg-day)	NA	1/(mg/kg-day)	NA	6.6E-07	(mg/kg-day)	2.0E-02	(mg/kg-day)	3E-05
			Total Ingestion									1E-06					5E-01
			Dermal	57-12-5	Cyanide	0.7911737	mg/kg	NA	(mg/kg-day)	NA	1/(mg/kg-day)	NA	NA	(mg/kg-day)	6.0E-04	(mg/kg-day)	NA
				16984-48-8	Fluoride	534.46734	mg/kg	NA	(mg/kg-day)	NA	1/(mg/kg-day)	NA	NA	(mg/kg-day)	4.0E-02	(mg/kg-day)	NA
				7440-47-3_EST	Chromium, Hexavalent - Estimated	0.7686064	mg/kg	NA	(mg/kg-day)	1.3E-02	1/(mg/kg-day)	NA	NA	(mg/kg-day)	7.5E-05	(mg/kg-day)	NA
				7429-90-5	Aluminum	26835.07	mg/kg	NA	(mg/kg-day)	NA	1/(mg/kg-day)	NA	NA	(mg/kg-day)	1.0E+00	(mg/kg-day)	NA
				7440-36-0	Antimony	3.230217	mg/kg	NA	(mg/kg-day)	NA	1/(mg/kg-day)	NA	NA	(mg/kg-day)	6.0E-05	(mg/kg-day)	NA
				7440-38-2	Arsenic	13.63231	mg/kg	2.6E-08	(mg/kg-day)	1.5E+00	1/(mg/kg-day)	4E-08	1.8E-06	(mg/kg-day)	3.0E-04	(mg/kg-day)	6E-03
				7440-48-4	Cobalt	8.4342999	mg/kg	NA	(mg/kg-day)	NA	1/(mg/kg-day)	NA	NA	(mg/kg-day)	3.0E-04	(mg/kg-day)	NA
				7440-50-8	Copper	274.29521	mg/kg	NA	(mg/kg-day)	NA	1/(mg/kg-day)	NA	NA	(mg/kg-day)	4.0E-02	(mg/kg-day)	NA
				7439-89-6	Iron	29941.156	mg/kg	NA	(mg/kg-day)	NA	1/(mg/kg-day)	NA	NA	(mg/kg-day)	7.0E-01	(mg/kg-day)	NA
				7439-96-5	Manganese	622.53615	mg/kg	NA	(mg/kg-day)	NA	1/(mg/kg-day)	NA	NA	(mg/kg-day)	9.6E-04	(mg/kg-day)	NA
				7439-97-6	Mercury	0.039584	mg/kg	NA	(mg/kg-day)	NA	1/(mg/kg-day)	NA	NA	(mg/kg-day)	NA	(mg/kg-day)	NA
				7440-02-0	Nickel	45.709272	mg/kg	NA	(mg/kg-day)	NA	1/(mg/kg-day)	NA	NA	(mg/kg-day)	8.0E-04	(mg/kg-day)	NA
				7782-49-2	Selenium	2.0769148	mg/kg	NA	(mg/kg-day)	NA	1/(mg/kg-day)	NA	NA	(mg/kg-day)	5.0E-03	(mg/kg-day)	NA
				7440-28-0	Thallium	0.169845	mg/kg	NA	(mg/kg-day)	NA	1/(mg/kg-day)	NA	NA	(mg/kg-day)	1.0E-05	(mg/kg-day)	NA
				7440-62-2	Vanadium	26.75556	mg/kg	NA	(mg/kg-day)	NA	1/(mg/kg-day)	NA	NA	(mg/kg-day)	1.3E-04	(mg/kg-day)	NA
				56-55-3	Benzo(A)Anthracene	32.192562	mg/kg	2.7E-07	(mg/kg-day)	1.0E-01	1/(mg/kg-day)	3E-08	1.9E-05	(mg/kg-day)	NA	(mg/kg-day)	NA
				50-32-8	Benzo(A)Pyrene	37.293364	mg/kg	3.1E-07	(mg/kg-day)	1.0E+00	1/(mg/kg-day)	3E-07	2.2E-05	(mg/kg-day)	3.0E-04	(mg/kg-day)	7E-02
				205-99-2	Benzo(B)Fluoranthene	42.149762	mg/kg	3.5E-07	(mg/kg-day)	1.0E-01	1/(mg/kg-day)	4E-08	2.5E-05	(mg/kg-day)	NA	(mg/kg-day)	NA
				207-08-9	Benzo(K)Fluoranthene	15.780315	mg/kg	1.3E-07	(mg/kg-day)	1.0E-02	1/(mg/kg-day)	1E-09	9.2E-06	(mg/kg-day)	NA	(mg/kg-day)	NA
				218-01-9	Chrysene	34.494904	mg/kg	2.9E-07	(mg/kg-day)	1.0E-03	1/(mg/kg-day)	3E-10	2.0E-05	(mg/kg-day)	NA	(mg/kg-day)	NA
				53-70-3	Dibenz(A,H)Anthracene	9.0286291	mg/kg	7.5E-08	(mg/kg-day)	1.0E+00	1/(mg/kg-day)	8E-08	5.3E-06	(mg/kg-day)	NA	(mg/kg-day)	NA
				193-39-5	Indeno(1,2,3-C,D)Pyrene	33.567209	mg/kg	2.8E-07	(mg/kg-day)	1.0E-01	1/(mg/kg-day)	3E-08	2.0E-05	(mg/kg-day)	NA	(mg/kg-day)	NA
				91-20-3	Naphthalene	0.4677863	mg/kg	3.9E-09	(mg/kg-day)	NA	1/(mg/kg-day)	NA	2.7E-07	(mg/kg-day)	2.0E-02	(mg/kg-day)	1E-05
			Total Dermal									5E-07					8E-02
		Total Soil Direct Contact										2E-06					5E-01

Table I-5
Calculation of Chemical Cancer Risks and Non-Cancer Hazards
(Main Plant Area - ISM - Construction Worker - Future)
Reasonable Maximum Exposure
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Scenario Timeframe:	Future
Receptor Population:	Construction
Receptor Age:	Adult

Medium	Exposure Medium	Exposure point	Exposure route	Cas Number	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
								Intake/Exposure Concentration		CSF/Unit Risk		Cancer	Intake/Exposure Concentration		RfD/RfC		Hazard
						Value	Units	Value	Units	Value	Units	Risk	Value	Units	Value	Units	Quotient
	Air	Airborne vapors /dust	Inhalation	57-12-5	Cyanide	0.7911737	mg/kg	2.5E-05	(µg/m3)	NA	1/(µg/m3)	NA	1.7E-06	mg/m3	8.0E-04	mg/m3	2E-03
				16984-48-8	Fluoride	534.46734	mg/kg	6.7E-04	(µg/m3)	NA	1/(µg/m3)	NA	4.7E-05	mg/m3	1.3E-02	mg/m3	4E-03
				7440-47-3_EST	Chromium, Hexavalent - Estimated	0.7686064	mg/kg	9.6E-07	(µg/m3)	8.4E-02	1/(µg/m3)	8E-08	6.7E-08	mg/m3	1.0E-04	mg/m3	7E-04
				7429-90-5	Aluminum	26835.07	mg/kg	3.3E-02	(µg/m3)	NA	1/(µg/m3)	NA	2.3E-03	mg/m3	5.0E-03	mg/m3	5E-01
				7440-36-0	Antimony	3.230217	mg/kg	4.0E-06	(µg/m3)	NA	1/(µg/m3)	NA	2.8E-07	mg/m3	NA	mg/m4	NA
				7440-38-2	Arsenic	13.63231	mg/kg	1.7E-05	(µg/m3)	4.3E-03	1/(µg/m3)	7E-08	1.2E-06	mg/m3	1.5E-05	mg/m5	8E-02
				7440-48-4	Cobalt	8.4342999	mg/kg	1.0E-05	(µg/m3)	9.0E-03	1/(µg/m3)	9E-08	7.3E-07	mg/m3	6.0E-06	mg/m6	1E-01
				7440-50-8	Copper	274.29521	mg/kg	3.4E-04	(µg/m3)	NA	1/(µg/m3)	NA	2.4E-05	mg/m3	NA	mg/m7	NA
				7439-89-6	Iron	29941.156	mg/kg	3.7E-02	(µg/m3)	NA	1/(µg/m3)	NA	2.6E-03	mg/m3	NA	mg/m8	NA
				7439-96-5	Manganese	622.53615	mg/kg	7.7E-04	(µg/m3)	NA	1/(µg/m3)	NA	5.4E-05	mg/m3	5.0E-05	mg/m9	1E+00
				7439-97-6	Mercury	0.039584	mg/kg	1.9E-06	(µg/m3)	NA	1/(µg/m3)	NA	1.3E-07	mg/m3	3.0E-04	mg/m10	4E-04
				7440-02-0	Nickel	45.709272	mg/kg	5.7E-05	(µg/m3)	2.6E-04	1/(µg/m3)	1E-08	4.0E-06	mg/m3	9.0E-05	mg/m11	4E-02
				7782-49-2	Selenium	2.0769148	mg/kg	2.6E-06	(µg/m3)	NA	1/(µg/m3)	NA	1.8E-07	mg/m3	2.0E-02	mg/m12	9E-06
				7440-28-0	Thallium	0.169845	mg/kg	2.1E-07	(µg/m3)	NA	1/(µg/m3)	NA	1.5E-08	mg/m3	NA	mg/m13	NA
				7440-62-2	Vanadium	26.75556	mg/kg	3.3E-05	(µg/m3)	NA	1/(µg/m3)	NA	2.3E-06	mg/m3	1.0E-04	mg/m14	2E-02
				56-55-3	Benzo(A)Anthracene	32.192562	mg/kg	5.2E-05	(µg/m3)	6.0E-05	1/(µg/m3)	3E-09	3.6E-06	mg/m3	NA	mg/m15	NA
				50-32-8	Benzo(A)Pyrene	37.293364	mg/kg	4.6E-05	(µg/m3)	6.0E-04	1/(µg/m3)	3E-08	3.2E-06	mg/m3	2.0E-06	mg/m16	2E+00
				205-99-2	Benzo(B)Fluoranthene	42.149762	mg/kg	5.2E-05	(µg/m3)	6.0E-05	1/(µg/m3)	3E-09	3.7E-06	mg/m3	NA	mg/m17	NA
				207-08-9	Benzo(K)Fluoranthene	15.780315	mg/kg	2.0E-05	(µg/m3)	6.0E-06	1/(µg/m3)	1E-10	1.4E-06	mg/m3	NA	mg/m18	NA
				218-01-9	Chrysene	34.494904	mg/kg	4.3E-05	(µg/m3)	6.0E-07	1/(µg/m3)	3E-11	3.0E-06	mg/m3	NA	mg/m19	NA
				53-70-3	Dibenz(A,H)Anthracene	9.0286291	mg/kg	1.1E-05	(µg/m3)	6.0E-04	1/(µg/m3)	7E-09	7.9E-07	mg/m3	NA	mg/m20	NA
				193-39-5	Indeno(1,2,3-C,D)Pyrene	33.567209	mg/kg	4.2E-05	(µg/m3)	6.0E-05	1/(µg/m3)	3E-09	2.9E-06	mg/m3	NA	mg/m21	NA
				91-20-3	Naphthalene	0.4677863	mg/kg	1.7E-05	(µg/m3)	3.4E-05	1/(µg/m3)	6E-10	1.2E-06	mg/m3	3.0E-03	mg/m22	4E-04
			Total Inhalation									3E-07					3E+00
		Total Dust Inhalation										3E-07					3E+00
	Total Soil Direct Contact and Dust Inhalation											2E-06					4E+00
Medium Total												2E-06					4E+00
												Total of Receptor Risks Across All Media 2E-06				Total of Receptor Hazards Across All Media	4E+00

Table I-6
Summary of Receptor Risks and Hazards for COPCs
(Main Plant Area - ISM - Construction Worker - Future)
Reasonable Maximum Exposure
Columbia Falls Aluminum Facility

Scenario Timeframe:	Future
Receptor Population:	Construction Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Cas Number	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
					Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Surface Soil	57-12-5	Cyanide	NA	NA	NA	NA	Testes (RfDo)	2E-03	NA	NA	2E-03
Main Plant Area		0-2 ft bgs	16984-48-8	Fluoride	NA	NA	NA	NA	NA (RfDo)	2E-02	NA	NA	2E-02
ISM Dus			7440-47-3_EST	Chromium, Hexavalent - Estimated	8E-09	NA	NA	8E-09	NA (RfDo)	4E-04	NA	NA	4E-04
			7429-90-5	Aluminum	NA	NA	NA	NA	Neurological (RfDo)	4E-02	NA	NA	4E-02
			7440-36-0	Antimony	NA	NA	NA	NA	hematologic (longevity, blood glucose, and cholesterol) (RfDo)	1E-02	NA	NA	1E-02
			7440-38-2	Arsenic	2E-07	NA	4E-08	3E-07	Skin and blood (RfDo)	4E-02	NA	6E-03	4E-02
			7440-48-4	Cobalt	NA	NA	NA	NA	Thyroid (RfDo)	4E-02	NA	NA	4E-02
			7440-50-8	Copper	NA	NA	NA	NA	Gastrointestinal system (RfDo)	1E-02	NA	NA	1E-02
			7439-89-6	Iron	NA	NA	NA	NA	GI Ttract (RfDo)	6E-02	NA	NA	6E-02
			7439-96-5	Manganese	NA	NA	NA	NA	Nervous (RfDo)	4E-02	NA	NA	4E-02
			7439-97-6	Mercury	NA	NA	NA	NA	NA (RfDo)	NA	NA	NA	NA
			7440-02-0	Nickel	NA	NA	NA	NA	Body weight (RfDo)	3E-03	NA	NA	3E-03
			7782-49-2	Selenium	NA	NA	NA	NA	nervous, hematologic, dermal (RfDo)	6E-04	NA	NA	6E-04
			7440-28-0	Thallium	NA	NA	NA	NA	Skin (RfDo)	2E-02	NA	NA	2E-02
			7440-62-2	Vanadium	NA	NA	NA	NA	Dermal (RfDo)	7E-03	NA	NA	7E-03
			56-55-3	Benzo(A)Anthracene	6E-08	NA	3E-08	9E-08	NA (RfDo)	NA	NA	NA	NA
			50-32-8	Benzo(A)Pyrene	7E-07	NA	3E-07	1E-06	Developmental (RfDo)	2E-01	NA	7E-02	2E-01
			205-99-2	Benzo(B)Fluoranthene	8E-08	NA	4E-08	1E-07	NA (RfDo)	NA	NA	NA	NA
			207-08-9	Benzo(K)Fluoranthene	3E-09	NA	1E-09	4E-09	NA (RfDo)	NA	NA	NA	NA
			218-01-9	Chrysene	7E-10	NA	3E-10	1E-09	NA (RfDo)	NA	NA	NA	NA
			53-70-3	Dibenz(A,H)Anthracene	2E-07	NA	8E-08	3E-07	NA (RfDo)	NA	NA	NA	NA
			193-39-5	Indeno(1,2,3-C,D)Pyrene	7E-08	NA	3E-08	1E-07	NA (RfDo)	NA	NA	NA	NA
			91-20-3	Naphthalene	NA	NA	NA	NA	Body weight (RfDo)	3E-05	NA	1E-05	5E-05
				Chemical Total	1E-06	NA	5E-07	***2E-06***		5E-01	NA	8E-02	5E-01
		Exposure Point Total						***2E-06***					5E-01
	Exposure Medium Total							***2E-06***					5E-01
	Air	Airborne	57-12-5	Cyanide	NA	NA	NA	NA	Thyroid (RfC)	NA	2E-03	NA	2E-03
		vapors	16984-48-8	Fluoride	NA	NA	NA	NA	NA (RfC)	NA	4E-03	NA	4E-03
		/dust	7440-47-3_EST	Chromium, Hexavalent - Estimated	NA	8E-08	NA	8E-08	Lungs (RfC)	NA	7E-04	NA	7E-04
			7429-90-5	Aluminum	NA	NA	NA	NA	Neurological (RfC)	NA	5E-01	NA	5E-01
			7440-36-0	Antimony	NA	NA	NA	NA	NA (RfC)	NA	NA	NA	NA
			7440-38-2	Arsenic	NA	7E-08	NA	7E-08	cardiovascular, nervous, and skin (RfC)	NA	8E-02	NA	8E-02
			7440-48-4	Cobalt	NA	9E-08	NA	9E-08	Respiratory Tract; Lung (RfC)	NA	1E-01	NA	1E-01
			7440-50-8	Copper	NA	NA	NA	NA	NA (RfC)	NA	NA	NA	NA
			7439-89-6	Iron	NA	NA	NA	NA	NA (RfC)	NA	NA	NA	NA
			7439-96-5	Manganese	NA	NA	NA	NA	Nervous (RfC)	NA	1E+00	NA	1E+00
			7439-97-6	Mercury	NA	NA	NA	NA	Nervous (RfC)	NA	4E-04	NA	4E-04
			7440-02-0	Nickel	NA	1E-08	NA	1E-08	Resp. (RfC)	NA	4E-02	NA	4E-02
			7782-49-2	Selenium	NA	NA	NA	NA	NA (RfC)	NA	9E-06	NA	9E-06
			7440-28-0	Thallium	NA	NA	NA	NA	NA (RfC)	NA	NA	NA	NA
			7440-62-2	Vanadium	NA	NA	NA	NA	Resp. (RfC)	NA	2E-02	NA	2E-02
			56-55-3	Benzo(A)Anthracene	NA	3E-09	NA	3E-09	NA (RfC)	NA	NA	NA	NA
			50-32-8	Benzo(A)Pyrene	NA	3E-08	NA	3E-08	Developmental (RfC)	NA	***2E+00***	NA	***2E+00***
			205-99-2	Benzo(B)Fluoranthene	NA	3E-09	NA	3E-09	NA (RfC)	NA	NA	NA	NA
			207-08-9	Benzo(K)Fluoranthene	NA	1E-10	NA	1E-10	NA (RfC)	NA	NA	NA	NA
			218-01-9	Chrysene	NA	3E-11	NA	3E-11	NA (RfC)	NA	NA	NA	NA
			53-70-3	Dibenz(A,H)Anthracene	NA	7E-09	NA	7E-09	NA (RfC)	NA	NA	NA	NA
			193-39-5	Indeno(1,2,3-C,D)Pyrene	NA	3E-09	NA	3E-09	NA (RfC)	NA	NA	NA	NA
			91-20-3	Naphthalene	NA	6E-10	NA	6E-10	Nervous, Respiratory (RfC)	NA	4E-04	NA	4E-04
				Chemical Total	NA	3E-07	NA	3E-07		NA	***3E+00***	NA	***3E+00***
		Exposure Point Total						3E-07					***3E+00***
	Exposure Medium Total							3E-07					***3E+00***
Medium Total								***2E-06***					***4E+00***
Receptor Total							Receptor Risk Total	***2E-06***				Receptor HI Total	***4E+00***

Table I-7
Calculation of Chemical Cancer Risks and Non-Cancer Hazards
(Main Plant Area - ISM - Trespasser - Future)
Reasonable Maximum Exposure
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Scenario Timeframe:	Future
Receptor Population:	Trespasser
Receptor Age:	Adolescent

Medium	Exposure Medium	Exposure point	Exposure route	Cas Number	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
								Intake/Exposure Concentration		CSF/Unit Risk		Cancer	Intake/Exposure Concentration		RfD/RfC		Hazard
						Value	Units	Value	Units	Value	Units	Risk	Value	Units	Value	Units	Quotient
Soil	Soil	Surface Soil 0-2 ft-bgs	Ingestion	57-12-5	Cyanide	0.7911737	mg/kg	4.9E-09	(mg/kg-day)	NA	1/(mg/kg-day)	NA	3.4E-08	(mg/kg-day)	6.0E-04	(mg/kg-day)	6E-05
				16984-48-8	Fluoride	534.46734	mg/kg	3.3E-06	(mg/kg-day)	NA	1/(mg/kg-day)	NA	2.3E-05	(mg/kg-day)	4.0E-02	(mg/kg-day)	6E-04
				7440-47-3_EST	Chromium, Hexavalent - Estimated	0.7686064	mg/kg	1.4E-08	(mg/kg-day)	5.0E-01	1/(mg/kg-day)	7E-09	3.4E-08	(mg/kg-day)	3.0E-03	(mg/kg-day)	1E-05
				7429-90-5	Aluminum	26835.07	mg/kg	1.7E-04	(mg/kg-day)	NA	1/(mg/kg-day)	NA	1.2E-03	(mg/kg-day)	1.0E+00	(mg/kg-day)	1E-03
				7440-36-0	Antimony	3.230217	mg/kg	2.0E-08	(mg/kg-day)	NA	1/(mg/kg-day)	NA	1.4E-07	(mg/kg-day)	4.0E-04	(mg/kg-day)	4E-04
				7440-38-2	Arsenic	13.63231	mg/kg	5.1E-08	(mg/kg-day)	1.5E+00	1/(mg/kg-day)	8E-08	3.6E-07	(mg/kg-day)	3.0E-04	(mg/kg-day)	1E-03
				7440-48-4	Cobalt	8.4342999	mg/kg	5.3E-08	(mg/kg-day)	NA	1/(mg/kg-day)	NA	3.7E-07	(mg/kg-day)	3.0E-04	(mg/kg-day)	1E-03
				7440-50-8	Copper	274.29521	mg/kg	1.7E-06	(mg/kg-day)	NA	1/(mg/kg-day)	NA	1.2E-05	(mg/kg-day)	4.0E-02	(mg/kg-day)	3E-04
				7439-89-6	Iron	29941.156	mg/kg	1.9E-04	(mg/kg-day)	NA	1/(mg/kg-day)	NA	1.3E-03	(mg/kg-day)	7.0E-01	(mg/kg-day)	2E-03
				7439-96-5	Manganese	622.53615	mg/kg	3.9E-06	(mg/kg-day)	NA	1/(mg/kg-day)	NA	2.7E-05	(mg/kg-day)	2.4E-02	(mg/kg-day)	1E-03
				7439-97-6	Mercury	0.039584	mg/kg	2.5E-10	(mg/kg-day)	NA	1/(mg/kg-day)	NA	1.7E-09	(mg/kg-day)	NA	(mg/kg-day)	NA
				7440-02-0	Nickel	45.709272	mg/kg	2.8E-07	(mg/kg-day)	NA	1/(mg/kg-day)	NA	2.0E-06	(mg/kg-day)	2.0E-02	(mg/kg-day)	1E-04
				7782-49-2	Selenium	2.0769148	mg/kg	1.3E-08	(mg/kg-day)	NA	1/(mg/kg-day)	NA	9.1E-08	(mg/kg-day)	5.0E-03	(mg/kg-day)	2E-05
				7440-28-0	Thallium	0.169845	mg/kg	1.1E-09	(mg/kg-day)	NA	1/(mg/kg-day)	NA	7.4E-09	(mg/kg-day)	1.0E-05	(mg/kg-day)	7E-04
				7440-62-2	Vanadium	26.75556	mg/kg	1.7E-07	(mg/kg-day)	NA	1/(mg/kg-day)	NA	1.2E-06	(mg/kg-day)	5.0E-03	(mg/kg-day)	2E-04
				56-55-3	Benzo(A)Anthracene	32.192562	mg/kg	6.0E-07	(mg/kg-day)	1.0E-01	1/(mg/kg-day)	6E-08	1.4E-06	(mg/kg-day)	NA	(mg/kg-day)	NA
				50-32-8	Benzo(A)Pyrene	37.293364	mg/kg	7.0E-07	(mg/kg-day)	1.0E+00	1/(mg/kg-day)	7E-07	1.6E-06	(mg/kg-day)	3.0E-04	(mg/kg-day)	5E-03
				205-99-2	Benzo(B)Fluoranthene	42.149762	mg/kg	7.9E-07	(mg/kg-day)	1.0E-01	1/(mg/kg-day)	8E-08	1.8E-06	(mg/kg-day)	NA	(mg/kg-day)	NA
				207-08-9	Benzo(K)Fluoranthene	15.780315	mg/kg	2.9E-07	(mg/kg-day)	1.0E-02	1/(mg/kg-day)	3E-09	6.9E-07	(mg/kg-day)	NA	(mg/kg-day)	NA
				218-01-9	Chrysene	34.494904	mg/kg	6.4E-07	(mg/kg-day)	1.0E-03	1/(mg/kg-day)	6E-10	1.5E-06	(mg/kg-day)	NA	(mg/kg-day)	NA
				53-70-3	Dibenz(A,H)Anthracene	9.0286291	mg/kg	1.7E-07	(mg/kg-day)	1.0E+00	1/(mg/kg-day)	2E-07	3.9E-07	(mg/kg-day)	NA	(mg/kg-day)	NA
				193-39-5	Indeno(1,2,3-C,D)Pyrene	33.567209	mg/kg	6.3E-07	(mg/kg-day)	1.0E-01	1/(mg/kg-day)	6E-08	1.5E-06	(mg/kg-day)	NA	(mg/kg-day)	NA
				91-20-3	Naphthalene	0.4677863	mg/kg	2.9E-09	(mg/kg-day)	NA	1/(mg/kg-day)	NA	2.0E-08	(mg/kg-day)	2.0E-02	(mg/kg-day)	1E-06
			Total Ingestion									1E-06					1E-02
			Dermal	57-12-5	Cyanide	0.7911737	mg/kg	NA	(mg/kg-day)	NA	1/(mg/kg-day)	NA	NA	(mg/kg-day)	6.0E-04	(mg/kg-day)	NA
				16984-48-8	Fluoride	534.46734	mg/kg	NA	(mg/kg-day)	NA	1/(mg/kg-day)	NA	NA	(mg/kg-day)	4.0E-02	(mg/kg-day)	NA
				7440-47-3_EST	Chromium, Hexavalent - Estimated	0.7686064	mg/kg	NA	(mg/kg-day)	1.3E-02	1/(mg/kg-day)	NA	NA	(mg/kg-day)	7.5E-05	(mg/kg-day)	NA
				7429-90-5	Aluminum	26835.07	mg/kg	NA	(mg/kg-day)	NA	1/(mg/kg-day)	NA	NA	(mg/kg-day)	1.0E+00	(mg/kg-day)	NA
				7440-36-0	Antimony	3.230217	mg/kg	NA	(mg/kg-day)	NA	1/(mg/kg-day)	NA	NA	(mg/kg-day)	6.0E-05	(mg/kg-day)	NA
				7440-38-2	Arsenic	13.63231	mg/kg	1.1E-08	(mg/kg-day)	1.5E+00	1/(mg/kg-day)	2E-08	7.5E-08	(mg/kg-day)	3.0E-04	(mg/kg-day)	3E-04
				7440-48-4	Cobalt	8.4342999	mg/kg	NA	(mg/kg-day)	NA	1/(mg/kg-day)	NA	NA	(mg/kg-day)	3.0E-04	(mg/kg-day)	NA
				7440-50-8	Copper	274.29521	mg/kg	NA	(mg/kg-day)	NA	1/(mg/kg-day)	NA	NA	(mg/kg-day)	4.0E-02	(mg/kg-day)	NA
				7439-89-6	Iron	29941.156	mg/kg	NA	(mg/kg-day)	NA	1/(mg/kg-day)	NA	NA	(mg/kg-day)	7.0E-01	(mg/kg-day)	NA
				7439-96-5	Manganese	622.53615	mg/kg	NA	(mg/kg-day)	NA	1/(mg/kg-day)	NA	NA	(mg/kg-day)	9.6E-04	(mg/kg-day)	NA
				7439-97-6	Mercury	0.039584	mg/kg	NA	(mg/kg-day)	NA	1/(mg/kg-day)	NA	NA	(mg/kg-day)	NA	(mg/kg-day)	NA
				7440-02-0	Nickel	45.709272	mg/kg	NA	(mg/kg-day)	NA	1/(mg/kg-day)	NA	NA	(mg/kg-day)	8.0E-04	(mg/kg-day)	NA
				7782-49-2	Selenium	2.0769148	mg/kg	NA	(mg/kg-day)	NA	1/(mg/kg-day)	NA	NA	(mg/kg-day)	5.0E-03	(mg/kg-day)	NA
				7440-28-0	Thallium	0.169845	mg/kg	NA	(mg/kg-day)	NA	1/(mg/kg-day)	NA	NA	(mg/kg-day)	1.0E-05	(mg/kg-day)	NA
				7440-62-2	Vanadium	26.75556	mg/kg	NA	(mg/kg-day)	NA	1/(mg/kg-day)	NA	NA	(mg/kg-day)	1.3E-04	(mg/kg-day)	NA
				56-55-3	Benzo(A)Anthracene	32.192562	mg/kg	3.3E-07	(mg/kg-day)	1.0E-01	1/(mg/kg-day)	3E-08	7.7E-07	(mg/kg-day)	NA	(mg/kg-day)	NA
				50-32-8	Benzo(A)Pyrene	37.293364	mg/kg	3.8E-07	(mg/kg-day)	1.0E+00	1/(mg/kg-day)	4E-07	8.9E-07	(mg/kg-day)	3.0E-04	(mg/kg-day)	3E-03
				205-99-2	Benzo(B)Fluoranthene	42.149762	mg/kg	4.3E-07	(mg/kg-day)	1.0E-01	1/(mg/kg-day)	4E-08	1.0E-06	(mg/kg-day)	NA	(mg/kg-day)	NA
				207-08-9	Benzo(K)Fluoranthene	15.780315	mg/kg	1.6E-07	(mg/kg-day)	1.0E-02	1/(mg/kg-day)	2E-09	3.8E-07	(mg/kg-day)	NA	(mg/kg-day)	NA
				218-01-9	Chrysene	34.494904	mg/kg	3.5E-07	(mg/kg-day)	1.0E-03	1/(mg/kg-day)	4E-10	8.3E-07	(mg/kg-day)	NA	(mg/kg-day)	NA
				53-70-3	Dibenz(A,H)Anthracene	9.0286291	mg/kg	9.3E-08	(mg/kg-day)	1.0E+00	1/(mg/kg-day)	9E-08	2.2E-07	(mg/kg-day)	NA	(mg/kg-day)	NA
				193-39-5	Indeno(1,2,3-C,D)Pyrene	33.567209	mg/kg	3.4E-07	(mg/kg-day)	1.0E-01	1/(mg/kg-day)	3E-08	8.0E-07	(mg/kg-day)	NA	(mg/kg-day)	NA
				91-20-3	Naphthalene	0.4677863	mg/kg	1.6E-09	(mg/kg-day)	NA	1/(mg/kg-day)	NA	1.1E-08	(mg/kg-day)	2.0E-02	(mg/kg-day)	6E-07
			Total Dermal									6E-07					3E-03
		Total Soil Direct Contact										2E-06					2E-02

Table I-7
Calculation of Chemical Cancer Risks and Non-Cancer Hazards
(Main Plant Area - ISM - Trespasser - Future)
Reasonable Maximum Exposure
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Scenario Timeframe:	Future
Receptor Population:	Trespasser
Receptor Age:	Adolescent

Medium	Exposure Medium	Exposure point	Exposure route	Cas Number	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
								Intake/Exposure Concentration		CSF/Unit Risk		Cancer	Intake/Exposure Concentration		RfD/RfC		Hazard
						Value	Units	Value	Units	Value	Units	Risk	Value	Units	Value	Units	Quotient
	Air	Airborne vapors /dust	Inhalation	57-12-5	Cyanide	0.7911737	mg/kg	1.7E-06	(µg/m3)	NA	1/(µg/m3)	NA	1.2E-08	mg/m3	8.0E-04	mg/m3	1E-05
				16984-48-8	Fluoride	534.46734	mg/kg	4.5E-08	(µg/m3)	NA	1/(µg/m3)	NA	3.1E-10	mg/m3	1.3E-02	mg/m3	2E-08
				7429-90-5	Aluminum	26835.07	mg/kg	2.3E-06	(µg/m3)	NA	1/(µg/m3)	NA	1.6E-08	mg/m3	5.0E-03	mg/m3	3E-06
				7440-36-0	Antimony	3.230217	mg/kg	2.7E-10	(µg/m3)	NA	1/(µg/m3)	NA	1.9E-12	mg/m3	NA	mg/m3	NA
				7440-38-2	Arsenic	13.63231	mg/kg	1.1E-09	(µg/m3)	4.3E-03	1/(µg/m3)	5E-12	8.0E-12	mg/m3	1.5E-05	mg/m4	5E-07
				7440-47-3_EST	Chromium, Hexavalent - Estimated	0.7686064	mg/kg	1.9E-10	(µg/m3)	8.4E-02	1/(µg/m3)	2E-11	4.5E-13	mg/m3	1.0E-04	mg/m5	5E-09
				7440-48-4	Cobalt	8.4342999	mg/kg	7.1E-10	(µg/m3)	9.0E-03	1/(µg/m3)	6E-12	5.0E-12	mg/m3	6.0E-06	mg/m6	8E-07
				7440-50-8	Copper	274.29521	mg/kg	2.3E-08	(µg/m3)	NA	1/(µg/m3)	NA	1.6E-10	mg/m3	NA	mg/m7	NA
				7439-89-6	Iron	29941.156	mg/kg	2.5E-06	(µg/m3)	NA	1/(µg/m3)	NA	1.8E-08	mg/m3	NA	mg/m8	NA
				7439-96-5	Manganese	622.53615	mg/kg	5.2E-08	(µg/m3)	NA	1/(µg/m3)	NA	3.7E-10	mg/m3	5.0E-05	mg/m9	7E-06
				7439-97-6	Mercury	0.039584	mg/kg	1.3E-07	(µg/m3)	NA	1/(µg/m3)	NA	9.1E-10	mg/m3	3.0E-04	mg/m10	3E-06
				7440-02-0	Nickel	45.709272	mg/kg	3.8E-09	(µg/m3)	2.6E-04	1/(µg/m3)	1E-12	2.7E-11	mg/m3	9.0E-05	mg/m11	3E-07
				7782-49-2	Selenium	2.0769148	mg/kg	1.7E-10	(µg/m3)	NA	1/(µg/m3)	NA	1.2E-12	mg/m3	2.0E-02	mg/m12	6E-11
				7440-28-0	Thallium	0.169845	mg/kg	1.4E-11	(µg/m3)	NA	1/(µg/m3)	NA	1.0E-13	mg/m3	NA	mg/m13	NA
				7440-62-2	Vanadium	26.75556	mg/kg	2.2E-09	(µg/m3)	NA	1/(µg/m3)	NA	1.6E-11	mg/m3	1.0E-04	mg/m14	2E-07
				56-55-3	Benzo(A)Anthracene	32.192562	mg/kg	2.5E-06	(µg/m3)	6.0E-05	1/(µg/m3)	2E-10	5.9E-09	mg/m3	NA	mg/m15	NA
				50-32-8	Benzo(A)Pyrene	37.293364	mg/kg	9.4E-09	(µg/m3)	6.0E-04	1/(µg/m3)	6E-12	2.2E-11	mg/m3	2.0E-06	mg/m16	1E-05
				205-99-2	Benzo(B)Fluoranthene	42.149762	mg/kg	1.1E-08	(µg/m3)	6.0E-05	1/(µg/m3)	6E-13	2.5E-11	mg/m3	NA	mg/m17	NA
				207-08-9	Benzo(K)Fluoranthene	15.780315	mg/kg	4.0E-09	(µg/m3)	6.0E-06	1/(µg/m3)	2E-14	9.3E-12	mg/m3	NA	mg/m18	NA
				218-01-9	Chrysene	34.494904	mg/kg	8.7E-09	(µg/m3)	6.0E-07	1/(µg/m3)	5E-15	2.0E-11	mg/m3	NA	mg/m19	NA
				53-70-3	Dibenz(A,H)Anthracene	9.0286291	mg/kg	2.3E-09	(µg/m3)	6.0E-04	1/(µg/m3)	1E-12	5.3E-12	mg/m3	NA	mg/m20	NA
				193-39-5	Indeno(1,2,3-C,D)Pyrene	33.567209	mg/kg	8.5E-09	(µg/m3)	6.0E-05	1/(µg/m3)	5E-13	2.0E-11	mg/m3	NA	mg/m21	NA
				91-20-3	Naphthalene	0.4677863	mg/kg	1.2E-06	(µg/m3)	3.4E-05	1/(µg/m3)	4E-11	8.1E-09	mg/m3	3.0E-03	mg/m22	3E-06
			Total Inhalation									2E-10					4E-05
		Total Dust Inhalation										2E-10					4E-05
	Total Soil Direct Contact and Dust Inhalation											2E-06					2E-02
Medium Total												2E-06					2E-02
												Total of Receptor Risks Across All Media 2E-06					Total of Receptor Hazards Across All Media 2E-02

Table I-8
Summary of Receptor Risks and Hazards for COPCs
(Main Plant Area - Trespasser - Future)
Reasonable Maximum Exposure
Columbia Falls Aluminum Facility

Scenario Timeframe:	Future
Receptor Population:	Trespasser
Receptor Age:	Adolescent

Medium	Exposure Medium	Exposure Point	Cas Number	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
					Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Surface Soil	57-12-5	Cyanide	NA	NA	NA	NA	Testes (RfDo)	6E-05	NA	NA	6E-05
Main Plant Area		0-2 ft bgs	16984-48-8	Fluoride	NA	NA	NA	NA	NA (RfDo)	6E-04	NA	NA	6E-04
ISM Dus			7440-47-3_EST	Chromium, Hexavalent - Estimated	7E-09	NA	NA	7E-09	NA (RfDo)	1E-05	NA	NA	1E-05
			7429-90-5	Aluminum	NA	NA	NA	NA	Neurological (RfDo)	1E-03	NA	NA	1E-03
			7440-36-0	Antimony	NA	NA	NA	NA	hematologic (longevity, blood glucose, and cholesterol) (RfDo)	4E-04	NA	NA	4E-04
			7440-38-2	Arsenic	8E-08	NA	2E-08	9E-08	Skin and blood (RfDo)	1E-03	NA	3E-04	1E-03
			7440-48-4	Cobalt	NA	NA	NA	NA	Thyroid (RfDo)	1E-03	NA	NA	1E-03
			7440-50-8	Copper	NA	NA	NA	NA	Gastrointestinal system (RfDo)	3E-04	NA	NA	3E-04
			7439-89-6	Iron	NA	NA	NA	NA	GI Ttract (RfDo)	2E-03	NA	NA	2E-03
			7439-96-5	Manganese	NA	NA	NA	NA	Nervous (RfDo)	1E-03	NA	NA	1E-03
			7439-97-6	Mercury	NA	NA	NA	NA	NA (RfDo)	NA	NA	NA	NA
			7440-02-0	Nickel	NA	NA	NA	NA	Body weight (RfDo)	1E-04	NA	NA	1E-04
			7782-49-2	Selenium	NA	NA	NA	NA	nervous, hematologic, dermal (RfDo)	2E-05	NA	NA	2E-05
			7440-28-0	Thallium	NA	NA	NA	NA	Skin (RfDo)	7E-04	NA	NA	7E-04
			7440-62-2	Vanadium	NA	NA	NA	NA	Dermal (RfDo)	2E-04	NA	NA	2E-04
			56-55-3	Benzo(A)Anthracene	6E-08	NA	3E-08	9E-08	NA (RfDo)	NA	NA	NA	NA
			50-32-8	Benzo(A)Pyrene	7E-07	NA	4E-07	1E-06	Developmental (RfDo)	5E-03	NA	3E-03	8E-03
			205-99-2	Benzo(B)Fluoranthene	8E-08	NA	4E-08	1E-07	NA (RfDo)	NA	NA	NA	NA
			207-08-9	Benzo(K)Fluoranthene	3E-09	NA	2E-09	5E-09	NA (RfDo)	NA	NA	NA	NA
			218-01-9	Chrysene	6E-10	NA	4E-10	1E-09	NA (RfDo)	NA	NA	NA	NA
			53-70-3	Dibenz(A,H)Anthracene	2E-07	NA	9E-08	3E-07	NA (RfDo)	NA	NA	NA	NA
			193-39-5	Indeno(1,2,3-C,D)Pyrene	6E-08	NA	3E-08	1E-07	NA (RfDo)	NA	NA	NA	NA
			91-20-3	Naphthalene	NA	NA	NA	NA	Body weight (RfDo)	1E-06	NA	6E-07	2E-06
				Chemical Total	1E-06	NA	6E-07	***2E-06***		1E-02	NA	3E-03	2E-02
		Exposure Point Total						***2E-06***					2E-02
Exposure Medium Total								***2E-06***					2E-02
	Air	Airborne	57-12-5	Cyanide	NA	NA	NA	NA	Thyroid (RfC)	NA	1E-05	NA	1E-05
		vapors	16984-48-8	Fluoride	NA	NA	NA	NA	NA (RfC)	NA	2E-08	NA	2E-08
		/dust	7440-47-3_EST	Chromium, Hexavalent - Estimated	NA	NA	NA	NA	Lungs (RfC)	NA	3E-06	NA	3E-06
			7429-90-5	Aluminum	NA	NA	NA	NA	Neurological (RfC)	NA	NA	NA	NA
			7440-36-0	Antimony	NA	5E-12	NA	5E-12	NA (RfC)	NA	5E-07	NA	5E-07
			7440-38-2	Arsenic	NA	2E-11	NA	2E-11	cardiovascular, nervous, and skin (RfC)	NA	5E-09	NA	5E-09
			7440-48-4	Cobalt	NA	6E-12	NA	6E-12	Respiratory Tract; Lung (RfC)	NA	8E-07	NA	8E-07
			7440-50-8	Copper	NA	NA	NA	NA	NA (RfC)	NA	NA	NA	NA
			7439-89-6	Iron	NA	NA	NA	NA	NA (RfC)	NA	NA	NA	NA
			7439-96-5	Manganese	NA	NA	NA	NA	Nervous (RfC)	NA	7E-06	NA	7E-06
			7439-97-6	Mercury	NA	NA	NA	NA	Nervous (RfC)	NA	3E-06	NA	3E-06
			7440-02-0	Nickel	NA	1E-12	NA	1E-12	Resp. (RfC)	NA	3E-07	NA	3E-07
			7782-49-2	Selenium	NA	NA	NA	NA	NA (RfC)	NA	6E-11	NA	6E-11
			7440-28-0	Thallium	NA	NA	NA	NA	NA (RfC)	NA	NA	NA	NA
			7440-62-2	Vanadium	NA	NA	NA	NA	Resp. (RfC)	NA	2E-07	NA	2E-07
			56-55-3	Benzo(A)Anthracene	NA	2E-10	NA	2E-10	NA (RfC)	NA	NA	NA	NA
			50-32-8	Benzo(A)Pyrene	NA	6E-12	NA	6E-12	Developmental (RfC)	NA	1E-05	NA	1E-05
			205-99-2	Benzo(B)Fluoranthene	NA	6E-13	NA	6E-13	NA (RfC)	NA	NA	NA	NA
			207-08-9	Benzo(K)Fluoranthene	NA	2E-14	NA	2E-14	NA (RfC)	NA	NA	NA	NA
			218-01-9	Chrysene	NA	5E-15	NA	5E-15	NA (RfC)	NA	NA	NA	NA
			53-70-3	Dibenz(A,H)Anthracene	NA	1E-12	NA	1E-12	NA (RfC)	NA	NA	NA	NA
			193-39-5	Indeno(1,2,3-C,D)Pyrene	NA	5E-13	NA	5E-13	NA (RfC)	NA	NA	NA	NA
			91-20-3	Naphthalene	NA	4E-11	NA	4E-11	Nervous, Respiratory (RfC)	NA	3E-06	NA	3E-06
				Chemical Total	NA	2E-10	NA	2E-10		NA	4E-05	NA	4E-05
		Exposure Point Total						2E-10					4E-05

Table I-8
Summary of Receptor Risks and Hazards for COPCs
(Main Plant Area - Trespasser - Future)
Reasonable Maximum Exposure
Columbia Falls Aluminum Facility

Scenario Timeframe:	Future
Receptor Population:	Trespasser
Receptor Age:	Adolescent

Medium	Exposure Medium	Exposure Point	Cas Number	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
					Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
	Exposure Medium Total							2E-10					4E-05
Medium Total								***2E-06***					2E-02
Receptor Total							Receptor Risk Total	***2E-06***				Receptor HI Total	2E-02

Table I-9
Calculation of Chemical Cancer Risks and Non-Cancer Hazards
(Central Landfill Area - ISM - Landfill Management Worker - Current/Future)
Reasonable Maximum Exposure
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Scenario Timeframe:	Current/Future
Receptor Population:	Landfill Management Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure point	Exposure route	Cas Number	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
						Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
								Value	Units	Value	Units		Value	Units	Value	Units	
Soil	Soil	Surface soil 0-2 ft-bgs	Ingestion	57-12-5	Cyanide	5.3941748	mg/kg	1.2E-06	(mg/kg-day)	NA	1/(mg/kg-day)	NA	3.5E-06	(mg/kg-day)	6.0E-04	(mg/kg-day)	6E-03
				16984-48-8	Fluoride	484.68199	mg/kg	1.1E-04	(mg/kg-day)	NA	1/(mg/kg-day)	NA	3.1E-04	(mg/kg-day)	4.0E-02	(mg/kg-day)	8E-03
				7440-47-3_EST	Chromium, Hexavalent - Estimated	0.8245674	mg/kg	1.9E-07	(mg/kg-day)	5.0E-01	1/(mg/kg-day)	9E-08	5.3E-07	(mg/kg-day)	3.0E-03	(mg/kg-day)	2E-04
				7429-90-5	Aluminum	25208.599	mg/kg	5.8E-03	(mg/kg-day)	NA	1/(mg/kg-day)	NA	1.6E-02	(mg/kg-day)	1.0E+00	(mg/kg-day)	2E-02
				7440-36-0	Antimony	0.6404657	mg/kg	1.5E-07	(mg/kg-day)	NA	1/(mg/kg-day)	NA	4.1E-07	(mg/kg-day)	4.0E-04	(mg/kg-day)	1E-03
				7440-38-2	Arsenic	7.3398394	mg/kg	1.0E-06	(mg/kg-day)	1.5E+00	1/(mg/kg-day)	2E-06	2.8E-06	(mg/kg-day)	3.0E-04	(mg/kg-day)	9E-03
				7440-48-4	Cobalt	6.7592142	mg/kg	1.5E-06	(mg/kg-day)	NA	1/(mg/kg-day)	NA	4.3E-06	(mg/kg-day)	3.0E-04	(mg/kg-day)	1E-02
				7440-50-8	Copper	108.76106	mg/kg	2.5E-05	(mg/kg-day)	NA	1/(mg/kg-day)	NA	7.0E-05	(mg/kg-day)	4.0E-02	(mg/kg-day)	2E-03
				7439-89-6	Iron	20494.073	mg/kg	4.7E-03	(mg/kg-day)	NA	1/(mg/kg-day)	NA	1.3E-02	(mg/kg-day)	7.0E-01	(mg/kg-day)	2E-02
				7439-96-5	Manganese	557.43143	mg/kg	1.3E-04	(mg/kg-day)	NA	1/(mg/kg-day)	NA	3.6E-04	(mg/kg-day)	2.4E-02	(mg/kg-day)	1E-02
				7439-97-6	Mercury	0.0416381	mg/kg	9.5E-09	(mg/kg-day)	NA	1/(mg/kg-day)	NA	2.7E-08	(mg/kg-day)	NA	(mg/kg-day)	NA
				7440-02-0	Nickel	49.755025	mg/kg	1.1E-05	(mg/kg-day)	NA	1/(mg/kg-day)	NA	3.2E-05	(mg/kg-day)	2.0E-02	(mg/kg-day)	2E-03
				7782-49-2	Selenium	2.8960475	mg/kg	6.6E-07	(mg/kg-day)	NA	1/(mg/kg-day)	NA	1.9E-06	(mg/kg-day)	5.0E-03	(mg/kg-day)	4E-04
				7440-28-0	Thallium	0.1651397	mg/kg	3.8E-08	(mg/kg-day)	NA	1/(mg/kg-day)	NA	1.1E-07	(mg/kg-day)	1.0E-05	(mg/kg-day)	1E-02
				7440-62-2	Vanadium	25.078513	mg/kg	5.7E-06	(mg/kg-day)	NA	1/(mg/kg-day)	NA	1.6E-05	(mg/kg-day)	5.0E-03	(mg/kg-day)	3E-03
				11097-69-1	PCB-1254 (Aroclor 1254)	0.2498239	mg/kg	5.7E-08	(mg/kg-day)	2.0E+00	1/(mg/kg-day)	1E-07	1.6E-07	(mg/kg-day)	2.0E-05	(mg/kg-day)	8E-03
				91-57-6	2-Methylnaphthalene	3.8887518	mg/kg	8.9E-07	(mg/kg-day)	NA	1/(mg/kg-day)	NA	2.5E-06	(mg/kg-day)	4.0E-03	(mg/kg-day)	6E-04
				56-55-3	Benzo(A)Anthracene	48.431015	mg/kg	1.1E-05	(mg/kg-day)	1.0E-01	1/(mg/kg-day)	1E-06	3.1E-05	(mg/kg-day)	NA	(mg/kg-day)	NA
				50-32-8	Benzo(A)Pyrene	47.975874	mg/kg	1.1E-05	(mg/kg-day)	1.0E+00	1/(mg/kg-day)	1E-05	3.1E-05	(mg/kg-day)	3.0E-04	(mg/kg-day)	1E-01
				205-99-2	Benzo(B)Fluoranthene	54.907891	mg/kg	1.3E-05	(mg/kg-day)	1.0E-01	1/(mg/kg-day)	1E-06	3.5E-05	(mg/kg-day)	NA	(mg/kg-day)	NA
				207-08-9	Benzo(K)Fluoranthene	23.769047	mg/kg	5.4E-06	(mg/kg-day)	1.0E-02	1/(mg/kg-day)	5E-08	1.5E-05	(mg/kg-day)	NA	(mg/kg-day)	NA
				92-52-4	Biphenyl (Diphenyl)	1.427299	mg/kg	3.3E-07	(mg/kg-day)	8.0E-03	1/(mg/kg-day)	3E-09	9.1E-07	(mg/kg-day)	5.0E-01	(mg/kg-day)	2E-06
				117-81-7	Bis(2-Ethylhexyl) Phthalate	0.1264368	mg/kg	2.9E-08	(mg/kg-day)	1.4E-02	1/(mg/kg-day)	4E-10	8.1E-08	(mg/kg-day)	2.0E-02	(mg/kg-day)	4E-06
				218-01-9	Chrysene	52.847833	mg/kg	1.2E-05	(mg/kg-day)	1.0E-03	1/(mg/kg-day)	1E-08	3.4E-05	(mg/kg-day)	NA	(mg/kg-day)	NA
				53-70-3	Dibenz(A,H)Anthracene	10.084171	mg/kg	2.3E-06	(mg/kg-day)	1.0E+00	1/(mg/kg-day)	2E-06	6.5E-06	(mg/kg-day)	NA	(mg/kg-day)	NA
				132-64-9	Dibenzofuran	9.0422005	mg/kg	2.1E-06	(mg/kg-day)	NA	1/(mg/kg-day)	NA	5.8E-06	(mg/kg-day)	1.0E-03	(mg/kg-day)	6E-03
				206-44-0	Fluoranthene	93.124745	mg/kg	2.1E-05	(mg/kg-day)	NA	1/(mg/kg-day)	NA	6.0E-05	(mg/kg-day)	4.0E-02	(mg/kg-day)	1E-03
				193-39-5	Indeno(1,2,3-C,D)Pyrene	32.869839	mg/kg	7.5E-06	(mg/kg-day)	1.0E-01	1/(mg/kg-day)	8E-07	2.1E-05	(mg/kg-day)	NA	(mg/kg-day)	NA
				91-20-3	Naphthalene	8.2178383	mg/kg	1.9E-06	(mg/kg-day)	NA	1/(mg/kg-day)	NA	5.3E-06	(mg/kg-day)	2.0E-02	(mg/kg-day)	3E-04
				129-00-0	Pyrene	88.764995	mg/kg	2.0E-05	(mg/kg-day)	NA	1/(mg/kg-day)	NA	5.7E-05	(mg/kg-day)	3.0E-02	(mg/kg-day)	2E-03
Total Ingestion												2E-05					2E-01
			Dermal	57-12-5	Cyanide	5.3941748	mg/kg	NA	(mg/kg-day)	NA	1/(mg/kg-day)	NA	NA	(mg/kg-day)	6.0E-04	(mg/kg-day)	NA
				16984-48-8	Fluoride	484.68199	mg/kg	NA	(mg/kg-day)	NA	1/(mg/kg-day)	NA	NA	(mg/kg-day)	4.0E-02	(mg/kg-day)	NA
				7440-47-3_EST	Chromium, Hexavalent - Estimated	0.8245674	mg/kg	NA	(mg/kg-day)	1.3E-02	1/(mg/kg-day)	NA	NA	(mg/kg-day)	7.5E-05	(mg/kg-day)	NA
				7429-90-5	Aluminum	25208.599	mg/kg	NA	(mg/kg-day)	NA	1/(mg/kg-day)	NA	NA	(mg/kg-day)	1.0E+00	(mg/kg-day)	NA
				7440-36-0	Antimony	0.6404657	mg/kg	NA	(mg/kg-day)	NA	1/(mg/kg-day)	NA	NA	(mg/kg-day)	6.0E-05	(mg/kg-day)	NA
				7440-38-2	Arsenic	7.3398394	mg/kg	2.1E-07	(mg/kg-day)	1.5E+00	1/(mg/kg-day)	3E-07	6.0E-07	(mg/kg-day)	3.0E-04	(mg/kg-day)	2E-03
				7440-48-4	Cobalt	6.7592142	mg/kg	NA	(mg/kg-day)	NA	1/(mg/kg-day)	NA	NA	(mg/kg-day)	3.0E-04	(mg/kg-day)	NA
				7440-50-8	Copper	108.76106	mg/kg	NA	(mg/kg-day)	NA	1/(mg/kg-day)	NA	NA	(mg/kg-day)	4.0E-02	(mg/kg-day)	NA
				7439-89-6	Iron	20494.073	mg/kg	NA	(mg/kg-day)	NA	1/(mg/kg-day)	NA	NA	(mg/kg-day)	7.0E-01	(mg/kg-day)	NA
				7439-96-5	Manganese	557.43143	mg/kg	NA	(mg/kg-day)	NA	1/(mg/kg-day)	NA	NA	(mg/kg-day)	9.6E-04	(mg/kg-day)	NA
				7439-97-6	Mercury	0.0416381	mg/kg	NA	(mg/kg-day)	NA	1/(mg/kg-day)	NA	NA	(mg/kg-day)	NA	(mg/kg-day)	NA
				7440-02-0	Nickel	49.755025	mg/kg	NA	(mg/kg-day)	NA	1/(mg/kg-day)	NA	NA	(mg/kg-day)	8.0E-04	(mg/kg-day)	NA
				7782-49-2	Selenium	2.8960475	mg/kg	NA	(mg/kg-day)	NA	1/(mg/kg-day)	NA	NA	(mg/kg-day)	5.0E-03	(mg/kg-day)	NA
				7440-28-0	Thallium	0.1651397	mg/kg	NA	(mg/kg-day)	NA	1/(mg/kg-day)	NA	NA	(mg/kg-day)	1.0E-05	(mg/kg-day)	NA
				7440-62-2	Vanadium	25.078513	mg/kg	NA	(mg/kg-day)	NA	1/(mg/kg-day)	NA	NA	(mg/kg-day)	1.3E-04	(mg/kg-day)	NA
				11097-69-1	PCB-1254 (Aroclor 1254)	0.2498239	mg/kg	3.4E-08	(mg/kg-day)	2.0E+00	1/(mg/kg-day)	7E-08	9.5E-08	(mg/kg-day)	2.0E-05	(mg/kg-day)	5E-03
				91-57-6	2-Methylnaphthalene	3.8887518	mg/kg	4.9E-07	(mg/kg-day)	NA	1/(mg/kg-day)	NA	1.4E-06	(mg/kg-day)	4.0E-03	(mg/kg-day)	3E-04
				56-55-3	Benzo(A)Anthracene	48.431015	mg/kg	6.1E-06	(mg/kg-day)	1.0E-01	1/(mg/kg-day)	6E-07	1.7E-05	(mg/kg-day)	NA	(mg/kg-day)	NA
				50-32-8	Benzo(A)Pyrene	47.975874	mg/kg	6.0E-06	(mg/kg-day)	1.0E+00	1/(mg/kg-day)	6E-06	1.7E-05	(mg/kg-day)	3.0E-04	(mg/kg-day)	6E-02
				205-99-2	Benzo(B)Fluoranthene	54.907891	mg/kg	6.9E-06	(mg/kg-day)	1.0E-01	1/(mg/kg-day)	7E-07	1.9E-05	(mg/kg-day)	NA	(mg/kg-day)	NA
				207-08-9	Benzo(K)Fluoranthene	23.769047	mg/kg	3.0E-06	(mg/kg-day)	1.0E-02	1/(mg/kg-day)	3E-08	8.4E-06	(mg/kg-day)	NA	(mg/kg-day)	NA
				92-52-4	Biphenyl (Diphenyl)	1.427299	mg/kg	NA	(mg/kg-day)	8.0E-03	1/(mg/kg-day)	NA	NA	(mg/kg-day)	5.0E-01	(mg/kg-day)	NA
				117-81-7	Bis(2-Ethylhexyl) Phthalate	0.1264368	mg/kg	1.2E-08	(mg/kg-day)	1.4E-02	1/(mg/kg-day)	2E-10	3.4E-08	(mg/kg-day)	2.0E-02	(mg/kg-day)	2E-06
				218-01-9	Chrysene	52.847833	mg/kg	6.7E-06	(mg/kg-day)	1.0E-03	1/(mg/kg-day)	7E-09	1.9E-05	(mg/kg-day)	NA	(mg/kg-day)	NA
				53-70-3	Dibenz(A,H)Anthracene	10.084171	mg/kg	1.3E-06	(mg/kg-day)	1.0E+00	1/(mg/kg-day)	1E-06	3.6E-06	(mg/kg-day)	NA	(mg/kg-day)	NA
				132-64-9	Dibenzofuran	9.0422005	mg/kg	2.6E-07	(mg/kg-day)	NA	1/(mg/kg-day)	NA	7.4E-07	(mg/kg-day)	1.0E-03	(mg/kg-day)	7E-04

Table I-9
Calculation of Chemical Cancer Risks and Non-Cancer Hazards
(Central Landfill Area - ISM - Landfill Management Worker - Current/Future)
Reasonable Maximum Exposure
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Scenario Timeframe:	Current/Future
Receptor Population:	Landfill Management Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure point	Exposure route	Cas Number	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
								Intake/Exposure Concentration		CSF/Unit Risk		Cancer	Intake/Exposure Concentration		RfD/RfC		Hazard
						Value	Units	Value	Units	Value	Units	Risk	Value	Units	Value	Units	Quotient
Soil				206-44-0	Fluoranthene	93.124745	mg/kg	1.2E-05	(mg/kg-day)	NA	1/(mg/kg-day)	NA	3.3E-05	(mg/kg-day)	4.0E-02	(mg/kg-day)	8E-04
				193-39-5	Indeno(1,2,3-C,D)Pyrene	32.869839	mg/kg	4.1E-06	(mg/kg-day)	1.0E-01	1/(mg/kg-day)	4E-07	1.2E-05	(mg/kg-day)	NA	(mg/kg-day)	NA
				91-20-3	Naphthalene	8.2178383	mg/kg	1.0E-06	(mg/kg-day)	NA	1/(mg/kg-day)	NA	2.9E-06	(mg/kg-day)	2.0E-02	(mg/kg-day)	1E-04
				129-00-0	Pyrene	88.764995	mg/kg	1.1E-05	(mg/kg-day)	NA	1/(mg/kg-day)	NA	3.1E-05	(mg/kg-day)	3.0E-02	(mg/kg-day)	1E-03
			Total Dermal									9E-06					7E-02
		Total Soil Direct Contact										3E-05					3E-01
	Air	Airborne	Inhalation	57-12-5	Cyanide	5.3941748	mg/kg	6.2E-03	(µg/m3)	NA	1/(µg/m3)	NA	1.7E-05	mg/m3	8.0E-04	mg/m3	2E-02
		vapors		16984-48-8	Fluoride	484.68199	mg/kg	2.2E-05	(µg/m3)	NA	1/(µg/m3)	NA	6.1E-08	mg/m3	1.3E-02	mg/m3	5E-06
		/dust		7440-47-3_EST	Chromium, Hexavalent - Estimated	0.8245674	mg/kg	3.7E-08	(µg/m3)	8.4E-02	1/(µg/m3)	3E-09	1.0E-10	mg/m3	1.0E-04	mg/m3	1E-06
				7429-90-5	Aluminum	25208.599	mg/kg	1.1E-03	(µg/m3)	NA	1/(µg/m3)	NA	3.2E-06	mg/m3	5.0E-03	mg/m3	6E-04
				7440-36-0	Antimony	0.6404657	mg/kg	2.9E-08	(µg/m3)	NA	1/(µg/m3)	NA	8.0E-11	mg/m3	NA	mg/m3	NA
				7440-38-2	Arsenic	7.3398394	mg/kg	3.3E-07	(µg/m3)	4.3E-03	1/(µg/m3)	1E-09	9.2E-10	mg/m3	1.5E-05	mg/m3	6E-05
				7440-48-4	Cobalt	6.7592142	mg/kg	3.0E-07	(µg/m3)	9.0E-03	1/(µg/m3)	3E-09	8.5E-10	mg/m3	6.0E-06	mg/m3	1E-04
				7440-50-8	Copper	108.76106	mg/kg	4.9E-06	(µg/m3)	NA	1/(µg/m3)	NA	1.4E-08	mg/m3	NA	mg/m3	NA
				7439-89-6	Iron	20494.073	mg/kg	9.2E-04	(µg/m3)	NA	1/(µg/m3)	NA	2.6E-06	mg/m3	NA	mg/m3	NA
				7439-96-5	Manganese	557.43143	mg/kg	2.5E-05	(µg/m3)	NA	1/(µg/m3)	NA	7.0E-08	mg/m3	5.0E-05	mg/m3	1E-03
				7439-97-6	Mercury	0.0416381	mg/kg	7.3E-05	(µg/m3)	NA	1/(µg/m3)	NA	2.0E-07	mg/m3	3.0E-04	mg/m3	7E-04
				7440-02-0	Nickel	49.755025	mg/kg	2.2E-06	(µg/m3)	2.6E-04	1/(µg/m3)	6E-10	6.2E-09	mg/m3	9.0E-05	mg/m3	7E-05
				7782-49-2	Selenium	2.8960475	mg/kg	1.3E-07	(µg/m3)	NA	1/(µg/m3)	NA	3.6E-10	mg/m3	2.0E-02	mg/m3	2E-08
				7440-28-0	Thallium	0.1651397	mg/kg	7.4E-09	(µg/m3)	NA	1/(µg/m3)	NA	2.1E-11	mg/m3	NA	mg/m3	NA
				7440-62-2	Vanadium	25.078513	mg/kg	1.1E-06	(µg/m3)	NA	1/(µg/m3)	NA	3.1E-09	mg/m3	1.0E-04	mg/m3	3E-05
				11097-69-1	PCB-1254 (Aroclor 1254)	0.2498239	mg/kg	1.8E-05	(µg/m3)	5.7E-04	1/(µg/m3)	1E-08	5.1E-08	mg/m3	NA	mg/m3	NA
				91-57-6	2-Methylnaphthalene	3.8887518	mg/kg	1.7E-07	(µg/m3)	NA	1/(µg/m3)	NA	4.9E-10	mg/m3	NA	mg/m3	NA
				56-55-3	Benzo(A)Anthracene	48.431015	mg/kg	6.7E-04	(µg/m3)	6.0E-05	1/(µg/m3)	4E-08	1.9E-06	mg/m3	NA	mg/m3	NA
				50-32-8	Benzo(A)Pyrene	47.975874	mg/kg	2.2E-06	(µg/m3)	6.0E-04	1/(µg/m3)	1E-09	6.0E-09	mg/m3	2.0E-06	mg/m3	3E-03
				205-99-2	Benzo(B)Fluoranthene	54.907891	mg/kg	2.5E-06	(µg/m3)	6.0E-05	1/(µg/m3)	1E-10	6.9E-09	mg/m3	NA	mg/m3	NA
				207-08-9	Benzo(K)Fluoranthene	23.769047	mg/kg	1.1E-06	(µg/m3)	6.0E-06	1/(µg/m3)	6E-12	3.0E-09	mg/m3	NA	mg/m3	NA
				92-52-4	Biphenyl (Diphenyl)	1.427299	mg/kg	6.4E-08	(µg/m3)	NA	1/(µg/m3)	NA	1.8E-10	mg/m3	4.0E-04	mg/m3	4E-07
				117-81-7	Bis(2-Ethylhexyl) Phthalate	0.1264368	mg/kg	5.7E-09	(µg/m3)	2.4E-06	1/(µg/m3)	1E-14	1.6E-11	mg/m3	NA	mg/m3	NA
				218-01-9	Chrysene	52.847833	mg/kg	2.4E-06	(µg/m3)	6.0E-07	1/(µg/m3)	1E-12	6.6E-09	mg/m3	NA	mg/m3	NA
				53-70-3	Dibenz(A,H)Anthracene	10.084171	mg/kg	4.5E-07	(µg/m3)	6.0E-04	1/(µg/m3)	3E-10	1.3E-09	mg/m3	NA	mg/m3	NA
				132-64-9	Dibenzofuran	9.0422005	mg/kg	3.5E-03	(µg/m3)	NA	1/(µg/m3)	NA	9.9E-06	mg/m3	NA	mg/m3	NA
				206-44-0	Fluoranthene	93.124745	mg/kg	4.2E-06	(µg/m3)	NA	1/(µg/m3)	NA	1.2E-08	mg/m3	NA	mg/m3	NA
				193-39-5	Indeno(1,2,3-C,D)Pyrene	32.869839	mg/kg	1.5E-06	(µg/m3)	6.0E-05	1/(µg/m3)	9E-11	4.1E-09	mg/m3	NA	mg/m3	NA
				91-20-3	Naphthalene	8.2178383	mg/kg	1.1E-02	(µg/m3)	3.4E-05	1/(µg/m3)	4E-07	3.0E-05	mg/m3	3.0E-03	mg/m3	1E-02
				129-00-0	Pyrene	88.764995	mg/kg	2.3E-03	(µg/m3)	NA	1/(µg/m3)	NA	6.4E-06	mg/m3	NA	mg/m3	NA
			Total Inhalation									4E-07					4E-02
		Total Dust Inhalation										4E-07					4E-02
	Total Soil Direct Contact and Dust Inhalation											3E-05					3E-01
Medium Total												3E-05					3E-01
											Total of Receptor Risks Across All Media	3E-05				Total of Receptor Hazards Across All Media	3E-01

Table I-10
Summary of Receptor Risks and Hazards for COPCs
(Central Landfill Area - ISM - Landfill Management Worker - Current/Future)
Reasonable Maximum Exposure
Columbia Falls Aluminum Facility

Scenario Timeframe:	Current/Future
Receptor Population:	Landfill Management Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Cas Number	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
					Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Surface Soil	57-12-5	Cyanide	NA	NA	NA	NA	Testes (RfDo)	6E-03	NA	NA	6E-03
Central Landfill Area		0-2 ft bgs	16984-48-8	Fluoride	NA	NA	NA	NA	NA (RfDo)	8E-03	NA	NA	8E-03
ISM Dus			7440-47-3_EST	Chromium, Hexavalent - Estimated	9E-08	NA	NA	9E-08	NA (RfDo)	2E-04	NA	NA	2E-04
			7429-90-5	Aluminum	NA	NA	NA	NA	Neurological (RfDo)	2E-02	NA	NA	2E-02
			7440-36-0	Antimony	NA	NA	NA	NA	hematologic (longevity, blood glucose, and cholesterol) (RfDo)	1E-03	NA	NA	1E-03
			7440-38-2	Arsenic	***2E-06***	NA	3E-07	***2E-06***	Skin and blood (RfDo)	9E-03	NA	2E-03	1E-02
			7440-48-4	Cobalt	NA	NA	NA	NA	Thyroid (RfDo)	1E-02	NA	NA	1E-02
			7440-50-8	Copper	NA	NA	NA	NA	Gastrointestinal system (RfDo)	2E-03	NA	NA	2E-03
			7439-89-6	Iron	NA	NA	NA	NA	GI Ttract (RfDo)	2E-02	NA	NA	2E-02
			7439-96-5	Manganese	NA	NA	NA	NA	Nervous (RfDo)	1E-02	NA	NA	1E-02
			7439-97-6	Mercury	NA	NA	NA	NA	NA (RfDo)	NA	NA	NA	NA
			7440-02-0	Nickel	NA	NA	NA	NA	Body weight (RfDo)	2E-03	NA	NA	2E-03
			7782-49-2	Selenium	NA	NA	NA	NA	nervous, hematologic, dermal (RfDo)	4E-04	NA	NA	4E-04
			7440-28-0	Thallium	NA	NA	NA	NA	Skin (RfDo)	1E-02	NA	NA	1E-02
			7440-62-2	Vanadium	NA	NA	NA	NA	Dermal (RfDo)	3E-03	NA	NA	3E-03
			11097-69-1	PCB-1254 (Aroclor 1254)	1E-07	NA	7E-08	2E-07	Whole body (RfDo)	8E-03	NA	5E-03	1E-02
			91-57-6	2-Methylnaphthalene	NA	NA	NA	NA	Lungs (RfDo)	6E-04	NA	3E-04	1E-03
			56-55-3	Benzo(A)Anthracene	1E-06	NA	6E-07	***2E-06***	NA (RfDo)	NA	NA	NA	NA
			50-32-8	Benzo(A)Pyrene	***1E-05***	NA	***6E-06***	***2E-05***	Developmental (RfDo)	1E-01	NA	6E-02	2E-01
			205-99-2	Benzo(B)Fluoranthene	1E-06	NA	7E-07	***2E-06***	NA (RfDo)	NA	NA	NA	NA
			207-08-9	Benzo(K)Fluoranthene	5E-08	NA	3E-08	8E-08	NA (RfDo)	NA	NA	NA	NA
			92-52-4	Biphenyl (Diphenyl)	3E-09	NA	NA	3E-09	Kidney (RfDo)	2E-06	NA	NA	2E-06
			117-81-7	Bis(2-Ethylhexyl) Phthalate	4E-10	NA	2E-10	6E-10	Liver (RfDo)	4E-06	NA	2E-06	6E-06
			218-01-9	Chrysene	1E-08	NA	7E-09	2E-08	NA (RfDo)	NA	NA	NA	NA
			53-70-3	Dibenz(A,H)Anthracene	***2E-06***	NA	1E-06	***4E-06***	NA (RfDo)	NA	NA	NA	NA
			132-64-9	Dibenzofuran	NA	NA	NA	NA	NA (RfDo)	6E-03	NA	7E-04	7E-03
			206-44-0	Fluoranthene	NA	NA	NA	NA	Whole body (RfDo)	1E-03	NA	8E-04	2E-03
			193-39-5	Indeno(1,2,3-C,D)Pyrene	8E-07	NA	4E-07	1E-06	NA (RfDo)	NA	NA	NA	NA
			91-20-3	Naphthalene	NA	NA	NA	NA	Body weight (RfDo)	3E-04	NA	1E-04	4E-04
			129-00-0	Pyrene	NA	NA	NA	NA	Kidney (RfDo)	2E-03	NA	1E-03	3E-03
				Chemical Total	***2E-05***	NA	***9E-06***	***3E-05***		2E-01	NA	7E-02	3E-01
		Exposure Point Total						***3E-05***					3E-01
Exposure Medium Total								***3E-05***					3E-01
Air	Airborne		57-12-5	Cyanide	NA	NA	NA	NA	Thyroid (RfC)	NA	2E-02	NA	2E-02
	vapors		16984-48-8	Fluoride	NA	NA	NA	NA	NA (RfC)	NA	5E-06	NA	5E-06
	/dust		7440-47-3_EST	Chromium, Hexavalent - Estimated	NA	3E-09	NA	3E-09	Lungs (RfC)	NA	1E-06	NA	1E-06
			7429-90-5	Aluminum	NA	NA	NA	NA	Neurological (RfC)	NA	6E-04	NA	6E-04
			7440-36-0	Antimony	NA	NA	NA	NA	NA (RfC)	NA	NA	NA	NA
			7440-38-2	Arsenic	NA	1E-09	NA	1E-09	cardiovascular, nervous, and skin (RfC)	NA	6E-05	NA	6E-05
			7440-48-4	Cobalt	NA	3E-09	NA	3E-09	Respiratory Tract; Lung (RfC)	NA	1E-04	NA	1E-04
			7440-50-8	Copper	NA	NA	NA	NA	NA (RfC)	NA	NA	NA	NA
			7439-89-6	Iron	NA	NA	NA	NA	NA (RfC)	NA	NA	NA	NA
			7439-96-5	Manganese	NA	NA	NA	NA	Nervous (RfC)	NA	1E-03	NA	1E-03
			7439-97-6	Mercury	NA	NA	NA	NA	Nervous (RfC)	NA	7E-04	NA	7E-04
			7440-02-0	Nickel	NA	6E-10	NA	6E-10	Resp. (RfC)	NA	7E-05	NA	7E-05
			7782-49-2	Selenium	NA	NA	NA	NA	NA (RfC)	NA	2E-08	NA	2E-08
			7440-28-0	Thallium	NA	NA	NA	NA	NA (RfC)	NA	NA	NA	NA
			7440-62-2	Vanadium	NA	NA	NA	NA	Resp. (RfC)	NA	3E-05	NA	3E-05
			11097-69-1	PCB-1254 (Aroclor 1254)	NA	1E-08	NA	1E-08	NA (RfC)	NA	NA	NA	NA
			91-57-6	2-Methylnaphthalene	NA	NA	NA	NA	NA (RfC)	NA	NA	NA	NA
			56-55-3	Benzo(A)Anthracene	NA	4E-08	NA	4E-08	NA (RfC)	NA	NA	NA	NA

Table I-10
Summary of Receptor Risks and Hazards for COPCs
(Central Landfill Area - ISM - Landfill Management Worker - Current/Future)
Reasonable Maximum Exposure
Columbia Falls Aluminum Facility

Scenario Timeframe:	Current/Future
Receptor Population:	Landfill Management Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Cas Number	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
					Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
	Air	Airborne vapors /dust	50-32-8	Benzo(A)Pyrene	NA	1E-09	NA	1E-09	Developmental (RfC)	NA	3E-03	NA	3E-03
			205-99-2	Benzo(B)Fluoranthene	NA	1E-10	NA	1E-10	NA (RfC)	NA	NA	NA	NA
			207-08-9	Benzo(K)Fluoranthene	NA	6E-12	NA	6E-12	NA (RfC)	NA	NA	NA	NA
			92-52-4	Biphenyl (Diphenyl)	NA	NA	NA	NA	Liver; Kidney (RfC)	NA	4E-07	NA	4E-07
			117-81-7	Bis(2-Ethylhexyl) Phthalate	NA	1E-14	NA	1E-14	NA (RfC)	NA	NA	NA	NA
			218-01-9	Chrysene	NA	1E-12	NA	1E-12	NA (RfC)	NA	NA	NA	NA
			53-70-3	Dibenz(A,H)Anthracene	NA	3E-10	NA	3E-10	NA (RfC)	NA	NA	NA	NA
			132-64-9	Dibenzofuran	NA	NA	NA	NA	NA (RfC)	NA	NA	NA	NA
			206-44-0	Fluoranthene	NA	NA	NA	NA	NA (RfC)	NA	NA	NA	NA
			193-39-5	Indeno(1,2,3-C,D)Pyrene	NA	9E-11	NA	9E-11	NA (RfC)	NA	NA	NA	NA
			91-20-3	Naphthalene	NA	4E-07	NA	4E-07	Nervous, Respiratory (RfC)	NA	1E-02	NA	1E-02
			129-00-0	Pyrene	NA	NA	NA	NA	NA (RfC)	NA	NA	NA	NA
				Chemical Total	NA	4E-07	NA	4E-07		NA	4E-02	NA	4E-02
		Exposure Point Total						4E-07					4E-02
	Exposure Medium Total							4E-07					4E-02
Medium Total								***3E-05***					3E-01
Receptor Total							Receptor Risk Total	***3E-05***				Receptor HI Total	3E-01

Table I-11
Calculation of Chemical Cancer Risks and Non-Cancer Hazards
(Central Landfill Area - ISM - Trespasser - Current)
Reasonable Maximum Exposure
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Scenario Timeframe:	Current
Receptor Population:	Trespasser
Receptor Age:	Adolescent

Medium	Exposure Medium	Exposure point	Exposure route	Cas Number	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
								Intake/Exposure Concentration		CSF/Unit Risk		Cancer	Intake/Exposure Concentration		RfD/RfC		Hazard
						Value	Units	Value	Units	Value	Units	Risk	Value	Units	Value	Units	Quotient
Soil	Soil	Surface Soil 0-0.5 ft-bgs	Ingestion	57-12-5	Cyanide	8.5364073	mg/kg	5.3E-08	(mg/kg-day)	NA	1/(mg/kg-day)	NA	3.7E-07	(mg/kg-day)	6.0E-04	(mg/kg-day)	6E-04
				16984-48-8	Fluoride	521.2503	mg/kg	3.2E-06	(mg/kg-day)	NA	1/(mg/kg-day)	NA	2.3E-05	(mg/kg-day)	4.0E-02	(mg/kg-day)	6E-04
				7440-47-3_EST	Chromium, Hexavalent - Estimated	0.9699767	mg/kg	1.8E-08	(mg/kg-day)	5.0E-01	1/(mg/kg-day)	9E-09	4.2E-08	(mg/kg-day)	3.0E-03	(mg/kg-day)	1E-05
				7429-90-5	Aluminum	29850.661	mg/kg	1.9E-04	(mg/kg-day)	NA	1/(mg/kg-day)	NA	1.3E-03	(mg/kg-day)	1.0E+00	(mg/kg-day)	1E-03
				7440-36-0	Antimony	0.6691332	mg/kg	4.2E-09	(mg/kg-day)	NA	1/(mg/kg-day)	NA	2.9E-08	(mg/kg-day)	4.0E-04	(mg/kg-day)	7E-05
				7440-38-2	Arsenic	8.3223418	mg/kg	3.1E-08	(mg/kg-day)	1.5E+00	1/(mg/kg-day)	5E-08	2.2E-07	(mg/kg-day)	3.0E-04	(mg/kg-day)	7E-04
				7440-48-4	Cobalt	7.2064956	mg/kg	4.5E-08	(mg/kg-day)	NA	1/(mg/kg-day)	NA	3.1E-07	(mg/kg-day)	3.0E-04	(mg/kg-day)	1E-03
				7440-50-8	Copper	93.660653	mg/kg	5.8E-07	(mg/kg-day)	NA	1/(mg/kg-day)	NA	4.1E-06	(mg/kg-day)	4.0E-02	(mg/kg-day)	1E-04
				7439-89-6	Iron	22588.703	mg/kg	1.4E-04	(mg/kg-day)	NA	1/(mg/kg-day)	NA	9.8E-04	(mg/kg-day)	7.0E-01	(mg/kg-day)	1E-03
				7439-96-5	Manganese	574.03518	mg/kg	3.6E-06	(mg/kg-day)	NA	1/(mg/kg-day)	NA	2.5E-05	(mg/kg-day)	2.4E-02	(mg/kg-day)	1E-03
				7439-97-6	Mercury	0.0509535	mg/kg	3.2E-10	(mg/kg-day)	NA	1/(mg/kg-day)	NA	2.2E-09	(mg/kg-day)	NA	(mg/kg-day)	NA
				7440-02-0	Nickel	71.435194	mg/kg	4.4E-07	(mg/kg-day)	NA	1/(mg/kg-day)	NA	3.1E-06	(mg/kg-day)	2.0E-02	(mg/kg-day)	2E-04
				7782-49-2	Selenium	4.2859406	mg/kg	2.7E-08	(mg/kg-day)	NA	1/(mg/kg-day)	NA	1.9E-07	(mg/kg-day)	5.0E-03	(mg/kg-day)	4E-05
				7440-28-0	Thallium	0.2071093	mg/kg	1.3E-09	(mg/kg-day)	NA	1/(mg/kg-day)	NA	9.0E-09	(mg/kg-day)	1.0E-05	(mg/kg-day)	9E-04
				7440-62-2	Vanadium	30.21697	mg/kg	1.9E-07	(mg/kg-day)	NA	1/(mg/kg-day)	NA	1.3E-06	(mg/kg-day)	5.0E-03	(mg/kg-day)	3E-04
				11097-69-1	PCB-1254 (Aroclor 1254)	0.184637	mg/kg	1.1E-09	(mg/kg-day)	2.0E+00	1/(mg/kg-day)	2E-09	8.0E-09	(mg/kg-day)	2.0E-05	(mg/kg-day)	4E-04
				56-55-3	Benzo(A)Anthracene	38.804527	mg/kg	7.2E-07	(mg/kg-day)	1.0E-01	1/(mg/kg-day)	7E-08	1.7E-06	(mg/kg-day)	NA	(mg/kg-day)	NA
				50-32-8	Benzo(A)Pyrene	38.066212	mg/kg	7.1E-07	(mg/kg-day)	1.0E+00	1/(mg/kg-day)	7E-07	1.7E-06	(mg/kg-day)	3.0E-04	(mg/kg-day)	6E-03
				205-99-2	Benzo(B)Fluoranthene	47.475602	mg/kg	8.9E-07	(mg/kg-day)	1.0E-01	1/(mg/kg-day)	9E-08	2.1E-06	(mg/kg-day)	NA	(mg/kg-day)	NA
				207-08-9	Benzo(K)Fluoranthene	16.534201	mg/kg	3.1E-07	(mg/kg-day)	1.0E-02	1/(mg/kg-day)	3E-09	7.2E-07	(mg/kg-day)	NA	(mg/kg-day)	NA
				117-81-7	Bis(2-Ethylhexyl) Phthalate	0.2198906	mg/kg	1.4E-09	(mg/kg-day)	1.4E-02	1/(mg/kg-day)	2E-11	9.6E-09	(mg/kg-day)	2.0E-02	(mg/kg-day)	5E-07
				218-01-9	Chrysene	47.756472	mg/kg	8.9E-07	(mg/kg-day)	1.0E-03	1/(mg/kg-day)	9E-10	2.1E-06	(mg/kg-day)	NA	(mg/kg-day)	NA
				53-70-3	Dibenz(A,H)Anthracene	8.1809379	mg/kg	1.5E-07	(mg/kg-day)	1.0E+00	1/(mg/kg-day)	2E-07	3.6E-07	(mg/kg-day)	NA	(mg/kg-day)	NA
				132-64-9	Dibenzofuran	4.063906	mg/kg	2.5E-08	(mg/kg-day)	NA	1/(mg/kg-day)	NA	1.8E-07	(mg/kg-day)	1.0E-03	(mg/kg-day)	2E-04
				206-44-0	Fluoranthene	79.826371	mg/kg	5.0E-07	(mg/kg-day)	NA	1/(mg/kg-day)	NA	3.5E-06	(mg/kg-day)	4.0E-02	(mg/kg-day)	9E-05
				193-39-5	Indeno(1,2,3-C,D)Pyrene	26.84653	mg/kg	5.0E-07	(mg/kg-day)	1.0E-01	1/(mg/kg-day)	5E-08	1.2E-06	(mg/kg-day)	NA	(mg/kg-day)	NA
				91-20-3	Naphthalene	4.2285384	mg/kg	2.6E-08	(mg/kg-day)	NA	1/(mg/kg-day)	NA	1.8E-07	(mg/kg-day)	2.0E-02	(mg/kg-day)	9E-06
			Total Ingestion									1E-06					1E-02
			Dermal	57-12-5	Cyanide	8.5364073	mg/kg	NA	(mg/kg-day)	NA	1/(mg/kg-day)	NA	NA	(mg/kg-day)	6.0E-04	(mg/kg-day)	NA
				16984-48-8	Fluoride	521.2503	mg/kg	NA	(mg/kg-day)	NA	1/(mg/kg-day)	NA	NA	(mg/kg-day)	4.0E-02	(mg/kg-day)	NA
				7440-47-3_EST	Chromium, Hexavalent - Estimated	0.9699767	mg/kg	NA	(mg/kg-day)	1.3E-02	1/(mg/kg-day)	NA	NA	(mg/kg-day)	7.5E-05	(mg/kg-day)	NA
				7429-90-5	Aluminum	29850.661	mg/kg	NA	(mg/kg-day)	NA	1/(mg/kg-day)	NA	NA	(mg/kg-day)	1.0E+00	(mg/kg-day)	NA
				7440-36-0	Antimony	0.6691332	mg/kg	NA	(mg/kg-day)	NA	1/(mg/kg-day)	NA	NA	(mg/kg-day)	6.0E-05	(mg/kg-day)	NA
				7440-38-2	Arsenic	8.3223418	mg/kg	6.6E-09	(mg/kg-day)	1.5E+00	1/(mg/kg-day)	1E-08	4.6E-08	(mg/kg-day)	3.0E-04	(mg/kg-day)	2E-04
				7440-48-4	Cobalt	7.2064956	mg/kg	NA	(mg/kg-day)	NA	1/(mg/kg-day)	NA	NA	(mg/kg-day)	3.0E-04	(mg/kg-day)	NA
				7440-50-8	Copper	93.660653	mg/kg	NA	(mg/kg-day)	NA	1/(mg/kg-day)	NA	NA	(mg/kg-day)	4.0E-02	(mg/kg-day)	NA
				7439-89-6	Iron	22588.703	mg/kg	NA	(mg/kg-day)	NA	1/(mg/kg-day)	NA	NA	(mg/kg-day)	7.0E-01	(mg/kg-day)	NA
				7439-96-5	Manganese	574.03518	mg/kg	NA	(mg/kg-day)	NA	1/(mg/kg-day)	NA	NA	(mg/kg-day)	9.6E-04	(mg/kg-day)	NA
				7439-97-6	Mercury	0.0509535	mg/kg	NA	(mg/kg-day)	NA	1/(mg/kg-day)	NA	NA	(mg/kg-day)	NA	(mg/kg-day)	NA
				7440-02-0	Nickel	71.435194	mg/kg	NA	(mg/kg-day)	NA	1/(mg/kg-day)	NA	NA	(mg/kg-day)	8.0E-04	(mg/kg-day)	NA
				7782-49-2	Selenium	4.2859406	mg/kg	NA	(mg/kg-day)	NA	1/(mg/kg-day)	NA	NA	(mg/kg-day)	5.0E-03	(mg/kg-day)	NA
				7440-28-0	Thallium	0.2071093	mg/kg	NA	(mg/kg-day)	NA	1/(mg/kg-day)	NA	NA	(mg/kg-day)	1.0E-05	(mg/kg-day)	NA
				7440-62-2	Vanadium	30.21697	mg/kg	NA	(mg/kg-day)	NA	1/(mg/kg-day)	NA	NA	(mg/kg-day)	1.3E-04	(mg/kg-day)	NA
				11097-69-1	PCB-1254 (Aroclor 1254)	0.184637	mg/kg	6.8E-10	(mg/kg-day)	2.0E+00	1/(mg/kg-day)	1E-09	4.8E-09	(mg/kg-day)	2.0E-05	(mg/kg-day)	2E-04
				56-55-3	Benzo(A)Anthracene	38.804527	mg/kg	4.0E-07	(mg/kg-day)	1.0E-01	1/(mg/kg-day)	4E-08	9.3E-07	(mg/kg-day)	NA	(mg/kg-day)	NA
				50-32-8	Benzo(A)Pyrene	38.066212	mg/kg	3.9E-07	(mg/kg-day)	1.0E+00	1/(mg/kg-day)	4E-07	9.1E-07	(mg/kg-day)	3.0E-04	(mg/kg-day)	3E-03
				205-99-2	Benzo(B)Fluoranthene	47.475602	mg/kg	4.9E-07	(mg/kg-day)	1.0E-01	1/(mg/kg-day)	5E-08	1.1E-06	(mg/kg-day)	NA	(mg/kg-day)	NA
				207-08-9	Benzo(K)Fluoranthene	16.534201	mg/kg	1.7E-07	(mg/kg-day)	1.0E-02	1/(mg/kg-day)	2E-09	4.0E-07	(mg/kg-day)	NA	(mg/kg-day)	NA
				117-81-7	Bis(2-Ethylhexyl) Phthalate	0.2198906	mg/kg	5.8E-10	(mg/kg-day)	1.4E-02	1/(mg/kg-day)	8E-12	4.0E-09	(mg/kg-day)	2.0E-02	(mg/kg-day)	2E-07
				218-01-9	Chrysene	47.756472	mg/kg	4.9E-07	(mg/kg-day)	1.0E-03	1/(mg/kg-day)	5E-10	1.1E-06	(mg/kg-day)	NA	(mg/kg-day)	NA
				53-70-3	Dibenz(A,H)Anthracene	8.1809379	mg/kg	8.4E-08	(mg/kg-day)	1.0E+00	1/(mg/kg-day)	8E-08	2.0E-07	(mg/kg-day)	NA	(mg/kg-day)	NA
				132-64-9	Dibenzofuran	4.063906	mg/kg	3.2E-09	(mg/kg-day)	NA	1/(mg/kg-day)	NA	2.2E-08	(mg/kg-day)	1.0E-03	(mg/kg-day)	2E-05
				206-44-0	Fluoranthene	79.826371	mg/kg	2.7E-07	(mg/kg-day)	NA	1/(mg/kg-day)	NA	1.9E-06	(mg/kg-day)	4.0E-02	(mg/kg-day)	5E-05
				193-39-5	Indeno(1,2,3-C,D)Pyrene	26.84653	mg/kg	2.8E-07	(mg/kg-day)	1.0E-01	1/(mg/kg-day)	3E-08	6.4E-07	(mg/kg-day)	NA	(mg/kg-day)	NA
				91-20-3	Naphthalene	4.2285384	mg/kg	1.4E-08	(mg/kg-day)	NA	1/(mg/kg-day)	NA	1.0E-07	(mg/kg-day)	2.0E-02	(mg/kg-day)	5E-06
			Total Dermal									6E-07					4E-03
		Total Soil Direct Contact										2E-06					2E-02

Table I-11
Calculation of Chemical Cancer Risks and Non-Cancer Hazards
(Central Landfill Area - ISM - Trespasser - Current)
Reasonable Maximum Exposure
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Scenario Timeframe:	Current
Receptor Population:	Trespasser
Receptor Age:	Adolescent

Medium	Exposure Medium	Exposure point	Exposure route	Cas Number	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
						Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
								Value	Units	Value	Units		Value	Units	Value	Units	
	Air	Airborne vapors /dust	Inhalation	57-12-5	Cyanide	8.5364073	mg/kg	1.8E-05	(µg/m3)	NA	1/(µg/m3)	NA	1.3E-07	mg/m3	8.0E-04	mg/m3	2E-04
				16984-48-8	Fluoride	521.2503	mg/kg	4.4E-08	(µg/m3)	NA	1/(µg/m3)	NA	3.1E-10	mg/m3	1.3E-02	mg/m3	2E-08
				7440-47-3_EST	Chromium, Hexavalent - Estimated	0.9699767	mg/kg	2.4E-10	(µg/m3)	8.4E-02	1/(µg/m3)	2E-11	5.7E-13	mg/m3	1.0E-04	mg/m3	6E-09
				7429-90-5	Aluminum	29850.661	mg/kg	2.5E-06	(µg/m3)	NA	1/(µg/m3)	NA	1.8E-08	mg/m3	5.0E-03	mg/m3	4E-06
				7440-36-0	Antimony	0.6691332	mg/kg	5.6E-11	(µg/m3)	NA	1/(µg/m3)	NA	3.9E-13	mg/m3	NA	mg/m3	NA
				7440-38-2	Arsenic	8.3223418	mg/kg	7.0E-10	(µg/m3)	4.3E-03	1/(µg/m3)	3E-12	4.9E-12	mg/m3	1.5E-05	mg/m3	3E-07
				7440-48-4	Cobalt	7.2064956	mg/kg	6.0E-10	(µg/m3)	9.0E-03	1/(µg/m3)	5E-12	4.2E-12	mg/m3	6.0E-06	mg/m3	7E-07
				7440-50-8	Copper	93.660653	mg/kg	7.9E-09	(µg/m3)	NA	1/(µg/m3)	NA	5.5E-11	mg/m3	NA	mg/m3	NA
				7439-89-6	Iron	22588.703	mg/kg	1.9E-06	(µg/m3)	NA	1/(µg/m3)	NA	1.3E-08	mg/m3	NA	mg/m3	NA
				7439-96-5	Manganese	574.03518	mg/kg	4.8E-08	(µg/m3)	NA	1/(µg/m3)	NA	3.4E-10	mg/m3	5.0E-05	mg/m3	7E-06
				7439-97-6	Mercury	0.0509535	mg/kg	1.7E-07	(µg/m3)	NA	1/(µg/m3)	NA	1.2E-09	mg/m3	3.0E-04	mg/m3	4E-06
				7440-02-0	Nickel	71.435194	mg/kg	6.0E-09	(µg/m3)	2.6E-04	1/(µg/m3)	2E-12	4.2E-11	mg/m3	9.0E-05	mg/m3	5E-07
				7782-49-2	Selenium	4.2859406	mg/kg	3.6E-10	(µg/m3)	NA	1/(µg/m3)	NA	2.5E-12	mg/m3	2.0E-02	mg/m3	1E-10
				7440-28-0	Thallium	0.2071093	mg/kg	1.7E-11	(µg/m3)	NA	1/(µg/m3)	NA	1.2E-13	mg/m3	NA	mg/m3	NA
				7440-62-2	Vanadium	30.21697	mg/kg	2.5E-09	(µg/m3)	NA	1/(µg/m3)	NA	1.8E-11	mg/m3	1.0E-04	mg/m3	2E-07
				11097-69-1	PCB-1254 (Aroclor 1254)	0.184637	mg/kg	2.5E-08	(µg/m3)	5.7E-04	1/(µg/m3)	1E-11	1.8E-10	mg/m3	NA	mg/m3	NA
				56-55-3	Benzo(A)Anthracene	38.804527	mg/kg	3.0E-06	(µg/m3)	6.0E-05	1/(µg/m3)	2E-10	7.1E-09	mg/m3	NA	mg/m3	NA
				50-32-8	Benzo(A)Pyrene	38.066212	mg/kg	9.6E-09	(µg/m3)	6.0E-04	1/(µg/m3)	6E-12	2.2E-11	mg/m3	2.0E-06	mg/m3	1E-05
				205-99-2	Benzo(B)Fluoranthene	47.475602	mg/kg	1.2E-08	(µg/m3)	6.0E-05	1/(µg/m3)	7E-13	2.8E-11	mg/m3	NA	mg/m3	NA
				207-08-9	Benzo(K)Fluoranthene	16.534201	mg/kg	4.2E-09	(µg/m3)	6.0E-06	1/(µg/m3)	2E-14	9.7E-12	mg/m3	NA	mg/m3	NA
				117-81-7	Bis(2-Ethylhexyl) Phthalate	0.2198906	mg/kg	1.8E-11	(µg/m3)	2.4E-06	1/(µg/m3)	4E-17	1.3E-13	mg/m3	NA	mg/m3	NA
				218-01-9	Chrysene	47.756472	mg/kg	1.2E-08	(µg/m3)	6.0E-07	1/(µg/m3)	7E-15	2.8E-11	mg/m3	NA	mg/m3	NA
				53-70-3	Dibenz(A,H)Anthracene	8.1809379	mg/kg	2.1E-09	(µg/m3)	6.0E-04	1/(µg/m3)	1E-12	4.8E-12	mg/m3	NA	mg/m3	NA
				53-70-3	Dibenz(A,H)Anthracene	8.1809379	mg/kg	2.1E-09	(µg/m3)	6.0E-04	1/(µg/m3)	1E-12	4.8E-12	mg/m3	NA	mg/m3	NA
				132-64-9	Dibenzofuran	4.063906	mg/kg	3.0E-06	(µg/m3)	NA	1/(µg/m3)	NA	2.1E-08	mg/m3	NA	mg/m3	NA
				193-39-5	Indeno(1,2,3-C,D)Pyrene	26.84653	mg/kg	6.8E-09	(µg/m3)	6.0E-05	1/(µg/m3)	4E-13	1.6E-11	mg/m3	NA	mg/m3	NA
				91-20-3	Naphthalene	4.2285384	mg/kg	1.0E-05	(µg/m3)	3.4E-05	1/(µg/m3)	4E-10	7.3E-08	mg/m3	3.0E-03	mg/m3	2E-05
			Total Inhalation									6E-10					2E-04
		Total Dust Inhalation										6E-10					2E-04
	Total Soil Direct Contact and Dust Inhalation											2E-06					2E-02
Medium Total												2E-06					2E-02
												Total of Receptor Risks Across All Media 2E-06					Total of Receptor Hazards Across All Media 2E-02

Table I-12
Summary of Receptor Risks and Hazards for COPCs
(Central Landfill Area - Trespasser - Current)
Reasonable Maximum Exposure
Columbia Falls Aluminum Facility

Scenario Timeframe:	Current
Receptor Population:	Trespasser
Receptor Age:	Adolescent

Medium	Exposure Medium	Exposure Point	Cas Number	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
					Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Surface Soil	57-12-5	Cyanide	NA	NA	NA	NA	Testes (RfDo)	6E-04	NA	NA	6E-04
Central Landfill Area		0-0.5 ft bgs	16984-48-8	Fluoride	NA	NA	NA	NA	NA (RfDo)	6E-04	NA	NA	6E-04
ISM Dus			7440-47-3_EST	Chromium, Hexavalent - Estimated	9E-09	NA	NA	9E-09	NA (RfDo)	1E-05	NA	NA	1E-05
			7429-90-5	Aluminum	NA	NA	NA	NA	Neurological (RfDo)	1E-03	NA	NA	1E-03
			7440-36-0	Antimony	NA	NA	NA	NA	hematologic (longevity, blood glucose, and cholesterol) (RfDo)	7E-05	NA	NA	7E-05
			7440-38-2	Arsenic	5E-08	NA	1E-08	6E-08	Skin and blood (RfDo)	7E-04	NA	2E-04	9E-04
			7440-48-4	Cobalt	NA	NA	NA	NA	Thyroid (RfDo)	1E-03	NA	NA	1E-03
			7440-50-8	Copper	NA	NA	NA	NA	Gastrointestinal system (RfDo)	1E-04	NA	NA	1E-04
			7439-89-6	Iron	NA	NA	NA	NA	GI Ttract (RfDo)	1E-03	NA	NA	1E-03
			7439-96-5	Manganese	NA	NA	NA	NA	Nervous (RfDo)	1E-03	NA	NA	1E-03
			7439-97-6	Mercury	NA	NA	NA	NA	NA (RfDo)	NA	NA	NA	NA
			7440-02-0	Nickel	NA	NA	NA	NA	Body weight (RfDo)	2E-04	NA	NA	2E-04
			7782-49-2	Selenium	NA	NA	NA	NA	nervous, hematologic, dermal (RfDo)	4E-05	NA	NA	4E-05
			7440-28-0	Thallium	NA	NA	NA	NA	Skin (RfDo)	9E-04	NA	NA	9E-04
			7440-62-2	Vanadium	NA	NA	NA	NA	Dermal (RfDo)	3E-04	NA	NA	3E-04
			11097-69-1	PCB-1254 (Aroclor 1254)	2E-09	NA	1E-09	4E-09	Whole body (RfDo)	4E-04	NA	2E-04	6E-04
			56-55-3	Benzo(A)Anthracene	7E-08	NA	4E-08	1E-07	NA (RfDo)	NA	NA	NA	NA
			50-32-8	Benzo(A)Pyrene	7E-07	NA	4E-07	1E-06	Developmental (RfDo)	6E-03	NA	3E-03	9E-03
			205-99-2	Benzo(B)Fluoranthene	9E-08	NA	5E-08	1E-07	NA (RfDo)	NA	NA	NA	NA
			207-08-9	Benzo(K)Fluoranthene	3E-09	NA	2E-09	5E-09	NA (RfDo)	NA	NA	NA	NA
			117-81-7	Bis(2-Ethylhexyl) Phthalate	2E-11	NA	8E-12	3E-11	Liver (RfDo)	5E-07	NA	2E-07	7E-07
			218-01-9	Chrysene	9E-10	NA	5E-10	1E-09	NA (RfDo)	NA	NA	NA	NA
			53-70-3	Dibenz(A,H)Anthracene	2E-07	NA	8E-08	2E-07	NA (RfDo)	NA	NA	NA	NA
			132-64-9	Dibenzofuran	NA	NA	NA	NA	NA (RfDo)	2E-04	NA	2E-05	2E-04
			206-44-0	Fluoranthene	NA	NA	NA	NA	Whole body (RfDo)	9E-05	NA	5E-05	1E-04
			193-39-5	Indeno(1,2,3-C,D)Pyrene	5E-08	NA	3E-08	8E-08	NA (RfDo)	NA	NA	NA	NA
			91-20-3	Naphthalene	NA	NA	NA	NA	Body weight (RfDo)	9E-06	NA	5E-06	1E-05
				Chemical Total	1E-06	NA	6E-07	***2E-06***		1E-02	NA	4E-03	2E-02
		Exposure Point Total						***2E-06***					2E-02
	Exposure Medium Total							***2E-06***					2E-02
	Air	Airborne	57-12-5	Cyanide	NA	NA	NA	NA	Thyroid (RfC)	NA	2E-04	NA	2E-04
		vapors	16984-48-8	Fluoride	NA	NA	NA	NA	NA (RfC)	NA	2E-08	NA	2E-08
		/dust	7440-47-3_EST	Chromium, Hexavalent - Estimated	NA	2E-11	NA	2E-11	Lungs (RfC)	NA	6E-09	NA	6E-09
			7429-90-5	Aluminum	NA	NA	NA	NA	Neurological (RfC)	NA	4E-06	NA	4E-06
			7440-36-0	Antimony	NA	NA	NA	NA	NA (RfC)	NA	NA	NA	NA
			7440-38-2	Arsenic	NA	3E-12	NA	3E-12	cardiovascular, nervous, and skin (RfC)	NA	3E-07	NA	3E-07
			7440-48-4	Cobalt	NA	5E-12	NA	5E-12	Respiratory Tract; Lung (RfC)	NA	7E-07	NA	7E-07
			7440-50-8	Copper	NA	NA	NA	NA	NA (RfC)	NA	NA	NA	NA
			7439-89-6	Iron	NA	NA	NA	NA	NA (RfC)	NA	NA	NA	NA
			7439-96-5	Manganese	NA	NA	NA	NA	Nervous (RfC)	NA	7E-06	NA	7E-06
			7439-97-6	Mercury	NA	NA	NA	NA	Nervous (RfC)	NA	4E-06	NA	4E-06
			7440-02-0	Nickel	NA	2E-12	NA	2E-12	Resp. (RfC)	NA	5E-07	NA	5E-07
			7782-49-2	Selenium	NA	NA	NA	NA	NA (RfC)	NA	1E-10	NA	1E-10
			7440-28-0	Thallium	NA	NA	NA	NA	NA (RfC)	NA	NA	NA	NA
			7440-62-2	Vanadium	NA	NA	NA	NA	Resp. (RfC)	NA	2E-07	NA	2E-07
			11097-69-1	PCB-1254 (Aroclor 1254)	NA	1E-11	NA	1E-11	NA (RfC)	NA	NA	NA	NA
			56-55-3	Benzo(A)Anthracene	NA	2E-10	NA	2E-10	NA (RfC)	NA	NA	NA	NA
			50-32-8	Benzo(A)Pyrene	NA	2E-10	NA	2E-10	Developmental (RfC)	NA	NA	NA	NA
			205-99-2	Benzo(B)Fluoranthene	NA	6E-12	NA	6E-12	NA (RfC)	NA	1E-05	NA	1E-05
			207-08-9	Benzo(K)Fluoranthene	NA	7E-13	NA	7E-13	NA (RfC)	NA	NA	NA	NA
			117-81-7	Bis(2-Ethylhexyl) Phthalate	NA	2E-14	NA	2E-14	NA (RfC)	NA	NA	NA	NA

Table I-12
Summary of Receptor Risks and Hazards for COPCs
(Central Landfill Area - Trespasser - Current)
Reasonable Maximum Exposure
Columbia Falls Aluminum Facility

Scenario Timeframe:	Current
Receptor Population:	Trespasser
Receptor Age:	Adolescent

Medium	Exposure Medium	Exposure Point	Cas Number	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
					Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
	Air	Airborne vapors /dust	218-01-9	Chrysene	NA	4E-17	NA	4E-17	NA (RfC)	NA	NA	NA	NA
			53-70-3	Dibenz(A,H)Anthracene	NA	7E-15	NA	7E-15	NA (RfC)	NA	NA	NA	NA
			132-64-9	Dibenzofuran	NA	1E-12	NA	1E-12	NA (RfC)	NA	NA	NA	NA
			206-44-0	Fluoranthene	NA	1E-12	NA	1E-12	NA (RfC)	NA	NA	NA	NA
			193-39-5	Indeno(1,2,3-C,D)Pyrene	NA	NA	NA	NA	NA (RfC)	NA	NA	NA	NA
			91-20-3	Naphthalene	NA	4E-13	NA	4E-13	Nervous, Respiratory (RfC)	NA	NA	NA	NA
				Chemical Total	NA	4E-10	NA	4E-10		NA	2E-04	NA	2E-04
		Exposure Point Total						4E-10					2E-04
	Exposure Medium Total							4E-10					2E-04
Medium Total								***2E-06***					2E-02
Receptor Total							Receptor Risk Total	***2E-06***				Receptor HI Total	2E-02

Table I-13
Calculation of Chemical Cancer Risks and Non-Cancer Hazards
(Central Landfill Area - ISM - Trespasser - Current)
Reasonable Maximum Exposure
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Scenario Timeframe:	Current
Receptor Population:	Trespasser
Receptor Age:	Adolescent

Medium	Exposure Medium	Exposure point	Exposure route	Cas Number	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
								Intake/Exposure Concentration		CSF/Unit Risk		Cancer	Intake/Exposure Concentration		RfD/RfC		Hazard
						Value	Units	Value	Units	Value	Units	Risk	Value	Units	Value	Units	Quotient
Soil	Soil	Surface Soil 0-0.5 ft-bgs	Ingestion	57-12-5	Cyanide	5.3941748	mg/kg	3.4E-08	(mg/kg-day)	NA	1/(mg/kg-day)	NA	2.4E-07	(mg/kg-day)	6.0E-04	(mg/kg-day)	4E-04
				16984-48-8	Fluoride	484.68199	mg/kg	3.0E-06	(mg/kg-day)	NA	1/(mg/kg-day)	NA	2.1E-05	(mg/kg-day)	4.0E-02	(mg/kg-day)	5E-04
				7440-47-3_EST	Chromium, Hexavalent - Estimated	0.8245674	mg/kg	1.5E-08	(mg/kg-day)	5.0E-01	1/(mg/kg-day)	8E-09	3.6E-08	(mg/kg-day)	3.0E-03	(mg/kg-day)	1E-05
				7429-90-5	Aluminum	25208.599	mg/kg	1.6E-04	(mg/kg-day)	NA	1/(mg/kg-day)	NA	1.1E-03	(mg/kg-day)	1.0E+00	(mg/kg-day)	1E-03
				7440-36-0	Antimony	0.6404657	mg/kg	4.0E-09	(mg/kg-day)	NA	1/(mg/kg-day)	NA	2.8E-08	(mg/kg-day)	4.0E-04	(mg/kg-day)	7E-05
				7440-38-2	Arsenic	7.3398394	mg/kg	2.7E-08	(mg/kg-day)	1.5E+00	1/(mg/kg-day)	4E-08	1.9E-07	(mg/kg-day)	3.0E-04	(mg/kg-day)	6E-04
				7440-48-4	Cobalt	6.7592142	mg/kg	4.2E-08	(mg/kg-day)	NA	1/(mg/kg-day)	NA	2.9E-07	(mg/kg-day)	3.0E-04	(mg/kg-day)	1E-03
				7440-50-8	Copper	108.76106	mg/kg	6.8E-07	(mg/kg-day)	NA	1/(mg/kg-day)	NA	4.7E-06	(mg/kg-day)	4.0E-02	(mg/kg-day)	1E-04
				7439-89-6	Iron	20494.073	mg/kg	1.3E-04	(mg/kg-day)	NA	1/(mg/kg-day)	NA	8.9E-04	(mg/kg-day)	7.0E-01	(mg/kg-day)	1E-03
				7439-96-5	Manganese	557.43143	mg/kg	3.5E-06	(mg/kg-day)	NA	1/(mg/kg-day)	NA	2.4E-05	(mg/kg-day)	2.4E-02	(mg/kg-day)	1E-03
				7439-97-6	Mercury	0.0416381	mg/kg	2.6E-10	(mg/kg-day)	NA	1/(mg/kg-day)	NA	1.8E-09	(mg/kg-day)	NA	(mg/kg-day)	NA
				7440-02-0	Nickel	49.755025	mg/kg	3.1E-07	(mg/kg-day)	NA	1/(mg/kg-day)	NA	2.2E-06	(mg/kg-day)	2.0E-02	(mg/kg-day)	1E-04
				7782-49-2	Selenium	2.8960475	mg/kg	1.8E-08	(mg/kg-day)	NA	1/(mg/kg-day)	NA	1.3E-07	(mg/kg-day)	5.0E-03	(mg/kg-day)	3E-05
				7440-28-0	Thallium	0.1651397	mg/kg	1.0E-09	(mg/kg-day)	NA	1/(mg/kg-day)	NA	7.2E-09	(mg/kg-day)	1.0E-05	(mg/kg-day)	7E-04
				7440-62-2	Vanadium	25.078513	mg/kg	1.6E-07	(mg/kg-day)	NA	1/(mg/kg-day)	NA	1.1E-06	(mg/kg-day)	5.0E-03	(mg/kg-day)	2E-04
				11097-69-1	PCB-1254 (Aroclor 1254)	0.2498239	mg/kg	1.6E-09	(mg/kg-day)	2.0E+00	1/(mg/kg-day)	3E-09	1.1E-08	(mg/kg-day)	2.0E-05	(mg/kg-day)	5E-04
				91-57-6	2-Methylnaphthalene	3.8887518	mg/kg	2.4E-08	(mg/kg-day)	NA	1/(mg/kg-day)	NA	1.7E-07	(mg/kg-day)	4.0E-03	(mg/kg-day)	4E-05
				56-55-3	Benzo(A)Anthracene	48.431015	mg/kg	9.0E-07	(mg/kg-day)	1.0E-01	1/(mg/kg-day)	9E-08	2.1E-06	(mg/kg-day)	NA	(mg/kg-day)	NA
				50-32-8	Benzo(A)Pyrene	47.975874	mg/kg	9.0E-07	(mg/kg-day)	1.0E+00	1/(mg/kg-day)	9E-07	2.1E-06	(mg/kg-day)	3.0E-04	(mg/kg-day)	7E-03
				205-99-2	Benzo(B)Fluoranthene	54.907891	mg/kg	1.0E-06	(mg/kg-day)	1.0E-01	1/(mg/kg-day)	1E-07	2.4E-06	(mg/kg-day)	NA	(mg/kg-day)	NA
				207-08-9	Benzo(K)Fluoranthene	23.769047	mg/kg	4.4E-07	(mg/kg-day)	1.0E-02	1/(mg/kg-day)	4E-09	1.0E-06	(mg/kg-day)	NA	(mg/kg-day)	NA
				92-52-4	Biphenyl (Diphenyl)	1.427299	mg/kg	8.9E-09	(mg/kg-day)	8.0E-03	1/(mg/kg-day)	7E-11	6.2E-08	(mg/kg-day)	5.0E-01	(mg/kg-day)	1E-07
				117-81-7	Bis(2-Ethylhexyl) Phthalate	0.1264368	mg/kg	7.9E-10	(mg/kg-day)	1.4E-02	1/(mg/kg-day)	1E-11	5.5E-09	(mg/kg-day)	2.0E-02	(mg/kg-day)	3E-07
				218-01-9	Chrysene	52.847833	mg/kg	9.9E-07	(mg/kg-day)	1.0E-03	1/(mg/kg-day)	1E-09	2.3E-06	(mg/kg-day)	NA	(mg/kg-day)	NA
				53-70-3	Dibenz(A,H)Anthracene	10.084171	mg/kg	1.9E-07	(mg/kg-day)	1.0E+00	1/(mg/kg-day)	2E-07	4.4E-07	(mg/kg-day)	NA	(mg/kg-day)	NA
				132-64-9	Dibenzofuran	9.0422005	mg/kg	5.6E-08	(mg/kg-day)	NA	1/(mg/kg-day)	NA	3.9E-07	(mg/kg-day)	1.0E-03	(mg/kg-day)	4E-04
				206-44-0	Fluoranthene	93.124745	mg/kg	5.8E-07	(mg/kg-day)	NA	1/(mg/kg-day)	NA	4.1E-06	(mg/kg-day)	4.0E-02	(mg/kg-day)	1E-04
				193-39-5	Indeno(1,2,3-C,D)Pyrene	32.869839	mg/kg	6.1E-07	(mg/kg-day)	1.0E-01	1/(mg/kg-day)	6E-08	1.4E-06	(mg/kg-day)	NA	(mg/kg-day)	NA
				91-20-3	Naphthalene	8.2178383	mg/kg	5.1E-08	(mg/kg-day)	NA	1/(mg/kg-day)	NA	3.6E-07	(mg/kg-day)	2.0E-02	(mg/kg-day)	2E-05
				129-00-0	Pyrene	88.764995	mg/kg	5.5E-07	(mg/kg-day)	NA	1/(mg/kg-day)	NA	3.9E-06	(mg/kg-day)	3.0E-02	(mg/kg-day)	1E-04
			Total Ingestion									1E-06					2E-02
			Dermal	57-12-5	Cyanide	5.3941748	mg/kg	NA	(mg/kg-day)	NA	1/(mg/kg-day)	NA	NA	(mg/kg-day)	6.0E-04	(mg/kg-day)	NA
				16984-48-8	Fluoride	484.68199	mg/kg	NA	(mg/kg-day)	NA	1/(mg/kg-day)	NA	NA	(mg/kg-day)	4.0E-02	(mg/kg-day)	NA
				7440-47-3_EST	Chromium, Hexavalent - Estimated	0.8245674	mg/kg	NA	(mg/kg-day)	1.3E-02	1/(mg/kg-day)	NA	NA	(mg/kg-day)	7.5E-05	(mg/kg-day)	NA
				7429-90-5	Aluminum	25208.599	mg/kg	NA	(mg/kg-day)	NA	1/(mg/kg-day)	NA	NA	(mg/kg-day)	1.0E+00	(mg/kg-day)	NA
				7440-36-0	Antimony	0.6404657	mg/kg	NA	(mg/kg-day)	NA	1/(mg/kg-day)	NA	NA	(mg/kg-day)	6.0E-05	(mg/kg-day)	NA
				7440-38-2	Arsenic	7.3398394	mg/kg	5.8E-09	(mg/kg-day)	1.5E+00	1/(mg/kg-day)	9E-09	4.1E-08	(mg/kg-day)	3.0E-04	(mg/kg-day)	1E-04
				7440-48-4	Cobalt	6.7592142	mg/kg	NA	(mg/kg-day)	NA	1/(mg/kg-day)	NA	NA	(mg/kg-day)	3.0E-04	(mg/kg-day)	NA
				7440-50-8	Copper	108.76106	mg/kg	NA	(mg/kg-day)	NA	1/(mg/kg-day)	NA	NA	(mg/kg-day)	4.0E-02	(mg/kg-day)	NA
				7439-89-6	Iron	20494.073	mg/kg	NA	(mg/kg-day)	NA	1/(mg/kg-day)	NA	NA	(mg/kg-day)	7.0E-01	(mg/kg-day)	NA
				7439-96-5	Manganese	557.43143	mg/kg	NA	(mg/kg-day)	NA	1/(mg/kg-day)	NA	NA	(mg/kg-day)	9.6E-04	(mg/kg-day)	NA
				7439-97-6	Mercury	0.0416381	mg/kg	NA	(mg/kg-day)	NA	1/(mg/kg-day)	NA	NA	(mg/kg-day)	NA	(mg/kg-day)	NA
				7440-02-0	Nickel	49.755025	mg/kg	NA	(mg/kg-day)	NA	1/(mg/kg-day)	NA	NA	(mg/kg-day)	8.0E-04	(mg/kg-day)	NA
				7782-49-2	Selenium	2.8960475	mg/kg	NA	(mg/kg-day)	NA	1/(mg/kg-day)	NA	NA	(mg/kg-day)	5.0E-03	(mg/kg-day)	NA
				7440-28-0	Thallium	0.1651397	mg/kg	NA	(mg/kg-day)	NA	1/(mg/kg-day)	NA	NA	(mg/kg-day)	1.0E-05	(mg/kg-day)	NA
				7440-62-2	Vanadium	25.078513	mg/kg	NA	(mg/kg-day)	NA	1/(mg/kg-day)	NA	NA	(mg/kg-day)	1.3E-04	(mg/kg-day)	NA
				11097-69-1	PCB-1254 (Aroclor 1254)	0.2498239	mg/kg	9.2E-10	(mg/kg-day)	2.0E+00	1/(mg/kg-day)	2E-09	6.4E-09	(mg/kg-day)	2.0E-05	(mg/kg-day)	3E-04
				91-57-6	2-Methylnaphthalene	3.8887518	mg/kg	1.3E-08	(mg/kg-day)	NA	1/(mg/kg-day)	NA	9.3E-08	(mg/kg-day)	4.0E-03	(mg/kg-day)	2E-05
				56-55-3	Benzo(A)Anthracene	48.431015	mg/kg	5.0E-07	(mg/kg-day)	1.0E-01	1/(mg/kg-day)	5E-08	1.2E-06	(mg/kg-day)	NA	(mg/kg-day)	NA
				50-32-8	Benzo(A)Pyrene	47.975874	mg/kg	4.9E-07	(mg/kg-day)	1.0E+00	1/(mg/kg-day)	5E-07	1.1E-06	(mg/kg-day)	3.0E-04	(mg/kg-day)	4E-03
				205-99-2	Benzo(B)Fluoranthene	54.907891	mg/kg	5.6E-07	(mg/kg-day)	1.0E-01	1/(mg/kg-day)	6E-08	1.3E-06	(mg/kg-day)	NA	(mg/kg-day)	NA
				207-08-9	Benzo(K)Fluoranthene	23.769047	mg/kg	2.4E-07	(mg/kg-day)	1.0E-02	1/(mg/kg-day)	2E-09	5.7E-07	(mg/kg-day)	NA	(mg/kg-day)	NA
				92-52-4	Biphenyl (Diphenyl)	1.427299	mg/kg	NA	(mg/kg-day)	8.0E-03	1/(mg/kg-day)	NA	NA	(mg/kg-day)	5.0E-01	(mg/kg-day)	NA
				117-81-7	Bis(2-Ethylhexyl) Phthalate	0.1264368	mg/kg	3.3E-10	(mg/kg-day)	1.4E-02	1/(mg/kg-day)	5E-12	2.3E-09	(mg/kg-day)	2.0E-02	(mg/kg-day)	1E-07
				218-01-9	Chrysene	52.847833	mg/kg	5.4E-07	(mg/kg-day)	1.0E-03	1/(mg/kg-day)	5E-10	1.3E-06	(mg/kg-day)	NA	(mg/kg-day)	NA
				53-70-3	Dibenz(A,H)Anthracene	10.084171	mg/kg	1.0E-07	(mg/kg-day)	1.0E+00	1/(mg/kg-day)	1E-07	2.4E-07	(mg/kg-day)	NA	(mg/kg-day)	NA
				132-64-9	Dibenzofuran	9.0422005	mg/kg	7.1E-09	(mg/kg-day)	NA	1/(mg/kg-day)	NA	5.0E-08	(mg/kg-day)	1.0E-03	(mg/kg-day)	5E-05

Table I-13
Calculation of Chemical Cancer Risks and Non-Cancer Hazards
(Central Landfill Area - ISM - Trespasser - Current)
Reasonable Maximum Exposure
Columbia Falls Aluminum Facility
Columbia Falls, Montana

Scenario Timeframe:	Current
Receptor Population:	Trespasser
Receptor Age:	Adolescent

Medium	Exposure Medium	Exposure point	Exposure route	Cas Number	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
								Intake/Exposure Concentration		CSF/Unit Risk		Cancer	Intake/Exposure Concentration		RfD/RfC		Hazard
						Value	Units	Value	Units	Value	Units	Risk	Value	Units	Value	Units	Quotient
			Dermal	206-44-0	Fluoranthene	93.124745	mg/kg	3.2E-07	(mg/kg-day)	NA	1/(mg/kg-day)	NA	2.2E-06	(mg/kg-day)	4.0E-02	(mg/kg-day)	6E-05
				193-39-5	Indeno(1,2,3-C,D)Pyrene	32.869839	mg/kg	3.4E-07	(mg/kg-day)	1.0E-01	1/(mg/kg-day)	3E-08	7.9E-07	(mg/kg-day)	NA	(mg/kg-day)	NA
				91-20-3	Naphthalene	8.2178383	mg/kg	2.8E-08	(mg/kg-day)	NA	1/(mg/kg-day)	NA	2.0E-07	(mg/kg-day)	2.0E-02	(mg/kg-day)	1E-05
				129-00-0	Pyrene	88.764995	mg/kg	3.0E-07	(mg/kg-day)	NA	1/(mg/kg-day)	NA	2.1E-06	(mg/kg-day)	3.0E-02	(mg/kg-day)	7E-05
			Total Dermal									7E-07					4E-03
		Total Soil Direct Contact										2E-06					2E-02
	Air	Airborne	Inhalation	57-12-5	Cyanide	5.3941748	mg/kg	1.2E-05	(µg/m3)	NA	1/(µg/m3)	NA	8.1E-08	mg/m3	8.0E-04	mg/m3	1E-04
		vapors		16984-48-8	Fluoride	484.68199	mg/kg	4.1E-08	(µg/m3)	NA	1/(µg/m3)	NA	2.8E-10	mg/m3	1.3E-02	mg/m3	2E-08
		/dust		7440-47-3_EST	Chromium, Hexavalent - Estimated	0.8245674	mg/kg	2.1E-10	(µg/m3)	8.4E-02	1/(µg/m3)	2E-11	4.8E-13	mg/m3	1.0E-04	mg/m3	5E-09
				7429-90-5	Aluminum	25208.599	mg/kg	2.1E-06	(µg/m3)	NA	1/(µg/m3)	NA	1.5E-08	mg/m3	5.0E-03	mg/m3	3E-06
				7440-36-0	Antimony	0.6404657	mg/kg	5.4E-11	(µg/m3)	NA	1/(µg/m3)	NA	3.8E-13	mg/m3	NA	mg/m3	NA
				7440-38-2	Arsenic	7.3398394	mg/kg	6.2E-10	(µg/m3)	4.3E-03	1/(µg/m3)	3E-12	4.3E-12	mg/m3	1.5E-05	mg/m3	3E-07
				7440-48-4	Cobalt	6.7592142	mg/kg	5.7E-10	(µg/m3)	9.0E-03	1/(µg/m3)	5E-12	4.0E-12	mg/m3	6.0E-06	mg/m3	7E-07
				7440-50-8	Copper	108.76106	mg/kg	9.1E-09	(µg/m3)	NA	1/(µg/m3)	NA	6.4E-11	mg/m3	NA	mg/m3	NA
				7439-89-6	Iron	20494.073	mg/kg	1.7E-06	(µg/m3)	NA	1/(µg/m3)	NA	1.2E-08	mg/m3	NA	mg/m3	NA
				7439-96-5	Manganese	557.43143	mg/kg	4.7E-08	(µg/m3)	NA	1/(µg/m3)	NA	3.3E-10	mg/m3	5.0E-05	mg/m3	7E-06
				7439-97-6	Mercury	0.0416381	mg/kg	1.4E-07	(µg/m3)	NA	1/(µg/m3)	NA	9.6E-10	mg/m3	3.0E-04	mg/m3	3E-06
				7440-02-0	Nickel	49.755025	mg/kg	4.2E-09	(µg/m3)	2.6E-04	1/(µg/m3)	1E-12	2.9E-11	mg/m3	9.0E-05	mg/m3	3E-07
				7782-49-2	Selenium	2.8960475	mg/kg	2.4E-10	(µg/m3)	NA	1/(µg/m3)	NA	1.7E-12	mg/m3	2.0E-02	mg/m3	9E-11
				7440-28-0	Thallium	0.1651397	mg/kg	1.4E-11	(µg/m3)	NA	1/(µg/m3)	NA	9.7E-14	mg/m3	NA	mg/m3	NA
				7440-62-2	Vanadium	25.078513	mg/kg	2.1E-09	(µg/m3)	NA	1/(µg/m3)	NA	1.5E-11	mg/m3	1.0E-04	mg/m3	1E-07
				11097-69-1	PCB-1254 (Aroclor 1254)	0.2498239	mg/kg	3.4E-08	(µg/m3)	5.7E-04	1/(µg/m3)	2E-11	2.4E-10	mg/m3	NA	mg/m3	NA
				91-57-6	2-Methylnaphthalene	3.8887518	mg/kg	3.3E-10	(µg/m3)	NA	1/(µg/m3)	NA	2.3E-12	mg/m3	NA	mg/m3	NA
				56-55-3	Benzo(A)Anthracene	48.431015	mg/kg	3.8E-06	(µg/m3)	6.0E-05	1/(µg/m3)	2E-10	8.8E-09	mg/m3	NA	mg/m3	NA
				50-32-8	Benzo(A)Pyrene	47.975874	mg/kg	1.2E-08	(µg/m3)	6.0E-04	1/(µg/m3)	7E-12	2.8E-11	mg/m3	2.0E-06	mg/m3	1E-05
				205-99-2	Benzo(B)Fluoranthene	54.907891	mg/kg	1.4E-08	(µg/m3)	6.0E-05	1/(µg/m3)	8E-13	3.2E-11	mg/m3	NA	mg/m3	NA
				207-08-9	Benzo(K)Fluoranthene	23.769047	mg/kg	6.0E-09	(µg/m3)	6.0E-06	1/(µg/m3)	4E-14	1.4E-11	mg/m3	NA	mg/m3	NA
				92-52-4	Biphenyl (Diphenyl)	1.427299	mg/kg	1.2E-10	(µg/m3)	NA	1/(µg/m3)	NA	8.4E-13	mg/m3	4.0E-04	mg/m3	2E-09
				117-81-7	Bis(2-Ethylhexyl) Phthalate	0.1264368	mg/kg	1.1E-11	(µg/m3)	2.4E-06	1/(µg/m3)	3E-17	7.4E-14	mg/m3	NA	mg/m3	NA
				218-01-9	Chrysene	52.847833	mg/kg	1.3E-08	(µg/m3)	6.0E-07	1/(µg/m3)	8E-15	3.1E-11	mg/m3	NA	mg/m3	NA
				53-70-3	Dibenz(A,H)Anthracene	10.084171	mg/kg	2.5E-09	(µg/m3)	6.0E-04	1/(µg/m3)	2E-12	5.9E-12	mg/m3	NA	mg/m3	NA
				132-64-9	Dibenzofuran	9.0422005	mg/kg	6.6E-06	(µg/m3)	NA	1/(µg/m3)	NA	4.6E-08	mg/m3	NA	mg/m3	NA
				206-44-0	Fluoranthene	93.124745	mg/kg	7.8E-09	(µg/m3)	NA	1/(µg/m3)	NA	5.5E-11	mg/m3	NA	mg/m3	NA
				193-39-5	Indeno(1,2,3-C,D)Pyrene	32.869839	mg/kg	8.3E-09	(µg/m3)	6.0E-05	1/(µg/m3)	5E-13	1.9E-11	mg/m3	NA	mg/m3	NA
				91-20-3	Naphthalene	8.2178383	mg/kg	2.0E-05	(µg/m3)	3.4E-05	1/(µg/m3)	7E-10	1.4E-07	mg/m3	3.0E-03	mg/m3	5E-05
				129-00-0	Pyrene	88.764995	mg/kg	4.3E-06	(µg/m3)	NA	1/(µg/m3)	NA	3.0E-08	mg/m3	NA	mg/m3	NA
			Total Inhalation									1E-09					2E-04
		Total Dust Inhalation										1E-09					2E-04
	Total Soil Direct Contact and Dust Inhalation											2E-06					2E-02
Medium Total												2E-06					2E-02
											Total of Receptor Risks Across All Media	2E-06				Total of Receptor Hazards Across All Media	2E-02

Table I-14
Summary of Receptor Risks and Hazards for COPCs
(Central Landfill Area - Trespasser - Current)
Reasonable Maximum Exposure
Columbia Falls Aluminum Facility

Scenario Timeframe:	Current
Receptor Population:	Trespasser
Receptor Age:	Adolescent

Medium	Exposure Medium	Exposure Point	Cas Number	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
					Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Surface Soil	57-12-5	Cyanide	NA	NA	NA	NA	Testes (RfDo)	4E-04	NA	NA	4E-04
Central Landfill Area		0-0.5 ft bgs	16984-48-8	Fluoride	NA	NA	NA	NA	NA (RfDo)	5E-04	NA	NA	5E-04
ISM Dus			7440-47-3_EST	Chromium, Hexavalent - Estimated	8E-09	NA	NA	8E-09	NA (RfDo)	1E-05	NA	NA	1E-05
			7429-90-5	Aluminum	NA	NA	NA	NA	Neurological (RfDo)	1E-03	NA	NA	1E-03
			7440-36-0	Antimony	NA	NA	NA	NA	hematologic (longevity, blood glucose, and cholesterol) (RfDo)	7E-05	NA	NA	7E-05
			7440-38-2	Arsenic	4E-08	NA	9E-09	5E-08	Skin and blood (RfDo)	6E-04	NA	1E-04	8E-04
			7440-48-4	Cobalt	NA	NA	NA	NA	Thyroid (RfDo)	1E-03	NA	NA	1E-03
			7440-50-8	Copper	NA	NA	NA	NA	Gastrointestinal system (RfDo)	1E-04	NA	NA	1E-04
			7439-89-6	Iron	NA	NA	NA	NA	GI Ttract (RfDo)	1E-03	NA	NA	1E-03
			7439-96-5	Manganese	NA	NA	NA	NA	Nervous (RfDo)	1E-03	NA	NA	1E-03
			7439-97-6	Mercury	NA	NA	NA	NA	NA (RfDo)	NA	NA	NA	NA
			7440-02-0	Nickel	NA	NA	NA	NA	Body weight (RfDo)	1E-04	NA	NA	1E-04
			7782-49-2	Selenium	NA	NA	NA	NA	nervous, hematologic, dermal (RfDo)	3E-05	NA	NA	3E-05
			7440-28-0	Thallium	NA	NA	NA	NA	Skin (RfDo)	7E-04	NA	NA	7E-04
			7440-62-2	Vanadium	NA	NA	NA	NA	Dermal (RfDo)	2E-04	NA	NA	2E-04
			11097-69-1	PCB-1254 (Aroclor 1254)	3E-09	NA	2E-09	5E-09	Whole body (RfDo)	5E-04	NA	3E-04	9E-04
			91-57-6	2-Methylnaphthalene	NA	NA	NA	NA	Lungs (RfDo)	4E-05	NA	2E-05	7E-05
			56-55-3	Benzo(A)Anthracene	9E-08	NA	5E-08	1E-07	NA (RfDo)	NA	NA	NA	NA
			50-32-8	Benzo(A)Pyrene	9E-07	NA	5E-07	1E-06	Developmental (RfDo)	7E-03	NA	4E-03	1E-02
			205-99-2	Benzo(B)Fluoranthene	1E-07	NA	6E-08	2E-07	NA (RfDo)	NA	NA	NA	NA
			207-08-9	Benzo(K)Fluoranthene	4E-09	NA	2E-09	7E-09	NA (RfDo)	NA	NA	NA	NA
			92-52-4	Biphenyl (Diphenyl)	7E-11	NA	NA	7E-11	Kidney (RfDo)	1E-07	NA	NA	1E-07
			117-81-7	Bis(2-Ethylhexyl) Phthalate	1E-11	NA	5E-12	2E-11	Liver (RfDo)	3E-07	NA	1E-07	4E-07
			218-01-9	Chrysene	1E-09	NA	5E-10	2E-09	NA (RfDo)	NA	NA	NA	NA
			53-70-3	Dibenz(A,H)Anthracene	NA	NA	1E-07	1E-07	NA (RfDo)	1E-04	NA	NA	1E-04
			132-64-9	Dibenzofuran	6E-08	NA	NA	6E-08	NA (RfDo)	NA	NA	5E-05	5E-05
			206-44-0	Fluoranthene	NA	NA	NA	NA	Whole body (RfDo)	2E-05	NA	6E-05	7E-05
			193-39-5	Indeno(1,2,3-C,D)Pyrene	6E-08	NA	3E-08	1E-07	NA (RfDo)	NA	NA	NA	NA
			91-20-3	Naphthalene	NA	NA	NA	NA	Body weight (RfDo)	2E-05	NA	1E-05	3E-05
			129-00-0	Pyrene	NA	NA	NA	NA	Kidney (RfDo)	1E-04	NA	7E-05	2E-04
				Chemical Total	1E-06	NA	7E-07	***2E-06***		2E-02	NA	4E-03	2E-02
		Exposure Point Total						***2E-06***					2E-02
Exposure Medium Total								***2E-06***					2E-02
Air	Airborne		57-12-5	Cyanide	NA	NA	NA	NA	Thyroid (RfC)	NA	1E-04	NA	1E-04
	vapors		16984-48-8	Fluoride	NA	NA	NA	NA	NA (RfC)	NA	2E-08	NA	2E-08
	/dust		7440-47-3_EST	Chromium, Hexavalent - Estimated	NA	2E-11	NA	2E-11	Lungs (RfC)	NA	5E-09	NA	5E-09
			7429-90-5	Aluminum	NA	NA	NA	NA	Neurological (RfC)	NA	3E-06	NA	3E-06
			7440-36-0	Antimony	NA	NA	NA	NA	NA (RfC)	NA	NA	NA	NA
			7440-38-2	Arsenic	NA	3E-12	NA	3E-12	cardiovascular, nervous, and skin (RfC)	NA	3E-07	NA	3E-07
			7440-48-4	Cobalt	NA	5E-12	NA	5E-12	Respiratory Tract; Lung (RfC)	NA	7E-07	NA	7E-07
			7440-50-8	Copper	NA	NA	NA	NA	NA (RfC)	NA	NA	NA	NA
			7439-89-6	Iron	NA	NA	NA	NA	NA (RfC)	NA	NA	NA	NA
			7439-96-5	Manganese	NA	NA	NA	NA	Nervous (RfC)	NA	7E-06	NA	7E-06
			7439-97-6	Mercury	NA	NA	NA	NA	Nervous (RfC)	NA	3E-06	NA	3E-06
			7440-02-0	Nickel	NA	1E-12	NA	1E-12	Resp. (RfC)	NA	3E-07	NA	3E-07
			7782-49-2	Selenium	NA	NA	NA	NA	NA (RfC)	NA	9E-11	NA	9E-11
			7440-28-0	Thallium	NA	NA	NA	NA	NA (RfC)	NA	NA	NA	NA
			7440-62-2	Vanadium	NA	NA	NA	NA	Resp. (RfC)	NA	1E-07	NA	1E-07
			11097-69-1	PCB-1254 (Aroclor 1254)	NA	2E-11	NA	2E-11	NA (RfC)	NA	NA	NA	NA
			91-57-6	2-Methylnaphthalene	NA	NA	NA	NA	NA (RfC)	NA	NA	NA	NA
			56-55-3	Benzo(A)Anthracene	NA	2E-10	NA	2E-10	NA (RfC)	NA	NA	NA	NA

Table I-14
Summary of Receptor Risks and Hazards for COPCs
(Central Landfill Area - Trespasser - Current)
Reasonable Maximum Exposure
Columbia Falls Aluminum Facility

Scenario Timeframe:	Current
Receptor Population:	Trespasser
Receptor Age:	Adolescent

Medium	Exposure Medium	Exposure Point	Cas Number	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
					Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
	Air	Airborne vapors /dust	50-32-8	Benzo(A)Pyrene	NA	7E-12	NA	7E-12	Developmental (RfC)	NA	1E-05	NA	1E-05
			205-99-2	Benzo(B)Fluoranthene	NA	8E-13	NA	8E-13	NA (RfC)	NA	NA	NA	NA
			207-08-9	Benzo(K)Fluoranthene	NA	4E-14	NA	4E-14	NA (RfC)	NA	NA	NA	NA
			92-52-4	Biphenyl (Diphenyl)	NA	NA	NA	NA	Liver; Kidney (RfC)	NA	2E-09	NA	2E-09
			117-81-7	Bis(2-Ethylhexyl) Phthalate	NA	3E-17	NA	3E-17	NA (RfC)	NA	NA	NA	NA
			218-01-9	Chrysene	NA	8E-15	NA	8E-15	NA (RfC)	NA	NA	NA	NA
			53-70-3	Dibenz(A,H)Anthracene	NA	2E-12	NA	2E-12	NA (RfC)	NA	NA	NA	NA
			132-64-9	Dibenzofuran	NA	NA	NA	NA	NA (RfC)	NA	NA	NA	NA
			206-44-0	Fluoranthene	NA	NA	NA	NA	NA (RfC)	NA	NA	NA	NA
			193-39-5	Indeno(1,2,3-C,D)Pyrene	NA	5E-13	NA	5E-13	NA (RfC)	NA	NA	NA	NA
			91-20-3	Naphthalene	NA	7E-10	NA	7E-10	Nervous, Respiratory (RfC)	NA	5E-05	NA	5E-05
			129-00-0	Pyrene	NA	NA	NA	NA	NA (RfC)	NA	NA	NA	NA
				Chemical Total	NA	1E-09	NA	1E-09		NA	2E-04	NA	2E-04
		Exposure Point Total						1E-09					2E-04
	Exposure Medium Total							1E-09					2E-04
Medium Total								***2E-06***					2E-02
Receptor Total							Receptor Risk Total	***2E-06***				Receptor HI Total	2E-02

Appendix J Additional Groundwater Evaluation

Table J-1
Calculation of Chemical Cancer Risks and Non-Cancer Hazards
(Resident - Adult - Future)
Reasonable Maximum Exposure
Columbia Falls Aluminum Facility

Scenario Timeframe:	Future
Receptor Population:	Resident
Receptor Age:	Adult

Medium	Exposure Medium	Exposure point	Exposure route	Cas Number	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
								Intake/Exposure Concentration[1]		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
						Value	Units	Value	Units	Value	Units		Value	Units	Value	Units	
Plume Area Upper Hydrogeologic Unit Groundwater	Plume Area Upper Hydrogeologic Unit Groundwater	Tapwater	Ingestion	57-12-5	Cyanide	1355	µg/l	1.7E-02	(mg/kg-day)	NA	1/(mg/kg-day)	NA	4.1E-02	(mg/kg-day)	6.0E-04	(mg/kg-day)	7E+01
				FREE CN	Cyanide (Free)	43.13	µg/l	5.5E-04	(mg/kg-day)	NA	1/(mg/kg-day)	NA	1.3E-03	(mg/kg-day)	6.0E-04	(mg/kg-day)	2E+00
				16984-48-8	Fluoride	7287	µg/l	9.4E-02	(mg/kg-day)	NA	1/(mg/kg-day)	NA	2.2E-01	(mg/kg-day)	4.0E-02	(mg/kg-day)	5E+00
				7429-90-5	Aluminum	143.1	µg/l	1.8E-03	(mg/kg-day)	NA	1/(mg/kg-day)	NA	4.3E-03	(mg/kg-day)	1.0E+00	(mg/kg-day)	4E-03
				7440-36-0	Antimony	0.885	µg/l	1.1E-05	(mg/kg-day)	NA	1/(mg/kg-day)	NA	2.7E-05	(mg/kg-day)	4.0E-04	(mg/kg-day)	7E-02
				7440-38-2	Arsenic	9.862	µg/l	1.3E-04	(mg/kg-day)	1.5E+00	1/(mg/kg-day)	2E-04	3.0E-04	(mg/kg-day)	3.0E-04	(mg/kg-day)	1E+00
				7440-48-4	Cobalt	5.871	µg/l	7.5E-05	(mg/kg-day)	NA	1/(mg/kg-day)	NA	1.8E-04	(mg/kg-day)	3.0E-04	(mg/kg-day)	6E-01
				7440-50-8	Copper	62.52	µg/l	8.0E-04	(mg/kg-day)	NA	1/(mg/kg-day)	NA	1.9E-03	(mg/kg-day)	4.0E-02	(mg/kg-day)	5E-02
				7439-89-6	Iron	954.6	µg/l	1.2E-02	(mg/kg-day)	NA	1/(mg/kg-day)	NA	2.9E-02	(mg/kg-day)	7.0E-01	(mg/kg-day)	4E-02
				7439-96-5	Manganese	68.58	µg/l	8.8E-04	(mg/kg-day)	NA	1/(mg/kg-day)	NA	2.1E-03	(mg/kg-day)	2.4E-02	(mg/kg-day)	9E-02
				7439-97-6	Mercury	0.13	µg/l	1.7E-06	(mg/kg-day)	NA	1/(mg/kg-day)	NA	3.9E-06	(mg/kg-day)	NA	(mg/kg-day)	NA
				7782-49-2	Selenium	1.484	µg/l	1.9E-05	(mg/kg-day)	NA	1/(mg/kg-day)	NA	4.4E-05	(mg/kg-day)	5.0E-03	(mg/kg-day)	9E-03
				7440-62-2	Vanadium	9.382	µg/l	1.2E-04	(mg/kg-day)	NA	1/(mg/kg-day)	NA	2.8E-04	(mg/kg-day)	5.0E-03	(mg/kg-day)	6E-02
			Total Ingestion									2E-04					8E+01
			Dermal	57-12-5	Cyanide	1355	µg/l	9.3E-05	(mg/kg-day)	NA	1/(mg/kg-day)	NA	2.3E-04	(mg/kg-day)	6.0E-04	(mg/kg-day)	4E-01
				FREE CN	Cyanide (Free)	43.13	µg/l	3.0E-06	(mg/kg-day)	NA	1/(mg/kg-day)	NA	7.2E-06	(mg/kg-day)	6.0E-04	(mg/kg-day)	1E-02
				16984-48-8	Fluoride	7287	µg/l	5.0E-04	(mg/kg-day)	NA	1/(mg/kg-day)	NA	1.2E-03	(mg/kg-day)	4.0E-02	(mg/kg-day)	3E-02
				7429-90-5	Aluminum	143.1	µg/l	9.8E-06	(mg/kg-day)	NA	1/(mg/kg-day)	NA	2.4E-05	(mg/kg-day)	1.0E+00	(mg/kg-day)	2E-05
				7440-36-0	Antimony	0.885	µg/l	6.1E-08	(mg/kg-day)	NA	1/(mg/kg-day)	NA	1.5E-07	(mg/kg-day)	4.0E-04	(mg/kg-day)	4E-04
				7440-38-2	Arsenic	9.862	µg/l	6.8E-07	(mg/kg-day)	1.5E+00	1/(mg/kg-day)	1E-06	1.6E-06	(mg/kg-day)	3.0E-04	(mg/kg-day)	5E-03
				7440-48-4	Cobalt	5.871	µg/l	1.6E-07	(mg/kg-day)	NA	1/(mg/kg-day)	NA	3.9E-07	(mg/kg-day)	3.0E-04	(mg/kg-day)	1E-03
				7440-50-8	Copper	62.52	µg/l	4.3E-06	(mg/kg-day)	NA	1/(mg/kg-day)	NA	1.0E-05	(mg/kg-day)	4.0E-02	(mg/kg-day)	3E-04
				7439-89-6	Iron	954.6	µg/l	6.5E-05	(mg/kg-day)	NA	1/(mg/kg-day)	NA	1.6E-04	(mg/kg-day)	7.0E-01	(mg/kg-day)	2E-04
				7439-96-5	Manganese	68.58	µg/l	4.7E-06	(mg/kg-day)	NA	1/(mg/kg-day)	NA	1.1E-05	(mg/kg-day)	2.4E-02	(mg/kg-day)	5E-04
				7439-97-6	Mercury	0.13	µg/l	8.9E-09	(mg/kg-day)	NA	1/(mg/kg-day)	NA	2.2E-08	(mg/kg-day)	NA	(mg/kg-day)	NA
				7782-49-2	Selenium	1.484	µg/l	1.0E-07	(mg/kg-day)	NA	1/(mg/kg-day)	NA	2.5E-07	(mg/kg-day)	5.0E-03	(mg/kg-day)	5E-05
				7440-62-2	Vanadium	9.382	µg/l	6.4E-07	(mg/kg-day)	NA	1/(mg/kg-day)	NA	1.6E-06	(mg/kg-day)	5.0E-03	(mg/kg-day)	3E-04
			Total Dermal									1E-06					4E-01
		Total tapwater										1E-06					4E-01
	Total Groundwater Direct Contact											2E-04					8E+01
Medium Total												2E-04					8E+01
												Total of Receptor Risks Across All Media 2E-04					Total of Receptor Hazards Across All Media 8E+01

Table J-2
Summary of Receptor Risks and Hazards for COPCs
(Upper Hydrogeologic Unit Plume Area - Resident Adult - Future)
Reasonable Maximum Exposure
Columbia Falls Aluminum Facility

Scenario Timeframe:	Future
Receptor Population:	Resident
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Cas Number	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
					Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Upper Hydrogeologic Unit Plume Area Groundwater	Upper Hydrogeologic Unit Plume Area Groundwater	Tapwater	57-12-5	Cyanide	NA	NA	NA	NA	Testes (RfDo)	***7E+01***	NA	4E-01	***7E+01***
			FREE CN	Cyanide (Free)	NA	NA	NA	NA	Testes (RfDo)	***2E+00***	NA	1E-02	***2E+00***
			16984-48-8	Fluoride	NA	NA	NA	NA	NA (RfDo)	***5E+00***	NA	3E-02	***5E+00***
			7429-90-5	Aluminum	NA	NA	NA	NA	Neurological (RfDo)	4E-03	NA	2E-05	4E-03
			7440-36-0	Antimony	NA	NA	NA	NA	hematologic (longevity, blood glucose, and cholesterol) (RfDo)	7E-02	NA	4E-04	7E-02
			7440-38-2	Arsenic	***2E-04***	NA	***1E-06***	***2E-04***	Skin and blood (RfDo)	1E+00	NA	5E-03	1E+00
			7440-48-4	Cobalt	NA	NA	NA	NA	Thyroid (RfDo)	6E-01	NA	1E-03	6E-01
			7440-50-8	Copper	NA	NA	NA	NA	Gastrointestinal system (RfDo)	5E-02	NA	3E-04	5E-02
			7439-89-6	Iron	NA	NA	NA	NA	GI Ttract (RfDo)	4E-02	NA	2E-04	4E-02
			7439-96-5	Manganese	NA	NA	NA	NA	Nervous (RfDo)	9E-02	NA	5E-04	9E-02
			7439-97-6	Mercury	NA	NA	NA	NA	NA (RfDo)	NA	NA	NA	NA
			7782-49-2	Selenium	NA	NA	NA	NA	nervous, hematologic, dermal (RfDo)	9E-03	NA	5E-05	9E-03
			7440-62-2	Vanadium	NA	NA	NA	NA	Dermal (RfDo)	6E-02	NA	3E-04	6E-02
				Chemical Total	***2E-04***	NA	***1E-06***	***2E-04***		***8E+01***	NA	4E-01	***8E+01***
		Exposure Point Total						***2E-04***					***8E+01***
	Exposure Medium Total							***2E-04***					***8E+01***
Medium Total								***2E-04***					***8E+01***
Receptor Total							Receptor Risk Total	***2E-04***				Receptor HI Total	***8E+01***

Table J-3
Calculation of Chemical Cancer Risks and Non-Cancer Hazards
(Resident - Child - Future)
Reasonable Maximum Exposure
Columbia Falls Aluminum Facility

Scenario Timeframe:	Future
Receptor Population:	Resident
Receptor Age:	Child

Medium	Exposure Medium	Exposure point	Exposure route	Cas Number	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
								Intake/Exposure Concentration[1]		CSF/Unit Risk		Cancer	Intake/Exposure Concentration		RfD/RfC		Hazard
						Value	Units	Value	Units	Value	Units	Risk	Value	Units	Value	Units	Quotient
Plume Area Upper Hydrogeologic Unit Groundwater	Plume Area Upper Hydrogeologic Unit Groundwater	Tapwater	Ingestion	57-12-5	Cyanide	1355	µg/l	NA	(mg/kg-day)	NA	1/(mg/kg-day)	NA	6.8E-02	(mg/kg-day)	6.0E-04	(mg/kg-day)	1E+02
				FREE CN	Cyanide (Free)	43.13	µg/l	NA	(mg/kg-day)	NA	1/(mg/kg-day)	NA	2.2E-03	(mg/kg-day)	6.0E-04	(mg/kg-day)	4E+00
				16984-48-8	Fluoride	7287	µg/l	NA	(mg/kg-day)	NA	1/(mg/kg-day)	NA	3.6E-01	(mg/kg-day)	4.0E-02	(mg/kg-day)	9E+00
				7429-90-5	Aluminum	143.1	µg/l	NA	(mg/kg-day)	NA	1/(mg/kg-day)	NA	7.1E-03	(mg/kg-day)	1.0E+00	(mg/kg-day)	7E-03
				7440-36-0	Antimony	0.885	µg/l	NA	(mg/kg-day)	NA	1/(mg/kg-day)	NA	4.4E-05	(mg/kg-day)	4.0E-04	(mg/kg-day)	1E-01
				7440-38-2	Arsenic	9.862	µg/l	NA	(mg/kg-day)	1.5E+00	1/(mg/kg-day)	NA	4.9E-04	(mg/kg-day)	3.0E-04	(mg/kg-day)	2E+00
				7440-48-4	Cobalt	5.871	µg/l	NA	(mg/kg-day)	NA	1/(mg/kg-day)	NA	2.9E-04	(mg/kg-day)	3.0E-04	(mg/kg-day)	1E+00
				7440-50-8	Copper	62.52	µg/l	NA	(mg/kg-day)	NA	1/(mg/kg-day)	NA	3.1E-03	(mg/kg-day)	4.0E-02	(mg/kg-day)	8E-02
				7439-89-6	Iron	954.6	µg/l	NA	(mg/kg-day)	NA	1/(mg/kg-day)	NA	4.8E-02	(mg/kg-day)	7.0E-01	(mg/kg-day)	7E-02
				7439-96-5	Manganese	68.58	µg/l	NA	(mg/kg-day)	NA	1/(mg/kg-day)	NA	3.4E-03	(mg/kg-day)	2.4E-02	(mg/kg-day)	1E-01
				7439-97-6	Mercury	0.13	µg/l	NA	(mg/kg-day)	NA	1/(mg/kg-day)	NA	6.5E-06	(mg/kg-day)	NA	(mg/kg-day)	NA
				7782-49-2	Selenium	1.484	µg/l	NA	(mg/kg-day)	NA	1/(mg/kg-day)	NA	7.4E-05	(mg/kg-day)	5.0E-03	(mg/kg-day)	1E-02
				7440-62-2	Vanadium	9.382	µg/l	NA	(mg/kg-day)	NA	1/(mg/kg-day)	NA	4.7E-04	(mg/kg-day)	5.0E-03	(mg/kg-day)	9E-02
			Total Ingestion									NA					1E+02
			Dermal	57-12-5	Cyanide	1355	µg/l	NA	(mg/kg-day)	NA	1/(mg/kg-day)	NA	3.0E-04	(mg/kg-day)	6.0E-04	(mg/kg-day)	5E-01
				FREE CN	Cyanide (Free)	43.13	µg/l	NA	(mg/kg-day)	NA	1/(mg/kg-day)	NA	9.5E-06	(mg/kg-day)	6.0E-04	(mg/kg-day)	2E-02
				16984-48-8	Fluoride	7287	µg/l	NA	(mg/kg-day)	NA	1/(mg/kg-day)	NA	1.6E-03	(mg/kg-day)	4.0E-02	(mg/kg-day)	4E-02
				7429-90-5	Aluminum	143.1	µg/l	NA	(mg/kg-day)	NA	1/(mg/kg-day)	NA	3.1E-05	(mg/kg-day)	1.0E+00	(mg/kg-day)	3E-05
				7440-36-0	Antimony	0.885	µg/l	NA	(mg/kg-day)	NA	1/(mg/kg-day)	NA	1.9E-07	(mg/kg-day)	4.0E-04	(mg/kg-day)	5E-04
				7440-38-2	Arsenic	9.862	µg/l	NA	(mg/kg-day)	1.5E+00	1/(mg/kg-day)	NA	2.2E-06	(mg/kg-day)	3.0E-04	(mg/kg-day)	7E-03
				7440-48-4	Cobalt	5.871	µg/l	NA	(mg/kg-day)	NA	1/(mg/kg-day)	NA	5.2E-07	(mg/kg-day)	3.0E-04	(mg/kg-day)	2E-03
				7440-50-8	Copper	62.52	µg/l	NA	(mg/kg-day)	NA	1/(mg/kg-day)	NA	1.4E-05	(mg/kg-day)	4.0E-02	(mg/kg-day)	3E-04
				7439-89-6	Iron	954.6	µg/l	NA	(mg/kg-day)	NA	1/(mg/kg-day)	NA	2.1E-04	(mg/kg-day)	7.0E-01	(mg/kg-day)	3E-04
				7439-96-5	Manganese	68.58	µg/l	NA	(mg/kg-day)	NA	1/(mg/kg-day)	NA	1.5E-05	(mg/kg-day)	2.4E-02	(mg/kg-day)	6E-04
				7439-97-6	Mercury	0.13	µg/l	NA	(mg/kg-day)	NA	1/(mg/kg-day)	NA	2.9E-08	(mg/kg-day)	NA	(mg/kg-day)	NA
				7782-49-2	Selenium	1.484	µg/l	NA	(mg/kg-day)	NA	1/(mg/kg-day)	NA	3.3E-07	(mg/kg-day)	5.0E-03	(mg/kg-day)	7E-05
				7440-62-2	Vanadium	9.382	µg/l	NA	(mg/kg-day)	NA	1/(mg/kg-day)	NA	2.1E-06	(mg/kg-day)	5.0E-03	(mg/kg-day)	4E-04
			Total Dermal									NA					6E-01
		Total tapwater										NA					6E-01
	Total Groundwater Direct Contact											NA					1E+02
Medium Total												NA					1E+02
												NA					1E+02
												Total of Receptor Risks Across All Media					Total of Receptor Hazards Across All Media

Note:
1/ Carcinogenic risks for this receptor are calculated based on a time-weighted average approach and are presented on Table J-1.

Table J-4
Summary of Receptor Risks and Hazards for COPCs
(Upper Hydrogeologic Unit Plume Area - Resident Child - Future)
Reasonable Maximum Exposure
Columbia Falls Aluminum Facility

Scenario Timeframe:	Future
Receptor Population:	Resident
Receptor Age:	Child

Medium	Exposure Medium	Exposure Point	Cas Number	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
					Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Upper Hydrogeologic Unit Plume Area Groundwater	Upper Hydrogeologic Unit Plume Area Groundwater	Tapwater	57-12-5	Cyanide	NA	NA	NA	NA	Testes (RfDo)	***1E+02***	NA	5E-01	***1E+02***
			FREE CN	Cyanide (Free)	NA	NA	NA	NA	Testes (RfDo)	***4E+00***	NA	2E-02	***4E+00***
			16984-48-8	Fluoride	NA	NA	NA	NA	NA (RfDo)	***9E+00***	NA	4E-02	***9E+00***
			7429-90-5	Aluminum	NA	NA	NA	NA	Neurological (RfDo)	7E-03	NA	3E-05	7E-03
			7440-36-0	Antimony	NA	NA	NA	NA	hematologic (longevity, blood glucose, and cholesterol) (RfDo)	1E-01	NA	5E-04	1E-01
			7440-38-2	Arsenic	NA	NA	NA	NA	Skin and blood (RfDo)	***2E+00***	NA	7E-03	***2E+00***
			7440-48-4	Cobalt	NA	NA	NA	NA	Thyroid (RfDo)	1E+00	NA	2E-03	1E+00
			7440-50-8	Copper	NA	NA	NA	NA	Gastrointestinal system (RfDo)	8E-02	NA	3E-04	8E-02
			7439-89-6	Iron	NA	NA	NA	NA	GI Ttract (RfDo)	7E-02	NA	3E-04	7E-02
			7439-96-5	Manganese	NA	NA	NA	NA	Nervous (RfDo)	1E-01	NA	6E-04	1E-01
			7439-97-6	Mercury	NA	NA	NA	NA	NA (RfDo)	NA	NA	NA	NA
			7782-49-2	Selenium	NA	NA	NA	NA	nervous, hematologic, dermal (RfDo)	1E-02	NA	7E-05	1E-02
			7440-62-2	Vanadium	NA	NA	NA	NA	Dermal (RfDo)	9E-02	NA	4E-04	9E-02
				Chemical Total	NA	NA	NA	NA		***1E+02***	NA	6E-01	***1E+02***
		Exposure Point Total						NA					***1E+02***
	Exposure Medium Total							NA					***1E+02***
Medium Total								NA					***1E+02***
Receptor Total							Receptor Risk Total	NA				Receptor HI Total	***1E+02***

Table J-5
Calculation of Chemical Cancer Risks and Non-Cancer Hazards
(Below Upper Hydrogeologic Unit - Resident Adult - Future)
Reasonable Maximum Exposure
Columbia Falls Aluminum Facility

Scenario Timeframe:	Future
Receptor Population:	Resident
Receptor Age:	Adult

Medium	Exposure Medium	Exposure point	Exposure route	Cas Number	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
						Value	Units	Intake/Exposure Concentration[1]		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
								Value	Units	Value	Units		Value	Units	Value	Units	
Below Upper Hydrogeologic Unit Groundwater	Below Upper Hydrogeologic Unit Groundwater	Tapwater	Ingestion	57-12-5	Cyanide	3.094	µg/l	4.0E-05	(mg/kg-day)	NA	1/(mg/kg-day)	NA	9.3E-05	(mg/kg-day)	6.0E-04	(mg/kg-day)	2E-01
				FREE CN	Cyanide (Free)	1.912	µg/l	2.5E-05	(mg/kg-day)	NA	1/(mg/kg-day)	NA	5.7E-05	(mg/kg-day)	6.0E-04	(mg/kg-day)	1E-01
				16984-48-8	Fluoride	256.3	µg/l	3.3E-03	(mg/kg-day)	NA	1/(mg/kg-day)	NA	7.7E-03	(mg/kg-day)	4.0E-02	(mg/kg-day)	2E-01
				7429-90-5	Aluminum	1014	µg/l	1.3E-02	(mg/kg-day)	NA	1/(mg/kg-day)	NA	3.0E-02	(mg/kg-day)	1.0E+00	(mg/kg-day)	3E-02
				7440-36-0	Antimony	14.94	µg/l	1.9E-04	(mg/kg-day)	NA	1/(mg/kg-day)	NA	4.5E-04	(mg/kg-day)	4.0E-04	(mg/kg-day)	1E+00
				7440-38-2	Arsenic	2.156	µg/l	2.8E-05	(mg/kg-day)	1.5E+00	1/(mg/kg-day)	4E-05	6.5E-05	(mg/kg-day)	3.0E-04	(mg/kg-day)	2E-01
				7440-39-3	Barium	589.5	µg/l	7.6E-03	(mg/kg-day)	NA	1/(mg/kg-day)	NA	1.8E-02	(mg/kg-day)	2.0E-01	(mg/kg-day)	9E-02
				7440-48-4	Cobalt	1.88	µg/l	2.4E-05	(mg/kg-day)	NA	1/(mg/kg-day)	NA	5.6E-05	(mg/kg-day)	3.0E-04	(mg/kg-day)	2E-01
				7439-89-6	Iron	3355	µg/l	4.3E-02	(mg/kg-day)	NA	1/(mg/kg-day)	NA	1.0E-01	(mg/kg-day)	7.0E-01	(mg/kg-day)	1E-01
				7439-96-5	Manganese	302.1	µg/l	3.9E-03	(mg/kg-day)	NA	1/(mg/kg-day)	NA	9.1E-03	(mg/kg-day)	2.4E-02	(mg/kg-day)	4E-01
				7440-62-2	Vanadium	2.603	µg/l	3.3E-05	(mg/kg-day)	NA	1/(mg/kg-day)	NA	7.8E-05	(mg/kg-day)	5.0E-03	(mg/kg-day)	2E-02
				7440-66-6	Zinc	216.6	µg/l	2.8E-03	(mg/kg-day)	NA	1/(mg/kg-day)	NA	6.5E-03	(mg/kg-day)	3.0E-01	(mg/kg-day)	2E-02
				107-06-2	1,2-Dichloroethane	0.28	µg/l	3.6E-06	(mg/kg-day)	1.0E-01	1/(mg/kg-day)	4E-07	8.4E-06	(mg/kg-day)	6.0E-03	(mg/kg-day)	1E-03
			Total Ingestion									4E-05					3E+00
			Dermal	57-12-5	Cyanide	3.094	µg/l	2.1E-07	(mg/kg-day)	NA	1/(mg/kg-day)	NA	5.2E-07	(mg/kg-day)	6.0E-04	(mg/kg-day)	9E-04
				FREE CN	Cyanide (Free)	1.912	µg/l	1.3E-07	(mg/kg-day)	NA	1/(mg/kg-day)	NA	3.2E-07	(mg/kg-day)	6.0E-04	(mg/kg-day)	5E-04
				16984-48-8	Fluoride	256.3	µg/l	1.8E-05	(mg/kg-day)	NA	1/(mg/kg-day)	NA	4.3E-05	(mg/kg-day)	4.0E-02	(mg/kg-day)	1E-03
				7429-90-5	Aluminum	1014	µg/l	6.9E-05	(mg/kg-day)	NA	1/(mg/kg-day)	NA	1.7E-04	(mg/kg-day)	1.0E+00	(mg/kg-day)	2E-04
				7440-36-0	Antimony	14.94	µg/l	1.0E-06	(mg/kg-day)	NA	1/(mg/kg-day)	NA	2.5E-06	(mg/kg-day)	4.0E-04	(mg/kg-day)	6E-03
				7440-38-2	Arsenic	2.156	µg/l	1.5E-07	(mg/kg-day)	1.5E+00	1/(mg/kg-day)	2E-07	3.6E-07	(mg/kg-day)	3.0E-04	(mg/kg-day)	1E-03
				7440-39-3	Barium	589.5	µg/l	4.0E-05	(mg/kg-day)	NA	1/(mg/kg-day)	NA	9.9E-05	(mg/kg-day)	2.0E-01	(mg/kg-day)	5E-04
				7440-48-4	Cobalt	1.88	µg/l	5.2E-08	(mg/kg-day)	NA	1/(mg/kg-day)	NA	1.3E-07	(mg/kg-day)	3.0E-04	(mg/kg-day)	4E-04
				7439-89-6	Iron	3355	µg/l	2.3E-04	(mg/kg-day)	NA	1/(mg/kg-day)	NA	5.6E-04	(mg/kg-day)	7.0E-01	(mg/kg-day)	8E-04
				7439-96-5	Manganese	302.1	µg/l	2.1E-05	(mg/kg-day)	NA	1/(mg/kg-day)	NA	5.1E-05	(mg/kg-day)	2.4E-02	(mg/kg-day)	2E-03
				7440-62-2	Vanadium	2.603	µg/l	1.8E-07	(mg/kg-day)	NA	1/(mg/kg-day)	NA	4.4E-07	(mg/kg-day)	5.0E-03	(mg/kg-day)	9E-05
				7440-66-6	Zinc	216.6	µg/l	8.9E-06	(mg/kg-day)	NA	1/(mg/kg-day)	NA	2.2E-05	(mg/kg-day)	3.0E-01	(mg/kg-day)	7E-05
				107-06-2	1,2-Dichloroethane	0.28	µg/l	1.7E-07	(mg/kg-day)	1.0E-01	1/(mg/kg-day)	2E-08	4.0E-07	(mg/kg-day)	6.0E-03	(mg/kg-day)	7E-05
			Total Dermal									2E-07					1E-02
		Total tapwater										2E-07					1E-02
	Total Groundwater Direct Contact											4E-05					3E+00
Medium Total												4E-05					3E+00
											Total of Receptor Risks Across All Media	4E-05				Total of Receptor Hazards Across All Media	3E+00

Note:
1/ Carcinogenic risks for this receptor are calculated based on a time-weighted average approach and represent a lifetime average daily intake. Refer to the text for additional information.

Table J-6
Summary of Receptor Risks and Hazards for COPCs
(Below Upper Hydrogeologic Unit - Resident Adult - Future)
Reasonable Maximum Exposure
Columbia Falls Aluminum Facility

Scenario Timeframe:	Future
Receptor Population:	Resident
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Cas Number	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
					Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Below Upper Hydrogeologic Unit Groundwater	Below Upper Hydrogeologic Unit Groundwater	Tapwater	57-12-5	Cyanide	NA	NA	NA	NA	Testes (RfDo)	2E-01	NA	9E-04	2E-01
			FREE CN	Cyanide (Free)	NA	NA	NA	NA	Testes (RfDo)	1E-01	NA	5E-04	1E-01
			16984-48-8	Fluoride	NA	NA	NA	NA	NA (RfDo)	2E-01	NA	1E-03	2E-01
			7429-90-5	Aluminum	NA	NA	NA	NA	Neurological (RfDo)	3E-02	NA	2E-04	3E-02
			7440-36-0	Antimony	NA	NA	NA	NA	hematologic (longevity, blood glucose, and cholesterol) (RfDo)	1E+00	NA	6E-03	1E+00
			7440-38-2	Arsenic	***4E-05***	NA	2E-07	***4E-05***	Skin and blood (RfDo)	2E-01	NA	1E-03	2E-01
			7440-39-3	Barium	NA	NA	NA	NA	kidney (nephropathy) (RfDo)	9E-02	NA	5E-04	9E-02
			7440-48-4	Cobalt	NA	NA	NA	NA	Thyroid (RfDo)	2E-01	NA	4E-04	2E-01
			7439-89-6	Iron	NA	NA	NA	NA	GI Ttract (RfDo)	1E-01	NA	8E-04	1E-01
			7439-96-5	Manganese	NA	NA	NA	NA	Nervous (RfDo)	4E-01	NA	2E-03	4E-01
			7440-62-2	Vanadium	NA	NA	NA	NA	Dermal (RfDo)	2E-02	NA	9E-05	2E-02
			7440-66-6	Zinc	NA	NA	NA	NA	Blood (RfDo)	2E-02	NA	7E-05	2E-02
			107-06-2	1,2-Dichloroethane	4E-07	NA	2E-08	4E-07	Kidney (RfDo)	1E-03	NA	7E-05	1E-03
				Chemical Total	***4E-05***	NA	2E-07	***4E-05***		***3E+00***	NA	1E-02	***3E+00***
		Exposure Point Total						***4E-05***					***3E+00***
	Exposure Medium Total							***4E-05***					***3E+00***
Medium Total								***4E-05***					***3E+00***
Receptor Total							Receptor Risk Total	***4E-05***				Receptor HI Total	***3E+00***

Table J-7
Calculation of Chemical Cancer Risks and Non-Cancer Hazards
(Below Upper Hydrogeologic Unit - Resident Child - Future)
Reasonable Maximum Exposure
Columbia Falls Aluminum Facility

Scenario Timeframe:	Future
Receptor Population:	Resident
Receptor Age:	Child

Medium	Exposure Medium	Exposure point	Exposure route	Cas Number	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
						Value	Units	Intake/Exposure Concentration[1]		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
								Value	Units	Value	Units		Value	Units	Value	Units	
Below Upper Hydrogeologic Unit Groundwater	Below Upper Hydrogeologic Unit Groundwater	Tapwater	Ingestion	57-12-5	Cyanide	3.094	µg/l	NA	(mg/kg-day)	NA	1/(mg/kg-day)	NA	1.5E-04	(mg/kg-day)	6.0E-04	(mg/kg-day)	3E-01
				FREE CN	Cyanide (Free)	1.912	µg/l	NA	(mg/kg-day)	NA	1/(mg/kg-day)	NA	9.5E-05	(mg/kg-day)	6.0E-04	(mg/kg-day)	2E-01
				16984-48-8	Fluoride	256.3	µg/l	NA	(mg/kg-day)	NA	1/(mg/kg-day)	NA	1.3E-02	(mg/kg-day)	4.0E-02	(mg/kg-day)	3E-01
				7429-90-5	Aluminum	1014	µg/l	NA	(mg/kg-day)	NA	1/(mg/kg-day)	NA	5.1E-02	(mg/kg-day)	1.0E+00	(mg/kg-day)	5E-02
				7440-36-0	Antimony	14.94	µg/l	NA	(mg/kg-day)	NA	1/(mg/kg-day)	NA	7.4E-04	(mg/kg-day)	4.0E-04	(mg/kg-day)	2E+00
				7440-38-2	Arsenic	2.156	µg/l	NA	(mg/kg-day)	1.5E+00	1/(mg/kg-day)	NA	1.1E-04	(mg/kg-day)	3.0E-04	(mg/kg-day)	4E-01
				7440-39-3	Barium	589.5	µg/l	NA	(mg/kg-day)	NA	1/(mg/kg-day)	NA	2.9E-02	(mg/kg-day)	2.0E-01	(mg/kg-day)	1E-01
				7440-48-4	Cobalt	1.88	µg/l	NA	(mg/kg-day)	NA	1/(mg/kg-day)	NA	9.4E-05	(mg/kg-day)	3.0E-04	(mg/kg-day)	3E-01
				7439-89-6	Iron	3355	µg/l	NA	(mg/kg-day)	NA	1/(mg/kg-day)	NA	1.7E-01	(mg/kg-day)	7.0E-01	(mg/kg-day)	2E-01
				7439-96-5	Manganese	302.1	µg/l	NA	(mg/kg-day)	NA	1/(mg/kg-day)	NA	1.5E-02	(mg/kg-day)	2.4E-02	(mg/kg-day)	6E-01
				7440-62-2	Vanadium	2.603	µg/l	NA	(mg/kg-day)	NA	1/(mg/kg-day)	NA	1.3E-04	(mg/kg-day)	5.0E-03	(mg/kg-day)	3E-02
				7440-66-6	Zinc	216.6	µg/l	NA	(mg/kg-day)	NA	1/(mg/kg-day)	NA	1.1E-02	(mg/kg-day)	3.0E-01	(mg/kg-day)	4E-02
				107-06-2	1,2-Dichloroethane	0.28	µg/l	NA	(mg/kg-day)	1.0E-01	1/(mg/kg-day)	NA	1.4E-05	(mg/kg-day)	6.0E-03	(mg/kg-day)	2E-03
			Total Ingestion									NA					4E+00
			Dermal	57-12-5	Cyanide	3.094	µg/l	NA	(mg/kg-day)	NA	1/(mg/kg-day)	NA	6.8E-07	(mg/kg-day)	6.0E-04	(mg/kg-day)	1E-03
				FREE CN	Cyanide (Free)	1.912	µg/l	NA	(mg/kg-day)	NA	1/(mg/kg-day)	NA	4.2E-07	(mg/kg-day)	6.0E-04	(mg/kg-day)	7E-04
				16984-48-8	Fluoride	256.3	µg/l	NA	(mg/kg-day)	NA	1/(mg/kg-day)	NA	5.6E-05	(mg/kg-day)	4.0E-02	(mg/kg-day)	1E-03
				7429-90-5	Aluminum	1014	µg/l	NA	(mg/kg-day)	NA	1/(mg/kg-day)	NA	2.2E-04	(mg/kg-day)	1.0E+00	(mg/kg-day)	2E-04
				7440-36-0	Antimony	14.94	µg/l	NA	(mg/kg-day)	NA	1/(mg/kg-day)	NA	3.3E-06	(mg/kg-day)	4.0E-04	(mg/kg-day)	8E-03
				7440-38-2	Arsenic	2.156	µg/l	NA	(mg/kg-day)	1.5E+00	1/(mg/kg-day)	NA	4.7E-07	(mg/kg-day)	3.0E-04	(mg/kg-day)	2E-03
				7440-39-3	Barium	589.5	µg/l	NA	(mg/kg-day)	NA	1/(mg/kg-day)	NA	1.3E-04	(mg/kg-day)	2.0E-01	(mg/kg-day)	6E-04
				7440-48-4	Cobalt	1.88	µg/l	NA	(mg/kg-day)	NA	1/(mg/kg-day)	NA	1.7E-07	(mg/kg-day)	3.0E-04	(mg/kg-day)	6E-04
				7439-89-6	Iron	3355	µg/l	NA	(mg/kg-day)	NA	1/(mg/kg-day)	NA	7.4E-04	(mg/kg-day)	7.0E-01	(mg/kg-day)	1E-03
				7439-96-5	Manganese	302.1	µg/l	NA	(mg/kg-day)	NA	1/(mg/kg-day)	NA	6.6E-05	(mg/kg-day)	2.4E-02	(mg/kg-day)	3E-03
				7440-62-2	Vanadium	2.603	µg/l	NA	(mg/kg-day)	NA	1/(mg/kg-day)	NA	5.7E-07	(mg/kg-day)	5.0E-03	(mg/kg-day)	1E-04
				7440-66-6	Zinc	216.6	µg/l	NA	(mg/kg-day)	NA	1/(mg/kg-day)	NA	2.9E-05	(mg/kg-day)	3.0E-01	(mg/kg-day)	1E-04
				107-06-2	1,2-Dichloroethane	0.28	µg/l	NA	(mg/kg-day)	1.0E-01	1/(mg/kg-day)	NA	6.0E-07	(mg/kg-day)	6.0E-03	(mg/kg-day)	1E-04
			Total Dermal									NA					2E-02
		Total tapwater										NA					2E-02
	Total Groundwater Direct Contact											NA					4E+00
Medium Total												NA					4E+00
											Total of Receptor Risks Across All Media	NA				Total of Receptor Hazards Across All Media	4E+00

Note:
1/ Carcinogenic risks for this receptor are calculated based on a time-weighted average approach and are presented on Table J-5.

Table J-8
Summary of Receptor Risks and Hazards for COPCs
(Below Upper Hydrogeologic Unit - Resident Child - Future)
Reasonable Maximum Exposure
Columbia Falls Aluminum Facility

Scenario Timeframe:	Future
Receptor Population:	Resident
Receptor Age:	Child

Medium	Exposure Medium	Exposure Point	Cas Number	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
					Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Below Upper Hydrogeologic Unit Groundwater	Below Upper Hydrogeologic Unit Groundwater	Tapwater	57-12-5	Cyanide	NA	NA	NA	NA	Testes (RfDo)	3E-01	NA	1E-03	3E-01
			FREE CN	Cyanide (Free)	NA	NA	NA	NA	Testes (RfDo)	2E-01	NA	7E-04	2E-01
			16984-48-8	Fluoride	NA	NA	NA	NA	NA (RfDo)	3E-01	NA	1E-03	3E-01
			7429-90-5	Aluminum	NA	NA	NA	NA	Neurological (RfDo)	5E-02	NA	2E-04	5E-02
			7440-36-0	Antimony	NA	NA	NA	NA	hematologic (longevity, blood glucose, and cholesterol) (RfDo)	***2E+00***	NA	8E-03	***2E+00***
			7440-38-2	Arsenic	NA	NA	NA	NA	Skin and blood (RfDo)	4E-01	NA	2E-03	4E-01
			7440-39-3	Barium	NA	NA	NA	NA	kidney (nephropathy) (RfDo)	1E-01	NA	6E-04	1E-01
			7440-48-4	Cobalt	NA	NA	NA	NA	Thyroid (RfDo)	3E-01	NA	6E-04	3E-01
			7439-89-6	Iron	NA	NA	NA	NA	GI Ttract (RfDo)	2E-01	NA	1E-03	2E-01
			7439-96-5	Manganese	NA	NA	NA	NA	Nervous (RfDo)	6E-01	NA	3E-03	6E-01
			7440-62-2	Vanadium	NA	NA	NA	NA	Dermal (RfDo)	3E-02	NA	1E-04	3E-02
			7440-66-6	Zinc	NA	NA	NA	NA	Blood (RfDo)	4E-02	NA	1E-04	4E-02
			107-06-2	1,2-Dichloroethane	NA	NA	NA	NA	Kidney (RfDo)	2E-03	NA	1E-04	2E-03
				Chemical Total	NA	NA	NA	NA		***4E+00***	NA	2E-02	***4E+00***
		Exposure Point Total						NA					***4E+00***
	Exposure Medium Total							NA					***4E+00***
Medium Total								NA					***4E+00***
Receptor Total							Receptor Risk Total	NA				Receptor HI Total	***4E+00***

Appendix K Groundwater Statistical Analysis

Appendix K. Evaluation of Fluoride Concentrations in Groundwater Samples from Aluminum City Neighborhood Residential Wells

On behalf of the Columbia Falls Aluminum Company, LLC (CFAC), Roux Associates, Inc. (Roux) performed a statistical evaluation of fluoride concentrations measured in groundwater samples from Aluminum City water supply wells. Aluminum City is a residential neighborhood located adjacent to the southwest corner of the former CFAC aluminum reduction facility (commonly referred to as an aluminum smelter) located in Flathead County, Montana (Site). The Site is the subject on an ongoing Remedial Investigation/Feasibility Study (RI/FS) that is being conducted pursuant to the Administrative Settlement Agreement and Order on Consent dated November 30, 2015, between CFAC and the United States Environmental Protection Agency (USEPA) (Comprehensive Environmental Response, Compensation, and Liability Act [CERCLA] Docket No. 08-2016-0002).

Analyses of quarterly groundwater samples collected from residential water supply wells in the Aluminum City neighborhood have detected the presence of fluoride, a naturally-occurring substance, in concentrations ranging from below laboratory method detection limits (MDLs) to a maximum of 0.28 mg/L. To determine whether fluoride concentrations in groundwater beneath Aluminum City are related to naturally-occurring conditions or should be attributed to historical Site operations, Aluminum City fluoride data was compared with regional groundwater analytical results (specifically, fluoride concentrations in public water supply [PWS] wells for Flathead County, MT).

Groundwater fluoride data from Flathead County PWS wells collected from 2013 to 2016 were obtained from the Montana Department of Environmental Quality (MDEQ) (Table 1a and Table 1b). The MDEQ confirmed that drinking water sources included in the dataset were not fluoridated.[1] Data from the Aluminum City wells were collected in quarterly sampling events from 2014 through 2017 (Table 2a and Table 2b). In order to properly compare the data, the following data preparation process was performed:

- Temporal averages were calculated for each PWS location and for each Aluminum City well and utilized in the below described statistical analysis (Tables 1b and 2b);
- Fluoride concentrations below laboratory MDLs were included in the analysis as one half the reporting limit (0.5 * MDL);
- Field duplicate samples were not included in the Aluminum City dataset;
- There are four instances in the Aluminum City dataset in which a monitoring well has two results for a given date (GW09 on 11/29/2016, GW12 on 07/14/2016, GW12 on 09/07/2016, and GW23 on 03/08/2017). In these instances, the greater of the two values was retained to be conservative; and
- PWS concentrations were reported in milligrams per liter (mg/L), while Aluminum City data was provided in micrograms per liter (µg/L). Aluminum City data was converted to mg/L for the purposes of these analyses.

Summary statistics for the two processed datasets are detailed in the table below.

Temporal Average Statistics	Unit	PWS dataset	AC dataset
Number of observations	Count	117	17
Minimum	mg/L	0.03	0.05
First Quartile	mg/L	0.08	0.07

[1] Email correspondence with Gregory Butts, Field Services Section Supervisor dated February 5, 2018.

Median	mg/L	0.12	0.10
Third Quartile	mg/L	0.15	0.11
Maximum	mg/L	2.75	0.18
Mean	mg/L	0.17	0.10
Standard Deviation	mg/L	0.29	0.04

To compare the means of groundwater fluoride concentrations between samples collected from PWS in Flathead County, MT and samples collected from residential water supply wells in Aluminum City, two-sample t-tests were performed utilizing ProUCL (version 5.1). The null hypothesis of the one-sided two-sample t-test is that the mean fluoride concentration from the PWS dataset is less than or equal to the mean fluoride concentration from the Aluminum City dataset (H_0: $\mu_1 \leq \mu_2$); and the alternative hypothesis is that the mean fluoride concentration from the PWS dataset is greater than the mean fluoride concentration from the Aluminum City dataset (H_A: $\mu_1 > \mu_2$).

First, an F-test for the equality of two variances was performed. The null hypothesis of the F-test is that the variances of the two datasets are equal (H_0: $\sigma_1 = \sigma_2$). There is sufficient evidence (F-statistic = 61.503 | df = 116,16 | p = 0.000) using a significance level $\alpha = 0.05$ to conclude that the variances between the two datasets are not equal. Due to the unequal sample variances, the pooled sample variance method was not utilized for the t-test and, instead, the Welch-Satterthwaite method for two-sample t-tests was employed (Welch's t-test).

Using the one-sided Welch's t-test, the t-statistic is equal to 2.380 (df = 131.5) with p = 0.009. Because the p-value is less than $\alpha = 0.05$, there is sufficient evidence to reject the null hypothesis and conclude that the mean fluoride concentration from the PWS dataset is greater than the mean fluoride concentration from the Aluminum City dataset.

Following the preliminary analysis, the data was evaluated for outliers. Box plots (Figure 1) and Q-Q plots (Figures 2 and 3) were generated to visually identify potential outliers. Three potential upper-tail outliers were visually identified in the PWS dataset; no potential lower-tail PWS outliers were identified. No potential upper- or lower-tail outliers were visually identified in the Aluminum City dataset. Statistical outlier tests were then performed to confirm the identification of potential outliers. Rosner's outlier test was performed on the PWS dataset for the three suspected outliers, and the three greatest fluoride concentrations were identified as potential outliers at the 5% significance level. These potential outliers correspond with temporal averages at the following locations: Montana Academy in Marion, MT; Kila School District No. 20 in Kalispell, MT; and Wettington Water Inc in Kalispell, MT. MDEQ identified two of these regions (the two locations with the greatest fluoride concentrations) as exhibiting naturally occurring elevated fluoride concentrations.[2] For the AC dataset, Dixon's outlier test was performed and no outliers were identified.

When the F-test is performed excluding these outliers from the dataset, the test once again indicates the variances are not equal (F-statistic = 4.183 | df = 113,16 | p = 0.002 at $\alpha = 0.05$). The one-sided Welch's t-test yields a t-statistic equal to 2.435 (df = 40.0) with p = 0.010 at $\alpha = 0.05$. Because the p-value is less than $\alpha = 0.05$, there is sufficient evidence to reject the null hypothesis and conclude that the mean fluoride concentration from the PWS dataset is greater than the mean fluoride concentration from the Aluminum City dataset.

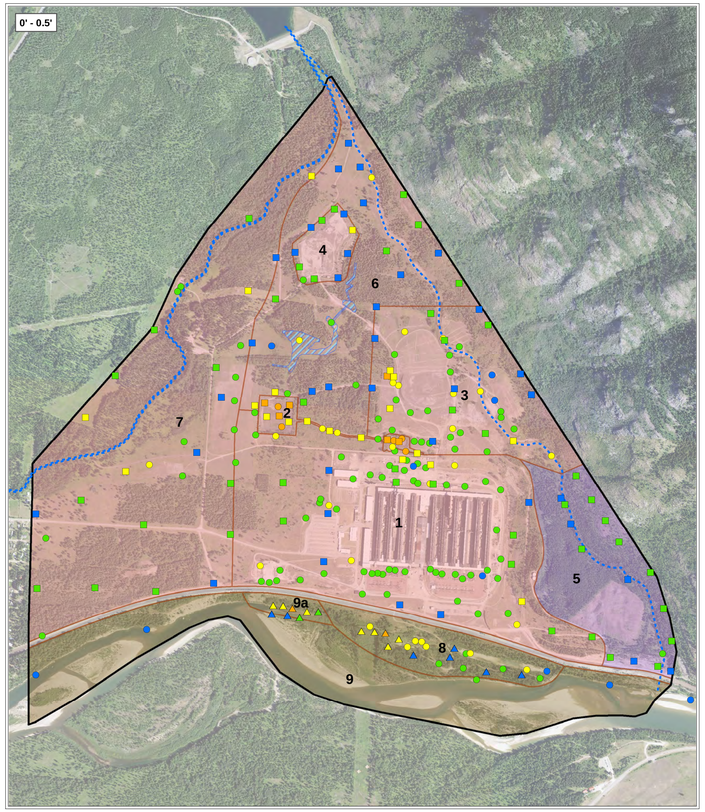
[2] Email correspondence with Gregory Butts, Field Services Section Supervisor dated February 5, 2018.

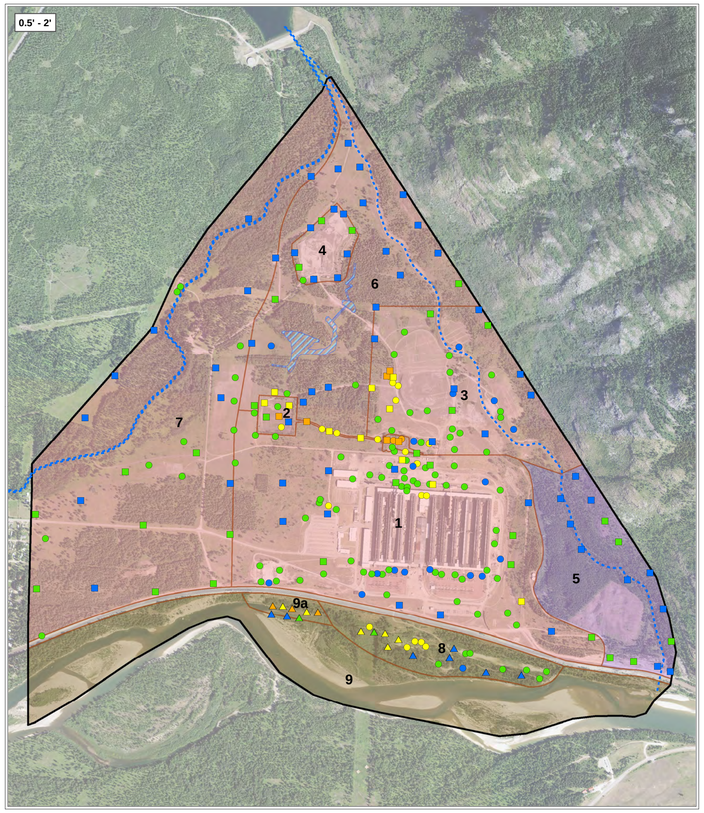
Appendix K. Evaluation of Fluoride Concentrations in Groundwater Samples from Aluminum City Neighborhood Residential Wells

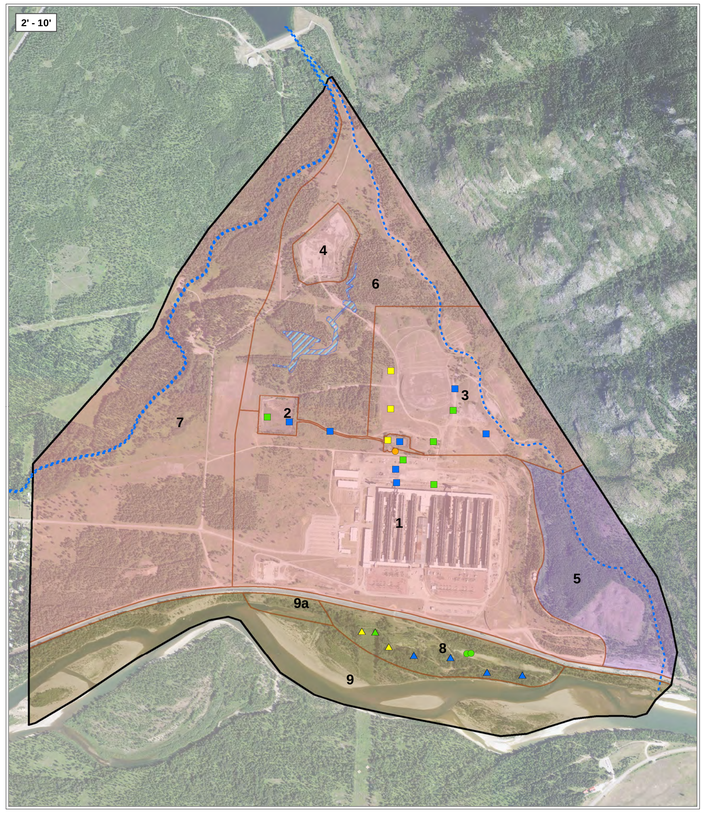
Based on the analyses described herein, Roux Associates is confident in the conclusion that the mean concentration of fluoride in the Aluminum City residential water supply wells is statistically less than the mean concentration of fluoride in other drinking water wells in the region. In addition, hydrogeologic investigations have shown that the flow of groundwater beneath the Site is toward the Flathead River, not towards Aluminum City (see Groundwater/Surface Water Data Summary Report dated March 16, 2018; Roux Associates, 2018). Together, these results provide multiple lines of evidence indicating that fluoride concentrations in groundwater beneath Aluminum City are related to naturally-occurring conditions; not historical operations at the Site.

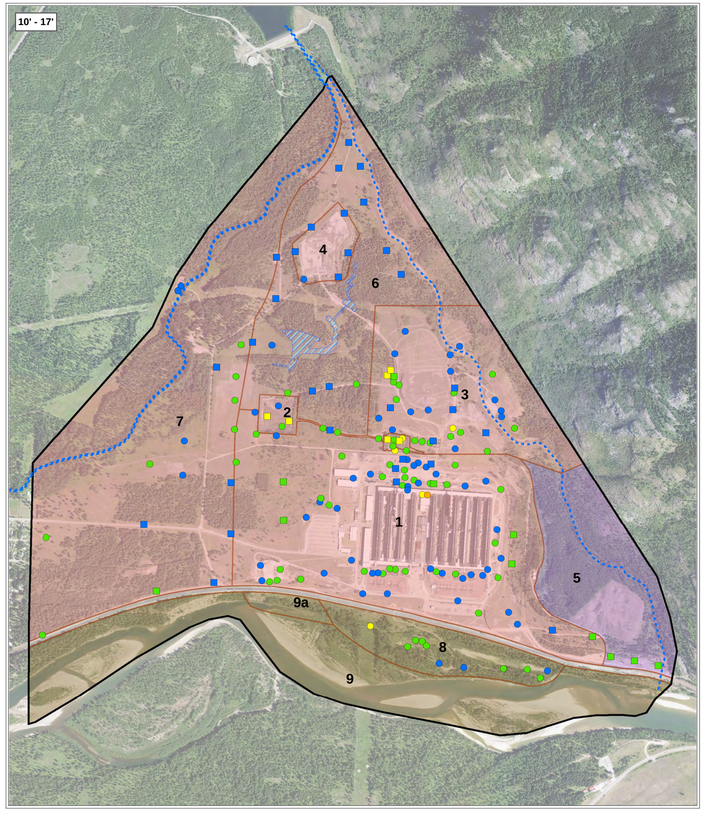
All ProUCL output is provided in Attachment 1.

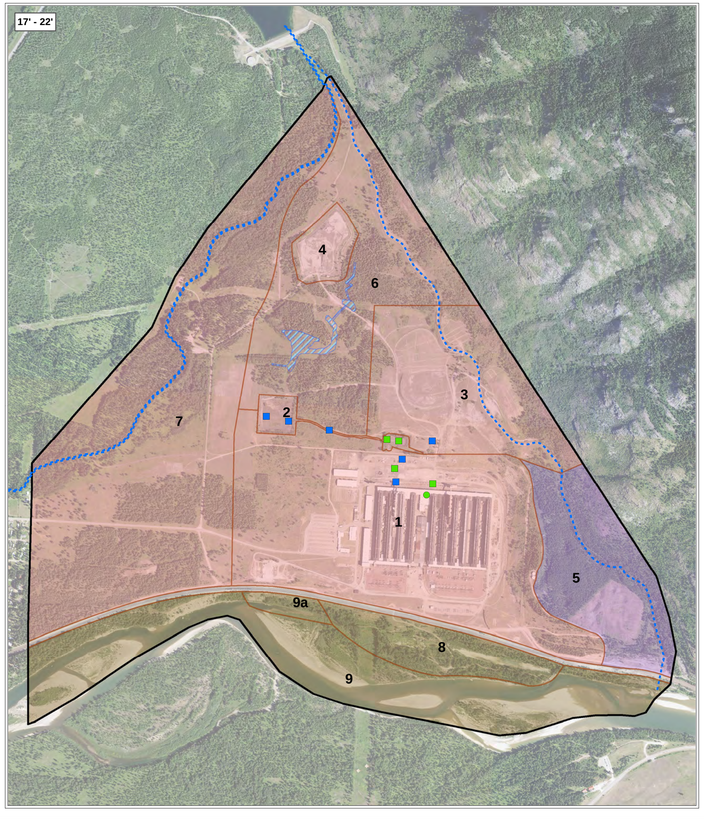
Appendix L Spatial Variability Analysis

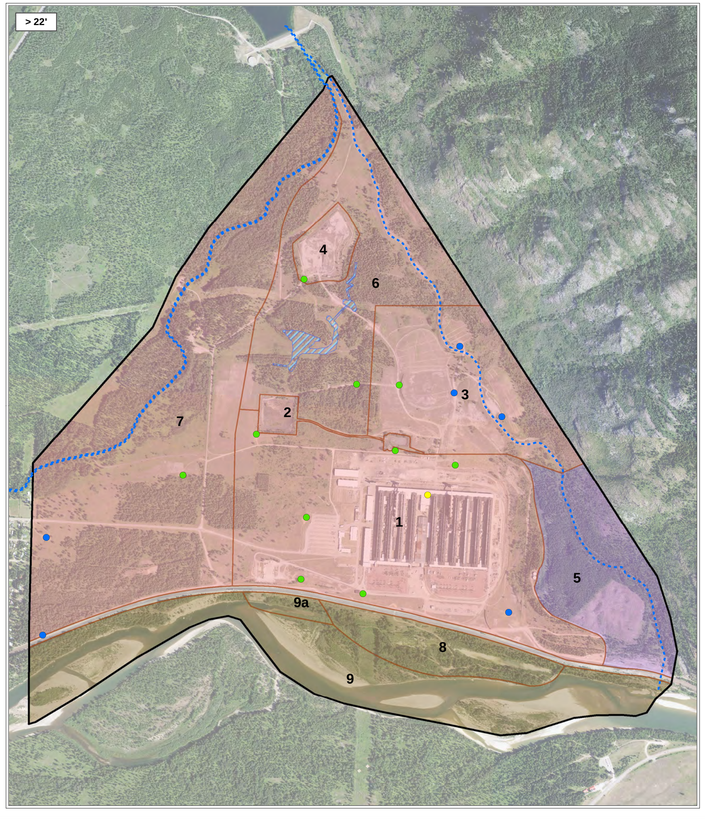












N

CONCENTRATION LEGEND FOR EXPOSURE AREAS – 1, 2, 3, 4, 6, 7

P1	SSPA	P2	
●	▲	■	ANALYTE NOT DETECTED
●	▲	■	ND – 0.273
●	▲	■	0.273 – 2.73
●	▲	■	>2.73

CONCENTRATION LEGEND FOR EXPOSURE AREA – 5

P1	SSPA	P2	
●	▲	■	ANALYTE NOT DETECTED
●	▲	■	ND – 0.793
●	▲	■	0.793 – 7.93
●	▲	■	>7.93

CONCENTRATION LEGEND FOR EXPOSURE AREAS – 8, 9, 9A

P1	SSPA	P2	
●	▲	■	ANALYTE NOT DETECTED
●	▲	■	ND – 0.178
●	▲	■	0.178 – 1.78
●	▲	■	>1.78

SOIL EXPOSURE AREAS #	ASSOCIATED BACKGROUND SOIL REFERENCE AREAS	TOTAL CYANIDE BTV (MG/KG)
1 – MAIN PLANT AREA	SOIL BACKGROUND REFERENCE AREA #1: GLACIAL TILL AND ALLUVIUM	0.273
2 – NORTH PERCOLATION POND AREA		
3 – CENTRAL LANDFILLS AREA		
4 – INDUSTRIAL LANDFILL AREA		
6 – NORTH- CENTRAL UNDEVELOPED AREA		
7 – WESTERN UNDEVELOPED AREA		
5 – EASTERN UNDEVELOPED AREA	SOIL BACKGROUND REFERENCE AREA #4: MOUNTAINOUS LAND WITH GLACIAL DEPOSITS	0.793
8 – SOUTH PERCOLATION POND AREA	SOIL BACKGROUND REFERENCE AREA #2/3: FLUVIAL DEPOSITS AND RIVERWASH	0.178
9 – FLATHEAD RIVER AREA		
9A – BACKWATER SEEP SAMPLING AREA		

*MG/KG – MILLIGRAMS PER KILOGRAM

1,100 0 1,100'

Title:

COMPARISON OF TOTAL CYANIDE CONCENTRATIONS IN SITE-WIDE SOIL TO BACKGROUND THRESHOLD VALUES

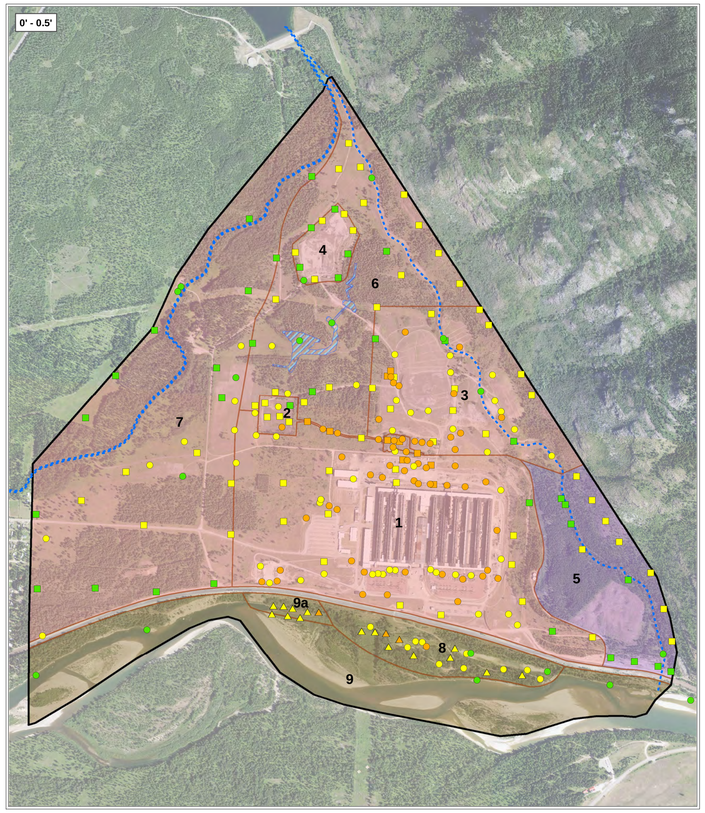
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COLUMBIA FALLS, MONTANA

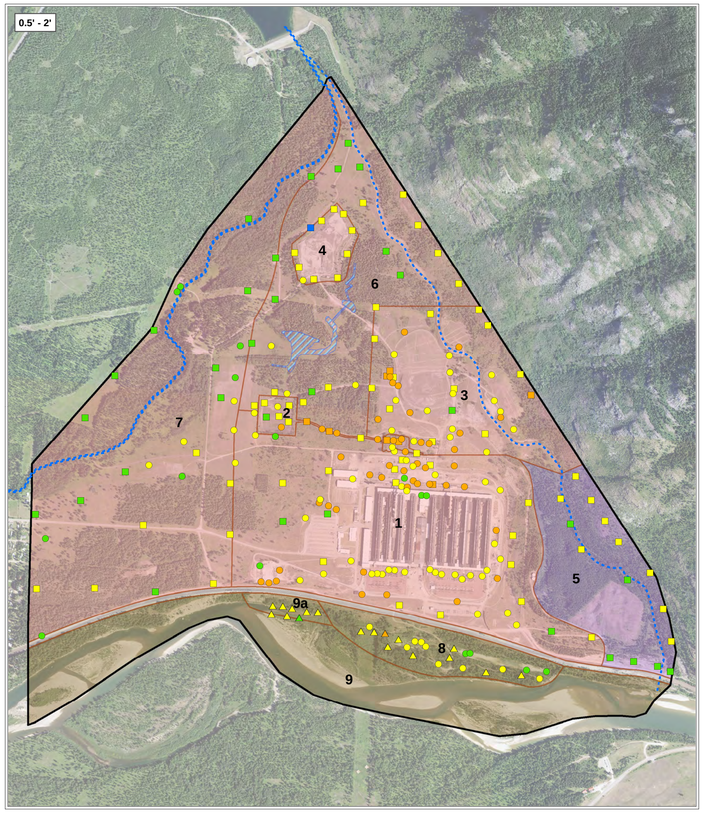
Prepared for:
COLUMBIA FALLS ALUMINUM COMPANY, LLC

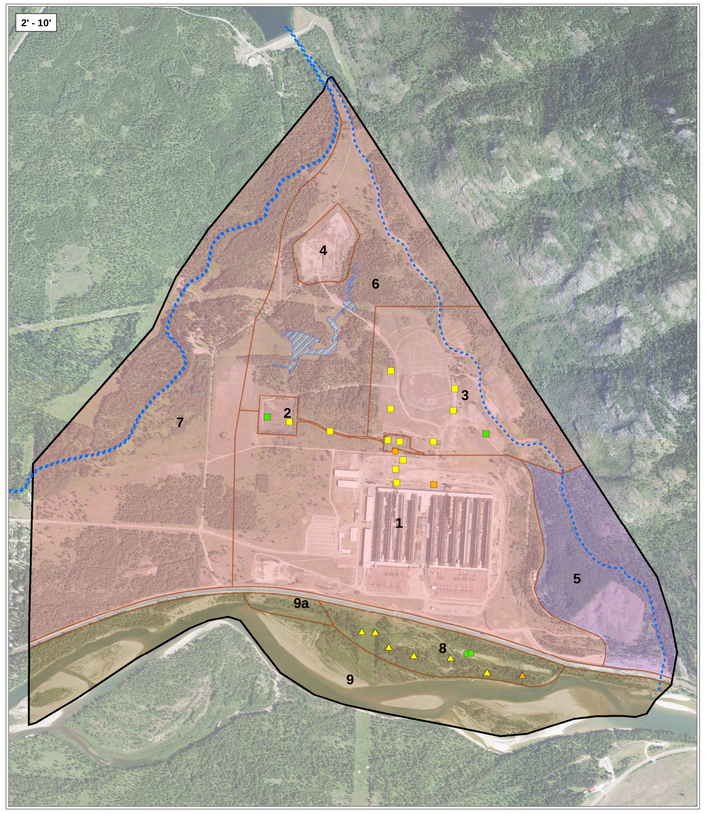
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CONCENTRATION LEGEND FOR EXPOSURE AREAS – 1, 2, 3, 4, 6, 7

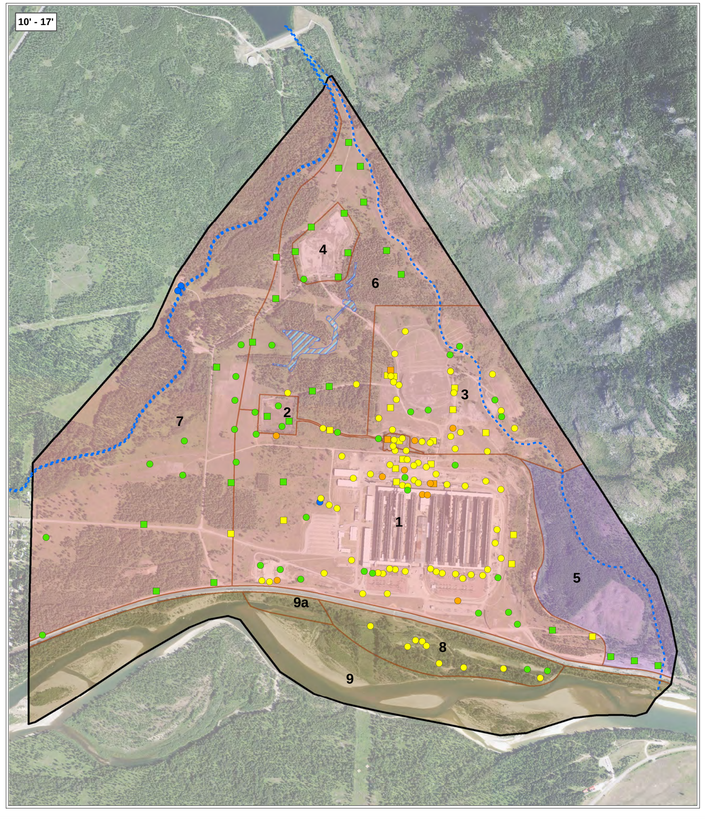
P1	SSPA	P2	
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●	▲	■	ND – 4.171
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●	▲	■	>41.71

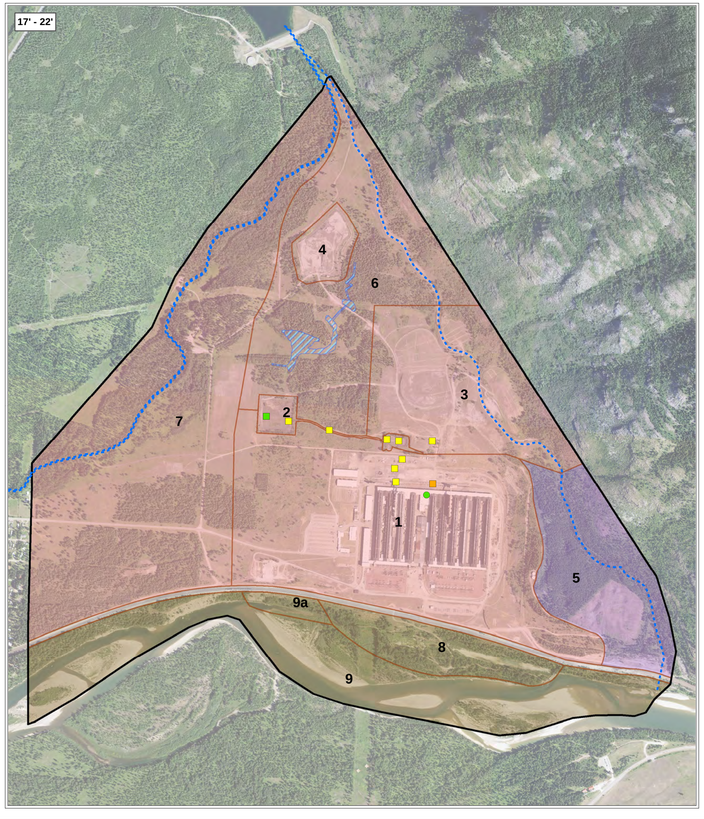
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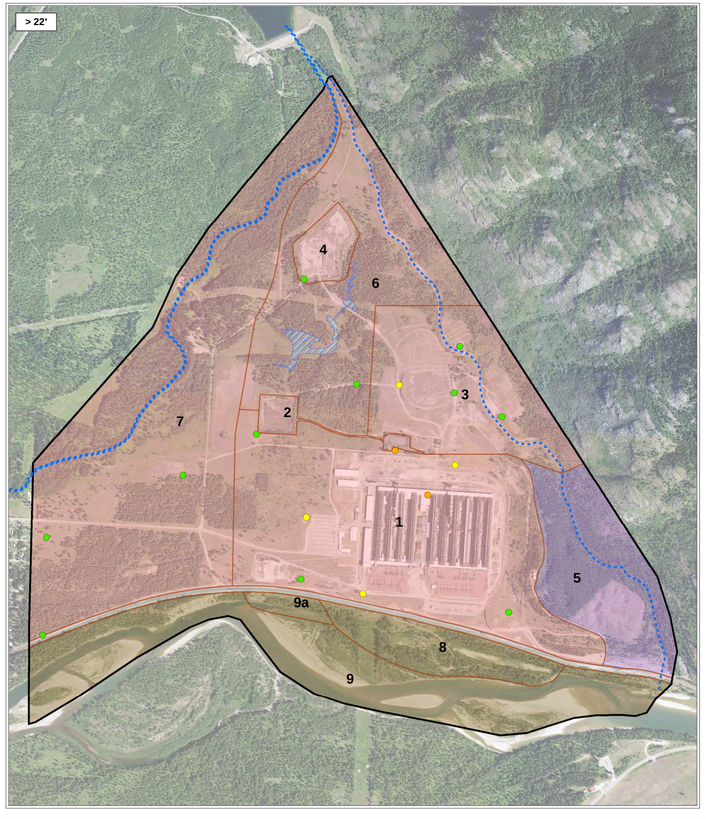
P1	SSPA	P2	
●	▲	■	ANALYTE NOT DETECTED
●	▲	■	ND – 11.29
●	▲	■	11.29 – 112.9
●	▲	■	>112.9

CONCENTRATION LEGEND FOR EXPOSURE AREAS – 8, 9, 9A

P1	SSPA	P2	
●	▲	■	ANALYTE NOT DETECTED
●	▲	■	ND – 2.68
●	▲	■	2.68 – 26.8
●	▲	■	>26.8







SOIL EXPOSURE AREAS #	ASSOCIATED BACKGROUND SOIL REFERENCE AREAS	FLUORIDE BTV (MG/KG)
1 – MAIN PLANT AREA	SOIL BACKGROUND REFERENCE AREA #1: GLACIAL TILL AND ALLUVIUM	4.171
2 – NORTH PERCOLATION POND AREA		
3 – CENTRAL LANDFILLS AREA		
4 – INDUSTRIAL LANDFILL AREA		
6 – NORTH- CENTRAL UNDEVELOPED AREA		
7 – WESTERN UNDEVELOPED AREA		
5 – EASTERN UNDEVELOPED AREA	SOIL BACKGROUND REFERENCE AREA #4: MOUNTAINOUS LAND WITH GLACIAL DEPOSITS	11.29
8 – SOUTH PERCOLATION POND AREA	SOIL BACKGROUND REFERENCE AREA #2/3: FLUVIAL DEPOSITS AND RIVERWASH	2.68
9 – FLATHEAD RIVER AREA		
9A – BACKWATER SEEP SAMPLING AREA		

*MG/KG – MILLIGRAMS PER KILOGRAM

1,100 0 1,100'

Title:

COMPARISON OF FLUORIDE CONCENTRATIONS IN SITE-WIDE SOIL TO BACKGROUND THRESHOLD VALUES

2000 ALUMINUM DRIVE
COLUMBIA FALLS, MONTANA

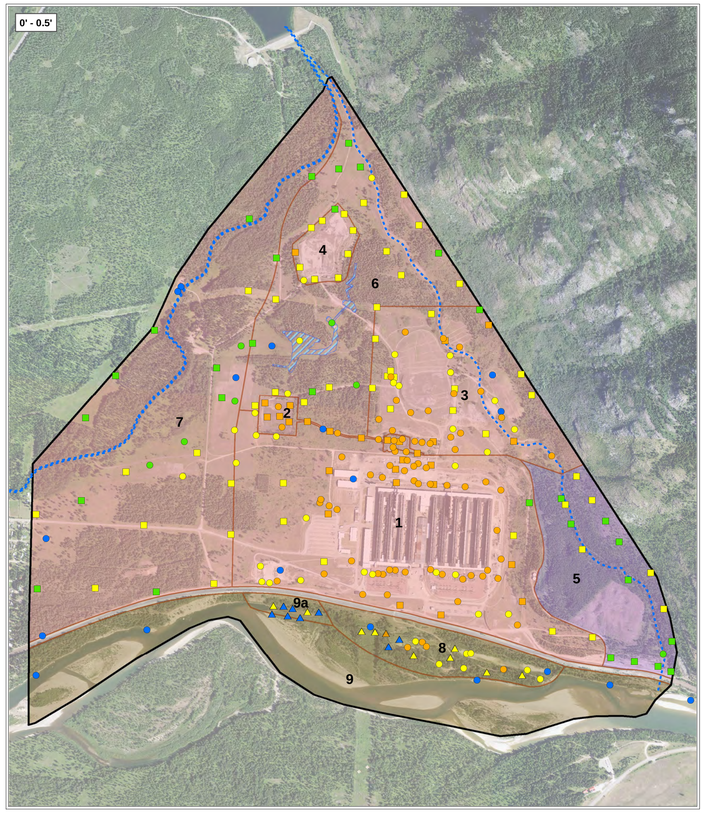
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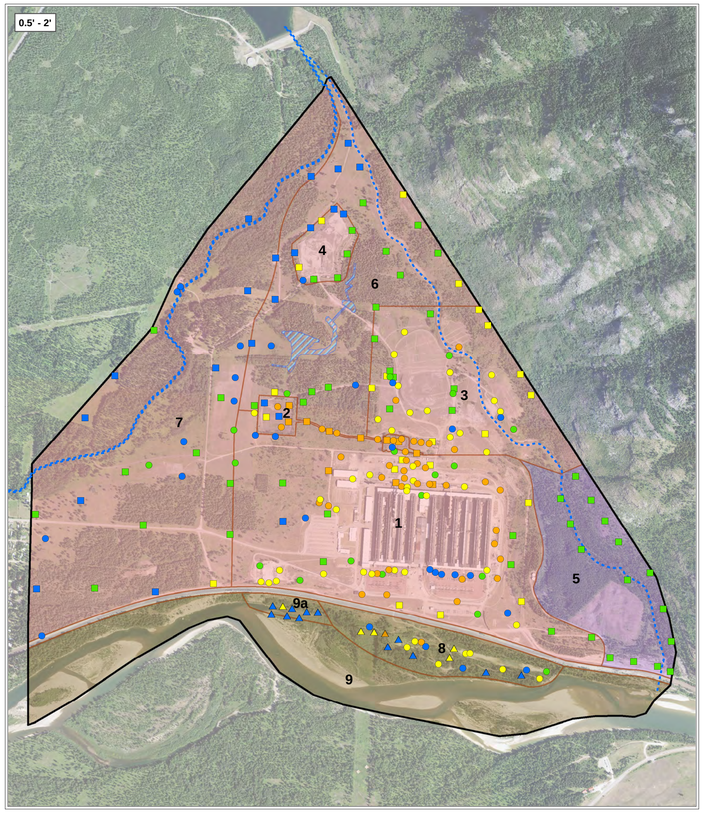
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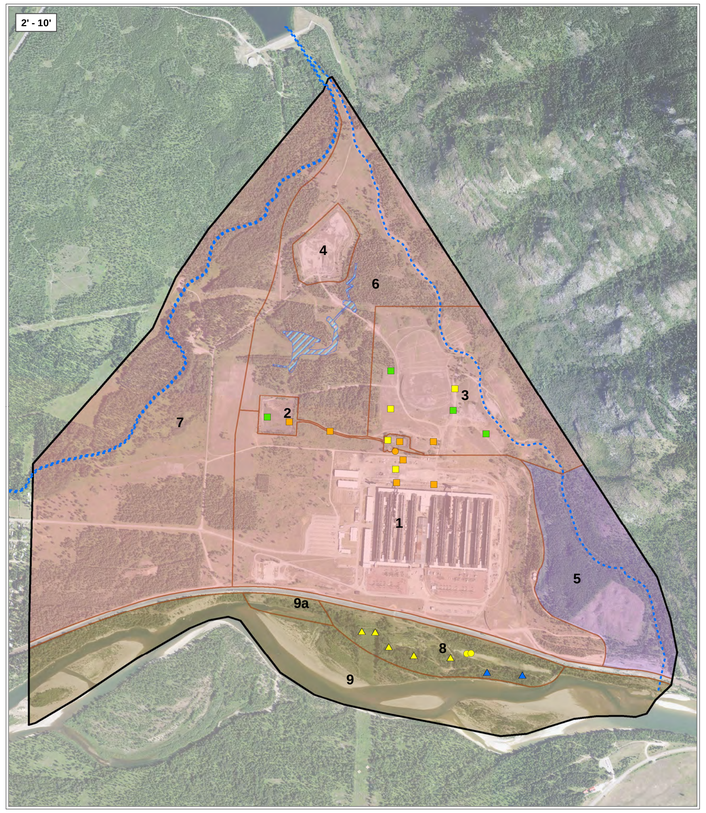
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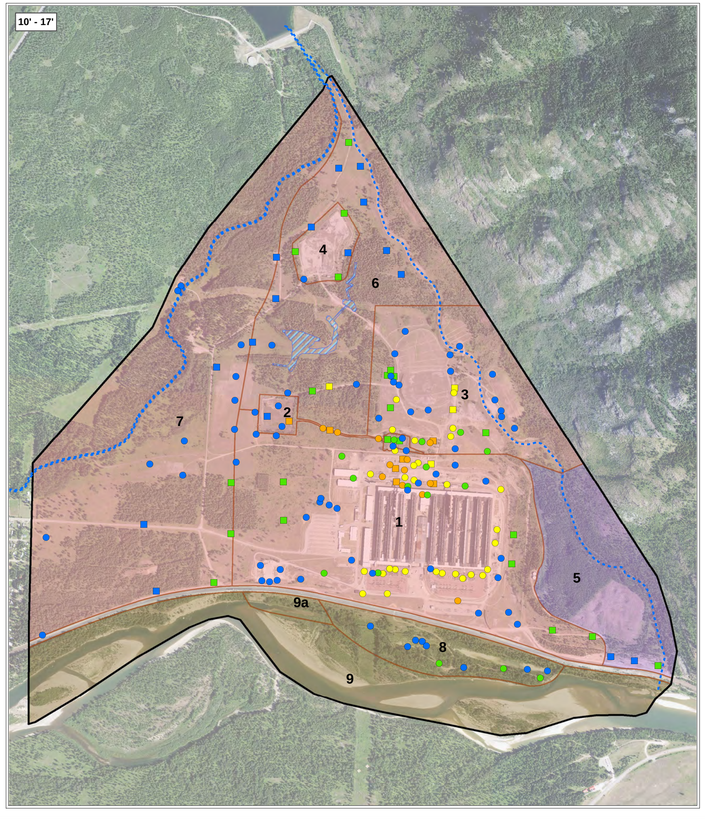
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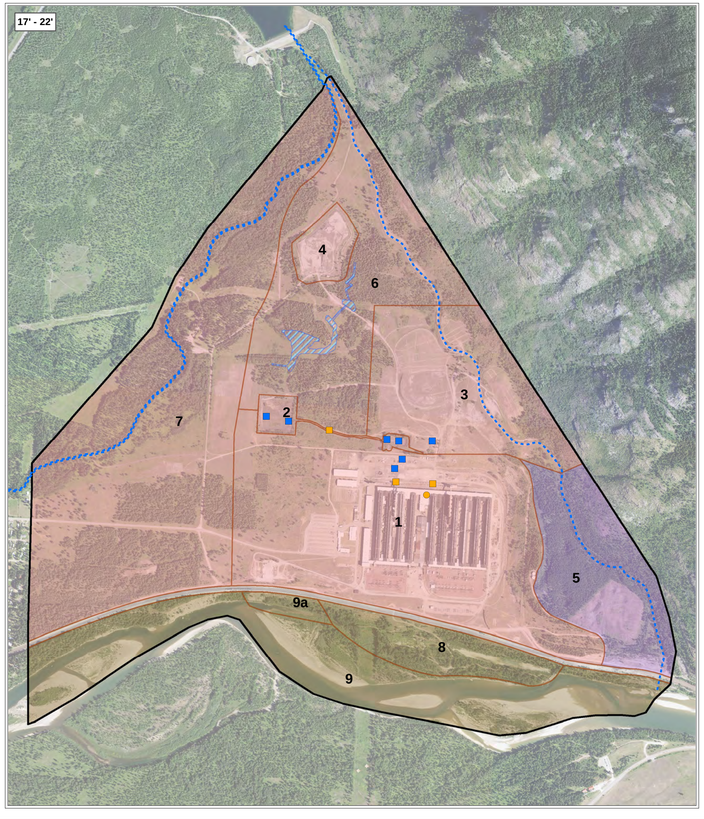
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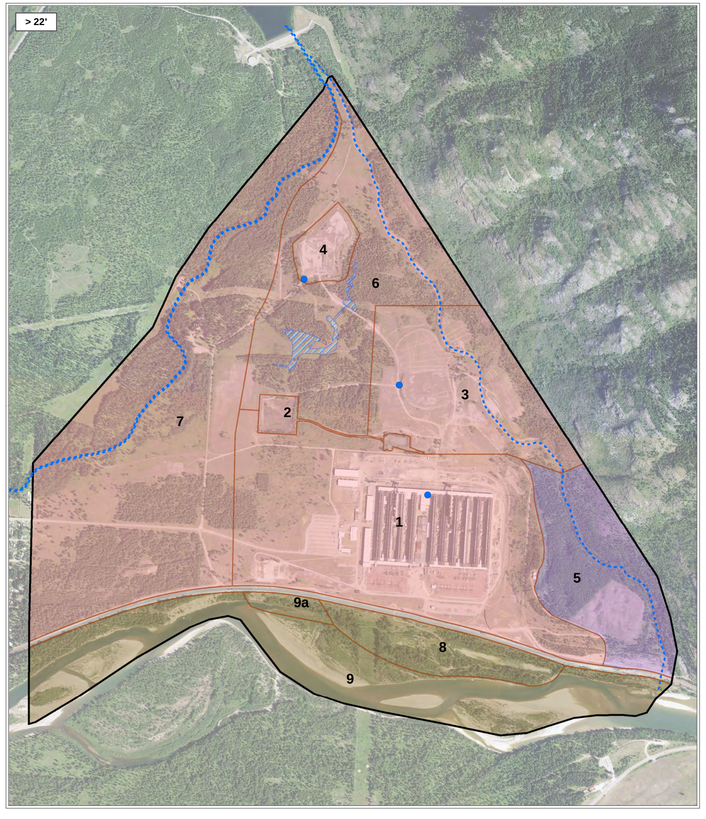












N

CONCENTRATION LEGEND FOR EXPOSURE AREAS – 1, 2, 3, 4, 6, 7

P1 SSPA P2

- ANALYTE NOT DETECTED
- ND – 0.0317
- 0.0317 – 0.317
- >0.317

CONCENTRATION LEGEND FOR EXPOSURE AREA – 5

P1 SSPA P2

- ANALYTE NOT DETECTED
- ND – 0.409
- 0.409 – 4.09
- >4.09

CONCENTRATION LEGEND FOR EXPOSURE AREAS – 8, 9, 9A

P1 SSPA P2

- ANALYTE NOT DETECTED
- ND – 0.0205
- 0.0205 – 0.205
- >0.205

SOIL EXPOSURE AREAS #	ASSOCIATED BACKGROUND SOIL REFERENCE AREAS	BENZO(A)PYRENE BTV (MG/KG)
1 – MAIN PLANT AREA	SOIL BACKGROUND REFERENCE AREA #1: GLACIAL TILL AND ALLUVIUM	0.0317
2 – NORTH PERCOLATION POND AREA		
3 – CENTRAL LANDFILLS AREA		
4 – INDUSTRIAL LANDFILL AREA		
6 – NORTH- CENTRAL UNDEVELOPED AREA		
7 – WESTERN UNDEVELOPED AREA		
5 – EASTERN UNDEVELOPED AREA	SOIL BACKGROUND REFERENCE AREA #4: MOUNTAINOUS LAND WITH GLACIAL DEPOSITS	0.409
8 – SOUTH PERCOLATION POND AREA	SOIL BACKGROUND REFERENCE AREA #2/3: FLUVIAL DEPOSITS AND RIVERWASH	0.0205
9 – FLATHEAD RIVER AREA		
9A – BACKWATER SEEP SAMPLING AREA		

*MG/KG – MILLIGRAMS PER KILOGRAM

1,100 0 1,100'

Title: **COMPARISON OF BENZO[A]PYRENE CONCENTRATIONS IN SITE-WIDE SOIL TO BACKGROUND THRESHOLD VALUES**

2000 ALUMINUM DRIVE
COLUMBIA FALLS, MONTANA

Prepared for:
COLUMBIA FALLS ALUMINUM COMPANY, LLC

ROUX

Compiled by: L.J.	Date: 06/25/19
Prepared by: M.S.R.	Scale: AS SHOWN
Project Mgr: M.R.	Project: 2476.0001Y006
File: 2476.0001Y247.3.mxd	

RTC PLATE L-3

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